

Promoting childhood nutrition through primary schools – A complex analysis of policy options

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Abstract

The negative social, educational and health consequences of obesity for children have been well documented, with downstream impacts on chronic disease for adults. A diet high in energy-dense nutrient-poor foods, and low in nutritious foods, is an important contributor to obesity. Such diets tend to have negative health and educational outcomes for children.

Childhood nutrition can be considered a complex system, with many influences on children's diets across home, community and school settings. Schools are often identified as a site for interventions to promote healthy diets. However, given the complexity of influences, the impact of school based actions is likely to be limited.

The first aim of this study was to identify a 'portfolio' of interventions across school, home and community settings that, taken together, will support primary schools to effectively promote healthy nutrition. Informed by complexity theory, a policy research method of analysis was developed. The research method sought to combine an understanding of case study primary school food environment 'systems', with the views of policymakers. Testing the research method for use in policy analysis of complex issues was the second aim of this study.

The food environments of five case study primary schools within the Wellington region of New Zealand were mapped using interview, documentary and observational data. Intervention options to improve the school food environment were identified across case studies, with support for interventions gathered from school principals. Interviews with sixteen policymakers considered the national level context of interventions.

To inform implementation, identified interventions were prioritised based on: (i) the level of support from case study school principals and policymakers; (ii) evidence of effectiveness from international literature; and (iii) theoretical likelihood of impacting on the complex system of childhood nutrition.

The top identified priority was to encourage schools to develop food policies that would promote consumption of healthy foods and minimise unhealthy foods within the school. Such school policies can be supported with external expertise, nutrition focused health

promotion programmes such as Fruit in Schools, and policy settings that direct schools to consider nutrition issues. Second and third priorities focus on home and community environments and include restricting food marketing to children, increasing the affordability of healthy foods, and social marketing campaigns. Comprehensive actions across policy settings are required for effective healthy nutrition promotion within primary schools.

Overall, the method proved to be useful for identifying intervention options to address complex policy issue. A manageable portfolio of interventions was identified to work across the systems under study. A number of tensions were evident within the complexity theory informed research method used for this study. These tensions included: balancing central government planning with flexibility at the community level; capturing enough information to adequately understand the entire ‘child nutrition system’; and the degree to which a ‘system perspective’ challenges the current machinery of government.

In conclusion, improving child nutrition is a significant public policy issue. Taking a complexity theory perspective to policy research and analysis aided development of a portfolio of interventions to impact widely across the ‘system’, from which child nutrition practices ‘emerge’. Taken together the interventions are likely to act to support schools to improve their food environments and effectively promote healthy nutrition. The results are a starting point for detailed policy design. This research suggests that the analysis method used deserves further investigation and refinement. The test for policymakers will be to develop cost effective interventions, which take account of local complexities, within a government system that favours linear programme logic and accountability lines.

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Glossary

Board of Trustees

All state funded schools in New Zealand are governed by a Board of Trustees. The board consists of the school principal, a teacher representative and elected parent representatives. In some secondary schools a student representative is also included.

Decile

The school decile is a ranking of a school's socioeconomic position. Decile one represents the ten percent of schools with the greatest proportion of students from the most socially deprived neighbourhoods, while decile ten represents the ten percent of schools with the lowest proportion of students from such neighbourhoods. The decile is calculated using population census data of the areas in which a school's student population lives. The decile calculation includes: household income; occupation; household crowding; educational qualifications; and income support recipients. Schools receive different levels of funding per student depending of their decile classification.

District Health Boards (DHBs)

District Health Boards (DHBs) have devolved responsibility for planning, providing or funding primary, secondary and tertiary health services for a defined geographical region. The Boards are made up of a mixture of locally elected representatives and government appointed members. There are 21 DHBs in New Zealand.

Food and Beverage Classification System

In 2008 the Ministry of Education released a Food and Beverage Classification System for schools. This was to support schools to implement the NAG 5. The system has three categories for food: everyday; sometimes; and occasional. The system recommends that sometimes food items do not dominate lunch menus, and that occasional items should not be restricted to about one per school term.

Kai

Te reo Māori word for food.

Kaitiakitanga

Te reo Māori word meaning guardianship and sustainability.

Kaumātua

Te reo Māori word referring to elders who often play a role in guiding and teaching.

Mahinga kai

Te reo Māori word referring to traditional forms of food gathering and harvesting.

Manaakitanga

Te reo Māori word meaning hospitality.

Māori

Indigenous people of New Zealand.

National Administration Guideline (NAG / NAG 5)

The National Administration Guideline is a set of requirements regarding teaching and management to be met by a School's Board of Trustees. The NAG 5 was introduced in June 2008 and required schools to promote healthy nutrition and when selling food at school, make only healthy options available. The requirement to make only health options available for sale was removed in February 2009.

Pacific ethnicity

People from Pacific islands (e.g. Samoa, Tonga, Cook Islands, Fiji, Niue, Tokelau), are the largest non-European and non-indigenous population grouping in New Zealand. This includes people who have directly migrated from Pacific islands and their descendants.

Primary School

Schools for children aged from five to twelve. Some primary schools only cater for children aged five to ten.

Tikanga Māori

Traditional Māori customs.

Treaty of Waitangi / Te Tiriti o Waitangi

Founding document of New Zealand, signed in 1840 between the British Crown and many of the Māori tribes (iwi). The Treaty set out respective rights, responsibilities and how the relationship between the parties should be maintained. Different understandings of the Treaty have been a source of debate. Many people, Māori in particular, consider that the Treaty has not been upheld for much of its history. The Treaty has recently been an important consideration in designing public policy in New Zealand.

Whānau

Te reo Māori word for family, usually meaning an extended family group (e.g. grandparents, aunts/uncles).

Complexity terms

Attractor state

An attractor is a pattern that depicts the behaviour of a system over time. There are various different types of attractor states, depending on the pattern of system movement. An attractor state can show a relatively stable pattern of behaviour, which suggests that the complex system has some stability. For this research, attractor state is being used to refer to a stable configuration of a complex system more than the pattern of system behaviour, and could be referred to as ‘phase state’.

Bifurcation

Bifurcation describes the process of change between attractor states of a complex system. At the point of change a complex system will have one or a series of fork like paths the system could move to. The paths represent ‘adjacent possibilities’. When change or bifurcation, occurs small differences in the control parameters determine which path the system follows.

Complex system

A complex system contains many interacting elements, often including other complex systems, and is considered to be open to its environment. Social phenomena can be considered to ‘emerge’ from complex systems as a whole, and therefore cannot be understood through reducing the system to its constituent parts. Complex systems have

certain properties, including: non-linear interactions; path dependence; feedback; and sensitivity to initial conditions.

Control parameters

Control parameters act to determine the range of possible states a system can move to at point of bifurcation. They are said to act as an external input into the system. For this research they are also considered to be highly linked within a system and to be key targets for policy interventions.

Emergence

The behaviour of a system operating as a whole are said to be ‘emergent’ properties. To understand emergent properties of a complex system, the system as a whole should be understood, and not reduced to its constituent parts.

Feedback

Feedback describes the nature of the relationships between elements within a complex system, or with the emergent property of a system with the system from which it emerged. There are two types of feedback commonly described. Negative feedback acts to dampen down change within a system, such as a thermostat regulating heat. Positive feedback acts to amplify change, which may lead to bifurcation and system wide change.

Initial conditions

Chaotic systems are said to be sensitive to initial conditions. Due to non-linear dynamics in chaotic or complex systems, small changes in the initial conditions of a system can lead to large differences in how a system develops over time and a system’s emergent properties. Weather systems are often used to describe sensitivity to initial conditions. Sensitivity to initial conditions suggests that prediction of a complex system over time is difficult if not impossible.

Phase Space

Phase space is a conceptual space within which system attractors reside. The area within a phase (or state) space contains the possible locations for a system attractor to move to over time.

Chapter One

Introduction: Defining a policy problem situation

An epidemic of obesity threatens to undo the significant progress made in improving our health and our quality of life. More than 50 per cent of New Zealanders are now either overweight or obese. Most alarmingly, more than 30 per cent of our children can already be classified the same.

Statement by the Prime Minister of New Zealand Helen Clark (2006)

1.1 Thesis overview

This thesis aims to provide public policy options to support New Zealand primary schools to promote healthy childhood nutrition. The second aim of this thesis is to explore the use of complexity theory (Byrne, 2005a) for identifying and researching policy interventions to address complex issues, like childhood nutrition and obesity.

To achieve these two research aims, a number of research objectives were identified. These were to:

- Develop a policy research method informed by complexity theory
- Develop a theoretical model of the ‘child nutrition system’ to guide data collection and analysis
- Identify the range of influences at a national, community and primary school level that act as barriers or supports to promoting nutrition in primary schools
- Identify policy intervention options at community and national levels to support primary schools in improving childhood nutrition
- Identify policy intervention options to impact on the ‘child nutrition system’ to promote healthy child nutrition
- Critically reflect on the research method used, and recommend development areas and further research.

Healthy childhood nutrition is crucial for a nation’s health and economy. Improving children’s diet is assumed to reduce excess weight gain (overweight and obesity) in

childhood, adolescence and adulthood (Swinburn, Jolley, Kremer et al., 2006; Wang & Beydoun, 2007). Poor diet and excess weight are key risk factors for chronic disease in adolescence and adulthood (Flynn, McNeil, Maloff et al., 2006), such as diabetes mellitus type 2 (Ogden, Yanovski, Carroll et al., 2007) and cardiovascular disease (Reilly, 2005). Children's nutrition is not only a health issue. School attendance and academic achievement have also been associated with nutrition practices (Ball, Watts, & Quigley, 2005; Datar & Sturm, 2006; Murphy, 2007).

The burden of obesity on population health, and health systems, has thrust nutrition and obesity into the domain of government policy, both in New Zealand (Ministry of Health, 2000, 2003b), and internationally (Lobstein & Baur, 2005; World Health Organization, 2004). Both the population health impacts and the economic cost of treatment and lost productivity are cited as drivers of policy action (Department of Health, 2004; Ministry of Social Development, 2004; World Health Organization, 2004). There is much debate, however, regarding the most appropriate policy response to improve diets and prevent excess weight gain (Health Select Committee, 2007; Lang & Rayner, 2007). One area of relative agreement is focussing on children and schools as a setting for interventions (Lang, Dowler, & Hunter, 2006; Longley & Sneed, 2009; Ministry of Health, 2003b; Story, Kaphingst, & French, 2006).

To justify a complexity theory informed research method, the issues of childhood nutrition, overweight and obesity must themselves be complex. The drivers of children's diets and causes of obesity are considered to be multiple and complex (Butland, Jebb, Kopelman et al., 2007; Finegood, Karanfil, & Matteson, 2008; Story, Kaphingst, Robinson-O'Brien et al., 2008; Swinburn, Egger, & Raza, 1999), with increasing recognition that individual level factors are inadequate to explain rising rates of obesity (van der Horst, Oenema, Ferreira et al., 2007). Individual focussed interventions seem unable to halt and reverse current trends in obesity and related chronic disease (Caraher & Coveney, 2004; Lang & Rayner, 2005).

The conceptualisation of obesity as a 'complex' issue will be further explored in Chapter 2, with an introduction to the concepts behind complexity theory. Chapter 3 provides a review of complexity theory and related policy analysis methods, to develop a complex approach to policy analysis. Chapter 4 discusses the five stage research method used for

this research, including case studies of primary schools and key informant interviews with policymakers.

Chapter 5 provides a working model of the ‘child nutrition system’ based on a narrative review of child nutrition and obesity literature. This is used to inform primary school case study data collection, the results of which are presented in Chapter 6. Chapter 7 provides a case comparison analysis between case study primary schools, with the aim of further understanding barriers and required supports for primary schools to promote healthy childhood nutrition. The results of 16 interviews with policymakers are presented in Chapter 8. In Chapter 9, the case study and policymaker interview results are considered in light of international research literature, to identify a set of interventions to include within an intervention ‘portfolio’. Taken together, it is proposed the portfolio of interventions should act to change the child nutrition system, with a resultant improvement in children’s diets.

The thesis concludes in Chapter 10 with a discussion of how the interventions identified to support primary schools to promote healthy nutrition, and improve children’s diets at school, may also impact on the wider ‘child nutrition system’. Chapter 10 also considers the utility of the research method developed for this study. This is done by considering the strengths and weaknesses of the method, and implications for a complexity theory informed approach to policy analysis.

The remainder of this introductory chapter provides valuable background information for this thesis. It defines childhood obesity and the contribution of nutrition to obesity, considers the health burden of childhood obesity, outlines recent policy initiatives regarding child nutrition and obesity in New Zealand, and profiles New Zealand primary schools.

1.2 Defining childhood overweight and obesity

Overweight and obesity can be defined as an excess of body fat (Ogden et al., 2007). It is considered that disease risk associated with excess weight begins to increase when an individual is overweight, and accelerates as more weight is gained (Reilly, 2005; World Cancer Research Fund / American Institute for Cancer Research, 2009). As body fat is difficult to measure directly (Ogden et al., 2007), body mass index (BMI) is often used as an estimation of body fat (Anderson & Butcher, 2006).

BMI is calculated by dividing weight (in kilograms) by height (in metres) squared (Sattar & Lean, 2007). What is considered a 'normal' BMI for children changes with age and gender. Therefore overweight is usually defined as a BMI equal or greater than the 85th percentile, with obesity the 95th percentile, of a reference population (Reilly, 2005; Sattar & Lean, 2007). There are some areas of debate within the definition of obesity. First, as the categorisation of a child as obese is made by comparing their BMI against a reference population, different reference populations will produce a categorisation of obesity at different BMI values (Ogden et al., 2007). This makes comparing the prevalence of obesity between populations difficult if different reference populations have been used. There is some debate as to which reference populations should be the standard (Ogden et al., 2007).

BMI does not measure body fatness directly, and does not distinguish between fat mass and fat-free mass, namely muscle (Eisenmann, 2006). In New Zealand there is some debate regarding the appropriateness of BMI cut off points for children of Pacific ethnicities. One reason is because at the same BMI, adults of Pacific ethnicities are generally leaner (less fat) than their European counterparts (Utter, Scragg, Schaaf et al., 2007c). Rush et al (2003) considered whether BMI is an appropriate measure of fatness in a population containing children of Māori, Pacific, and European ethnicities. Body fatness was measured using bioelectrical impedance and then compared against BMI measurements for a sample of children. The study conclusion was that BMI is not an appropriate measure for girls aged between 5-14 years, due to lower percentages of body fat at a given weight between Māori and Pacific ethnicities, compared with girls of European ethnicity.

While the debate regarding measurement of overweight and obesity is important for any national monitoring or screening efforts (Ministry of Health, 2006a), it has few implications for this current study. The debate does, however, suggest caution should be exercised when interpreting research findings of school or child nutrition and related obesity interventions. If BMI is the main outcome measure, there may be some uncertainty regarding the impact the intervention has actually had (e.g. decrease in muscle or body fat).

1.2.1 The role of nutrition in obesity, disease and education

This research focuses on improving children's diets, or nutrition practices. If children's diets can be improved, then there are possible downstream impacts on preventing excess weight gain, reducing chronic disease risk, and increasing educational achievement.

Nutritional intakes and physical activity are considered to be independent risk factors for excess weight gain (Astrup, 1999; Swinburn & Egger, 2004). Nutrition and physical activity practices have also been linked with risk of chronic disease, such as cardiovascular disease and some cancers, independently of overweight or obesity (Egger & Dixon, 2009; Seidell & Visscher, 2004; Wardley, Puntis, & Taitz, 1997; World Cancer Research Fund / American Institute for Cancer Research, 2009).

Children's nutrition practices may also be linked with educational achievement. A rapid review of literature has found consistent evidence between cross-sectional, longitudinal, and evaluation studies that nutritionally poor diets were associated with lower academic achievement for children (Ball et al., 2005). The same review concluded that, while several studies report inverse associations between obesity and academic performance, once cofounders are taken into account there appears to be little independent effect of obesity (Ball et al., 2005). Whether children have breakfast, or not, seems to provide the most consistent link with both school attendance, and educational achievement (Murphy, 2007; National Children's Bureau, 2004; School Food Trust, 2008).

While the research evidence suggests that both nutrition and physical activity play a part in excess weight gain and risk of chronic disease, this research only considers children's nutrition (diets). Within this, the main focus is on what children eat while at school, and what contributes to diets at school (e.g. food availability, household food security, or food marketing – see Chapter 5).

There is some research to suggest that nutrition is more important than physical activity for prevention of overweight and obesity. For example, Swinburn et al (2006) developed a model of population effects of nutrition compared with physical activity for children. The study concluded that a daily reduction of energy intake equivalent to 450 ml of soft drink over the study population, would reduce mean weight by 1.4 kg. To achieve the equivalent weight reduction through physical activity would require 2.5 hours a day more walking. This model suggests that changing the dietary behaviours of children is likely

to be easier than changing physical activity behaviours. Harris et al. (2009), conducted a systematic review of randomised controlled trials involving physical activity within schools. Of the 18 studies reviewed there was no consistent effect on BMI.

Most authors, however, suggest that both nutrition and physical activity interventions are required for population wide prevention of overweight, obesity, cardiovascular disease and other chronic illness (Leviton, 2008; Story et al., 2008; Swinburn & Egger, 2002; World Health Organization, 2004). While nutrition is the focus of this current research, it is assumed that interventions to increase physical activity for children will also be required in a comprehensive approach to preventing overweight and obesity.

1.2.2 The burden of childhood nutrition, overweight and obesity

1.2.2.1 Rates of overweight and obesity

Overweight and obesity is a growing issue internationally. Health data collated by the Organization for Economic Development and Co-operation (OECD) suggests that obesity is increasing among adults across all 30 member countries (OECD, 2009). New Zealand ranks as having the third highest rate of adult obesity across the 30 OECD countries at 26.5 percent in 2007, behind the US (34.3 percent in 2006) and Mexico (30.0 percent in 2006). The report does note that data from many of the 30 member countries is based on self-reported height and weight (to calculate BMI), where as in New Zealand, Australia and the US, national surveys are conducted that include measurement of participant height and weight. Self reported data may underestimate obesity (OECD, 2009).

Amongst children, a study comparing trend data on overweight and obesity prevalence, by Wang and Lobstein (2006), concluded that childhood obesity prevalence 'is increasing in almost all industrialized countries for which data are available, and in several lower-income countries' (p 13). A weakness of this comparison is the data used ranged in terms of: age groups included; whether the samples represented national or regional populations; and in the reference populations used for overweight and obesity BMI cut off values. Even though accurate international comparisons are difficult, the International Obesity Taskforce has concluded that the combined prevalence of child overweight and obesity is over 20 percent across the World Health Organization regions

of the Americas, Mediterranean, Europe, and the Pacific (International Obesity Taskforce, 2007).

An International Obesity Task Force estimation in 2004 suggested that, worldwide, ten percent of school aged children were overweight or obese (Lobstein, Baur, & Uauy, 2004). The US had the highest reported combined prevalence of overweight and obesity, with 35 percent and 36 percent of 6 to 17 year old boys and girls respectively classified as such in 2003/04 (International Obesity Taskforce, 2007). In New Zealand for comparison, the 5 to 14 year old population combined overweight and obesity prevalence was 26 percent and 32 percent for boys and girls respectively in 2002 (Parnell, Scragg, Wilson et al., 2003). Even if the estimates are not completely comparable due to differing data collection methods between countries, the data suggests that interventions to prevent excess weight gain are required in much of the world, including New Zealand.

For New Zealand two representative population surveys provide high quality data regarding overweight and obesity (as measured by BMI). Table 1-1 below shows the percentage of children in the normal, overweight and obese BMI ranges, for Māori, Pacific and the total population, for the 2002 New Zealand Children's Nutrition Survey and the 2006/07 New Zealand Health Survey (for children aged 5-14 years). While the sampling frames used between the surveys do differ, both are designed to be representative of the national population. The 2002 Children's Nutrition Survey sampling frame was all schools in New Zealand, from which a random sample of schools were drawn, with students then randomly sampled within schools. The 2006/07 New Zealand Health Survey sample frame consisted of all census small geographical area units (meshblock), from which a random sample of meshblocks were selected, and a random sample of households selected within meshblock. As schools generally draw from a local geographical area, both sampling methods first select small geographical areas from which to then select households. The same Cole et al. (2000) BMI cut off points, as well as height and weight measurement methods were used between surveys. Both surveys also over sampled for Māori and Pacific participants, to increase confidence when comparing between ethnic groups. While the ages of children included in both surveys differ slightly, for the use of the data here, the survey results can be considered highly comparable.

Table 1-1 shows that, for both the 2002 and 2006/07 surveys, more girls tend to be overweight and obese than boys, and that children of Pacific ethnicities have the highest prevalence of overweight and obesity, followed by Māori children, compared to the total population. Table 1-1 shows that the proportion of Māori and Pacific boys categorised as overweight increased from 2002 to 2006/07, while the proportion of Pacific girls classified as obese increased slightly. The proportion of Māori, Pacific and total girls classified as overweight reduced between the two surveys. With the exception of Pacific girls, there was a trend of reduced proportion of children classified as obese in 2006/07 compared to 2002.

Table 1-1– Age-standardised BMI range prevalence for children in New Zealand in 2002 and 2006/07*

	Māori		Pacific		Total	
	2002 Childhood Nutrition Survey	2006/07 New Zealand Health Survey	2002 Childhood Nutrition Survey	2006/07 New Zealand Health Survey	2002 Childhood Nutrition Survey	2006/07 New Zealand Health Survey
BMI normal range						
Boys	64.7	62.5	42.7	42.3	70.0	69.3
Girls	53.4	57.6	34.5	41.2	64.5	68.0
BMI overweight range						
Boys	19.1	23.7	28.3	33.6	18.0	20.1
Girls	29.8	25.6	37.0	28.3	21.7	20.1
BMI obese range						
Boys	14.3	12.0	27.5	23.7	8.1	8.1
Girls	14.4	13.4	27.2	28.9	10.0	8.7

Source: 2002 New Zealand Children's Nutrition Survey and 2006/07 New Zealand Health Survey (Ministry of Health, 2008a)

* Note that columns do not total 100% as children in the BMI thin range are not shown.

The unequal distribution of overweight and obesity amongst New Zealand children is shown by socioeconomic status, as well as ethnicity. Table 1-2 shows the prevalence of overweight and obesity for boys and girls aged 2-14 years, by the New Zealand Deprivation Index 2001 (NZDep01) quintiles. The NZDep01 is a composite measure of nine variables taken from the 2001 New Zealand Census, including: income; car access; employment; and telephone access (Salmond & Crampton, 2002). In quintile format the index ranges from least deprived quintile at one, to most deprived at five. Table 1-2 shows that for boys and girls, the percentage of children overweight and obese increases with increasing deprivation.

Table 1-2– Age-standardised percentage of overweight and obesity amongst New Zealand children aged 2-14 years by New Zealand Deprivation Index 2001 quintiles*

	Least Deprived	Most Deprived	Total
BMI Normal Range			
Boys	77.4	59.2	69.0
Girls	76.1	53.7	66.7
Total	76.8	56.6	67.9
BMI Overweight			
Boys	14.7	25.3	20.5
Girls	15.4	27.3	21.4
Total	15.0	26.3	20.9
BMI Obese			
Boys	5.2	13.9	8.0
Girls	5.7	16.4	8.7
Total	5.5	15.1	8.3

Source: 2006/07 New Zealand Health Survey (Ministry of Health, 2008a)

* Note that columns do not total 100% as children in the BMI thin range are not shown.

Aspects of children's diets and related behaviour also appear to vary between ethnic groups. A series of secondary analyses of the 2002 New Zealand Children's Nutrition Survey, by Utter and colleagues, show a number of differences in nutrition practices between children of Māori, Pacific and other ethnic groups (Utter, Schaaf, Mhurchu et al., 2007a; Utter, Scragg, Mhurchu et al., 2007b; Utter et al., 2007c). For example, Māori and Pacific children are more likely to watch two or more hours of television a day, compared with other ethnicities. Māori and Pacific children are also more likely to consume the commonly advertised food products (Utter, Scragg, & Schaaf, 2006a). Children of Māori and Pacific ethnicities were more likely than children of other ethnicities to purchase breakfast, or food to eat at school, from food outlets on the way to school or the school canteen/tuck-shop (Utter et al., 2007a; Utter, Scragg, Schaaf et al., 2006b). A positive association between BMI and purchasing food from the school canteen was shown for all ethnic groups, but the effects were largest for Pacific students (Utter et al., 2007c).

In summary, the burden of overweight and obesity amongst New Zealand children are disproportionately located with Pacific, Māori and children from lower socioeconomic status households. Nutrition behaviours, some of which are themselves associated with overweight and obesity, are also unequally distributed by ethnic group in New Zealand. The ethnic and socioeconomic patterning of nutrition practices, and overweight and obesity in children, must be taken into account when designing interventions to improve diet and prevent excess weight gain (Utter et al., 2007c). If ethnic and socioeconomic

differences are not considered through intervention design, the risk of increasing health inequalities between groups will likely be increased (Whitehead, 2007).

With a projected increase in the proportion of the school aged population identified as Māori or Pacific¹, it can be argued that the imperative to address ethnic inequalities in children's nutrition and weight outcomes is increased. Additional imperative for action to address nutrition inequalities between Māori and other population groups, can be taken from the Treaty of Waitangi principal of protection (Durie, 1998), and Article Three, which Reid (Reid, 1999: 58) describes as '...[constituting] a guarantee of equity between Māori and other citizens of New Zealand'.

1.2.2.2 Chronic disease and childhood nutrition, overweight and obesity

There are generally considered to be different short term and long term health impacts of childhood obesity (Sattar & Lean, 2007). Short term impacts of overweight and obesity in children include low self esteem and behaviour problems (Reilly, 2005), increased hypertension, raised total cholesterol, and hyperinsulinaemia² (Lobstein & Jackson-Leach, 2006; Reilly, 2005; Sattar & Lean, 2007) – all of which are risk factors for cardiovascular disease in adults (Flynn et al., 2006). Worldwide there are also emerging trends of a small but significant (in terms of impact on a child's health), growth in type 2 diabetes amongst obese children and adolescents (Flynn et al., 2006; Lobstein & Jackson-Leach, 2006; Ogden et al., 2007). The morbidity experienced by obese children may also impact negatively on academic achievement (Ball et al., 2005; Datar & Sturm, 2006; Story et al., 2006).

Wang and Beydoun (2007) estimate that in the United States, about one half of all obese school aged children become obese adults. Continuation of obesity from childhood into adulthood is more likely to occur if there is already a continuation of obesity from childhood into adolescence, and with increasing severity (Reilly, 2005; Sattar & Lean, 2007). The patterns of cardiovascular risk factors associated with childhood obesity are also present in obese adults (Reilly, 2005). Other health impacts of obesity in adulthood include stroke, several common cancers (including breast, colon, endometrium, prostate,

¹ Statistics New Zealand population projections suggest, from base 2006 census figures, that the proportion of the total 0-14 year population will: increase from 24% for Māori in 2006 to 28% in 2016, and 28% in 2026; while for Pacific the proportion will increase from 12% in 2006 to 16% in 2016, to 18% in 2026 (Statistics New Zealand, 2008).

² Hyperinsulinaemia is a form of insulin resistance, often considered as an early indicator of type two diabetes (Erhardt & Molnar, 2004).

kidney, and gallbladder), insulin resistance, and type 2 diabetes (Sattar & Lean, 2007). In a systematic review of obesity literature, produced by Reilly (2005), adult social and economic outcomes (social isolation, educational attainment, and income), were inversely associated with obesity in childhood and adolescence.

In New Zealand, Lawes et al. (2006) have examined nutrition-related adult deaths in 1997. They conclude that for all deaths, 47 percent of deaths amongst Māori, and 39 percent of deaths amongst non-Māori were due to non-optimal levels of systolic blood pressure, total blood cholesterol, BMI, and vegetable and fruit intake. For BMI alone, it is estimated that 23-27 percent of deaths amongst Māori and 10 percent of deaths amongst non-Māori, are attributable to higher than optimal BMI. This analysis suggests that if the unequal distribution of childhood obesity across ethnic groups (shown in Table 1-1), continues into an unequal distribution of chronic disease in adulthood, then an unequal distribution of obesity related deaths may also occur.

The financial cost of overweight and obesity amongst the New Zealand population is another type of burden. The Ministry of Health has produced an estimate of the direct cost of health care for excess weight related treatment that ranged from \$400 to \$500 million in 2004. Productivity losses for the same year were estimated to cost around \$370 million (0.25 percent of GDP) (New Zealand Government, 2007).

1.3 Childhood nutrition, overweight and obesity as a health policy problem

In the discussion above it has been shown that: around a third of all New Zealand children aged 5 to 14 are overweight or obese; nutrition factors may be linked in some studies to academic achievement in children; over 40 percent of deaths amongst adult Māori may be due to nutrition and weight related risk factors; and that the direct and indirect cost of overweight and obesity could add up to over \$800 million a year. Taken together these appear compelling drivers for a government policy response to improve diets and prevent excess weight gain.

Over the last ten years a number of government strategies and policies have been put in place focussing on nutrition, physical activity and obesity. These are summarised in Table 1-3 below. Soon after the election of the Labour led coalition government in 1999, improving nutrition, reducing obesity and increasing physical activity were identified as

key health priorities (Ministry of Health, 2000). This was in line with the activities of several other governments around the world between 2000 and 2005, such as Scotland, England and several Australian States (Department of Health, 2004; King, Turnour, & Wise, 2007; Lang et al., 2006; World Health Organization, 2004). Many of the actions implemented within New Zealand focussed on children and schools, such as Fruit in Schools (Boyd, Dingle, Campbell et al., 2007; King, 2005), the Food and Beverage Classification System for Schools (Ministry of Health, 2007a), and several Mission-On related programmes (Sport and Recreation New Zealand, 2007).

A largely ecological theory of nutrition practice and obesity causation is contained within the strategy documents produced by the Labour-led government between 2000 and 2005. An ecological theory views causation as an interplay of environmental, organisational (such as schools, health providers) and personal factors (Dooris, 2006). This can be seen with an explicit use of the Ottawa Charter for Health Promotion model (World Health Organization, 1986) to structure the Healthy Eating – Healthy Action (HEHA) implementation plan (Ministry of Health, 2004), and the inclusion of environments as a key area for action within the HEHA strategy (Ministry of Health, 2003b).

Table 1-3 - Summary of major government strategy and policy developments regarding childhood nutrition, overweight and obesity – 1999 to 2009

Strategy/policy	Date	Description
November 1999 election of Labour-led coalition government		
New Zealand Health Strategy	2000	Identified improving nutrition, reducing obesity and increasing levels of physical activity as key government priorities.
July 2002 election of Labour-led coalition government		
Healthy Eating – Healthy Action: Oranga Kai – Oranga Pūmau A Strategic Framework (HEHA)	2003	Identified priorities and areas for action to improve nutrition, reduce obesity and increase physical activity. Children, young people and their families and whānau identified as priority groups..
The New Zealand Cancer Control Strategy	2003	Included an objective to reduce the number of people developing nutrition related cancer.
Healthy Eating – Healthy Action: Oranga Kai – Oranga Pūmau Implementation Plan 2004-2010	2004	Listed 87 actions to be implemented across a range of government and non-governmental agencies.
Opportunity for All New Zealanders	2004	Statement of government wide priority areas. Healthy eating and healthy action identified as a critical area of social policy across government.
Budget 2004/05	2004	\$10 million allocated to nutrition and physical activity related programmes, including Fruit in

Strategy/policy	Date	Description
		Schools.
September 2005 election of Labour-led coalition government		
Mission-On	2006	\$67 million set of policy interventions focussed on children and young people.
Budget 2006/07	2006	\$19.033 million allocated for implementation for HEHA programmes.
Change to National Administration Guideline (NAG) 5	2007	This added two requirements that school Board of Trustees must meet. Promotion of healthy food and nutrition and that only healthy food options are available for sale within schools.
November 2008 election of National-led coalition government		
Change to National Administration Guideline (NAG) 5	2009	Removal of the requirement that only healthy food options are available for sale within schools.
Budget 2009/10	2009	\$19.033 million per year for HEHA programmes maintained in the first budget of new government.

In November 2008 a National-led government came to power. At the time of writing it is not clear the precise strategies and policies regarding childhood nutrition, overweight and obesity the new government will take. There are, however, some indications from press releases and related documents. In 2006/07 a parliamentary select committee inquiry was held into type 2 diabetes and obesity. Within the committee's inquiry report the National party expressed a view different to the rest of the committee. This stressed personal choices and minimised environmental influence on choice, compared to the majority view (Health Select Committee, 2007). This suggests a theory of nutrition and obesity causation more focussed on individual actions regarding energy in and energy out – a simple model of obesity causation (discussed in Chapter 2).

Under the Labour-led government a series of ten health targets were developed for high level monitoring and reporting, including a target to improve nutrition, increase physical activity and reduce obesity (Ministry of Health, 2009b). The new targets for 2009/10, introduced by the National led government, have reduced in number from ten to six, with nutrition, physical activity and obesity related targets removed (Ministry of Health, 2009b). This means that District Health Boards will now not be monitored directly on efforts in nutrition and obesity areas, a signal that such activities are to be given a lower priority.

Finally, in press statements, the Minister of Health, Tony Ryall, has indicated that the government plans to announce programmes focussed around physical activity and sports for children and young people (Eleven, 2009). This statement follows a number of funding cuts to nutrition focussed programmes, such as Mission-On (Sport and

Recreation New Zealand, 2007), and signals a change in focus from nutrition to structured physical activity. This change of focus must be kept in perspective that, from the 2009/10 Budget announcements, it appears similar levels of overall funding for nutrition, obesity and physical activity programmes will remain (The Treasury, 2009).

Some authors suggest that more conservative political groups favour focussing on individuals, seeking to influence their choices through information and incentives (Schwartz & Brownell, 2007; White, 2007), while more liberal political groups have a greater focus on changing the environments that shape individual actions (Lang & Rayner, 2005; White, 2007). This political preference for conceptions of obesity causation could be used to explain some of the apparent difference between the Labour and National led governments, as described above.

1.3.1 Summary

In summary, nutrition, overweight and obesity have clearly been considered issues demanding a policy response for New Zealand over the past ten years. While the nature of this response may be set to change under a National-led government, the budget allocation suggests it may still be an area for government action. Within this action the focus on children and schools seems likely to remain.

Some of the difference in approaches mirrors different perspectives on causation of nutrition practices and excess weight gain. Models of causation are discussed in Chapter 2, where it is argued that a complex model is required for effective policy development. In short, the simple model of obesity causation focuses on a balance between energy in (consumed) and energy out (physical activity) (World Health Organization, 2003). More complicated models also consider how social, political, economic and physical environment act to determine the energy people consume or the activity they carry out (Swinburn et al., 1999).

1.4 A focus on children and schools

There is sufficient research evidence to justify focussing interventions on children to prevent excess weight gain. The link between the likelihood of adult obesity, with severity and presence of obesity in childhood and adolescence (Reilly, 2005; Sattar & Lean, 2007; Wang & Beydoun, 2007), suggests that prevention of obesity in childhood

can have an impact on population wide prevalence. Even without the link to adult obesity and related chronic disease, prevention of nutrition and weight related morbidity in childhood could be viewed as justification for action (Lobstein et al., 2004; Lobstein & Baur, 2005; Story et al., 2008). The link between nutrition and academic achievement in children (Ball et al., 2005; Datar & Sturm, 2006; Murray, Low, Hollis et al., 2007) provides another reason to focus interventions on improving children's diets.

Schools have been commonly identified as settings to implement interventions targeted and nutrition outcomes for children (Fox, Dodd, Wilson et al., 2009; French & Wechsler, 2004; Livingstone, McCaffrey, & Rennie, 2006; Pyle, 2006; Story et al., 2006; World Health Organization, 1998). With over a third of children's daily energy intake potentially taking place within schools (Bell & Swinburn, 2004), there are obvious opportunities to directly influence children's diets. There is also a chance to indirectly influence children's diet and food preferences through nutrition education (Basdevant, Boute, & Borys, 1999; Pyle, 2006; Story et al., 2006).

Around the globe there have been many intervention trials based within schools, and a number of systematic and comprehensive reviews of interventions (Doak, Visscher, Renders et al., 2006; Flynn et al., 2006; Jaime & Lock, 2009; Lissau, 2007; Livingstone et al., 2006; Peterson & Fox, 2007; Sharma, 2006; Story et al., 2006; Wall, Mhurchu, Blakely et al., 2006). In a review of reviews, Livingstone et al. (2006) conclude that few obesity prevention interventions aimed at children have proven to be effective. A number of difficulties in proving effectiveness are identified, including: duration of interventions are often not long enough to expect changes in BMI; interventions that include dietary and physical activity components may not see reduction in BMI as lean muscle mass may increase while fat mass decreases; a number of studies rely on self-reported dietary behaviours during a period where education activities are occurring, this creates a possible self-report bias; few studies have sufficiently long periods of follow-up to determine whether dietary changes are sustained over time; and there is insufficient tailoring of interventions to gender, socioeconomic or ethnic make up of study populations.

Doak et al (2006) note that changes to the environment in which children live have the greatest potential to prevent overweight and obesity. However, intervention studies, by

necessity of resources and study design, focus on a small number of actions and outcomes, rather than large changes to food environments.

An example of the type of intervention conducted in school based trials is provided by Anderson et al (2005a). The availability of fruit and vegetables was increased in two schools in Scotland over a period of nine months (two matched control schools were also included). Actions included: increased provision of fruit and vegetable in school tuck shops (canteens) and school lunches; point of purchase marketing; tasting sessions; classroom education sessions; and newsletters for parents and children. Children's attitudes and knowledge towards fruit and vegetables, as well as intake using dietary recall, were measured at baseline and nine months later. Several statistically significant differences were identified between the intervention and control groups post intervention, including: more fruit and vegetables tasted in the intervention schools; intervention group children showed a decrease in preference for high sugar and fat foods and beverages, and for girls a larger increase in daily fruit consumption was recorded. No statistical difference was shown for vegetable consumption.

While positive results were shown, there are a number of limitations to this study. The number of schools involved was small within one geographical region, and therefore questions must be raised regarding generalisability of results. The intervention period was short, with no investigation of whether differences between intervention and control schools were maintained over time. The outcome measures rely on self report, and with such clear objectives of the study, a report bias that overestimates fruit and vegetable consumption and attitudes is possible. Also, while not an aim of this study, for the purposes of informing interventions to impact on both diet and prevention of overweight and obesity, there is no indication that focussing on fruit and vegetables has any effect on excess weight gain. Such limitations are common across school based nutrition and obesity prevention studies, and lead to conclusions across review articles that the evidence of effective interventions is limited (Doak et al., 2006; Flynn et al., 2006; Livingstone et al., 2006).

With the cautions regarding quality and generalisability of evidence in mind, a number of authors do suggest lessons from the research literature can be applied to the design of nutrition and obesity related interventions. These lessons are largely based on an ecological model of obesity causation, which considers the multiple influences on

children's diets across home, school, community settings (Story et al., 2008; Swinburn et al., 1999). A further discussion on ecological models follows in Chapter 2. There is evidence, for example, that interventions are more likely to be successful if they operate within multiple settings (e.g. home and school), and target multiple behaviours (e.g. food eaten and television watching), compared to targeting single behaviours within single settings (Danielzik, Pust, Landsberg et al., 2005; Livingstone et al., 2006; Peterson & Fox, 2007; Pyle, 2006; Reynolds, Klepp, & Yaroch, 2004; World Health Organization, 2003).

There is also a small, but growing, body of literature that suggests factors outside of schools are likely to impact on the effectiveness of school based interventions. For example, Danielzik et al (2005), in a large longitudinal study, found that the impacts of a nutrition education intervention favoured girls and children from higher socioeconomic backgrounds, compared to boys and those from lower socioeconomic backgrounds. A number of studies have included efforts to involve parents within the intervention, and have shown equivocal impacts to date on children's diets (Doak et al., 2006; Golan, 2006; Horne, Hardman, Lowe et al., 2008; Lytle, Kubik, Perry et al., 2006). There is, however, a strong body of evidence that parents play a significant role in children's diets (Hart, Herriot, Bishop et al., 2003; Patrick & Nicklas, 2005; Reinaerts, de Nooijer, Candel et al., 2007; Scaglioni, Salvioni, & Galimberti, 2008).

Aspects of the home environment associated with children's diets and excess weight gain have been shown to often vary by socioeconomic status, such as parent's perceptions of health and diet (Coveney, 2005; Jain, Chamberlin, Carter et al., 2001; Rosenkranz & Dzewaltowski, 2008). In designing effective school based dietary and obesity prevention interventions, it may be necessary to also consider the influences on children's diets within home and community settings (Livingstone et al., 2006; Story et al., 2008). Food policies and the types of food available in schools, have been shown to vary by geographical and socioeconomic categories in a small number of US based cross-sectional studies (Kubik, Lytle, & Story, 2005b; Minaker, McCargar, Lambraki et al., 2006; Nanney, Bohner, & Friedrichs, 2008). From cross-sectional studies, it has been suggested that availability of food within schools may directly influence children's diets (Briefel, Wilson, & Gleason, 2009; Kubik, Lytle, Hannan, Perry, & Story, 2003), while school based interventions can also have some impact on the availability of food at home (Lytle et al., 2006). Further research is needed to more fully understand how influences

across environments might interact to support or inhibit efforts to improve children's diets within schools.

A range of studies have also documented aspects of the environments within which schools are located, which are independently associated with children's diets and excess weight gain. For example, in a small pilot study in New Zealand, Maher et al (2005) recorded an average of 87 outdoor food advertisements within a one kilometre radius of ten secondary schools, with around 70 percent categorised as for unhealthy food products. A number of studies have linked children's diets with commonly advertised foods (Hastings, Stead, McDermott et al., 2003; Utter et al., 2006a). A small number of studies have demonstrated some clustering of food outlets around schools (Austin, Melly, Sanchez et al., 2005; Pearce, Blakely, Whitten et al., 2007; Zenk & Powell, 2008), which provides opportunity for children to purchase food, and theoretically may undermine efforts within schools to improve children's diets (Gittelsohn & Kumar, 2007).

1.4.1 Summary

There are clear practical and evidence based reasons for focussing at least some interventions to improve children's diets within schools. While there have been many intervention studies based within schools, to date there are few definitive findings that can be generalized across geographical, gender and socioeconomic categories. Research findings do suggest that targeting multiple diet related behaviours, across multiple settings (e.g. home, school and community), are likely to be more effective than single behaviours within single settings. Availability and accessibility of food and food practices within home and community settings have also been shown to vary by geographic and socioeconomic categories. A small number of studies suggest that geographic and socioeconomic variation across home and community settings can impact on the outcomes of school based dietary interventions. Chapter 2 introduces complexity theory as a methodology to examine the interaction between settings. A narrative review of literature is used to develop a theoretical model of how settings may interact in Chapter 5.

In recent years a number of authors have been suggesting and investigating the role of public policy and health policy in creating change across multiple settings to improve diets (Butland et al., 2007; Hammond, 2008; Lang & Rayner, 2007; Livingstone et al., 2006; Sacks, Swinburn, & Lawrence, 2008; Story, Nannery, & Schwartz, 2009). This

study focuses on policy level interventions and impact across settings, to support healthy nutrition within primary schools. While the focus is on policy level interventions, a number of specific actions within schools (like nutrition education) are considered. Chapter 9 provides a brief literature scan for each intervention area identified from the primary school case studies and policymaker interviews.

1.5 The primary school setting in New Zealand

As outlined earlier, the first aim of this research is to identify policy interventions to support primary schools to promote healthy childhood nutrition. A brief summary of the organisation and range of nutrition focussed interventions currently within New Zealand primary schools is provided below. This description provides background information of use when considering primary school case study results from Chapter 6. Background material for the second aim of this research, to investigate the use of complexity theory for health policy analysis, is provided in Chapters 2 and 3.

Children in New Zealand (with few exceptions) are required to attend school from the age of 6 to 16 years (Ministry of Education, 2001). In general children attend a primary school between 5 and 12 years of age (referred to as years one through eight). There are three types of primary schools: full primary; contributing; and intermediate. A full primary school teaches years one to eight, contributing primary school years one to six, and intermediate school years seven and eight. As at 1 July 2008 there were 1115 full primary schools, 796 contributing primary schools, and 123 intermediate schools in New Zealand. This study includes full and contributing primary schools only. It was considered that intermediate schools, catering only to the oldest primary school children, may be more similar to secondary schools than other primary schools, and were therefore excluded.

All schools receive government money for operations (excluding some private schools), and are governed by a Board of Trustees, which includes the principal, a teacher representative, and a number of elected parent representatives. Boards of Trustees are responsible for developing a school Charter, which sets out how the school will meet the National Administration Guidelines (NAGs) set by Government (Ministry of Education, 2007b). As well as requirements related to curriculum and administration issues, the NAGs currently include a requirement for regular and quality physical activity, and for

the promotion of healthy nutrition. As indicated in Table 1-3, for a short time there was also a NAG requirement that where schools sold food, only healthy options were available. This NAG concerning the sale of healthy food came into force shortly after school data was collected (June 2008). It was removed in February 2009 by the recently elected National-led government (Tolley, 2009).

Unlike many other countries (Harper, Wood, & Mitchell, 2008), there is little state funded provision of food within schools in New Zealand. Since 2005 a number of schools have been part of the Fruit in Schools scheme, which aims to provide one free piece of fruit per day per student, within a health promoting schools framework³ (Boyd et al., 2007). This is restricted to low socioeconomic status schools only. Some charitable organisations also run school breakfast or lunch programmes (e.g. New Zealand Red Cross, 2008). The curriculum that schools must teach children includes a health and physical education component. This includes age appropriate teaching around nutrition and movement skills (Ministry of Education, 2007c).

There are a number of nutrition related health promotion programmes operating within New Zealand primary schools, run by both government and non-governmental organisations (for example the National Heart Foundation Healthy Heart Award Programme (National Heart Foundation, 2008) and Fruit in Schools (Ministry of Health, 2009a)). As each school is governed independently, each school has a choice as to whether they get involved with specific health promotion programmes. For this reason, there is a wide variety of involvement between schools.

1.6 Conclusion

In this chapter it has been argued that nutrition practices of children can have significant impacts on levels of overweight, obesity, depression and education attainment of children (Datar & Sturm, 2006; Reilly, 2005; Sattar & Lean, 2007). Nutrition practices in childhood can also influence morbidity and mortality in adulthood, both directly and through impacts of overweight and obesity (Lawes et al., 2006; Reilly, 2005; Wang & Beydoun, 2007). In New Zealand approximately 30 percent of children are obese, with

³ Health promoting schools is a health promotion strategy where: ‘the focus is on the whole of the school environment, including the social, physical and community, and extends beyond health education in the classroom to consider a range of policy issues (for example bullying, nutrition policy for the school canteen) and environmental issues (trees in the school yard, growing vegetables, recycling).’ (Baum, 2008: 516)

the burden falling disproportionately on Māori, Pacific and children from more socioeconomically deprived circumstances (Parnell et al., 2003).

Schools can provide a convenient place to deliver interventions aimed at improving children's diets and preventing excess weight gain (Peterson & Fox, 2007). Internationally there have been many interventions trialled within schools to achieve this, with mixed results (Flynn et al., 2006). The emerging consensus seems to be that the effectiveness of interventions is enhanced if they target multiple behaviours across multiple settings, known as an ecological approach (Egger & Swinburn, 1997; Story et al., 2008). While reviews of research evidence to improve children's nutrition have used an ecological perspective, to date there has been little empirical evidence to suggest which grouping of interventions may usefully be implemented.

This study attempts to provide such empirical evidence by identifying policy level interventions that will support the role of New Zealand primary schools in effectively promoting healthy nutrition practices for children. It is assumed that healthy nutrition practices will help prevent the development of overweight and obesity amongst children. It is also assumed, extending the ecological perspective with complexity theory, that multiple interventions will be required across multiple settings (e.g. home, school and community). Examining the use of a complexity theory informed approach to health policy analysis is the second aim of this research, and is the focus of Chapters 2 and 3.

The focus on primary schools, and primary school aged children, excludes a number of potentially effective interventions to improve nutrition across the population. For example, emerging research in the field of epigenetics suggest that risk factors for obesity begin in utero (Godfrey, Lillycrop, Burdge et al., 2007), with nutrition at crucial periods of development having potentially life-long impacts on weight (Ben-Shlomo & Kuh, 2002; Rush, Paterson, & Obolonkin, 2008). Opportunities to influence nutrition practices in utero or in early childhood will not be considered within this study. Likewise, some authors focus attention on secondary school (for ages 13 to 16 years), as a key site for intervention (Finkelstein, Hill, & Whitaker, 2008; Molnar, 2005), which will not be covered here. Finally, physical activity also has a role in preventing overweight and obesity (Wareham, van Sluijs, & Ekelund, 2005). Further research to consider policy interventions to support primary schools to promote physical activity may be justified.

Chapter Two

Childhood nutrition, overweight and obesity as a complex problem: An introduction to complexity theory

In sum, the obesity epidemic is a particularly challenging problem because it results from a system containing a diverse set of actors, at many different levels of scale, with differing individual motivations and priorities. This system has many moving parts ... Taken together these features are classic characteristics of a complex adaptive system (Hammond, 2009: 2).

2.1 Introduction

Understanding childhood nutrition, overweight and obesity requires a research methodology that can deal with complexity, as does a search for appropriate policy interventions (see Chapter 3). As stated in the previous chapter, one of the assumptions behind the approach of this research is that childhood obesity is caused by a complex interaction of physical and social settings, with personal choices and actions limited or supported by these settings. This type of causal theory is generally referred to as a social ecological model (Green, Poland, & Rootman, 2000; Story et al., 2008), with the ‘obesogenic environment’ (Swinburn et al., 1999) model a popular example within the obesity literature.

This chapter will argue that complexity theory offers a useful conceptual and methodological approach to considering the complex causation of childhood obesity, and provides an extension to the social ecological model. A brief discussion of the history and use of complexity theory and its main components is provided; with a more detailed examination of the use of complexity theory in policy analysis presented in Chapter 3. While complexity theory has been chosen for this study, other theoretical approaches, such as structuration theory, may also provide useful extensions to social ecological models. A brief comparison between complexity theory and a small number of alternative theories is provided in section 2.5.

The aim of this chapter is not to provide a full history of complexity theory, or a detailed examination of the various facets of complexity theory. This thesis, and the application

of complexity theory contained within it, does not attempt a ‘first principals’ discussion of complexity theory. Instead, complexity theory is used to inform a policy research and analysis method. For these reasons, several aspects of complexity theory will not be discussed in detail here. These include ‘path dependency’ (Bennett & Elman, 2006), ‘initial conditions’ (Reed & Harvey, 1992), ‘fitness landscapes’ (Kauffman, 1995), ‘bifurcation points’ and ‘phase transitions’ (Capra, 2005), and ‘non-linear dynamics’ (Priogine, 1997; Richardson, 2008). As a result of the limited discussion of complexity theory concepts, the reflection and discussion of the method contained within Chapter 10 does not attempt theory development. Rather the discussion considers application of a case based application of complexity theory to policy research and analysis.

The interested reader is referred to the following books for a more detailed description of complexity theory development: Byrne (1998); Cilliers (1998); Eve, Horsfall and Lee (1997); Merry (1995); and Morçöl (2002). For ease of reference, a number of complexity terms used in this thesis are briefly described in Figure 2-1.

<p>Attractor state</p> <p>An attractor is a pattern that depicts the behaviour of a system over time. There are various different types of attractor states, depending on the pattern of system movement. An attractor state can show a relatively stable pattern of behaviour, which suggests that the complex system has some stability. For this research, attractor state is being used to refer to a stable configuration of a complex system more than the pattern of system behaviour, and could be referred to as ‘phase state’.</p>	<p>Bifurcation</p> <p>Bifurcation describes the process of change between attractor states of a complex system. At the point of change a complex system will have one or a series of fork like paths the system could move to. The paths represent ‘adjacent possibilities’. When change, or bifurcation, occurs small differences in the control parameters determine which path the system follows.</p>	<p>Emergence</p> <p>The behaviour of a system operating as a whole are said to be ‘emergent’ properties. To understand emergent properties of a complex system, the system as a whole should be understood, and not reduced to its constituent parts.</p>
<p>Complex system</p> <p>A complex system contains many interacting elements, often including other complex systems, and is considered to</p>	<p>Control parameters</p> <p>Control parameters act to determine the range of possible states a system can move to at point of</p>	<p>Feedback</p> <p>Feedback describes the nature of the relationships between elements within a complex system, or with the emergent</p>

<p>be open to their environment. Social phenomena can be considered to ‘emerge’ from complex systems as a whole, and therefore cannot be understood through reducing the system to its constituent parts. Complex systems have certain properties, including: non-linear interactions; path dependence; feedback; and sensitivity to initial conditions.</p>	<p>bifurcation. They are said to act as an external input into the system. For this research they are also considered to be highly linked within a system and to be key targets for policy interventions.</p>	<p>property of a system with the system from which it emerged. There are two types of feedback commonly described. Negative feedback acts to dampen down change within a system, such as a thermostat regulating heat. Positive feedback acts to amplify change, which may lead to bifurcation and system wide change.</p>
<p>Initial conditions</p>	<p>Phase Space</p>	
<p>Chaotic systems are said to be sensitive to initial conditions. Due to non-linear dynamics in chaotic or complex systems, small changes in the initial conditions of a system can lead to large differences in how a system develops over time and a system’s emergent properties. Weather systems are often used to describe sensitivity to initial conditions. Sensitivity to initial conditions suggests that prediction of a complex system over time is difficult if not impossible.</p>	<p>Phase space is a conceptual space within which system attractors reside. The area within a phase (or state) space contains the possible locations for a system attractor to move to over time.</p>	

Figure 2-1 - Summary of complexity theory terms

2.2 What is complex?

Complexity theory is best used when the phenomena or problem being studied is complex (Richardson, 2005; Westley, Zimmerman, & Patton, 2006). To understand this statement the distinction between simple, complicated and complex must be first understood.

Westley et al (2006) illustrate the difference between simple, complicated and complex by comparing baking a cake (simple), sending a rocket to the moon (complicated), and raising a child (complex). In baking a cake a recipe is essential, experience of baking increases the rate of successfully baking a cake, and a good recipe gives good results most of the time. In sending a rocket to the moon, detailed blueprints are required, as are

expertise and training. Components of the rocket must be identical every time for success. If the blueprint is followed, and the required parts used, there is a high degree of certainty in the outcome of sending a rocket to the moon. In raising a child, however, there are limits to how useful ‘instruction books’ will be. Experience in raising one child is likely to help in raising another, but is no guarantee of success, as responsiveness to the needs of each individual child is required. In raising a child there is no guarantee of the outcome, uncertainty will always remain. ‘Moreover, the child evolves and changes in response to forces that parents do not control. The flour does not suddenly change its mind, and gravity can be counted on. Children, however, have minds of their own. Hence our interventions are always interactions’ (Westley et al., 2006: 10).

2.3 Defining complexity theory

Complexity theory has grown within the biological and natural sciences over the past 20 years (Capra, 2005; Gare, 2000), and since the 1990’s has begun a transition to influence thinking in a range of social sciences (Medd, 2001; Rickles, Hawe, & Shiell, 2007). Recent uses of complexity theory has seen it applied to organisational design (Houchin & MacLean, 2005; Richardson, 2005), social movements (Chesters & Welsh, 2005; Roberts, 2000), and the interaction between neighbourhoods and health (Blackman, 2006; Durie & Wyatt, 2007) – to name a few.

Complexity theory does not refer to one coherent theory and field of research (Medd, 2001). Morçöl (2001b), for example, incorporates chaos theory, nonlinear dynamics, complex systems theory, and self-organization theory within the complexity camp. Manson (2001) identifies three major streams of complexity theory, mathematical, deterministic and aggregate. Mathematical and deterministic both employ mathematical equations and a limited number of variables in an attempt to understand the development of complex patterns of behaviour in systems (Manson, 2001). Aggregate complexity on the other hand seeks to consider how relationships between elements of a system combine, in order to understand the holistic system (Manson, 2001).

This research will focus on a form of aggregate complexity, within what Castellani and Hafferty (2009) identify as the British School. Two main streams of British school complexity theory development, applied to the social sciences, can be traced through the 1990’s. One is based on modernist and realist social theories and writings of Bashkar

and of Reed and Harvey (Byrne, 1998). The other from post-modern and post-structuralist theories and influenced particularly by the writing of Luhmann (Cilliers, 1998). The realist approach uses multi-discipline research methods, identification of statistical patterns, and participatory methods to study social phenomena (Anderson, Crabtree, Steele et al., 2005b; Blackman, 2006; Byrne, 1998; Byrne & Uprichard, 2007; Durie & Wyatt, 2007; Uprichard & Byrne, 2006). The post-modern approach focuses on modelling complex systems, particularly through agent-modelling (Banks, 2002; Cilliers, 1998; Plate, 2001). Medd (2002) describes the two approaches as follows:

On the one hand there are those who analyse the social world in terms of complex social orders (e.g...Byrne 1998), and on the other hand, there are those who analyse the social world through models of complex social orderings (e.g...Cilliers 1998). Those studying complex social orders are concerned with analysing social dynamics through the emergent patterns represented by variables, thus involving ex post observations of the underlying social dynamics...By contrast those concerned with complex social orderings are concerned with simulating the underlying interactive dynamics which involve making ex ante assumptions about those dynamics (Medd, 2002: 74).

This research is primarily informed by Byrne (1998, 2005a) and the approach of studying complex social orders. For this research, the food systems operating within and around case study primary schools are the focus.

2.4 Key tenets of complexity theory

The diverse approaches to complexity theory are united by a set of ontological and epistemological similarities. 'Complexity theorists describe emergent holistic systems, whose properties are not reducible to those of their parts. These systems are integrated into and co-evolve with their environments' (Morçöl, 2001b: 112), where a 'system can be any collection of objects or processes deemed to be of interest' (Gare, 2000: 330).

Perhaps the most fundamental aspect of complexity theory is that the interaction of components within a complex system give rise to 'emergent' properties, which cannot be understood by examining the individual system components (Byrne, 1998; Goldstein, 1999). The process of emergent properties is often described as the whole being greater than the sum of its parts (e.g. Cooper & Geyer, 2008). Emergent phenomena appear as 'integrated wholes' (Goldstein, 1999: 49). Rickles (2007) provides the example of temperature, as a phenomenon that emerges from the interaction of various elements.

An implication for research and policy is that to understand the emergent phenomena, the system from which it emerged must be understood as a whole (Anderson et al., 2005b; Byrne, 1998). In relation to this research, the implication of emergence is that the primary school food 'system' from which children's dietary patterns at school 'emerge', must be understood as a whole, in order to identify opportunities to improve children's diets while at school. Only examining food for sale within the school, for example, is unlikely to provide enough information to develop successful policy interventions. This is because food sales may make up only a small part of the primary school food system. As interactions within complex system may be 'non-linear' and the system can 'self-organise', even a large intervention such as a complete change in school food sales, may have little or no impact on the system as a whole if the intervention gets 'absorbed' through self-organisation (Elliott & Kiel, 1997).

Emergent phenomena change over time as systems evolve through adaption to feedback. The emergent phenomena of a system can feedback onto components of the system in what is commonly termed either positive or negative feedback (Byrne, 1998; Rickles et al., 2007). Feedback may also enter from outside the system, as system components may belong to multiple systems (Walby, 2007). Feedback can be negative, and act to maintain the system in its current state, or positive and generate change (Rickles et al., 2007).

For example, a financial market attempts to maintain stability by adjusting to information as varied as crop yields, the labour market, fuel prices, and the perceived confidence of businesses. When the level of instability increases, a system may adapt by qualitatively changing (Byrne, 1998; Capra, 2005). An example may be the market for bio fuels that has emerged in response to rising oil prices. While the development of bio fuel production may be the result of positive feedback within transport fuel systems, the effect on the overall system of the market economy may be negative. That is the development of bio fuels may meant that the market economy does not have to adapt to having reduced availability of transport fuels, or fuels at a substantially higher price (Giampietro & Ulgiati, 2005; Runge & Senauer, 2007; Steenberghen & Lopez, 2008).

Another key concept in complexity theory is that the relationships within and between systems are not linear (Elliott & Kiel, 1997; Morçöl, 2001b). This means that a change in one component of the system may have either a negligible or large effect on the

system as a whole (Medd, 2002). The implication of non-linear relationships is a difficulty in predicting the type and scale of system adaptations to new feedbacks (Byrne, 2005a).

The system is open to feedback from the wider environment it is operating within (Gatrell, 2005). Environments may differ between time, social and geographic contexts. It is possible, therefore, that the configuration of seemingly similar systems, and their emergent phenomena, can be different across different environments (Morçöl, 2002). Having said this, it is also possible that emergent phenomena will be similar, even though there are differences in the environmental context and configuration of systems (Byrne & Uprichard, 2007; Richardson, 2008). Again, using the market economy as an example, this variation between contexts may be seen through regional differences in labour markets, or differences between the economies of countries, even when similar types of market structures and regulations exist. Likewise, similar economic outcomes may be seen across economies with differing configurations of natural resources and tax systems for example.

Systems may maintain a degree of stability at an ‘attractor state’ (Blackman, 2000; Mackenzie, 2005). An attractor is a point or region towards which a system is pulled (Merry, 1995). For example, a market economy may be considered as stable around a doughnut shaped ‘torus’ attractor (Merry, 1995). There is a limited range within which an economy usually operates, or a government tries to operate it, such as the requirement on the Reserve Bank in New Zealand to maintain inflation between two and three percent (Reserve Bank of New Zealand, 2007). When the nature of the emergent phenomena changes, it can be said that the system has moved from one attractor state to another (Byrne, 1998). An example could be the case in Zimbabwe where the attractor state was one of increasing rather than stable inflation (The Economist, 2008)⁴. In section 2.6, the concept of ‘control parameters’ will be introduced as one way to direct a change in attractor state towards one that will produce an emergent phenomena consistent with policy goals.

From the basic outline of complexity theory presented above, it should be clear that complexity theory is not a positivist epistemology (Byrne, 1998; Cilliers, 1998; Morçöl,

⁴ A change from a stable inflation rate to one of hyper-inflation may also represent a change of system path within a single ‘strange’ attractor, rather than a new ‘torus’ attractor, as both are within an overall monetary system where inflation exists.

2001b; Walby, 2004). Morçōl (2001) describes a positivist approach to research as assuming that reality consists of discrete entities that are aggregated hierarchically. Reality can then be understood by disaggregating the parts and testing the relationship between them. This then assumes that the whole is not greater than the sum of the parts, and that relationships between parts of a system are similar across contexts, two assumptions at odds with complexity theory. Indeed Gare (2000) cites the development of complexity theory as partly the result of an effort to overcome a reductionist view of the world brought about by a positivist ontology and epistemology.

The next section of this chapter will argue that a realist conception of complexity theory, as advanced by David Byrne (1998, 2005a), is likely to provide a useful means of understanding the systems responsible for increasing rates of childhood obesity, for the purpose of changing their attractor states.

In summary the key common assumptions behind complexity theory are:

- Social phenomena (such as increasing rates of obesity) ‘emerge’ from complex systems
- Complex systems are comprised of many factors, and are open to internal and external feedback
- The stability of a complex system is dependent on how internal or external feedback changes the system as a whole (negative feedback acts to maintain a system, while positive feedback acts to change a system)
- The relationships between factors within a system are non-linear, so it is not possible to accurately predict how feedback will impact on the system.

2.5 Realist complexity theory

The basic premise of a realist approach to complexity theory, is that social phenomena are emergent properties of complex social systems, but that these phenomena are real in that they impact through feedback onto multiple social systems (Byrne, 1998). As discussed in chapter 5, research evidence suggests that multiple factors, including household income and time constraints, interact to influence what children eat. Over time dietary habits can emerge, which in turn also influence what children eat. For this reason the version of complexity theory used here is not a post-modern (or relativist)

approach, where a social phenomena can only be understood through considering the interaction between individual agents operating within a social system (Byrne, 1998, 2005a; Cilliers, 1998). Neither is it a positivistic approach, as the social phenomena cannot be understood independently of the systems from which it emerges, and the systems cannot be understood by disaggregating the system components and context (Blackman, 2006; Byrne, 1998; Morçöl, 2002).

In this study a social system is considered to be all the interacting factors from which the social phenomena of interest emerges (Byrne & Uprichard, 2007). This is not a discrete system, with factors likely to belong to multiple social systems. The boundaries drawn around a system for the purposes of research will be partly arbitrary, depending on the research question and practicalities of managing information (Byrne, 2005a; Uprichard & Byrne, 2006). Walby (2007) describes this as ‘each system takes all other systems as its environment’ (p 458). This suggests that changing the attractor state of one system is likely to impact also on all those systems that interact with the changed system. Walby (2004, 2007) suggests that to understand a system, the internal working of the system of focus needs to be understood – termed ‘ontological depth’, as well as the interaction with the other systems that act to define the system of focus.

Within a social system being studied, there are likely to be elements that are more macro or more micro in relation to an individual (Byrne, 1998). For example, in childhood obesity, the development and maintenance of food preferences for an individual child or group of children may be influenced by parents, the food available locally, and the food advertising they are exposed to. These could be considered more micro factors.

From a macro perspective food preferences may be influenced by regulations around the promotion of food, subsidies, or by taxes for food products which influence the production of certain foods. These interventions could limit the options for preference development. The relationship between these micro and macro factors should not be viewed as hierarchical however (Byrne, 1998; Uprichard & Byrne, 2006). Macro factors are perhaps more likely to be what is termed a ‘control parameter’ (Blackman, 2006) on food preferences, by influencing the range of food options available. However, actors within the system make choices, even if options are limited. These choices may in turn feedback to create change in the more macro factors (Byrne, 2005a; Uprichard & Byrne,

2006). Control parameters are discussed further in section 2.6, and the role of action within a system is expanded on in chapter 3.

In researching social systems Byrne (1998) suggests that neither micro nor macro be privileged. Macro factors of a social system may influence micro factors, but micro factors will also influence the macro factors, as feedback occurs between levels. This position is consistent and informed by critical realist philosophy. Critical realism does not privilege either structure or agency in understanding social phenomena, and in fact sees them as part of the same process of emergence (Harre & Bhaskar, 2001). Emergence in this sense is considered as ‘social structures that are created by the actions of individuals, but which exert a causal influence over individuals, although individuals retain the power to alter social structures’ (Cruickshank, 2003: 112). Social systems also adapt over time, and are considered to have an evolutionary irreversibility (Priogine, 1997). This means that knowledge of the history of a system is important to understand future possibilities (Byrne, 1998).

2.6 Changing a complex system

What has been described to date is largely how complexity theory can be used as a method for understanding how social phenomena ‘emerge’ from social systems. For the purpose of this research we are also interested in how systems can be changed to impact on emergent phenomena. As already mentioned, systems can have some degree of stability around an attractor state (Byrne, 1998). When the attractor state of a system changes, at the point of change (known as the bifurcation point), there are a number of possible attractor states that the system could move to, within what is termed ‘phase space’ (Blackman, 2000; Capra, 2005).

The possible attractor states are a function of the history of a system and the control parameters of a system (Blackman, Greene, Hunter et al., 2006; Byrne, 1998). Byrne (2001b) refers to control parameters as elements of a system that have a controlling influence on other system elements. A control parameter can also be seen as an external input to the system (Rickles et al., 2007). Control parameters may then influence systems through both internal and external interactions. As Byrne states (2001b: 65) ‘complex systems can change as a consequence of internal change, external change, or both together’.

Control parameters act to determine the range of possible attractor states the system can move to (Blackman, 2006; Byrne, 1998). It will be argued in the next chapter that policy interventions should aim to impact on control parameters (Blackman, 2006). This is for the purpose of influencing the range of attractor states a system may move to; with the assumption that this will increase the likelihood of the emergent phenomena of interest changing in a desired direction. There are likely similarities between control parameters and ‘tipping points’ (Hammond, 2009; Meadows, 1999), or ‘leverage points’ (Vandenbroeck, Goossens, & Clemens, 2008), referred to by some authors in relation to systems theory, as areas of leverage within systems that can act to move systems into a new state.

For example, if considering activities undertaken by older adults, a mandatory retirement age may act as a control parameter, as it may restrict other factors that contribute to these activities, such as: work habits; perceived value of older workers; and retirement income options. A more subtle control parameter may be the level of parental education on household circumstances, as it acts as an inclusion and exclusion criteria to types of work, which is likely to impact on income levels and aspirations (Adler & Newman, 2002).

Where multiple control parameters are identified, it is likely that multiple simultaneous policy interventions will be required. As Dennard et al. (2008: 11) state: ‘...complexity implies that there is no one solution to any problem anymore than there is one discreet cause’. Shiell (2008) suggests that a complex system view of a problem could restrict action, as it seems a ‘push at one part of the bubble and another [part] expands to accommodate and nullify the change’ (p 43). However, this view of systems as dynamic and adapting also suggest that ‘... multi-sector, multi-level, whole-of-government ...’ (Shiell, 2008: 44) policy approaches are required.

For this research, it is theorised here that another feature of control parameters is that they are highly connected and interact with many other parts of a system. Defining control parameters as being highly connected within a system is implied within the literature, but not explicitly discussed (Blackman, 2006; Byrne, 1998, 2001b). If control parameters are highly connected within a system, then they may be quite efficient at distributing external resource, as well as both negative and positive feedback through the system. The ability to distribute resources and feedback could be one reason why they

can have a control influence. In Chapters 3 and 4, the theory of control parameters being highly connected is used to help identify possible control parameters within qualitative visual models of complex systems. As will be discussed in Chapter 10, further development of the research method developed in this thesis will require improved identification of control parameters, and closer examination of their role within policy interventions.

2.7 The place of other social theories in explaining childhood obesity

While complexity theory has been chosen to provide the theoretical framework for this current study, this does not mean that other theoretical approaches could not have provided an appropriate research methodology. Other theoretical approaches may offer similar opportunities to examine multiple and interacting determinants of child nutrition and weight gain. To be of similar use as complexity theory in examining a ‘complex’ causation of children’s nutrition and weight gain, other theories would need to provide a means of incorporating aspects of context (e.g. socioeconomic, geographic) within which children are located; examine the relationship between more macro and more micro influences; deal with non-linear relationships; and provide a theory to guide action for change.

Anthony Gatrell, in a paper exploring complexity theory for use in health geography (Gatrell, 2005), identifies the basic tenets of complexity theory as having similarities with actor-network theory, Giddens’ structuration theory, Bourdieu’s relational sociology, and many aspects of various systems theories. These will each be explored briefly below. This is not a detailed comparison of the philosophical and methodological underpinning of these approaches compared to complexity theory. Such a comparison is outside the scope of this research. Instead, the literature has been briefly scanned to identify any comparison work, and to consider some broad similarities and differences of these approaches. The purpose of this comparison is to provide a wider theoretical context for complexity theory, and consider whether research and analysis tools developed within these theories could be applied within a complexity theory analysis.

2.7.1 Structuration Theory

Developed by Giddens in the early 1980's (Giddens, 1984), structuration theory describes how the structure of social systems 'provide the means by which people act and ... are also the outcomes of those actions' (Abercrombie, Hill, & Turner, 1988: 245). Action by agents and structure are bound together and can not be considered separately, as similarly conceived within complexity theory. Structure is not possible without action, as it is action that produces and reproduces structure. At the same time, action is not possible without structure, as 'action begins with a given structure resulting from prior actions' (Cockerham, Rutten, & Abel, 1997: 330).

This suggests another similarity with complexity theory, that the history of the system is crucial to current action. While structures provide a starting point for action, Giddens also considers that agents have choice in their actions, that structures are not necessarily limiting, as action can either reproduce or change structure (Cockerham et al., 1997; Morrison, 2005). While routine action can occur without motivation from an actor, motivation can lead to action other than the routine, which will impact on the structure for future action (Giddens, 1984). This perhaps suggests a point of divergence with Byrne's description of complexity theory. While Byrne also considers that agents have choice, and it is through agency that changes in systems occur (Uprichard & Byrne, 2006), the history of a system and its attractor state also act to limit the possible future forms of a system (Byrne, 1998). Changing components of a system (structure) can alter the range of future possible system attractor states. This in turn may prompt or suppress some forms of action by agents within the system. While Giddens argues for the duality of structure and action, Cockerham et al (1997) suggest that Giddens focus is more on agents and the implications of their actions on structure, than the impact of structure on action. The concept of emergence in complexity theory allows for a structure/action duality where neither can be considered without reference to the other.

An implication of structuration theory for policy development is that top down policies are unlikely to have much impact if they do not in fact change the actions of individuals, as it is individual action that produces structure, which in turn guides future actions. Giddens suggests that ongoing communication between researchers, policymakers and individuals impacted on by policies is required to create change (Giddens, 1987). While this would also be desirable for policy action under complexity theory, as discussed in

Chapter 3, ongoing communication may not be a necessary condition for creating a change in attractor state of a complex system.

2.7.2 Relational Sociology

Pierre Bourdieu introduced the concept of habitus as part of his 'relational sociology', along with concepts of capital and fields (Bourdieu, 1998). Bourdieu considers that the study of society must focus on understanding social systems as a whole, and that comparison is only possible between complete systems (Bourdieu, 1998). This is the first similarity with a complexity theory position (Byrne, 2005a). For Bourdieu, a social system can be seen as a series of fields (Gatrell, Popay, & Thomas, 2004), with actors taking positions within a field based on the level of capital they have. For example, in the field of food consumption, economic capital will impact on the type and amount of food somebody may purchase, while cultural capital of what foods are considered acceptable to certain people will also play a part. Bourdieu contends that taste, such as food preference, is a practice that is produced by, and reproduces, a structured system where people with different practices are separated in social space (Bourdieu, 1998; Cockerham et al., 1997; Gatrell et al., 2004).

The everyday practice of agents is shaped by both the distribution of different forms of capital within different fields, and habitus (Gatrell et al., 2004). Habitus can be considered a set of embodied dispositions for how individuals should perceive, think and act in various situations (Cockerham et al., 1997). It is 'both a result of social structures and yet also structures; that is, changes and influences behaviour, life-styles and social systems' (Morrison, 2005: 313). The majority of actions are routine, because habitus provides a set of schema for relating to both familiar and novel situations (Morrison, 2005).

Returning to food consumption as an example, past experience of foods that are affordable and acceptable, creates a template to guide future food consumption actions. If the food choices guided by these templates prove adequate, then they are likely to be reinforced. This does not mean that change is not possible, however, and Bourdieu argues that people can consciously change their predispositions (Cockerham et al., 1997), with habitus constantly changing through new experiences. While agency and structure cannot be separated in habitus, like structuration theory and complexity theory,

Cockerham et al (1997) suggests that structure is dominant in Bourdieu's analysis, much like agents are for Giddens.

2.7.3 Structuration, Habitus, and Complexity

Morrison (2005) has conducted a comparison of structuration, habitus and complexity theory. He concludes that:

In many respects, structuration theory and habitus sit comfortably with complexity theory...For example, they all suggest action and structure are interconnected and they all emphasize connectivity...They all emphasize co-evolution; for example agency and structure, the individual and the environment...all three theories emphasize the circulatory rather than linearity of causality... (pp 319-320).

Morrison (2005) does point out some difference between the three theories, suggesting that structuration and habitus are more descriptive of a particular phenomenon, while complexity theory is more prescriptive and focussed on change. Another point of difference noted by Morrison (2005) is that both structuration and habitus, or perhaps more accurately Bourdieu's relational sociology, give a stronger role to power in social systems. This point seems more relevant to the mathematical forms of complexity theory than to Byrne's realist version, with its cross over to critical realism. However, it would be fair to say that even in Byrne's complexity theory; the role of power is somewhat opaque compared to Bourdieu's treatment of power in social analysis. In Chapter 3, critical systems theory and participatory policy approaches are borrowed to reinforce the power analysis within a complexity theory research and analysis methodology.

2.7.4 Systems Theories

Gerald Midgley, who has written extensively on the history and development of systems theories, (for example see Midgley, 2003), notes that there are many similarities between complexity theory and some types of systems theories (Midgley & Richardson, 2007). He suggests that both complexity theory and systems theory have developed similar sub-theories, including: scientific theories; modelling approaches; interpretive and social interaction approaches; and critical approaches. The basic tenets of complexity theory are essentially the same as for most systems theories, with differences centred on the process of emergence.

For the purpose of working on policy issues, Midgley has developed a ‘systemic action’ approach (Midgley, 2000) from interpretive and critical systems thinking. As discussed in Chapter 3, there appears to be a utility in utilising aspects of such theories, particularly Vickers’s appreciative system (Checkland & Casar, 1986), and Ulrich’s critical systems thinking (Ulrich, 2000), for the application of complexity theory to policy analysis. There are two reasons for this cross over when focussing on policy. The first, and primary reason, is the number of similarities in theory, which appear largely realist, and reject a reductionist view of the world. The second reason is that systems theories have a longer history of application to problem solving, including policy areas, and have developed a useful set of analytical tools.

2.7.5 Actor Network Theory

Actor Network Theory (ANT), according to John Law (2009), is a term given to a range of material-semiotic analytical methods. The common concept behind these methods is that both the social and natural world can be considered ‘relational effects generated in precarious patterned networks’ (Hill & Smith, 2002: 76). Networks are made up of both human and non-human elements (Law, 2009). While to a degree the network studied is constructed by the researcher in tracing associations related to an object or phenomena of interest (Latour, 2003), the network can have stability (Law, 2009).

In a sense the relationality between elements of a network that construct a phenomenon, could be viewed as similar to the process of emergence in complexity theory. Both suggest that the phenomenon cannot be understood by reducing it to its constituent parts. Byrne does acknowledge that physical resources are part of the attractor state of complex systems (Byrne, 1998), which could be viewed as a network. It seems, however, that complexity theory favours the role of humans over non-humans, identifying human actors as the mechanism for change in social systems (Uprichard & Byrne, 2006). ANT is focussed on descriptive work, without necessarily laying claims to how society or nature is constructed in a broader theoretical sense (Law, Mol, & Editors, 2002). Complexity theory does make suggestions about the ordering of society, even if couched in caveats of context (Byrne, 1998; Cilliers, 1998). Gatrell’s comment (2005: 2663) appears correct, that ‘the recognition that complexity gives to connectedness and hybridity, and to breaking down divisions (whether the social and material, structure and agency, or micro/macro) means it has much in common with actor-network theory’.

There also seem to be differences between the constructivist and realist positions that should caution against an over-enthusiasm for how the two approaches could come together. Having said this, ANT may provide tools of use to complexity theory. The process of identifying both human and non-human associations in a network could be useful to identifying elements of a system or attractor state. The ANT concept of ‘vehicles’ being required to transport agents between different sites is interesting (Latour, 2005), and might be usefully applied to thinking how multiple complex systems interact.

Hill and Smith (2002) suggest that a watered down version of ANT could prove useful in policy analysis to challenge definitions of issues and causative assumptions. This could in turn help identify possible unintended impacts of policy. This is similar to the system boundary critique methods of Ulrich, supported by Midgley (2000). For this research, ANT can provide a useful reminder that components included within a complex system can include physical actors as well as human actors. The methods used to develop system descriptions (see section 3.4.2.2) need to be able to identify both types of system components. The approach used here is to take ‘practice’ as the basic unit of analysis, where practice includes different types of system components.

2.7.6 How does complexity theory compare?

In summary, it appears that complexity theory would likely be sympathetic to other research methodologies that take a system (or network) perspective of how phenomena come into being. Such approaches blur, or remove, strict agent/structure and micro/macro distinctions. These include structuration theory, relational sociology, interpretive and critical systems theories and actor-network theory. This is not to say that differences do not exist. The realist underpinnings of complexity theory may be at odds with actor-network theory in particular, but also aspects of the other approaches mentioned here. Complexity theory also seems unique in the concept of bifurcation and control parameters, useful concepts when thinking about changing a system, which is the focus of policy analysis and discussed further in Chapter 3. However, due to the similarities, it is likely that in applying the ideas of complexity theory to examine policy issues in general, including childhood nutrition and weight gain, some of the research tools developed in these other theoretical perspectives could be usefully employed.

2.8 Childhood Obesity – A case for complex causation

In relation to childhood obesity, as briefly discussed in the previous chapter, the theories of obesity causation can be classified in terms of simple, complicated and complex. The simple theory is that normal weight is maintained by a balanced energy equation of energy in (consumed) equals energy out (expended). Overweight and obesity is caused by an imbalance in the energy equation, with more energy being taken in than expended (Swinburn et al., 1999; World Health Organization, 2003). The simple model suggests that there is a direct relationship between energy intake, energy expenditure, and body weight. To understand the impact on body weight of energy intake or energy expenditure, then all the information that is required is a measure of energy intake, and a measure of energy expenditure. Simple linear statistical methods can then be used to test the impact on body weight of different energy intake and energy expenditure levels.

While accurately measuring energy intake, energy expenditure, and body weight may present several technical challenges (Metcalf, Scragg, Sharpe et al., 2003; Reilly, 2005; Rush et al., 2003; Swinburn et al., 2006; Yngve, Wolf, Poortvliet et al., 2005), this type of analysis of the energy equation is the basis for much of the evaluation of interventions to prevent or reduce childhood obesity (Doak et al., 2006; Goran, Reynolds, & Lindquist, 1999; Sharma, 2006; Summerbell, Waters, Edmunds et al., 2005; Wareham et al., 2005). The simple model of obesity causation in effect focuses on the individual, and does not consider elements of the physical or social environments within which individuals live, and how these impact on energy intake and energy expenditure. The inclusion of physical and social environments on the energy equation is the focus of social ecological models of obesity causation (Story et al., 2008).

A widely cited⁵ example of an ecological model is the obesogenic/leptogenic environment model developed by Swinburn et al (1999). An obesogenic environment is defined as: ‘the sum of influences that the surroundings, opportunities, or conditions of life have on promoting obesity in individuals or populations’ (p 564). In contrast a leptogenic environment is defined as: ‘[an environment] that promotes healthy food choices and encourages physical activity’ (p 564).

⁵ A search on the SCOPUS bibliographical database on 28/01/2008 showed that Swinburn et al (1999) has been cited in 125 papers.

The idea of an obesogenic or leptogenic environment is based on an ecological model that combines environmental, biological and behavioural influences on energy intake and expenditure. This model assumes that both biology and environment influence behaviour, which in turn, determines the energy in and energy out portion of the energy equation. The model also shows how physiological adjustments, such as changes in metabolic rate, can moderate the impact of the energy consumed and expended on body fat.

Swinburn et al (1999) recognise that there are multiple environments impacting on the behaviour of individuals and populations, and proposes the ANGELO framework (analysis grid for environments linked to obesity), to consider environments in more detail. To explain the ANGELO framework, it is useful to quote from Swinburn et al (1999) at some length:

The ANGELO framework is a grid which comprises two sizes of environment on one axis and four types of environment on the other. Individuals interact with the environment in multiple micro (local) environments, or settings, including schools, workplaces, homes and neighbourhoods. Micro environmental settings, in turn, are influenced by the broader macro environments, or sectors (such as the education and health systems, all levels of government, the food industry, and a society's attitudes and beliefs), which are less amenable to the control of individuals (p 565).

The four types of environments represented in the columns of the grid, illustrated in Table 2-1, are physical, economic, political, and sociocultural environments. In completing the grid, micro and macro influences on both food and physical activity should be considered in each of the four environments. Research that attempts to understand the relative influence of biology, behaviour, and environments on obesity, along the lines of a complicated ecological model, typically uses multivariate statistical modelling. (For examples see Giles-Corti & Donovan, 2002; Roos, Lahelma, Virtanen et al., 1998; Stafford, Cummins, Ellaway et al., 2007; Utter et al., 2007c).

Table 2-1 - Analysis Grid for Environments Linked to Obesity (ANGELO)

	Socio-cultural environment	Political environment	Economic environment	Physical environment
Micro setting				
Macro setting				

(Swinburn et al., 1999)

2.8.1 Towards a model that more fully recognises complexity

Although the Swinburn et al. (1999) ecological model of obesity contains many of the components of a complex model of obesity causation, such as multiple environments, it is more of a complicated model than complex. It does not assume that the whole is greater than the sum of the parts. The ANGELO framework keeps the four environments and micro/macro settings in silos, then within the silos attempts to identify areas for intervention. This may be a criticism of the Swinburn et al. (1999) model rather than social ecological models more generally, which may emphasise a greater role on 'reciprocity' between environments (Green et al., 2000). Reciprocity means that environments influence each other, and do not exist as silos. However, the cross-environment influence created by reciprocity does not seem to extend to causation across environments in the same way as 'emergence' does in complex systems. This is a position supported by Finegood et al. (2008), who suggest that ecological models can 'oversimplify and de-emphasize the relationships between the factors' (p 37) included within the model.

In contrast to Swinburn et al. (1999), a complex model of obesity causation would assume that an obesogenic or leptogenic environment emerges as a holistic entity from interactions across the ANGELO framework, and therefore needs to be considered as a whole, rather than a collection of parts. A complex model would also consider how obesity may change over time, how different environments may interact to influence behaviour, how behaviour may act to reinforce or change the environments (feedback), and how environments and behaviour may be different across geographical, socioeconomic, or ethnicity dimensions (Albrecht, Freeman, & Higginbotham, 1998; Blackman, 2006; Byrne, 2005a, b; Cilliers, 1998). Most importantly, for designing interventions to prevent or reduce rates of obesity, a complex model will need to provide a means of considering the stability of the system of interacting factors that are producing an obesogenic environment, and the possible levers to change this system to produce a more leptogenic environment.

A final point regarding the difference between simple, complicated and complex theories of obesity causation. The simple, complicated and complex may also be thought of in terms of the 'distance from the system' (Cilliers, 1998: 3). To some extent the simple theory of obesity causation is the result of looking only at the micro level of the

individual, and even then only at the biological processes of the individual. A complex theory of obesity causation on the other hand, takes a much broader view. Although the biological processes are incorporated in this view, they may at times be difficult to see amongst all the other interacting factors. For this reason there will always be a place for research that focuses on the simple and complicated, but from a complexity perspective, this research must also seek to locate the simple and complicated within the context of the holistic complex system.

Chapter 5 utilises a review of the literature to develop a working understanding of complex systems from which childhood nutrition and obesity emerge. The primary school setting, the focus for this research, is identified as a complex system in itself, interacting with other complex systems that form a child's world – home, community and peer groupings.

2.9 A complex theory of obesity causation

To summarise, a complexity theory view of obesity causation provides a dynamic picture of the interaction of environments, with the individual embedded within multiple environments. An obesogenic environment then would not be considered 'the sum of influences that the surroundings, opportunities, or conditions of life have on promoting obesity in individuals or populations' (Swinburn et al., 1999: 564). Instead an obesogenic environment would be considered an emergent behaviour of a complex social system (incorporating aspects of multiple settings and environments). The emergent behaviour is greater than the sum of influences.

Increasingly within the literature, ecological, systems and complex system views of obesity are being proposed when considering policy interventions to address rising levels of obesity (Butland et al., 2007; Finegood et al., 2008; Hammond, 2009; Shiell, 2008; Story et al., 2008). While several authors have called for a complex view of the problem and required solutions for obesity, to date there have been few empirical attempts to identify or develop policy interventions. A notable exception is the UK Foresight project, Tackling Obesities (Butland et al., 2007).

The Tackling Obesities project developed a causal loop diagram of the obesity system in the UK, to test out various policy scenarios and the impacts on population obesity levels (Butland et al., 2007; Vandebroek et al., 2008). The causal loop diagram approach is

different to the method developed for this research, as discussed in Chapters 3 and 4. In particular the scale of the project far exceeds this modest sized study, which aims to evaluate a policy research and analysis method, which may be achievable within policy agencies. The system dynamics approach behind the causal loop diagram also minimises differences between local contexts in developing a generic model (Maani & Cavana, 2000), and does not consider possible changes in system attractor states (Hammond, 2009).

What the Tackling Obesity causal loop diagrams do have in common with the method proposed here, is the potential of a system diagram to engage actors across the system in developing solutions, by illustrating where within the system their actions fit (Shiell, 2008). As will be discussed in the next chapter, the method proposed here places actors within the system in a central position for designing and implementing effective policy to support primary schools to promote healthy nutrition.

To date the use of complexity theory within policy analysis appears to be largely limited to simulation modelling as one input into decision making (Banks, 2005; Dennard et al., 2008). Chapter 3 will consider the entire policy process from a complexity theory perspective, and in doing so suggest a policy research and analysis method for use in this study.

2.10 Conclusion

This chapter has argued that a complex view of childhood nutrition and obesity causation should be employed in this research. Complexity theory offers a useful conceptualisation of how social phenomena, such as childhood obesity, emerge from social systems. In particular David Byrne within the British school of complexity theory (Byrne, 1998), offers a coherent theoretical framework to examine how primary schools promote childhood nutrition, and policy interventions to support this, with the ultimate aim of reducing rates of overweight and obesity. Complexity theory has similarities with other relational theories, such as structuration theory, relational sociology, some systems theories, and actor-network theory. These other theories may provide methods and tools to complement the complexity theory approach of this research. Some cross over with system theories in particular will be discussed in the next chapter, which examines how complexity theory may be translated into a policy analysis method.

While theory is important for this thesis, it is not focussed on theory development. The aim is to test application of complexity theory to policy analysis. This has been a very brief overview of complexity theory. The danger with brevity is that important, but subtle, aspects of the theory will be overlooked. For this reason, this chapter should be read in conjunction with Chapter 3 for a fuller understanding of the approach being suggested here. Chapter 10 will reflect on the developed method for analysing policy on complex social phenomena in general, and childhood nutrition and obesity in particular.

Chapter Three

Using complexity theory to analyse public policy: A review of literature and proposed approach

In the face of complexity, possible policy solutions to social problems are conjectures. We cannot be sure a priori that they will work, so we tread carefully, evaluate the effects and learn from the results, moving forward in an incremental way (Sanderson, 2006: 124).

3.1 Introduction

The previous chapter introduced complexity theory and made the argument that childhood nutrition, overweight and obesity can be viewed as phenomena emerging from a complex system of interacting factors. To develop policy interventions to improve diets and reduce rates of overweight and obesity, policy analysis tools that can work with complexity may be required. This chapter will explore the use of complexity theory as one approach to policy analysis for such complex situations.

There is currently no cohesive body of work applying complexity theory to policy analysis, although a number of authors have begun exploring this area (e.g. Blackman, 2006; Dennard, 2008; Hammond, 2008; Morçöl, 2008). This chapter pulls together complexity theory literature, and complimentary policy approaches, to consider a complexity theory informed policy analysis and research method.

The quote above from Sanderson suggests one approach to a complexity theory informed policy approach, incremental action informed by experimentation and ongoing evaluation. As will be shown, this idea appears to have merit. There is also a need for methods of analysis to identify where the experiments should begin, and to guide broad policy and budgetary allocations. For this thesis, the following discussion suggests that developing an understanding of the social systems from which childhood nutrition emerges is an important first step in the analysis for child nutrition policy. This understanding may need to be complimented by sustained dialogue between actors who are broadly within the system of interest.

This chapter first provides a working definition of policy, the policy process and policy analysis, to orient subsequent discussion. The remainder of the chapter uses a stages model of the policy process to consider how a complexity theory approach may proceed at each stage. There is not a perfect fit between a stages approach and the developed complexity theory approach. In itself, the difference between approaches could be illustrative of how methods used for complex policy analysis may differ from those often used in designing policy interventions. Finally a set of principles to guide a complexity theory policy analysis approach is suggested. These are used to inform research methods employed in this study (see Chapter 4).

3.2 Definition of Policy and Policy Analysis

For the purpose of the following discussion, a working definition of public policy, which also applies to health policy, can be considered as ‘whatever governments choose to do or not to do’ (Dye, 1978). As Shaw and Eichbaum (2008) describe, defining policy is difficult and any simple definition is likely to have flaws. In the above definition there are obvious questions raised concerning how governments decide, what is considered ‘government’, and how governments ‘do’? Government can be considered to include individuals and institutions that make up parliament, cabinet, government departments, the judiciary and other government owned organisations (such as Crown Entities) (Shaw & Eichbaum, 2008). A grey area of what is included in government could be those businesses or non-profit organisations who deliver services on behalf of government, with public funding.

Both the processes of governments ‘choosing’ (decision making) and ‘doing’ (implementation), suggest an ongoing process that is referred to as the policy process (Parsons, 1997). There are several competing theoretical models of how policy decisions are made and implemented (Shaw & Eichbaum, 2008), and it is not the intention to canvas these in any detail here. The difference between policy models generally rests on the degree to which policy decisions are considered to be made in an objective manner, utilising full information, and choosing between the best option to achieve the desired goal. More rational models assume a high degree of objective decision making, while more incremental models suggest that information is always limited, and policy options restricted, by current and past policy interventions

(Parsons, 1997). Some more recent policy process models attempt to break out of this continuum and focus more on how relationships between actors within the policy process shape policy, such as the advocacy-coalition framework (Burton, 2006) and participatory policy theories (Fischer, 1993).

For this study, a rational stages policy process will be used to shape the discussion of how complexity theory may be applied to policy analysis. The stages model suggests that the policy process starts when an issue gains the attention of policy decision makers, and progresses through analysis of the issue and intervention options, a decision making process, then implementation and finally evaluation for effectiveness (Hogwood & Gunn, 1984; Parsons, 1997). This is discussed more in section 3.4.

The policy process also encompasses the activities that can be considered as policy analysis. For the purposes here, policy analysis can be considered to be the study of a problem, for which solutions are being sought. Harold Lasswell asserted that policy analysis, or what he called ‘policy sciences’, should be problem-oriented, where analysis takes account of the context within which the problem is situated, through multiple methods, and informs democratic decision making (Lasswell, 1970). This is the basic conception of policy analysis that shall inform the following discussion.

3.3 A Complexity Theory Approach to Policy Analysis

Before exploring in detail how complexity theory may inform policy analysis approaches, it is useful to briefly describe why a complexity theory approach is useful to public policy.

Morçöl (2002) suggests that complexity theory views public policy problems as:

Comprised of interlocking cultural, economic, and political systems, and they emerge from a dynamical interaction of all these systems. Once they emerge, they take on systemic properties that cannot be reduced to solely economic, psychological, or cultural factors (p153).

A policy problem is not then one discrete issue, but an emergent phenomena of a system, resulting from interactions within and between systems (Byrne, 2001a; Gatrell, 2005). This is consistent with what Stewart and Ayres call a ‘problem

situation' (Stewart & Ayres, 2001). In attempting to change a problem situation through policy interventions, the focus is on identifying those parts of the system that are likely to influence the configuration of the system, and thus change the emergent phenomena (Blackman, 2001; Stewart & Ayres, 2001).

Within health policy there is a history and acceptance of system influences on health outcomes (Midgley, 2006; National Health Committee, 1998), with an equal acceptance of the need for ecological frameworks that consider both agency and structure, utilise both qualitative and quantitative methods, and consider normative effects of policies on inequalities (Gatrell, 2005; Green et al., 2000; Krieger, 1994; O'Neill & Pederson, 1992; Poland, 1992). Complexity theory offers an approach sympathetic to this approach in health policy.

Complexity theory has been applied to a wide range of areas, from research (Anderson et al., 2005b; Durie & Wyatt, 2007), to organisational design (Burnes, 2004; Houchin & MacLean, 2005), and policy evaluation (Sanderson, 2000). This provides a useful base to consider how complexity theory may inform policy analysis approaches, and can be supported by methods from sympathetic theories, as discussed in Chapter 2.

3.4 Methods for complexity theory policy analysis

Policy analysis can be split into two broad types of outputs. Analysis *for* policy, and analysis *of* policy (Parsons, 1997). The following discussion focuses on analysis *for* policy, which focuses on the inputs into the policy process, rather than examining the process itself. Discussion of the developed complexity theory approach to policy analysis will be guided by a rational stages policy process model, developed by Hogwood and Gunn (1984), and shown in Table 3-1 below. The model is comprised of eight stages and progresses from agenda setting, through to policy maintenance, succession or termination.

By using a rationale stages model it is not suggested that a rational stages model reflects actual practice against which a complexity theory approach must be compared. In fact studies suggest that actual practice by policy analysts varies from more positivist to more postpositivist, largely depending on their academic training

background (Durning, 1999; Morçöl, 2001a). While the stages model is not directly comparable to a complexity theory approach to policy analysis, it will be used to structure the following discussion. As the title of this thesis suggests, the results of this thesis focus primarily on identification and analysis of intervention options, rather than the whole policy process. However, to locate this research within the wider policy process, this chapter considers possible complexity theory informed methods across the eight stages shown in Table 3-1.

3.4.1 Deciding to decide and deciding how to decide

The most useful complexity theory concept for considering how an issue comes to the attention of policy decision makers seems to be that of system entropy (Walker, 2007), or increasing instability within a system. Agenda setting theories (Parsons, 1997), suggest that political decisions on an issue are more likely when the issue has a perceived sense of urgency generated through advocacy or an event, such as a general election (Green-Pedersen & Wilkerson, 2006). From a complexity perspective, this sense of urgency can be seen as forcing change into the social system from which the issue of attention emerges. In complexity theory, system entropy increases the likelihood of a bifurcation point and subsequent change in attractor state. A change in the system attractor state is likely to result in changes to emergent phenomena, which if noticed, could heighten awareness of the phenomena amongst those actors with an influence on the policy process.

Table 3-1 – A stages model of the policy process

Policy Stages	Description
Deciding to decide (issue search or agenda setting)	Issues will become objects for policy analysis when attention is raised with policymakers. Attention can be external to the public sector through media interest, sustained interest group activity, high profile events, or internal to the public sector such as demand for services creating resource pressures.
Deciding how to decide (issue filtration)	Issues for policy attention will be identified amongst all possible issues. This is a matter of negotiation between agencies and government Ministers based on perception of urgency or importance.
Issue definition and forecasting	Issue definition, or policy problem definition, under the rational model usually involves a quantification of the issue, impacts on achieving government strategic goals, and impacts on government finances or capacity to deliver services. An issue definition will often also include a description of causal influences contributing to the issue.
Setting objectives and priorities	Desired changes to the issue will be described, with priorities logically falling out of issue definition and forecasting.
Option analysis	The likely ability of different policy interventions to achieve the described objectives will be compared. An assumption follows that the intervention most likely to achieve the objective, within an affordable cost, will be chosen for implementation.
Policy implementation, monitoring and control	Agreed policy interventions will be implemented through government agency procedures. Implementation will be monitored to ensure that procedures are adequate and being followed.
Evaluation and review	Changes to the issue will be considered against the set objectives. If they have not been achieved then implementation procedures may be altered.
Policy maintenance, succession and termination	If the set objectives have been achieved then either the policy implementation procedures will be stopped or they will carry on to maintain the outcome.

Source: Based on Hogwood and Gun (1984)

The ability to generate entropy within a system will often be dependent on power within the system (Byrne, 2005b). For example, if media attention on an issue increases the chance of being placed on a policy agenda, then those individuals or groups with good access to the media are likely to be privileged in getting items on the policy agenda. To counter this power imbalance, some theorists posit forms of

participatory politics (Innes & Booher, 2003; Walton, 2007), which encourage fairness in access to media and political processes. The role of the policy analyst in this participatory politics view, is to act as ‘facilitator’ (Fischer, 2003), to ensure that as many citizen perspectives as possible are able to be heard and have influence on policymaker’s agenda setting processes.

The focus on obesity within government policy can be seen as one example of entropy in the political system. While evidence of an increasing rates of obesity and implications for non-communicable disease had been available for some time, it emerged as a top health policy priority in 2000 after relatively little previous government policy attention. This can be seen as a mixture of increasing pressure from the weight of evidence being generated, and the election of a Labour-led government (after nine years in opposition) late in 1999. As Scott (2003) says, the Labour-led government brought with it a large policy manifesto that set much of the policy agenda for the years to come.

The application of complexity theory to agenda setting within the policy process, provides an additional lens of how issues gain a place on the policy agenda and the implications for subsequent policy development. If an issue gains attention leading up to an attractor state change, then discussion regarding how that issue is defined, and policy intervention options, may actually help determine the new attractor state configuration. This is because the policy attention may have some impact on the control parameters of the system, and small changes in control parameters can determine the possible attractor states a system can move to (see section 2.6). In contrast, if an issue gains attention following a change in attractor state (possibly because of the attractor state change), then definition of the issue and policy intervention options may be somewhat constrained by the new attractor state. Understanding where within the process of system change the issue is could help direct action.

3.4.2 Issue Definition

Under complexity theory, the process of issue definition is one of defining the boundaries of the system of interest, or describing the problem situation (Stewart & Ayres, 2001). When a social phenomenon gains policy attention, such as increasing

rates of obesity, to a large extent the issue has already been defined by the language and actions that lead to the attention. Whether the language describes ‘poor food choices’, ‘sedentary lifestyles’, or ‘environmental barriers’, boundaries are being drawn around the elements of the system of interest and their interaction (Midgley, 2000).

However, for the purpose of further analysis, the system boundaries implicit within the language used to describe problem situations need to be critically examined (Fischer, 1998; Midgley, 2000). Not critically examining system boundaries runs the risk of problem definitions being dominated by those with the loudest voices. That domination may restrict the policy options considered. For issues, such as rates of obesity, which exhibit differential impacts across socioeconomic and ethnic groups, this is likely to mean continued inequalities (Innes & Booher, 2003). Further critical examination of the system boundaries will inevitably also consider which components are included within the system of focus.

In considering the methods that may be employed to examine system boundaries, the elements within boundaries, and their interactions (system configuration), we encounter our first difficulty with fitting a complexity theory approach into a stages model. The stages model outlined in Table 3-1, describes issue definition, objective setting and option analysis as separate stages. What is suggested here, however, is that the process of defining what is within and outside the system of interest has impacts across issue definition, objective setting and option analysis.

The boundaries drawn around a system of interest may impact on how a policy problem is defined and therefore the range of policy options considered. As both Byrne (2001) and Midgley (2000) contend, a critical focus on systems, for the purpose of change, entails identification of options for action. Fischer (1998) usefully summarises the role of the analyst here when he states that:

The job of the analyst is to tease out the normative conflicts lurking behind the often equally plausible interpretations of the same abstract goal or value...In the process, various modes of defining policy problems have to be recognised as competing languages in which people offer and defend conflicting interpretations (p 141).

The policy analyst may undertake two types of analysis in relation to issue definition. The first is to actively construct descriptions of system boundaries and components, in a definition of the problem situation. The description will seek to identify control parameters and possible areas for policy interventions. The second is to critically examine the system boundaries and configurations within issue definitions being offered by competing interests, including those developed by the analyst. An obvious example of relevance to this thesis is whether obesity is seen in terms of a simple or complex system (see Chapter 2). The simple and complicated system views may lead to consideration of quite different types of interventions. The two types of issue definition analysis (system description development and critical examination), have a common focus on examining system boundaries, while the one seeks to describe the system; the other critically examines this description. For this reason they should both be used in analysis.

3.4.2.1 Describing System Boundaries and Configurations

To summarise again, social phenomena are considered, within a complexity theory frame, to be emergent properties of complex systems made up of many interacting factors. These factors consist of both agency and structure, at micro and macro levels. An argument is presented below, that for the purposes of policy research and analysis; ‘practice’ should be the basic unit of analysis. For this purpose ‘practice’ can be defined as the emergent property, or system behaviour, of a small and localised system.

The complexity theory conceptualisation of reality, presented in this thesis, is largely consistent with Soft Systems Methodology (Checkland & Scholes, 1990; Stewart & Ayres, 2001) and the concept of ‘practice theory’ (Hajer & Wagenaar, 2003). Bringing together these two theories seems to provide a useful approach to describing systems of interest and attempting to identify the control parameters.

Soft systems methodology seeks to identify models of the real world situation, against which interventions can be considered, by elucidating the standards, values, and facts within the appreciative system of interest. (Checkland & Scholes, 1990). Checkland (Checkland, 1994; Checkland & Casar, 1986) describes soft systems methodology as operationalising Vickers’ theory of appreciative systems. This considers how actors

perceive reality, identifies 'facts' within this perception relevant to the actor's interests and concerns, and formulates action to maintain, modify or elude relevant relationships that impact on reality.

Both the perception of reality and the defining of the 'facts' are influenced by standards of what is good/bad, acceptable/unacceptable, and these standards are influenced through each cycle of action (Checkland & Casar, 1986). Vickers' work on appreciative systems was primarily a result of considering how organisations work (Checkland & Casar, 1986). The focus within an appreciative system on maintaining or modifying relationships echoes findings from some complexity theory informed organisational research. For example, Houchin and Maclean (2005) found that maintaining relationships was a key factor to whether procedural change is implemented within organisations.

Hajer and Wagenaar (2003) suggest that practice should be the unit of policy analysis where practice:

...integrates the actor, his or her beliefs and values, resources and external environment, in one 'activity system', in which social, individual and material aspects are interdependent (Hajer & Wagenaar, 2003: 20).

Wagenaar and Cook (2003), in describing practice, draw on a range of theorists including '...Engestrom's concept of an 'activity system', Wenger's concept of a 'community of practice', and in Vicker's notion of an 'appreciative system' (Wagenaar & Cook, 2003: 148). A common thread between these theories of practice, and with complexity theory, is that practice emerges from multiple interconnected elements, that is greater than the sum of the parts and cannot be understood by looking at the elements in isolation (Engestrom, 1993; McMurtry, 2006; Reckwitz, 2002). These theories also place an importance on the history of the activity system or practice in determining the current system; a trait also shared with complexity theory (Byrne, 1998).

For the purposes of this analysis, the concept of practice as described by Wagenaar and Cook (2003) will be used, as this already represents an amalgamation of practice and activity theories, for the purpose of application to policy analysis. Wagenaar and

Cook (2003) describe practice as emerging from an interaction of action, community, knowledge, criteria, standards, warrants, emotion, values and discourse. Action alone is not practice, but action that is guided by normative beliefs, available resources, institutional rules, and past experience is practice. Thus, attempts to change practices may be made by changing one or more of these elements, such as available resources or institutional rules, but there can be no certainty that practice will change as the relationships between elements and practice are not linear.

Practice theory and complexity theory can be considered to provide complementary views of a social system. Practice theory provides a more micro view, where practice of individuals (or individual institutions) can be considered, while complexity theory provides a more macro view of how a system of interacting practices leads to emergent social phenomena. To research social phenomena then, both a description of the macro system, the interacting practices, and the micro, the interacting elements of the practices, will provide useful information. A possible approach to describing systems is provided below, using practice as the unit of analysis, which attempts to explicitly show system boundaries and configuration.

3.4.2.2 *Describing attractor states*

A visual representation of this micro and macro view is presented below. A simplified version of practice is shown in Figure 3-1, where a dynamic relationship between action, power, resources, and values, shaped by history, can be considered an attractor state of practice. An example could be the food parents buy during a week to feed members of the household. The parent's values of what constitutes acceptable or unacceptable food (Coveney, 2005) will influence what is brought, but in turn is likely to be influenced by: what foods are available and the money available to spend on food (resources) (Drewnowski & Darmon, 2005); the influence of other members of the household in demanding certain foods (power) (Backett-Milburn, Wills, Gregory et al., 2006); and habits formed by past actions (action and history) (Inglis, Ball, & Crawford, 2005).

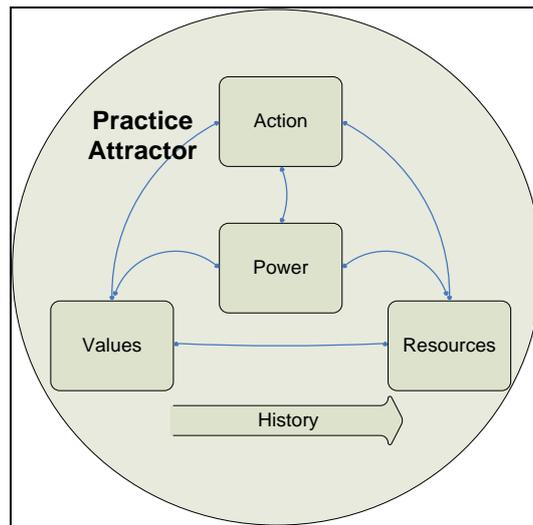


Figure 3-1 - Practice Attractor

Moving up a level, Figure 3-2 shows how multiple practice attractors can combine to create an attractor state at a setting level. To carry on with the example, the food eaten within the household by members of the household described above, will be determined by not only the food purchased, but also food preparation practices (Devine, Jastran, Jabs et al., 2006), which in turn are likely to be influenced by practices based outside the household such as work or leisure practices.

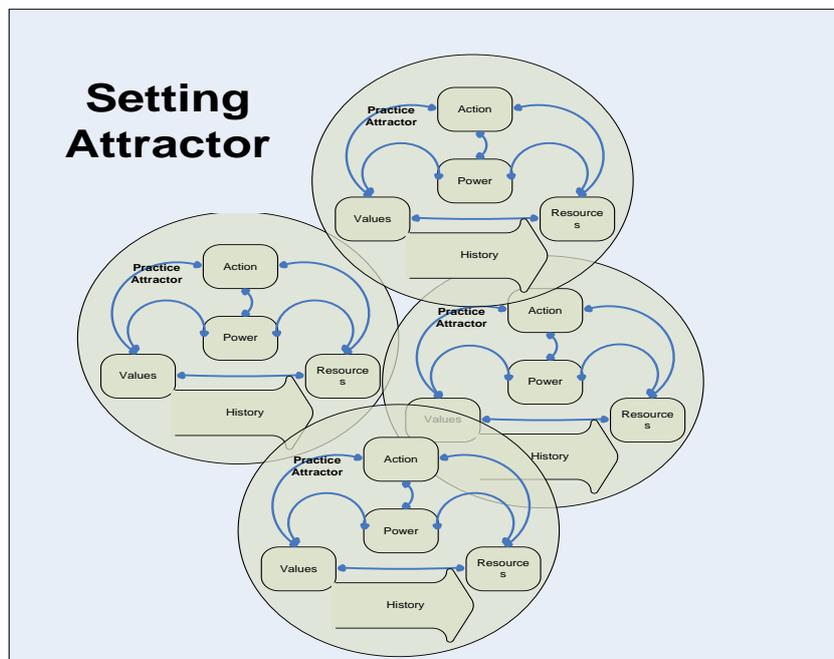


Figure 3-2 - Setting Attractor

Again moving up a level of aggregation, Figure 3-3 shows how multiple setting attractors can combine to produce a whole system attractor. In the example being followed here, the system that produces increasing rates of childhood obesity will include several settings attractors, such as the home setting, school setting (Story et al., 2006), and environmental setting (World Health Organization, 2003; Wrigley, Warm, & Margetts, 2003), which includes the availability of food, and the food production and pricing setting (Cawley, 2006). An important point here is that to understand the increasing rates of childhood obesity, the system as a whole must be understood (Reidpath, Burns, Garrard et al., 2002; Swinburn et al., 1999; Woog, Cavana, Roberts et al., 2006), as must each setting within the system and their interaction, as must the practices within each setting and their interactions. Of course one implication of complexity theory is that perfect knowledge of a complex system is unlikely to be achieved (Byrne, 1998). So complete understanding of the components and their interactions at a practice, setting or system level is an ideal rather than a necessity for analysis. As the level of aggregation moves down towards practice, the degree to which local variation exists will become more evident.

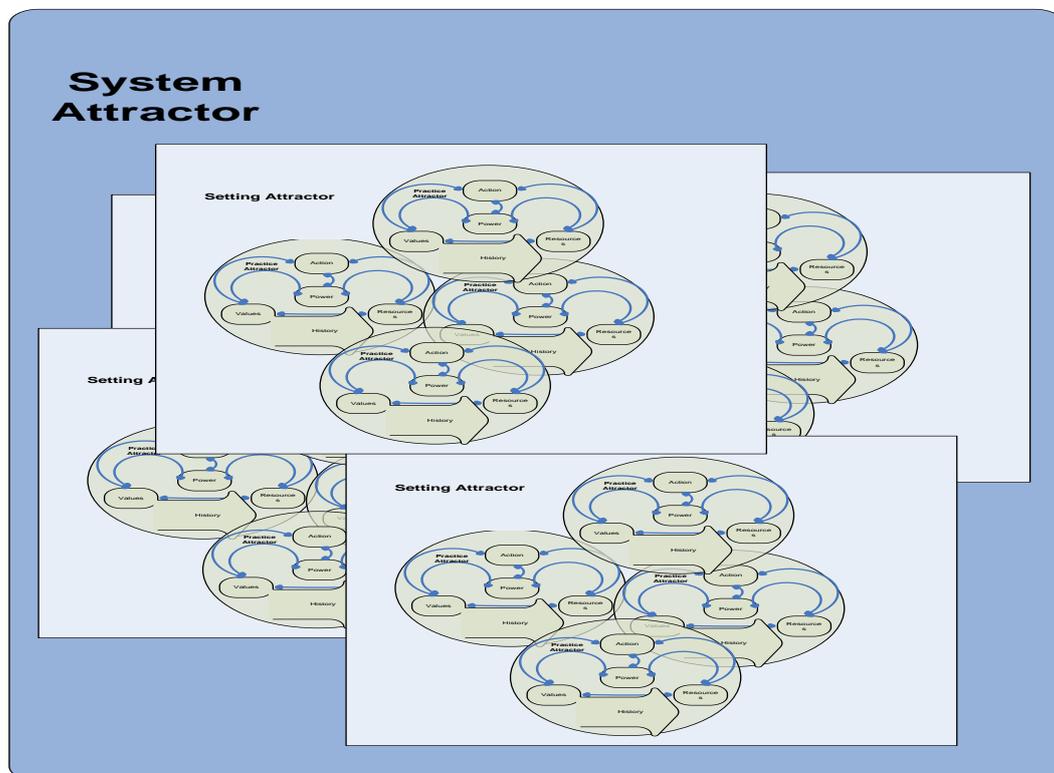


Figure 3-3 - System Attractor

O'Sullivan (2004) contends that at less aggregated levels (towards practice level attractors) the 'initial conditions' of the attractor will matter more on how a system evolves. At more aggregate levels (towards system level attractors), the ability of the system to 'self-organise' reduces the degree to which initial conditions are evident in emergent system outcomes. The implication of this is that examining only the emergent properties of a system at the system attractor level for a society, is likely to hide diversity at disaggregated levels. Without understanding this diversity, interventions may have unintended and possibly unrecognised outcomes, particularly when looking at outcomes at a more disaggregated level.

Because action is included in each level of attractor, there is transformative opportunity to make changes to the configuration of attractors. A common element amongst all forms of complexity theory is that small changes in the configuration of attractor states can lead to qualitative, potentially large, non-linear changes in the emergent phenomena of the system (Cilliers, 1998). Actors, individuals, or institutions may undertake action within practice, setting or system attractors, and often simultaneously within multiple attractors (Byrne, 1998).

Therefore, to understand the nutrition practice of a household using this theoretical framework, the values, standards, and knowledge of the household would be considered, within a context of available choices. It is not possible, however, to investigate one type of practice in isolation from other practices taking place within the household. There may be a trade-off between actions linked both to available choices, and the standards of that household. In other words, to understand a system, the practices, settings, and system level attractor states must be understood. It is suggested here that when using complexity theory, this is best done through producing descriptions of these attractor states.

In this thesis, the majority of data is collected and analysed to inform a setting level understanding of primary school food environment systems. To aid understanding of primary school food environments, a system attractor view is also gained through analysis of research literature (Chapter 5). The system level view is returned to in Chapter 10 to consider how interventions identified to operate at the setting level

(primary school food environments), may also impact on the wider ‘child nutrition’ system within which primary schools are located.

For the purpose of policy analysis, systems may be described using available information, such as literature, existing research reports, previous policy consultation results, and administrative data. For research purposes, or policy projects with longer timeframes, new data can be generated to help create system descriptions. Byrne (2005a; Byrne & Uprichard, 2007) describes a case-comparison method of research which seems useful as a starting point for describing systems. This uses both qualitative and quantitative information to describe systems, and aims to include different perspectives, or develop different cases to aid comparison.

For policy relevance, a desired outcome of the description of a system will be the identification of control parameters of the system. Policy system maps are an example of a method that may be used to visually synthesize system description information.

3.4.2.3 Policy System Maps

For this research a number of system descriptions have been developed using a method referred to as ‘policy system maps’, developed for this research. The policy system maps (at the setting level) are used to identify the areas of practice operating within case study primary schools. Control parameters are identified within the maps and, with the linkages between practices, are used to inform an intervention theory of where policy interventions may impact within the system (Hawe, Shiell, & Riley, 2004; Joffe & Mindell, 2006; Whitehead, 2007). Models are often used in policy analysis to assess theory against likely real world impacts (Parsons, 1997), or in policy evaluation, to identify intended outputs of the policy interventions against which real impacts can be measured (Millar, Simeone, & Carnevale, 2001). However, it is fair to say that many of the models routinely used in policy analysis and evaluation make assumptions about causality that follow a positivist epistemology (Sanderson, 2000). Many such models have been depicted by visual means (usually diagrams) to help convey situations.

As Joffe and Mindell (2006) note, using diagrams to examine complex systems is relatively undeveloped in public health, outside of epidemiology. Even within epidemiology, Krieger's (1994) critique of causal models suggests the diagrams used are not consistent with a complexity theory frame, as they are used in a reductionist way, rather than to understand the system as a whole.

The approach developed for this research was to develop a policy system map that collated various sources of data on a system of interest. The system of interest is defined as all those system components at a setting level (practices) that appear to be linked to the emergent phenomena of interest. In this case child nutrition in relation to primary schools. Because population survey data suggests that children's nutrition varies across socioeconomic and ethnic context (Ministry of Health, 2008a; Parnell et al., 2003), multiple policy system maps were produced, each representing one specific setting of a particular primary school. Primary schools were chosen to vary by socioeconomic context, with a mix of student ethnicities. In other words, each policy system map represents a case (example) of a system from which the emergent phenomena of interest (child nutrition) emerges. This then allows the policy system maps to form the basis of a case-comparison method, advocated by Byrne (2005a) as an appropriate method to research complex systems. The five case study primary school policy system maps are shown in Chapter 6.

For the purpose of identifying policy intervention options, the comparison across cases would focus on identifying common control parameters across cases. These control parameters will then become the focus of policy interventions, as they are more likely to produce changes in the systems of interest and emergent phenomena than other system components. As discussed in section 2.6, an element of a system is identified as a control parameter if it appears to be an external input into the system (Rickles et al., 2007), and is likely to be highly connected within the system. Interventions should then be designed with the purpose of enabling the system of interest to move to desired attractor states.

A caution should be expressed here. Morçöl (2008) suggests that we do not yet fully understand the extent that emergence in complex systems is impacted on by external influences (interventions), as opposed to internal self-organisation (through feedback).

Focussing on control parameters appears likely to be a good place to intervene, but there is no guarantee that the attractor state of a system will be changed by external interventions. If attractor states are changed following interventions, the effect on emergent phenomena is difficult to predict due to the non-linearity of interactions within a system.

It is not proposed here that there should be a standard way of visually representing policy system maps. The approach used in this research is just one example of possible approaches. There are, however, some common components of systems to consider within the diagram to highlight possible differences in system elements between contexts, and increase the usefulness for policy analysis purposes. These include:

- The most useful level of representation is likely to be at the setting attractor, with practices displayed within the diagram, and multiple diagrams developed to show system attractors
- Non-directional connections between system components are represented when data suggests a relationship
- Control parameters are identified
- Components that show change on a particular dimension (e.g. socioeconomic status, or age of actors, or geographical location) are indicated to highlight areas of perceived differences across contexts.

3.4.2.4 Critically evaluating system definitions

Identifying what is within a system of interest, and what is outside, is always going to be a subjective exercise (Byrne, 2002). While multiple data sources can be used to help guide decisions regarding system definitions, the interpretation of the data requires subjective processes (Ragin, 2000). One implication of this subjective process of system definition is the potential to not adequately include elements in the system that contribute to inequalities in the emergent phenomenon of interest.

In relation to childhood nutrition and primary schools, there are well established associations between lower socioeconomic status and obesity and poor diets (Utter et

al., 2007c). In defining the primary school food environment from which children's diets at school emerge, it would be possible to not include the socioeconomic circumstances of the home and communities of students within the system description. If such factors are not included within the system description, then it seems unlikely that policy intervention options identified from such descriptions will address socioeconomic circumstances.

Once a system description has been produced, Midgley (2000) quotes Ulrich's twelve critical heuristic boundary questions as a tool for examining system boundaries, and the values and power dynamics inherent in boundary definitions. Lockett (2006) has applied these questions to policy analysis and concludes they are particularly useful for this purpose.

Ulrich's questions seek to provide a description of the current system and identify what the emergent properties of the ideal system would be, from the perspective of the person answering the questions. Topics include: who benefits; how is success measured; who makes decisions; what resources are within the system; what representation of expertise and citizens are included; and, what world view underlies the system description (Midgley, 2000).

To be most useful in identifying potential 'losers' from the system description, it is proposed that multiple sets of answers to these questions should be sought from a variety of respondents. Where there is a difference between the current and ideal answers to the above questions, then further consideration can be given to whether the system is producing inequalities (Gatrell, 2005; Midgley, 2000). These questions helped guide development of the policy participant interview schedule (Appendix D). The interviews sought to examine the system descriptions developed from local school case studies, from a national perspective.

3.4.3 Forecasting

An implication of complexity theory is that prediction of future attractor states is limited due to non-linear relationships between and within systems, local variation and sensitivity to initial conditions. Having said this, much of the research activity within complexity theory seeks to identify rules within a system that can help predict

how a system may evolve, often using simulation models (Byrne, 2005a). Simulation modelling has been the most active area of complexity theory use within policy analysis to date (Bankes, 2002, 2005; Borrelli, Ponsiglione, Iandoli et al., 2008; Levy, Bauer, & Lee, 2006).

The simulation approach seems to be primarily a mathematical version of complexity theory (Manson, 2001), which does not appear entirely consistent with a realist approach (Byrne, 2005a; Morçöl, 2002). These models appear to have little consideration for the elements of practice described above (section 3.4.2.1). Byrne (2005a) for example, argues that simulation models do not represent social structure and the importance of history in developing social structure. Also, the outputs of simulation models are examples, based on interaction defined by simple rules, of what the future behaviour of a system may be. While simulations based on these simple rules may provide interesting information on possible system wide changes based on small adjustments in the rules, such models can only be a simplification of actual social systems. Results from simulation models themselves suggest that potentially small differences in the actual social system operating, compared to the simulation model, could generate quite different outcomes. For this reason, there can be no claim that simulation forms a sound basis for forecasting future behaviour of complex systems (Byrne, 2005a).

If changes in social phenomena are considered qualitative shifts in the interactions and boundaries of systems (Byrne, 2001a), then it is difficult to predict what the impact on social phenomena will be if the system is altered through policy interventions (Blackman, 2001). This raises the question of why any policymaker would want to invest in policy interventions that will lead to an unknown outcome. The answer is that confidence in desired outcomes is still possible using complexity theory. Instead of information from forecast models to provide this confidence, policy goals and interventions need to have support from a wide range of stakeholders before proceeding (Hajer & Wagenaar, 2003).

As stated earlier, organisational studies using complexity theory have shown that resistance to change can act as negative feedback (Houchin & MacLean, 2005). If broad support is gained, there is a good case for confidence in achieving desired

outcomes. A clear vision of desired outcomes, tempered with reflective practice that provides information on how interventions are actually impacting on the ground, will enable policymakers to have confidence that they will retain some control and accountability for interventions (Sanderson, 2006; Westley et al., 2006). Levinthal and Warglien (1999) suggest that coordination and communication around a clearly articulated strategy can act to generate support and direct action towards a common goal (reduce negative feedback).

In summary, it seems that policy interventions should be based on a theory of direction of change of a social phenomena (Brunner, 2006; Whitehead, 2007), supported by analysis of the system descriptions outlined above. It seems that a clearly articulated vision, supported by analysis of how interventions can lead to a change in system attractor states, may help generate support and lead towards stated goals. Interventions guided by such a vision have a good likelihood of leading to desired change in the emergent phenomenon of interest. Policy implementation and evaluation methods (see sections 3.4.2.6 and 3.4.2.7), consistent with complexity theory are likely to provide further confidence that desired outcomes will be achieved. Such methods will provide opportunities to change the interventions if unanticipated outcomes begin to emerge.

3.4.4 Setting objectives and priorities, and option analysis

As described under issue definition (section 3.4.2), the line between issue definition and option analysis is blurred under the proposed complexity theory analysis approach. By describing system boundaries and areas of practice, and comparing different system descriptions, areas for policy intervention can be identified.

The intervention options chosen will be implicitly connected with the issue definition and, therefore, with objectives for change in the social phenomena of concern. This is a political exercise. As discussed under issue definition, if there is inequity in the ability of sections of society to voice opinion within the political process, then it is likely those sections with greater voice will determine policy agendas and influence issue definitions (Innes & Booher, 2003). This same power imbalance is likely to influence priority setting, which in turn will influence the policy intervention options chosen.

Authors such as Fischer (2003) argue that a collaborative and deliberative policy approach is required to achieve commonly agreed objectives and interventions. Hajer and Wagenaar (2003) suggest that when objectives and goals are derived through deliberative processes, involving all key interest groups, then these goals may themselves be better predictors of future impacts of interventions than more traditional forecasting and modelling. This places the policy analyst in the position of 'facilitator' (Fischer, 2003), where different perspectives are discussed and common ground sought. Such deliberative processes will test assumptions contained both within dialogue used, and evidence or analysis presented. As Fischer (2003: 338) states:

...participatory policy analysis is designed to facilitate the exchange between the everyday commonsense perspectives of the social actors in the situational context...and the available theoretical knowledge (empirical and normative) about the larger social system in which the action context is situated...'

This exchange of perspectives is also necessary for policy relevant research as a method of describing systems. So, there are two purposes of policy deliberation amongst a wide range of interest groups, citizens and politicians. The first is to gather the information required to construct system descriptions, including boundaries and areas of practice. The second is to gain agreement of objectives and goals for policy interventions, and select amongst intervention options.

It seems reasonable to propose that the first purpose can help stimulate the second. The system description generated by the analyst, or preferably several competing descriptions constructed from a wide range of information sources, may act as 'issue guides' for public deliberation. System descriptions may help actors to identify where within the system their actions may impact (Shiell, 2008). Citizens, politicians, or institutions engaged in a deliberative process, may either identify with, or critique the system descriptions, to support their dialogue within the process. This will in turn help to make explicit the assumptions and values underlying competing positions, which will aid in identifying areas of commonality and difference. Through discussions of commonality and difference in a deliberative process, then it is likely that some agreement on preferred policy interventions will be reached (Innes & Booher, 2003).

Of course it needs to be pointed out that most political decisions regarding policy objectives and interventions are not currently made through deliberative or participatory political processes (Goodin & Dryzek, 2006). To do so would require a significant shift in current decision making processes. However, where deliberative and participatory processes have been used, they have shown an ability to change opinion, create consensus, and identify ‘win-win’ intervention options (Barabas, 2004; Forester, 1999; Goodin & Dryzek, 2006; Robinson, 2003). Within New Zealand the establishment of District Health Boards partly elected by local populations, and the requirement for local government to produce Long Term Council Community Plans (Institute of Policy Studies, 2006), shows an appreciation for greater participation in local policy development.

3.4.5 Policy Implementation

A central concept of complexity theory is the ability for self-organisation within complex systems (Burnes, 2004). The ability for self-organisation, combined with the limit and uncertainty for both analysis and interventions created by contextual variations, has implications for how implementation of policies occurs. Sanderson (2000, 2006) contends that the uncertainty regarding changes to a system attractor, following a policy intervention, leads to a need for continual feedback on impacts and regular adjusting of intervention design and delivery.

This process of intervention adjustment limits the ability of government agencies to plan and deliver interventions from a ‘national office’. It would certainly limit the ability of national politicians to agree on one intervention design to be universally applied. Instead the focus of governments should be to develop the overall framework of interventions (Sanderson, 2000), and ‘... influence processes of social interaction, seek to balance social forces and interests, and enable social actors and systems so as to facilitate such self-organisation’ (Sanderson, 2006: 122).

There is not the space here, or the need, to consider the detail of what complexity theory informed service or policy intervention delivery should look like. However, the organisational literature which uses complexity theory (Burnes, 2004; Houchin & MacLean, 2005), and the literature on collaboration approaches to ‘wicked’ policy problems (Blackman et al., 2006; Durant & Legge, 2006; Durie & Wyatt, 2007;

Humpage, 2005), probably provides a starting point. Common themes from these works highlight: the importance of a shared vision of the problem, objectives, and intervention goals; trust between agents implementing services and the communities they are located in; local flexibility to self-organise in ways appropriate to the context; and good information flows between organisations and individuals regarding impacts of interventions.

3.4.6 Policy Evaluation

With the exception of Ian Sanderson (2000), there has been little research into policy evaluation methods using complexity theory. Insights into evaluation methods may however be gleaned from realist evaluative techniques (Befani, Lederman, & Sager, 2007; Pawson & Tilley, 1997), deliberative methods (Fischer, 1995), and empowerment evaluation (Fetterman & Wandersman, 2007). Several common threads run through these evaluation approaches which allow a borrowing of methods and approaches. The first is that evaluation should be theory driven. That is, a theory of change (Walker, 2007) of how the policy intervention is likely to impact on the social phenomena of interest is explicit within the intervention. The second thread, is that the context within which the intervention is being implemented must be taken into account and interventions tailored for the context. The third thread, is that interventions should be developed through iterative stages, that is, evaluation information should refine the intervention in an ongoing and timely way.

As discussed under forecasting, taking a complexity theory approach assumes that there are inherent uncertainties when intervening in a social system, as to what the resultant emergent phenomena from the altered system may be. Taking a complexity theory approach necessitates an explicit theory of how an intervention, or series of interventions, may impact on a system and its emergent phenomena. Given the theory driven nature of intervention design, and the inherent uncertainty of the resultant system changes, policy intervention implementation and evaluation can be combined to enable constant checking against, and the refinement of the theory and intervention (Westley et al., 2006). This refinement may need to vary locally (Blackman, 2001).

Several evaluation methodologies exist, consistent with complexity theory, which offer methods for identifying changes in systems and refining both theory and

interventions. One such methodology is realistic evaluation, as described by Pawson and Tilley (1997). At the core of realistic evaluation is an understanding about how outcomes are generated through the interaction between context and the change mechanism. That is the context that the intervention is operating within, and the mechanism by which change is created.

According to realistic evaluation, political programmes can trigger a range of mechanisms of change. The specific mechanisms triggered will depend on the programme context. As a result, a political programme can lead to a variety of outcomes in different contexts (Befani et al., 2007:172).

As outcomes may differ between contexts, a variety of context-mechanism-outcome combinations must be understood to identify the ‘winners and losers’ (Pawson & Tilley, 1997: 204) of policy interventions. The differences identified between context-mechanism-outcome configurations are then used to refine the policy intervention theory, usually with the intention of maximising winners and minimising losers. As Pawson and Tilley note (1997: 116), ‘Theory is the bridgehead between the goals of generalization and specification in evaluation research’.

The comparison between context-mechanism-outcome configurations is consistent with case comparison methods which, as already stated, are supported by Byrne as a way of analysing configurations of complex systems (Byrne, 2005a). Qualitative Comparative Analysis (QCA) provides one structured method for conducting case comparison analysis (Ragin, 2000), and is seen as consistent with realistic evaluation (Befani et al., 2007).

Another evaluation approach is to focus on the practices of actors involved in implementation of policy interventions. The focus of this type of evaluative activity is an ongoing reflective process for those involved to refine theory, planning, and implementation approaches according to the ever changing realities of context and the outcomes being achieved (Fetterman & Wandersman, 2007; Patton, 1994; Westley et al., 2006). This type of evaluation is variously titled developmental evaluation, empowerment evaluation, and formative evaluation. Methods and information types are not heavily prescribed in this approach, with methods adopted if they can support the goals of reflective practice.

The effectiveness of this evaluation approach will, however, depend on the breadth of information collected and actors involved in reflecting on the information. If the voices of either the winners or losers are not adequately included in the evaluative process, then the intervention is unlikely to be changed for their benefit. To this degree the arguments made earlier for deliberative policy analysis methods also hold for evaluation methods. The evaluator also acts as facilitator to gather information that supports alternative perspectives on the appropriateness and effectiveness of an intervention (Fischer, 1995). Refinements to interventions will then be made through deliberative processes informed by the evaluative information collected.

A third approach to evaluation, again consistent with the previous two and complexity theory, has been referred to as entropic evaluation (Walker, 2007). Walker's conception of entropic evaluation is similar to the use of policy system maps described above. The focus of evaluative activity is to map the systems within which interventions are intended to work. As Walker describes (2007: 210):

In effect [the evaluator] would seek to map sequences of cause and effect linking the policy implementation to observed effects through the interaction of various policy actors.

The same variety of methods and information sources required to generate policy system maps for policy analysis would again be required for evaluative purposes. This is likely to include information that helps to define the system boundaries, including quantitative descriptions, and qualitative data that considers the interaction of elements within systems. In this case the winners and losers may be identified through differences in perspectives and views between groups.

3.4.7 Policy Maintenance, Succession and Termination

Obviously the reflective and iterative refinement of interventions described above is key to maintenance, succession and termination of policy interventions. A crucial component of complexity theory is that changes to attractor states, and the resultant emergent phenomena, can be quick and significant. An obvious example is the rush of policy changes that regularly follow general elections, as the political power emergent from parliament changes (New Zealand Government, 2009a, b). It may be that the trend of increasing childhood obesity shows a rapid turnaround. This does not

necessarily mean that interventions that were implemented to slow the growth of childhood obesity should be either stopped, or doubled, to increase their effect. Interventions are likely to become part of an attractor state at some level, so a careful consideration of how changes in that intervention will impact on the new attractor state must inform decisions regarding succession or termination.

Blackman (2006) makes a compelling argument against using strict national targets and performance measures to manage implementation of policies, arguing that local variability makes these meaningless. Instead, the ongoing reflection and agreement of priorities and approaches amongst local stakeholders is required (Durant & Legge, 2006). The role of central government politicians and officials then becomes one of creating the structures, frameworks, and supports to enable this local level policy intervention management.

3.5 Conclusion

This chapter builds the base of a policy focussed, complexity theory informed, research methodology. Methods derived from this, and used to examine the role of primary schools in promoting childhood nutrition, are discussed in Chapter 4. This chapter has provided a summary of literature reviewing how complexity theory, and sympathetic postpositivist and systems theories, consider policy analysis and policy making processes. To organise the literature it has been considered within a rational stages model of policy making. While to date there has been no comprehensive consideration of how complexity theory may inform policy analysis and decision making in the literature, there is sufficient writing on elements of policy to begin to pull together a coherent picture. To compliment this picture, analysis methods established in postpositivist politics or evaluation fields may be drawn on.

In particular, policy system maps have been developed here as a method of synthesising multiple information sources, to produce a description of the system of interest. Multiple policy system maps can be used to perform case-comparison type analysis between competing system descriptions. If used within a deliberative forum, these maps may act as an aid to participatory politics.

In conclusion, given the focus on history and context within complexity theory, a prescriptive approach to a complexity theory informed policy analysis method would not be appropriate. Instead, the following principles for policy analysis and research may be applied (see Chapter 4):

- Explore definitions of policy problem situations – be mindful that inequalities of social outcomes are likely to impact on the ability for individuals and groups to engage in policy processes. To counter this, problem situations should be critically examined by analysts.
- In exploring problem situation definitions, collect information on elements of attractor states at practice, setting, and system levels.
- Look to identify control parameters within system descriptions as key areas to focus interventions.
- Encourage a wide range of views to be expressed and considered, and compare contrasting views to explore differences of context.
- Seek to identify policy intervention options from a system description and exchange and contrasting of views.
- Encourage local collaboration and management of policy interventions, within an agreed national and regional framework.
- Seek locally focussed, iterative, and comparative evaluation processes, which inform policy objective and intervention refinement.

A research method consistent with these principles has been developed for this research focussed on intervention option identification and analysis.

Chapter Four

Methods

Every PhD student in everything should get to grips with the ‘chaos/complexity’ programme, not for the reasons of fashion or even legitimate career building but because this is the way the world works and we need to understand that (Byrne, 1998: 161).

4.1 Introduction

This Chapter will draw together the strands of methodology outlined in the previous two Chapters, and detail the methods used in this study. To bring this discussion into context, it is worth restating the aims of this study, which are to: (i) identify policy interventions that will support primary schools in improving childhood nutrition and reduce rates of childhood obesity in the long term; and (ii), consider the usefulness of complexity theory for policy analysis and research, through the development and application of policy analysis methods consistent with complexity theory. This is not a focus on theoretical development of complexity theory, but rather an attempt to provide evidence of its effectiveness, or otherwise, in an applied research setting.

For this research a five stage case comparison policy research method has been developed. The method focuses on issue definition through to option analysis stages of the policy process outlined in Table 3-1. Stages one to four of the research method cover: case selection; data collection and analysis to develop a description of the school food environment operating in each case study school; identification of possible interventions; and a case-comparison.

Stage five attempts to engage policymakers in considering the results of the case-comparison work, to further refine the identification of possible policy interventions. Stage five also consists of prioritisation across the identified intervention options, drawing on evidence from case study schools, policymaker interviews and international research. The final output is a ‘portfolio’ of interventions, which taken together, have the potential to support primary schools in New Zealand to effectively promote healthy nutrition, with a subsequent potential to improve children’s diets.

4.2 Complexity theory research methodology – a summary

In order to understand primary school food environments, the research methodology was informed by complexity theory. The ontological and epistemological assumptions of a realist version of complexity theory are discussed in Chapter 2, and will not be repeated here. For ease of reference, however, David Byrne's (2005) working definition of complexity theory is quoted below, where complexity theory is defined as:

The interdisciplinary understanding of reality as composed of complex open systems with emergent properties and transformational potential. A crucial corollary of complexity theory is that knowledge is inherently local rather than universal. Complexity science is inherently dynamic. It is concerned with the description and explanation of change... (Byrne, 2005a: 97).

The development of methodology and method for this study is drawing heavily on the work of David Byrne. The quote above emphasises the importance of understanding the context of knowledge, and an emphasis on the explanation of change in complex systems. An averaging of many cases will not explain change in complex systems. As already shown in Chapter 2, understanding the increase in childhood obesity cannot be understood by knowing the average energy consumption, and calories burned, of population groups. These measurements are themselves only representations of complex system outcomes, or emergent phenomena (Byrne & Uprichard, 2007), and so offer no help in explaining causation. Instead the configuration (both what is included and the interaction between elements) of a system should be known in order to better understand emergence of the phenomenon of interest (Byrne, 2005a).

From a realist perspective, the same outcome – increasing rates of childhood obesity – can be caused by different configurations of elements within a system, and interactions with other systems and their environments (Byrne, 2005a; Pawson & Tilley, 1997; Ragin, 2000). To understand causation therefore, whole systems with differing configurations should be compared, with the aim of research being to identify the causal conditions shared by systems (Ragin, 2000). A theory of causation is required to identify policy interventions, as interventions will seek to impact on causation to change outcomes (Parsons, 1997). In this research, case studies of primary schools formed the core set of data from which subsequent data collection and analysis builds.

Byrne identifies a case comparison study method as appropriate to deal with complexity (Byrne, 2005a; Byrne & Uprichard, 2007), where a case can be defined as:

The essence of the case in a complex frame is that cases are in themselves complex systems which are nested in, have nested within them, and intersect with other complex systems (Byrne, 2005a: 105).

Anderson (2005b) also puts forward case studies as appropriate for understanding complex ‘phenomenon as an integrated whole’ (p 681). The Byrne definition above is important, as it indicates that a case can never be completely categorically defined, as the point of view at the time of defining cases will impact on what systems are included in the definition (Byrne, 2005a; Byrne & Uprichard, 2007; Midgley, 2000; Ragin, 2000). For the purpose of this study, a case will be considered a setting level attractor, which has within it practice level attractors, and which combine with other setting level attractors to form system level attractors (see section 3.4.2.1). In other words, the food environment within primary schools will be the main focus (setting level attractor). Within this there will be areas of practice, such as the food children bring from home, that in and of themselves can be understood as complex systems (practice level attractors). It will also be recognised that children move between multiple settings, such as school, home and community, all of which will impact on each other and, taken together, form a wider system (system level attractor).

For the purpose of identifying policy interventions for this research, the case-comparison method needs to consider how future changes in systems and social phenomena of interest, may be created or avoided. Bryne and Uprichard (2006) identified narrative, the expression of meaning that an actor attaches to actions, as a way of understanding the role of actors and action in past system changes, and potential action in future change. This is summarised in the quote below:

We can employ narratives not just as a means of identifying phase shifts in the past and the present, but also in terms of the imagined potential for change in the future...Narratives help us to explore not only how people do describe their world, they can also be used to learn about how they want their world to change (Uprichard & Byrne, 2006: 675).

For the purposes of policy research, a case comparison method, which includes narrative, appears appropriate as it seeks to understand both the history of systems and the potential for change in systems. As stated in Chapter 3, if the most basic unit of analysis is a practice level attractor, which includes action, then gaining insight of possible future action from actors located within the practice level attractor has important implications.

Understanding possible future actions helps to understand the potential for transformation of the system.

4.3 A Realist Complexity Theory Research Methodology for Policy Research

In general, it is fair to say that policy research and analysis is less concerned with identifying causes of social phenomena, than it is with identifying options to impact and change social phenomena (Majchrzak, 1984). This does not mean that an understanding of causation is not important, but that informing decisions requires an argument for how desired outcomes can be achieved, which will draw on many different sorts of information (Wolf, 2004).

One implication of complexity theory – that the same outcome can be caused by different configurations of systems (Byrne, 2005a) – means that the same intervention can lead to different outcomes in different contexts (Befani et al., 2007). As discussed in Chapter 3, this limits the use of forecasting, and increases the importance of decision making and policy implementation activity, which includes local level actors. More central areas of government still play a role, however, in providing the frameworks and resources to support local level interventions.

Taking into account the nature of complex systems, and the summary points from Chapter 3 (section 3.5), it can be argued that the aim of policy research is to examine different configurations of systems to identify: (i) the policy interventions that are likely to be effective in creating change within a local context; and (ii) the national or regional level supports required to help make the local interventions effective in achieving the desired outcome (change in the systems locally). Within this process a critical examination of both the definition of the policy problem situation, and the understanding of local systems which inform the analysis, can aid intervention design and may help to reduce the construction of inequalities between groups from policy interventions.

Policy research taking this approach has implications for policy decision making, promoting the use of participatory decision making through deliberative processes (Byrne, 2005a; Fischer, 2003; Midgley, 2000). The use of a deliberative process is an attempt to maximise the effectiveness of policy interventions to local contexts. The policy research methodology falling out of this perspective of policy research is a

combination of the case comparison method described by Bryne (Byrne, 2005a; Byrne & Uprichard, 2007), with the methods for policy analysis described in Chapter 3, and is summarised below as a five step process.

Stage One: Identify cases

Stage one is the identification and selection of cases. The cases should be able to test implicit theories of causation in the policy problem situation definition, by including different configurations of systems. Yin (2003) suggests that selection of cases must be theoretically informed to predict either similar or contrasting results.

Stage Two: Generate system descriptions

Stage two involves the development of a system description for each case. For this research system descriptions are setting level attractor policy system maps (see section 3.4.2.2), which include practice level attractors, and can be combined with other setting attractor level maps to produce a system attractor policy system map. The research was informed by multiple sources of information (including interviews, observation and literature as outlined in this chapter), to identify the various elements of practice, including measurement and narrative.

Stage Three: Identification of intervention options

Stage three seeks to identify intervention options relevant to each case. This focussed on identifying what the likely control parameters of the system were, what the desire for change of actors within the system was, and the type of change desired.

Stage Four: Case comparison

Stage four comprised of a comparison between cases. The case-comparison focussed on a critical examination of the different system descriptions and policy intervention options, with the aim of identifying likely ‘winners’ and ‘losers’ (Pawson & Tilley, 1997). The case comparison also considered the variety of local factors that may make policy intervention options work, or not, within different contexts.

Stage Five: Decision Making

In stage five, the case-comparison results were presented to a wide audience of national level actors. Combined with case study data, decisions on policy interventions can be informed by understanding the views of multiple policy actors regarding policy goals and interventions.

4.3.1 Summary

The data collection and analysis methods for this research are described below under the five research method stages outlined above. Each stage is designed to build on the previous stages, and this is reflected in the presentation of results. The selection of cases is discussed within this Chapter. A literature based system description is detailed in Chapter 5, while primary school case study system descriptions are provided in Chapter 6. Chapter 7 covers the identification of policy intervention options and a case comparison analysis. Interviews with policymakers were conducted to consider decision making, and analysis of these is included in Chapter 8. Chapter 9 brings together both school and policymaker data for a selected portfolio of interventions. A summary of international research evidence of impact for identified interventions, and a prioritisation process amongst portfolio interventions is also included in Chapter 9.

4.4 Study Methods

4.4.1 Researcher perspective

As the researcher who collected and analysed the majority of data included in this research, I have several theoretical and political positions that could have biased the results of this study. Over the course of the research, my worldview has become increasingly “complex”. That is, I consider that a majority of social phenomena do emerge from complex systems. Holding a complex worldview may reduce my ability to always consider alternative theoretical explanations.

I also believe that public health research should aspire to social justice, which for me means actively working to reduce social and health inequalities, and the processes that create these. Because of my social justice and “complex” views, I tend to favour policy interventions to change social processes and structures over interventions focussed on individual behaviour and responsibility. These views could have influenced data

collection and analysis. Where I consider that my perspectives could have impacted on the data collected and analysis of results, this possibility is discussed.

The research perspectives of collaborators (discussed below) in this study were not questioned. It is therefore difficult to know how they may have influenced the results. However, it seems unlikely that the results and conclusions will be greatly affected by collaborator's research perspectives. Each collaborator only worked on a relatively small part of the research. When put in context of the overall research output, collaborator research perspectives are unlikely to be dominant.

4.4.2 Advisory processes

This study was supported by an advisory group consisting of an experienced public health academic, a senior government official, and experienced school and Māori nutrition health promoters. The advisory group provided input into the early stages of the research, particularly regarding methods. Where input of the advisory group impacted on methods, this is noted.

In addition to the advisory group, draft method, results and discussion Chapters were reviewed by one Māori and one Pacific researcher. As I am of Pākehā ethnicity (New Zealander of European descent), an external Pākehā reviewer was not considered necessary. The aims of this review process were to: (i) point out any inaccuracies or insensitivities when discussing Māori and Pacific results; and (ii) point out any results or discussion regarding Māori or Pacific children and families that they disagreed with, or thought could be further highlighted. There were relatively few comments received, and these have been integrated where appropriate so that this final version hopefully accurately and fairly presents that data and discussion in relation to Māori and Pacific people, in an accurate and fair manner.

4.4.3 Stage One – Case selection

Five primary school case studies were included in this research, in a collective case study design (Stake, 2003). The cases were not chosen because they themselves are of interest, but because they help to understand the phenomenon of interest, child nutrition and primary schools. This design is what Yin (2003) refers to as multiple case study design,

where cases are selected to either replicate other cases, or replicate a theoretically predicted difference between cases.

Cases were selected to examine an expected difference between schools across socioeconomic context, and ethnic mix of students. Nutrition and obesity differences across these two characteristics have been shown in national surveys of children (e.g. Parnell et al., 2003). Some difference in the food environment systems of schools across socioeconomic context and ethnic mix of students was therefore expected. Selection and recruitment of primary school case studies is described below. A holistic design was chosen, where the nature of the whole food environment system of the school is of interest (Yin, 2003). This is in line with complexity theory, seeking to consider the case as an integrated whole system (Anderson et al., 2005b).

A case was also developed from a narrative review of the international research literature. The advantage of creating a literature based case was threefold. The first was that the nature of the data collected from primary school case studies was informed by the literature based system description. The second was that the literature based school setting policy system map could be compared to the actual primary school cases policy system maps (system descriptions), which allowed for direct comparison between research findings reported in the literature and the new findings of this research. The third advantage was that the actual cases are based within primary schools, and while information on home settings and community settings may be collected as part of the case study data, this is from the school perspective only. The literature review based policy system maps of the home, community and child centred settings allowed for a more detailed consideration of how the school setting may interact with other settings, than would be possible from data collected within primary school case studies only.

4.4.3.1 Sampling and selection of primary school cases

It was assumed that each case study school had a unique collection of factors interacting to form the school food environment particular to that school. For this reason, the exact findings from each case study school will not be generalisable to other primary schools. However, across the five case study primary schools, it was expected to identify some common factors and some divergent factors and interactions. Such similarities and differences can give guidance on how school food environment systems may be operating for all primary schools in New Zealand, and possibly similar jurisdictions such

as Australia and the UK. To maximise the generalisability of this research, it was considered important that case study schools cover the range of factors associated with varying nutritional outcomes for children, identified in the literature (Yin, 2003).

The sampling method was therefore purposeful and theoretically informed (Stake, 2003). Descriptive studies of nutrition and obesity, particularly the 2002 New Zealand Children's Nutrition Survey (Parnell et al., 2003), indicated that there were different rates of childhood overweight, obesity and nutrition practices between ethnic groups and socioeconomic groups. Other research also suggests that access to food outlets and exposure to food advertisements surrounding schools is higher in lower socioeconomic areas (Maher et al., 2005; Pearce et al., 2007). On top of this, several nutrition focussed government initiatives were targeted to schools in lower socioeconomic areas (or low decile schools) (New Zealand Government, 2006a). It therefore could be assumed that there would be some difference in experience of both the problem of child nutrition, and existing efforts at promoting nutrition, across schools located in communities experiencing different levels of socioeconomic deprivation, and with different ethnic profiles.

Primary schools were recruited from the Wellington Region, and more specifically Wellington City, Porirua City, Upper Hutt City, and Hutt City regions. This was for practical reasons of minimising travel time and cost. There were 105 full and contributing primary schools in the geographic area, including state integrated schools⁶ (Ministry of Education, 2007d). These schools are across four local government areas, and located within a diverse range of socioeconomic neighbourhoods. This was considered an adequate sampling frame from which to select the five case study schools. It is likely that primary schools within the sample frame would be similar in many characteristics to a large number of schools across New Zealand. Having five case study schools was considered adequate to cover a range of school characteristics (e.g. ethnic mix of students, schools size and socioeconomic profile). Practical considerations of time and resource were also key factors in limiting the number of case study primary schools to five.

⁶ State integrated schools are privately owned and usually of a particular religious character. They have, however, been integrated into the state system and receive some state funding, deliver the common curriculum, and are governed by a Board of Trustees in the same way as publicly owned schools.

With a key component of the case-comparison method being to look for similarities and difference across cases, the selection criteria for inclusion of primary schools focussed on recruiting schools with quite different characteristics from each other. The initial selection criteria were:

- Two low decile (deciles 1-3), two medium decile (deciles 4-7), one high decile (deciles 8-10) schools.
- One semi/rural school and four urban schools with a mixture of urban density.
- A range of ethnic mix of students between schools (including Māori and Pacific students who are overrepresented in overweight and obesity statistics referred to in Chapter 1).
- At least one school already advanced in nutrition policy development and implementation through the Healthy Heart Award Programme, Fruit in Schools, or other programmes.

School decile refers to a socioeconomic deprivation ranking system for schools, developed by the Ministry of Education, and used to help determine operational funding for schools. The decile rating is calculated using population census area information based on student home addresses. Five factors make up the decile rating: household income; occupation; household crowding; educational qualifications; and income support recipients (Ministry of Education, 2008). Decile one represents the ten percent of schools with the greatest proportion of students from the most socially deprived neighbourhoods, while decile ten represents the ten percent of schools with the lowest proportion of students from such neighbourhoods. The mixture of rural, semi-rural, or urban location was considered based on the size of population and number of occupied dwellings in the statistical area unit the school was located within (Statistics New Zealand, 2007). Classifying as suburban, urban or semi-rural was determined relative to other schools already in the sample.

Following a project advisory group meeting on 11 February 2008, where proposed methods for the study were discussed, an additional selection criterion was added. This was that one school should be a kura kaupapa. ‘A kura kaupapa Māori school is a State school where teaching is in the Māori language and the school's aims, purposes and objectives reflect the Te Aho Matua philosophy’ (Ministry of Education, 2007a).

Members of the advisory group considered that kura kaupapa are sufficiently different in their organisation and operation to justify being specifically included in the study. Given the disproportionate burden of overweight and obesity amongst Māori children, the inclusion of a kura kaupapa had the potential to highlight results of particular significance for Māori children.

Recruitment of primary schools was facilitated by the Wellington Regional Public Health Unit (RPH). RPH has responsibility for providing government funded advice to schools on nutrition, sun care, smoke free and other health promotion areas. RPH are key to implementation of programmes such as Fruit in Schools. The author met with the manager of the school health team at RPH, who agreed to support school recruitment. Subsequently a number of meetings were held with RPH staff, including the Health Promoting Schools Team, the Hutt Valley Public Health Nurse Team, and the Public Health Nurse Team Leaders for Wellington City and Porirua. All these groups work with primary schools in the Wellington Region. At each meeting, staff of RPH was asked to suggest schools that would meet the selection criteria as specified above. In general, staff from RPH have working relationships with lower decile schools, as this is the focus of the majority of their work. Over six meetings a list of 23 schools across the Wellington region was developed, which allowed for selection of schools to meet the selection criteria listed above.

For each possible school on the list, the following characteristics were noted within an Excel spreadsheet: decile, number of students, proportion of students by ethnic group according to the school's last Education Review Office report, involvement with health promotion activities (such as Fruit in Schools), and location. A set of five schools were identified that provided the mix of schools required. As schools were recruited, if one declined to be involved, a school with similar characteristics was then included and approached.

Where staff from RPH had a working relationship with the school, those staff made the initial contact, usually with the school principal, but on one occasion with the teacher responsible for Fruit in Schools. Where there was not an existing working relationship, either because staff had changed, or the school was not involved in any health promotion initiatives, the author made the initial approach by sending a letter outlining the study, and following up with a phone call a few days later.

Eleven schools were approached in order to get the five needed. The schools that agreed to be involved were in all circumstances contacted first by staff from RPH. Table 4-1 shows the characteristics of the five schools that agreed to be involved. Six schools declined to be involved. The reason given by all schools for not being involved in the study was a concern over the time involved for school staff. This seemed particularly so for lower decile schools who were involved in several health promotion programmes. One school was already involved in research on physical activity with the University of Otago, and said that one research project at a time was enough.

Table 4-1 – Characteristics of Schools Involved in Study

School	School socio-economic deprivation rating	Number of students	Ethnicity of students	Rural/urban location	Number of health promotion programmes in school
A	1-3	175	Māori 36% Pacific 46% NZ European/Pākehā 13% Other ethnic groups 5%	Suburban	4+
B	1-3	159	Māori 98% Pacific 2%	Suburban	4+
C	4-6	296	Māori 23% Pacific 11% NZ European/ Pākehā 47% Other 19%	Urban	1-3
D	7-10	246	Māori 15% Pacific 2% NZ European/ Pākehā 79% Other 4%	Suburban	0
E	7-10	129	Māori 10% NZ European/ Pākehā 89% Other 1%	Rural/Semi-rural	0

4.4.4 Stage Two: Generating system descriptions

System descriptions represent a narrative, constructed by the author from the various forms of data collected. For this study, system descriptions describe the school food environment systems of the case studies. They are used to inform consideration of interventions with potential to change a system attractor (see section 3.4.2.1). As mentioned above, two types of case were included in this study, a case based on

literature, and actual primary school cases. The data used to generate system descriptions for each type of case is described below.

4.4.4.1 Literature Generated Case Study

Chapter 5 presents the results of a narrative review of literature and subsequent development of four setting level policy system maps, looking at associations and causes of childhood obesity. Together, the policy system maps provide a view of the child nutrition system. The system elements included within the school setting policy system map helped guide data collection for the primary school case studies. It particularly helped the questioning of informants regarding impacts of home and community settings within the school.

The narrative review method drew on the work of Mays et al. (2005). The review was developmental in nature, focussed on generating descriptions of the child nutrition system to inform subsequent data collection and policy development (Mays et al., 2005). A literature review identified factors associated with childhood obesity and nutrition practices, with a particular focus on differences between ethnic and socioeconomic groupings. The focus on socioeconomic status and ethnicity was to explore findings of the 2002 New Zealand Child Nutrition Survey (Parnell et al., 2003; Utter et al., 2006b), outlined in Chapter 1 and discussed further in Chapter 5.

Literature searches were conducted using Medline, Academic Search Premier, Index New Zealand and PubMed, between January and March 2007. Combinations of search terms were used to highlight literature related to children's nutrition and the prevention of obesity, limited to English language. Search terms included: child, children's, student, family; and nutrition, diet, obesity, overweight, food; and school, home, community; and policy, intervention, determinant, and association. As the purpose of this review was to identify the range of factors which may be operating within a system from which child nutrition and obesity emerge in New Zealand, the searches were designed for breadth rather than depth. Preference was given to review articles and research conducted in New Zealand. In areas where comprehensive reviews were not found (such as the location of food shopping outlets), peer reviewed original research articles were included. A process of snowballing from the references of identified papers was also used to supplement database searches.

There was no exclusion of papers by study design. Both qualitative and quantitative methods were included so as to not exclude any potentially relevant findings. The main exclusion criteria was theoretical saturation (Mays et al., 2005), when the papers ceased to provide new ideas to refine the narrative summary (Dixon-Woods, Agarwal, Jones et al., 2005), discussed below.

By including papers with both qualitative and quantitative methods, quality assessment of papers becomes difficult (Dixon-Woods et al., 2005; Mays et al., 2005). This is because quite different concepts and standards of validity and reliability have developed across the different research disciplines. Some authors suggest that comparison between qualitative methodologies alone is not possible (Seale & Silverman, 1997). While some review studies do not undertake quality assessment of qualitative papers for this reason (Mays et al., 2005), the position of Seale and Silverman (1997) was taken for this study. That is, not considering quality can lead to ‘methodological anarchy’, which makes it difficult to interpret findings.

A simple quality criterion was therefore employed before papers were included. These were adopted from the Critical Appraisal Skills Programme set of ten questions to appraise qualitative research (Critical Appraisal Skills Programme (CASP), 1998). The ten questions include: was the aim clear; was the design appropriate to address the aims; was the data collected relevant to addressing the aims; have possible sources of bias been discussed; is the description of data analysis sufficient to consider rigour; and are the findings explicit? As these questions were used to judge both qualitative and quantitative study designs, they were slightly adapted. For example one question asked whether a qualitative method was appropriate. This question was changed to consider the appropriateness of any method to the study aims.

The ten appraisal questions have been used by a number of researchers (e.g. Campbell, Pound, Pope et al., 2003; Wiles, Cott, & Gibson, 2008). Seven papers were excluded due to lack of clarity around methods and uncertainty of result validity. A total of 53 papers were used to generate the policy system maps shown in Chapter 5.

An interpretive synthesis approach was used to develop a narrative summary of reviewed research using thematic analysis (Dixon-Woods et al., 2005; Mays et al., 2005). An interpretive synthesis focuses on development of concepts and theories (Dixon-Woods et

al., 2005). This can be contrasted against an integrative synthesis that seeks to summarize data (Dixon-Woods et al., 2005). Narrative reviews can be criticised for lower levels of transparency of inclusion criteria and quality appraisal of papers (Bollini, Pampallona, Kupelnick et al., 2006), compared to systematic reviews (Mays et al., 2005). This criticism may be justified when conducting a review to inform clinical decisions. However, for the purposes of generating theory and exploring concepts, the flexibility and inclusive nature of narrative summaries is an advantage.

As the papers were reviewed, a thematic analysis was conducted (Dixon-Woods et al., 2005; Mays et al., 2005). Dixon-Woods et al (2005) describe the process of thematic analysis as involving ‘the identification of prominent or recurrent themes in the literature, and summarising the findings of different studies under thematic headings’ (p 47). In this research an iterative process was used, with thematic headings refined as more papers were reviewed.

The four settings (school, home, community/economic and child centred) shown in Chapter 5 emerged from examining themes coming from the literature review. The fact that themes regarding school, home and community were identified reflects the search terms used. The search terms were themselves informed by literature reviewed in development of this research topic and method. Factors were grouped under common thematic headings, and it is these headings that are shown in the policy system maps. Once elements were identified for inclusion in a policy system map, possible interactions were inductively identified through the results presented in the literature, and therefore represents a theory of how interacting factors lead to the childhood nutrition outcomes in New Zealand (Walker, 2007). For example, the work of Drewnowski and colleagues (Drewnowski, 2004; Drewnowski & Specter, 2004), identified the cost of food as impacting on diets, but more so for households with limited income, so an interaction between cost of food and household economic resources is suggested.

4.4.4.2 School Case Studies:

System descriptions aim to identify the different practice level attractors interacting within the school setting. Multiple methods are required to identify practices, as they are shaped by history and other systems; and include agency, values, physical resources, power relations, and action (see section 3.4.2.1). In this study two main data sources were used: key informant interview; and observation (both direct and indirect) of the

school food environment. Because system descriptions alter with the perspective of the person doing the describing (Byrne, 2005a; Midgley, 2000), multiple case study interviews were conducted in each school to triangulate between perspectives (Stake, 2003). For the purpose of this study, the school food environment was defined to also include possible influences and sources of food in the community environment surrounding the schools. In particular, this included location of food outlets and outdoor food advertisements. Information from the different data sources were then analysed and compared to develop a single school setting policy system map.

For each primary school an initial meeting was held with the school principal. At this meeting the purpose of the study was further explained, and the types of information to be collected discussed. Informed consent was also discussed at this meeting with information sheets and consent forms provided. As each school is different, a checklist of possible data sources was considered to identify data relevant for that school. The narrative summary of literature highlighted a number of data types used across child nutrition and school focussed studies, which informed development of the checklist. The possible data identified for this study were:

- School lunch programme sales information
- Documents detailing any sponsorship arrangements
- School food policies (final or draft)
- School fundraising policies (final or draft)
- Travel to school audit/study (how children travel to/from school)
- Lunchbox audit results (what children bring to school)
- Health survey results (asking parents about the role of the school in promoting health topics).

During the discussion, school principals were asked for any other information they thought might be useful. None was identified. No school had the same set of data available. All schools managed to provide some information on school lunch programme sales, as well as student addresses for the analysis of food outlet and advertisement locations in relation to students and the school, and at least three key informant interviews (discussed below).

4.4.4.3 *Key informant interview methods*

Key informant interviews are a common data collection method for health and policy research (Britten, 1995; Fitzpatrick & Boulton, 1994; Kvale, 2007; Thomas, 2001). For each primary school, three interviews were undertaken with individuals involved in leadership on nutrition issues for the school. In all cases this included the school principal. In all cases this also included a teacher at the school with particular responsibility for nutrition or health, although the actual roles varied. For one school the teacher had been part of the Board of Trustees and helped to draft the school's food policy. In another case the teacher was the health and physical education curriculum leader for the school. In yet another, the teacher was in charge of a student led health committee. In four of the five cases there was also an interview with a parent on the Board of Trustees, although their direct involvement with food and nutrition in the school varied. For one school no parent Board of Trustee member responded to interview requests, and a school administrator who managed the lunch programme was interviewed.

The school principal nominated and approached teacher and parent informants in all cases. Because of the potential coercion of teachers to be involved by the principals, a particular point was made of explaining to the further interviewees the voluntary nature of participating and explaining the informed consent process. Two nominated informants declined and alternative suggestions were sought from the principals.

Interviews took place between March and June 2008. All interviews were conducted face-to-face and audio recorded. The length of interview varied between 17 minutes and one hour. In general the interviews with school principals were the longest, as they had some knowledge across a wide variety of topics. The teachers and parents sometimes had knowledge in only a limited number of areas, such as the curriculum and not fundraising, or the school food policy but not the school lunch programme.

Each interview was based around a semi-structured interview guide (Kvale, 2007), with two pages of questions and question prompts for the interviewer. The questions began by eliciting factual information about the school, such as whether a food policy was in place, to ease informants into the interview (Britten, 1995). Questions then progressed to cover informant's thoughts on causes of nutrition practices and obesity, through to the relative influence of school, home and community setting on children's nutrition

practices. In all cases additional and unique questions were asked outside of the interview guide, to further explore answers to the interview guide questions.

The development of the interview guide was influenced by the literature review and analysis as described in Chapter 5, and the concept of practice attractors which include values, action, power and resources. The interview guide was provided to the project advisory group for comment, of which several were received, and was tested in two pilot interviews. One pilot interview was with a school principal of a decile one school, while the other was with a teacher of a decile ten school. Both schools were on the initial list of 23 possible study schools described earlier and not approached regarding further participation. No substantive changes were made to the questions following the pilots, although the order of questions was altered to better align with the flow of conversation. The interview guide is attached as Appendix C.

Things that were *not* discussed within the interviews included defining the ‘school’, the historical and future time frame of interest, or particular theories of obesity, such as a simple versus complex theory of causation. Through analysis of the interviews it is obvious, however, that each informant viewed these things slightly differently, as discussed in Chapter 6.

Each interview was transcribed by the interviewer. The transcription, whilst verbatim, was kept simple in that limited transcription symbols were used and emphasis or pause not recorded (Silverman, 1993). From a practical perspective, the interviews were analysed by importing the interview transcripts into NVivo7 (QSR International, 2006), and used free nodes to group references under common themes (Gibbs, 2002). A new project was created with NVivo7 for each case study school.

Although the interviews were semi-structured, in that a common set of questions were used to guide the direction of interviews, the analysis of interviews took a holistic-content approach (Lieblich, Tuval-Mashiach, & Zilber, 1998), described below. Pope et al (2000) describe the process of coding transcript data: ‘...the data are read and reread to identify and index themes and categories...The key point about this process is that it is inclusive; categories are added to reflect as many of the nuances of the data as possible ...’ (p 114). It is difficult to succinctly describe the full process of coding transcript data, and is probably why qualitative method text books tend to use examples more than

descriptive text of the process (e.g. Babbie, 2001; Silverman, 1993). The quote by Pope et al. above is a close match to the process used, with further detail provided below.

The holistic-context approach attempted to understand answers in relation to other parts of the interview. This allowed for consideration of informant views on, for example, parental responsibility for feeding children at school to be understood in relation to school responsibilities. The identification of the theme regarding responsibility would then contain sub-themes of school and parental responsibilities, with links across the sub-themes where a informant had answers coded to both. This type of linking was made easier by use of software for managing transcripts and coding (Pope et al., 2000).

The holistic approach was used because of the importance of understanding context and history within system descriptions. Each respondent was in effect asked to describe the 'system of interest', that is the school setting attractor and its component and interacting practice level attractors. To understand the context within which each respondent was providing this description, it was felt that an ability to consider all answers together was needed.

Where documents such as a school's food policy or health survey of parents were collected, these were imported into the NVivo7 project for that school and analysed in the same way as the interview transcripts. That is, read with the portions of text selected and labelled with thematic codes (Babbie, 2001; Gibbs, 2002). Thematic codes were refined as more interview transcripts and other documents were analysed (Boyatzis, 1998).

The Kura

Methods for collecting and analysing data for the kura kaupapa were slightly different. Upon advice from Māori advisors to the research project, a Māori researcher, Jordon Waiti, was employed to liaise and conduct interviews with staff and parents of the kura. Prior to contacting the kura, Jordan was briefed on the aim of the study, the type of information that was required, and provided with an example of a completed holistic-content thematic analysis of a case study school. When interviewing the staff and parent of the kura, Jordan based the interview on the same interview schedule as used for the other schools. While the interviews were conducted in English, there were many Māori

words brought into the conversation and at one stage several sentences spoken in te reo Māori. Jordan translated and transcribed these interviews, conducted the thematic analysis, and prepared a summary analysis of the themes including quotes from the interview transcripts. The author, who conducted all other interviews, listened to all three interview recordings. As much as it was possible to determine, all transcripts appeared to accurately reflect the interview content.

Identifying barriers and policy intervention options for the kura kaupapa was a mixture of interview analysis and thematic identification, undertaken by Jordan, and development of a policy system map and subsequent analysis, undertaken by the author. To finalise the analysis and identification of barriers and policy intervention options, a regular review and discussion approach between Jordan and the author occurred. This process allowed Jordan to comment on whether he thought the analysis accurately represented the information from the interviews, and considered the appropriateness and implications of the identified policy intervention options from a Māori perspective. Several times Jordan provided more information on Māori concepts discussed in the interviews to refine the analysis.

The process of Jordan conducting interviews and transcript analysis added significantly to the study. This was evidenced by the obvious rapport he had with informants, enabling informants to move between English and te reo Māori. Results from the kura case study were also successfully integrated with other case studies in the case-comparison (Chapter 7), through the process of discussion between Jordan and the author. It is possible that the kura would not have engaged in the study without Jordan's involvement.

The method used here approached cross-cultural research (Gibbs, 2001). It should not be viewed as attempting to approach a kaupapa Māori research method (Walker, Eketone, & Gibbs, 2006), nor a true parallel process (Cram, Phillips, Tipene-Matua et al., 2004). A move towards a parallel would have necessitated a greater involvement of Māori researchers in the initial project design and interview guide construction. Instead, the inclusion of the kura, and involvement of Jordan, brought in a more robust consideration of Māori children into the research.

4.4.4.4 *School Food Environment Methods*

The school food environment is defined as the food available for children to eat within the school. This incorporates both food brought into the school by children, and food purchased at school. The food that children bring into the school could either be from home or purchased on the way to school. A focus of government policy at the time of the research, as outlined through the Mission-On set of initiatives, was to reduce the energy-dense and nutrient poor foods that are available in schools.

As mentioned above, for each school data was collected on food sales within the school lunch programme. Each school had a lunch programme running, although no school was similar in what they were offering or how it was run. One school started collecting the lunch sales following the initial meeting to discuss data. Other schools had been keeping sales records but had not collated them. The information was provided in various ways, from copied daily order tally sheets, to bar charts and tables. One school got a senior class to undertake the collation as a maths exercise. The variability in food sales data collection methods meant that they were viewed as indicative only.

The items available for sale within the lunch school food programme were classified by the author according to the Food and Beverage Classification System for Years 1-13 (Ministry of Health, 2007a). This classification has three categories 'everyday', 'sometimes', and 'occasional', based on energy, fat and sodium levels particular to food groups. The guidelines recommend that schools make 'occasional' type food items available no more than once per school term, whilst 'sometimes' food should not dominate the foods available in school. For the vast majority of items, the quick reference guides of the Food and Beverage Classification System were used. Where an item could be classified within more than one category, the healthiest classification was used, in order to be conservative about quality of food. Where a branded food product was identified, the Nutrition Information Panel on the product packaging was used to classify the product.

Informants in the interviews were asked questions regarding the school lunch programme. This helped to interpret the food sales classification and sales information. No school had completed a lunchbox audit, so there was little information available on what food was brought to school by children, apart from impressions included within interview data.

4.4.4.5 *Community Food Environment Methods*

As already discussed, schools do not operate in isolation from their communities. There are likely to be numerous food related advertisements and opportunities to purchase food in the community environment surrounding schools. These all have an opportunity to either reinforce or counter the efforts of schools to promote healthy nutrition. To consider how big an impact the community food environment surrounding schools may be, information was collected on food outlets and outdoor food advertisements in areas surrounding four of the case study schools. School E, due to its rural location, had no food outlets or outdoor food advertisements within the catchment area for students. School E was therefore excluded from the community food environment analysis, and lack of food influences in the areas surrounding the school is absent from the school description in Chapter 6 (Figure 6-18).

Geographic Information Systems (GIS) computer analysis of geographic information is regularly applied to health topics (Gatrell & Löytönen, 1998). This research used GIS analysis of the community environment data, which provided the ability to estimate: (i) the percentage of students that do not pass any food outlet or outdoor food advertisement on the route to/from school; (ii) the number who pass at least one food outlet or outdoor food advertisement; and (iii) of those that pass at least one food outlet or outdoor food advertisement, how many on average are passed. The community maps developed for each case study school, also provide some indication of how urban design surrounding schools may impact on the number of food outlets and outdoor food advertisements children pass on route to and from school (Chapter 6). This analysis builds on and extends the work of both Pearce et al. (2007) and Maher et al. (2005).

The assumption behind the GIS analysis, as described in Chapter 5, is that food outlets and outdoor food advertisements can act to influence children's food preferences. Food outlets also provide an opportunity for some children to purchase food. In this analysis the possible effects of food outlets and outdoor food advertisements are not separated, because almost all outdoor food advertisements recorded were co-located with food outlets. Outdoor advertising has the ability to geographically target potential consumers, while having an immediate impact on product awareness (Bhargava & Donthu, 1999). If co-located with food outlets near schools, food-related advertising can be expected to reach students with opportunity for immediate purchase of promoted items. Opportunity

for purchasing is likely, of course, to be restricted by mode of transport, with children in cars or buses perhaps less likely to purchase food along the route to school. The New Zealand Health Survey 2006/2007 reported that 47 percent of children 5 to 14 years old used active transport (walk, bike or skateboard) to school (Ministry of Health, 2008a).

Data collection of food outlet and outdoor food advertisement location and content was guided by where students lived. A systematic method of walking and driving the streets radiating from the school was developed. Student addresses were approximately located on a street map. The streets were not systematically scanned for outlets and advertisements if less than five students lived in the vicinity. This number was chosen as a practical consideration when locating students for the first case study school, which formed a benchmark for subsequent data collection. Typically this meant that data collection stopped three to four kilometres from the school (School B is a notable exception). As distance away from the school increased, the chance of not recording data (outlet or advertisement) potentially increased, as there was more street area to cover.

To increase certainty of analysis, a two kilometre buffer was drawn around schools for analysis of food outlet and outdoor food advertisements types. The analysis of whether children walked past at least one food outlet or outdoor food advertisement used all student addresses collected, regardless of distance from school. Where the students lived outside the two kilometre buffer, the number of outlets or advertisements passed may be slightly less reliable and therefore underestimate the total number of food outlets and advertisements passed.

A Geographical Positioning System (GPS) coordinate was taken for each food outlet and outdoor food advertisement using a handheld Garmin GPS 60. A digital photo of the food outlet or advertisement was also taken to aid categorisation. An Excel spreadsheet was developed for each school, which listed each food outlet and advertisement with coordinate and classification information. Food outlets were classified in a similar way to Pearce et al. (2007), as either: dairy/convenience store; service station; local takeaways; multinational takeaways; or, supermarket.

Food advertisements were classified according to the Food and Beverage Classification System for Years 1-13 into either 'everyday', 'sometimes', or 'occasional' categories. An additional category of shop signage was required, as many of the advertisements were

not advertising specific food product, but a food outlet, such as ‘KFC’, or ‘Fish and Chips’. As with products on sale within schools, a conservative approach was taken. For purposes of food advertisement classification an assumption was made that the advertisement was for the healthiest option of that food product. For example Cookie Time cookies were advertised. There are cookies made by Cookie Time that fit exclusively into the ‘occasional’ category. However, the company also make cookies that fit into the ‘sometimes’ category, and therefore Cookie Time cookie advertisements (that did not differentiate between the types of cookies) were classified as ‘sometimes’. This may underestimate the number of ‘occasional’ foods advertised.

The geocoding and geographic analysis was conducted by Peter Day and Jamie Pearce of the GeoHealth Laboratory, University of Canterbury. The home address for each school pupil from the four schools was geocoded using ArcGIS 9.2 software from the street address and suburb information provided. For three schools the geocoding success rate was 100 percent. For school B the initial success rate was only 53 percent as difficulties with the school database meant that street numbers were not provided. These were eventually all resolved to a 100 percent success rate but there may be discrepancies in the geocoding of pupil addresses for this school. Any discrepancies are likely to be small variations in street number and therefore unlikely to significantly impact on the accuracy of the analysis, or the implications drawn from the results.

The food outlet and outdoor food advertisement data was also entered into ArcGIS 9.2 software. Each advertisement was entered separately, so a food outlet with multiple attached advertisements would register as multiple data points at the same location.

The student addresses, schools and advertisements were loaded into ArcMap along with a road network of the Wellington region. A road network analysis was done to calculate (i) the food advertisements and food outlets within a two kilometre radius of each of the schools; and (ii) descriptive information about the number and types of each food advertisement and food outlet students would need to pass on roads to get to/from school.

Using the road network analysis tool within ArcGIS 9.2, a two kilometre buffer was calculated around each school. All food outlets and advertising points within this two kilometre buffer around each school were then appended off. A two kilometre buffer was chosen for consistency between schools. Most students lived within this two

kilometre buffer (75.5 percent students school A, 60.9 percent students school C, 74.1 percent students school D), with the exception of school B (24.2 percent) who have a high proportion of students travelling from further away.

Road network functionality in ArcMap was used to calculate for each pupil the road distance (metres) travelled from their home address to school. The assumption here is that pupils would take the shortest most direct route to school, whether by walking, bike or car. The resulting map output produced a road route (line) and distance for each pupil for their travel between home and school. Future advances on this method could consider collecting information on actual travel routes rather than assuming the most direct road route.

Further GIS analysis added a 50 metre buffer around each pupil's road route to then merge all food and advertising locations that intersected with each route buffer. The buffer was used to capture advertising that was located on or near roads and to account for line of sight observation of advertisements. The 50 metre buffer was developed for this study and not tested for accuracy regarding what students actually see from the road. The accuracy of the 50 metre buffer could be explored in future studies.

All outlets and advertising intersected by each pupil's buffered travel route was merged together, so that each pupil could pass by zero or one or more food outlets and advertisements. The resulting output produced a road travel route for each unique pupil with the distance travelled, and the food outlets and advertising locations passed to and from school.

The analysis method is an advance over previous studies. The calculation of student travel routes is a better exposure measure than simple counts within a buffer zone, as used previously (Crawford, Timperio, Salmon et al., 2008; Maher et al., 2005; Zenk & Powell, 2008). Further refinement of the method by testing road routes and buffer assumptions could be considered in future research.

4.4.4.6 Policy System Maps

Each case study food environment system was described with a policy system map. There were three stages to developing the policy system map: first, identification of system elements or practices; second identification of interaction between elements; and

third, identification of control parameters. Identifying system elements and their interactions is a largely inductive process (Pope et al., 2000). The practices to include as system elements were identified, in the main, from analysis of the three interview transcripts for each school. The themes included were those that helped explain the food that was available and eaten by children at school. For example, school A informants noted that a ban on big bags of potato crisps and fizzy drinks had reduced the frequency with which these were brought to school. This ban is not written in the school food policy, however, and is represented in the policy system map (Figure 6-3) as ‘informal food rules (e.g. ban on fizzy drink)’.

Interactions between system elements were identified by informants and noted in coding of transcripts. Continuing the example, the ban on fizzy drinks was reported as having an impact on how often children brought fizzy drinks from home. The food brought from home was identified by all informants from school A as an important factor in what food children eat at school. The interview evidence suggests an interaction between ‘informal school rules’ and ‘food brought from home’, as shown in Figure 6-3.

Other data sources, such as school food policies and community surveys, were used to triangulate themes identified from interviews where possible. However, for the majority of themes, the additional information was not directly relevant and triangulation could only occur between school interview informants. No themes identified from school informant interviews were contradicted by other data.

Once a first draft of the policy system map had been produced, which included all identified system elements and interactions, control parameters were identified. Two criteria were used to identify control parameters. The first was identifying system elements with the most interactions with other elements, by counting connections from each element. This is to satisfy the criteria that control parameters are sites where feedback is easily distributed through the system (see section 2.6). The second criterion was to consider, amongst the highly linked system elements, those that were likely to act to bring resources into the system (Rickles et al., 2007). For example, for school A, ‘food brought from home’ is highly linked (to five other system elements) and acts to bring food from the home setting into the school setting, and is therefore identified as a control parameter.

4.4.5 Stage Three: Identification of intervention options

According to the method developed for this study, informed by complexity theory, an emergent phenomena of a system may be changed by changing the attractor state of a system (a phase transition). A key assumption behind this method is that the most likely candidate for changing a system attractor is by influencing a system's control parameters. Identification of policy options for this research has focussed on identified system control parameters. For each school, the policy system map was used to identify possible control parameters, as discussed above. Two sources of information were then used to identify possible interventions to impact on control parameters: (i) suggestions from school informants; and (ii) the literature reviewed to generate the literature case, as described in section 4.4.3.1. A total of 28 interventions were identified across the five case study schools, as described in Chapter 7.

4.4.6 Stage Four: Case Comparison

Government decisions regarding policy interventions must strike a balance somewhere between those interventions designed to impact widely, and those designed to have specific local impacts (Moobela & Price, 2008). Complexity theory suggests that systems from which child nutrition practices emerge will be different across geographical and social space, as well as time. By comparing system descriptions across cases, both common aspects of cases, as well as differences, can be used to inform policy making. Commonalities may point towards aspects of systems open to influence from more universal type policies. Differences may indicate areas where interventions tailored to the local system attractor are required.

The case comparison detailed in Chapter 7 seeks to identify the policy interventions to be further explored with policy makers (Chapter 8). There are three components to this analysis. First, the barriers to promoting healthy childhood nutrition identified within each primary school case study are examined. This helps to establish practical and conceptual limits to action within primary schools that may help when designing interventions. The analysis of barriers took the form of a simple Word table, across which the identified barriers could be compared for case study schools (Table 7-3). This analysis shows a range of barriers, some of which are common to all case study schools, and others which differ, largely along lines of socioeconomic deprivation.

The second component of the case-comparison analysis considered the identified control parameters across case study primary schools (Table 7-4). It is suggested here that control parameters should be targeted by policy interventions, as they are theoretically more likely to lead to a change in system attractor state (by influencing the possible range of future attractor states), than other system elements. The degree to which control parameters are common or different between cases may help determinant the degree to which policy interventions are universal or tailored in design.

The third aspect of the case-comparison analysis compared the identified intervention options across the case study primary schools (Table 7-5). The degree to which policy options are similar or different between case studies will likely be influenced by the degree that control parameters are similar. To be effective, however, policy interventions will also take into account identified barriers.

4.4.6.1 Identification of interventions to discuss with policy makers

The final part of the analysis sought to reduce the interventions identified from each case study primary school into a short list to be discussed with policymakers. There were three parts to the short listing process: (i) focus on interventions with a locus of control based with local agencies or central government; (ii) only short list those interventions with some level of support from case study primary school principals; and (iii) combine similar interventions. This process is discussed in more detail below.

The first step of the short listing process was to only consider those interventions with a locus of control at local agency or central government level. For example, included in the short list were mandatory bans made by government on the foods able to be brought into school from home. Not included was engagement of students by the school in improving the food environment. The focus of this research is to identify public policy interventions to support primary schools to promote healthy nutrition. The decision to implement any of the interventions identified for schools rests with each Board of Trustees. At this level, the within school decisions are not considered to be issues of public policy. There may, however, be policy decisions that inform Board of Trustee decisions, such as changes to the NAG. These broader policy decisions are captured within central government locus of control in Table 7-5.

The second step of the short listing process was a feedback meeting with each case study school principal. These meetings had two purposes: (i) to present school specific data, such as analysis of food sales, back to the school; and (ii), to discuss the identified intervention options and register an initial level of agreement as to the worth of such an intervention for improving children's diets. Only interventions that were discussed with at least two school principals, and where some level of support for the intervention area was provided by at least some of the principals, were shortlisted. The term 'support' is used to refer to the degree that case study school principals expressed positive views that an intervention may help improve children's diets in their school. It is possible that researcher bias played some part in determining which interventions were discussed with principals during feedback meetings. However, I was aware of my research bias and did attempt to cover a range of intervention types.

Feedback meetings also provided an opportunity to check the accuracy of collected data and analysis for each school. For example, three informants across two schools identified a possible role for care and protection agencies to focus on parental responsibilities to provide an adequate diet. However, when discussing possible interventions of this nature with principals of these schools, they did not express any support for actions beyond those already in place with statutory care and protection agencies. The reaction from principals suggests that the emphasis on nutrition as a care and protection issue was slightly exaggerated in analysis of interview data. As a result, this intervention was not included in the shortened list of interventions to discuss with policymakers.

The research feedback meetings were held only with case study school principals for two reasons. First, the principal had been the primary contact point for the school since initial contact was made regarding the study. From this perspective it made sense to continue to interact with the principal. The principal is also in a position to provide information to both the school's Board of Trustees and staff members. For this reason it seemed important that the principals were well informed regarding the research. Second, limiting feedback to school principals took less time than arranging a meeting where all informants or other interested individuals could attend.

The feedback meetings each lasted around one hour, with copies of a research report for each school left with the principal (see Appendix E for an example). Notes were taken

during the meeting to annotate a version of Table 7-5. Not every intervention option was discussed with every school principal due to time constraints, and it was considered important to first discuss the school specific information, such as food sales analysis and community food environment mapping.

As not every intervention was discussed with every school principal, the absence of support should not be taken as the principal not supporting an intervention. The intervention options discussed across at least two schools are shown in Table 7-6, with an indication of support offered by case study school principals. The ranking of support is based on comments made by school principals at research feedback sessions, and not a direct ranking by school informants.

The last step in short listing the interventions identified was a process of combining very similar interventions into a common description. For example undertake more ‘hands-on’ work within schools, was combined with increase funding to support agencies to allow more ‘hands-on’ work in schools, to produce support agencies working more directly in schools in Table 7-6.

4.4.6.2 Consideration of case study validity and reliability

It is important in any research, qualitative or quantitative, that audiences have a level of confidence in the results, and clear guidance on how generalisable results may be (Mays & Pope, 1995; Seale & Silverman, 1997). As one of the research aims of this study is to test the usefulness of the method for policy analysis, it is crucial to consider issues of validity and reliability of results. For case studies, Yin (2003) identifies four tests of validity and reliability. Each one of these is considered below in relation to the case study method used in this study.

Construct Validity

Construct validity is defined by Yin (2003: 34) as ‘establishing correct operational measures for the concepts being studied’. To increase construct validity within a case study, Yin (2003) identifies three tactics: using multiple sources of data; establishing a chain of evidence; and having key informants review draft case study reports. In this research all three tactics were employed. Multiple interviews were undertaken in each case study school, supplemented with food sales data, documents and community

surveys. In Chapter 6, analysis of interview, food sales data, policy documents and community survey data provides a chain of evidence between the data and each policy system map. The detail of the data provided for each case study school allows for some critique of the policy system maps. The draft case study results for each school were briefly discussed with the relevant school principal, as one check on accuracy of the analysis.

The key concept being explored through the case studies is developing an understanding of the elements that make up the school food environment system and their interactions. In keeping with the collective case study design (Stake, 2003), which seeks to provide insight and generate theory, an inclusive approach to identifying system elements was taken. Identification was a process of retroduction (Esterberg, 2002), where an inductive identification of themes from the data was guided by a deductive frame provided by complexity theory (as developed in Chapters 2 and 3).

A potential disadvantage of a retroductive process, as with an inductive process, is a lack of transparency compared to some quantitative procedures where all measures are defined prior to data collection (Babbie, 2001). However, well documented methods for qualitative analysis and reporting were followed (Babbie, 2001; Britten, 1995; Mays & Pope, 1995; Pope et al., 2000; Seale & Silverman, 1997; Silverman, 1993), which increases the confidence audiences can have that the results are a plausible representation of the school food environments of each case study school. The data collection was also guided by a review of research literature, which means that the concepts being explored have been identified across a range of other research studies, and not plucked from the air based on researcher bias.

Elements of the methods for data collection and analysis of the community food environment surrounding schools were innovative, such as the analysis of food outlets and advertisements likely passed by students on route to school. Because they were innovative, the methods were also being tested. However, the concepts behind the methods, such as the location of food outlets and outdoor advertisements in relation to schools, have been previously explored in the literature (e.g. Maher et al., 2005; Pearce et al., 2007; Zenk & Powell, 2008).

One area where uncertainty remains is in the identification of control parameters. The criteria for identifying control parameters (see section 4.4.4.6) were developed for this study based on theory. The accuracy of the criteria need to be examined, and are considered further in the discussion (Chapter 10).

Internal Validity

The concept of internal validity, according to Yin (2003), focuses on the establishment of a causal relationship within the case study data. Yin (2003) suggests four possible strategies to increase internal validity: pattern-matching; explanation building; addressing rival explanations; and using logic models. In this research, internal validity has been strengthened by pattern-matching through a form of theoretical replication across cases, which may also be a form of explanation building.

In a complex system, causation is not derived from simple relationships between a small number of elements within a system of interest. Instead, causation is the process of emergence, where all system elements and their interactions, are part of the causal process (Anderson et al., 2005b). For the purpose of examining complex systems, it seems that Yin's criterion of internal validity is useful with some minor revisions.

While not a definitive answer, it is proposed here that the internal validity of a case study school food environment system description be judged by comparison with other case studies. That is, does the system description adequately take into account the unique features of that case study? If it does, then it can be considered that some theoretical pattern-matching is achieved. The best way to determine this may be to consider differences in context between case studies and how well these differences are reflected in the system descriptions.

For example, there are relatively large differences in funding per student received by school A, compared to school E, due to the socioeconomic position of the communities each school is located within. The system description of school A includes an element of 'lack of money' within households, and no system element related to operational funding or fundraising. School E, in contrast, includes the elements 'school operating budget' and 'fundraising activities', but no reference to lack of money in households. The system descriptions appear to reflect the local context which relates to locally emergent child

nutrition outcomes. The differences (and similarities) between cases are generally in line with what would be expected from the literature reviewed for Chapter 5. Matching patterns across cases to consider similarities and differences can also act to build explanation. As described above, socioeconomic position appears as one explanation of the observed food environment systems. It can be inferred from the pattern-matching and explanation building that the system descriptions have some level of internal validity.

External Validity

External validity relates to claims of how far from the individual case studies results can be applied to (Yin, 2003). What appears to be the most generalisable from this study, is the understanding generated of how complex systems produce child nutrition outcomes, the breadth of elements likely to be involved, and the types of interventions likely to have a positive impact. The exact configuration of primary school food environment systems are not generalisable, as the history and context of each school is different. This can be seen by comparing the policy system maps in Chapter 6. However, the broader understanding of the range of system elements, control parameters and useful interventions, will likely be of use in national policy development.

The understanding of primary school food environment systems generated by this study was, in part, facilitated by inclusion of a range of schools across socioeconomic, ethnic mix of students, school size, and so on. A number of findings are consistent with the reviewed literature. For these reasons, aspects of the findings will likely be generalisable to many primary schools in New Zealand. A caveat to this claim is that one of the important results is that the exact nature of each school's food environment system is unique. Therefore, the mix and delivery of interventions must be tailored accordingly.

Reliability

The data collection and analysis methods used in this study, such as interviews and thematic analysis of transcripts, are commonly used (Pope et al., 2000). It seems likely that researchers could repeat the methods described in this chapter. If similar methods were followed, then comparable results are likely to be obtained. Although differences in the socioeconomic and historical context of the schools will likely how comparable the results are. Repeatability constitutes the crux of Yin's (2003) test of reliability. To aid

reliability the procedures used are carefully documented in this Chapter, with discussion of assumptions made.

While attempts have been made to increase reliability, there are likely limits to repeatability of results. Exact results are unlikely to be gained if the study was repeated, and are not expected in qualitative research (Seale & Silverman, 1997). There are several reasons for this. First, the exact conditions at the case study schools are likely to have changed. The school food environment system descriptions are a time bound snapshot. Students, staff and priorities are likely to have changed. Second, the policy context has changed with a National led government elected in November 2008, and subsequent removal of the National Administration Guideline regarding healthy food (Tolley, 2009). This is likely to have some impact on the approach being taken by schools in relation to nutrition. Third, another researcher is likely to have a different perspective, relate to informants differently, and identify different aspects of interview transcripts and other data as important.

4.4.6.3 Summary of case studies

Five primary school case studies were selected for this study, in a collective case study design (Stake, 2003) taking a holistic approach (Yin, 2003). Interviews, supported by a range of other information, were collected to develop a description of the complex school food environment system for each case study. Data collection was informed by a narrative review of literature (Mays et al., 2005). A process of retroduction (Esterberg, 2002) was used to identify system elements and interactions. From the system descriptions a range of possible interventions were identified. A case-comparison condensed the intervention options and formed the basis for discussion during the next research stage, to be outlined below. The case studies can be considered to have a high degree of construct validity, internal validity and reliability. External validity is theoretically informed, but aspects of the results are likely applicable to all primary schools in New Zealand.

4.4.7 Stage Five: Decision Making

An assumption of this thesis is that policy interventions are more likely to achieve their desired goals if designed to take account of real life system dynamics, with support of actors within the system at both a local and national level. Stage four identified policy

options that meet the requirement of local conditions, by being relevant to the school food environment system, and having some level of expressed support from principals. The final stage seeks to identify the national level factors likely to impact on interventions to support primary schools to promote healthy nutrition. These factors include: how the policymakers perceive the issues of childhood nutrition, overweight and obesity; the values policymakers held in relation to responsibility for action; how nutrition related interventions may compete against other policy areas for resources; and level of support for intervention options. This is achieved through interviews with members of the education and health policy communities.

The policy community is defined here along the lines of a policy subsystem under the Advocacy Coalition Model of policy making (Burton, 2006), and can be considered to include interest groups, bureaucracy, elected politicians, academics, think-tanks, researchers, journalists, those focused on implementation, as well as those charged with formal policy decision making (Parsons, 1997).

4.4.7.1 Recruitment

The number of interviews with policymakers was initially set between 15 and 20. This was considered sufficient to represent a wide range of actors within the policy community, while also being practically achievable within available timeframes and resources (Kvale, 2007). Criteria for inclusion was wide, but informants had to be involved either with health policy, education policy, obesity and nutrition advocacy, or have a national level overview of school based nutrition programmes and school operations.

Recruitment began by using personal contacts of the researcher and supervisors. One advantage of undertaking policy focussed research in the capital city is that personal contacts with politicians, officials, and non-governmental organisation staff is common. No doubt this is also a feature of a small country. All informants were asked for suggestions of other people to approach, and in that way sampling was largely a snowball method. Requests to participate were first made by email that included an information sheet (that stressed the interview would be anonymous), and followed up a few days later with a phone call. Multiple follow up emails and phone calls were made if no response was received. Possible bias resulting from the recruitment method is discussed in section 4.4.7.3.

Sixteen policy informants were interviewed for this research. Six informants worked for health, education or population focussed government ministries. Two informants worked for Crown entities, which are harder to define as health or education focussed, as they are usually developed along service lines that may cross several disciplines. Four policy informants worked for non-governmental organisations (NGOs) from both health and education focussed organisations. Two Members of Parliament were also interviewed, who had some specialist knowledge of health or education policy. Finally, two informants worked for a District Health Board, which has responsibility for health policy development, service provision and coordination for a geographically distinct population. While most of the policy informants were located within predominately health or education focussed organisations, during the course of the interviews it became apparent that the majority of informants had worked across both sectors during their careers.

The degree of seniority varied amongst policy informants. However, all had potential to influence decisions in their area, including advising decision makers directly, or themselves making decisions regarding implementation of nutrition focussed programmes. Three informants identified themselves as of either Māori or Pacific ethnicity. Twelve informants were female, and four male.

Seven people declined to be interviewed. Two of these were from education NGOs representing parents. Two were Members of Parliament within the newly formed government administration. Three were officials working within general social policy focussed agencies. From those that declined to be involved, the results may have been weakened slightly by not having voices representing the current government, or with specialist knowledge of the benefit and tax systems.

One challenge in recruitment was timing. Recruitment began shortly before Christmas 2008. In New Zealand organisations are often thinly staffed over the summer months from Christmas to February. This also coincided with the first 100 days in office of a new government, which may have reduced the availability of members of parliament. However, on balance the sample appears to include a sufficient mix of policymakers across the health and education policy communities for the purposes of this research.

4.4.7.2 *Interview methods*

Informants were asked for personal opinions rather than organisational positions. This was a practical approach, as those from government ministries are restricted in the degree to which they can criticise government policy under the Public Service Code of Conduct (State Services Commission, 2007). To further ensure officials were not placed in conflict with this requirement, it was stated in the interview that the purpose is not to critique current policy, but to consider future options in the medium and long-term. Informants were supplied with an information and ethics consent form prior to the interview, attached as appendix B.

All interviews were undertaken by the author between October 2008 and February 2009. Most interviews were conducted face-to-face, with two interviews being conducted over the telephone. While there were both Māori and Pacific informants, cultural matching between interviewer and interviewee was seen as less important than with school informant interviews. The kura kaupapa is an explicitly Māori environment, where te reo Māori is the main language used. None of the informants were from organisations with a similarly focussed environment. Care was taken by the interviewer to not appear to favour one conceptualisation of child nutrition as a policy problem, or certain intervention options, to bias responses (Britten, 1995). Having said this, it was made explicit that influences across school, home and community would be explored, which may have challenged some informant's concepts of childhood nutrition causation.

A semi-structured interview guide was developed for policy informant interviews, and is attached as appendix D. The interview guide was tested in one practice interview with a colleague public health physician with experience in child nutrition policy. A few minor changes in the structure of the interview guide were made following the pilot to improve the flow of questions.

The interview guide is in two parts. First, informants were asked some background questions regarding their understanding of causes of children's diets and childhood obesity, as well as their thoughts on the role of schools in promoting healthy nutrition, the role of other institutions, and the degree to which children's diets and obesity were perceived as a problem. These questions act to include elements of Ulrich's critical heuristic boundary questions, discussed in section 3.4.2.4. The second part of the interview guide details some of the results from the primary school case study

comparison, and asks policy informants for their views on the identified policy intervention options. This is designed both to provide policy informants with some information of the case study research results, and to elicit their views for the final stage of this research method. Policy informants were given an indication of the range of support expressed for policy options by school principals.

Interviews averaged about an hour in length. Audio recordings were made, and a verbatim transcription of the interview made. Like the school informant interviews, emphasis and pauses were not captured in the transcript (Silverman, 1993), as they were not considered key to the thematic analysis. Transcripts were analysed using NVivo 7, with all interview transcripts included within one project file (Gibbs, 2002). A thematic analysis, using a mixture of free and tree nodes was conducted on all transcripts (Gibbs, 2002). Care was taken to link answers to the background questions with answers regarding specific interventions. Other research findings have shown a link between perceptions of obesity causation and the policy options supported (Barry, Brescoll, Brownell et al., 2009). In general there was a high degree of consistency between answers to background questions and intervention specific questions. The analysis of policy maker interviews seeks to strike a balance between investigating the unique perspective of the individual (depth) and convergence or divergence between informants (breadth). Where differences between informants were evident, then closer examination of background assumptions was made. This highlighted, for example, some different concepts between health and education professions on the idea of targeting resources.

4.4.7.3 Policy informant interview validity

Consideration of rigour, reliability and validity in the policy informant interviews is similar to that for case studies, with the main difference being that the policy informant interviews were not seeking to consider causation for children's diets at school. For this reason, internal validity is not an issue (Yin, 2003).

A number of techniques for increasing the rigour and validity of qualitative studies, including interview data, are commonly identified in the literature. These include: theoretically informed sampling; a systematic research process; triangulation; respondent validation; and seeking and accounting for negative cases (Fitzpatrick & Boulton, 1994; Forman, Creswell, Damschroder et al., 2008; Mays & Pope, 1995; Seale & Silverman,

1997). A number of these techniques were employed in this research and are discussed below.

As discussed above, the sample of policy informants was designed to provide a wide range of views from policy actors across education and health policy communities. Both the inclusion of policy informants in this research, and the conception of policy communities were theoretically informed (Burton, 2006; Fischer, 2003). The sample included a wide range of informants, from elected representatives to service managers, with several senior government officials in between. Because of the range of informants, it is likely that a good range of views held by actors within these policy communities have been captured. The range of views captured means that a number of negative cases are included, as discussed shortly.

There are, however, a number of types of policy informant views missing from the data. These include: members of the government current at time of writing; actors within income and taxation policy; and parent groups. It is possible that informants from these areas not covered would hold different views from those gathered in this research. In Chapter 10, a process of more detailed intervention design is suggested that could attempt to gather the missing policy perspectives.

The construct validity of the data is supported by the interview questions being informed by theory and data from the case studies. The interview methods repeated those used in the case study interviews, and are therefore well practiced and allow for some comparisons of information. Finally, the pilot interview generated the range and form of data expected for this study, as did the interviews themselves.

The research process used was systematic and is clearly documented here. Mays and Pope (1995) suggest that systematic documentation of the research process is the main way qualitative researchers ensure reliability. The analysis of the interview transcripts was conducted using NVivo. Seale and Silverman (1997) suggest that use of computer programmes for data analysis can aid in the systematic analysis of qualitative data.

As described above, one of the aims for the thematic analysis was to identify similarity and difference expressed by participants. This is to seek out negative cases and consider whether type of informant influenced answers. Some differences between type of

informant are noted in Chapter 8, related to whether the informant had an education or health background. Differences between the interventions supported by informants seemed to mostly relate to perceptions of diet, obesity causation, and where responsibility of action lies. These types of difference between informants were able to be identified due to the range of informants interviewed, which is a form of triangulation (Forman et al., 2008). Triangulation can help ensure validity of results (Mays & Pope, 1995).

In this research no member checking or respondent validation was undertaken. Member checking is another way to help ensure validity (Mays & Pope, 1995). The reason for not undertaking member checking was a concern that the additional time commitment required of informants for this process could discourage participation. It was considered that having a sufficient range of informants was more important for validity, in regards to this research, than the ability to member check.

4.4.7.4 Prioritising between interventions

Results of the policymaker interview analysis, combined with school case comparison results, provide an indication of the intervention areas for more detailed analysis and development. It is acknowledged, however, that there is unlikely to be the capacity within the policy community to develop and implement all identified interventions at once. Although over the medium to long-term, implementation of the entire portfolio should remain the aim. For this reason, a process of further prioritisation was used to inform the final portfolio of interventions recommended in Chapter 9.

The criteria for prioritisation were theoretically informed by complexity theory, to provide the highest likelihood that interventions would impact on the system to bring about a change in attractor state. Two considerations were that: (i) interventions would impact on control parameters; and (ii), there was some support for the intervention from a range of perspectives. It was assumed that support from actors in the policy and school communities would increase the likelihood of successful implementation. The concept of support for interventions was extended to include research evidence of the intervention being implemented with subsequent impacts on child nutrition, overweight or obesity outcomes. A series of rapid literature reviews on the identified interventions is included in Chapter 9, where a process of prioritisation, and portfolio development, is also included.

The brief literature reviews for each intervention were conducted by searching the Scopus bibliographic database for terms relevant to the intervention. Search terms were informed by the literature already reviewed in Chapter 5. Papers were included where they focused on effectiveness of the intervention, or describing aspects relevant to policy development. Papers that further describe the problem, such as content analysis of food advertising to children, were excluded.

As discussed in Chapter 9, 11 interventions are identified for inclusion within an intervention portfolio. It seems unlikely in the short-term that all 11 interventions will be able to be implemented at once, due to resource constraints, and the varying level of specificity of the interventions. Criteria are then required to determine which interventions, if any, should have priority within the portfolio. The following criteria were considered:

- Privilege interventions that impact on control parameters identified from primary school case studies (compared to control parameters identified from literature review or non-control system elements).
- Privilege interventions that impact on multiple control parameters.
- Privilege interventions with support from a wide range of informants (school and policy).
- Privilege interventions with evidence of effectiveness in the research literature.

While these four criteria have been developed for use in this study, the principles are likely to be applicable to any study using similar methods. The rationale for the criteria is explained below. If applied to other research projects, additional criteria could be developed relevant to the specific research question. For example, interventions could be privileged if they seem particularly relevant for Māori children's diets, if Māori were a particular research focus.

Privilege interventions that impact on control parameters identified from primary school case studies.

Interventions that are likely to impact on the control parameters identified from the primary school case studies should be privileged, as these represent 'real-life' examples

of the systems we are trying to influence. The control parameters identified through the literature may or may not apply to schools in New Zealand. The identified control parameters from case studies apply to at least one school, assuming the system descriptions are an accurate reflection of reality.

Privilege interventions that impact on multiple control parameters

Interventions that are likely to impact on multiple control parameters may be prudent investments, because of the impact control parameters may have on changing the system attractor state. Interventions that impact on multiple control parameters may have more opportunity to influence the social systems we are targeting compared to interventions that impact upon a single control parameter.

Privilege interventions with support from a wide range of informants

Interventions that are identified as having some support across a number of school and policy informants, may have more chance of being successfully implemented, compared to interventions with little support or support from a limited range of informants. Those interventions with less support, or divided support, may require a longer process of deliberation and design before decisions on their value can be made. For this research, it should be noted that indications of support are indicative only, due to both number of informants asked about interventions, and the level of knowledge about some intervention areas expressed by informants. A possible disadvantage of this criteria could be the exclusion of novel interventions. For such interventions more research is recommended, to further test ideas and develop a wider pool of understanding and support if merited.

Privilege interventions with evidence of effectiveness in the research literature

Research evidence of intervention effectiveness can provide a useful indicator of issues or questions that may need to be addressed during intervention design. For example, some evidence from England suggests schools can have difficulty meeting nutritional standards for school meals, which may limit the nutritional impact of school meals (Gatenby, 2007; Rogers, Ness, Hebditch et al., 2007). This issue would need to be considered before implementation of school meals in New Zealand.

Identifying interventions against prioritisation criteria

Based on the criteria described above, four categories of interventions have been identified. Table 4-3 outlines how the criteria relate to each category. Category one interventions should be considered first for implementation as they are likely to impact on multiple control parameters identified from the case studies and have good support from informants and some research evidence of effectiveness. Category two interventions also impact on multiple case study control parameters with slightly less support and evidence than category one. Category three interventions may only impact on one control parameter, but retain reasonable levels of support and evidence.

Category four interventions are likely to impact on one control parameter and have limited support. Category two and three interventions may play a role in supporting category one interventions, by reinforcing impact on control parameters and helping to create possible attractor states for a system in the desired direction. Category 4 interventions are likely to require more research (possibly including pilot interventions), and deliberation amongst various stakeholders before implementation is considered.

Table 4-2 - Intervention categories to guide portfolio development

Category of interventions	Criteria included in category	
Category One	Impact on control parameters from case studies	✓
	Impact on multiple control parameters	✓
	Support from wide range of informants	✓
	Research evidence of effectiveness	✓
Category Two	Impact on control parameters from case studies	✓
	Impact on multiple control parameters	✓
	Support from wide range of informants	-
	Research evidence of effectiveness	-
Category Three	Impact on control parameters from case studies	✓
	Impact on multiple control parameters	X
	Support from wide range of informants	-
	Research evidence of effectiveness	-
Category Four	Impact on control parameters from case studies	✓
	Impact on multiple control parameters	X
	Support from wide range of informants	X
	Research evidence of effectiveness	X

✓ = appears to meet criteria

- = mixed or uncertain whether meets criteria

X = does not appear to meet criteria

The limitations of such a prioritisation process in this research are discussed in Chapter 10. Briefly, the limitations can be considered as threefold. First the process of

determining support for an intervention from case study school principals and policy informants does not always clearly differentiate between whether the informant strongly supports an intervention, or merely thinks it an interesting idea. Second, the use of control parameters to guide areas for intervention was untested prior to this research, and potentially could: exclude effective interventions by either incorrectly assessing the potential impact on control parameters; incorrectly identify the control parameters within a system; or overstate the importance of control parameters in creating change in the systems of study. The third limitation relates to the literature scan for each short listed intervention area detailed in Chapter 9. The literature scan process for each intervention was not as comprehensive as a systematic review, although it appeared to be sufficient. As a result the assessment of intervention effectiveness may be over or under stated.

The advantage of the prioritisation process is a relatively transparent process, informed by theory and empirical evidence. The triangulation provided by these prioritisation criteria is at least likely to produce a starting point for more detailed intervention design and investigation.

4.5 Conclusion

The research methodology developed for this study attempts to integrate local and national perspectives for the purpose of identifying policy intervention options to promote healthy nutrition through primary schools. Complexity theory is used as a theoretical base. The five stage research method is largely focussed around a case comparison method, where multiple data sources are used to develop descriptions of setting level system attractors for a number of cases. The system descriptions are then used to identify possible system control parameters and intervention options to influence these. A case comparison seeks to consider the degree of similarity between cases to inform intervention design.

The identified interventions are then discussed with policymakers within a broadly defined child nutrition policy community. A set of criteria to prioritise recommendations has been developed. Following prioritisation a portfolio of interventions is recommended that, when taken together, are likely to positively impact on childhood nutrition at primary schools.

Both the methodology and detailed method used in this study are being trialled for application to policy analysis. While aspects of the method are commonly used, such as key informant interviews, the combination of methods and theoretical perspective is tentative and appears to be innovative. Reflection on the success of these methods, for identification of policy interventions to support primary schools to promote health nutrition, is provided in Chapter 10.

Chapter 5

The ‘Childhood Nutrition System’

New figures reveal an alarming rise in the cost of feeding a family healthily, and a leading nutrition expert warns that the price increases will have long-term health impacts...Otago’s human nutrition head, associate professor Winsome Parnell, was expecting the high price jump. “Everyone told me prices had been going up dramatically and they were right,” she said... “When money is tight the first thing that people drop is fresh fruit and then fresh dairy products. With fortnightly pay or benefit payments people do one large shop but might not have the cash available to top up with items like milk”. Parnell said poor nutrition led to compromised immune systems and a deterioration in general health – something that would not be immediately apparent...Parnell said it was important for the government to review benefit levels and look at how to keep people in work so those affected could afford to feed themselves healthily – Sunday Star Times 12 July 2009 (Pepperell, 2009).

5.1 Introduction

This chapter seeks to understand the range of factors which interact and lead to child nutrition, overweight and obesity outcomes. Using published literature, a theoretical ‘working’ model of the childhood nutrition system is developed across four settings: home; community; child centred; and school.

The working model of the childhood nutrition system was developed for the purpose of informing data collection and analysis of primary school case studies and policymaker interviews. A narrative review method was used to identify factors related to child nutrition and weight outcomes from the literature, as described in Chapter 4 (section 4.4.3.1). A series of policy system maps were developed from the narrative review, and are presented below. The policy system maps were used to identify possible control parameters, which could influence the range of change possible within the child nutrition system. Change within the child nutrition system is likely to have some resultant change on the emergent system phenomena related to child nutrition, overweight and obesity.

As the analysis begins to focus more specifically on primary school data (from Chapter 6 onwards), the information presented in this chapter will provide the basis for linking to the wider childhood nutrition system within which primary schools are located. In particular, the impact of household economic resources and the availability of food on nutrition promotion within schools.

This chapter begins with a brief description of how to read policy system maps, before presenting the four maps generated from the narrative review of literature. The remainder of the chapter explores in greater depth the control parameters identified from the review derived policy system maps, in particular, how the control parameters identified from international literature may apply in New Zealand. This provides a wider context within which the primary school case studies can be located within.

5.2 Reading Policy System Maps

The four policy system maps developed as the childhood nutrition system description are presented below. Development of policy system maps is described in more detail in sections 4.4.3.1 and 4.4.3.6. Each text box, or system element, within the policy system map can be considered an area of practice related to childhood nutrition. Areas of practice shown are the themes that emerged from the literature.

The links between system elements represent interactions either directly identified in the literature, or suggested across studies. The links between system elements are not asserting causation, which is why there is no direction shown on the links. It is assumed that causality within a complex system will be different across time and space, and therefore the nature of the interaction between system elements may well be different in different contexts. The interaction between system elements is intended to show a theory of how change in one system element may flow through into other system elements.

The control parameters are system elements coloured darker than other system elements (see section 4.4.3.6 for how control parameters are identified). System elements with a bell symbol highlight that the system element is represented further in one of the other three policy system maps, while a clock (Figure 5-3) indicates the system element is likely to vary as children age, and a star indicates variability across socioeconomic gradients of households. These symbols are intended to highlight how the system may differ across contexts.

The policy system maps were developed in early 2007, with the subsequent analysis of control parameters completed by October 2007. There has been considerable new literature released on children's diets, obesity and the role of schools in the two years since this time. The updated literature is reflected in Chapters 9 and 10. The work included in this chapter has not been updated, as it is intended to show how it informed case study and policymaker data collection and analysis. The policy system maps are also a lesson in how system descriptions are only snapshots of the system of interest at a particular time, from a particular perspective.

5.3 Policy System Maps

5.3.1 The school setting

Four policy system maps are presented below, followed by a discussion of three identified control parameters (system elements that are highly linked within the system and act to bring external resources into the system). Figure 5-1 presents the policy system map related to the primary school setting. Table 5-1 presents the literature reviewed in relation to Figure 5-1. Three control parameters are identified as operating within the primary school setting: the home setting; availability of food in schools; and school policies. Both the home setting and availability of food in schools also link to other policy system maps; the home setting and community setting maps respectively.

The home setting is identified as having a relationship with the food consumed at school by children, children's food preferences, and availability of food surrounding school. Studies, such as Sanigorski et al. (2005), show that the food children bring to school from home may be healthier than the food purchased from school canteens in general, while also containing many energy-dense and nutrient-poor snack foods. This study had a fairly large sample, and while cross-sectional, it was descriptive in nature rather than attempting to explain causal links to lunch box contents. The contents of children's lunch boxes are obviously a direct link between home food environments and the food consumed within school. Less direct links can operate through the influence of children's food preferences on the foods requested by children within the home, and purchased at school, as suggested by focus group (Evans, Wilson, Buck et al., 2006; Wind, Bobelijjn, De Bourdeaudhuij et al., 2005) and questionnaire results (Kubik, Lytle, & Story, 2005c). When considering the influence of children's food preference, the home setting and child centred setting, policy system maps provide conceptual links

between system elements and food preferences (Figures 5-2 and 5-3). For example, the availability of food has been shown to be a factor in food preferences (Evans et al., 2006).

Figure 5-1 shows two factors related to food availability, one concerned with food available within the school and one the food available surrounding the school. Results from the 2002 New Zealand Child Nutrition Survey showed that many children combine sources of food consumed at school between home, food purchased at school and food purchased at a food outlet on the way to school (Utter et al., 2007a). More Pacific, Māori, and children from lower socioeconomic areas were shown to purchase food at school and from outlets on the way to school, compared to other ethnicities (Utter et al., 2007a). Only one high quality study was reviewed investigating the foods available within primary schools in New Zealand (Carter & Swinburn, 2004). The results suggest that, in 1999 when the study was conducted, a majority of food items for sale in a majority of New Zealand primary schools were energy-dense and cheaper than healthier alternatives. School food policies may help to determine the range of food available in schools (Kubik et al., 2005b), as well as food related advertising and fundraising activities in schools (Richards, Darling, & Reeder, 2005; Stuart, 2005). Both availability and promotion of food in school may have impacts on children's food preferences.

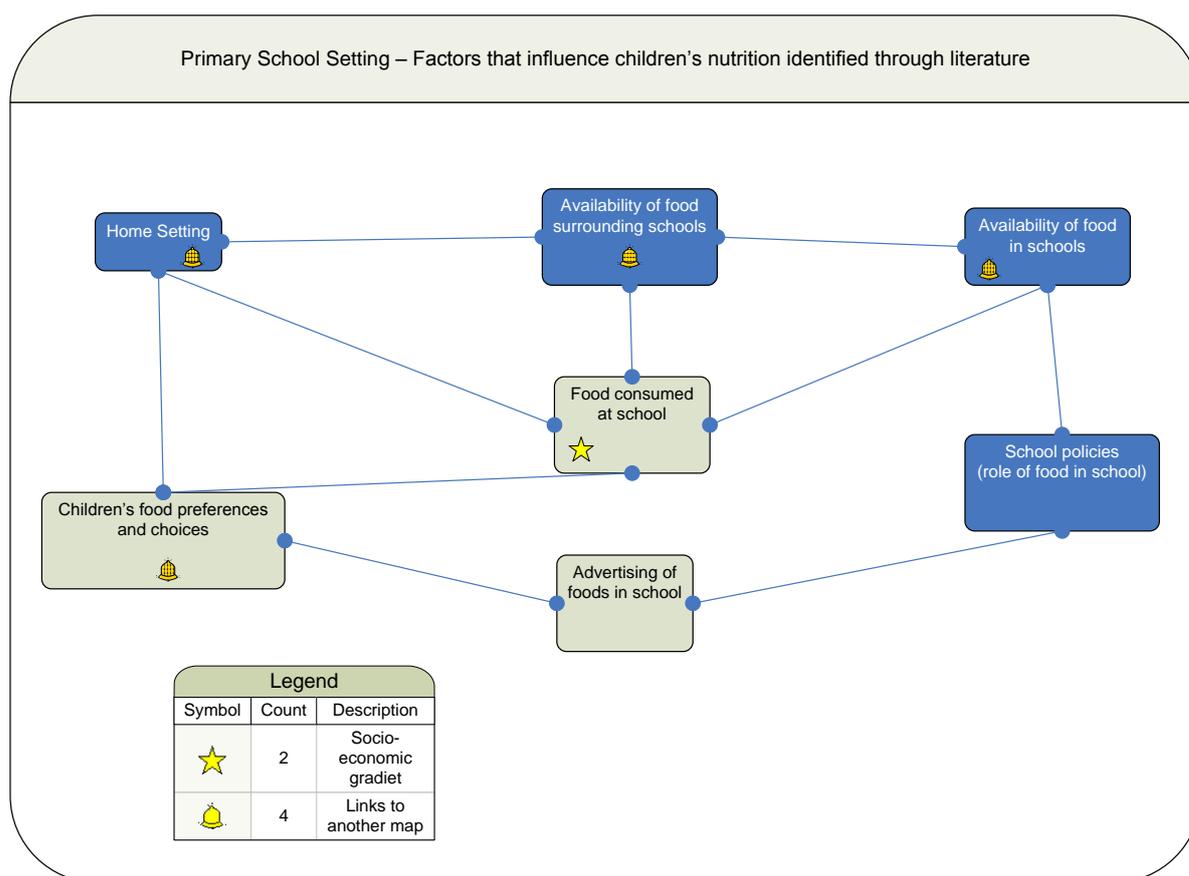


Figure 5-1 - Primary School Setting Policy System Map

Table 5-1– Literature used in developing Figure 5-1

Element Descriptor	Relevant literature included in review
Home Setting	See Household Setting table
Food consumed at school	(Kubik, Lytle, & Fulkerson, 2005a), (Kubik et al., 2005c), (Sanigorski et al., 2005), (Utter et al., 2007a)
Child attitudes, preferences and food choices	(Anderson et al., 2005a), (Drewnowski, 2004), (Drewnowski & Specter, 2004)
Availability of food surrounding schools	(Maher et al., 2005), (Pearce et al., 2007) See also food environment/availability of community/economic settings map
Availability of food in school	(Carter & Swinburn, 2004)
School policies	(Brown, Akintobi, Pitt et al., 2004), (Carter & Swinburn, 2004), (Kubik et al., 2005b), (Richards et al., 2005), (Story et al., 2006), (Stuart, 2005)
Advertising of food in schools	(Stuart, 2005), (Richards et al., 2005)

There are a couple of areas of weakness in the research evidence used to develop the school policy system map. Overall the number of papers reviewed to inform Figure 5-1 is lower than the number reviewed for the home setting. Fewer papers relating to the school setting were identified during literature searches. As mentioned above, in the two years since the literature searches were conducted there have been a number of studies published that would have added to the strength of evidence used here. The scarcity of evidence is particularly obvious in the availability of food in school and availability of food surrounding schools.

5.3.2 The Home Setting

The home setting policy system map (Figure 5-2), shows a mixture of elements concerned with physical resources and perceptions or action by household members. These appear to interact to influence each other. Two control parameters are identified; household economic resources, and the food available in the community. Both control parameters also link to the community policy system map (Figure 5-4). While parent's food purchasing is more highly linked than any other system elements, it is considered to be limited by the connected elements, and therefore not itself introducing new resources into the system, and not a control parameter.

Figure 5-2 suggests that the foods that are eaten within a household are influenced directly by perceptions of the cost of food (Devine et al., 2006; Inglis et al., 2005), non-financial resources such as time (Inglis et al., 2005), cultural acceptability of foods included within the 'foods eaten' box (Signal, Lanumata, Robinson et al., 2008), and the foods available within the household (Campbell, Crawford, Jackson et al., 2002). These factors all show variation by socioeconomic status. The research quoted above is largely qualitative or from small cross-sectional surveys. A small number of studies have identified that parents from lower socioeconomic circumstances perceive health, obesity and food differently from parents in higher socioeconomic circumstances (Campbell et al., 2002; Coveney, 2005; Jain et al., 2001). These studies are qualitative in nature, and suggest that health is perceived as being more related to energy levels amongst lower socioeconomic parents, than weight or nutrient intakes.

Drewnowski and colleagues (Drewnowski, 2004; Drewnowski & Darmon, 2005; Drewnowski & Specter, 2004), suggest that energy-dense foods tend to be cheaper per calorie than nutrient-dense foods. Combined with parental perceptions of health and

food, for parents in lower socioeconomic circumstances, energy-dense foods may not only be more affordable, but also the rationale choice (Turrell & Kavanagh, 2006). A number of studies, largely qualitative, also suggest that preferences and demands of children influence the foods purchased by parents, and that as children age these demands may increasingly influence purchasing decisions (Backett-Milburn et al., 2006). An emerging research literature also suggests that availability of food in the community may influence purchasing decisions (Horowitz, Colson, Hebert et al., 2004; Reidpath et al., 2002). However, findings from this literature are inconsistent, and suggest that experience in the US may differ from that elsewhere (Winkler, Turrell, & Patterson, 2006), including New Zealand (Pearce et al., 2007).

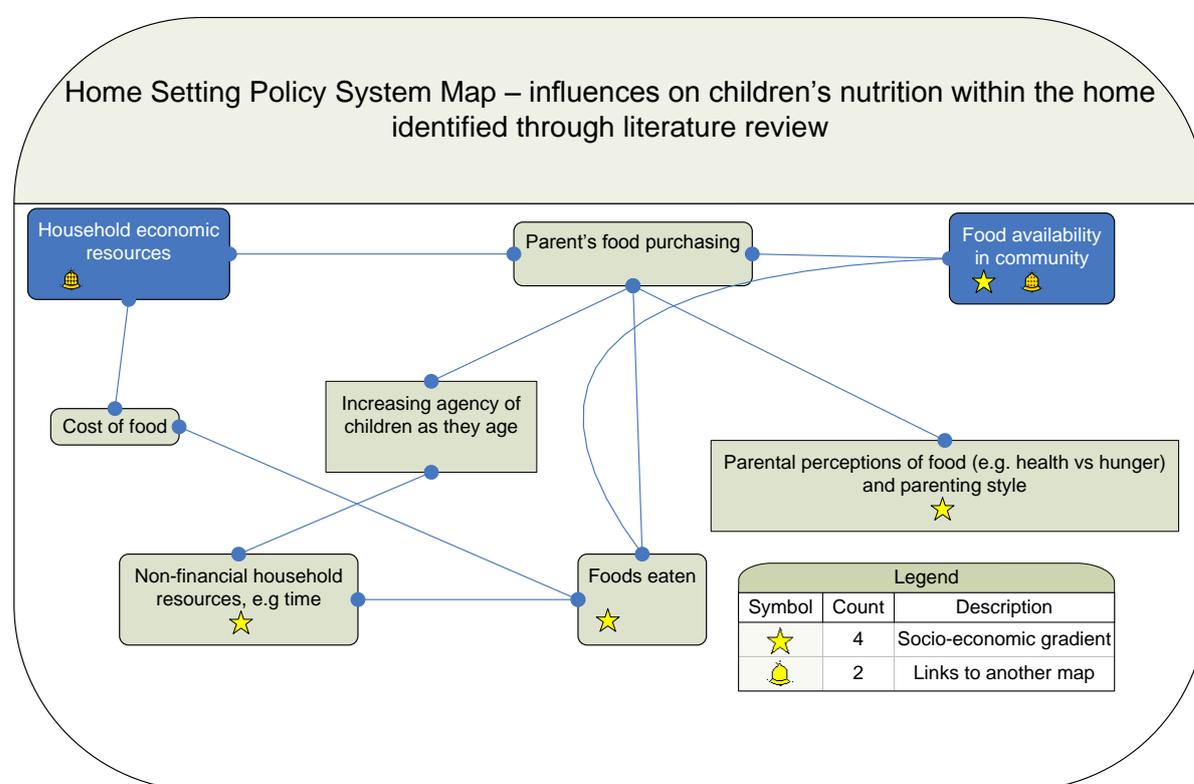


Figure 5-2– Home setting policy system map

Table 5-2– Literature used in developing Figure 5-2

Element Descriptor	Relevant literature included in review
Household economic resources	(Power, Manor, & Matthews, 2003), (Campbell et al., 2002),(Turrell & Kavanagh, 2006), (Drewnowski, 2004), (Drewnowski & Darmon, 2005), (Drewnowski & Specter, 2004), (Casey, Simpson, Gossett et al., 2006), (Bhattacharya, Currie, &

Element Descriptor	Relevant literature included in review
	Haider, 2004)
Parent's food purchasing	(Turrell, 1996), (Drewnowski & Darmon, 2005), (Jain et al., 2001), (Wynd, 2005), (Ricciuto & Tarasuk, 2007)
Food availability in community	(Campbell et al., 2002), (Reidpath et al., 2002), (Horowitz et al., 2004), (Salis & Glanz, 2006), (Wrigley et al., 2003), (Block, Scribner, & DeSalvo, 2004), (Winkler et al., 2006)
Cost of food	(Mhurchu & Ogra, 2007), (James, Nelson, Ralph et al., 1997), (Ricciuto, Tarasuk, & Yatchew, 2006)
Increasing agency of children as they age	(Backett-Milburn et al., 2006), (Wills, Backett-Milburn, Gregory et al., 2006), (Darling, Reeder, McGee et al., 2006), (Story et al., 2006), (Story, Neumark-Sztainer, & French, 2002), (Easthope & White, 2006), (Borra, Kelly, Shirreffs et al., 2003), (Evans et al., 2006)
Non-financial household resources e.g. time	(Backett-Milburn et al., 2006), (Inglis et al., 2005), (Devine et al., 2006)
Parental perceptions of food	(Coveney, 2005), (Jain et al., 2001), (Danielzik et al., 2005), (Campbell et al., 2002), (Drewnowski & Specter, 2004)
Foods eaten	(Signal et al., 2008), (Inglis et al., 2005), (Campbell et al., 2002), (Drewnowski, 2004)

There was a scarcity of New Zealand literature in relation to the home setting. It is difficult to know how transferable the results from the UK, US and Australia are to the New Zealand context.

5.3.3 The community setting

The fourth policy system map developed from the narrative review of literature focuses on the economic and community setting (Figure 5-4). The community setting map shows the interactions between household income and economic resources, availability of food in the community, cost of food, and food production. The household economic resources, cost of food and food availability interaction was also shown in the household setting policy system map. What Figure 5-4 adds is a consideration of how food production interacts both with the cost of food and the availability of food in the community. Aspects of food production were largely not captured in the literature search, which was focussed on schools first, followed by home and community. Only two papers are referred to in relation to food production. The value of Figure 5-4, is to signal that interventions designed to impact on one of the elements highlighted within the figure, may need to consider the support or opposition other system elements provide.

For example, efforts at increasing the economic resources in households may be hampered if food costs rise rapidly. Changing the cost of foods may be supported by

food production methods. Of course, interactions with elements in the other three policy system maps should also be considered.

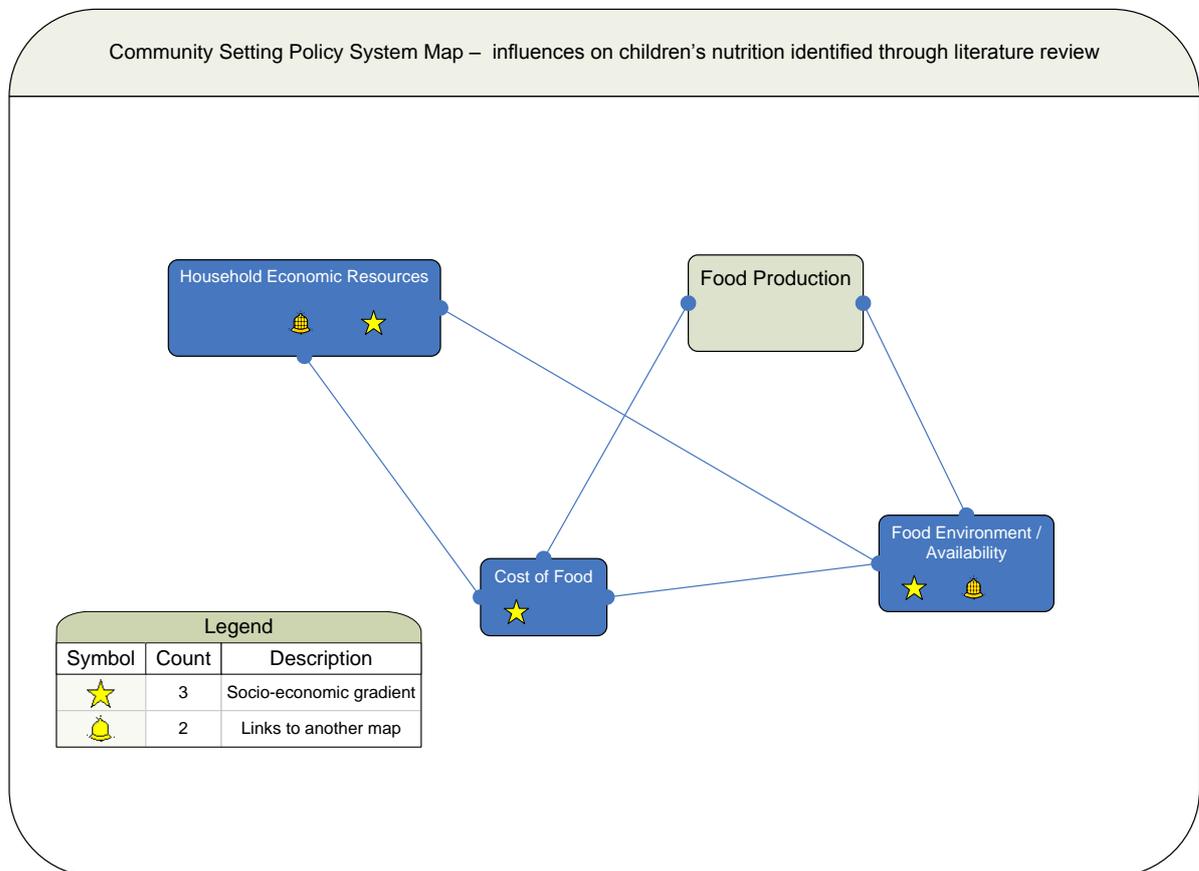


Figure 5-3– Community Policy System Map

Table 5-3– Literature used to develop Figure 5-4

Element Descriptor	Relevant literature included in review
Household economic resources	See household setting map
Food production	(Cawley, 2006), (Drewnowski & Specter, 2004)
Cost of food	(Mhurchu & Ogra, 2007), (James et al., 1997), (Ricciuto et al., 2006), (Drewnowski & Specter, 2004), (Winkler et al., 2006), (Turrell, 1996), (Ricciuto & Tarasuk, 2007)
Food environment / availability	(Block et al., 2004), (Wynd, 2005), (Wrigley et al., 2003), (Horowitz et al., 2004), (Salis & Glanz, 2006)

5.3.4 The Child Centred Setting

Several of the themes identified from the narrative review could not easily fit within one physical setting (such as home or school). To accommodate these themes, a child centred setting policy system map was developed (Figure 5-3). Unlike the three other maps, the contextual variation shown in this map is dominated by children's age, rather than socioeconomic circumstances. Two control parameters are shown (home and community settings), which both link to separate policy system maps. Research that considers children's diets from children's perspectives is largely qualitative, and a limited number of studies were reviewed. Many of the interactions are also shown in the other policy system maps, such as the home setting interacting with availability of foods and food preference development; or the school setting interaction with availability of foods and advertising of foods. Particular to this map are the elements of time constraints for children, peer groups, places to socialise and sports.

In a review article by Story et al. (2002), a small number of US studies were noted, which have shown that adolescents did not have time to consider healthy eating. Papers that considered children and adolescents were included in the review to increase numbers. One use of adolescents time is socialising with friends (Easthope & White, 2006). For socialising, fast food restaurants may serve as accessible and welcoming locations (Story et al., 2002). One interesting finding from focus group research in South Carolina (Evans et al., 2006), was a perception amongst adolescents that healthy eating may be beneficial for sports, while sport is seen as part of interacting with peers.

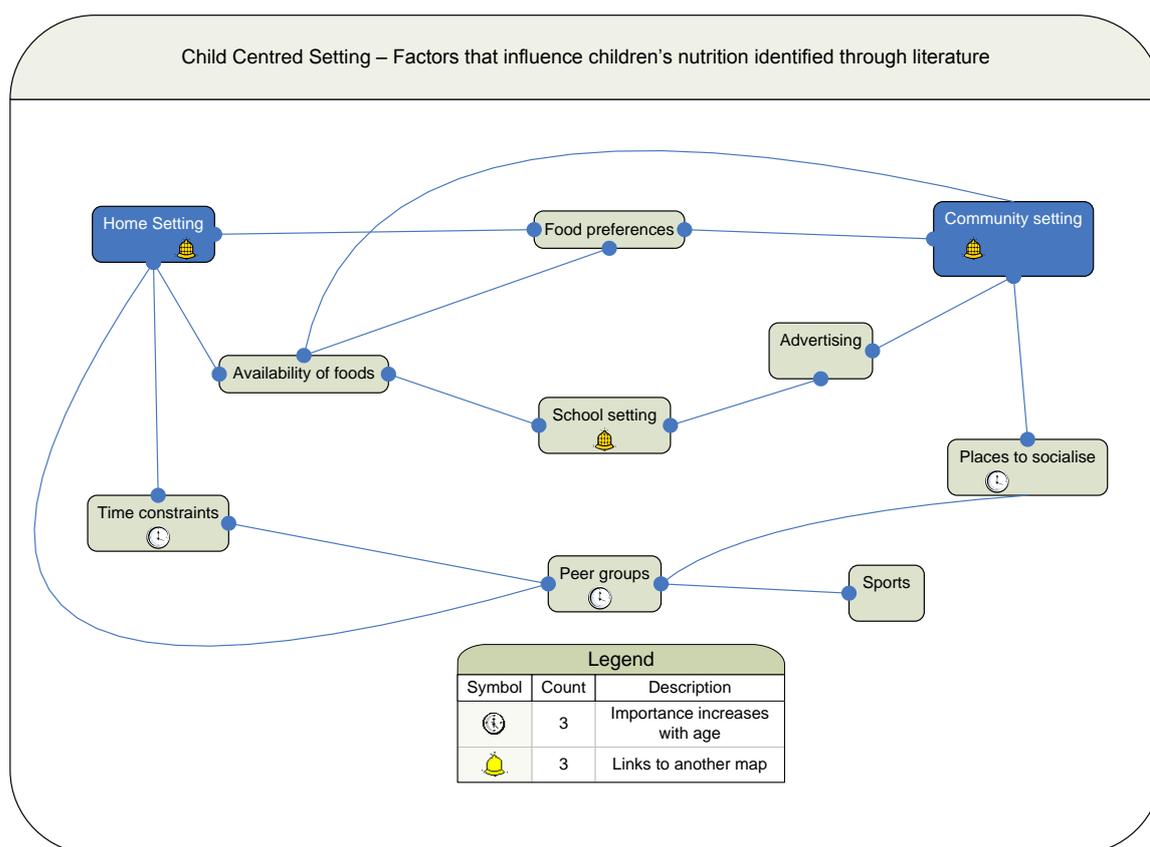


Figure 5-4 – Child Centred Policy System Map

Table 5-4 – Literature used in developing Figure 5-3

Element Descriptor	Relevant literature included in review
Home Setting	See Household setting map
Availability of foods	(Borra et al., 2003), (Evans et al., 2006), (Martens, van Assema, & Brug, 2005), (Story et al., 2002), (Wind et al., 2005) see also food environment/availability in community/economic settings map
Food preferences	(Evans et al., 2006), (Story et al., 2002), (Wind et al., 2005)
Community setting	See community/economic settings map
Advertising	(Chapman, Nicholas, Banovic et al., 2006), (Maher et al., 2005), (Maher, Wilson, Signal et al., 2006), (Utter et al., 2006a), (Wilson, Signal, Nicholls et al., 2006)
School setting	See school setting map
Places to socialise	(Story et al., 2002)
Peer groups	(Borra et al., 2003), (Easthope & White, 2006), (Story et al., 2002)
Time constraints	(Story et al., 2002)
Sports	(Borra et al., 2003), (Evans et al., 2006)

Caution is required when applying the child centred setting policy system map to the situation for New Zealand primary school students. First, a minimal amount of literature was reviewed, with two elements identified in Figure 5-3 relating to only one review paper. Second, most of the research is US based, and third, much of the research applies

to adolescents rather than primary school aged children. All the same, considering how children move between settings may be useful for considering primary school case study results.

5.4 Identified control parameters

Across the four policy system maps identified above, a number of control parameters were identified, as shown in Table 5-5. Identification of control parameters is discussed in section 4.4.3.6, but briefly they are system elements that are highly linked within the system, and act to bring external resources into the system. The methodology being used assumes that control parameters should be the first place to intervene within a system to create change (as discussed in Chapter 3). Theoretically, a small change in a control parameter has the potential to change the system and its emergent properties, in this case children’s diets and weight gain. As this research aims to identify policy interventions to support primary schools to promote healthy childhood nutrition, the control parameters will be considered in more detail below.

Table 5-5 – Control parameters identified from narrative review of literature

School Setting	Home Setting	Child Centred Setting	Community Setting
Home Setting Availability of food in schools School Policies Availability of food surrounding schools	Household economic resources Food availability in community	Home Setting Community Setting	Household economic resources Cost of food Food environment and availability

There is a large degree of overlap between the control parameters identified across the four policy system maps. To avoid duplication in the discussion below, the control parameters can be summarised as:

- Household economic resources and cost of food.
- Availability of food in the community and within schools.
- School food policies.

Household economic resources and cost of food are considered together in this chapter, as both are likely to relate to the affordability of food, and in particular ‘healthy’ food. The availability of food in the community and within schools are considered together in

this chapter, as it is assumed there are similar issues involved with availability of food in both settings. The following discussion provides information on household economic resources, availability of food in community and school settings, and a discussion of school food policies, which will provide a context for considering results from case study primary schools.

5.4.1 Household Economic Resources

Household economic resources have been identified as a control parameter on child nutrition related practices, both within the home and at school. Household economic resources are defined here as the income available to spend on food after all other non-discretionary costs has been removed. Based on Figure 5-2, it is argued here that as the money available to spend on food decreases, there is a corresponding decrease in the degree of choice parents have in the foods they purchase. At the same time an availability of low cost, energy-dense, food provides an affordable option for parents with limited resources. This may have an impact on how much of the household income is prioritised for food purchases.

Unlike rent or mortgage payments, the amount of money a household spends on food is to some degree discretionary (Turrell, 1996; Turrell & Kavanagh, 2006). In a large pan European Union survey of barriers to healthful eating and food cost data, Kearney and McElhone (1999), report that low-income families, in the face of diminishing income, will attempt to maintain food costs as a fixed percentage of income. Drewnowski and Darmon (2005) suggest this will drive families in the direction of energy-dense foods and a higher proportion of food containing grains, added sugars and added fats.

In another review paper Drewnowski (2004) cites a US economic modelling study, using national household expenditure and consumption data (Blisard, Stewart, & Jolliffe, 2004). Results suggest that for low-income families, the amount of energy-dense foods purchased is unlikely to change with only marginal increases in income. This assertion is supported by studies that have reported cost as a key factor in purchasing vegetables, fruit, and perceived healthier goods amongst lower socioeconomic households (Campbell et al., 2002; Inglis et al., 2005; Signal et al., 2008).

The foods purchased and available in the home are a key determinant of the food available to children, which in turn has an impact on children's consumption patterns and

preference development (Evans et al., 2006; Klepp, Pérez-Rodrigo, Bourdeaudhuij et al., 2005; Story et al., 2002). With the foods purchased being largely constrained by household resources available to spend on food, options for either increasing household resources or reducing the price of certain ‘healthy’ foods need to be considered.

A key piece of research in New Zealand that provides some insight into household resources is the New Zealand Living Standards work produced by the Ministry of Social Development (Jensen, Krishnan, Hodgson et al., 2006). A survey tool was used to gather information, from a nationally representative population sample, on a wide range of items to measure households access to amenities, social and recreational activities, preferred foods, and so on. The responses were scored against an index known as the Economic Living Standard Index (ELSI). Scores were divided into seven categories ranging from ‘severe hardship’ through to a ‘very good’ living standard. Severe hardship includes: a restriction of items termed as basic, such as restricting fruit and vegetable purchases due to cost, and household heating; accommodation problems; financial problems including difficulty paying rent, mortgage or utilities; and few items termed as luxuries. As the living standard improves the percentage of basics and luxuries increases, while accommodation and financial problems decrease.

Links between socioeconomic status, whether defined by income or parental education, and childhood obesity have been shown in the literature (Bhattacharya et al., 2004; Danielzik et al., 2005; Parnell et al., 2003). The living standards research showed an increased likelihood for hardship for households that could be classified as more socioeconomically deprived. It showed that twenty-seven percent of those households where the responding parent had no formal education qualification were in severe hardship (Jensen et al., 2006). Households with children whose main income source was income-tested benefits, were much more likely to be in a hardship category than those receiving market incomes (Jensen et al., 2006).

While no direct correlation can be drawn between the 2004 Living Standards Survey (Jensen et al., 2006) results and the 2002 New Zealand Children’s Nutrition Survey (Parnell et al., 2003) results, comparisons can be drawn from the ethnic distribution of the households with children living in hardship, and the proportion of children overweight and obese. The 2002 New Zealand Children’s Nutrition Survey used a nationally representative sample of children, with oversampling of Māori and Pacific

children to ensure robustness of results when broken into ethnic categories (Parnell et al., 2003).

As shown in Table 5-6, the trend across ethnic groups of the percentage of children who are overweight or obese, is similar to that for households with children in some degree of hardship. Given the link between socioeconomic status, economic hardship and overweight and obesity in the literature, it seems likely that some drivers are operating on both overweight and obesity outcomes for children, as well as hardship outcomes for households. For Pacific households in hardship, and overweight or obese Pacific children, both categories show proportions around 60 percent. It seems particularly likely that some Pacific households will feature in both overweight/obese and hardship categories. The similarity in the proportions of households in hardship, and the proportions of children overweight and obese shown in Table 5-6, suggests that some of the drivers of economic standards of living, measured through the ELSI survey, may be similar to some of the drivers of childhood overweight and obesity. Further research to understand the interaction between economic hardship and overweight and obesity is required.

Severe hardship is also more likely to be experienced in households with a single parent, three or more children, and particularly with an income tested benefit as the main income source (Jensen et al., 2006). The level of severe hardship amongst these groups has increased between the 2001 and 2004 living standards surveys.

Table 5-6 - Percentage of children overweight and obese by the 2002 Children's Nutrition Survey, and percentage of households with dependent children in hardship by the 2004 Living Standards survey – by ethnic group

Ethnicity and Gender	Total % Overweight and Obese¹	Total % of economic family units with dependent children in hardship²
Pacific Males	60.0	
Pacific Females	63.9	
Pacific Households		61.0
Māori Males	35.3	
Māori Females	47.3	
Māori Households		44.0
NZEO ³ Males	23.1	
NZEO Females	24.8	
European Households		30.0

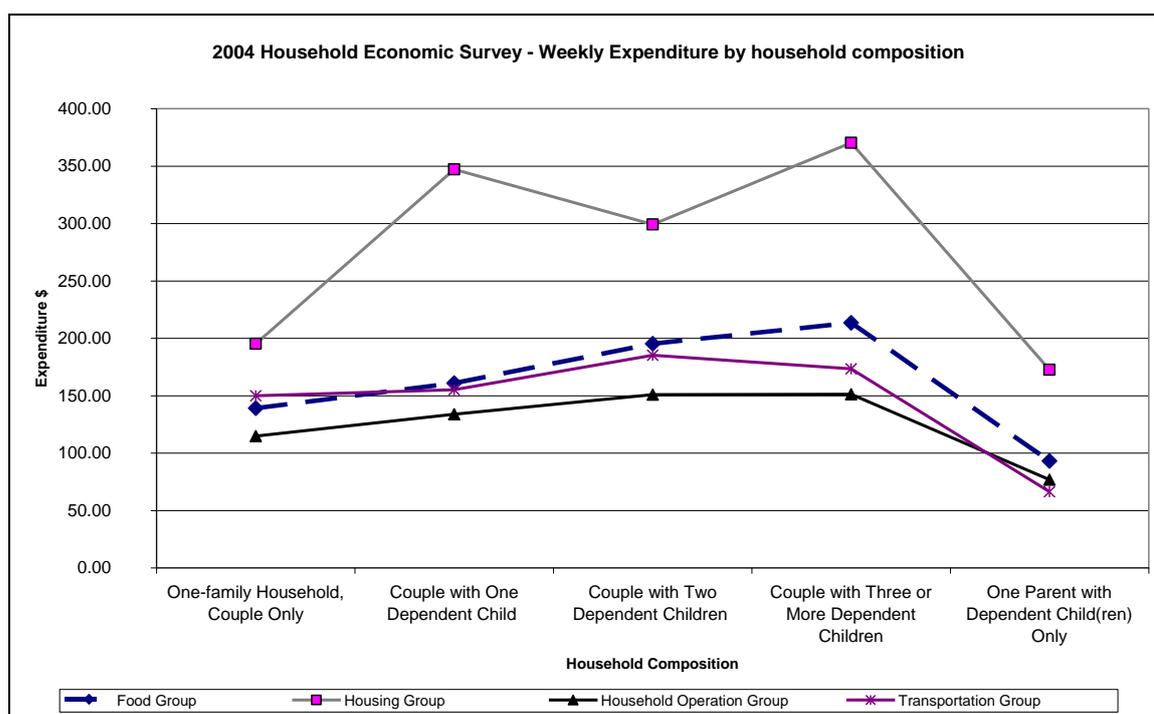
1. 2002 Children's Nutrition Survey (Parnell et al., 2003)

2. 2004 Living Standards (Jensen et al., 2006)

3. NZEO refers to New Zealand European ethnic category plus 'other' ethnic category

The nationally representative Household Economic Survey results for 2004 (Statistics New Zealand, 2004) are shown below in Figure 5-5. The figure shows household expenditure, by expenditure type, and household composition. For all household composition types the largest cost category is related to housing costs, followed by the food costs, with the exception of couple only households. Housing costs include: rent and mortgage payments; local rates; and maintenance. Food costs include: fruit; vegetables; meats and fish; dairy; fats and oils; cereals; sweetened products and beverages; other; and meals away from home.

Because the resources a household has to spend on food are considered a key variable to the type of food consumed by children, it is necessary to examine whether New Zealand food expenditure is sufficient to purchase a nutritionally adequate diet. The University of Otago Department of Nutrition has been tracking the cost of food baskets since 1972 (personal communication, Parnell, 2009). The basic basket consists of the most commonly consumed fruits and vegetables and lowest priced items from different food categories to meet the nutrition needs of most people according to the Ministry of Health New Zealand Food and Nutrition Guidelines (Department of Human Nutrition, 2006; Ministry of Health, 1997, 1998, 2003a). Spending less than the basic food basket cost on food would increase the risk of not receiving necessary nutrients.



Source: 2004 Household Economic Survey (Statistics New Zealand, 2004)

Figure 5-5 – Weekly Household Expenditure by Household Composition, 2004 Household Economic Survey

Two scenarios are presented below. Table 5-7 shows a comparison of weekly food expenditure by household composition types, as described by the 2004 Household Economic Survey, with the cost of the basic food basket in 2004. To calculate likely food costs it was assumed that the first child in the household was ten years old, the second child five years, and the third child four years old. Table 5-8 shows the same information as Table 5-7, with the changed assumption that the first child was an adolescent boy.

Table 5-7 - Food Cost Survey 2004 basic basket cost compared with 2004 Household Expenditure Survey weekly expenditure by household composition – Scenario One

Household Composition	Weekly food expenditure¹	Basic cost basket for household²	Difference between weekly expenditure and basic food basket	Basic basket cost as percentage of weekly food expenditure
Couple only	\$139.10	\$96.80	\$42.30	70%
Couple with 1 child	\$160.90	\$138.60	\$22.30	86%
Couple with 2 children	\$195.20	\$167.00	\$28.20	86%
Couple with 3+ children	\$213.50	\$193.40	\$20.10	91%
Single Parent (1+ children)	\$93.10	\$89.20	\$3.90	96%

1. 2004 Household Economic Survey (Statistics New Zealand, 2004)

2. University of Otago Food Cost Survey 2004 (Department of Human Nutrition, 2006), for cost calculation assumption that first child was 10 years old, second child 5 years old, third child 4 years old.

Table 5-8 - Food Cost Survey 2004 basic basket cost compared with 2004 Household Expenditure Survey weekly expenditure by household composition – Scenario Two

Household Composition	Weekly food expenditure¹	Basic cost basket for household²	Difference between weekly expenditure and basic food basket	Basic basket cost as percentage of weekly food expenditure
Couple only	\$139.10	\$96.80	\$42.30	70%
Couple with 1 child	\$160.90	\$160.00	\$0.90	99%
Couple with 2 children	\$195.20	\$201.80	-\$6.60	103%
Couple with 3+ children	\$213.50	\$230.20	-\$16.70	108%
Single Parent (1+ children)	\$93.10	\$110.60	-\$19.70	119%

1. 2004 Household Economic Survey (Statistics New Zealand, 2004)

2. University of Otago Food Cost Survey 2004 (Department of Human Nutrition, 2006), for cost calculation assumption that first child was adolescent boy, second child 5 years old, third child 4 years old.

Under the first scenario, all household types have a weekly expenditure on food sufficient to purchase the basic food basket. Under the second scenario, only the couple only and couple with one child households could afford the basic basket. Even then, the

couple with one child had less than \$1 spare. The figures presented in Tables 5-7 and 5-8 are averages. Households with higher than average housing costs, for example, or lower than average income could easily be in a position where purchasing the basic food basket is difficult.

Twenty two percent of households were identified as food insecure in the 2002 Children's Nutrition Survey (Parnell et al., 2003). Of the food insecure households, 22 percent stated they sometimes run out of food, 18 percent stated they sometimes needed to eat less, 35 percent restricted the variety of food purchased, while 21 percent needed to sometimes rely on others, food banks or special grants for food. Analysis of the survey results by Parnell et al. (2005), indicate that children from food insecure households had lower levels of nutrient intake of lactose and calcium (gained from dairy products); and β -carotene and vitamin A (gained from fruits and vegetables).

Recently in New Zealand, a large cohort study of Pacific families has shown that a higher proportion of fruit and vegetables in the diet of families is associated with higher birth weights, yet lower BMI and weight gain over the first four years of life (Rush et al., 2008). Both of which have established links to health outcomes in later life, such as depression and type two diabetes (Reilly, 2005). This highlights the importance of a healthy nutritious diet, and the possible impacts food insecurity in households with children could have on later health outcomes.

It is assumed that periods of not being able to afford food arise due to pressures of expenditure required in other areas such as rent or utility bills, as suggested by Turrell (1996). Limiting discretionary spending, even if on necessary items, occurs not only with food, and may explain why so many households described as being within a hardship living standard categories reported restrictions due to lack of money as shown in Table 5-9 below.

Table 5-9 - Percentage of households in hardship living standard categories reporting restrictions due to cost of items

	Severe Hardship	Significant Hardship	Some Hardship
Item not obtained/participated in because of cost			
Personal computer	55	27	23
Internet access	51	30	23
Have child's friend over for a meal	38	9	6
Consumption cut back because of cost			
Not gone on school outings	66	32	26
Not brought school books/supplies	49	30	19
Postponed child's visit to doctor	46	19	20
Child's involvement in sports limited	66	42	40
Child went without cultural lessons	55	50	40
Limited space for child to study or play	72	48	34

Source: 2004 Living Standards Survey (Jensen et al., 2006)

While further research is required that describes the trade-offs and lifestyle experienced by households in these hardships categories, it seems reasonable to assume some connection between the higher proportions of Māori and Pacific children reporting inactivity and television watching (Utter et al., 2006a; Utter et al., 2006b), with households in hardship having to restrict children's involvement in sporting and cultural lessons, and limited space to play.

5.4.1.1 Summary of household economic resources

There is no research that looks at the economic resources within a household and considers spending decisions, hardships and impacts across the socioeconomic determinants of health, such as housing, heating, physical activity, education and diet (National Health Committee, 1998). However, by drawing on several nationally representative surveys there is enough evidence to suggest that economic hardship may lead to poorer diets. The food budget is likely to be more discretionary than some other household expenses, such as rent. If the Drewnowski (2004) thesis of lower per calorie costs for energy-dense foods holds true for New Zealand, then reducing the food budget may push households towards consuming more energy-dense and nutrient-poor foods. Limited New Zealand research data has shown a slightly confused picture, where energy-dense foods do appear cheaper per calorie, but households with restricted food budgets

do not appear to purchase increased amounts of energy-dense foods (Rush, Puniani, Snowling et al., 2007).

There are likely to be two broad areas of intervention to increase the economic resources in households to spend on food. The first is to increase income. This has been the aim of the New Zealand government Working for Families package (Jensen et al., 2006). There is some evidence that this has effectively increased the income for many lower-income households (Perry, 2008). However, Working for Families may also have increased income inequality between those in work and those on benefits (Centre for Social Research and Evaluation, 2007; Perry, 2008). The second area for intervention is to reduce the cost of food. The cost of food is examined in more detail below.

5.4.2 Cost of Food

The cost of food is one component of overall household expenditure, and as such impacts on household economic resources. The greater the cost of food, the more money is required to purchase adequate food for a family. As already mentioned above, food may be more of a discretionary item than rent or mortgage payments.

The policy system maps (shown above) show cost of food is linked to household economic resources and the types of food consumed in households (Campbell et al., 2002; Drewnowski, 2004; Inglis et al., 2005; Signal et al., 2008), as well as at school by children (Campbell et al., 2002; Sanigorski et al., 2005). The cost of food in turn may be influenced by food production policies and practice (Cawley, 2006; Drewnowski & Specter, 2004).

The well documented arguments of Adam Drewnowski (Andrieu, Darmon, & Drewnowski, 2006; Drewnowski, 2004; Drewnowski & Darmon, 2005; Drewnowski & Rolls, 2005; Drewnowski & Specter, 2004), that foods with high energy-density and often nutritionally-poor, cost less than low foods with low energy-density and nutrient-rich, appears compelling. This has been shown to hold true in a New Zealand study with a modest sized sample of foods (Rush et al., 2007). That households with fewer economic resources are likely to consume more energy-dense foods than households with more economic resources also appears likely (James et al., 1997; Ricciuto et al., 2006; Ricciuto & Tarasuk, 2007). In New Zealand, focus group research with Māori, Pacific and low-income people, identified the perception of cost as a barrier to healthy diets.

However, when analysing foods reportedly purchased by Pacific households, who limited foods due to lack of money, no increase in energy-dense food purchasing was found (Rush et al., 2007). As shown in the discussion of household resources above, New Zealand survey data suggests a possible link between households in hardship living standard categories, households reporting food insecurity, and household spending on food items.

In the New Zealand context, there is no reliable population wide assessment of the foods consumed by households. Instead the Ministry of Health has analysed food balance sheets, looking at food supply, available on the United Nations Food and Agricultural Organisation (FAO) statistical database (FAOSTAT) (Ministry of Health, 2006b). Table 5-10 below, shows that the per capita of energy in the New Zealand food supply increased between 1961-1963 and 2000-2002 by nine percent. This change was driven largely by increased energy from vegetable oils, animal fats, sugar and sweeteners, and cereals, while partly offset by a decrease in energy from dairy products, meat and poultry.

Table 5-10 - Per capita energy in New Zealand food supply, 1961-63 versus 2000-02

Food group	Kilojoules/day		Percent total energy	
	1961-63	2000-02	1961-63	2000-02
Meat and poultry	2119	1830	17.2	13.7
Fish	84	184	0.7	1.4
Animals fat, raw	105	569	0.9	4.3
Milk and milk products	1135	527	9.2	3.9
Vegetable oils	75	854	0.6	6.4
Cereals	3069	3375	24.9	25.2
Sugars and sweeteners	2031	2378	16.5	17.8
Starchy root vegetables	440	515	3.6	3.8
Vegetables	255	427	2.1	3.2
Fruit	381	662	3.1	4.9
Alcohol	532	532	4.3	4.0
Other	641	708	5.2	5.3
Total	12,309	13,394	100	100

Source: FAOSTAT (Ministry of Health, 2006b, 18)

As was shown in Figure 5-5 above, single parent households or those with three or more children, are likely to spend less per household member on food than couple only or households with fewer children. Table 5-11 below shows that single parent and multiple children (3+) households, spend a greater percentage of their food budget on items more likely to be energy dense, including high fat dairy products, cereals and sweetened

products. This provides some evidence to support Drewnowski's hypothesis of cost per calorie in New Zealand, however, further evidence is required to better understand the link between cost of food and food consumption.

Table 5-11 - Percentage of household weekly expenditure on food groups, by household composition

	One family household, couple only	Couple with one dependent child	Could with two dependent children	Couple with three or more dependent children	One parent with dependent child(ren) only
Food group total	15.93	14.75	16.38	16.58	17.49
Fruit	1.06	0.95	1.04	1.00	1.13
Vegetables	1.27	1.06	1.17	1.03	1.30
Meat	1.68	1.49	1.53	1.76	1.86
Poultry	0.53	0.42	0.45	0.57	0.66
Fish	0.37	0.26	0.27	0.32	0.28
Farm	1.51	1.48	1.63	1.65	2.14
Cereals	1.77	1.68	2.08	2.23	2.35
Sweet	1.64	1.64	1.93	1.70	2.22
Other	1.71	2.26	2.27	2.31	3.19
Meals away	4.37	3.41	3.88	4.00	2.39

Source: 2004 Household Economic Survey (Statistics New Zealand, 2004)

5.4.2.1 Summary of cost of food

The research literature consistently identifies differences in nutrition practices and outcomes across socioeconomic groupings. This is reflected primarily in the household setting policy system map. For New Zealand there is some evidence to indicate availability of energy-dense foods has increased. Energy-dense food may be cheaper per calorie than less energy-dense foods. There is also representative survey data that suggests that the average single parent household, and those with three or more children, may struggle to purchase a basic nutritious food basket. The policy system maps (Figures 5-1 to 5-4) show that foods consumed within the home are likely to impact on foods consumed at school, and children's food preference development.

5.4.3 Availability of Food in the Community and Within Schools

The narrative review of literature identified the availability of food as a recurring theme in children's diets. The policy system maps show availability of food to be highly linked to many other system elements, and considered a control parameter. In the home setting, for example, food available in the community is linked with parent's food purchasing and

foods eaten (Figure 5-2). In the school setting, the food available within the school is a control parameter, while food available in the community is also identified as a system element (Figure 5-1).

The availability of foods can be considered to impact on a variety of food practices. System elements likely to interact with availability of foods identified in the policy system maps include:

- Types of food eaten in the home (Campbell et al., 2002; Reidpath et al., 2002; Story et al., 2002).
- Types of food eaten in the school (Carter & Swinburn, 2004; Utter et al., 2007a; Wind et al., 2005).
- Development of food preferences in children (Anderson et al., 2005a; Klepp et al., 2005; Story et al., 2002).
- Cost of food (James et al., 1997; Ricciuto & Tarasuk, 2007).
- Parents food choices for the household (Jain et al., 2001).

Taking into account the range of system elements interacting with availability of food across the four policy system maps, the maps, supported by the literature, suggest that the availability of food for children can be considered an interaction of:

- Food outlets within a geographical area from which to purchase food, including within schools (such as tuck shops, canteens and lunch menus).
- The products being sold within these food outlets, which is also driven by food production and marketing.
- The cost of food for sale in the food outlets.

These three aspects of food availability do not include the influence of locally grown food, such as school gardens, as these were not identified in the reviewed literature.

The following analysis will consider the evidence that availability of food impacts on children's diets in New Zealand. If aspects of food availability are operating to influence children's diets, then interventions to change the location, cost or variety of foods available may be justified to improve diets.

Before these elements of the availability of food are explored further it is worth noting that agency, the action of individual children and parents, is important within this function. There obviously has to be an act of buying food before it can be eaten. The policy system maps, however, suggest that this agency is limited by structural aspects described above (cost, available products, location of food outlets), by individual values influenced through habit or tradition (Inglis et al., 2005; Signal et al., 2008), and by preferences. Preferences in turn are influenced by both familiarity (Drewnowski & Specter, 2004) and marketing (Chapman et al., 2006).

5.4.3.1 Availability of Food

There are some mixed results of studies that have compared the availability of food types, food outlets and food price by socioeconomic status or geographical areas. Some US based studies have found a relationship that poorer people and ethnic minorities have worse access to healthier foods (Block et al., 2004; Horowitz et al., 2004; Salis & Glanz, 2006). Cummins and Macintyre (2006), however, note that unlike the US, in the UK studies have not found consistent associations. There is also mixed evidence from the UK and Australia regarding the concept of 'food deserts'. Food deserts are defined as geographical areas with few or no food outlets. There is some evidence in the UK and Australia that some food deserts do exist, shown by supermarket location patterning by socioeconomic status of areas, however less evidence of an impact on diet (Coveney, 2005; Whelan, Wrigley, Warm et al., 2002; Wrigley et al., 2003).

In New Zealand recent research suggests that physical access to local food retailers, supermarkets, and fast food outlets are all better in more deprived (lower socioeconomic status) areas (Pearce et al., 2007). Pearce et al. (2007) developed a national dataset, which provides some confidence in identified national level trends. While this study did not examine the actual foods available in the food outlets or price, it indicates that physical distance to shops alone does not explain lower fruit and vegetable consumption amongst lower socioeconomic households and children. The findings do suggest that reducing the access to convenience and fast food outlets surrounding schools may have an impact on children buying food on the way to school. Analysis of the 2002 New Zealand Children's Nutrition Survey, showed that BMI was positively associated with buying food on the way to school (Utter et al., 2007b). While availability of food may not consistently differ by socioeconomic status of communities, internationally both

availability and cost of fruit and vegetables have been identified as limiting the purchase of these by parents from low socioeconomic groupings (Campbell et al., 2002), which mirrors concerns expressed by New Zealand adults (Mhurchu & Ogra, 2007; Signal et al., 2008).

The Ministry of Health has detailed changes in the number of food outlets in New Zealand between 2000-2005 (Ministry of Health, 2006b), as shown in Table 5-12 below. Data is taken from the Retail Trade Survey administered by Statistics New Zealand (Statistics New Zealand, 2009). Data indicates a greater increase in the number of shops selling what are likely to be less healthy foods compared to more healthy foods. For example, there have been increases in all takeaway food outlets, and a reduction in fresh meat, fish, poultry, fruit and vegetable outlets (Figure 5-12). While this is only one factor of food availability, when the concerns regarding cost of foods, such as fruit and vegetables expressed by lower socioeconomic groups, are taken into account, the impression is that food availability (including a cost component) limits opportunity for lower socioeconomic households to eat healthily.

Table 5-12 - Change in food outlets between 2000-2005

Category	Number change 2000-2005	% change	2005 actual outlet numbers
Bread and cake retail	172	18	1055
Fish n chip, hamburger, ethnic food takeaway	238	14	1905
Other takeaway	186	18	1217
Cafes and restaurants	1409	27	6705
Pubs, taverns, bars	363	30	1568
Chicken takeaway	37	33	148
Specialised food retail ¹	210	38	758
Pizza takeaway	92	57	245
Supermarket	66	17	466
Grocery and diary	248	11	2565
Fresh meat, fish, poultry	43	-6	679
Fruit and vegetables	40	-8	464

Source: Retail Trade Survey (Ministry of Health, 2006b)

1. Specialised food retail includes: confectionary; non-alcoholic drinks; small goods (meat); specialised foods not elsewhere classified; and tobacco products.

5.4.3.2 Availability of Food in and around New Zealand Schools

For children in New Zealand, the availability of food both in and around schools does seem to have an impact on what food is consumed at school. Utter et al. (2007)

conducted a secondary analysis of the 2002 Children's Nutrition Survey using multiple regression models and concluded that almost 50 percent of primary school aged children purchased some or most of the food they consumed at school from a school based canteen or tuck-shop. Pacific, Māori and students from lower socioeconomic backgrounds, were more likely to purchase some or all of the food they ate at school from the school canteen (Utter et al., 2007a). Carter and Swinburn (2004) undertook a survey of school food environments across a nationally representative sample of school. Analysis was restricted to primary and intermediate schools, where a 60.6 percent response rate was achieved. Results showed that the most commonly available items in primary school canteens were pies (79%) and sausage rolls (54.5%), with pies and other 'occasional' food items leading sales. The range of costs for pies and hot chips, compared with sandwiches and filled rolls, meant that a pie was likely to be a cheaper option than a sandwich or filled roll (Carter & Swinburn, 2004).

As discussed in Chapter 1, a requirement was introduced in June 2008 for schools to only sell healthy food options (Education Review Office, 2008), supported by a food and beverage classification system (Ministry of Health, 2007a). The requirement was only in place for six months before being removed. It is unclear whether this, and other health promotion activities in schools (e.g. Ministry of Education, 2009), have changed school food sales from those reported by Carter and Swinburn (2004).

In another analysis by Utter et al. (2006b) Māori children were identified as being 3.3 times more likely, and Pacific children 4.7 times more likely than New Zealand European and Other ethnic group children, to purchase some of their food consumed at school from a dairy or takeaway. In a small pilot study, Maher et al. (2005) surveyed food outlets within a one kilometre distance of a sample of secondary schools. It was found that food outlets were on average closer to low socioeconomic secondary schools and overwhelmingly sold 'occasional' (less healthy) foods. An analysis of the geographical distribution of food outlets in New Zealand by Pearce et al. (2007), showed that fast food outlets tend to be closer to more deprived schools (low school decile rating) than less deprived schools.

Again, the tentative conclusion that can be drawn from this information, is that the factors contributing to food availability are creating a situation where lower socioeconomic, Māori and Pacific households and children, are likely to be consuming

less nutritious and more energy-dense foods at home and school. More qualitative research is required to determine why these patterns persist as they do. However, there appears to be sufficient evidence to draw some conclusions regarding the interaction of household economic resources, cost of food, and availability. For households with fewer economic resources, the cost of nutritious foods is likely to be one barrier to healthier diets for children. Children in households with fewer economic resources also appear to rely on foods available in local settings (e.g. neighbourhood and school), to a greater extent than more affluent households. The food available in neighbourhoods and schools is likely dominated by less healthy options (energy-dense and nutrient poor).

5.4.3.3 Marketing to Children

Another environmental factor that is linked with food purchasing decisions and children's preference development, is marketing of food to children (Alexandra, Lauren, & Marion, 2006; Chapman et al., 2006; Utter et al., 2006a). In New Zealand, the 2005 reported advertising expenditure on categories of food, such as confectionary (\$14.2 million), aerated drinks (\$20.7 million), breakfast foods (\$28.7 million) and chocolate (\$17.7 million), far exceed those spent on advertising fruit (\$1.5 million) and vegetables (\$4.7 million) (Ministry of Health, 2006b).

This means that children are less likely to be exposed to advertising for fruit and vegetables than for categories of food and beverages containing high levels of sugar and fat. This has been confirmed through three studies that have produced content analysis of television advertisements during children's television viewing times in New Zealand (Jenkin, Wilson, & Hermanson, 2008; Wilson, Quigley, & Mansoor, 1999; Wilson et al., 2006). The three studies, while not directly comparable, have used similar methods. Across the three studies 60-70 percent of food advertisements were for food likely to be high in fat, sugar or salt. The policy system maps show advertising of foods being linked with children's food preferences and availability of foods in community and school settings (Figures 5-1 to 5-4).

5.4.3.4 Summary

The availability and advertising of foods links through numerous system elements in multiple policy system maps. Based on limited evidence, New Zealand primary school

aged children are likely to have easy access to heavily promoted ‘occasional’⁷ food in schools and community settings. The degree to which children purchase these foods is patterned by ethnic and socioeconomic characteristics, as availability and exposure may also be to some degree. It appears that a complex mix of structural and personal influences is operating to determine food purchasing practices, both within households and by children outside of the home.

5.4.4 School Policies

The policy system maps identify the policies implemented within a primary school as a control parameter on the availability of food within the school. School food policies can also impact upon advertising or other marketing opportunities present within the school environment. The availability of food within the school is in turn linked with childhood food preference development. While the policy system maps do not show school food policies to be as widely influential as household economic resources across the entire system of childhood nutrition, school policies do seem highly linked within the primary school food environment.

The availability of food in schools was discussed earlier, with almost 50 percent of children purchasing some of the food they eat at school, with a greater proportion of these being of Māori or Pacific ethnicities (Utter et al., 2007a). As reported above, Carter and Swinburn (2004) conducted a survey of food available in New Zealand primary schools. Of the schools sampled, only 16.5 percent had a food policy. Of these 91 percent rated the policy as effective or very effective at promoting healthy eating. Of schools that ran a food service (canteen or lunch service), 37 percent ran it for profit, 29 percent contracted out the service, and 34 percent ran it as a not-for-profit service.

Richards et al. (2005) found only four percent of primary and intermediate schools had policies or processes to guide participation in sponsorship or incentive programmes. This is despite 53 percent having sponsored programmes, 52 percent being involved in incentive programmes and 32 percent having sponsored education materials. In the same study 91 percent of all schools (primary and secondary) sold products for fund raising, over half of which are food products likely to be classified as ‘occasional’.

⁷ ‘Occasional’ food is a category of the Food and Beverage Classification System for Schools (Ministry of Health, 2007). The classification system suggests that ‘occasional’ foods should be consumed no more than about once per school term.

It is clear that New Zealand schools, including primary schools, are reliant on fundraising activities, including food sales, to carry out operational and development tasks. This is illustrated by the following quote of a Ministry of Education review of school funding:

The various government expectations and requirements of schools should be capable of being met by the resources provided by government to schools, though not necessarily in the way or to the extent that parents and the local community would desire (Ministry of Education, 2006, 7).

The Ministry of Education report goes on to say:

The majority of schools are able to remain financially viable using a mix of operational and locally raised funds. However, an increasing but still small percentage of schools are faced with ongoing deficits (Ministry of Education, 2006, 19).

Each School is governed by an elected Board of Trustees, with accountability to both government and community. What is suggested by the statements quoted above, is that school activities which are accountable to government are largely funded through government operational grants, while community accountable activities are funded through local fundraising. It is not clear that communities themselves would appreciate the difference. This places schools in a position where fundraising activities must be conducted. Sale of food, either as an in-school food service, or as straight fundraising activity (such as selling chocolate) is obviously part of this mix.

The Carter and Swinburn (2004) survey reported that of the primary schools that ran a food service, only 15.5 percent had purpose built canteen facilities. This would obviously restrict the degree to which food could be prepared on site and increases the likelihood of ready made 'heat and eat' options, or the school purchasing from a local food retailer who delivers to the school. With only 34 percent of primary schools operating food services as not-for-profit, it suggests that, for many schools, the profit margin of food sales will be important. Drewnowski's hypothesis would suggest that energy-dense foods will be cheaper to prepare. The Carter and Swinburn (2004) survey results showed that pies and sausage rolls were the most readily available and sold food items. Pies and sausage rolls are likely to be energy-dense. No information was available on profit margins.

Improving the nutritional quality of foods sold in schools may therefore require expenditure to improve facilities for food preparation, and a reduction in profits. A

reduction in food sale profits could result from either selling more food items with lower profit margins, or a fall in sales due to increased price of items. A reduction in profits from food sales may have serious consequences for some schools in fulfilling their educational obligations, and meeting the expectations of both government and community stakeholders.

5.4.4.1 Summary

While there is only one high quality study to date examining New Zealand primary school environments, it shows a variety of nutrition related practices. A minority of schools have food policies, while a majority sell ‘occasional’ foods on site. The intervention logic suggested by the school policy system map, based on limited research evidence, suggests development of school food policies may be effective in promoting healthy nutrition. However, in practice the place of food sales in school revenue generation may present a barrier to change.

5.5 Conclusion

The childhood nutrition system can be considered to operate across household, community, school, and child-centred settings. A narrative review of 53 peer reviewed papers has shown that within each setting, different system elements are operating and interacting. Based on the two criteria for control parameters, highly connected and bring external resources into the system, three control parameters have been identified. These are: household economic resources and the cost of food; availability of food; and school food policies.

A complexity theory approach to policy analysis highlights the importance of understanding diversity in how the factors of a system interact differently across communities, households and time. For this reason, the policy system map analysis does not represent the current ‘reality’ of the situation for all New Zealanders. The identified control parameters do, however, point to areas within the system of childhood nutrition that policy interventions could target. The analysis in this chapter provides some contextual information for these control parameters in New Zealand.

As discussed in Chapter 3, policy interventions will need to be locally relevant, and an understanding of how the childhood nutrition system is actually operating for primary

schools is required. Examples will be provided in the next chapter, which presents results of the primary school case studies.

The purpose of this review was to develop a working model of the childhood nutrition system to inform data collection and analysis. The narrative review of literature was designed to be inclusive of research methods and perspectives (see Chapter 2). Even so, the tables accompanying each policy system map (Tables 5-1 to 5-4), highlight that the amount of evidence reviewed behind a few of the identified system elements was light (for example two papers referenced to food production). This highlights a possible limitation of a complexity theory analysis, the difficulty of reaching theoretical saturation across all elements of a complex system. Time and resource limitations mean that a line has to be drawn at some point. Here, that meant system elements outside the more immediate school food environment system were less thoroughly reviewed. This theme is picked up again within Chapter 10.

Even though the surface of supporting literature had only been scratched in some areas, there are clear advantages of having an inclusive theoretical model of the child nutrition system. As the analysis begins to focus more specifically on primary school data, the information presented in this chapter provides the basis for linking to the wider childhood nutrition system within which primary schools are located. In particular, the impact of household economic resources and the availability of food on nutrition promotion within schools should be considered. The results from this review informed the case study primary school data collection (as discussed in Chapter 4). Because case study data collection is necessarily focussed on primary schools, many aspects of the home and community/economy settings remain unexplored through primary data. Having a theoretical model extends the ability of the primary data to help inform intervention design.

Chapter Six

Primary school case studies – Description and analysis

6.1 Introduction

This chapter presents results and analysis of five primary school case studies that provide examples of school food environment systems operating in New Zealand. It is from the school food environment system as a whole that children's diets at school 'emerge'. Understanding the elements that make up the school food environment, and connections between elements, will aid identification of policy interventions in supporting primary schools to promote healthy nutrition (as discussed in Chapter 3 and 4).

Three key informant interviews were conducted for each case study school, including: the principal, a teacher with special responsibility regarding nutrition or health, and a parent from the Board of Trustees or involved with school lunch menus (with the exception of school A where no parent responded to interview requests and a school administrator who managed the school lunch menu was interviewed). Other data collected included: school food sales, any existing school food policy documents and a survey of food outlets and outdoor food advertisements in the community surrounding the school. A full description of the data collected, and methods, is included in Chapter 4.

From the collected data a description of each school's food environment system (in the form of a policy system map – see section 4.4.3.6), was developed. To develop the school food environment descriptions themes, and interaction between themes, were identified from the data and included as system elements. Control parameters were also identified as those system elements highly connected within the system description, and which act to introduce resources into the school food environment system. Options for intervening upon control parameters identified by key informants are briefly discussed.

Detailed information on case study data collection and analysis methods is included in Chapter 4. A comparative analysis between case studies is presented in Chapter 7, which establishes the range of intervention options discussed with policymakers (Chapter 8).

6.2 Minimum nutrition practices common to all case study schools

During the course of the interviews with staff and parents of the case study schools, certain common rules and expectations regarding food in the school were mentioned. In all cases these were mentioned in passing, providing context for other points being discussed. It appears that these rules and practices almost form an unspoken benchmark for nutrition practice in schools. These are briefly described here rather than in the detail of each case study below:

- All schools required children to sit down and eat lunch for a period of ten to fifteen minutes before being allowed to play at lunchtimes. There are various ways of teachers monitoring this eating period, but all schools had such a period in place.
- No school allowed children to leave the school grounds at lunchtime, unless there was written permission from parents for the child to go home for lunch.
- Children were expected to take uneaten lunchbox items back home, although the degree to which this was enforced varied. As described, this is so that parents can see what children eat.
- Children were discouraged from bringing soft drinks and confectionary to school, although again there was variation as to how formal this rule was (e.g. included within a written policy for school B, or word of mouth for school A).

These common nutrition related practices should be kept in mind when reading the detail of each case study school below.

6.3 Case Study A

6.3.1 School Description

The first case study school is a low decile (high socioeconomic deprivation) school, set in a residential suburban neighbourhood, well connected to a series of other suburban neighbourhoods. In early 2008 the Education Review Office audit report⁸ for the school reported the school roll at 174 students, of whom 36 percent were identified as Māori, 46

⁸ Education Review Office audit reports for case study schools are not referenced here as this would identify schools contrary to the ethics requirement for this research.

percent as Pacific, 13 percent as New Zealand European/Pākehā, and 5 percent as other ethnic groups.

The school is involved in several nutrition and physical activity health promotion programmes, including Fruit in Schools, and the National Heart Foundation Healthy Heart Award programme (a structured programme of nutrition education and school food environment changes, such as school food policy development (National Heart Foundation, 2008)).

6.3.2 Perceptions of children's diets and obesity at the school

When asked about children's diets at school, there was agreement amongst informants that, in general, the diets of children at the school are not as good as they could be. There was a perception and concern that a lot of packaged foods were brought to school from home by almost all children, particularly potato crisps. In describing the food children brought to school one participant stated:

What is noticeable is packaged foods, bought lunches, chips [potato crisps] especially. You know I would say that the children in the class, probably eighty percent of them would have chips every day.

All informants described a regular situation where students came to school without having breakfast, or without enough food for the day (as defined by their classroom teachers). As described, only a small number of students would be in this position on any given day. These are not necessarily the same students often in this position, but across the student population this regularly occurred. When teachers identified students as needing additional food, there were a variety of options available within the school including fruit from the Fruit in Schools scheme, sandwiches supplied by a local dairy, and school lunch programme menu items. The school also purchased some breakfast cereals that were made available to the children requiring breakfast.

The food provided within the school lunch menu (from which children can purchase food items) was modified in 2006 as part of the process of achieving the National Heart Foundation Health Heart Award. One participant who led the menu changes described the situation prior to the Healthy Heart Award programme:

... the options that we had available for the lunches then were not healthy options. There was the offer of a pie or sausage roll every day of the week. ... very little in the way of sandwiches, filled rolls. It was all chippies, cookies ... and with the

help of the Heart Foundation we decided to make a very radical change to the lunch system.

The school took part in the Fruit in Schools scheme, where external funding provides around one piece of fruit per student every school day. There was a lot of support for the scheme, particularly from the two informants who discussed the scheme in some detail. From their observations they identified an improvement in student's health and behaviour over the twelve months the scheme had been operating, including a reduction in the number of skin sores evident. At the time of interviews the school was eligible for a further two years funding for the scheme. At this time no consideration had been given as to how the scheme may be funded at the end of this period. Since then the government has announced a continuation of funding for all schools involved, while an evaluation of the scheme and future options are considered (Ministry of Health, 2009a).

Obesity was considered to be an issue amongst students at the school. One participant suggested that as many as 25 percent of the students are overweight and three to four percent obese. Concern over children's weight was also cited as an impetus for the changes to the school lunch menu. The concern over weight was heightened by the recognition amongst all informants that weight gain is probably more pronounced in adolescents, and therefore not yet fully realised in the student population.

The school did not rely heavily on fundraising to bolster operational funding. Informants suggested there was not the money available in the local community to make this worthwhile. Also, there was a lack of support and help in fundraising activities by parents, who in other schools often drive fundraising. Having said this, the school was conducting student led chocolate sales, and there had been some Friday lunches sold for fundraising – such as chow mein or hamburgers.

6.3.3 School food sales

Food sales from the school lunch programme were provided by the school for term one of 2008. During this period there were 2103 items sold, which averages eight items per child over the term. Table 6-1 shows the school lunch menu classified according to the Ministry of Health Food and Beverage Classification System for Schools (Ministry of Health, 2007a).

Table 6-1 - School lunch menu items by food and beverage classification system categories for school A

Category	Available every day	Available 1 or 2 days
Everyday	4	1
Sometimes	1	4
Occasional	0	0

Pies, sausage rolls and savouries are categorised as ‘sometimes’, by the Ministry of Health system, and are only available one day a week. American hotdogs are categorized as ‘sometimes’ and are available two days a week. Pizza is categorized as ‘everyday’ and is available two days a week. Figure 6-1 below shows that as a proportion of total sales, the ‘sometimes’ category foods available for limited days occupy a much larger percentage of sales than they do availability. Flavoured milk is the only menu item categorized as ‘sometimes’ and available every day, but made up 22 percent of total sales.

On informant stated that following the changes in 2006 there was a reduction in sales, mainly due to the elimination of cookies, potato crisps, and other snack foods. The changes were reported as being largely accepted by students and parents, although there were a “few grizzles”.

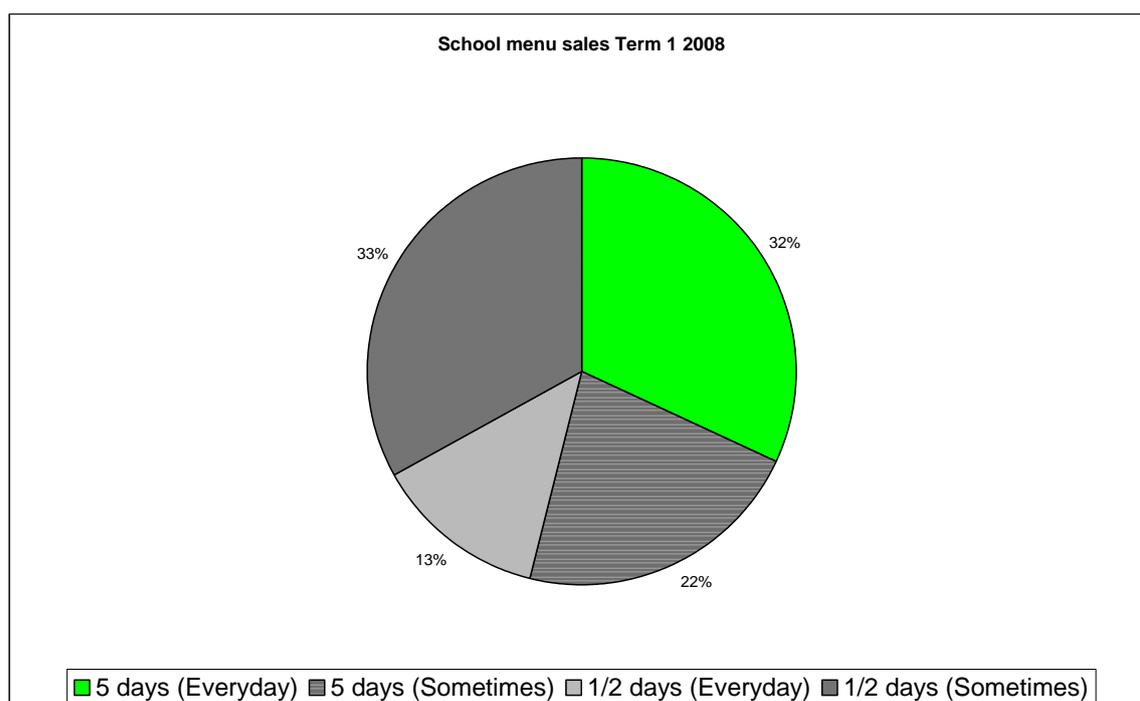


Figure 6-1 - School lunch item sales for term one 2008 by food and beverage classification for school A

6.3.4 Perceptions of causes of diet and obesity

Informants were asked about their thoughts on the causes of a good diet, overweight and obesity, and whether children's diet was a concern for the school and why. There seemed to be a fairly even proportion of blame for obesity on both nutrition and physical activity. All informants expressed the view that nutrition was more important influence than physical activity on children's ability to learn and behaviour at school. Two themes were evident across the three interviews, the first was that a sufficient amount of food is required for children's concentration, and secondly that the right types of food are required for student's health and longer term achievement. For example, carbonated soft drinks were identified by all informants as promoting hyper-activity in the short term, which impacted on ability to concentrate in class, and over time contributed to weight gain.

Informants all attributed parents as the largest influence on children's diets and their knowledge of what constitutes a good diet. All three informants identified the low socioeconomic context in which many parents and households lived as a major influence on the foods that parents brought into the home, and provided for children. Informants described this environment as characterised by a lack of money and low investment of time and effort in cooking. One informant suggested parents and children placed a high value on takeaway and pre-packaged foods as an achievable luxury.

6.3.5 The school's role in influencing children's nutrition

When asked what the role of the school could, or should, be in influencing children's diets, all three informants were careful not to overstate the positive impact the school might have. Given that the informants described aspects of the home environment and parents' decisions as key impacts on nutrition, there was some hesitancy over what the role of the school should be in promoting healthy nutrition. There was also acknowledgment that there are some in-school actions that can help, such as the school lunch menu. There was a reluctant acceptance by all informants that schools have a role in educating parents, as well as children, in regards to nutrition because "who else will do it if schools don't?" The role of parental education was, however, not seen as the key role of a school, which is to "educate kids".

There was concern expressed that if the school takes on a parental education role, then additional resources are required, as engagement with parents was seen as requiring evening sessions and other opportunities for face to face contact outside of the normal school day.

The majority of external support from the various health promotion programmes focuses on aspects of the food and physical exercise environment within the school, and is not externally focused on households and parents. An example is the Healthy Heart Award programme focus on changing the school lunch menu, and developing the school food policy. While there is often an attempt to engage parents in designing programmes, these programmes are firmly focused on the school setting, and thus their impact on the home or community environments is likely limited.

What did come through clearly is that the current model under which the health promotion programmes are operating, while providing resources into the school, also places a strain on teaching staff. School staff were regularly in contact with four agencies regarding health promotion programmes. Each programme had unique paperwork requirements and activities that the school must undertake in order to receive resources. While the resources were appreciated, it was suggested that more coordination between the programmes was required. Under the current model the requirements were seen as having a negative impact on the lead teacher's classroom responsibilities.

Time spent on health promotion activities was also seen as placing pressure on other curricula areas, such as literacy, where the school was involved in an improvement project with other local schools that also required classroom teacher release time.

There was a concern from all informants, that to influence children's nutrition there is a need for additional resources to enable the school to attempt to impact on home environments. The type of resources required may differ from those currently provided through the various health promotion programmes. As discussed above, currently the support often requires teachers to have time away from the classroom which creates other types of pressures. Instead, it was suggested by one informant that having support people come into the school and undertake the non-teaching work may be more appropriate.

6.3.6 Interaction with community food environment

Tables 6-2 through 6-4 show details of the food outlets and outdoor food advertisements within a two kilometre buffer zone around the school. As shown in Figure 6-2, the outlets and advertisements are mostly located in a shopping area to the north-east of the school. A total of 13 food outlets and 28 food advertisements were located within the buffer zone. Twenty of the 28 advertisements were for foods classified as ‘occasional’, with Coke the most frequently advertised product.

Using student home addresses and location of food outlets and outdoor food advertisements, an analysis was conducted that considered whether students are likely to pass food outlets and advertisements on the route between school and home (see section 4.4.3.5 for full method details). The analysis suggests that 21.2 percent of students are likely to pass one or more food outlets or food advertisements on the way to school. These students are likely to pass an average of 22 food outlets and advertisements.

Compared to the other schools in this research study, 21.2 percent is a low percentage of students passing food outlets and advertisements. Figure 6-2 shows that the food outlets are located in a distinct area to the north-east of the school, rather than spread around the community, while the majority of students live to the north of the school. This means the majority of students do not need to pass outlets on route to school. The likely travel routes used by students, when compared to food outlet locations, supports comments made by informants that they considered food outlets had little impact on the food students had at school.

Table 6-2 – Number of food outlets within 2km buffer by outlet type for school A

Café/tearooms/lunch bar	1
Local fast food	5
Multinational fast food	1
Service Station	1
Dairy	5
Total	13

Table 6-3– Number of food advertisements within 2km buffer by food and beverage classification category for school A

Everyday	2
Sometimes	6
Occasional	20
Total	28

Table 6-4 – Number of food advertisements by item within 2km buffer for school A

Meat pies	7
Coke	13
Milk	2
Ice cream	5
Cookies	1
Total	28

Two informants were questioned about whether the local environment was a concern regarding nutrition. There was not a great level of concern, primarily because the children are of an age where the informants did not consider they would often go to the shops by themselves. One participant also noted that “they don’t have the money” to spend on food at the shops.

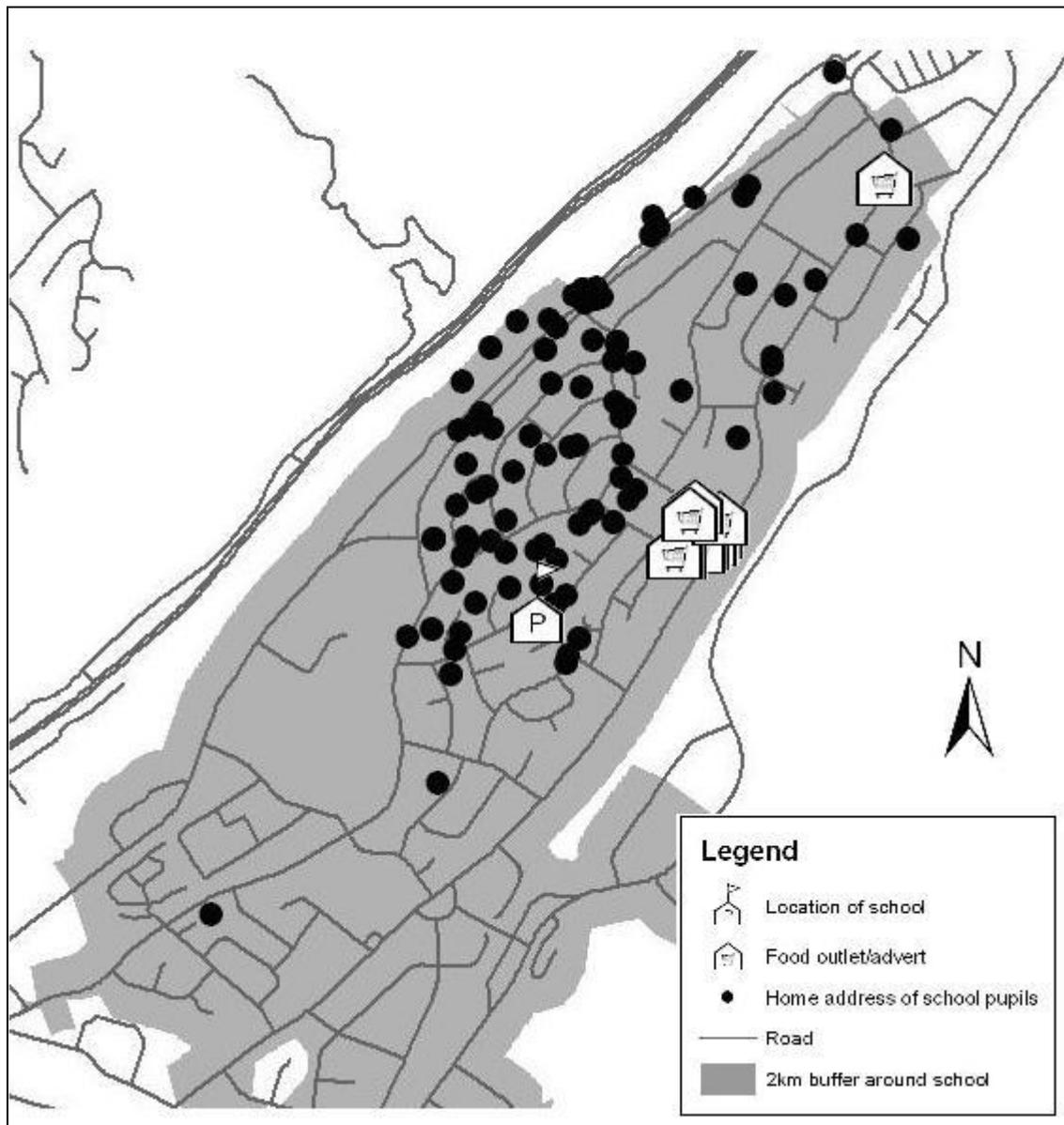


Figure 6-2 – Student home address, food outlet and outdoor food advertisement location in relation to case study school A

6.3.7 School policy system map

As described in Chapter 4, the system elements within Figure 6-3 are identified from analysis of the interview transcripts, supported by the other school specific data where relevant. The interaction between system elements represent connections between themes made by key informants. No direction is shown between system elements, as it is assumed that influence can move both ways. The system elements included within Figure 6-3 cut across the physical school, community and home settings. As described in Chapter 4, the boundary of the school food environment system is considered to include

all those ‘practices’ (see section 3.4.2.1 for a discussion of practices), which interact to lead to what children eat at school.

The two elements in Figure 6-3 with darker borders are the system control parameters. The control parameters were identified by considering whether, amongst the most highly linked system elements, the element was likely to bring external resources into the system. This map shows two control parameters: *Food brought from home*; and *Parent’s food decisions (within the home environment)*. Many of the school’s actions, in relation to food, attempt to first of all supplement, and secondly influence the food children bring from home. The school lunch programme is offered as an alternative to parents providing food from home. The Fruit in School scheme is designed to supplement food brought from home. The food that the school has available for breakfast or lunch, if a child does not have sufficient food, is also an attempt to supplement what children bring from home. All of this activity is consistent with the understanding within the school of nutrition having an impact on a child’s ability to learn, and their behaviour. It is interesting to note that two external agencies (Regional Public Health and National Heart Foundation) appear within the map connected to the school lunch programme and the Fruit in Schools programme. Without the input of these two agencies it seems likely that action in these two areas would not have occurred.

The food children bring from home into the school environment is by and large a result of parents’ food decisions. Even if children make their own lunch, the food ingredients available in the house are likely to be the result of parents’ or caregiver’s food purchasing decisions. The map shows only one element connected with *parent’s food decisions* that can be seen as directly amenable to health education type interventions, *nutrition knowledge*. *Lack of time/effort* and *lack of money* have similarities, in that informants described a combination of working long hours, or shift work as impacting on the time parent’s have to prepare fresh foods, and also the impact that low paid jobs are likely to have on parent’s purchasing power in relation to food. Parents on income support benefits may have time but also little purchasing power.

Within an environment of little money and stretched time or low motivation, one informant suggested that takeaway foods and packaged foods represent attainable goals as treats. Thus the *value (non-economic) of takeaway/packaged foods* may be higher for those families where money and/or time are tight. Informants considered that the price of

food reinforced these behaviours, with packaged treat foods often costing less than fresh fruit and vegetables. One participant noted that this is not always the case, however, and cited cooking a roast lamb meal as being probably about the same price as buying takeaway pizza for a family. However, the time taken to cook a roast meal compared to a buying takeaway pizza may favour the pizza when economic and non-economic factors are taken into account.

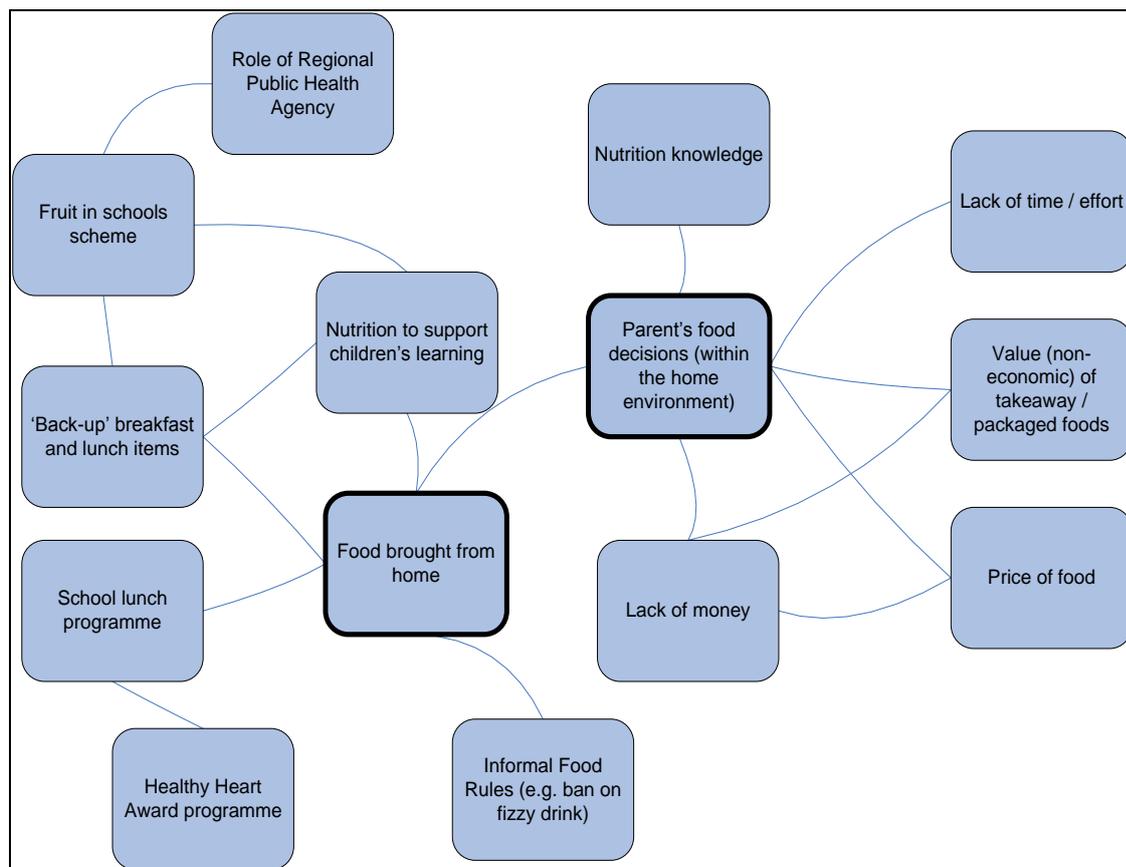


Figure 6-3 - School food environment policy system map for case study school A

6.3.8 Intervention options identified by informants

A number of possible interventions to promote healthy nutrition were suggested by the interview informants. Some of these were at the school level, whilst others would require action at an local agency or government level.

At the school level it was suggested by one informant, and acknowledged by another, that more effort could go into rules around types of food allowed at school. Of particular

focus was a ban on potato crisps. Other actions include a greater focus on student's drinking only water at school.

At the local agency level, as discussed above, there was a suggestion from one informant that agencies working with the school need to coordinate amongst themselves better. Also, to work with the school in planning out requirements and work programmes for all the different health promotion activities in a coordinated way.

At the level of central government policies, informants regularly discussed the price of healthy food as a barrier to parents purchasing more healthy food. One informant suggested removal of Goods and Services Tax (GST) from fruit and vegetables as a possible intervention. Two informants noted that poor nutrition for children could be seen as a form of abuse or neglect, and that perhaps statutory agencies should get more actively involved in families where unhealthy food was consistently being provided.

6.4 Case Study B

6.4.1 School description

The second case study school is a kura kaupapa, or Māori language immersion school. This means that in the classroom te reo Māori is the only language spoken, and the school operates according to a Māori worldview and orientation, or kaupapa. The school is set in a large suburban setting. The school is classified as being a low socioeconomic decile. While the immediate neighbourhoods surrounding the school are lower socioeconomic areas, there are medium and higher socioeconomic areas in connecting neighbourhoods. The school roll was 197 at the time of the latest Education Review Office report in October 2007, at which time 97 percent of students were classified as Māori, with Pacific ethnicities making up the rest of the student roll.

The kura is involved in the Fruit in Schools scheme and the associated health promotion activities, including regular liaison with a healthy schools advisor from the local public health agency. The kura is also involved with the National Heart Foundation Healthy Heart Award Programme.

6.4.2 Perceptions of children's diets and obesity at the school

There was agreement amongst informants that children's eating habits are important in the school environment due to the impact on behaviour at school, and the ability to concentrate. The informants noted a change in classroom behaviour since the introduction of the Fruit in Schools scheme. As one participant noted "we've got less incidents of kids becoming frustrated with one another because they're switched off".

Diets of students were not considered to be very healthy prior to the development of a food policy in the school, changes to the lunch menu, and introduction of Fruit in Schools. Informants were very enthusiastic about the Fruit in Schools programme, stating that not only were there changes to students behaviour in the classroom, but that fruit had replaced some packaged foods brought to school and had encouraged more consumption of fruit and vegetables, "they chomp on an apple instead of chomping on a biscuit". An example of the comments made by one participant was:

Our kids are so much [more] balanced, they're not so hungry anymore, they can actually concentrate in class, play well, that's the things we've noticed.

Like case study school A, a reduction in skin sores since the introduction of Fruit in Schools was also noted. At the time interviews were conducted, the kura had not identified how to continue funding the fruit following the three year government funding period. Several ideas had been suggested, but no solution was yet in place. The kura was in their final year of government funding for the scheme. Government funding has since been extended while the scheme is reviewed.

Food was regularly donated to the kura, which allowed sandwiches to be provided to children who came to school with no, or inadequate, lunch. It also allowed teachers to replace banned foods taken from children. Informants reported that some individuals regularly donate, so that the supply is fairly consistent. When asked about fundraising, all informants explained that fundraising activities were minimal, due to a perceived lack of money in the local physical and school communities. There is an annual gala, which includes the sale of foods. Other than the gala, the kura did not sell food products as a fundraising activity.

The Kura has a healthy kai (food) policy which aims to encourage whānau (families) to provide healthy kai choices; bans confectionary, large bags of potato crisps and large

bottles of soft drink, except on special occasions. The informants indicated that the healthy kai policy has been successful in changing the types of food brought to school, with more homemade sandwiches and baking, and less packaged foods.

The kura provides a lunch menu every school day, but the menu items change on different days. For example pies are only available on a Friday. Changes to the lunch menu were made following the development of the healthy kai policy in 2002, which states that ‘the Kura will provide a variety of nutritional food options so that tamariki [children] may learn to make responsible choices for themselves’.

6.4.3 School food sales

School lunch sales data were collected for March and April only of term one 2008, as the school could not locate February data. During this period there were 2167 items sold, which equates to eleven items per student. Table 6-5 below shows the school lunch menu items placed into Food and Beverage Classification system for schools categories. It shows that there are no ‘occasional’ items available any day. On Fridays two types of pie and chocolate milk are available (‘sometimes’ items). Hot options available every day are hamburgers (‘everyday’), hot dogs (‘sometimes’) and pizza (‘everyday’), with cold filled rolls (‘everyday’), muffins (‘sometimes’) and juices (‘sometimes’) also being available.

Table 6-5 –School lunch menu items by food and beverage classification system for school B

Category	Available every day	Available 1 day
Everyday	5	0
Sometimes	8	3
Occasional	0	0

Figure 6-4 below shows the proportion of sales by category of the items sold every day. The ‘everyday’ items sell well compared to the ‘sometimes’ items. Hamburgers, hot dogs and pizza are by far the biggest selling items. Figure 6-5, however, shows total sales of all items, including the items only available one day a week. It shows that

‘sometimes’ items now dominate sales, as 54 percent of total sales are made up of the three ‘sometimes’ items only available on a Friday.

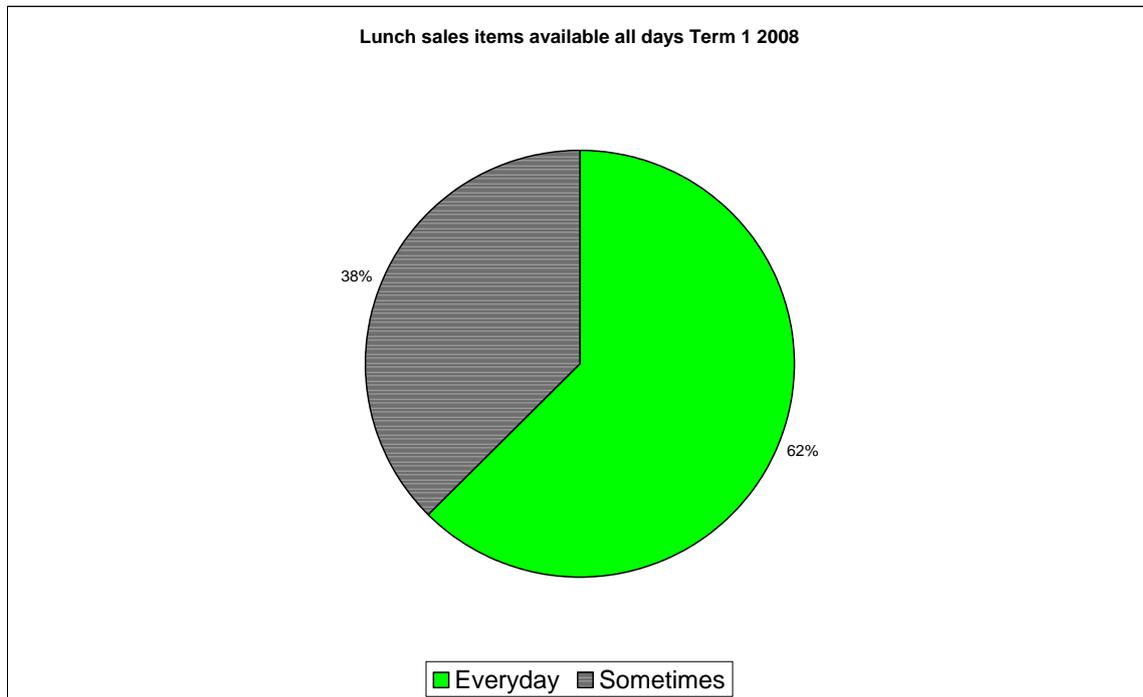


Figure 6-4 – School lunch sales for items available all days by food and beverage classification for school B

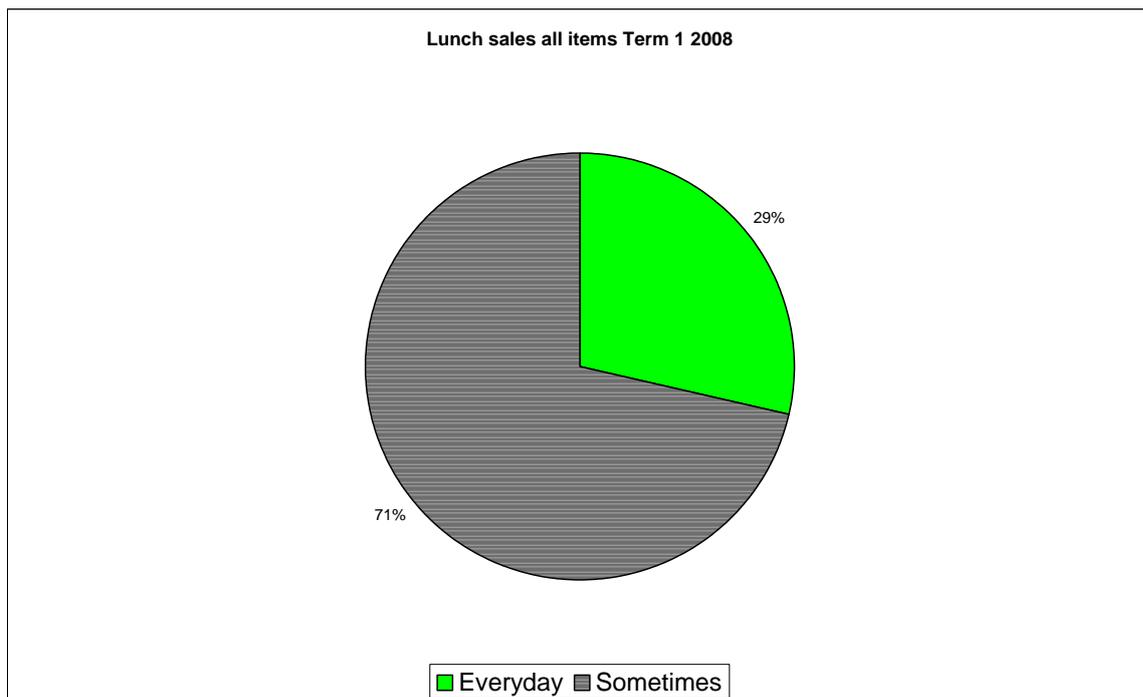


Figure 6-5 - School lunch sales for items available all days and one day only by food and beverage classification for school B.

6.4.4 Perceptions of causes of diet and obesity

Three themes about what leads to children's diets were identified from the three interview transcripts. These were: the media (advertising); cost of foods; and the role of parents. All three informants identified the role of parents as important, with a suggestion that for some parents a lack of knowledge around nutrition lead to less healthy food choices. A lack of time and money were also considered by all informants to reinforce these less healthy food options.

The economic position of many of the families of the school was identified by all informants as impacting on food choices. As one participant said, "...once again it comes back to the dollars. Its easier and cheaper to buy unhealthy food than healthy food". The advertising of less healthy foods was also a concern of informants. While mass media advertising dominated discussion, other forms of marketing, such as billboards in the local community and product placement of less healthy food items in local food outlets, were also identified.

6.4.5 The school's role in influencing children's nutrition

When asked about the role of the school in influencing children's nutrition, the informants all expressed the view that teaching should be consistent with a Māori worldview and tikanga Māori (traditional customs). Within this, nutrition messages needed to be combined with physical activity and tikanga. One informant described how nutrition needs to be integrated with a Māori worldview in the following way:

Its about manaakitanga [hospitality], its about kaitiakitanga [guardianship, sustainability], its about your whānau [family], all of those other things.

This approach is included in the kura's healthy kai policy which states:

- Shared kai events will encourage children to bring kai to share and enjoy. Whānau will be encouraged to support the healthy eating policy by providing healthy kai choices.
- The wharekai (eating area) will be the place where our children will be taught the appropriate behaviours for the wharekai – this will include speaking quietly, moving safely and caring for the environment.

Several times informants mentioned the school in promoting healthy nutrition as role modelling, informing and encouraging both parents and students to make healthy choices. Having healthy choices available on the school lunch menu was identified by all three informants as one way of achieving these roles. Focusing on appropriate behaviour in the wharekai was also identified by two informants as an important food related role for the school.

Two of the informants suggested that expanding the school garden would be useful, whereby local kaumatua (elders) could help planning and harvesting, as well as provide teaching of tikanga Māori and mahinga kai (traditional forms of food gathering and harvesting). This again demonstrates that to fit in with the kaupapa of the kura, the messages around kai need to be more than about health. One frustration mentioned by informants was the lack of nutrition promotion materials that were translated in te reo Māori. Before resources could be used in nutrition related education, the resources had to be translated, usually by teachers. This added one more task into what is considered a full timetable for teachers.

All informants noted the important contribution made by the healthy schools advisor that worked with the school through the Fruit in Schools team. Besides providing excellent support and advice, the fact that the advisor is Māori was considered important.

Informants did see factors external to the kura as influencing their ability to promote healthy nutrition. Of particular concern was the cost of healthy food for families where money is limited. As noted above, food advertising was also viewed as an influence on children's diets outside of the school.

6.4.6 Interaction with community food environment

Tables 6-6 through 6-8 provide details of the food outlets and outdoor food and beverage advertisements within a two kilometre buffer zone around the kura. There are eight food outlets identified. Most food outlets have multiple food and beverage advertisements attached, with a total of 16 advertisements identified. Only one advertisement was for an 'everyday' food item (milk).

Using student address information, an analysis was conducted that considered whether students were likely to be within view of a food outlet or food advertisement on the route

from home to the kura along the roading network. It is estimated that 87.5 percent of students would pass by a food outlet or food advertisement on route to kura. Of these students, they are likely to pass an average of 6.6 outdoor food advertisements and food outlets. The reason why so many students are likely to pass a food outlet or food advertisement is shown in Figure 6-6, where it is evident that there is a food outlet in close proximity to the school in most directions of travel. The school also has a large catchment area which increases the likelihood of a student passing a food outlet.

Table 6-6 – Number of food outlets within 2 km buffer by outlet type for school B

Café/tearooms/lunch bar	1
Local fast food	3
Multinational fast food	0
Service Station	1
Dairy	3
Total	8

Table 6-7 – Number of food advertisements within 2 km buffer by food and beverage classification category for school B

Everyday	1
Sometimes	7
Occasional	8
Total	16

Table 6-8 – Number of food advertisements by item within 2 km buffer for school B

Meat pies	2
Coke	6
Milk	1
Ice cream	6
Cookies	1
Bread	0
Total	16

Through the interviews, informants expressed concern that the close proximity of food outlets, and the marketing practices of food outlets, would influence the diets of students. Tables 6-6 to 6-8 and Figure 6-6 support the concerns of informants by showing that food outlets are in close proximity to the school, and that advertisements associated with those outlets promote less healthy foods. The food environments within the community were seen as outside of the control of the school, and often counter to nutrition messages being provided inside the school. As stated by one informant:

...you can go to any local dairy, they're close enough to school, they're on their way to school, on their way home, and they are advertising. It's advertising outside the school that would prevent us from promoting [healthy nutrition more].

6.4.7 School policy system map

Figure 6-7 below shows the food environment system for case study school B. The method for developing the system description (policy system map), involved thematic analysis of school data and is explained in section 4.4.3.6. Two control parameters are shown in Figure 6-7, with darker borders. These are *food brought from home* and *healthy kai policy*.

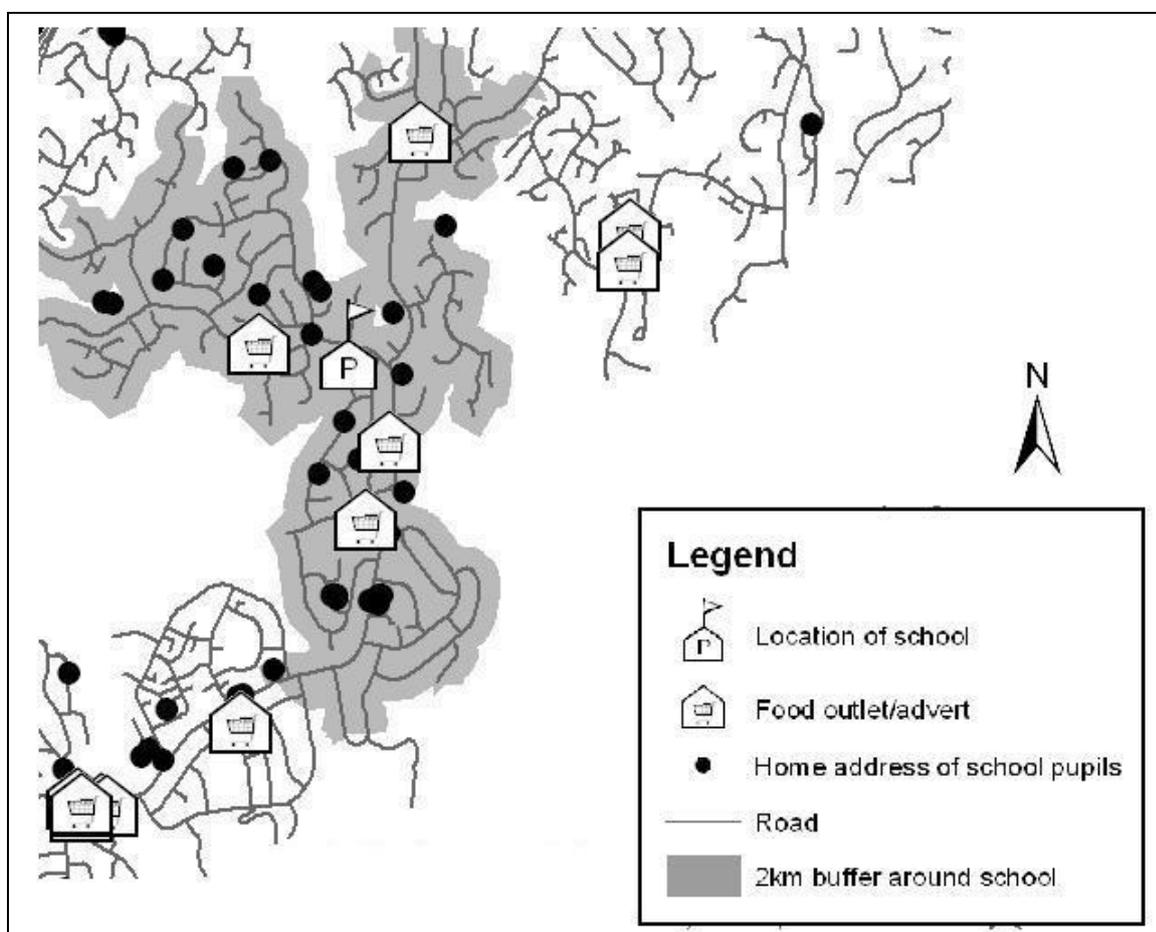


Figure 6-6 – Map of student home address, food outlets and outdoor food advertisements in relation to school B

The *healthy kai policy* is highly linked and is a central focus around which other elements are organised. The *healthy kai policy* also places limits on the food entering the school, through restricting items on the school lunch menu, and placing a ban on several food

items. For this reason it can be seen as operating as a control parameter. The *food brought from home* into the school environment is a control parameter, as a large amount of the food consumed at school comes from the home environment. The food brought from home is influenced by several factors including *price of healthy compared to less healthy food, advertising of foods, community availability/placement of food, and parent's nutrition knowledge*.

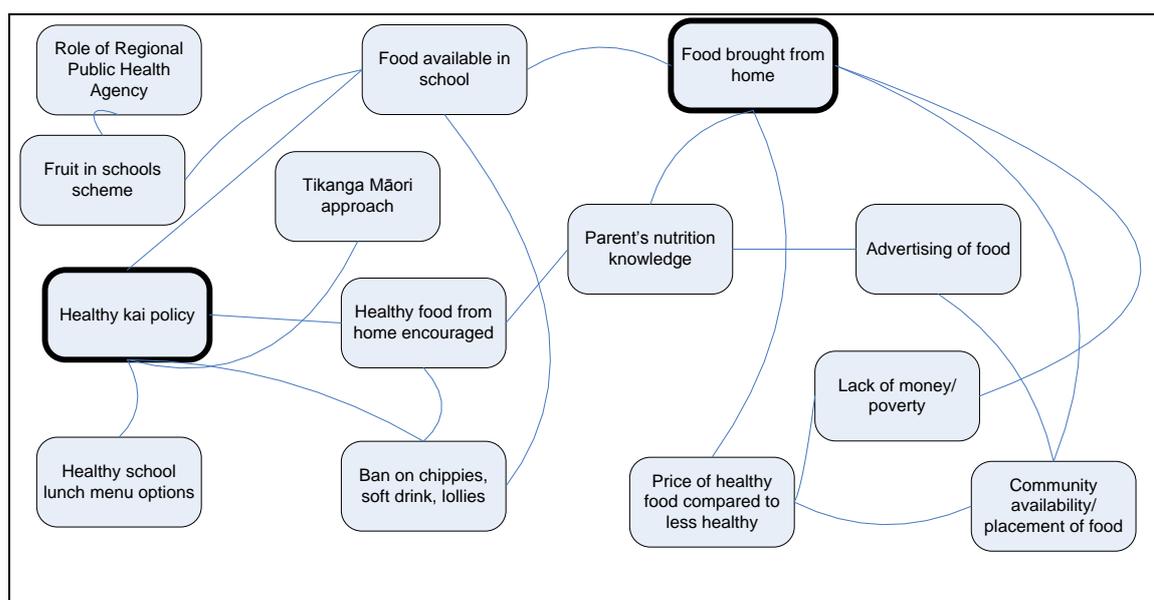


Figure 6-7 – School food environment policy system map for case study school B

6.4.8 Intervention options identified by informants

Informants were asked what they thought the best way to influence children's diets was. In addition to the activities already undertaken by the kura to promote healthy nutrition, informants identified expanding the school garden, with support from tūpuna (grandparents), and planting fruit trees as practical ways of increasing both nutrition knowledge and other skills including tikanga Māori.

From the perspective of government interventions, the price of food was consistently identified as a barrier to healthier diets, and both the removal of GST on healthy foods, or taxes on unhealthy foods were raised. The role of advertising on children's food preferences was cited across informants, and a reduction in advertising of 'occasional'

food suggested by two informants. Two informants were concerned that interventions are appropriately targeted to impact on Māori, suggesting that Māori often miss out from full benefit of policies. No specific examples were provided.

6.5 Case Study C

6.5.1 School description

The third case study school was the biggest case study school, set in a large suburb that, in addition to housing, contains a number of light industrial sites and a shopping precinct. The school is at the low end of medium socioeconomic status. There is a mix of ethnicities amongst the students reported in the June 2006 Education Review Office audit report, with New Zealand European/Pākehā being the largest group (47 percent), followed by Māori (23 percent), and Pacific (15 percent). The school was not involved in any nutrition focussed health promotion activities, but did have regular engagement with a healthy schools advisor from the local public health agency.

6.5.2 Perceptions of children's diets and obesity at the school

The impression from all three interviews was that the vast majority of children regularly eat lunches at school brought from home. All informants considered there to be a range of lunch practices amongst students. While many children have quite healthy lunches, including sandwiches and fruit, there is also a lot of pre-packaged food, and some children who buy lunch quite regularly. There are also a small number of children who may not have enough food for lunch on occasion, or have not had breakfast.

A small breakfast club had started recently to cater for children who missed breakfast, and the school has several items from the lunch menu in stock that can be given to children who did not bring enough food to school. While it was not thought that this happens in large numbers, it was recognized as a need within the school.

Two reasons were given across the three interviews for why the school should provide food through a school lunch menu programme. These were to provide a “service” to parents, and to have something on hand if a child had no lunch. The school lunch programme consists of a variable menu during the week. Effort was made in 2002 to review the menu and to reduce the ‘occasional’ category food choices. One informant described this effort as “[coming] from the staff originally ... to look at what was going

on because we noticed there were a few families that were getting pies everyday ...”. Examples of the changes include fish and chips only being offered once a week and the cookies changed to a brand with less sugar, fat and salt. There was recognition that there were still improvements to be made to the school lunch menu. Two approaches to making changes to the menu were mentioned across the three interviews. The first was by “stealth”, and the second, identified by all informants, was through dialogue with parents. All informants expressed concern that radical or swift changes would draw complaints from parents. For this reason consultation with parents was considered essential in making lunch menu changes.

6.5.3 School food sales

Table 6-9 below shows the school lunch menu items available four or more days per week, and those available only one day a week, placed into ‘everyday’, ‘sometimes’ and ‘occasional’ categories. It shows that there are more ‘everyday’ food items available than ‘sometimes’ and ‘occasional’ available most or every day of the school week. The majority of the items that are available only one or two days a week are ‘occasional’ food items.

Table 6-9 – School lunch menu items by food and beverage classification system for school C

Category	Available 4+ days	Available 1-2 days
Everyday	6	0
Sometimes	5	3
Occasional	2	6

The lunch menu sales reflect this split in menu to a degree. Figure 6-8 below shows food sales by ‘everyday’, ‘sometimes’ and ‘occasional’ categories for all menu items over the 29 days of term one 2008 for which data was collected (2300 items sold, average across students of 9 items). This shows a similar proportion of sales by category as there are items available.

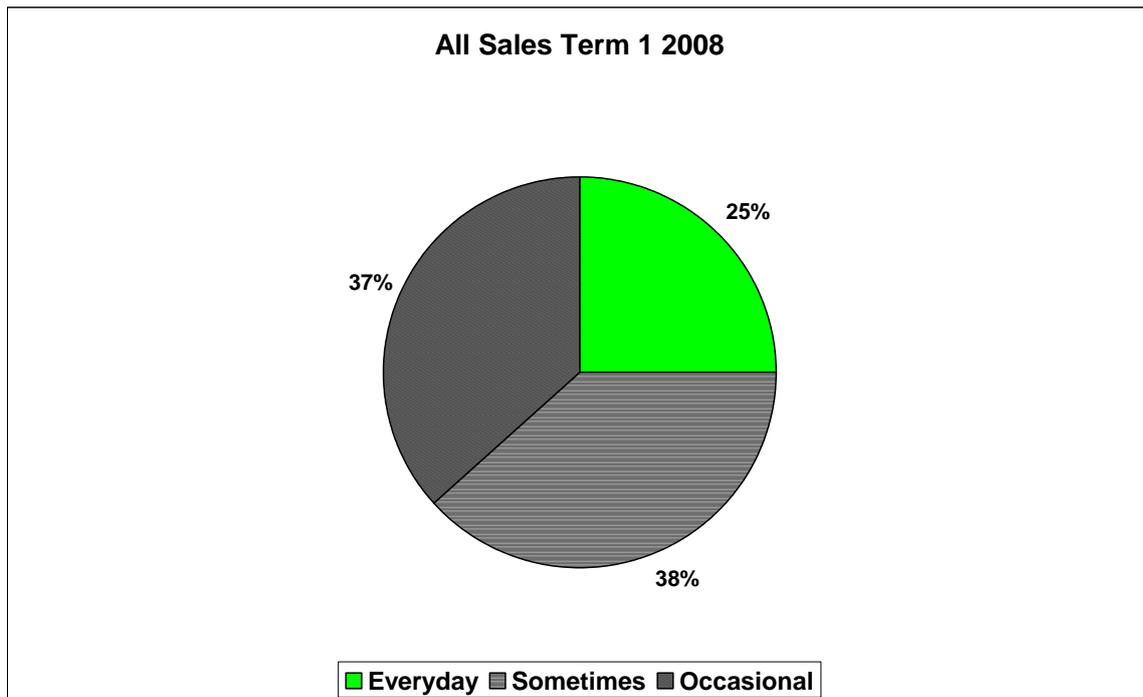


Figure 6-8 – School lunch sales for term one 2008 by food and beverage classification for school C

In contrast, Figure 6-9 below shows the sales of items available four or more days a week for term one by ‘everyday’, ‘sometimes’ and ‘occasional’ categories. The 11 percentage point differences in ‘occasional’ food sales between Figures 6-8 and 6-9, show that ‘occasional’ category foods made up a much larger proportion of sales than their share of the menu. An example of this is the sale of items from a local fish and chip shop, available one day a week, but accounting for 17 percent of total sales. As one informant noted when discussing the lunch menu “...on fish and chip day all the kids are in ...”.

All informants expressed a view that a minority of children regularly purchase their lunches from the school lunch menu. No data was collected to track individuals to quantify this perception. However, an average across term one of nine lunch menu items per student, supports the view of informants that few children regularly purchase their lunch.

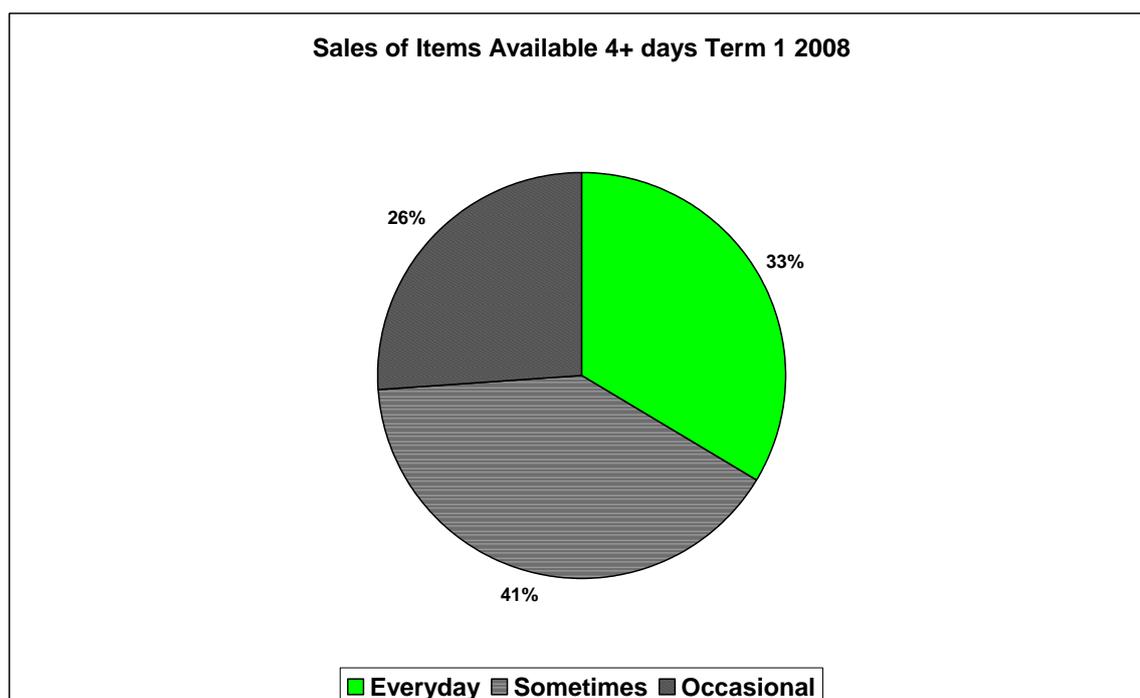


Figure 6-9 – School lunch sales for term one 2008 for items available four or more days a week, by food and beverage classification for school C

6.5.4 Perceptions of causes of diet and obesity

Several perceived causes of children's diet at school were mentioned throughout the three interviews. These included: convenience for parents; nutrition knowledge of parents; preferences of children; and cost of healthy food. Overweight and obesity were not considered to be an issue at the school. Although a few individual overweight children did come to the mind of informants, these were considered isolated examples. One participant suggested that overweight and obesity were not common in the school because children tend to put on weight in adolescence. Overweight and obesity were seen as caused by lack of physical activity, rather than through nutrition, with television watching and video games highlighted by all three informants as contributing to reduced physical activity. Nutrition was viewed as important for children's ability to concentrate and for their behaviour in class.

6.5.5 The school's role in influencing children's nutrition

The informants were pragmatic about the degree of influence they have over the food that children eat, at school or outside of school. As indicated by informants and the volume of food sales within the school, the majority of food eaten by children in the school is brought from home. Informants were asked about the degree to which the

school could influence the food children bring from home. All the informants highlighted the limit of the school in influencing what food gets brought to school. One informant stated they had no desire to be the “food police”. A sentiment echoed by the other informants, who were clearly stated that they did not want to get dictatorial in specifying types of food allowed or not allowed at school. They considered such an approach would not work, nor be accepted by parents.

There was agreement amongst all informants, however, that the school could influence parents and children to some degree, through education on what foods are healthy, providing support and suggestions, and introducing targeted rules such as water only in classrooms. Optimism about what the school could achieve was tempered with consideration of the causes of children’s nutrition – parents’ time, children’s preferences and cost of food. There was also a concern expressed by two of the informants, that if the school stopped selling all ‘occasional’ food, then the children would buy it elsewhere. This again reflected the main barrier perceived by the informants, of the limited influence of the school when considering causation of children’s diets.

Two other barriers to promoting healthy childhood nutrition were also mentioned by two of the three informants: nutrition knowledge of school staff; and the time resource required to change the school food environment. The informants acknowledged that promoting healthy nutrition, including through the food available at school, was something they had to do. However, it was seen as largely an add on to the main job of teaching a class, requiring specialist knowledge.

The issue of fundraising was also seen as a potential barrier to changing the school food environment, but not by all informants. One informant saw selling chocolates as separate from food provided by the school for children to eat at school, and with the event only happening once a year completely consistent with the use of the ‘occasional’ food category. All informants saw the chocolate sales as vital to the school’s operation, bringing in five to six thousand dollars a year for a relatively small amount of work. Two informants could see that pressure to stop the chocolate sales would increase with the focus on promoting healthy nutrition. As one informant noted, the chocolate sales revenue “[is] a tidy little sum. It’s a lot if you spread it over the parents [through school fees rather than fundraising]”.

6.5.6 Interaction with community food environment

Tables 6-10, 6-11 and 6-12 provide details of the food outlets and outdoor food advertisements within a two kilometre buffer zone around the school. There are 16 food outlets and 35 outdoor food advertisements within the buffer zone. Figure 6-10 illustrates how there are food outlets in multiple directions from the school. By analysing the shortest road route to school using the road network from student home addresses, it is estimated that 74.1 percent of students could travel within view of at least one food outlet or advertisements on the route to school. This distribution of food outlets and student home addresses can be seen in Figure 6-10 below.

It is estimated that the average number of food outlets or food advertisements potentially seen by these children is 5.6 per child. Tables 6-11 and 6-12 show that the majority of food advertisements within the buffer are for food products categorised as ‘occasional’ category foods, with Coke being the most commonly advertised.

Table 6-10 – Number of food outlets within 2 km buffer by outlet type for school C

Café/tearooms/lunch bar	0
Local fast food	6
Multinational fast food	3
Service Station	2
Dairy	5
Total	16

Table 6-11 – Number of food adverts within 2 km buffer by food and beverage classification category for school C

Everyday	8
Sometimes	5
Occasional	22
Total	35

Table 6-12 – Number of food advertisements by item within 2 km buffer zone for school C

Meat pies	2
Coke	20
Milk	7
Ice cream	4
Cookies	1
Bread	1
Total	35

For the younger children at the school, the presence of multiple food outlets close to the school was not considered a problem. One participant suggested that it is more of an issue for intermediate and high school pupils, who are more independent and likely to have more money to spend. The proximity of outlets gave weight to the worry that not supplying any ‘occasional’ foods through the school will send the children to the dairy to buy ‘occasional’ foods anyway. As one informant stated when discussing the reaction of parents to removing ‘occasional’ food from the lunch menu:

...some [parents] would be affronted by it. And they would just give the money to the children and they would get in on the way to school.”

6.5.7 School policy system map

Figure 6-11 below shows the food environment system map for case study school C. The method for developing the system description (policy system map), is based around thematic analysis of school data, and is explained in section 4.4.3.6. By identifying highly linked system elements, and considering whether they act to bring external resources into the system, two possible control parameters were identified. These are: *school food rules and policies*; and *parent’s food decisions*.

The *school food rules and policies* in this case study are not formal written rules and policies, but rather informal policies that are influenced by: the role of the school lunch programme; the perceptions of what rules around food parents will find acceptable; the existing school lunch programme; and, a perception of what children will find acceptable. These informal rules act as a site for negative and positive feedback from the related areas within the school food environment system.

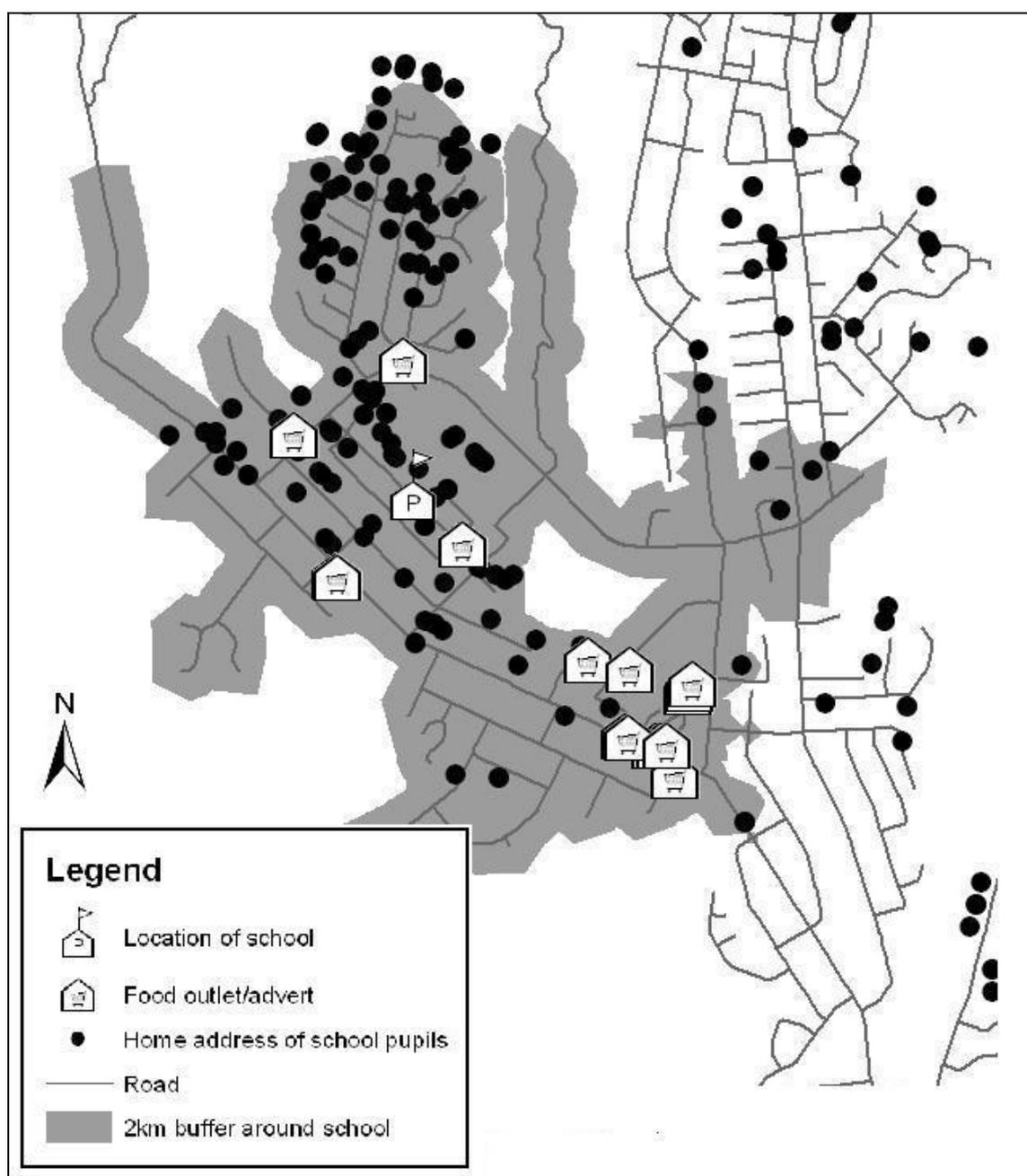


Figure 6-10 – Location of student home addresses, food outlets and outdoor food advertisements in relation to case study school C

Parents' food choices provide a link between factors external to the school, with factors more internal to the school, primarily through parent's influence on rules and policies. There are only two system elements that parent's food choices are not directly linked to. This reflects the finding that all interview informants identified parents and the home environment as occupying a key position in determining children's diets.

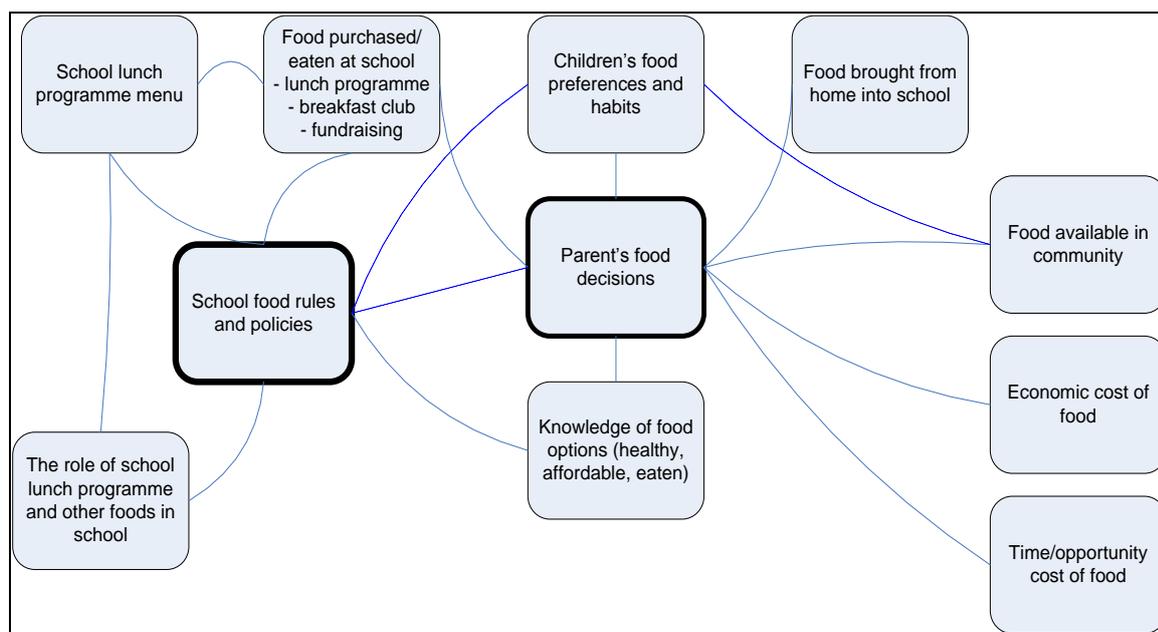


Figure 6-11 – School food environment policy system map for case study school C

6.5.8 Intervention options identified by informants

Informants identified a limited number of interventions within the school to improve nutrition promotion. These centred on greater engagement with parents regarding children's diets at school, with the possible development of a food policy. It was seen that a policy could help send messages to parents around the types of foods that were most appropriate for school. Some attempt had already been made to form a parent/staff group to discuss possible lunch menu changes. The parent/staff group had not yet undertaken any specific project. Engaging with parents, and sending messages regarding food choices, was seen as being in line with a identified key role for the school of being a role model around healthy eating.

Outside of the school, all informants expressed concerns over the price of healthy food, and indicated that making healthy food cheaper than unhealthy food would promote increased purchasing of healthy food. Making milk cheaper than Coke was mentioned as an example. Another idea from one participant was to provide free lunches to all students. This would then increase school or government control over what children ate during the day at school.

6.6 Case Study D

6.6.1 School description

The fourth case study school is a medium sized school set in a medium sized suburban setting that is distinct from surrounding areas due to physical barriers and urban design. The school is of high-medium socioeconomic status. According to the October 2007 Education Review Office report for the school, the majority of children are New Zealand European/Pākehā ethnicity (79 percent), with 15 percent recorded as Māori, two percent Pacific, and four percent other ethnicities. The school was not involved in any nutrition related health promotion programmes at time of data collection.

6.6.2 Perceptions of children's diets and obesity at the school

No informant identified obesity as an issue in the school, but it was acknowledged that some children could be considered overweight. No group of students were identified as being more overweight than others.

There was a general agreement that what children eat can influence their behaviour in class, concentration levels and ultimately their learning. As one informant put it "...what they [children] eat is important in terms of how they learn and how they focus in class". For these reasons the school already has rules around water only in class, and discourages carbonated drinks and confectionary at school. One informant volunteered that fitness had similar effects as nutrition on a child's concentration and learning.

The amount of packaged food brought to school in children's lunchboxes was mentioned in all three interviews, without prompting. Even though in general there was no alarm raised through the interviews that students has 'bad' diets, packaged food was identified as: creating rubbish in the school environment; having possible negative effects on children's concentration and learning; and, perhaps restricting what the school could do to have a healthy school food environment. The school has not carried out any study of what children bring to school, such as a 'lunchbox audit', but was planning to conduct a survey of rubbish later in 2008, which they expected to highlight the amount of packaged food in the school, either brought from home, or purchased through the school lunch programme.

The school has a lunch menu available four days a week. There had been some changes in the menu over recent times. Concern over the health of students was cited as a key motivation for menu changes by the two informants who discussed this. In general, the food made available in the school was not seen as a major driver of children's diets or weight, as it is considered a treat, and not something that individual children have very often. Having said this it was acknowledged that there are a few children who purchase lunch at school regularly.

While there have been changes to the food available on the school lunch programme – mostly selling lower fat pies, removing carbonated drinks, and reducing availability to four days a week – there is also a reality that the programme is a fundraising activity (or at least must break even). Therefore items that appeal to children and sell well must be provided. As one informant noted “it's ... hard when your looking for every bit of funding you can get ... not to sell a pie and make seventy cents out of it”.

A secondary reason cited for the school lunch programme was to provide a service to parents, and an ability to provide children with some food if they had not brought enough to school for any reason. There was also a concern that if the school did not provide food, then the children would just buy food at the dairy across the road before school. The school would then loose out on food sale revenue, with no benefit in terms of children's diets. The motivation to compete with the dairy was captured by one informant in the following statement:

... [the school lunch menu] provides a service [and is] an attempt to keep kids out of the dairy.

6.6.3 School food sales

Sales from the school lunch programme were collated for 22 days of term one in 2008. There was a total of 1236 items sold, which is an average of five items per student. Given that few students are reported to buy lunch regularly, then it supports the view of informants that for most children buying lunch is a treat. Figure 6-12 below shows the number of items available on the school lunch menu by category of the Food and Beverage Classification System for Schools. With more 'occasional' food category items for sale than 'everyday', there is some room for modification of the menu to fit Ministry of Health guidelines.

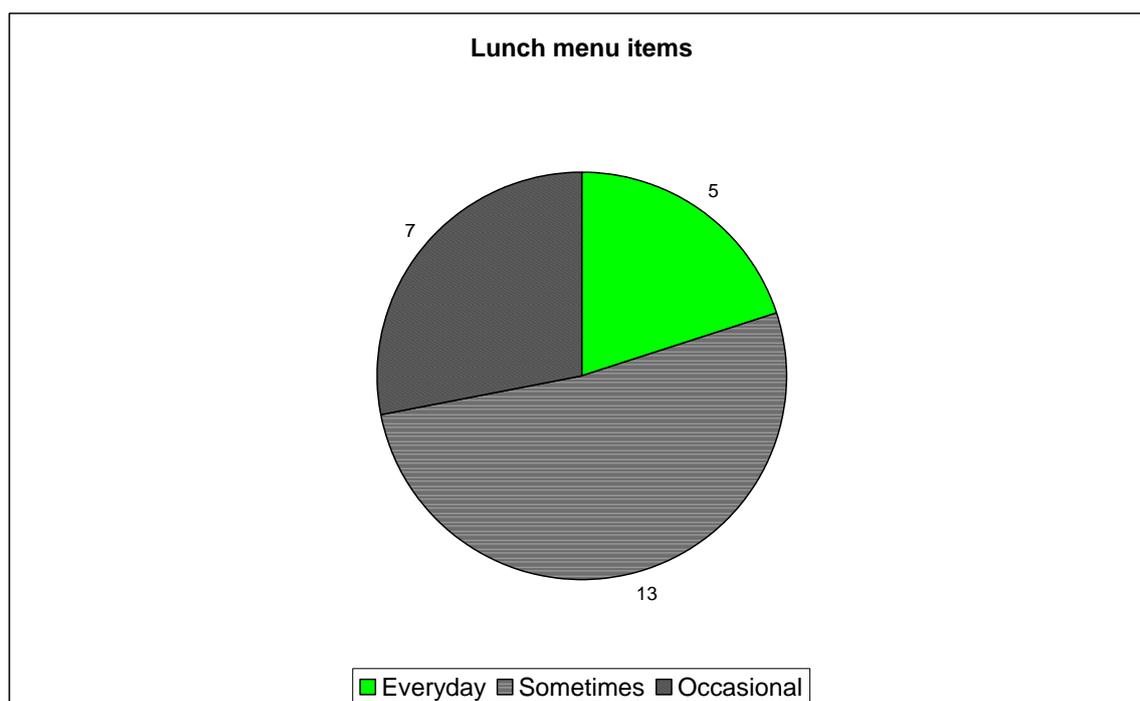


Figure 6-12 – School lunch menu items available by food and beverage classification for school D

Figure 6-13 below shows that sales of the 'occasional' food category items, as a proportion of all sales, are higher than the proportion of 'occasional' food items on the menu. The 'everyday' food items only attract three percent of sales. The five most popular items sold are: mince savouries; mince and cheese pies; chocolate chip biscuits; mince pie; and, sausage rolls. Three of these were classified as 'occasional', and two as 'sometimes' food items.

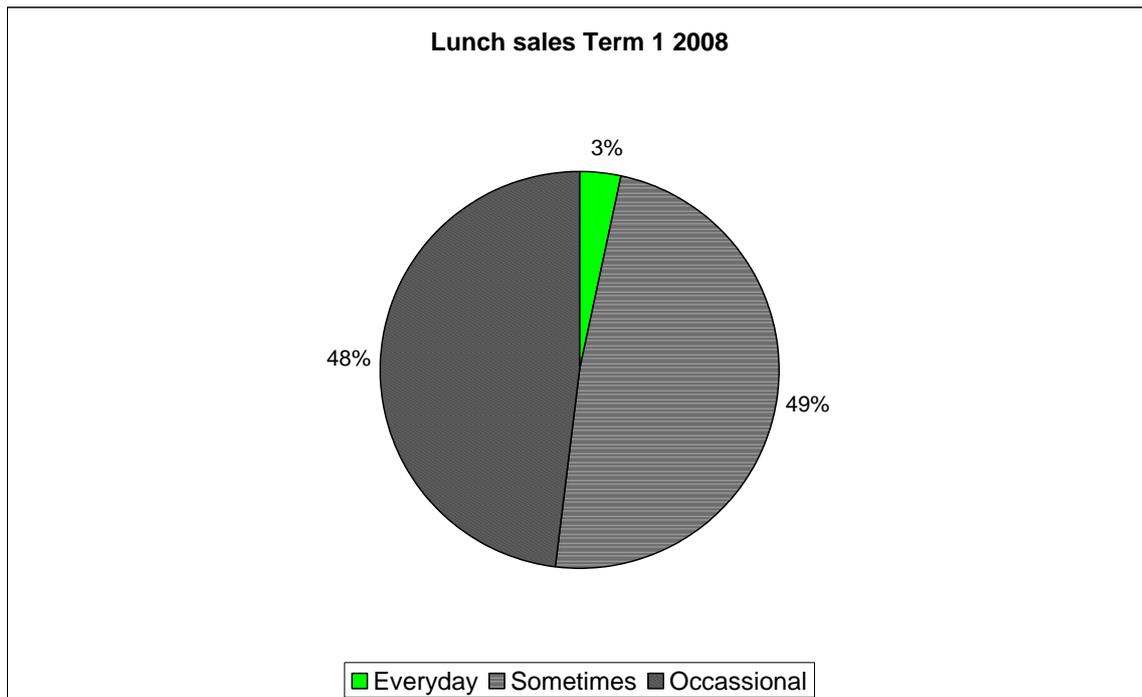


Figure 6-13 – School lunch item sales for term one 2008 by food and beverage classification for school D

6.6.4 Fundraising

It seems that a majority of fundraising activities involve food, including the school lunch programme. Fundraising efforts were described by all informants as required for the purchase of classroom equipment and to meet operating expenses. While the school had not conducted student led chocolate sales for a few years, there were a number of other food sales, from the lunch menu, confectionary and carbonated drinks sold at school discos, and regular sausage sizzles – where a local business donates the sausages. There was a general impression from all informants that this was not ideal when trying to promote healthy nutrition. Only one informant was particularly concerned about this contradictory message to students, and suggested that the school should “...make sure that kids don’t have the option of buying something unhealthy every single day if they want to”.

Fundraising activities were considered necessary for school operations, expressed by one informant in the following way:

... gosh, fund the school correctly and we wouldn’t have to do any of this junk.

6.6.5 Perceptions of causes of diet and obesity

Perhaps one reason why the school lunch menu contains such a number of ‘sometimes’ and ‘occasional’ category foods is the understanding expressed by informants of causes of children’s diets, and of overweight and obesity. Four themes were identified from the interviews regarding what influences children’s diets. These were: the role of parents; packaged foods; the cost of foods; and, children’s preferences. With most food eaten at school coming from home, the influences within the home were seen as important by all informants. As one informant said “... parents choose what goes in their lunch”. Ultimately parents were identified as the decision makers regarding food in the home. Across the interviews, influences on parents’ food choices were identified as: what children want and like to eat; the cost of food; and convenience and appeal of packaged foods.

While there was a recognition that children’s diets may have an impact on children’s ability to learn, in general it was not considered the major factor in children being overweight or obese. Of the three interviews, two focused more on physical activity than nutrition in thinking of the causes of overweight and obesity, although nutrition was still mentioned after physical activity. The third interview, where there was a greater mix of focus on nutrition and physical activity, also introduced a theme of working parents with limited time, leading to a reliance on convenience foods, and using children’s sedentary activities such as watching television or playing video games for entertainment.

6.6.6 The school’s role in influencing children’s nutrition

All informants acknowledged that the school had a role in promoting the health of its students, including through nutrition and physical activity, and this role is what prompted the changes to food available on the school lunch menu, and rules such as water only in class. In general, the opportunities for the school to promote healthy nutrition were considered fairly limited. Because the majority of food was brought into the school by children, there is only limited influence that can be exerted over those choices. While the school can introduce rules such as ‘no chippies’, it was considered that the children would need to drive such an initiative, in order to get parents on board, and to minimize the children’s own action in purchasing chippies at the dairy and bringing them to school.

In a similar vein, while one participant suggested that the school could take steps to stop selling unhealthy food at the tuck shop, other informants thought that this would drive children to buy similar foods at the local dairy, encounter resistance from parents, and potentially reduce the money derived from food sales.

All informants expressed a concern over the potential for promoting healthy nutrition to take time away from other teaching areas. While one participant identified value in engaging parents through events, such as a parent evening where nutrition information and healthy lunch ideas could be provided, it was acknowledged that this is additional work. As another informant put it "... I've got enough to do educating the kids".

One reason why physical activity appeared to dominate descriptions of causes of overweight and obesity, as articulated by one informant, was the perceived control of the school over physical activity compared to nutrition. By and large, physical activity can be entered into during school time without relying on resources brought from home, thereby reducing the reliance on parents' actions and resources.

6.6.7 Interaction with community food environment

Tables 6-13 and 6-14 show that there were only two food outlets in a two kilometre buffer zone around the school, and no outdoor food advertisements. Even though there are only two food outlets, it was estimated that 81.3 percent of students would pass within sight of a food outlet on the way to and from school. The reason for this was the close proximity of the dairy and fish and chip shop, to the school as shown in Figure 6-14.

Of the students who do pass within sight of a food outlet or advertisement, it was estimated they would pass an average of 2.9 food outlets or outdoor food advertisements on the route to school (as outlets and advertisements outside the two kilometre buffer zone are also included in this figure).

Table 6-13 – Number of food outlets within 2 km buffer by outlet type for school D

Café/tearooms/lunchbar	0
Local fast food	1
Multinational fast food	0
Service Station	0
Dairy	1
Total	2

Table 6-14 – Number of food advertisements within 2 km buffer by food and beverage classification category for school D

Everyday	0
Sometimes	0
Occasional	0
Total	0

The close proximity of the dairy was noted by all three informants as an influence, both on what children brought to school, and on the practicalities of restricting the foods available in the school. While it seems that many students are dropped off at school by car, which may limit the ability for those children to choose to go to the dairy, senior students were reported as more likely to walk or bike to school. Senior students were also seen as more likely to go to the dairy. There was a strong perception, in two of the interviews, that if the school further restricted what was available to purchase on the school lunch menu, then children would purchase similar types of food at the dairy anyway.

6.6.8 School policy system map

Figure 6-15 below shows the school food environment system map for case study school D. The system elements were identified through thematic analysis of the interview transcripts, supported by the other school specific data. A full description of methods is provided in section 4.4.3.6. Connections between system elements were also identified from analysis of interview transcripts. From the identified system elements and connections, possible control parameters were identified. Control parameters are highly linked elements, which act to bring external resources into the system.

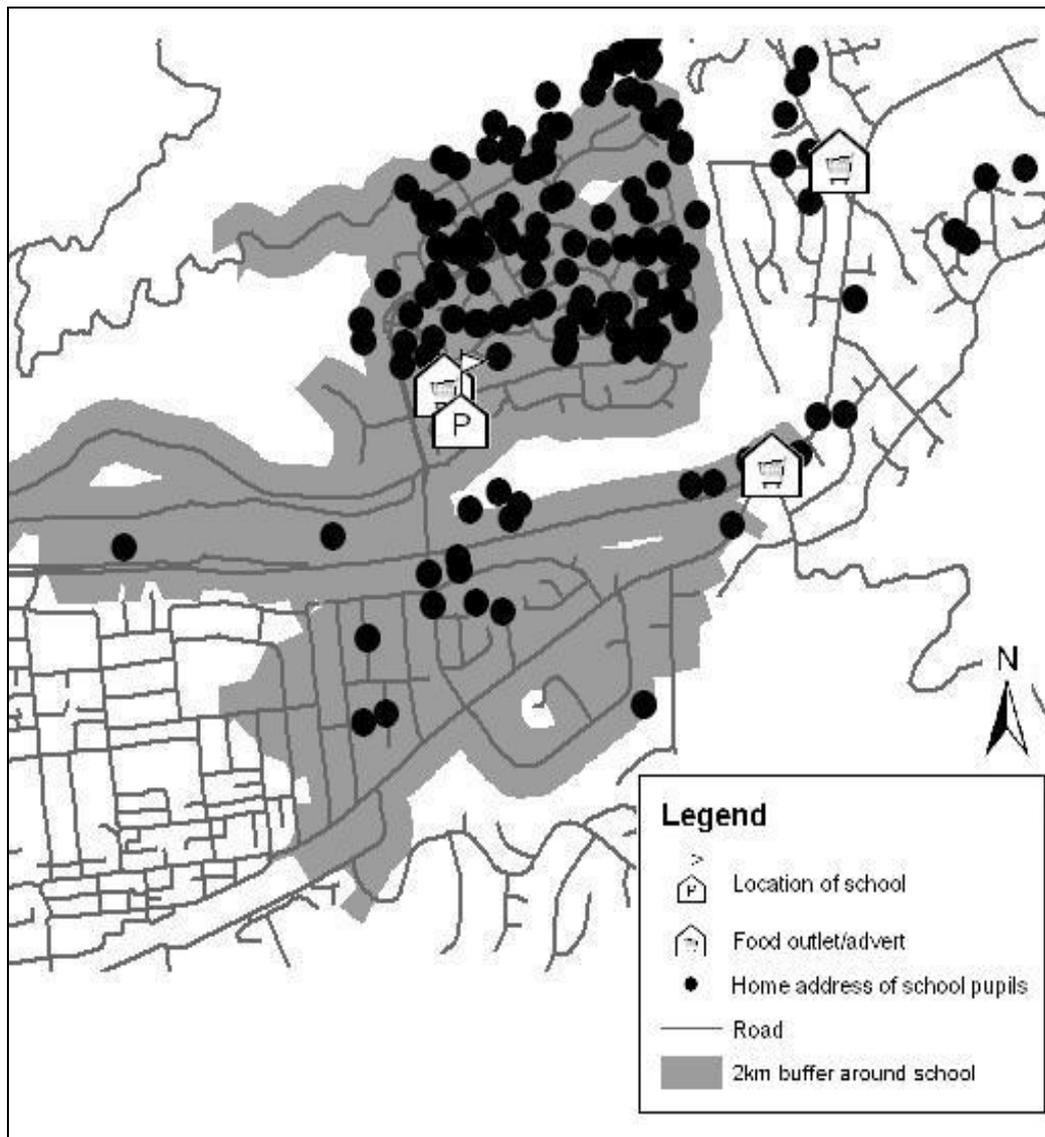


Figure 6-14 - Location of student home address, food outlets and outdoor food advertisements in relation to case study school D

Three possible control parameters are shown in Figure 6-15 with dark borders: the *school lunch programme*; *school fundraising*; and, *children's preferences*. The system element *parents' food decisions* was not been identified as a control parameter. While it meets the first test of being highly connected within the system (five connections, the same number as school lunch programme and children's food preferences), it does not meet the second test of bringing external resources into the system. From all three interviews parents' food decisions were described as being reactive to the system elements it is connected to. In contrast children's food preference was described as actively taking information from other system elements and negotiating action between them. An example could be purchasing 'occasional' food from the dairy, even though it is counter

to the education messages delivered in the classroom. So, while parents' food choices were described as important by informants and likely to change with system wide changes, informants seemed to consider that system wide changes were more likely to occur through focusing on changing children's food preferences and food choices.

It is worth noting that this is a different description of the relative role of children's food preferences and parent's food choices/decisions, compared to some other case study schools. The policy system map of school C for example (see Figure 6-11), identifies parent's food decisions and not children's food preferences and habits, as a control parameter. Informants from school D described the role of children's food preferences in a different way to school C informants, which accounts for the difference in identified control parameters.

School fundraising refers to the real and perceived need for fundraising identified by informants, and the various roles of fundraising activities in the school. For example, fundraising was described as helping to purchase physical activity equipment, and physical activity was identified as important in preventing children gaining excess weight by two informants. In this case, the need for equipment acts as negative feedback through school fundraising on the school lunch programme. That is acting to maintain the requirement for the school lunch programme to make a profit to fund equipment purchases, restricting the range of possible changes to the lunch programme.

The school lunch programme itself seems to operate as a focal point for thinking about the school food environment. There is room for improvement in the school lunch programme menu, according to the Ministry of Health Food and Beverage Classification System. However, perceptions of negative feedback from parent's, children, the community environment, and the requirement for fundraising, appear to limit the options that informants consider available for the school lunch programme. It is possible that focusing on changing the school lunch programme menu could act to inject positive feedback through several elements of the system.

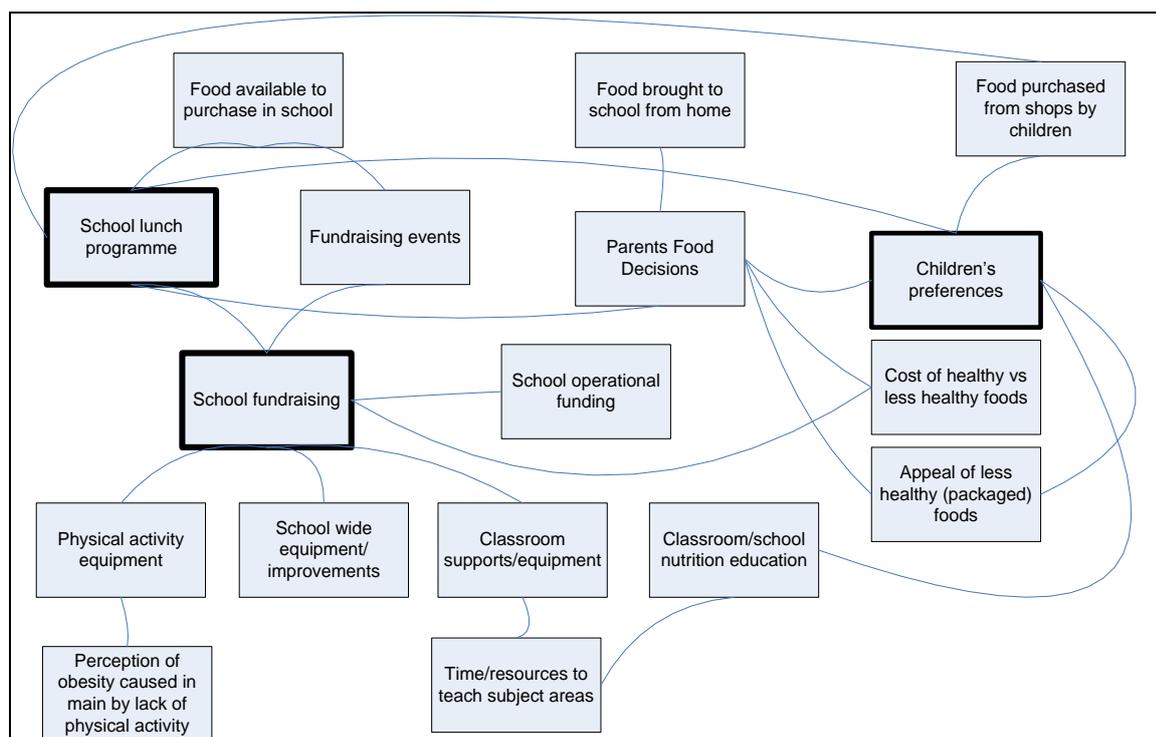


Figure 6-15 – School food environment policy system map for case study school D

6.6.9 Intervention options identified by informants

When asked about possible actions to improve children's diets, a slight difference of opinion regarding the number of actions open to the school, was evident between informants. There was a mix of opinion between informants as to whether most actions open to the school had already been undertaken, such as changes to the school lunch menu, or whether further changes to the menu and funding activities were possible.

Consistent between the informants was the view that increasing the government operations grant would reduce the requirement to fundraise and the pressure to use food in these activities. One participant also suggested that provision of free lunches would increase the control available to the school for determining the foods children ate during the school day.

6.7 Case Study E

6.7.1 School description

The fifth case study is a small semi-rural school, with a high socioeconomic decile rating (low socioeconomic deprivation). The school has little involvement with health

promotion activities related to nutrition and physical activity – which tend to have resources focussed towards lower socioeconomic schools. The majority of students at the school are New Zealand European/Pākehā, with ten percent of students recorded as Māori ethnicity according to the April 2006 Education Review Office report. The environment surrounding the school is semi-rural, with many lifestyle blocks of a few acres in size. There are no food outlets within the school's catchment area. The school was in the process of developing a school food policy, and provided a copy of the draft policy.

6.7.2 Perceptions of children's diets and obesity in the school

When asked about children's diets at school, informants expressed few concerns. All informants considered that the children generally bring healthy food from home, including a lot of fruit. As one participant noted "we very rarely ever see kids without fruit". The only concern was that some children bring too much pre-packaged food from home, such as muesli bars and crackers. There was recognition by all informants that the school is in a relatively privileged socioeconomic position and that, for other schools and children, the cost of healthy food may be a barrier to healthy diets. Like diet, informants expressed no real concern over obesity or overweight in the school. Some individual children were discussed as examples of the few that may be heading towards being overweight, but it was not considered to be a common issue in the school.

6.7.3 School food sales

The school ran a lunch programme one day a week. The menu included pies and savouries, sandwiches and rolls, and cakes and slices, provided by a local bakery. Figure 6-16 below shows the lunch menu items by the Ministry of Health food and beverage classifications of 'everyday', 'sometimes' and 'occasional'. This shows that the menu is dominated by 'sometimes' food items, with five 'everyday' items available. The 'everyday' items consist of filled rolls and sandwiches. The 'sometimes' items include a number of pastry items, sweet buns and slice. No nutritional information was available on the menu item (these were made at a local bakery and not packaged with nutritional information panels), so the items were placed into the healthiest category available for that food type according to the classification system.

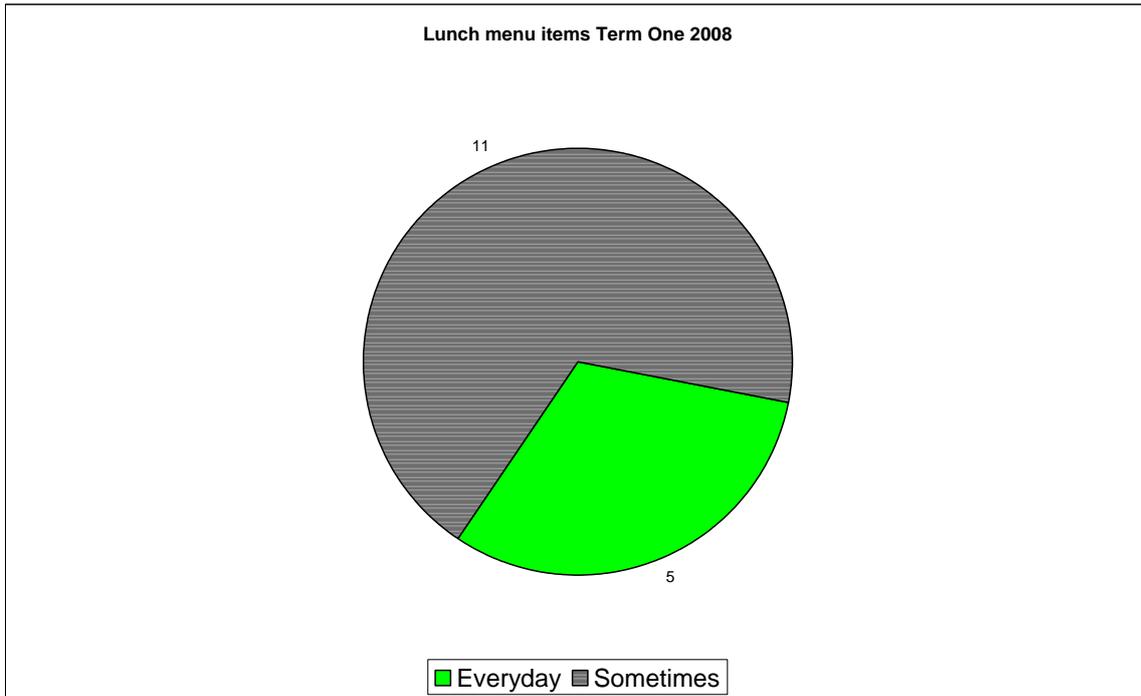


Figure 6-16 - Lunch menu items by food and beverage classifications category for school E

Figure 6-17 shows sales of lunch menu items by food and beverage categories over the first term of 2008. A total of 862 items were sold over the term, at 6.7 items per student averaged across the school roll. Figure 6-7 shows that the ‘sometimes’ items take up a larger proportion of sales than they do the lunch menu items. It should be stressed that the lunch menu is only available one day a week, and the informants did not believe that many students would buy their lunch more than a couple of times a term. Given that more than one item may be purchased at a time, the volume of sales supports the informants’ perceived frequency of purchased lunches.

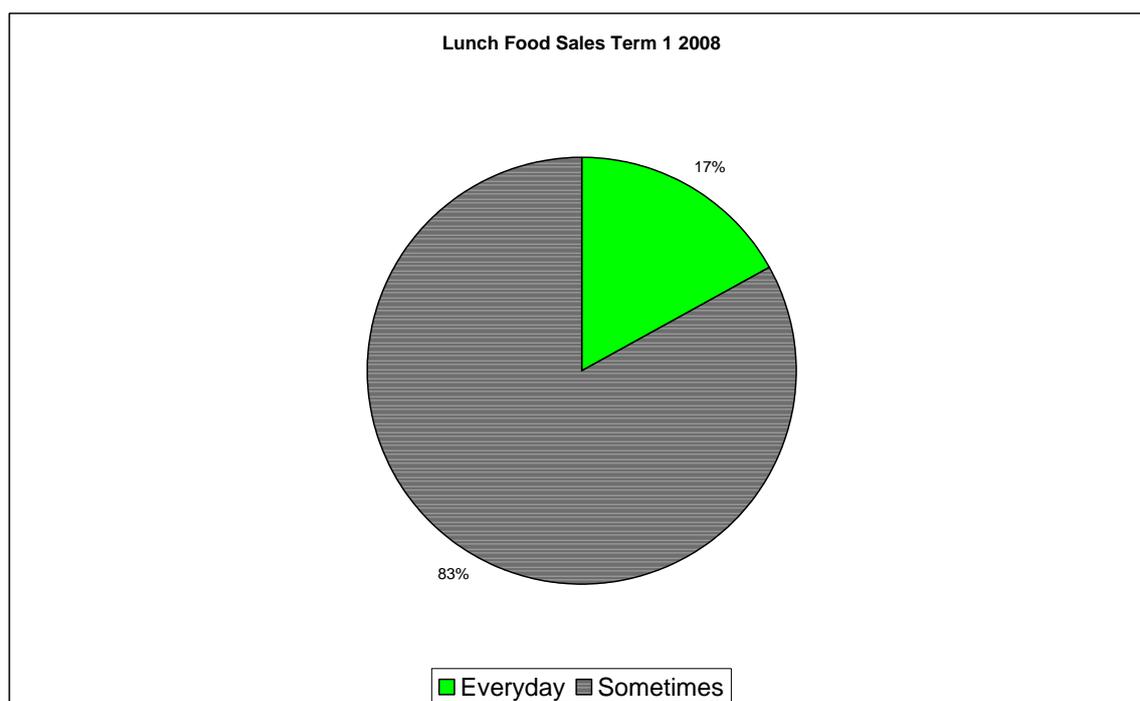


Figure 6-17 – School lunch item sales for term one 2008 by food and beverage classification for school E

6.7.4 Perceptions of causes of diet and obesity

As mentioned above, there was an acknowledgement from informants that, compared to other schools in more deprived socioeconomic areas, cost of food probably has less of an influence on the foods eaten by children. Influences identified as more relevant across the three interviews were: time of food preparation or convenience; and, parents' knowledge of what are healthy and less healthy foods. As one informant noted "I think there are a lot of working families ... and some of those things that are quickly dished out are an easy option". When convenience items were included in lunches, all informants were concerned that parents did not understand the nutritional quality of these foods.

Perhaps because it was thought that the diets of children at the school were on the whole healthy, that discussion around the causes of obesity related mostly to physical activity, indicated by one informant:

They are just so active. You know, and I could probably think of maybe one child who might be slightly [overweight], but you know he runs around a lot ... it's probably just puppy fat.

6.7.5 The school's role in influencing diet

It was clearly identified in the interviews that the school's role in promoting healthy nutrition is largely restricted to educating the children about food, with the aim of influencing children's food decisions. There was a secondary role identified by all informants (but more strongly by two of the three), of restricting the availability of unhealthy or 'occasional' category foods within the school environment. Restricting 'occasional' food was described as a way of reinforcing nutrition education messages, rather than a direct influence on children's diets.

Informants' description of the school's role in children's diets was reflected in the draft food policy, where the role of the school was identified as being to:

- Help young people find accurate and unbiased information about healthy eating.
- Encourage young people to clarify their own ideas about making healthy choices.
- Help young people develop the skills they need to make responsible decisions about healthy eating.
- Help young people understand the factors that influence their food and beverage choices and the possible long-term effects of their choices on their well-being.
- Ensure that only food and beverages that enhance young people's health are sold or served at school.
- Provide an environment that encourages and supports healthy eating.

Two informants had a strong sense that parents would not appreciate any actions by the school to restrict or influence children's diets beyond informing children about food. This view was for the most part supported by parents comments on a health survey conducted in late 2007, which included questions on the provision of food in school and emphasis on healthy eating. Informant views of parents attitudes are encapsulated by an answer provided on the health survey from one parent, "[I] don't feel it is necessarily the school's responsibility to teach this – it should come from home". However, the third informant suggested that there would only be a minority of parents opposed to rules around the food brought from home being instigated, with a majority of parents supportive of any moves to encourage healthier lunches coming from home.

There appeared to be limited opportunity to improve the food environment through changes in food provided in school. Parents manage the school lunch programme, and while other menu options were being explored at the time of data collection, this was due to energy of new parents to the school. The school also had limited facilities to prepare any food on site. With the school lunch programme only available one day a week, and few children buying lunch regularly, the impact of any changes on children's diets is likely to be small.

Besides the school lunch programme, food is offered within the school as part of fundraising events, such as an annual school gala. While these events are not regular, they do involve foods that would usually be in the 'occasional' category. There was a concern that availability of 'occasional' food through fundraising undermined the education messages being delivered around food. Options for fundraising that did not involve food were a concern for the school, as indicated by one informant:

We have to fundraise about \$6000-\$8000 a year to meet our basic budget... we can sell chocolate and make about \$3500. Now to make that on something else is jolly near impossible.

6.7.6 Interaction with community food environment

The school is in a semi-rural location, and there are no food outlets or outdoor advertisements that the children would pass to or from school. All food eaten at school must either be brought from home, or purchased through the school lunch programme.

6.7.7 School Food Environment Policy System Map

Figure 6-18 below shows the food environment policy system map for case study school E. The system elements (and connections between elements) included within Figure 6-18 were identified in a thematic analysis of case study data, as described in section 4.4.3.6. The system elements with darker borders were identified as possible system control parameters. Control parameters are highly linked within the system and introduce resources into the system.

The first identified control parameter was *parents as decision maker regarding children's food*. Through the interviews, parents were identified as key in providing and making decisions about the food children would take to school to eat, and how often and what children may buy from the school lunch programme. The perception of parents reacting

negatively to restrictions on the foods that could be brought to school also influenced the school food policy, which in turn influences the school food environment.

Fundraising activities with occasional foods is also identified as a control parameter. Fundraising is crucial to the schools operating as discussed earlier, and food plays a big part in fundraising, through events such as the school gala, student led chocolate sales, and the school lunch programme. Any changes to fundraising activities, either towards selling more ‘everyday’ and ‘sometimes’ foods, or moving away from food altogether, are unlikely to be sustained if fundraising profits decline.

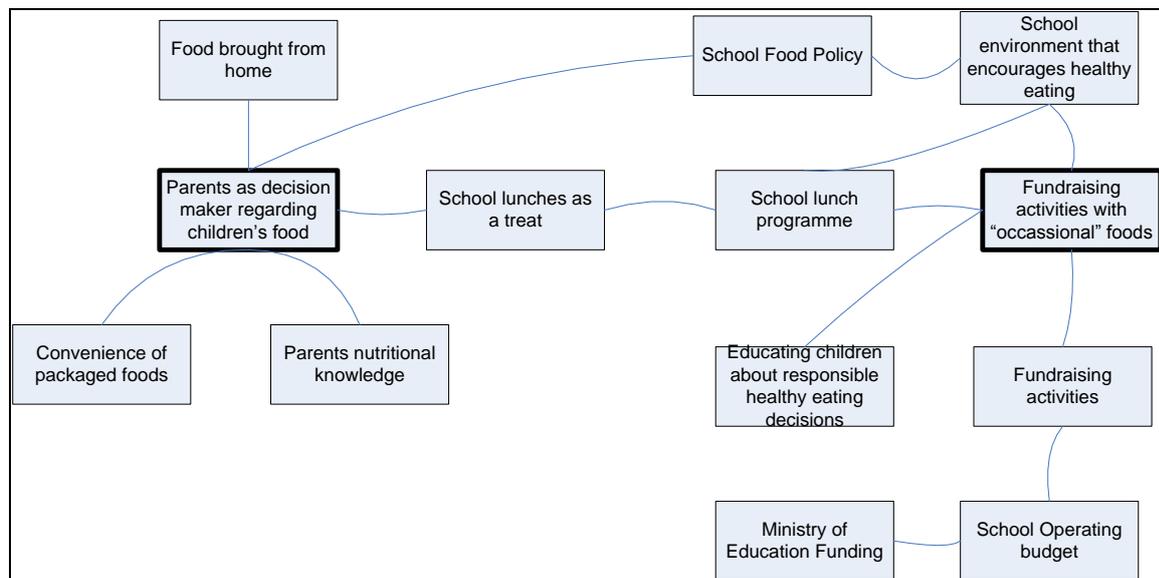


Figure 6-18 - School food environment policy system map for case study school E

6.7.8 Intervention options identified by informants

The discussion regarding interventions to support the school promote healthy childhood nutrition was limited, with the majority of interview time taken up describing the barriers and current practice within the school. That said a number of interventions were discussed. From the school perspective, it was noted by all informants that efforts to reduce the amount of ‘occasional’ food used in fundraising would help provide a consistent message to students about healthy foods. Within the discussion regarding fundraising, was an acknowledgement that an increase in the schools operational budget would likely reduce the pressure to fundraise. Reducing the amount of ‘occasional’ food on the school lunch menu was also identified in all three interviews as a practical step the school would undertake. One informant expressed a desire for greater nutritional

expertise support for the school in developing policy and considering lunch menu changes.

Interventions discussed by all informants, external to the school, focussed around the price of healthy food compared to unhealthy food. As mentioned, this was considered likely to impact more on other schools, but was considered an important area for intervention. Also mentioned in all interviews was reducing children's exposure to advertising of 'occasional' type food, and directing social marketing to parents to help provide healthy lunch ideas, and inform parents about the nutritional contents of commonly consumed packaged food.

6.8 Conclusion

The case studies provide five snapshots on the influences of children's diets within primary schools in New Zealand. There are many strong similarities amongst schools. Some of these are highlighted in section 6.2 where areas of practice common to all case studies are discussed. Other similarities include the perception of informants that schools have limited influence over the majority of food consumed within schools. Instead, parents were commonly identified as a key influence. A number of differences between the case study schools are also evident. The socioeconomic context of the school appears to impact, for example, on the degree to which fundraising is a central concern regarding food for schools in higher socioeconomic communities. Likewise, the role of schools acting as a 'back-up' provider of food for children that do not appear to have enough food for the school day was much more of an issue for schools within lower socioeconomic communities. The case comparison, presented in Chapter 7, examines these issues in more depth.

The policy system maps generated for each school from school specific data, particularly interview data, also show how similar food environment systems between schools have subtle but distinct differences, which should be considered when developing interventions to work within and with primary schools.

The similarities between case studies suggest that the data collection methods were producing consistent types of data between schools. The differences between case studies suggest that the developed food environment system descriptions were sensitive to socioeconomic, geographical and historical context of each school. As discussed in

Chapter 4, this mix of similarity and sensitivity to school context suggests the case studies are internally valid.

The data collected for the case study schools forms the basis for identifying possible intervention options to support primary schools to promote healthy childhood nutrition. The case comparison conducted in Chapter 7 further examines identified intervention options. Policymaker interviews, discussed in Chapter 8, provide a national level perspective on possible policy intervention options. Shortlisted intervention options are considered against international literature in Chapter 9, before a ‘portfolio’ of interventions is proposed in Chapter 10.

Chapter Seven

Case comparison analysis of primary schools and identification of policy options

7.1 Introduction

Understanding the dynamics of primary schools nutrition systems is key to developing effective nutrition promotion policy interventions. It is difficult to anticipate how interventions may act to maintain or alter the school food environment system without understanding: (i) the range of elements included within school food environment systems; (ii) the interaction between elements; and (iii) possible control parameters. The primary school case studies (Chapter 6) illustrated how each school's food environment system is likely to be different. This raises questions of how to design national level policies that take account of local variation. A possible answer to such a question is provided in Chapter 10. First, a more detailed consideration of similarities and differences between the case studies is required.

This chapter provides a comparison between the case study primary schools, of the identified barriers, control parameters, and intervention options to promote healthy childhood nutrition. The aim is to further explore the case study data and identify intervention areas to be discussed within policymaker interviews. Both similarities and differences between case study schools are of interest here. Similarities between case study schools can suggest areas where policy interventions may be effective across these (and possibly other) schools. Differences between case study schools could highlight areas where different policy interventions are required across varying contexts. Special attention is paid to the control parameters identified through school food environment policy system maps, as these form the focus for interventions.

This analysis will show considerable overlap between case study schools in: key informants' views on the role of the school in nutrition promotion; and perception of the key drivers of children's diets and weight gain. Differences between case study schools will also be shown, which can largely be traced to the socioeconomic position of the school. Stresses within both home and school settings may differ across socioeconomic context. Support for policy interventions varied between case study

school principals, as expressed during research feedback meetings. Support was shown for the Fruit in Schools scheme, reducing the need to fundraise, and changing the affordability of healthy food. The government introducing mandatory bans on foods brought to school, subsidising the cost of ‘everyday’ food, and considering child nutrition as a care and protection issue received the least support.

During this chapter schools are referred to as school A through to E, as they are identified in the methods chapter. For ease of reference Table 4-1 from the methods chapter is reproduced here as Table 7-1. Where the results are related to analysis of the school food environment policy system maps, or information related to food sales or food policy documents, the comparison will refer to ‘schools’ as the actors being compared. When the result being discussed relate directly to results from interviews, then the comparison will refer to ‘informants’ as the actors being compared, so as to not suggest that three key informants always accurately represents the school as an entire institution.

7.2 The burden of obesity and diet in case study schools

Case study informants were all asked for their opinion on how much of an issue overweight, obesity and diets were in their school. They were also all asked what they thought the school’s role was in promoting healthier nutrition to students. The format of questions and additional prompts used are shown in Appendix C. As discussed in the methods (Chapter 4), the actual questions used varied between interviews, as the interviews were semi-structured. The answers to these questions were consistent enough between informants within a case study school to develop a school summary statement, as shown in Table 7-2.

Table 7-1 – Characteristics of case study primary schools

School	School socio-economic deprivation *	Number of students	Ethnicity of students	Rural/urban location	Involvement in health promotion programmes
A	1-3	175	Māori 36% Pacific 46% NZ European/Pākehā 13% Other ethnic groups 5%	Suburban	4+
B	1-3	159	Māori 97.5% Pacific 2.5%	Suburban	4+
C	4-6	296	Māori 23% Pacific 11% NZ European/ Pākehā 47% Other 19%	Urban	1-3
D	7-10	246	Māori 15% Pacific 2% NZ European/ Pākehā 79% Other 4%	Suburban	0
E	7-10	129	NZ European/ Pākehā 89% Māori 10% Other 1%	Rural/Semi-rural	0

* School deprivation description based on rating generated by Ministry of Education using population census data (Ministry of Education, 2008). Ranking of 1 represents the 10% of most socioeconomically deprived schools. Ranking of 10 represents the 10% of least socioeconomically deprived schools.

A trend was evident amongst case study school informants, that the perceived burden of overweight and obesity in the school increased moving from higher decile (less socioeconomically deprived) to lower decile (more socioeconomically deprived) schools, as shown in Table 7-2. In general, with the exception of school A, informants did not perceive overweight or obesity to be a major concern at their school.

Regardless of school socioeconomic position, all informants from all schools perceived children's diets as impacting on student behaviour in class and ability to concentrate. This in turn impacts on what most informants described as their school's primary purpose, to educate children. The particular school roles in promoting

healthy nutrition identified by almost all informants were: nutrition education; role modelling; and informing parents about nutrition. The identified actions to achieve this differed slightly between informants from different case studies, with some considering changes to the school food environment, such as water-only policies, as being more important than others.

In summary, there was agreement amongst informants of the importance of diet and nutrition to student learning, yet generally little perceived burden of overweight and obesity. Most participants described the role of primary schools in promoting healthy childhood nutrition in similar ways. An obvious point of difference however, is the inclusion of teaching within a Māori worldview, expressed by school B informants. The interview questions regarding perceptions of overweight, obesity, diets and the role of schools, provide a background against which both barriers experienced by schools, and the supports required to promote healthy childhood nutrition, can be considered.

7.3 Barriers to promoting healthy nutrition

Key informants were asked what they thought the barriers to promoting healthy nutrition amongst students were. Additional prompts included questions on barriers related to school resources, families and the community more generally. In considering the identified barriers to primary schools in promoting healthy childhood nutrition, it became obvious that some perceived barriers were common across schools, while others varied. Table 7-3 shows the identified barriers to promoting healthy nutrition, for the five case study primary schools, broken into themes for ease of comparison. The disadvantage of presenting data in this way is that it minimises any difference between informants within case study schools. While there were no incidents of clearly divergent views between informants within any case study school, to fully understand the summary statements presented in Table 7-3, the relevant results should be consulted in Chapter 6.

Table 7-2 – Case study school, perceptions of overweight and obesity, diets, and the role of schools in promoting healthy nutrition.

School	Overweight & Obesity as an issue	Diet/nutrition as an issue	Role of school in promoting nutrition
School A	Overweight and obesity is an issue.	Diets are not as good as they could be; Diet is linked to behaviour and concentration.	Educate children; Food provided at school should be healthy; Role modelling.
School B	Some children with weight problems, but obesity not a major issue.	Impact on behaviour and ability to concentrate.	Role modelling; Integrate diet with teaching within Māori worldview; Inform and encourage parents and students to make healthy choices.
School C	Not a big problem with obesity.	Many children have good lunches, but also room for improvement; Diet impacts on behaviour and learning.	Healthy food provided in school; Role modelling; Educate children; Influence parents.
School D	Not a major issue, some kids overweight.	Diet impacts on learning and behaviour; A lot of packaged food at school;	Encourage healthy diets through education, rules and role modelling.
School E	No concern over obesity.	Good lunches, although a lot of packaged food; Diet impacts on behaviour and learning.	Educating students about healthy food; Influence children's choices; Restrict unhealthy food in school; Role modelling.

7.3.1 Identified barriers common to all schools

6.3.1.1 School lunch programme

Food sales data from schools shows that ‘sometimes’ and ‘occasional’ food items on school lunch menus tend to account for a high proportion of sales, even when these items had restricted availability (one or two days a week). Where ‘occasional’ food on lunch menus was restricted to certain days (see schools A, B and C in Chapter 6), the motivation for restriction cited by informants was to either: improve the diets of a

small number of children who regularly brought their lunch; or send consistent messages regarding healthy food. In presenting analysis of food sales data back to school principals, most were surprised that the 'occasional' food items still accounted for so many sales. These results should be read in the context that food sales, over the school term that information was collected, ranged from an average of five to twelve items per student. This volume of sales would suggest that most students do not regularly purchase lunch from the school menu.

6.3.1.2 School resources

Interview informants from all schools expressed some concern over their ability to plan and implement changes to the school food environment, due to competing demands on staff and parent time. Informants from all schools described competing initiatives within the school, such as literacy programmes, or capital developments.

6.3.1.3 Food brought from home

A consistent barrier for schools was that the majority of food consumed in the school was brought from home, and that schools have limited influence over this. Informants across all schools expressed concern over the amount of packaged food brought into the school. This concern related both to the impact on children's diets (expressed by informants from all schools), and the amount of rubbish in the school (expressed by informants from three schools). There was a common perception amongst informants who discussed packaged foods (most informants), that packaged foods are likely to be energy dense, and have negative consequences for children's ability to concentrate and behave appropriately in class.

6.3.1.4 Home environment

Informants consistently identified the home environment as a driver of what children eat at school, and in this way, a barrier to improving the school food environment system. Economic resources, time pressures and the marketing of food were identified by informants, across the schools, as drivers of foods available within the home environment. Time pressure in the home environment was consistently suggested as a barrier to healthier type foods being brought into the school. The perceived convenience of packaged foods, or bought lunches, with time pressures in

the home environment, was seen as contributing to their use by several informants. There was quite consistent identification of parents' lack of knowledge of the nutrition requirements for children, and the nutrition content of various foods such as muesli bars, as a barrier to improved practice.

7.3.2 Identified barriers that varied between schools

There were also a number of barriers that varied across schools, as shown in Table 7-3. This variation seemed to be largely related to the degree of socioeconomic deprivation in the area within which the school is located.

6.3.2.1 Home environment and food brought from home

The informants from less deprived schools considered that the home environment was more supportive of healthy childhood nutrition practices, compared to informants from more deprived schools. An example is the amount of fruit that informants described children as eating. Informants from school E reported that it was usual to see children bring at least one piece of fruit a day to school. Informants from schools A and B, both part of the government funded Fruit in Schools scheme, which provides one piece of fruit per school day per student, stated that this programme had dramatically increased the fruit being consumed by children at school.

In schools A, B and C some food was made available for children who did not bring enough food to school for the day, as judged by their teachers. Across these schools this was reported to happen on a regular (school A), through to semi-regular (school C) basis. In these circumstances, the nutritional quality of this food seemed less important than having some food available. School C for example relied on packaged snack foods available on the school menu to provide to children in this circumstance. Schools all had to either purchase this food themselves, or rely on donated food.

6.3.2.2 Fundraising

Informants from less socioeconomically deprived schools discussed fundraising as a requirement to meet operational costs. Most informants saw fundraising as a barrier to promoting healthy nutrition. For example, selling food, such as chocolate, was described as a successful fundraiser, yet several informants suggested it was counter

to healthy eating messages. This was not raised as a significant barrier by informants in the more socioeconomically deprived schools, which receive more operational funding per student from government, and therefore rely less on fundraising.

6.3.2.3 Parents

Parents were identified between informants as having both a positive and negative influence on school food environments systems. The principals of the less socioeconomically deprived schools described how resistance to possible changes in the food environment from parents had hindered changes. Having said this, parents were actively engaged in running the school lunch menu programme, and other aspects of the food environment such as fundraising. The principals of the more socioeconomically deprived schools, on the other hand, reported a lack of engagement by parents, making rule changes easier to implement. School A informants commented that parents of Pacific children tended to view the teachers as the 'experts' and generally accept rule changes. The more deprived schools accessed more resources to support food environment changes from local support agencies (governmental and non-governmental), which perhaps reduced the need to rely on parent's time and support.

6.3.2.4 Community environment

Informants from schools B, C and D expressed some concern over the presence of food outlets in proximity to the school, and associated availability of 'occasional' type food. Almost all the outdoor food advertisements noted in the community food environment survey, were co-located with a food outlet. The GIS analysis of children's route to schools, in relation to food outlets and outdoor food advertisements, is based on visual corridors and therefore assumed to be relevant to all modes of transport.

Most of the children attending school A lived to the north and north-east of the school, while the food outlets and outdoor food advertisements are clustered within a suburban shopping precinct to the east of the school. This accounts for the low (21.2 percent) of students likely to pass at least one food outlet or advertisement on the route to school. Although the shops are a short distance away from the school, for the

majority of pupils, the most direct travel route does not require them to travel past the shopping precinct.

Informants from school A described little impact from the presence of food outlets or food advertisements in the surrounding community on what happens inside the school. Key informants identified the distance of food outlets from the school, and that few children had money to spend on things like junk food, as key reasons why there was little impact on the school. For school E, with no food outlets or outdoor food advertisements within the geographical area that students lived, informants did not consider there to be any impact of food outlets or outdoor food advertisements on food within the school.

In contrast, informants of the other three schools with food outlets within a two kilometre zone around the school did perceive some barriers to school efforts to promote healthy diets due to the close proximity of food outlets. In particular, informants from schools C and D suggested that removing all ‘occasional’ type food items for sale in the school, would result in some children and their parents purchasing these types of food from dairies within easy walking distance of the school gates. Informants from school B (with 87.5 percent of students likely to pass food outlets or advertisements), discussed advertising of foods in the community surrounding the school. Here it was considered that the advertising, availability, and price structure of ‘occasional’ type food in and around local food outlets limited the effectiveness of some of the nutrition promotion activities happening within the school.

Table 7-3 – Identified barriers to promoting healthy childhood nutrition across case study primary schools

School food environment aspect	School A	School B	School C	School D	School E
School lunch programme	'Sometimes' menu items sell relatively more even though availability restricted.	'Sometimes' menu items sell relatively more even though availability restricted.	Restricted 'occasional' food, but take up high proportion of sales; Influence of parent's on lunch menu; Influence of food outlets near school on lunch menu.	More 'occasional' items on menu than 'everyday' 'occasional' menu items sell more; Influence of parent's on lunch menu; Influence of food outlets near school on lunch menu.	More 'sometimes' foods items on lunch menu 'Sometimes' items sell more; Limited on site food preparation facilities Influence of parents on lunch menu.
Fundraising			Requirement to fundraise and 'occasional' food sells effective	Requirement to fundraise and 'occasional' food sells effective	Requirement to fundraise and 'occasional' food sells effective
School resources	Impact on teacher's time of making changes to school food environment; Lack of school resources to educate parents.	Lack of nutrition education resources in Māori language; Limited teacher time to develop resources and initiate changes.	Limited school staff time to plan and implement changes.	Limited teacher time to focus on nutrition and food environment changes; Limited ability to educate parents.	Changes reliant on parent and teacher energy/time.
Food brought from home	Amount of packaged foods brought to school; Limited amount of sandwiches and fruit type foods brought to school; Sometimes not enough food brought to school.		Variable lunch practices Large amount of packaged foods; Sometimes not enough food brought to school.	Amount of packaged foods brought to school.	Good diets, but also high amount of packaged foods.
Parents	Limited nutrition knowledge; Lack of engagement with school.	Limited nutrition knowledge.	Limited nutrition knowledge; Limited lunch ideas; Reaction to sudden rule changes or food bans.	Limited nutrition knowledge; Resistance to school food rules or bans.	Some vocal parent opposition to restricting food availability in school.
Children			Preferences for less healthy foods.	Preferences for packaged foods.	

School food environment aspect	School A	School B	School C	School D	School E
Home environment	Time pressure on parents leads to convenience of packaged foods; Low socioeconomic context – lack of money; Cost of healthy vs. less healthy food.	Cost of healthy vs. less healthy food; Mass media marketing of ‘occasional’ foods to children.	Time pressure on parents leads to convenience of packaged foods; Cost of healthy food vs. less healthy food.	Time pressure on parents leads to convenience of packaged foods; Children’s influence on parent’s food decisions.	Time pressure on parents leads to convenience of packaged foods.
Community Environment		Availability of ‘occasional’ foods; Local marketing of ‘occasional’ foods.	Opportunity to buy ‘occasional’ foods (if not available at school).	Opportunity to buy ‘occasional’ foods (if not available at school).	

6.3.2.5 Supports

Schools A and B highlighted some supports for schools to make changes to the school food environment. School B appeared to have relatively few identified barriers compared to the other case study schools. School B is quite socioeconomically deprived and, as a result, is able to access a number of supports, such as the Fruit in Schools scheme. The school has also had a focus on healthy food for a number of years, and has a well established food policy. School B is a Māori immersion school, and food was described by informants as part of teaching within a Māori culture. This showed in activities such as school garden and communal lunches. There also appeared to be effective engagement with families, utilising wider family structures where appropriate. While this school has developed its school food environment to meet its specific needs of promoting Māori cultural practices (such as focussing on manaakitanga or hospitality), it is possible that some of the approaches used would be useful interventions for other schools, particularly those with a high number of Māori students.

The two schools that had established school food policies (schools A and B), appeared more advanced in control aspects of their school food environment, such as school lunch menus, and rules around what foods should not be brought to school. These schools also had greater support from non-governmental and government agencies to make changes. Food environment changes focussed around making small incremental changes, which built each year. This is the suggested approach of the National Heart Foundation Healthy Heart Award Programme (National Heart Foundation, 2008), which both these schools were engaged in. For example, getting a commitment from staff and parents to make changes was the first step, followed by changes to the food available for purchase at school, with schools then considering fundraising issues and ways to further engage parents.

7.3.3 Summary of barriers and supports

These results show that schools varied in their current practices around food and nutrition. While some barriers were common across all schools, such as the amount of food brought into school from home, others differed across socioeconomic context, such as the use of food in fundraising. Two case study primary schools also demonstrated how external agency nutrition programmes can support food environment changes.

The understanding of similarity and variability in barriers and supports can be applied when designing interventions to support schools in making improvements to their school food environments. Areas of similarity suggest opportunities for more universal interventions, while differences suggest more tailored solutions for particular school decile, ethnic mix, or geographic location. The degree to which interventions are universal or locally specific is discussed to some degree with policymakers in Chapter 8.

7.4 Identified Control Parameters

In developing interventions that will improve school food environments and promote healthy childhood nutrition, it is important to understand the ‘system’ of the school food environment. As described in Chapters 3 and 4, ‘control parameters’ are considered particularly important to understanding how the food environment system may be changed. Control parameters were identified through the school food environment policy system maps, discussed for each case study school in Chapter 6. Control parameters are highly linked within the policy system map, and operate as inputs into the system. Identified control parameters are presented for all case study schools in Table 7-4. These have been categorised as located more within school, home or community environments. While they have been separated into these environments. for ease of comparison, it is acknowledged that these environments overlap, and help form and define each other (Walby, 2007).

Within schools, food policies and rules were identified as a control parameter in two schools (schools B and C). Each school had a number of factors connected to the food policies or rules of a school, and so likely to influence these. Across the two schools these included children’s food preferences, parent’s food decisions, food available within the school, the perceived role of the school lunch programme, and tikanga Māori. Fundraising activities using ‘occasional’ type foods are identified as control parameters for two schools (schools D and E), and across the schools are connected to the school environment, school lunch programme, nutrition education, and fundraising activities in general which is in turn linked with school’s operating budgets, equipment purchases and the cost of ‘everyday’ compared to ‘occasional’ type food.

Within the home environment, parent’s food decisions, which impact on food brought into the school, are identified as a control parameter for three schools (schools A, C and

E). Across the schools this links with: time available within the home; convenience of packaged foods; the non-economic value placed on different types of food; money available; nutrition knowledge; food available in the community; and, school food policies. The food brought from home into the school is identified as a separate control parameter to parent’s food decision making in two schools (schools A and B), with connections to: school food policy; school lunch programme; the school providing ‘back-up’ food provision; the role of nutrition in supporting children’s learning; parent’s food decisions; availability of food in the community; and the advertising of food.

The system map for school D identified children’s food preferences as a control parameter and locates this both within the home and community environments, connected to factors such as the cost of ‘occasional’ compared to ‘everyday’ food, food purchased by children, parent’s food decision making, appeal of ‘occasional’ type food, and the school lunch programme.

For comparison, Table 7-4 also shows the control parameters identified in the literature based school system map from Chapter 5 (Figure 5-1). There is some cross over from the literature with the case study schools, in that school food policies are identified as a control parameter within the school environment. Control parameters identified in the narrative review of literature, but not the case study schools are the: availability of ‘everyday’ type food within schools; household economic resources within the home environment; and availability of food in the community environment.

Table 7-4 - Identified control parameters by environment and case study

Schools	School Environment	Home Environment	Community Environment
School A		Food brought from home Parent’s food decisions	
School B	Healthy kai policy	Food brought from home	
School C	School food rules and policies	Parent’s food decisions	
School D	School lunch options School fundraising	Children’s food preferences	
School E	Fundraising activities with ‘occasional’ foods	Parent’s as decision maker regarding children’s diets	
Literature Review	School food environment policies Availability of ‘everyday’ food in schools	Household economic resources	Availability of food

7.5 Intervention Options

To change a school's food environment system, it is considered that control parameters should be influenced, both directly and through connections. For each case study school a number of intervention options were identified. The process of identifying interventions is described in section 4.4.4. In summary, two sources of information were used to identify intervention to impact on the control parameters operating within a school's food environment system. The first were informants' intervention suggestions, a summary of which is provided for each case study school in Chapter 6. The second source of data was the literature reviewed to develop the literature generated case study, presented in Chapter 5. Logical extensions of intervention ideas based on a school's food environment system and identified barriers were also included. For example, schools D and E described the pressure to fundraise using 'occasional' food to support operational costs. The suggested intervention from informants was to increase the government operating grant. A possible barrier to moving away from fundraising activities using 'occasional' food was the risk of a drop in revenue. A logical extension from an increase in government operations grant that may also address this barrier was a guarantee by government of minimum income while alternative fundraising activities are tried.

The intervention options identified from case study schools, and the literature, are shown in Table 7-5. The interventions are located within school, home and community environments, and by school, local agency/local government, or central government locus of control. This follows the general approach developed by Sacks et al. (2008), where possible policy interventions are classified across two dimensions: the level of governance that is primarily responsible for the policy; and the setting within which the policy action will mostly occur. Sacks et al. (2008) suggest that taking such a systematic approach will help to develop strategic responses to obesogenic environments.

For focussing on schools, three levels of governance have been identified. This first level is the school, through the Board of Trustees. Boards develop policy for their schools and have discretion over many areas of a school's budget. The next level of governance resides in local agencies and local government. District Health Boards are responsible for policy and resource allocation for many health services within their geographical areas, including some health promotion focussed programmes such as health promoting schools. Non-governmental organisations and education support

agencies working at the local level have areas of discretion in how and where services are delivered. At this level another key player is local government, which has discretion over local physical infrastructure and design, through district and strategic planning. The third level of governance is central government, which has control over legislative frameworks and broad budgetary allocations.

A total of 28 unique interventions are shown in Table 7-5. Some interventions are repeated where there is a possible duplication of control between local agencies and central government, such as social marketing of convenient, affordable ‘everyday’ lunch options. The identified intervention options are discussed in more detail below.

7.5.1 School based actions

For schools, the identified actions focus most on: (i) limiting the availability of ‘occasional’ and ‘sometimes’ food, while increasing ‘everyday’ food, on school lunch menus; and (ii), working towards reducing the regularity and quantity of ‘occasional’ foods brought into the school by children. For the case study schools that have successfully done this, it seems that a school food policy helps as a focal point for action. Given the barriers discussed above (section 7.3), higher decile (low socioeconomic deprivation) schools will likely need to engage parents in order for a school food policy to be developed. To help ensure the effectiveness of policies, informants from all schools suggested that engaging parents and caregivers regarding what school food policies practically mean will be crucial. Several informants expressed the view that parents need guidance and suggestions on what food should be brought from home to meet the policy aims.

Other interventions identified by informants, and consistent with increasing ‘everyday’ and reducing ‘occasional’ food in schools, were: school gardens and fruit trees; engaging students to lead food environment changes; and actively promoting alternative foods to replace any banned or discouraged food items.

7.5.2 Local agency based actions

The proposed actions for local agencies (such as District Health Boards and non-governmental organisations), focus on the type of support provided to schools. For the mid to high decile schools, there was little support provided for the development of food

policy or improvement to the school food environment. More advice and sharing of experiences from other schools are likely to help here. Schools A and B may provide some evidence to suggest that development of a school food policy can help to stimulate food environment changes. The structured approach and expert advice offered as part of the National Heart Foundation Healthy Heart Award programme, and the Fruit in Schools scheme, appeared important for these schools. This suggests that local agencies can have an important role in school food policy development.

Engagement of parents regarding the school food environment is currently left to school staff and some active parents. Local agencies could further support schools by providing information directly to parents. In lower decile schools (high socioeconomic deprivation) there was a lot of advice, encouragement, and access to resources. However, the work of policy development, engagement with parents, and meeting the various requirements for accessing resources, all fell to school staff. In these schools, staff from support agencies might be able to actually undertake more of the work in the school, such as working with staff and Boards of Trustees to draft and monitor food policies. Increasing the support currently given to schools is likely to require additional staffing levels for these agencies.

A sub-theme of interventions here is also to provide support tailored to each school. A high decile school, which currently relies on several fundraising activities selling 'occasional' foods, is likely to need help identifying effective alternate fundraising activities. A kura kaupapa will require physical resources in te reo Māori, and advice consistent with tikanga Māori. This suggests that agencies need flexibility in how they deliver support to different schools. District Health Board and central government funding and monitoring mechanisms will need to allow for local agency flexibility.

Other interventions identified with a local agency locus of control include: providing specialist advice to support school based initiatives such as edible gardens; local social marketing activities; and working with well child providers⁹ to educate parents of young children about food preference development. A possible intervention identified at local government level was to limit the availability and advertising of 'occasional' foods near schools using urban planning mechanisms. Several of these local agency and local

⁹ Well-child refers to a range of community based health services for children and parents from birth to primary school. Services include immunisations, hearing and vision tests, and health education activities (Ministry of Health, 2008b)

government level interventions may require legislation, policy development, additional funding, or a mixture of all three from central government. This is why there is repetition with central government interventions listed in Table 7-5.

7.5.3 Central government based actions

The proposed central government interventions focus on increasing the availability and accessibility of ‘everyday’ type food in schools. This is achieved through the direct provision of food in schools, and/or subsidisation of food in schools. For lower decile schools, the popularity of the Fruit in Schools scheme suggested that government funding for this should be retained, and possibly expanded to higher decile schools (perhaps decile 3-5), and additional provision of lunch type foods could be considered.

While Fruit in Schools may also be an effective intervention for higher decile schools (decile 5-10), it is currently unclear if the benefits of the Fruit in Schools scheme may reduce if students already regularly consume fruit at school. Informants from schools D and E suggested that most children already bring at least one piece of fruit to school a day. A risk of targeting a programme based on school decile is missing children who could benefit from the intervention because they are outside the ‘average’ situation of children in the school. As one informant from school D stated, across the school population they had children from homes in a socioeconomic situation more commonly associated with both higher and lower decile schools.

Besides direct provision of food in schools, subsidising ‘everyday’ type foods provided by the school may be effective in increasing availability of ‘everyday’ food. Sales records indicate ‘everyday’ foods do not sell as well as ‘occasional’ and ‘sometimes’ foods. A subsidy could make the economics of reducing availability of ‘sometimes’ and ‘occasional’ foods more agreeable. Lunch programmes operate to break even as a minimum, so reducing availability of ‘occasional’ food could be problematic for a school if income reduces. A subsidy could potentially be appropriate for any school operating a lunch menu.

The other area for central government action is to reduce the reliance of mid to higher decile schools on fundraising by selling ‘occasional’ foods, of which the most regular example was student led chocolate sales. The first means of doing this could be through increasing school operations funding to reduce the need to fundraise. If fundraising is to

continue, then guaranteeing a minimum level of income for schools trialling new forms of fundraising could reduce the hesitation for schools to move away from the proven money raisers. Examples of successful fundraising, not using 'occasional' food, could be systematically shared with schools to help change fundraising practices.

Moving from the school to the home environment, Table 7-5 shows that the majority of identified actions lie within central government control, with some implementation likely to be managed at a local agency level. There are two main areas for central government action to influence the home environment: (i) increasing money available within the home to spend on 'everyday' and 'sometimes' food items; and, (ii) helping educate and change the behaviour of parents in relation to the food being provided for school lunches, and in the development of children's food preferences (well-child services). It is in the education and behaviour change actions that local agencies (such as District Health Boards) are likely to have a supporting and implementation role. The education role, as described here, could include social marketing activities to promote affordable and convenient 'everyday' lunch options.

As the cost of food was commonly identified as a barrier to healthier diets, both increasing household income and reducing non-food household expenses are suggested as possible areas for intervention. This is summarised as increasing the money available within households to spend on food.

Three informants from two case study schools discussed a possible role for child care and protection agencies to consider ongoing poor quality diets as a form of child neglect. Ways of enforcing parental responsibilities to provide adequate diets, through government agencies, could be explored.

The prominent role of parents' food decisions within the case study policy system maps, and the identified barrier of parents' resistance to food environment changes (particularly for school E); suggest a role for bans on food items being brought to school. Such items may include soft drinks, confectionary or potato crisps. Indeed schools A and B both had some bans already in place. If mandated for all schools by government, the parent resistance within the school may be reduced.

Within the community environment, the majority of identified actions are again within central government control. These include: reducing the cost of ‘everyday’ food compared to ‘occasional’ and then ‘sometimes’ food items (e.g. removing GST for certain foods or introducing a ‘fat tax’); providing front of pack nutrition labelling; and, restricting marketing of ‘occasional’ foods to children. These actions are likely to influence both children’s food preferences, and parent’s food purchasing decisions.

It is worth noting that Table 7-5 does not include an intervention that prohibits schools selling ‘occasional’ items on lunch menus, as was required by the NAG 5 between June 2008 and February 2009. At the time of interviews, the NAG 5 requirement was not yet in place. Key informants could not predict the impact it would have on the school food environment system. There was, however, already some evidence of impact, such as school E developing a food policy as part of their plan to meet the new requirement. Table 7-5 does include a within school action to reduce ‘occasional’ food available on lunch menus, with a school locus of control. This school intervention was identified by participants in relation to the NAG 5, and was seen as a positive step schools could take. If the interviews had been conducted after February 2009, when the NAG 5 requirement to sell only healthy food was removed, it may have been identified within a government locus of control to support within school lunch menu improvements.

7.5.4 Summary of identified interventions

This research seeks to identify intervention options to support primary schools to promote healthy childhood nutrition. Taking a complex system view of childhood nutrition, intervention actions lie both inside and outside of primary schools. Inside actions focus on reducing ‘occasional’ foods and increasing ‘everyday’ foods. Development of school policies, reducing fundraising reliance on ‘occasional’ food, school gardens and support from external agencies were identified actions that are likely to support this inside school focus.

Outside of primary schools, actions focussed on reducing the ‘occasional’ food parents provide for children, and increasing the ‘everyday’ food parents provide. Actions to support this may be social marketing and educating parents on children’s food preference development, restricting marketing of ‘occasional’ foods and increasing money available to spend on food. The next section discusses the level of support from case study school

principals for these identified policy options, focussing on those where the locus of control is external to the school.

Table 7-5 - Identified policy interventions by environment and locus of action

Environment	School	Local Agencies/Local Government	Central Government
School	<p>Reducing availability of ‘occasional’ and ‘sometimes’ foods on lunch menu, increasing ‘everyday’ items (E, D, B)#</p> <p>Development of formal food rules/policy (C)</p> <p>Widen scope of food policy to include aspects of school food environment (B, A)</p> <p>Engagement of students in improving food environment (C)</p> <p>Grow ‘everyday’ foods at school (B)</p> <p>Promote alternatives to banned or discouraged food items (A)</p>	<p>Guarantee any short-fall from school trialling new ‘occasional’ food free fundraising (E)</p> <p>Evaluate and share information on ‘occasional’ food free fundraising activities (E)</p> <p>Extending specialist HEHA support to higher decile schools (C, D)</p> <p>Supporting development of formal school food rules/policy (B, LR)</p> <p>Support schools to grow ‘everyday’ foods at school (B)</p> <p>Produce nutrition education resources in te reo Māori, reflecting tikanga Māori (B)</p> <p>Undertake more ‘hands-on’ work within schools (A)</p> <p>Work to engage parents around food choices in relation to school (A)</p>	<p>Provision of free or subsidised food at school (C, B, A, LR*)</p> <p>Mandatory school policies e.g. ban on chippies (E)</p> <p>Increase operating budget to reduce reliance on fundraising (E, D)</p> <p>Guarantee any short-fall from school trialling new ‘occasional’ food free fundraising (E, D)</p> <p>Evaluate and share information on ‘occasional’ food free fundraising activities (E)</p> <p>Subsidy of ‘everyday’ food items in schools (D)</p> <p>Continue to fund ‘Fruit in Schools’ (B)</p> <p>Produce nutrition education resources in te reo Māori, reflecting tikanga Māori (B)</p> <p>Increase funding to support agencies to allow more ‘hands-on’ work in schools (A)</p>
Home		<p>Social marketing – convenient, affordable ‘everyday’ lunch options (E, C, B, A)</p> <p>Extend well-child programme to include child food preference development (C, D)</p>	<p>Social marketing – convenient, affordable ‘everyday’ lunch options (E, C, B, A)</p> <p>Extend well-child programme to include child food preference development (C, D)</p> <p>Increasing household budgets to spend on ‘everyday’ and ‘sometimes’ food items (B, A, LR)</p> <p>Subsidise non-food related household expenses to increase food budget (LR)</p>

Environment	School	Local Agencies/Local Government	Central Government
			Enforcement of parental responsibilities regarding children's diets (A)
Community		Limit availability of 'occasional' food around schools (C, B)	Reducing cost of healthy food compared to less healthy food (C, D, B, A, LR) Restriction on marketing of 'occasional' food to children (D, B) Front of pack nutrition labelling (A)

Case study schools from which intervention identified in brackets

* LR = Literature Review Chapter 5

7.6 Support for intervention options located outside of schools

From the list of 28 interventions identified in Table 7-5, a short listing process was used to identify those interventions to discuss with policymakers. There were three parts to the short listing process: (i) focus on interventions with a locus of control based with local agencies or central government; (ii) only short list those interventions with some level of support from case study primary school principals; and (iii) combine similar interventions. Section 4.4.5.1 details the methods used to short list interventions.

It should be noted interventions not shortlisted may be effective interventions for improving children's diets. However, they are either outside the scope of this research (by being within a school's locus of control and therefore not policy interventions), or have more uncertainty of effectiveness. The uncertainty stems from key actors within the food environment systems studied (school principals), either being opposed to the intervention or not convinced that it will have positive impacts. The interventions that are short listed provide a base from which this study could continue, and therefore there was a luxury in being able to have a simple short listing process. Further research on the excluded interventions, for example care and protection issues related to child nutrition, may still prove useful for future policy development.

All interventions discussed within a local agency locus of control were supported to some degree by the school principals. The exception was the principal of school B, who did not support resources being directed at availability of food around schools, and saw other items such as cigarettes and lighters being sold to students as a more immediate concern.

The most consistent support from schools was for the Fruit in Schools scheme, both to continue funding for those schools already eligible, and to extend the scheme. No clear guidance on how far the scheme should be extended was provided by any school principal. There was also some support for government funded lunch provision. Where and how principals thought this would work was again unclear. Support from lower decile school principals seemed to focus on alleviating food insecurity, whereas support from higher decile school principals was more directed around increasing control over what children ate during the day. A clear message from principals was that a design principle of any school feeding scheme should be that additional resources are required, for implementation rather than relying on existing school staff.

The two school principals who discussed subsidies for selling ‘everyday’ food did not think this would encourage changes to school lunch menus. One principal suggested that administration of such a scheme, from a school perspective, would be prohibitive.

Four of the principals were in agreement that government directed rules banning certain food items from being brought to school was, “crossing a line”, over government direction into within-school policies. No principal expressed an opinion that schools should be less autonomous, although they were not specifically prompted on this issue. Only the principal of school E, which identified parent resistance as a barrier to school food environment system changes, supported mandatory bans. They suggested that a government directed ban would subvert parent resistance, or at least redirect complaints towards the government rather than the school management.

Within discussion of mandatory food bans, the NAG 5 requirement, that schools sell only healthy foods, was considered as a comparison. Principals expressed more support for the NAG 5 type requirement for several reasons. The NAG 5 focus on school lunches was in direct control of school management, and therefore seen as more achievable than directing parents’ actions. Also, decisions on implementing the NAG 5 were to be kept

with the school. Principals suggested this was more likely to achieve compliance, as the approach taken would fit with the situation of the school.

Principals from higher decile schools expressed support for more involvement with external nutrition support agencies, such as Health Promoting Schools teams. The two principals from the highest decile schools were clear, however, that they did not want to access more external support at the expense of lower decile schools. Also, as the principal of school D noted, they did not know what the school was missing out on from support agencies, so could not really comment on whether it would be useful for the school. For those schools that did receive support from agencies, one participant suggested a more direct role for support agency staff in some discrete projects. This would relieve school teaching staff of some of the work. An example was provided by one informant of organising quotes for, and installation of, water fountains. This received tentative support from school principals, with a caveat that there are likely to be a limited number of projects where this is relevant.

There was generally support for interventions around fundraising from school principals where fundraising forms a larger part of school operating revenue. Having said this, the support was lukewarm for a guarantee of fundraising income where schools are trialling alternative methods. The principals of the two highest decile schools were supportive of increased operations funding.

Restricting marketing of 'occasional' foods, changing the price structure of 'everyday' compared to 'occasional' foods, and increasing household budgets to spend on food, all generally had support from school principals where these were discussed. Income and price of food were seen as some of the key drivers of children's diets. The specificity of interventions in this area was low, so the support provided by principals was for interventions in the general area of food price, household budgets and marketing restrictions. Questions to principals did not prompt for support on specific intervention, like a 'fat tax'. An exception to the support expressed for a restriction of food marketing to children was expressed by the principal of school B. While they expressed concern over the influence marketing had on children's diets, they suggested bans or regulatory restrictions were not the way to address the issue.

Table 7-6 - Case-comparison – School support for intervention options

Intervention Option	No Support				Strong Support
Fruit in schools – continue and expand			D	E	B C A
Provide (govt funded) school lunches		A		E	C B
Subsidise ‘everyday’ food on school lunch menus	A	C			
Fundraising – increase school operating budgets to reduce need to fundraise					D E
Fundraising – guarantee profit to support transition away from fundraising using ‘occasional’ foods		B	D	C	E
Fundraising – coordinated sharing of information on successful events across schools		B			C E
Mandatory school rules restricting food items that can be brought into schools	A	C B	D		E
Support agencies working more directly in schools			B	A	C
Increasing household budgets to spend on food		B			E C A
Restrict marketing of ‘occasional’ foods	B				D E
Change price structure of food ‘occasional’ compared to ‘everyday’			D	A	E
Limit availability of ‘occasional’ food around schools		D	A B		C
Social marketing of convenient and affordable ‘everyday’ lunch options			A	D	E
Child nutrition as a care and protection issue	B	A			

Note: If a school is not shown against an intervention, then it was not discussed with that school during the feedback meeting

7.6.1 Summary of principal support for intervention options

The support shown by case study school principals for intervention options largely mirrors the identified barriers. There was general support for options focussed on reducing ‘occasional’ food coming into school from home. For schools where fundraising was identified as a barrier, the principals gave support to most interventions focussed on fundraising. There was strong support for Fruit in Schools, and virtually no support for mandated bans on types of food that could be brought into school from home.

7.7 Summary and Conclusions

This chapter has presented a case comparison analysis across five case study primary schools. The analysis has focussed on: the perceived burden of children’s diets and obesity; the barriers to improving school food environments and promoting healthy nutrition; possible policy interventions; and, the level of support for intervention options as indicated by case study school principals.

In general it can be said that there was considerable similarity between informants in the perceived role of schools in promoting healthy nutrition. They all saw promoting healthy diets for children as an issue to be at least partially addressed by schools. There were also similarities in the identified barriers and intervention options across the case study schools. Where identified barriers and intervention options differed between case study schools, differences appeared to largely relate to the socioeconomic position of the school. In particular how household socioeconomic status may create different stresses on families and students. School operations funding is also tied to school socioeconomic position. Some difference shown by school B, however, may be better explained by the different emphasis and teaching style based around tikanga Māori, compared to other schools. In relation to the community food environment, some geographical and urban design differences, and the impact these had within schools, were apparent.

Three areas related to possible interventions to promote healthy nutrition within schools can be identified for discussion with policy makers in the next phase of research: (i) the role of support agencies; (ii) fundraising in schools; and (iii), food provided in schools. Support agencies, such as Health Promoting School teams at the time of writing, appear more focussed on working with lower decile schools. There were two issues raised by

school informants around support agencies. For those lower decile schools where there was good engagement from agencies, there was a sense that agencies can create pressure on school staff by attempting to run multiple programmes within the school at the same time. Some better coordination between agencies was required, while it was even suggested that staff from agencies could actually do more of the work in schools, rather than advising school staff. For higher decile schools, there was a sense that they were trying to make changes with very little expert support, and some more advice from support agencies could be useful.

Informants from mid to higher decile schools (decile 4 upwards) increasingly saw fundraising as being vital to the running of the school. Much of the fundraising carried out was based around selling food, much of it unhealthy food, of the sort that the NAG 5 was attempting to remove from sale within schools. Possible types of interventions discussed ranged from a more coordinated sharing of information between schools on successful non-food based events, to guaranteeing a minimum level of income for schools trialling new alternative events, to increasing schools operating budgets to lessen the need to fundraise.

There was some support from school principals for the provision of food in schools, funded by government. This ranged from an ongoing commitment to the current Fruit in Schools scheme, increasing the range of schools that receive Fruit in Schools (currently decile 1 and 2), to providing free lunches in schools.

The interaction between school, home and community can be summarised through three further areas, also to be investigated in the next phase of research with policymakers: (i) influencing food brought to school; (ii) influencing home environments; and (iii) influencing community environments. At the time of data collection the NAG 5 required schools to sell only healthy foods at school. Several schools described how little of food eaten by students is purchased or provided by the school. Most food children eat at school comes from home. Informants from some schools suggested that they have trouble influencing the food parents provide for children, and that attempts to limit types of food brought to school have meet resistance. Policy options discussed here ranged from social marketing campaigns focussed on school lunches, to support agencies such as Health Promoting School teams within District Health Boards to try and work directly

with parents, to mandatory bans on certain food items from being brought to school, such as chippies and soft drinks, imposed by government.

The lack of influence schools have on children's diets within the home was commonly expressed. In discussion with school informants several drivers of children's diets in homes were identified, from the school's perspective. These included parents' knowledge around nutrition, time pressures within home and the convenience of packaged foods, the cost of healthy food compared to some unhealthy foods, and for low income families, the cost of food compared to other living costs. In a similar vein, school informants commonly cited barriers to healthy diets in the community, such as the pricing of healthy food, marketing of unhealthy food to children, and accessibility of unhealthy food in the community.

The next phase of this research involved investigating the views of policymakers around childhood nutrition, obesity and primary schools. The aim was to identify intervention areas where support reinforced or differed from that of school principals. To do this policy informants were verbally presented with a summary of the case comparison analysis as discussed above, and detailed in Appendix D. The results of policy maker interviews are considered in the next chapter.

Chapter Eight

Policymaker interview results

8.1 Introduction

Any new policy intervention requires the endorsement of the relevant policy decision makers. While elected politicians make the high level decisions regarding policy direction and allocation of funding, policy actors within both government and non-governmental organisations also shape policy through advocacy and implementation decisions. In this thesis it is assumed that, to be most effective in supporting primary schools to promote healthy nutrition, policy interventions need to meet a number of criteria. Criteria include addressing local community needs and being acceptable to actors within the community. The interventions must also be acceptable to policymakers, or else they are unlikely to ever have resources allocated to them.

This chapter presents results from interviews with 16 policymakers, designed to test policy support for the intervention options identified from the primary school case studies (see Chapter 7). The results of this chapter are used to further refine the list of interventions for inclusion in a ‘portfolio’ of interventions to impact across the school food environment system (see Chapter 9).

The policymaker interviews were carried out between October 2008 and February 2009, with 16 informants from a range of organisations considered to be part of the ‘policy community’ around children’s nutrition in primary schools. Informants were recruited to provide a range of opinions from both an education and health perspective, from inside and outside central government. The recruited informants included: elected Members of Parliament; government ministry officials; and members of health, education and food industry focussed NGOs. Emphasis was on recruiting informants with a national level view, rather than a community focus. However, two informants of a District Health Board were included as this is a key delivery mechanism for support to schools. Attempts were also made to include Māori and Pacific informants. Informants were asked for personal opinions, rather than organisational positions, as a way of ensuring informants did not breach government code of conduct guidelines. However, it is expected there will be some overlap between organisational and personal opinion.

As discussed in Chapter 4, while most informants worked for organisations that could be labelled as more health or education focussed, in fact many informants described an awareness of both sectors. Any identified difference between health and education views are highlighted within the discussion below.

Further discussion of the selection, recruitment and methods for policymaker interviews can be found in Chapter 4. One point to note when reading the results below is that no member of the government elected in November 2008 was successfully recruited. This means that no view from a member of the current government is presented. If the areas of intervention supported by the current government are different from the support expressed here, then it could change the dynamic of the recommendations discussed in Chapter 10. However, an attempt to anticipate areas of support from the current government is included in the discussion.

Interviews were guided by a semi-structured interview schedule (Appendix D). The first part of the interview gathered policy informant views on: drivers of children's diets, overweight and obesity; the role of primary schools in promoting healthy nutrition; and how much of a problem children's diets, overweight and obesity are in New Zealand. The second part of the interview described the case study school results and asked informants a range of questions regarding: the role of support agencies; fundraising in schools; food in schools; influencing food brought into schools; influencing home environments to support schools; and influencing community environments to support schools.

To provide a context for the results and analysis, this chapter will briefly outline some of the background assumptions of policy informants regarding childhood nutrition, obesity, the role of primary schools in promoting nutrition. Following this, an indication of the range of policy informant support for interventions within school, home and community settings will be provided. By comparing policy informants' responses with analysis of case study primary schools, 11 intervention areas are identified for further analysis and discussion. The 11 interventions form an intervention 'portfolio', discussed in Chapter 9. At times informants are identified as being from an education focussed organisation or background. These education informants are still policy informants and separate from school informants interviewed during the primary school case studies.

The analysis of policy informant interviews seeks to provide a depth of understanding, by considering support for interventions, against expressed values and assumptions regarding drivers of diet and weight gain. This research also seeks to identify areas of convergence and divergence between diverse policy actors, in order to inform further policy development. For this reason consideration is given to how many informants held a similar view. In the results below descriptive words are used to describe the breadth of views held, such as a ‘couple’, ‘few’, ‘several’ or ‘most’ informants. This should not be read as a quantitative assessment of support for an intervention area (such as a percentage of informants). Rather it is a qualitative indication of convergence or divergence across actors.

8.2 Background Assumptions of Policy Informants

Each policy informant was asked a number of background questions regarding child nutrition, obesity and the role of primary schools in promoting healthy nutrition. This provided the context for discussion of policy intervention options in section 8.2 onwards, and helped to identify differences between informants in analysis of agreement with intervention areas.

8.2.1 Childhood obesity as an issue in New Zealand

Most informants rated childhood obesity as a significant issue to be addressed in New Zealand. It was seen to impact on overall child wellbeing, education and long term health outcomes. There were also some differences noted. For example, some informants suggested that childhood obesity is probably a higher priority from a public health perspective than an education perspective. This is even though adequate nutrition was seen as important for children’s ability to concentrate and learning outcomes. A few informants noted that whilst important from a public health perspective, they considered that children and families were less likely to view obesity as important. One informant described their understanding of the family perspective in the following way:

There are much more important things in families, whether it’s to do with family dynamics or reconstituted families and stresses around ... money ... (10).

8.2.2 Drivers of Childhood Nutrition and Obesity

Informants were asked to explain what they thought the key drivers or causes of children's diets were. Many informants identified multiple drivers of children's diets, for example:

... we have created an environment where unhealthy food is more heavily promoted, more accessible and for the most part cheaper than healthy food (16).

A few participants, mostly from a health perspective, explicitly identified multiple drivers as an 'obesogenic' environment. Where informants discussed the role of individual choices in diets, most also acknowledged the influence of environmental drivers on individuals. This can be seen as consistent with a public health socio-ecological model, and may reflect the relatively large number of informants with experience in health focussed agencies.

Most informants described nutrition drivers of obesity more than physical activity drivers. This may reflect the initial question focussed on diets. Nutrition was also clearly stated as a focus of the research in the information sheets provided to informants. When physical activity was mentioned it was more likely to be tacked on rather than explored in depth, as one informant added "it's very easy to not move in this society" (15). A couple of informants suggested that physical activity is a more important driver of obesity than nutrition, but this was not the norm. Even with these cases, nutrition was still seen as an influential driver of obesity.

Two informants discussed the role of research evidence about drivers of diet and obesity. One informant sounded caution that the evidence is not conclusive about causes, while the other suggested that there is enough evidence for action. Quotes from both informants are provided below to illustrate this point:

I don't think we have a full understanding of the causal pathway exactly. We're making a lot of assumptions without concrete evidence of the causal relationship (14).

... we do have evidence for example that food marketing to children influences the types of foods that are purchased and consumed. But we're not prepared to act on it (7).

Both informants gave the impression of having a good grasp of research literature concerning drivers of children's diet. As one informant was from within a government

ministry, and the other a nutrition focused NGO, these views may represent differing imperatives for action related to organisational accountabilities (elected officials and public money on one hand, and public health focussed interest groups on the other).

8.2.2.1 *Home environment drivers of children's nutrition*

Informants identified multiple contributors to children's diets within what can be broadly considered the home environment. Several informants identified elements of parents' knowledge around nutrition, and the value parents place on healthy eating. A number of informants identified a lack of cooking skills, and knowledge of preparing healthy meals, as a barrier to children eating healthy diets.

There was also some discussion about the perception of what healthy eating is, particularly amongst Pacific families. Informants suggested that there was both a knowledge gap around foods in New Zealand, and a difference in perception of health. As described by a Pacific informant:

What's healthy for them [Pacific informants in a research project] was ... if there was food then you eat it ... the indicator was basically that you live and breath, not that you were gaining weight or anything like that (13).

Besides knowledge, informants identified other factors that lead to the decisions parents make around food for their children. Time pressures were commonly referred to, with a suggestion that people turn to processed foods when short of time, because of "...the convenience factor ..." (4). One of the reasons for time pressures most commonly discussed was parents' working hours and patterns.

Most informants described money available to spend on food and the price of food as drivers of the foods purchased and available in households. As an example, four informants noted that soft drink is cheaper than milk or water to purchase. There were two minor dissenting voices to this theme. While both dissenters acknowledged price as a factor in diets, they suggested that it was possible to eat a healthy diet on a limited budget.

Several informants highlighted the influence of poverty and food insecurity on diets within a household. Amongst these informants, addressing food insecurity was seen as

necessary for impacting on children's diet and weight outcomes. As one informant stated "I would think that if we grappled [with] food security, we would reduce obesity ..." (7).

8.2.2.2 *Community environment drivers of children's nutrition*

The commercial pressures from "the omniscient advertising that is all around us in society" (16), and easy availability of food for children, were two aspects of the community environment identified by several informants as impacting on children's diets. Marketing of food products was seen as related both to children wanting certain food products, but also normalising the types of food advertised. Food outlets surrounding schools were identified as a contributor to children's diets by several informants, of whom most had worked directly with schools. It should be noted that more informants acknowledged the availability of energy-dense foods generally as a contributor, without identifying food outlets surrounding schools as a particular problem.

8.2.2.3 *Children's environment drivers of children's nutrition*

As discussed in Chapter 5, a different perspective on the child nutrition system can be had by taking a child centred view, compared to a home, school or community environment view. Two drivers of children's diets were identified by several informants that relate directly to children: the influence of peers; and, children's food choices. As an informant noted "there is a huge stigma out there in terms of [the] different foods you eat ... we don't even realise that kids feel those pressures" (15). As well as peer influences, informants listed food marketing as another pressure on the diet choices of children.

8.2.3 **The role of schools in influencing children's diets**

Informants were asked what they thought the role of primary schools should be in promoting healthy nutrition. There was almost unanimous positive response that schools have some role to play in children's diets and promoting healthy nutrition. As one informant put it:

[School is] one of the key areas in the world where we have almost universal contact with children ...they spend a significant proportion of their life at school, and its really influential in a whole lot of ways (1).

Several informants, however, qualified this by stating that the role of school is limited in some way. In particular, the opinion was expressed by informants from both health and education organisations, that the primary responsibility of schools is to educate children.

There seemed to be varied opinions on the types of activities within schools that were consistent with educating children, from environmental changes such as restricting the types of food available in school, to focussing on nutrition education in the classroom.

Most informants identified multiple roles for schools in promoting healthy nutrition. As one informant summed up:

[School is] the place that helps form their attitudes and values, it's the place that models behaviour, and it's the place that can be a gate keeper around access ... to the foods that we're concerned with (10).

Policy informants also discussed a number of specific roles for primary schools in more detail. Several informants identified schools as having a role in sending children and their family “powerful” (3) and “consistent” (5) messages regarding healthy nutrition, and role modelling desired behaviours. A number of informants also identified a role for primary schools in shaping “children’s norms” (9) and habits around food. It is possible that shaping children’s norms regarding food and sending healthy eating messages are different descriptions of similar activities.

Most informants identified a role of schools in influencing parents around healthy nutrition. Again, some informants raised a caution over expecting schools to have a large influence on parents. As described by one informant:

... if parents are adamant that they want to provide their kids with fish and chips every day, they will do it. Whether they meet them at the school gate or throw it over the fence ... (12).

The role of schools providing a supportive environment was discussed by a few informants. A supportive environment in this context appears to be one where unhealthy food options are limited and healthy food options are available.

8.2.4 Settings other than schools where action to promote healthy nutrition should take place

Informants were asked to identify areas, other than schools, where they thought action to promote healthy nutrition for children needed to take place. The most commonly identified setting was local government. This seemed to primarily relate to the number and location of food outlets, specifically fast food and dairies. The possible role for local government was identified by one informant as focussing “... particularly [on] the

location of take-away places in the immediate vicinity of schools and ... also the physical activity side of it (1).

Community action was also identified by several informants. There were few concrete examples given of what community action activities were. However, marae and church based nutrition promotion programmes were mentioned. When questioned further, a couple of informants suggested that the specific actions would likely vary according to the need of each community.

Two other settings were identified, each by one informant. They were primary care providers and well-child providers, which can both be labelled as parts of the primary care sector. A similar advantage of action within the primary care sector was described by both informants, of utilising existing networks of health care providers to deliver nutrition focussed messages and services. The informant who discussed well-child providers stressed their perception of early childhood as important for establishing nutrition habits and foundation for nutrition outcomes in later life.

8.3 Interventions within schools

Policy informants were asked direct questions regarding a number of areas for intervention that were identified from the case study schools (as described in Chapter 7). During the course of the interviews, policy informants also identified a small number of interventions not identified through the case study analysis.

8.3.1 National Administration Guideline

As discussed in Chapter 1, the NAG 5 came into effect in June 2008. This required all state funded schools to 'promote healthy food and nutrition for all students; and where food and beverages are sold on school premises, make only healthy options available' (Education Review Office, 2008). The NAG 5 requirement was removed by the new Minister of Education in February 2009. Fourteen of the 16 policy informant interviews had taken place before the NAG 5 removal. As a result, informants were not questioned specifically about their support for a requirement on schools to only sell healthy food options. However, a number of spontaneous comments arose regarding the NAG 5 that provides some indication of support for such a policy.

All informants (11 out of 16), that referred to the NAG 5 directly, or to restrictions in the food available within schools, indicated support for such restrictions. A few informants expressed the view of the NAG 5 being the most significant action to improve children's diets to date. One informant described the NAG as "powerful because of the fact that it will change the environment of the school" (10). Another informant described restricting the food available within the school as consistent with the school's job to "... send messages and teach children ... the most practical way that the school could do that was to say the food we provide is healthy food" (3).

A small number of informants suggested that imposing regulations on schools was not the best approach, but also stated that the NAG 5 "... seems to be accepted now ..." (7), and acted as an impetus for change within schools.

A couple of informants indicated that they supported the NAG 5, but were concerned that it was not further supported with additional requirements or programmes implemented in schools. One informant described the regulation as "... a NAG with no teeth" (12), given the degree of flexibility provided to schools in how they interpret the requirement. Another informant suggested that programmes were needed to support the NAG 5, such as "... bring[ing] community members in ... [to] cook lunch each day, or on the weekend they could be running cooking classes for people" (11).

8.3.2 Influencing the home environment to support schools

Most school informants expressed the view that they had limited influence on the types of foods brought into the school. Policy informants were asked about the role they thought schools could play in influencing this. All policy informants who discussed this aspect (13 of 16) suggested that schools do have a role. The description of what this role was varied from a strong to a weak position. An example of a strong position was provided by one informant who stated:

There's behaviour that they won't accept in schools, there's language that they won't accept in schools, certain types of clothing. ... And so I think the food argument ... fits alongside that quite comfortably (8).

At the weaker end, informants described how influence is limited. Reasons for this limitation, cited by informants, included parent's who are "just not interested" (15), some families not being able to afford the type of food being suggested, and time pressures

within the home. A few informants expressed a caution around the ability of parents and families from low-socioeconomic or food insecure households to meet any school guidelines.

Several informants expressed the view that the school needed clear policies or guidelines over what food is considered acceptable at school. They suggested that guidelines should be developed with the parent community, explained at time of enrolment, and backed up with consistent messages from the school.

There were mixed views on whether schools should completely ban certain foods from being brought to school. A few informants were concerned with monitoring and enforcing bans, suggesting that schools should not become “food police” (4). Besides practical issues within schools, some informants did not think parents would take note of bans. As one informant stated, “In the end parents make choices ... if they send chips or coke to school with a child that’s their business” (3). In contrast, some informants saw bans on certain food items by schools as appropriate and effective, if developed in consultation with the school community, and understood by parents and children.

Policy informants were asked whether they supported government directed bans on the types of foods allowed to be brought into schools. No informant expressed support for government mandated bans. In regards to restricting availability of foods in schools, most policy informants supported government directed bans on what schools could sell through the NAG 5. A smaller number of policy informants supported school directed bans on certain foods being brought into schools.

8.3.3 Fundraising

Most informants stated that they felt school fundraising, using types of food classified as ‘occasional’ under the School Food and Beverage Classification System, was inconsistent with the healthy eating messages. Similar to school informants, most policy informants stated that their preference was for fundraising that does not use ‘occasional’ type food, while not advocating that schools be required to stop this type of fundraising. Of the three informants who were most supportive of using ‘occasional’ foods in school fundraising, two were from government agencies with an education focus, and the third came from a food industry perspective.

There was little support amongst informants for ‘active’ policies to move schools away from using ‘occasional’ food in fundraising. However, two informants suggested that a government guarantee of profits during a transition period may encourage schools to try new fundraising avenues. Another two informants were unsure whether a change in schools operations budgets would reduce the need for schools to fundraise. As one informant put it:

The jury is out in my head as to whether [increased operations funding] would stop fundraising requirements because we ... just keep on wanting to do more (2).

Most informants identified responsibility for fundraising alternatives as resting with the school. A few informants identified a potential role for government agencies in providing good practice examples and ideas for schools to work from. The comments of one policy informant sums up the majority of policy informant views (across health and education) on this issue:

... if they [schools] choose to fundraise then they should be looking at other ways of doing it, and I don’t think we should be helping them with their fundraising. ... Provide advice to them, and ideas, and encouragement, but not doing it for them (14).

8.3.4 Support Agencies

There was considerable difference in the level of knowledge held by policy informants regarding the current role played by various agencies in providing nutrition support to schools. Those in service agencies tended to have more detailed knowledge, while those in government ministries tended to base comments on matters of principle. Four themes emerged and are presented below: distribution of nutrition support resources across school decile; coordination between agencies; the level of support resources; and, sustainability. Support agencies and resources include organisations such as: the Ministry of Education School Support Services, District Health Board Health Promoting Schools teams and education coordinators within District Health Boards; and NGO provided programmes such as the National Heart Foundation Healthy Heart Award programme, and Life Education Trust health educational programme.

Distribution of resources

Most policy informants supported a focus of agency resources onto lower decile schools. For several informants this was a somewhat reluctant position. They argued that ideally

all schools would have a full range of supports available. However, the reality of constrained resources meant targeting decisions were required. All policy informants expressed a view that there tends to be more need in lower decile schools for supports, and therefore this represents "... the best hit for the bucks" (3).

There was a consistent sense from informants from an education background, or from those working directly with schools, that mid to higher decile schools would also benefit from support to make changes to the school food environment. This may pick up a difference between health and education perspectives in how inequalities (in health language) or disparities (in education language) are addressed. The education view seems to be that resources are provided to schools who ask for assistance, as this implies schools are ready to make changes. From the health perspective "... to reduce inequalities ... an unequal distribution of resources [is required]" (9). The health perspective, as expressed by a couple of participants, suggests that schools be actively targeted and recruited into programmes.

Coordination between agencies

A number of initiatives have been put in place to increase coordination between agencies and programmes working with primary schools on nutrition and physical activity, such as district coordinators based in each District Health Board¹⁰. Even so, several informants expressed the view that improved coordination between agencies providing nutrition support to schools is required. These informants usually had direct experience of schools and/or the support agencies in question. The key intervention idea, above what is already in place, is for each school to have a point of contact through which all support agencies go, who can save time for school staff in responding to information requirements.

Support Agency Resources

Two informants suggested that an increase in the number of support staff working with schools was required to achieve both the desired level of school engagement and to improve coordination between agencies. Both of these policy informants work directly

¹⁰ Note that funding for education coordinators placed in District Health Boards has been stopped since the interviews were conducted.

with schools. The 14 other policy informants did not explicitly state that additional support agency resource is required.

Sustainability

Sustainability emerged as a theme from several policy informants in regards to the support provided to schools. Sustainability in this sense appeared to refer to the degree to which changes or activity would be maintained in the school if support agency resources were withdrawn. For reasons of sustainability, there was little support for support agency staff actually undertaking more of the work within schools, as opposed to school staff. However, the suggestion was that nutrition related activities may stop within schools if the support agencies are removed. The suggestion from school informants for support agency staff working in a more 'hands-on' way in schools, was seen as likely applicable to only a few types of discrete projects.

8.3.5 Provision of food in schools

Most policy informants stated that parents have primary responsibility for the food that children eat during the day at school. A few informants noted that the responsibility rests with parents because of historical development of the schooling system in New Zealand, and that internationally there is a wide variety of practice. There was also recognition by several informants, that for some households when faced with food insecurity, the school may be required to take on some responsibility for feeding children. As one informant stated:

... if we think about that food security end of things, it's absolutely obvious that for large numbers of children [it's not] an issue of parent's responsibility, [it's] ... ability to provide that [food] (8).

Who should provide food in schools?

Most of the case study schools did provide some food to children who either forgot their lunch, or did not bring enough food to school. This food was either donated or purchased by the school. Policy informants were asked about the type of support that should be available for schools to provide when it was considered children did not have enough to eat. A range of opinions were expressed. Some informants stated that lower decile schools already receive more money in operations grant from government, compared

with higher decile schools. They suggested that some of this operations money should be used to purchase food if this is a need for the school.

A few policy informants suggested that the number of children presenting as hungry is likely to vary between schools and communities. They suggested that the best place to locate solutions therefore was to use community resources to support schools. One informant suggested that "... the whānau can take care of its own, without having to get the school to do it as a proxy for parents" (11). Concerns were raised by a small number of informants regarding the sustainability of community based solutions and charitable models.

Not all suggestions of food provision at school related only to food security. A few informants were of the view that food could be provided at school as an integrated part of the school day. As expressed by these informants, this was both to address food insecurity and other reasons why children may not have eaten sufficient food, such as the impact of parents working patterns on breakfast consumption. When such a model was discussed, informants suggested that state funding would be required.

On balance, a mix of views was expressed regarding the funding and provision of food at school in relation to food insecurity or hunger. A majority of informants supported schools providing food to address hunger. Where support was expressed, funding was identified as coming either from within existing school budgets, through additional government funding, or charitable provision. A minority of policy informants suggested that issues of hunger and food insecurity should be addressed outside of schools. A few informants suggested that provision of food at school can be of benefit to a wider range of children than those who are food insecure.

Type of food provision in schools supported

When the provision of food in schools was supported by informants, existing schemes received the greatest support. This appears to be because informants could draw on examples where the schemes had benefited children and schools. Where informants did not support a scheme, they generally did not have any direct contact with existing schemes, or detailed knowledge of programme evaluations.

In this regard the Fruit in Schools scheme received the most support. Several informants who were familiar with the scheme highlighted how the scheme had increased the amount and types of fruit being eaten by children. These informants expressed the view that the scheme had encouraged greater fruit consumption at home, and not substituted at home fruit consumption as some people had feared. As one informant noted "... students are loving the fruit, realising they enjoy it and then bringing more fruit as well themselves" (15).

There was mixed support for breakfast being provided at school. The support that did exist was split between the impact breakfast is likely to have on student learning and behaviour at school, and addressing some stresses in the home around parents' work commitments and before school care. One informant with direct experience of a breakfast programme described the benefit in the following way:

... we have supported a number of breakfast programmes. Some of it due to food security issues certainly ... Parents are happier about that because it means they can get off to work a hell of a lot earlier, and their kids, once they are in the grounds are safe (8).

Those informants that did not support breakfast provision suggested that there was a lack of evidence of need, and that the reasons for children not having breakfast are complex and not necessarily related to money.

There was very little discussion of provision of lunches at school. No informants pointed to existing programmes in New Zealand as a basis for discussion. As a result, when lunches were discussed, the comments were more general reflections on the experience of other countries, the role schools should play in providing food, and comparing lunch provision to breakfast or fruit provision schemes.

In line with the views expressed by policy informants in relation to where responsibility for feeding children at school lies, most informants did not express support for universal breakfast or lunch programmes. In cases of food insecurity or hunger, most informants expressed a need for some provision of food, although there was no consistently identified type of in-school food provision (e.g. breakfasts). Informants expressed more support for the school food programmes where they had personal experience. As a result the Fruit in Schools scheme received the most support amongst informants.

8.4 Other Interventions to support schools

Besides examining the intervention ideas generated from the school case studies, some policy informants suggested other interventions to improve children's diets and reduce obesity. Two informants suggested a health check for year nine students, at the transition from primary to secondary school. As described, this could potentially identify any emerging concerns with weight and direct families to a programme, such as the Green Prescription programme (Sport and Recreation New Zealand, 2008a). An informant from a health focussed organisation stated that a year nine health check programme was being developed.

One informant also suggested that schools should be utilised as community centres, and not focussed only on educating children, but also provide opportunities to engage whānau and community. They suggested a possible integration with programmes to produce food for children at school and educate children about nutrition.

8.5 Interventions within homes to support schools

Policy informants were asked to comment on a number of intervention areas, focussed on home environments, identified from case study schools. In general less time was spent discussing these interventions than those based around schools, as informants often had more to say on the schools aspect.

8.5.1 School's role in influencing parents

As discussed above (section 8.1.6), there were several suggestions of the type of activity that schools can undertake to influence the food children bring from home. Three informants discussed the induction or enrolment procedure when a child starts at a new school. It was considered that this is an ideal time to explain school rules around food and provide guidance on "... how to provide good lunches ..." (1). It was suggested that a school food policy should be in place for schools to provide consistent messages around food. A number of informants suggested that food policies are best if developed in dialogue with school communities. These types of actions are consistent with what school informants identified as the role of schools, providing messages and role modelling. No informant expressed a view that influencing parents was outside the school's role.

8.5.2 Health messages / Social marketing

School informants identified the nutrition knowledge of parents as a barrier to improving children's diets. A number of policy informants agreed that increasing parents' knowledge was an area for intervention. Several informants focussed on influencing the knowledge of parents through settings other than schools, including: mass media; supermarkets; churches; and other existing community networks. As one informant summed up, "... it's about getting the message across in the most effective way possible" (3).

There was good support for the Feeding Our Futures (Feeding our Futures, 2009) campaign. This came particularly from those informants either broadly involved with the campaign, or in roles close to service delivery. The support of informants with some involvement in Feeding Our Futures could be interpreted in two ways. One is that they have a bias towards this programme because of their involvement. The second is that they have a more detailed level of knowledge regarding implementation and evaluation information.

8.5.3 Money available to spend on food

Most policy informants noted income as a limiting factor on diets, but said little about interventions. There was some discussion, amongst several informants, about reducing the price of healthy food, which is discussed in section 8.5 below. Two informants expressed uncertainty whether additional money provided to households would be spent on healthy food. As one informant asked, "how do you know that they would spend it [additional money] on healthy food?" (16).

Two informants were asked directly if they supported a voucher system to provide households with more spending power for food. This was an idea raised within one case study school. Neither informant was supportive of introducing voucher systems, with one expressing opposition in the following way:

No I wouldn't agree with that, I think that again stigmatises the poor, and it would be the thin edge of the wedge to food stamps and moving the whole American direction (3).

8.6 Interventions within communities to support schools

8.6.1 Marketing Restrictions

All policy informants identified food marketing as having some impact on children's diets. Policy informants were asked if they supported greater restrictions on food marketing to children. Of the 16 informants, 10 indicated support, 5 did not support further restrictions, and one did not voice a preference.

Those informants that did not support further restrictions came from a range of organisations. With the exception of one informant, the informants who did not support marketing restrictions, came from outside health or public health focussed organisations or background. This may suggest that those with a public health focus are more accepting of regulation. Most of the informants that did not support further restrictions also expressed stronger views on the responsibility of parents and whānau for directing children's diets.

Amongst those informants who supported further restricting marketing of food to children, there was a range from those who very strongly supported restrictions to those who thought it was generally a good idea. Examples of these two views are provided below from two informants within the same government ministry:

I probably have quite a black and white view there. I don't think we should be marketing to children ... (1).

I think that what we do know it certainly causes some harm, and we're not sure of the degree of it, but I think we should be using the precautionary approach ... (14).

A minority of informants discussed their view of the political viability of restrictions on food marketing to children. No informant stated that they thought further restrictions were currently politically viable.

8.6.2 Influencing the price of healthy food compared to unhealthy food

Most policy informants expressed the view that the price of food influences children's diets. Many informants suggested that healthy foods are often more expensive than less healthy foods.

Following this view, several informants favoured the removal of GST from fruit and vegetables, and perhaps some other foods. Some of the informants who did support the removal of GST off certain food items, also warned that by itself removal of GST would likely have limited impact. There was a suggestion from a small number of informants that any interventions, such as removing GST from some food items, needs to be explained and supported through social marketing. A number of informants were not sure whether removing GST from foods would have much of an impact on children's diets, but suggested that it was worth exploring further. A few informants raised doubts about the practicality of removing GST, all citing the bureaucracy required to manage GST in Australia.

There was less discussion around introducing taxes on unhealthy foods to make them more expensive. Of the few informants that raised it, there was about an even distribution of support, opposition and those uncertain about impacts. One informant suggested that a tax on sugary drinks for example would need to be "... 20 percent or something to make it worthwhile" (16).

Two informants raised concerns that removal of GST on healthy food, or introduction of a tax on aspects of less healthy foods, could increase inequalities by benefiting those that currently spend more money on fruit and vegetables.

8.6.3 Food outlets and advertising around schools

Policy informants were asked about their thoughts on influencing children's exposure to food outlets and advertisements around schools. A majority of informants expressed views that availability of 'occasional' food in the community is likely to impact on children's diets. Opinion was mixed amongst policy informants regarding whether attempts should be made to influence the availability and advertising of certain foods in community settings around schools. A number of informants who have some contact with schools discussed examples where work is already beginning with dairy owners and schools to make changes. One example was provided by an informant:

Some schools have approached dairies etc themselves and come to agreements about what will be sold at what times. So for example the dairies have agreed that they won't sell food to kids before school (10).

When discussing the possibility of changing children's exposure to food and food advertising in the community, only two informants discussed the role of local government and urban planning. Yet, when discussing settings other than schools to intervene to improve children's diets (discussed in section 8.1.7), local government was identified by several informants (including the two that made a link with urban planning), as having a potential role in influencing the number and location of food outlets.

Several informants stressed that efforts should be made to work with the food industry to develop and promote healthier products, rather than attempting to regulate the food industry to create change. The logic of such an approach was described by one informant:

... look at their budgets compared to ours, you know, millions and millions. We should be working with them (12).

8.6.4 Nutrition Labelling

The role of nutrition labelling on foods was raised several times in school case studies, either in relation to the Heart Foundation Pick the Tick, current nutrition information panels, or raising possibilities of other types of labelling. This did not tend to get discussed during school principal feedback sessions due to time pressures. As a result this was not raised as an intervention option with policy informants. However, several policy informants raised the role of nutrition labelling, and in particular front of pack labels. Of those informants that raised the idea there was mixed support. One informant, who was not in favour of front of pack nutrition labels, suggested that promoting "knowledge about healthy eating is a more practical way of doing it [influencing diets]" (3). An informant who was in favour pointed to the success of the Heart Foundation Pick the Tick programme as a marketing approach that "... helps people make a decision really really quickly" (6).

8.6.5 Community Action

Several policy informants suggested that action at the community level is important for creating change in children's diets. This did not come through strongly from the school case studies. One informant suggested that government regulation around marketing, or other food industry practices, should only occur once there was existing community support for such action, "otherwise you are trying to stimulate something that isn't already there" (11).

One common perception amongst informants that promoted community level action, was that needs and drivers of diet vary across communities. Interventions therefore need to be tailored for each community. One way of doing this is for the interventions to be designed and run by communities.

8.7 Interventions to be considered in next phase of research

This research is designed to be iterative, building layers of evidence to guide policy action. The policymaker informant interviews sought to identify intervention areas where policy informants expressed some agreement that interventions may work to support primary schools in promoting healthy nutrition. The assumption behind these interviews was that interventions are unlikely to be implemented unless there is some support for such interventions from those actors who have some control over the distribution of resources. Rather than a completely exploratory approach (where the policy informants would be asked to identify interventions without prompting), informants were asked to comment on the interventions areas short listed from analysis of primary school case studies. The assumption was that actors within the school food environment system should also have some level of agreement with the interventions to increase the likelihood of effective implementation.

Now that the policy informants' views have been described, a further process of short listing interventions can occur, and a 'portfolio' of interventions developed. The aim for the portfolio of interventions is that they may act to change the attractor state of school food environment systems. The new attractor state will hopefully produce 'emergent' patterns of behaviour that can be described as promoting healthy childhood nutrition through primary schools. A discussion of the data relevant for each intervention to be included in the portfolio, supplemented with relevant literature, is presented in Chapter 9. In Chapter 10, consideration is given to how the interventions within the portfolio may interact and impact on school food environment systems, along with an overall discussion of the thesis findings.

8.8 Conclusion

This chapter has presented an analysis of 16 interviews with policymakers within a broadly defined 'policy community' involved in nutrition and primary schools. The aim of the analysis was to identify support, or otherwise, for interventions identified from

work with case study primary schools (Chapters 6 and 7). There was considerable similarity in policy informants understanding of diet and obesity drivers. However, a greater range of diversity was evident in the interventions supported. Support for interventions seemed closely aligned with perceptions of responsibility for children's diets. Where parents were viewed as responsible, there was less support for interventions aimed at environmental changes. Where parent's choices were considered more constrained by the 'obesogenic' environment, environmental interventions had more support.

By comparing policy informant interviews with case study primary school analysis (Chapter 7), a list of 11 interventions was identified for consideration within an intervention portfolio (discussed in Chapter 9). Most of these 11 interventions had been short listed for discussion with policy informants based on support for the intervention area from case study school principals. However, a minority of the 11 interventions had not been short listed for discussion with policy informants, and instead represent a convergence of ideas from case studies and policy informants, which signal a slight change in direction from that developed from case study analysis alone. This change in direction perhaps suggests the value of combining local (school) and national (policymaker) perspectives.

Chapter Nine

Discussion of interventions for inclusion in portfolio

9.1 Introduction

This chapter addresses the first aim of this thesis, to identify policy interventions that support primary schools to promote healthy childhood nutrition. The research approach used in this thesis is premised on effective policy interventions being: (i) relevant to local context and impacting on system control parameters; and, (ii) supported at both a local and national level. Chapters 6 and 7 explored examples of primary school food environments systems to identify possible interventions and control parameters at a local level, with an indication of support for intervention options from primary school principals. Chapter 8 presented analysis of interviews with policymakers to consider national level support for intervention options.

To inform conclusions and recommendations for this research, this chapter will bring the local and national results together. The purpose is to consider how a short listed set of interventions may meet the two assumptions for effective policy interventions outlined above. While doing this, another layer of information will added, by briefly reviewing the national and international research literature relevant to each of the 11 interventions. Literature searches were conducted (see Chapter 4 for details), within each intervention area to consider any previous studies examining impact of the interventions on children's diets.

Experiences of implementing similar interventions can be useful for considering effectiveness of intervention for New Zealand primary schools. If, for example, an intervention proves more difficult to implement than anticipated, then the impact on system control parameters may be reduced. Within this discussion, some remaining questions regarding the interventions to be considered in more detail are highlighted.

While 11 interventions are discussed below, these do not represent the only policy and intervention options available to support primary schools in promoting healthy nutrition. Even within this research, other interventions have been identified, such as

subsidising non-food related household expenses. However, for various reasons these were not short listed for more detailed consideration, as outlined in previous chapters. There are likely to be other intervention options not identified in this research, due to selection of case study schools, policy informants or reviewed literature, which may be effective. Having said this, taken together the interventions that have been short listed appear to have a good chance of positively impacting on primary school food environments and therefore children's nutrition within schools.

To conclude, this chapter will consider a possible prioritisation between portfolio interventions to help inform implementation planning. Such a prioritisation is not intended to suggest that one intervention is necessarily more important than another. Having said this, one of the criteria against which interventions have been categorised does relate to how they may impact upon control parameters, and therefore the system as a whole. However, this is to guide implementation planning amongst relative equals, rather than suggest interventions that can be cherry picked from the portfolio. In fact, the strength of the portfolio approach is likely to be how the interventions compliment each other. Two assumptions make a prioritisation process necessary. First, that it is unlikely there will be resources to implement all interventions at once. Second, that due to the lack of specificity in some interventions, further research and development is likely required before these can be implemented. The prioritisation therefore, provides guidance on order of implementation.

9.2 Interventions for inclusion within 'Intervention Portfolio'

The approach of this research assumes that no one policy intervention will provide the 'magic bullet' of successfully promoting nutrition through primary schools, with an impact on overweight and obesity. Consistent with complexity theory and an ecological understanding of obesity causation (Dennard et al., 2008; Story et al., 2008), most authors in the area of obesity policy point to the need for multi-component programmes, which impact over a range of settings and environments (Sacks et al., 2008; Story et al., 2008; Swinburn, Gill, & Kumanyika, 2005). Swinburn et al. (2005) refer to the multi-component programme as an intervention 'portfolio'.

In this chapter, the 11 interventions identified for inclusion within an intervention portfolio to support primary schools in promoting healthy childhood nutrition are discussed. Within the discussion of each intervention, the following things will be considered: (i) the rationale for inclusion within the portfolio; (ii) discussion of relevant school case study and policy informant data; and (iii) discussion of relevant literature.

The process for identifying and refining interventions for inclusion in the final portfolio has been an iterative process. Table 9-1 lists the interventions identified at the three stages of the research: case study school analysis; policy informant interviews; and inclusion within final portfolio. From the five case studies (Chapter 6), 28 interventions were identified. From these 28 interventions, 11 were short listed for discussion with policy informants. The process of short listing excluded those interventions where: control over the intervention rested solely with schools; where the intervention was not discussed with at least two case study school principals during research feedback meetings; and, where there was no expression of support for an intervention from principals during research feedback meetings.

Following policy informant interviews, a process of comparison between expressed support from policy and school informants was used to identify interventions for inclusion in the final portfolio. Description of the process is outlined for each included intervention area below. Eleven interventions have again been identified for inclusion within the final portfolio. While there is considerable overlap with the 11 interventions short listed for discussion with policy informants, there are also a number of differences, particularly in the description and focus of the intervention area.

Only one intervention discussed with policy informants is not included in the final portfolio in any way, which is extending the work of support agencies work into higher decile primary schools. However, as will be discussed at the end of this chapter, there may still be a place for interventions concerning support agencies for coordination and working within a complex food environment system.

Two intervention areas included in the final portfolio were not short listed for discussion with policy informants. These were: nutrition education; and front of pack nutrition labelling. As discussed below, the data suggests that these intervention areas have enough support from both school and policy informants to warrant further investigation.

The 11 interventions are discussed below, identified as focussed within school, home or community environments, but all operating within school food environment systems, and more widely, the child nutrition system.

Table 9-1 – Identified interventions, short listed interventions, and interventions for inclusion within intervention portfolio

Environment	Interventions identified from case study schools	Interventions discussed with policymakers	Interventions considered for inclusion in ‘portfolio’
School	Reduce availability of ‘occasional’ and ‘sometimes’ food on lunch menu, increasing ‘everyday’ items		
	Development of formal food rules/policy		
	Widen scope of food policy to include aspects of school food environment		
	Engagement of students in improving food environment		
	Grow ‘everyday’ foods at schools		
	Promote alternatives to banned or discouraged food items		
	Guarantee short-fall from school trialling fundraising activities	Guarantee short-fall from school trialling fundraising activities	
	Evaluate and share information on ‘occasional’ food free fundraising activities	Evaluate and share information on ‘occasional’ food free fundraising activities	Promoting/sharing good practice in fundraising
	Increase school operating budgets to reduce reliance on fundraising	Increase school operating budgets to reduce reliance on fundraising	
	Extend specialist HEHA support to higher decile schools	Extend support services into higher decile schools and to work more directly in schools	
Support agencies to undertake more ‘hands-on’ work within schools		Nutrition education	

Environment	Interventions identified from case study schools	Interventions discussed with policymakers	Interventions considered for inclusion in ‘portfolio’
	Provision of free or subsidised food at school	Provide government funded free or subsidised food in schools (Fruit in Schools, breakfasts, lunches)	Provision of food in school
	Continue to fund Fruit in Schools		
	Mandatory bans on certain foods being brought to school	Restricting food to be brought into schools – bans on food items	School food policies
	Subsidise ‘everyday’ lunch options on school menu		Reduce availability of ‘occasional’ food in schools
	Support development of formal school rules/food policy (by support agencies)		
	Support school gardens		
	Produce nutrition resources in te reo Māori		
	Work to engage parents around food choices in schools		
Home	Social marketing of convenient, affordable ‘everyday’ lunch options	Social marketing to encourage healthier foods brought to school	Social marketing
	Extend well-child programmes to include child food preference development		
	Subsidise non-food related household expenses to increase food budget		
	Increase household budgets to spend on ‘everyday’ and ‘sometimes’ foods	Increase households budget to spend on food	Money available to spend on food
	Enforcement of parental responsibilities regarding		

Environment	Interventions identified from case study schools	Interventions discussed with policymakers	Interventions considered for inclusion in 'portfolio'
	children's diets		
Community	Reduce cost of healthy food compared to less healthy food	Change price structure of 'occasional' food compared to 'everyday' food	Price of food
	Restrict marketing of 'occasional' food to children	Restrict marketing of 'occasional' foods	Restriction of food marketing
	Front of pack nutrition labelling		Front of pack nutrition labelling
	Limit availability of 'occasional' food around schools	Limit availability of 'occasional' food around schools	Limiting 'occasional' food available around schools

9.3 Within Schools

Six intervention areas are discussed below for implementation within schools. Some, such as nutrition education, are essentially business as usual. Others, like provision of free school lunches, would likely require significant new policy development.

9.3.1 Fundraising

Fundraising using ‘occasional’ foods was identified as a control parameter for one case study school. Three interventions related to fundraising within schools were short listed for policy informant interviews: increasing school operating grants; government guarantee of revenue while schools trial alternative fundraising activities; and support and advice for schools. Fundraising was not identified as a barrier to school food environment improvements for all case study schools, and not all policy informants viewed fundraising using ‘occasional’ food as a problem, although most did to some degree.

From the two highest decile schools there was some support for increased operations grants, although also an acknowledgement from one principal that an increase in grants may not reduce the desire to fundraise for additional resources. There was a little interest from the same two principals for a guarantee of revenue; however, several practical barriers to this intervention were discussed. There was more support expressed from principals for a coordinated way of sharing good practice regarding fundraising activities not using ‘occasional’ foods. Amongst policy informants, there was little support for increases in operation grants or guarantee of revenue. Several policy informants were supportive of schools being supported in moving away from the use of ‘occasional’ food in fundraising through advice and sharing of practice.

Based on views from school and policy informants, the fundraising related intervention for inclusion in the final intervention portfolio is promoting/sharing good practice in fundraising, where good practice refers to moving away from selling ‘occasional’ food.

As discussed in Chapter 5, only one small New Zealand based study provides information on how common the sale of ‘occasional’ food is within primary schools for fundraising. Richards et al. (2005) found that 91 percent of all schools (primary and secondary) sold products for fundraising, over half of which are food products likely to

be classified as ‘occasional’. Carter and Swinburn (2004) in a large survey of primary and intermediate schools with a high response rate, reported that 37 percent of primary schools in New Zealand ran a food service for profit, with the most commonly sold foods likely to be energy-dense.

International literature, particularly from the US, has suggested that where schools generate income from the sale of food, for example through a la carte options and vending machines, any reduction in sales resulting from an increase in healthy food availability could cause a loss of income to support school operations (Bauer, Yang, & Austin, 2004; Finkelstein, French, Variyam et al., 2004; Fleischhacker, 2007; Nollen, Befort, Snow et al., 2007; Sallis, McKenzie, Conway et al., 2003; Wojcicki & Heyman, 2006). There has been little research to test this assertion, although a recent review of seven US reports showed no reduction in revenue to date when healthier foods were introduced (Wharton, Long, & Schwartz, 2008).

It seems unlikely that schools will be required to stop fundraising using ‘occasional’ foods, as to date this has not been promoted as an option and may create financial difficulties for many schools without increases in operations funding. An obvious concern for primary schools, expressed by the case study schools that relied more heavily on fundraising, was that any reduction in revenue could not be sustained. This has also been highlighted in a 2006 review of New Zealand school funding (Ministry of Education, 2006).

Several school and policy informants suggested that any fundraising alternative to the sale of ‘occasional’ foods (such as student led chocolate sales) would need to be equally as profitable for equivalent amounts of work. A few policy informants pointed to the work of Sport and Recreation New Zealand (SPARC), who developed an on-line list of non-food related fundraising activities, with examples and contact details for schools with experience in each activity (Sport and Recreation New Zealand, 2008b). It is difficult to establish the impact of such information sharing interventions. Schools retain decision making regarding which fundraising activities they undertake, and there is no regular monitoring of fundraising activities. From a policy perspective, allocating resources to initiative such as the SPARC website may be relatively easy to implement.

9.3.2 School Food Policies

School food related rules and policies were identified as control parameters for two of the case study primary schools (Chapter 7). Case study school principals were not questioned about whether they supported development of school food policies as an intervention area, as this was seen as located within a school locus of control. One intervention that relates broadly to school food policies was included for discussion with policy informants; restricting food to be brought into schools through mandatory bans. No policy informant supported a mandatory ban. There was support, however, from a majority of policy informants for restrictions on the food schools can provide, which is discussed further below (section 9.3.3).

There was also support from several school and policy informants, for school developed bans as part of school food policies (which was raised by informants when discussing mandatory bans). From the case studies, school food policies to reduce the availability of ‘occasional’ food in schools (and increase ‘everyday’ food), were identified as an intervention, but not discussed further. Even though school food policies were not short listed for discussion with policy informants, similar interventions regarding school food policies were identified from school case studies and policy informants. For this reason school food policies are included for consideration in the final portfolio.

Policy informants identified school food policies and rules as one way of encouraging parents to provide children with healthy lunches, and as consistent with the identified role of schools in sending healthy messages to children and parents (Chapter 8). With each school in New Zealand self-governed, policy development would likely be undertaken independently for each school. Both school and policy informants generally described development of schools rules and policies as best achieved through engaging staff, students and parents.

Currently in New Zealand schools are being encouraged to develop policies through programmes such as Fruit in Schools, the National Heart Foundation Healthy Heart Award Programme, and the National Administration Guideline requirement that schools promote healthy nutrition. These types of encouragement and support for schools could be maintained or enhanced. Alternatively, a prescriptive type regulation could be introduced to require that schools develop a policy, and stipulate the types of activities to be included. Given the preference of both school and policy informants for school rules

and policies to meet the specific needs of the school, it seems unlikely that a prescriptive approach, applied universally to schools, would be effective. Having said this, some policy informants expressed surprise that schools appeared to be largely accepting of the NAG 5, contrary to their expectations. Similarly, once in place, school stakeholders may be accepting of a prescriptive type requirement.

A third way could be to stipulate that schools must have a food policy, but not introduce rules around coverage. As will be discussed below, the non-prescriptive approach adopted by the NAG 5 did appear to be an impetus for change within the case study schools. This may suggest that a prescriptive approach is not required. From a complexity theory perspective, food policies may be more effective if schools are able to mould food policies to the particular realities of their school food environment system.

Many schools in the US are required to have a school wellness policy (Longley & Sneed, 2009). An evaluation of wellness policies across a nationally representative sample of school districts in the US concluded that ‘federally mandated wellness policies ...have brought about change in the types of food offered students, time and place of food availability, and nutrition and physical education’ (Longley & Sneed, 2009, 101). Barriers to wellness policy development identified included the need to use food in fundraising, and competition for time of teachers and principals in development of policies (Longley & Sneed, 2009). Both these barriers were identified by a number of primary school case study informants, as limiting the actions of schools to make changes to the school food environment (Chapter 7). As was shown with case study schools 1, 3 and to a lesser extent 5 (Chapter 6), the development of a food policy lead to changes in the types of food offered at school, with a reduction of ‘occasional’ type foods for sale on school lunch menus.

Studies that examine the effects of school food policies (while usually small and cross-sectional in nature), have found modest positive impacts of policies that seek to increase fruit and vegetable consumption and decrease consumption of foods high in fat or energy (Gonzalez, Jones, & Frongillo, 2009; Jaime & Lock, 2009; Sallis et al., 2003; Wojcicki & Heyman, 2006). Of course a policy alone does not change the availability of foods in a school. Gonzalez et al. (2009) concludes that an intervention, such as increasing availability of fruit with the aim of increasing students’ fruit consumption, is more likely to be successful if school policies restrict competing food options for students. Wojcicki

and Heyman (2006), in evaluating a nutrition policy in the San Francisco school district, also found that restricting the types of foods available in schools increased participation in the federally funded school lunch programme, which itself has nutritional standards.

While it is difficult to suggest direct implications of international studies for primary schools in New Zealand, they do suggest that a considered policy on where, when and what types of foods are available in a school, may positively support interventions to improve student's diets at school.

9.3.3 Restricting availability of 'occasional' foods in school

As discussed above, an intervention was identified from analysis of case study primary schools, for schools to reduce the availability of 'occasional' and 'sometimes' food available on lunch menus, and increase 'everyday' food available. This was identified by several school informants as an action largely within the school's control, although some school informants did suggest parent reaction could limit change. The reduction of 'occasional' food for sale within schools (and increase of 'everyday' food), was one aim of the previous NAG 5 requirement. A majority of policy informants, who discussed the NAG 5 requirement that schools sell only healthy foods, supported this intervention. This is even though the NAG 5 was not prompted as a specific intervention option. Because restrictions on what type of food is sold within schools were identified by both case study and policy informants, restricting the availability of 'occasional' foods in school is included within the final portfolio. It is considered that this intervention may impact upon the control parameter of 'availability of 'occasional' versus 'everyday' food in school'.

In the time between initial data collection and feedback meetings, every case study school had either undertaken actions to change the food available for sale within the school, or had put in place processes for initiating change, such as student health committees or parents groups. This suggests that the NAG 5 had prompted some action on the part of schools. The Education Review Office audit report of 173 schools between February and May 2008, stated that 87 percent of primary schools had considered actions for making healthy food options available (Education Review Office, 2008), in preparation for the NAG 5 requirement. Of course, the schools that agreed to be involved in this study may have viewed nutrition as more important than some other schools. If so, they may have been more inclined to make changes without the NAG 5.

Having said this, the NAG 5 was described as one of the motivators for change by several school informants in this current study.

Research studies looking at the impact of restricting the foods available in schools have shown positive impacts on students diets (Fernandes, 2008; Fox et al., 2009; Schwartz, Novak, & Fiore, 2009), particularly where all food options in the school (schools meals, a la carte, vending machines, etc), are included (Brownson, Haire-Joshu, & Luke, 2006; Kubik, Lytle, Hannan et al., 2003; Story et al., 2006; Wojcicki & Heyman, 2006). Studies that have examined the impact of restricting food on students' diets suffer from issues of confounding and difficulty in accurately measuring diets (rather than food available) in establishing causal links. However, a picture is emerging from this rapidly expanding body of research evidence, that reducing the exposure of children to 'unhealthy' food in the school environment is likely to have some impact on the amount of 'unhealthy' food consumed. It may also have an impact on children's attitudes to both 'unhealthy' and 'healthy' foods.

Interventions to restrict the foods available in schools are being implemented in several jurisdictions. In England food standards are progressively being introduced that will cover all food sold or served in schools (School Food Trust, 2007). These standards seek to increase fruit and vegetable consumption and reduce sugar and fat from children's diets at school. In the US there are nutrition standards that must be met in the provision of food funded under the federal School Breakfast and School lunch programmes (Finkelstein et al., 2004; Hayne, Moran, & Ford, 2004), while a number of states and school districts have introduced additional standards around vending and a la carte food services (sometimes referred to as competitive food when competing with free or subsidised lunch programmes) (Schwartz et al., 2009; Wojcicki & Heyman, 2006).

Carter and Swinburn (2004) documented that in New Zealand 37 percent of primary schools surveyed ran a food service for profit, while energy-dense foods were more likely to be available for sale and sold than healthier foods. As discussed above, international evidence suggest that, in general, when food is available for sale within a school as part of the school revenue stream, those foods are likely to be less healthy (Finkelstein et al., 2008; Fleischhacker, 2007; Kubik et al., 2003). The primary school case studies indicated that 'occasional' foods generally sold more than both 'everyday' and 'sometimes' type foods (Chapter 6). This suggests that limiting the sale of

‘occasional’ foods may reduce profits for those schools that derive a profit from food sales, an argument made against limiting types of food sold in some jurisdictions (Sallis et al., 2003; Wojcicki & Heyman, 2006).

As discussed above, there is little research to test this assertion, although a recent analysis of seven US reports showed no reduction in revenue when healthier foods were introduced in schools (Wharton et al., 2008). There is also some anecdotal evidence in New Zealand of increased profits with a healthier lunch menu (National Heart Foundation, 2009a). On balance, it seems that a restriction on types of foods available to be sold in schools, as was in place under the NAG 5 requirement, may promote modest changes to children’s diets, is being implemented in several similar jurisdictions, and appears to be mostly acceptable to school and policy stakeholders interviewed for this study.

There are also other options, besides reintroducing the NAG 5, to restrict the availability of ‘occasional’ foods in schools. More prescriptive regulations on schools would be possible, which could specify in detail what foods can and cannot be sold. Such a regulation could also stipulate monitoring and reporting requirements. A more prescriptive regulation may increase compliance costs for schools and the Ministry of Education, and as discussed above, could reduce the ability to devise solutions that fit the local situation. The advantage of a more prescriptive regulation may be that change occurs more rapidly in some schools, which may otherwise drag the chain on the less regularly monitored NAG requirement.

9.3.4 Provision of free food in schools

The provision of free food in school has been included within the final intervention portfolio. From the primary school case studies, the provision of government funded food in school was short listed for discussion with policy informants. From the literature derived policy system maps (Chapter 5) the availability of ‘everyday’ foods in schools was identified as a control parameter. There are also similarities with the control parameters *food brought from home* (identified for two case study schools), and aspects of *school food rules and policies* (identified for two case study schools).

There was mixed support expressed by policy informants for the provision of free food in schools. The Fruit in Schools scheme received the most support. Breakfast in schools

received support from a few policy informants, while there was almost no support for lunches provided in schools. This largely mirrors the support expressed by case study school principals, where Fruit in Schools was largely supported and there was limited support split between breakfast and lunch provision. All three types of food schemes (fruit, breakfast and lunch), are briefly reviewed below in relation to national and international literature. When developing the final intervention portfolio, the apparent preference amongst informants for fruit schemes over breakfast and lunch will be considered.

A number of countries have school fruit schemes (Harper et al., 2008), and fruit has been included as a component of a number of school based intervention studies (de Sa & Lock, 2008; Moore & Tapper, 2008; Ransley, Greenwood, Cade et al., 2007). A review of 34 articles reporting 30 studies (de Sa & Lock, 2008), concluded that 70 percent of school schemes to increase fruit and vegetable intake reported positive results. Ten of these studies considered free or subsidised fruit and/or vegetable distribution to students, while the other studies were a mixture of promotion and education interventions. In a randomised controlled trial, Bere et al. (2007) compared uptake of a free fruit programme compared to a subsidised fruit programme in Norway. Uptake was higher for the free fruit programme with increased fruit consumption. This intervention effect was present three years post intervention.

In New Zealand increases in fruit consumption have been shown from two fruit in school intervention studies with fairly small samples (Ashfield-Watt, Stewart, & Scheffer, 2008; Boyd et al., 2007). These schemes have received good levels of support from staff and students. In the Auckland pilot fruit in schools scheme (Ashfield-Watt et al., 2008), the increased fruit intake was not sustained six weeks post intervention, and the authors suggest the intervention period of one school term was not long enough to establish new habits independently of the intervention. Given the regular turn-over of students coming in and out of primary schools, and the length of intervention required for a sustained effect, a fruit in school intervention may need to be permanent to avoid disparities between cohorts.

Some school and policy informants questioned both the practicality of feeding children meals at school, with limited kitchen and dining facilities in most schools (Carter & Swinburn, 2004), and the impact this would have on parent's responsibility for children's

diets while at school. When support was expressed, it related more to addressing food insecurity of children than to improving dietary practices. An exception should be noted with case study school two, the kura kaupapa. For this school meals were seen as an important part of children's education, with meals frequently being cooked at school, and children eating together.

As one policy informant noted, New Zealand is in a minority compared with developed countries, by not providing meals at school. A review of practice in 18 countries (Harper et al., 2008), identified a wide variety of schemes, ranging from pre-packed sandwiches and soup, to full meals. Meals are provided free or at a reduced price in most countries. The majority of literature reviewed relating to school breakfast and lunch programmes comes from the UK and US, where both breakfasts and lunches are subsidised by government, with free meals available to children from low socioeconomic households. In the UK there have been several studies examining the nutrient content, and impact on students diets, of school meals.

In an analysis of a nationally representative survey, Nelson et al. (2007) conclude that 'if anything, schools meals are making matters worse rather than better' (p 660), due to the number of foods high in fat and sugar, and the relatively few vegetable and fruit options. The exception was for those students from the poorest households, where the school meal provided a benefit. The authors suggest that for these groups school meals offer a 'safety net'. Two small UK studies (Gatenby, 2007; Rees, Richards, & Gregory, 2008) highlight the difficulty schools face in providing healthy school meals. These studies suggest that unless school meals are achieving adequate nutritional intake for students, they may not contribute to improved diets.

Breakfast provided at school has been associated with increased school attendance and performance, however, a review of these studies notes caution in generalising results due to study sizes and methods (National Children's Bureau, 2004). A recent study of 22 primary schools in deprived areas of London (13 with and nine without breakfast clubs), showed a significant increase in academic test scores for schools with breakfast clubs comparing results pre and post breakfast club introduction (School Food Trust, 2008). There was no change in test scores for schools without breakfast clubs. Principals from schools with breakfast clubs reported several perceived benefits for children, including:

improved social skills; improved punctuality; improved concentration levels; and promoted links between schools and parents (School Food Trust, 2008).

In the UK and US, not all children in a school will be eligible for free school meals, and several studies report concerns over stigma as a reason for children not taking up free meals (National Children's Bureau, 2004). There is some indication from breakfast clubs and fruit schemes that universal eligibility within a school increases take up (Ball et al., 2005; Bere et al., 2007). Studies that include qualitative components with teachers and school staff have reported positive attitudes for school meals from students (Wojcicki & Heyman, 2006), school staff (School Food Trust, 2008), and parents (Shemilt, Harvey, Shepstone et al., 2004). This suggests general acceptability to school stakeholders, if the organisation of the food provision is easy to access and meets their needs (National Children's Bureau, 2004; School Food Trust, 2008; Shemilt et al., 2004).

From both the literature and comments from school and policy informants, a policy to provide free breakfast or lunches at school, may have broader aims than improvements in children's diets (e.g. food security). Informants made a clear link between providing food at school and food insecurity or hunger. In New Zealand currently the provision of breakfast and lunches to children, for the purpose of addressing food insecurity, is provided by charities and ad hoc arrangements within schools (Gerritsen, 2005). Another aspect of school breakfasts, raised by a few informants but not discussed in the literature, is before school child care for working parents.

In contrast to provision of breakfast or lunch, school fruit schemes may only have dietary outcome motivations, and not pose the same level of challenge to perceptions of parental responsibility, or practical concerns. This may be one reason why the Fruit in Schools scheme appears to have a reasonable degree of acceptability amongst both school and policy informants. Although another explanation for the support could simply be greater familiarity with the scheme amongst informants. Fruit consumption also has clear health related benefits across a number of non-communicable diseases (Van Duyn & Pivonka, 2000), while breakfast and lunch programmes seem dependent on a variety of factors in achieving a high nutritional standard (Gatenby, 2007).

9.3.5 Nutrition Education

Teaching children in primary schools about healthy diets was not included in the short list of interventions for discussion with policy informants. In fact, nutrition education was not identified within the initial 28 interventions identified from analysis of the case studies (Table 7-5). This may have been because the focus was on identifying new or additional interventions, and nutrition education was well established in all case study schools. However, nutrition education was consistently identified by school informants as an appropriate role for primary schools in promoting healthy nutrition. Policy informants also consistently identified nutrition education as an important role for schools. For this reason nutrition education is included for consideration as part of the intervention portfolio. Interventions that were identified from case study schools, which may act to support nutrition education, included: engagement of students in improving school food environments; extending specialist support to higher decile schools; supporting schools to grow ‘everyday’ foods at schools’ and producing nutrition resources in te reo Māori.

Most informants described education as the core role of schools, and therefore nutrition education was consistent with this. Nutrition education may also have had widespread support because it is consistent with both an obesogenic environment and personal responsibility perspective on obesity causation. Under an obesogenic environment causation model, individual actors still make decisions regarding food choices, and knowledge of nutrition can be seen as one input into that decision making process. Being informed about nutrition is of crucial importance to a personal responsibility view of obesity causation, as without knowledge there is little likelihood that ‘healthy’ choices will be made.

From a complex causation perspective, nutrition education can be seen as an intervention that may impact on children’s food preferences, which was identified as a control parameter. The US and Australian literature reviewed, suggests that children have a general understanding that diet impacts on health, and that fruit and vegetables are ‘healthy’ (Borra et al., 2003; Easthope & White, 2006; Evans et al., 2006). Nutrition knowledge alone, however, has not been shown to lead to healthy eating practices (Evans et al., 2006; Wind et al., 2005). Intervention studies that include nutrition education as a component, along with increasing availability and motivation to eat ‘healthy’ foods, have

shown positive impacts on consumption and attitude to such foods (Anderson et al., 2005a; Story et al., 2006).

Some authors, and one school informant in this study, have sounded a caution about the amount of food industry sponsored educational material that schools, including those in New Zealand, receive (Molnar, 2005; Stuart, 2005). There is a possibility that sponsored nutrition education materials may send messages counter to those being delivered through the education lessons. This was not raised as a major concern by school or policy informants.

There was some support from both school and policy informants for school gardens to aid in hands-on education to meet both sustainability and nutrition goals. Two interventions related to edible school gardens were identified. There is some supportive discussion of the use of gardens for nutrition education in the literature (McAleese & Rankin, 2007; Ozer, 2007; Robinson-O'Brien, Story, & Heim, 2009), and supporting development and maintenance of gardens may be one area for intervention development. A few school and policy informants noted that some schools have used the nutrition fund (Ministry of Health, 2007b), administered by District Health Boards, to establish school gardens.

9.3.6 Summary of within school interventions

In effect, most of the interventions described above are incremental changes on existing policies and programmes, which may reflect informants preferring what is already known. The exception would be the widespread expansion of food provision in schools. The intervention with the most evidence of impact is restricting the availability of 'occasional' food within schools within the context of a school policy. The area with the most policy development and research still required is the provision of meals at school. This would be a significant policy change for New Zealand. Both the policy aims of such a policy and practical implementation questions, need to be considered before a policy decision regarding investment is made.

A key to achieving change within the childhood nutrition system will be to consider how these interventions may work together. An example is the Fruit in Schools scheme, which is designed to be implemented within a whole school health promotion model. Within the two case study schools with the scheme, it appears to have provided a focus

for nutrition education and other food environment initiatives. Besides the nutritional impacts of the fruit, impacts on nutrition education and attempts to reduce ‘occasional’ food in schools should also be considered when evaluating such a scheme.

9.4 Within the Home

Two interventions are discussed below located within the home setting: social marketing; and money available in households to spend on food. While these are the only interventions discussed under the heading of the home setting, it is likely that interventions discussed under school and community settings will also impact within the home to some degree.

9.4.1 Social Marketing

Although social marketing action is likely to occur outside the home, media such as television advertising may be viewed within the home. For this reason social marketing is considered as an intervention within the home. Social marketing is identified as impacting on both ‘food brought from home’ and ‘parent’s food decisions’ control parameters. Three case study school principals positively discussed social marketing to provide parents and children with practical and affordable lunch ideas. As a result, an intervention area of social marketing of convenient and affordable ‘everyday’ lunch ideas, to rival packaged foods being brought to school, was discussed with policy informants. A majority of policy informants saw a role for social marketing, both in specific action regarding school lunches, and to support other interventions, such as those aimed at changing the price of food. Reflecting this wider description of social marketing, social marketing has been included within the final portfolio.

Social marketing can be considered the application of commercial marketing principles and processes applied to promote socially positive behavioural changes (Hastings, 2007). As with nutrition education for children, there did not appear to be any informants who were against social marketing interventions. Having said this, there was little examination of informants understanding of social marketing.

Internationally, social marketing is being increasingly used to impact on ‘unhealthy’ behaviours (Evans, 2008). In a recent review of social marketing aimed at children, Evans (2008) notes that social marketing campaigns have produced modest (five to ten

percent), population level changes in behaviours related to smoking, nutrition and physical activity. In a rapid review of literature to inform a New Zealand social marketing campaign, it was noted that the evidence for effectiveness within schools is good, while there is little evidence of effectiveness at changing behaviours in the home setting (Thornley, Quigley, Watts et al., 2007). The review also notes that to increase the effectiveness of social marketing campaigns environmental influences such as the marketing of unhealthy foods aimed at children, should be addressed (Thornley et al., 2007). Evans (2008) also notes that changes to social and health policies should be one of the marketing ‘channels’ used. This is similar to the idea of ‘upstream’ social marketing (Hastings, 2007).

In New Zealand, social marketing campaigns have been a very visible aspect of the HEHA strategy (Ministry of Health, 2003b), and Mission-On set of initiatives (New Zealand Government, 2006b). At the time of writing, it is unclear how social marketing will fit with the National led government. However, given the National Party view expressed to date (Health Select Committee, 2007), it is possible that social marketing activities may be restricted in the marketing channels used, for example mass media rather than community development and environmental change. The literature suggests that restricting marketing channels may reduce the impact of social marketing interventions.

9.4.2 Increasing money available in households to spend on food

Increasing the money available in households to spend on food was identified through the literature review as an intervention to impact on ‘household economic resources’ control parameter, but may also impact on ‘parent’s food decisions’. When discussing increasing household budgets to spend on food, both school and policy informants struggled to identify particular instruments to do this. In contrast to the minimal discussion of interventions, most school and policy informants expressed an opinion that money available does impact on children’s diets. As a result there was support for some form of intervention from many informants. For this reason the money available to spend on food has been included within the final portfolio.

The suggestion of an in-kind payment, such as food vouchers, while supported by informants of one case study school, was not raised as an option by any policy informants. The two policy informants asked specifically about this option did not

support a voucher system. A recent analysis of the potential for food vouchers to improve food security in New Zealand (O'Dea, Gorton, & Mhurchu, 2009), tentatively concluded that a food voucher system may improve food security and that further investigation of the intervention is warranted.

A number of policy informants identified food insecurity, poverty and rates of income support benefits as barriers to improved diets. However, there was little discussion of interventions to impact on these barriers. A few school and policy informants, while suggesting that money available did impact on diets, expressed uncertainty about whether additional money in a household would lead to additional spending on food, or changed food purchasing habits to improve diets. The assumption appeared to be that, unless restricted in some way to expenditure on food, additional income may be spent on non-food areas. As shown in Chapter 5, households in economic hardship may have multiple demands on income, including food.

As discussed in Chapter 5, the argument is well documented that on a per calorie basis energy-dense foods are cheaper than less energy-dense foods, with subsequent impacts on food purchasing decisions in low income households (Dowler, 2008; Drewnowski, 2004; Drewnowski & Darmon, 2005). An observed association between food insecurity and obesity (Casey et al., 2006), also suggests that limited choice based on money available may lead to less healthy diets with more reliance on high-energy foods.

Food insecurity may be associated more with overall household budgets than with the price of food as such. For example, studies have linked food insecurity with other household expenses such as housing (Kirkpatrick & Tarasuk, 2007) and heating costs (Frank, Neault, Skalicky et al., 2006). Efforts to increase money available in households to spend on food could take several forms. A food voucher system was discussed above. Other options could include increases in minimum wage (O'Dea, 2009), benefits (Carter, Lanumata, & Signal, 2009), or tax credits. Alternatively expenses other than food, such as electricity, housing costs, or schooling costs could be subsidised in some way to free up money that could be used on food. None of these options were discussed with informants and no literature that considered the impact of such policies on nutrition or food security was identified. This is clearly an area where further investigation of possible interventions and their impact on diets is required.

9.5 Within the Community

Four interventions located within the community setting were identified. These are: influencing the price of food; restricting marketing of ‘occasional’ food to children; front of pack nutrition labelling; and impacting on food outlets around schools. All four interventions would likely require significant new policy development, and the locus of control rests more with central government due to lack of legislative or regulatory infrastructure on these issues to date.

9.5.1 Price of food

Most school informants identified the price of food, and particularly ‘healthy’ food being more expensive than ‘unhealthy’ food, as a driver of children’s diets. The exact mechanisms for changing the price structure of ‘everyday’ compared to ‘occasional’ type food were not clear to school informants. This is reflected in the medium levels of support shown by the three school principals asked about influencing the price of food as an intervention. A majority of policy informants also expressed the view that the price of food impacted on diets. There was no in-depth discussion of mechanisms to achieve a change in relative pricing between food items, and several informants expressed their lack of knowledge in this area. Having said this, the removal of GST from ‘everyday’ foods, was suggested by a number of school and policy informants and appeared to have reasonable support for further exploration.

Influencing the price of food, so that ‘occasional’ type food items are relatively more expensive than ‘everyday’ food items, is identified as an intervention that will impact on three control parameters – parent’s food decisions (identified with three primary school case studies), household economic resources, and availability of food in the community (both identified from literature derived policy system maps Chapter 5).

The food policy literature often raises the possibility of taxes on certain ‘unhealthy’ foods or price subsidisation of ‘healthy’ foods (Brownson et al., 2006; Finkelstein et al., 2004), without a large body of evidence to inform discussion. There is limited evidence from small studies based in school or workplace cafeteria and vending machines, that discounting healthy food items increases sales of these items (Faith, Fontaine, Baskin et al., 2007; Wall et al., 2006). A price reduction of ‘healthy’ foods is the logic behind suggestions of removing GST from certain foods such as fruits and vegetables in New

Zealand (where currently GST is applied at 12.5% to all foods). For example, Value Added Tax (VAT) in the UK is applied to some ‘treat foods’, but not to the majority of foods, while in Australia GST is excluded from most foods (Caraher & Cowburn, 2005). The bureaucracy required to manage this system of GST in Australia was highlighted by three policy informants as a barrier to this type of intervention. Similar views were expressed by New Zealand policy key informants in a recent analysis of economic instruments to improve food security by O’Dea et al. (2009). The analysis concluded that removal of GST on foods would be a blunt instrument for reducing food insecurity, with possible tax implications, to achieve revenue neutrality, that could negatively impact on the households the intervention aims to benefit (O’Dea et al., 2009).

Caraher and Cowburn (2005) identify four approaches to imposing a tax on food: raising general revenue as through GST in New Zealand; applying a general tax such as GST to only some foods considered ‘unhealthy’ by some criteria; imposing new taxes on categories of foods with the aim of impacting on purchasing behaviour, with the additional benefit of raising revenues; and, imposing taxes on categories of foods to impact directly on behaviour with no revenue gathering purpose.

Taxes on foods have been explored in a limited number of modelling studies based on household food purchasing data (Kuchler, Tegene, & Harris, 2005; Mytton, Gray, Rayner et al., 2007). Mytton (2007) identified a number of cross-elasticities when modelling the impact of VAT on various food products, where food items were subsidised for non-taxed items. Subsidisation of food products potentially reduces the nutritional impacts of differential rates of VAT. Kuchler (2005) examined possible dietary and revenue impacts of imposing a tax on sugar and salted snack foods in the US. The modelling suggested that the amount of tax imposed on sugar or salted snack food would need to be large in order to have significant dietary impacts.

A tax on food may also be regressive, in that lower income households are likely to spend a higher proportion of their income on food (Powell & Chaloupka, 2009). Two policy informants raised a similar concern that removing GST from fruit and vegetables, for example, may not provide much of a benefit for those households that currently spend little on fruit and vegetables. However, the regressive nature of a food tax could partially be offset by targeted subsidies, potentially paid for by the increased tax revenue (Powell & Chaloupka, 2009). Kuchler (2005) suggests that a small tax in the US on salted snacks

would only have a very small impact on consumption. However, given the population in the US, it would raise substantial revenue that could potentially be used on programmes to impact on diet in other ways. Two policy informants suggested taxing soft drinks as a revenue raising activity to fund other programmes, such as Fruit in Schools.

The literature is sparse on the effectiveness of both taxes and subsidies on foods, and subsequent impacts on diet, household budgets, food security and equity amongst households. With the level of interest from many school and policy informants, and the inclusion of taxes and subsidies in much of the policy focussed nutrition and obesity literature, it appears to be an intervention area for further work and dialogue.

9.5.2 Marketing of Food to Children

A majority of school informants identified food marketing as having some influence on children's diets. Two of the three case study school principals, who discussed restricting food marketing as an intervention option, supported restrictions. One principal suggested that industry should be encouraged to change marketing practices through collaboration rather than regulation. Restricting marketing of 'occasional' food was short listed for discussion with policy informants. All policy informants identified food marketing as having an impact on children's diets. A majority of policy informants supported some form of regulation or restriction on food marketing to children. Restriction of food marketing is identified as an intervention to impact on the control parameter of 'children's food preferences', and is included within the final portfolio.

Within public health literature there is a strong case developed that food marketing influences children's food preferences (Brug, Tak, te Velde et al., 2008) and food choices (Hastings et al., 2003; Utter et al., 2006a). Limiting children's exposure to food advertisements is often cited as a possible policy intervention to impact on children's food choices, and ultimately obesity levels (Brownson et al., 2006; Finkelstein et al., 2004; Nestle, 2006; Seiders & Petty, 2004). In New Zealand, advertising to children is guided by an industry code of conduct with no statutory regulations (Shaw, 2009), which places it in a minority of the twenty countries reviewed by Caraher et al. (2006). Three options for reducing children's exposure to television advertising have been identified by Caraher et al. (2006). These are:

- A complete ban on advertising (all food products) directed at children.

- Partial restrictions on advertising by food product type, or times shown.
- Setting a limit on the number of advertisements to be shown within a time period, or around children focussed programmes.

School and policy informants were not asked explicitly about these three options. The literature reviewed here would suggest that industry are unlikely to support a heavily restrictive approach (Caraher et al., 2006; Shaw, 2009). If industry does not self-regulate, government legislation and regulation would likely be required. A minority of policy informants, and one school informant, stated they were against regulation. Based on available documents, the current National-led government appear unlikely to support regulation (Health Select Committee, 2007). Changing the industry codes, or introducing additional industry codes, may be currently easier to implement, but arguably may have less of an impact on reducing children's advertising exposure. Internationally there is little evidence of the best approach to reducing children's food marketing exposure to impact on nutrition outcomes.

9.5.3 Front of pack nutrition labelling

Like nutrition education, front of food package signpost nutrition labelling was identified within analysis of case study schools, but not short listed for discussion with policy informants. This was because it was not discussed with at least two principals during research feedback meetings (see section 7.6). However, several policy informants raised front of pack nutrition labelling, without prompting, as one way of influencing parents' food choices. Not all policy informants who raised the intervention were supportive of it. However, because the intervention was raised unprompted across school and policy informant interviews, front of pack nutrition labelling has been included for further consideration.

The existing National Heart Foundation 'Pick the Tick' programme (National Heart Foundation, 2009b) was cited a number of times by both school and policy informants, as one example of a nutrition labelling scheme. The Pick the Tick programme may be used by as many as 59 percent of consumers (Young & Swinburn, 2002), although this figure may be lower amongst Māori, Pacific and low-income consumers (Signal et al., 2008). The Pick the Tick programme has also been a driver for companies wanting to use the tick logo to reformulate products, particularly salt content (Young & Swinburn, 2002). Some informants suggested that nutrition labelling would help parents make healthier

food choices, and would therefore impact on the control parameter of ‘parent’s food decisions’.

Internationally, research suggests there is high consumer demand for nutrition labelling, with support for the idea of front of pack ‘sign-post’ labels (Grunert & Wills, 2007). While there is support for nutrition labelling, there is less evidence about its impacts on actual food purchases, with understanding of labels, lack of time to consider and compare nutrition information, and concerns about accuracy of information cited as barriers to use (Van Kleef, Van Trijp, Paeps et al., 2008). In New Zealand, focus group research with Māori, Pacific and low-income shoppers found similar barriers to use of nutrition labels in food purchasing, with the additional barrier of a perception that healthy food costs more (Signal et al., 2008). The results from Signal et al. (2008), suggest the introduction of a simple front of pack summary nutrition label would be well supported by Māori, Pacific and low-income shoppers in New Zealand. To increase the effectiveness of any front of pack label, the authors suggest it is included on budget brand items, and supported by a social marketing campaign to explain the label and promote its use.

9.5.4 Food outlets surrounding schools

The availability of ‘occasional’ type foods in close proximity to schools was identified as a barrier to improving children’s diets for three case study schools. Amongst the four case study school principals who discussed restricting the availability of ‘occasional’ food in the community near schools, there was some cautious support. There was also doubt about practicalities of implementing such an intervention. Limiting ‘occasional’ food available around schools was short listed for discussion with policy informants. There was more support from policy informants, who also seemed to consider availability of ‘occasional’ food in the community as a more significant barrier to healthier diets than identified from case study schools. Interventions to reduce the availability of ‘occasional’ type foods from around schools may impact on the ‘availability of food in the community’ control parameter, which was identified from the literature review. Because of the fairly common perception amongst school and policy informants of the negative impact of availability of ‘occasional’ food near schools, and some support for interventions in this area, limiting ‘occasional’ food near schools is included for consideration in the final portfolio.

Currently there is very little literature that documents interventions to impact on availability of foods in the community surrounding schools. Internationally there are some attempts to use urban planning to limit fast-food outlets (Mair, Pierce, & Teret, 2005; Spatial Planning Unit, 2008), and outdoor advertisements for tobacco and alcohol near schools, several of which have been subject to legal challenge (Hackbarth, Schnopp-Wyatt, Katz et al., 2001).

In New Zealand the statutory framework for urban planning is the Resource Management Act 1991 (RMA). The legislation has been criticised for its strong emphasis on maintaining 'environmental bottom lines' and its limited ability to reflect urban and social planning concerns (Perkins & Thorns, 2001). Due to the limitations of the RMA, recent attempts to influence social practices through urban planning have required separate pieces of legislation, such as the Gambling Act 2003. It is possible that attempts to limit children's exposure to food outlets and outdoor food advertising will require additional legislative frameworks. These in turn would require political support.

9.5.5 Summary of interventions within home and community

Unlike the school focussed interventions, most interventions identified within the home and community settings will require substantive policy developments, largely at a central government level. It could be argued that these are likely to have a greater impact on child nutrition, given the range of nutrition drivers identified by informants. For example, all informants to some degree linked time and money constraints within households to children's diets. Interventions that make healthy food choices easier, or more affordable, can therefore potentially impact on all children. In contrast, differences between case study schools suggest that interventions based within schools are unlikely to have universal impacts.

As a basis for deliberation and further policy development, this section has attempted to summarise the support for intervention options from informants and the literature, as well as highlight some issues to be considered in taking options forward.

9.6 Interventions not included for consideration within the intervention portfolio

As shown in Table 9-1, most interventions short listed for discussion with policy informants are included in some way within the portfolio of interventions to be discussed in the next chapter. The interventions discussed with policy informants and not being considered further include: guaranteeing any short-fall from schools trialling fundraising activities not using ‘occasional’ food; increasing school operating grants to reduce reliance on fundraising; government mandated bans on food items brought into schools; and extending support services into higher decile schools and to work more directly (‘hands-on’) within schools. The reasons why these interventions are not considered further is a lack of support from policy informants, combined with mixed support from case study school principals. The reasoning behind excluding each intervention has been discussed above, with the exception of extending the scope and focus of support agencies, discussed below.

Extending support agencies work into higher decile schools

Increasing the access of specialist nutrition support for mid to higher decile schools was included for discussion with policy informants, after identification from analysis of case study schools and tentative support from principals. Part of this discussion also focussed on whether outside agencies should undertake more ‘hands-on’ work within schools. Most policy informants were supportive of specialist advice for mid to higher decile schools, if additional resources were available. There was no signal from policy informants that this was viewed as an investment priority, with the exception of two informants closely aligned with support agencies.

A few policy informants challenged the assertion, gained through analysis of school informant interviews, that most nutrition programmes were targeted to lower decile schools. There was almost no support for nutrition support agencies to provide more ‘hands-on’ work within schools. Overall, extending the role of nutrition support agencies in schools received low levels of support from informants, and is not included for consideration in the intervention portfolio. A few school and policy informants did suggest an increased role of coordination between nutrition focussed programmes operating within schools. A possible role of coordination within a complex system is discussed in Chapter 10.

Other identified interventions

As stated in the introduction to this chapter, 28 interventions were identified from analysis of the case study schools. From these, 11 were selected for discussion with policy informants. A slightly different 11 have been selected for discussion as part of a recommended portfolio of interventions to support the work of primary schools in promoting healthy childhood nutrition. The 11 portfolio interventions are not exhaustive of all possible interventions. While the 11 portfolio interventions appear to meet the two criteria for effective interventions stated at the beginning of this chapter, other interventions may also meet the criteria.

Increasing the number of interventions will not necessarily increase the likelihood of change within complex school food environment systems. As resources are always limited, decisions must be made at some point regarding interventions to include and exclude. For this research, a series of decisions at each stage of the research have led to the inclusion of the 11 interventions discussed above.

9.7 A suggested intervention portfolio

An assumption of the research methodology was that the focus of policy interventions should be to impact on the ‘control parameters’ of the social systems from which childhood diet emerges. Control parameters are considered to be subsets of the system with particular properties to influence possible future states of the system (Byrne, 2001b). While intervening upon non-control parts of the system may also achieve desired results, change in control parameters may be more likely to generate system wide change.

The control parameters identified from the case studies are discussed in Chapter 7 (section 7.4). Table 9-2 lists the identified control parameters and suggests which portfolio interventions may impact upon the different control parameters. Six control parameters were identified across the five primary school case studies, with household economic resources and availability of food in the community identified through the literature review.

The interventions range across school, home and community settings, to form an intervention portfolio. Taken together the interventions have a good likelihood of

altering the childhood nutrition system to improve children's diets and prevent obesity. This is for two reasons. First because they have some support from both local and national level actors within the wider school food environment system, which may increase the likelihood of successful implementation. And second, because the interventions impact widely across school food environment systems. The impact across the child nutrition system is discussed in Chapter 10.

Table 9-2 - Identified control parameters and interventions to impact on control parameters

Environment	Control parameter	Intervention
School	School food rules/policies	School food policy
	School fundraising	Promoting/sharing good practice in fundraising
	Availability of 'occasional' versus 'everyday' food in school	Restricting availability of 'occasional' food
		School food policy
	Provision of food in school	
Home	Food brought from home	School food policy
		Social marketing
	Parent's food decisions	Social marketing
		Price of food
		Money available to spend on food
		Front of pack labelling
	Household economic resources	Price of food
Money available to spend on food		
Children's food preferences	Nutrition education (likely based within schools)	
Community	Children's food preferences	Restriction of food marketing
	Availability of food in community	Limiting 'occasional' food available around schools

As discussed in section 4.6.4, a process of prioritisation into four categories has been used amongst the 11 portfolio interventions. Four criteria are used to assign interventions to a category. These are: whether the intervention is likely to impact on a control parameter identified from case studies; whether the intervention is likely to

impact on multiple control parameters; whether the intervention has support from a wide range of informants; and whether there is research evidence of intervention effectiveness.

The categories aim to inform priority for implementation, assuming that not all interventions can be implemented at once. The categories do not suggest the overall importance of an intervention for impact on childhood nutrition. Because of non-linear interactions and local variability in complex systems, it is difficult to predict which interventions will have the greatest impact. However, it is assumed that category one interventions have more likelihood of effective implementation in the short-term, compared to category 2 interventions, and so on. Category one interventions may also have a greater theoretical likelihood of generating change in the school food environment systems, as they may impact on multiple control parameters. However, as discussed below, the effectiveness of category one interventions may be enhanced by interventions across the other three categories. The interaction between interventions is another reason why the entire portfolio is important, and prioritisation should only be used to guide implementation.

9.7.1 Category one interventions

Category one interventions are considered to impact on multiple case study identified control parameters, have some support from a range of informants and some level of research evidence of effectiveness. Two interventions are identified under category one: school food policies and reducing the availability of ‘occasional’ food in school. These are combined under the heading of school food policies, as it is considered that actions to reduce availability of ‘occasional’ food in school can be include within school food policies. As discussed below, the success of school food policies may be supported by category two and three interventions, such as fundraising support for schools and Fruit in Schools. While school food policies themselves are under the control of school Board of Trustees, the interventions to support school food policies have a local agency or government locus of control. Further discussion of school food policies is provided below.

School Food Policies: *focused on reducing ‘occasional’ food consumed at school and promoting healthy nutrition practices.*

Identified from primary school case studies, school food policies appear likely to impact on control parameters within both school and household settings. International literature suggests that school food policies can successfully reduce the amount of ‘occasional’ food available within schools, and have been associated with decreased BMI of students (Kubik et al., 2003; Kubik et al., 2005b). Policy informants described school food policies as a means of communicating expectations to parents and for driving changes to the school food environment.

Considering the number of system elements school food policies could potentially impact on (see Figure 10-1 for example), it may be that the development of school food policies could generate a ‘bifurcation point’ (Byrne, 1998), or ‘tipping point’ (Hammond, 2008), in the school food environment system, where the school food environment system qualitatively changes. The school food policy can act to guide the direction of that change by influencing the range of attractor states the school food environment system could move to.

Success factors for school food policies, identified from both case study primary schools and the literature, suggest that schools require motivation and support to develop a policy. As discussed above, US experience suggests a requirement for schools to have a wellness policy may have influenced school actions in this area. In this study, one case study school was in the process of developing a school food policy at the time of data collection, partly to meet the NAG 5 requirement to promote healthy nutrition and sell only healthy food at school. Analysis of the case study schools suggest that expert advice and encouragement from local support agencies acted as motivation to develop a policy. Advice and support may be part of a programme such as Fruit in Schools or the National Heart Foundation Healthy Heart Award.

For mid to higher decile (less socioeconomically deprived) schools, a need was identified for help with fundraising events that reduce reliance on ‘occasional’ food sales. The identified success factors related to school food policies, suggest that some of the interventions identified in category three below may help schools achieve development and implementation of effective school food policies.

A strong message from all informants who discussed school food policies was that they need to be relevant to each school and be developed with their school community. This

suggests that prescriptive regulations on what a school food policy should contain are unlikely to be appropriate. Good practice examples of successful school food policies, on the other hand, may be useful. The current approach of the NAG 5, limited to promoting healthy nutrition and not restricting food sales, may be sufficient to prompt schools to develop a food policy. However, it seems logical that the reintroduction of the additional requirement that schools sell only healthy food, would provide a greater stimulus to action within schools. The sale of healthy or unhealthy food is likely easier to measure and hold schools accountable for, compared to a more nebulous idea of promoting healthy nutrition. It is the reduction of ‘occasional’ food in the school setting which is associated with positive results on student BMI in the literature, as discussed above. Several school and policy informants also identified reducing ‘occasional’ food available in schools as an important action for promoting healthy nutrition more generally.

The NAG 5 also has the advantage of an existing monitoring and reporting agency in the Education Review Office, which may work as a negative feedback loop (Meadows, 1999) to keep schools aimed towards the goals included in the NAG 5. If the full NAG 5 requirement is reintroduced in the short term, the support materials already developed for schools, such as information packs and training sessions, can be utilised. Staff based in District Health Boards funded to support changes in schools to meet the NAG 5 have already been removed. An examination of how to better support middle and higher decile schools to develop food policies may be warranted. The case study schools showed some differences between higher and lower decile schools in nutrition practices and access to nutrition focussed programmes. Additional funding to programmes like Fruit in Schools, making it available to higher decile schools, may help these schools focus on nutrition and provide a direct benefit to children

Ongoing monitoring and evaluation of school food policy development could consider whether more prescriptive requirements than a NAG 5 type approach are required, and whether additional or different supports would aid policy effectiveness.

9.7.2 Category two interventions

Category two interventions are considered to impact upon multiple case study control parameters, with limited support from informants and research evidence of effectiveness. Three of the portfolio interventions are identified within category two: social marketing;

changing the price of food; and increasing the money available in households to spend on food. All three interventions are likely to be mostly within a central government locus of control.

Social Marketing

There was strong support for various forms of social marketing from both school and policy informants, although less evidence of impact on children's diets in the literature. School informants particularly identified social marketing to provide lunch ideas to parents and children, which might displace some packaged food brought into schools. A number of informants identified social marketing activities as important to support other interventions, such as restriction in food marketing to children. Social marketing interventions also have the opportunity to impact on both school and home settings. Within New Zealand, the Health Sponsorship Council (Health Sponsorship Council, 2009) is an experienced social marketing agency. This experience may be an advantage in producing effective social marketing campaigns.

Price of food / Money available in households to spend on food

If the price of food is a barrier to sufficient or healthy diets, then reducing the cost of healthy food, or increasing the money households have to spend on food, may improve diets. Interventions in these two areas are only identified as impacting on one primary school case study identified control parameter. However, they are linked with both literature review derived control parameters, so have been included in category two.

It seems likely that, changes to food prices may also impact on the food spending power of households. For this reason, interventions that affect the price of food and those that offset the money available in households to spend on food, will be considered together. It should be kept in mind, however, that they will each likely have different interventions, such as tax arrangements to impact on price, and income supplements or wage adjustments for money in households. The possible interventions in these areas are poorly defined in this research to date.

An issue that may need to be teased out in developing interventions, is the role of food security on food purchasing, and whether the price or income change needed would

change between food secure and insecure households. Also, the impacts across different types of households of a change in food price compared to a change in money available, should be considered. It may be that one type of intervention has more impact on diets for some types of households than others. There is little research evidence into actual impacts of changes to price or money available on the quality of diets. This appears to be a research need.

From a complexity theory perspective, households may provide different local ‘initial conditions’, which could generate quite different system outcomes in the future. An example may be the impact of removing GST from some foods, which may benefit the households who are already spending higher amounts of money on these foods. For those households where additional money becomes available, the impact of social marketing or nutrition labelling interventions may increase if the additional money increases the food choices available to buy. In designing interventions in this area, a range of approaches may be required to take account of the range of initial conditions operating within households.

9.7.3 Category three interventions

Category three interventions are considered to likely impact upon one identified control parameter, with limited support amongst informants and research evidence of effectiveness. Four of the portfolio interventions have been identified within category three: promoting good practice in school fundraising; nutrition education; restriction of food marketing; and Fruit in Schools. Fruit in schools has been separated from other interventions about providing food in schools, because of different levels of support from informants.

Supporting good practice in school fundraising

There was general agreement amongst informants that, if possible, schools should be replacing fundraising activities using ‘occasional’ food. School informants were positive that being supported with more ideas would help make the switch in types of activities undertaken. There is already work underway within New Zealand agencies to provide schools with ideas about fundraising events to replace the sale of ‘occasional’ foods (Sport and Recreation New Zealand, 2008b). Fundraising seemed more of an issue with mid-higher decile case study schools, and may be more effective in supporting other

interventions, such as school food policies, than creating system changes on its own. Compared to some of the other interventions, this may be a low cost option.

Nutrition Education

The link between students' learning about food and nutrition, and consequent diet, is not clear in the literature. However, there is almost universal acknowledgement from school and policy informants that education is the key role of schools, and nutrition education is a practical and achievable action for schools. A number of school informants mentioned the current support provided by agencies for teacher training and lesson support in relation to nutrition. This appears to be important for effective teaching in this area. Continued investment in nutrition focussed school support agencies is likely required. It could possibly be expanded to provide more support for mid to higher decile schools. These agencies were also identified above as supporting schools to develop food policies.

Restriction of food marketing to children

Restricting food marketing to children links to one control parameter, children's food preferences. If the research question was how to improve children's diets, rather than how to support primary schools to promote healthy childhood nutrition, this intervention may be a category one intervention (refer to policy system maps in Chapter 5, to see how advertising is identified in multiple settings). As discussed earlier, there is growing research evidence that advertising plays a role in children's food preferences and consumption. The role of marketing on children's diets was acknowledged by most school and policy informants.

While a majority of informants favoured some reduction in advertising of 'occasional' foods, opinion on appropriate interventions was somewhat mixed. There are numerous examples around the world of different approaches to this issue. As of yet, research evidence about the most effective regulatory or control mechanisms is lacking. More dialogue between a variety of stakeholders about an approach appropriate for New Zealand is likely required to develop a practical intervention.

Fruit in Schools

Fruit in schools is likely to impact on one identified control parameter, received some support from a range of informants, with some limited evidence of effectiveness in the literature. Fruit in schools is not identified as a separate intervention in Table 9-2, but is assumed under provision of food in school, and is linked to availability of ‘occasional’ versus ‘everyday’ food in school. It has been separated out from school breakfast and lunches, however, as the level of support for Fruit in Schools far outweighs these other intervention options. The Ministry of Health has announced that an evaluation of the existing Fruit in School scheme will be completed in 2009, with a decision on the future of the scheme made following receipt of the evaluation (Ministry of Health, 2009a). From this study, it appears that further deliberation regarding continuation and expansion of the scheme is warranted. The stakeholders to be included in deliberation could include schools, fruit growers, politicians, and health and education policy makers.

Questions remain about effectiveness of the Fruit in Schools scheme in higher decile schools, as this has not been the focus on the current programme. By itself, this should not stop expansion of the programme into higher decile schools, if this is supported by stakeholders. Incremental implementation and ‘real-time’ evaluation approaches, discussed in Chapter 3, can be employed to adapt the programme in iterative stages. It may be worth investigating, as one policy informant noted, options for funding a Fruit in Schools scheme through taxes on soft drinks or on sugar more generally. A tax on soft drinks, for example, may have small population health benefits of its own (see section 9.4.1), and aid sustainability of the Fruit in Schools scheme.

9.7.4 Category four interventions

Category four interventions are considered likely to impact upon one identified control parameter, but lack support from informants and research evidence of effectiveness. Three portfolio interventions are identified under category four: front of pack nutrition labelling; provision of breakfast and lunch at school; and limiting ‘occasional’ food available around schools. As category four interventions, these may require significant research to inform intervention design, or be considered for implementation later than some of the category one to three interventions.

Front of pack nutrition labelling

A simple front of pack signpost nutrition label may impact on the parent's food choices control parameter, and had some support from the limited number of informants who discussed this option. The research evidence of impact on actual food purchasing practices is limited. Having said this, front of pack labelling does appear to be an intervention worth exploring further. Front of pack labelling may act to support education and social marketing efforts to improve nutrition.

Provision of breakfast and lunch at school

From the school perspective, the provision of free breakfast and lunch at school is only likely to directly impact on one control parameter – availability of 'occasional' versus 'everyday' food in school, assuming that the food provided met the 'everyday' criteria. Indirectly it is possible that this intervention will also impact on parent's food decisions. If providing food at school reduces the amount of food brought from home, then breakfast and lunch may also impact on the food brought from home control parameter.

The actual impact on the quality of children's diets is unclear, as much of the research overseas highlights the poor quality of foods served (Nelson et al., 2007). It is also unclear what impact the provision of food at school may have on food insecure households, although it seems logical to assume largely positive impacts if additional food of high nutritional standards is provided. Additional food provided at school may reduce the food required to be purchased for households. As discussed above, breakfast provision may be able to meet multiple aims of improved diet, supporting educational achievement, and supporting working parents.

There was a range of views on the provision of free breakfast and/or lunch in schools from school and policy informants. There was considerable uncertainty about how it might practically work in New Zealand, with the existing minimal kitchen and dining infrastructure in most primary schools (Carter & Swinburn, 2004). Provision of breakfast and lunch may be one of the more costly intervention areas identified. Increasing the evidence base of how different models of provision impact on nutrition and education outcomes, would assist intervention design before large scale investment is made.

Limiting ‘occasional’ food available around schools

There seemed to be a fairly common perception amongst school and policy informants, that the availability of ‘occasional’ food for sale near schools could have a negative impact on children’s diets. There was minimal support, however, for interventions to limit ‘occasional’ food available around schools. From the literature there were few examples of successful interventions. Further research to determine the feasibility of interventions in this area may be a useful addition to the portfolio to support the promotion of healthy nutrition within primary schools.

9.7.5 Interventions to address complexity

To take account of local variations, and to actively navigate the interaction between multiple complex systems (such as home, school and community settings), one more intervention area outside of the four prioritisation categories may be required. This was suggested by a two school informants, and a few policy informants - local coordination of services and tailored support for schools.

Feedback from system elements, within and between social systems, can act as an input into a system. Feedback is likely to originate from a range of sources, including: parent reaction to proposed school rules; the introduction or withdrawal of a service from a local agency; or an increase in unemployment leading to a rise in hungry children at school because households have less money. Somebody at the school may need to manage feedback, whether that involves a change to policy, or linking with specialist agencies. From the school case studies it appeared that school staff are currently stretched providing the core education functions of schools. Also, not all schools have to currently have interaction with outside support agency staff. Schools may need a person who can join the dots between agencies, identify trends and emerging issues for the school, and link schools into processes of dialogue in intervention design.

No research literature relevant to a coordination intervention was identified, and it was discussed in depth with only two informants. However, from a practical and theoretical perspective, such a role is likely to be required for successful multi-component interventions across complex systems (Finegood et al., 2008). It is possible that a clustering arrangement of geographically proximate primary schools could share a coordinator, who could focus on health and social issues more broadly. Attempts to

move in this direction were made with HEHA education coordinators placed within District Health Boards. The suggestion here is that more coordination may be required. If coordinators had a wider focus than strictly nutrition and physical activity, then they may be better placed within an education setting than a health setting. Having said this, with a key aim of breaking down sector barriers, the agency that hosts coordinators may be less important than the access to information and the relationships they have.

9.8 Conclusion

This chapter has addressed the first aim of this thesis by identifying a portfolio of interventions to support primary schools to promote healthy childhood nutrition. Consideration of intervention and implementation design issues of the portfolio has also been begun through this chapter. Twenty-eight interventions were originally identified from the six case study schools. After considering support from school principals, policymakers, and combining a number of similar interventions, a list of 11 interventions has been developed for policy consideration within a portfolio of interventions (see Table 9-1).

There is a range of support for these interventions across school and policy informants, ranging from little support to strong support. Most interventions discussed with informants gathered a mixed response in terms of support, or agreement that the intervention will have a positive impact on children's diets and could be realistically implemented. The literature reviewed in this chapter also shows a mixed level of evidence of effectiveness. Some interventions, such as school food policies and restricting the availability of certain foods within schools, have an emerging evidence base which suggests positive impacts. Other areas, such as interventions to impact on the price of food, appear to have little research evidence to guide intervention design or support claims of effectiveness, but nonetheless appear worthy of further investigation.

By considering how the portfolio interventions may impact on complex primary school food environment systems, some implementation priorities can be determined. Prioritisation does not reduce the need for a multi-intervention approach, and should not be viewed as licence to cherry pick one or two of the identified interventions. The strength of the portfolio approach is the combined effect on complex systems.

The impact of portfolio interventions across school food environment systems, and the wider child nutrition system, is considered in more detail in the next chapter. The next chapter also examines the strengths and limitations of the current research in order to consider the utility of the complexity theory informed method for policy analysis and research used here.

The portfolio of interventions identified here is not the end of the story. There are still many questions to be answered in detailed design, particularly for interventions with a impacting more within home and community settings. As discussed in Chapter 3, complexity theory suggests the need for an iterative approach to intervention implementation and development, which takes account of local context. Deliberation between local and national stakeholders is identified as one way to negotiate local system dynamics and guide such an iterative process. This research can be used as a starting point for such deliberation.

Chapter Ten

Discussion of system wide impacts and a reflection on methods

10.1 Introduction

This chapter draws the thesis to a close and seeks to answer two questions: (i) are there any wider issues or impacts regarding the identified portfolio of interventions to be considered; and (ii) how useful has the developed method been for policy analysis, and how can it be improved.

To answer the first question, this chapter will consider possible impacts of the portfolio of interventions on school food environment and wider child nutrition systems (section 10.5). It is suggested here that the intervention portfolio, discussed in Chapter 9, may have a slightly wider significance than only supporting primary schools to promote healthy child nutrition. A brief comparison with other policy focussed obesity research is also made (section 10.4), before reflection on the research in relation to Māori and Pacific children (sections 10.6 and 10.7).

The second question addresses the second aim of this thesis, to explore the use of complexity theory for identifying and researching policy interventions to address complex issues. To answer the second question, the bulk of this chapter will consider how useful the complexity theory informed research method was, by analysing the strengths and limitations of this research (sections 10.8 and 10.9). The chapter then considers possible further research topics to strengthen both intervention and method results (section 10.10). The thesis is brought to a conclusion in section 10.11, where the overall findings of this thesis are revisited, with a brief consideration of their significance to public health. To begin, however, a brief summary of the research to date is presented below.

10.2 Research questions and methods

Reducing rates of obesity in the general population, and for children, is a high priority in New Zealand (Ministry of Health, 2000), as it is in much of the world (World Health Organization, 2004). The social, educational and health consequences of

obesity for children have been well documented (Datar & Sturm, 2006; Reilly, 2005), with downstream impacts on chronic disease for adults (Sattar & Lean, 2007; World Cancer Research Fund / American Institute for Cancer Research, 2009). Schools have been identified as a key setting for interventions to improve the diets of children (Story et al., 2006).

The first aim of this research was to identify policy interventions that would support the role of primary schools in promoting healthy childhood nutrition to improve children's diets. An anticipated longer term benefit of improved diets is assumed to be the prevention of excess weight gain leading to overweight or obesity amongst children. Children's nutrition practices, and childhood obesity, are complex phenomena that create complicated challenges for the design of policy interventions. The second aim of this research was to develop and test a method for policy analysis of complex phenomena, such as childhood nutrition practices.

For this research, primary schools were considered to be complex systems, nested in and interacting with other complex systems within which children live their lives, such as the home and community. To research policy interventions within complex systems, a five stage research method was developed (Chapters 3 and 4), that sought to integrate an understanding of childhood nutrition and excess weight gain through: research literature (Chapter 5); local knowledge and needs through primary school case studies (Chapters 6 and 7); and regional and national level perspective through key informant policymaker interviews (Chapter 8).

The five stage research method, informed by complexity theory (Byrne, 2005a) is outlined in Figure 10-1. This is essentially a case-comparison method. Stages one to four cover: case selection; data collection and analysis to develop a description of the school food environment operating in each case study school; identification of possible interventions; and a case-comparison. Stage five attempts to engage policymakers in considering the results of the case-comparison work and further refine the identification of possible policy interventions.

A key assumption in identifying policy interventions was that areas of commonality in stakeholders' views on the causes, consequences and solutions for children's dietary

practices, would form the basis for developing interventions. Several of the identified interventions are currently too broadly defined to be practically implemented. For example, influencing the price of food to make ‘healthy’ foods relatively more affordable than ‘less-healthy’ foods is identified as an intervention area. However, the actual policy mechanisms to achieve this have not been well defined. Where interventions require more development, the results of this research may help facilitate deliberation between school and policy stakeholders to inform detailed policy intervention design. The areas of commonality between stakeholders can be taken as the impetus for working productively together.

10.3 Summary of intervention portfolio

From 28 intervention options identified from the case studies, 11 have been included within a final intervention portfolio. The portfolio is not the only possible set of interventions that could be applied. Instead it provides a range of interventions that, taken together, have an opportunity to change primary school food environment systems. The portfolio interventions were classified into four priority categories, as a guide for planning implementation.

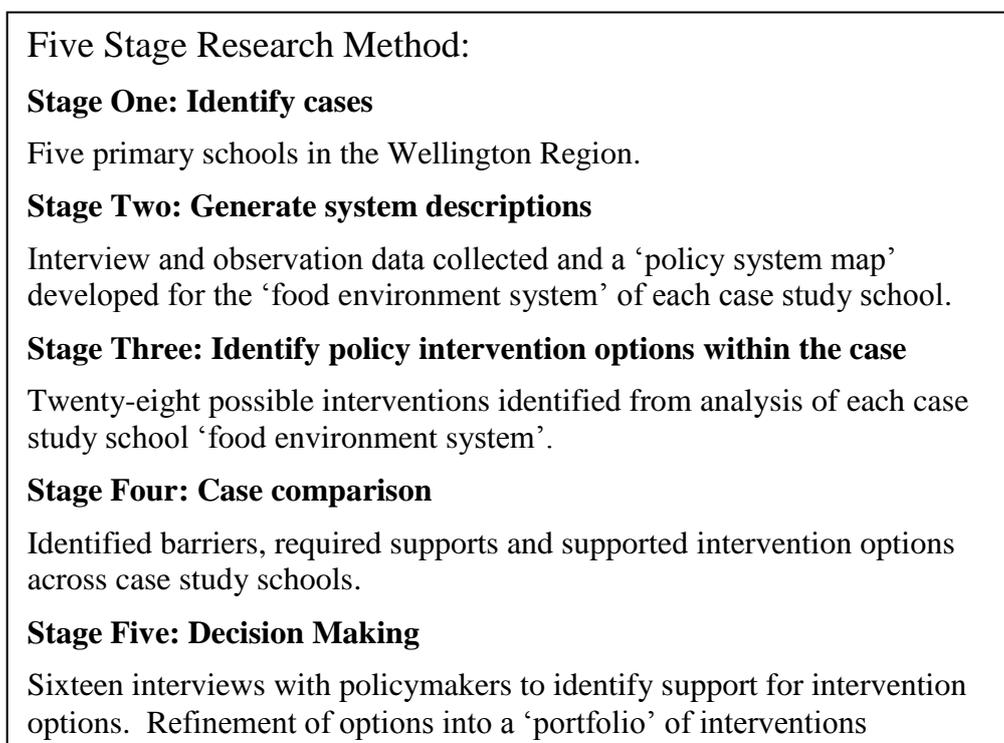


Figure 10-1 - Summary of research method

This research suggests that school food policies, which reduce ‘occasional’ and increase ‘everyday’ foods available and consumed within primary schools, are the top intervention priority for improving children’s diets at school. It appears that schools would benefit from encouragement and support to invest the time required to develop an effective food policy. A mixture of carrot and stick may be applied here. The stick (albeit a relatively soft stick), involves re-introduction of the NAG 5 requirement that only healthy food is sold at school. The carrots include slightly lower priority programmes such as: Fruit in Schools, which could be expanded; supporting nutrition education; and promoting good practice in school fundraising.

School food environment systems appear likely to contain elements based within home and community settings, as well as within the school setting. As a result, interventions focussed more in homes and communities may also be required, including: increasing affordability of healthy food through price and income manipulations; and at a slightly lower priority, restricting food marketing to children. Across home, community and school settings, interventions with a lower implementation priority, or that require significant research to better define, were identified as: front of pack nutrition labelling; provision of school breakfast or lunches; and limiting the availability of ‘occasional’ food around schools.

Given the variation in school food environment systems shown in case studies, flexibility is likely required for schools. Tailored support and coordination may be required, while too many prescriptive requirements are unlikely to be helpful.

10.4 Comparison with other obesity policy research

While there have been a number of review based articles considering policy options to impact on obesity, both generally and focussed on schools (e.g. Cawley, 2006; Lang & Rayner, 2005; Lang & Rayner, 2007; Sacks et al., 2008; Story et al., 2008), there has been little empirical research conducted into policy intervention options. Two recent studies have been published examining policy options to address obesity in general, with some emphasis on children and schools (Brescoll, Kersh, & Brownell, 2008; Lobstein, Millstone, Jacobs et al., 2006; Millstone & Lobstein, 2007). These

studies have examined the views of experts in policy and/or obesity related service communities.

Three common findings from these two studies are evident: (i) that informants consider a portfolio approach of policies is required to tackle the multifaceted causes of obesity; (ii) a perception exists that the most effective policies, in terms of impact on rates of obesity, have poor acceptability amongst policy stakeholders and high cost; and, (iii) that interventions within schools offer a good mixture of effectiveness and acceptability.

Interventions with support across the studies include: improving the availability of sports facilities; improving nutrition labelling; improving the food for sale in public institutions (including schools); increasing control over advertising (Millstone & Lobstein, 2007); improving school lunches; expanding free fruit and vegetable programmes; and, increasing funding for research and assessment of interventions (Brescoll et al., 2008). Several of these interventions are consistent with the recommended portfolio, with some of the differences likely to relate to a wider focus on obesity generally, rather than children and schools.

While useful for comparison, the studies listed above did not use primary research to identify the intervention options to be considered by experts. Instead they were identified by researchers from reviewing literature. This means that the interventions considered are not based on local realities. Identifying the interventions in this research through local data collection, informed by literature, is seen as one key strength of the current research.

The findings of the research in this thesis are largely consistent with intervention recommendations for schools made by the Centres for Disease Control (CDC) in the US. The CDC has identified ten interventions to address childhood obesity (Story et al., 2009). Two of these relate to school nutrition and physical activity policies, while another two focus on making healthy options available to children while at school, and two more relate to nutrition and physical activity education. It is also suggested that a school health coordinator is in place, and that mechanisms such as school health councils are used to engage students.

Finally, Haby et al. (2006) developed a method to assess the cost-effectiveness of obesity interventions aimed at children and adolescents. The study concluded that the number of children impacted by an intervention is a key factor in determining population impacts and effectiveness. What the results of Haby et al. (2006) may suggest, is that restricting interventions to a minority of schools or a highly targeted group of households, could reduce population impacts and cost-effectiveness of interventions.

The approach used in the cost-effectiveness study of Haby et al. (2006) is interesting for comparison to the current research. In Haby et al. (2006), each intervention considered within the cost-effectiveness model was considered in isolation and not as part of a portfolio. Interaction between interventions, important from a complexity theory perspective, was not considered. If the portfolio of interventions described in this current study led to a qualitative change in primary school food environments (a change in attractor state), then the assumptions within a cost-effectiveness model may no longer be accurate. From a complexity theory perspective, it may be that cost-effectiveness should evaluate how an intervention may act to generate change in a system, rather than how it may achieve longer term changes to emergent phenomena, which requires an assumption of system stability over time. The implications of complexity theory for intervention evaluation and cost-effectiveness studies are just beginning to be explored (Shiell, Hawe, & Gold, 2008), and appear to be a worthwhile avenue of further policy relevant research.

10.5 System Wide Effects of Interventions

The approach of this research assumes that no one policy intervention will provide the 'magic bullet' of successfully promoting nutrition through primary schools with an impact on overweight and obesity. Most authors in the area of obesity policy point to the need for multi-component programmes that impact over a range of settings and environments (Sacks et al., 2008; Story et al., 2008; Swinburn et al., 2005). A framework is needed to guide selection of multiple interventions that will reinforce, rather than counteract, each other. As discussed in Chapter 3, for the purpose of identifying policy level interventions to change a complex system, control parameters

should be targeted (Blackman, 2006). Change within the system will hopefully lead to change in the emergent phenomenon of interest, in this case child nutrition.

An assumption used in this study is that control parameters are highly linked within a social system. Because of their connections within a system, control parameters may have some sort of direct impact on several other system elements. The type of impact is difficult to predict, as a key feature of complex systems is the non-linear interactions between elements (Gatrell, 2005). Control parameters are also considered to be external inputs into the social system (Ricklees et al., 2007), and act to determine the range of possible attractor states (broadly considered to be the collective structure of a system) that a system can move to (Byrne, 1998). Control parameters may be sites where feedback is distributed through the system due to their connections. Feedback can be negative, acting to keep the system in its current state, or positive and promote system wide change (Chapman, 2002).

Combining the concept of non-linearity and control parameters, small changes in control parameters have a greater theoretical opportunity to lead to system wide change, than small or even large changes in some other system elements. While this theory suggests influencing control parameters should become the focus of interventions within complex social systems, an intervention impacting on any system element has the potential to in turn impact on control parameters and the system as a whole.

By overlaying the identified portfolio interventions (see Table 9-2) onto the literature derived policy system maps from Chapter 5, we can begin to appreciate how interventions may interact on the school food environment and child nutrition systems. Figure 10-2 below shows the primary school setting policy system map, with identified interventions connected to the system elements they may impact on. Control parameters are darker than other system elements.

Figure 10-2 illustrates that school food policies, provision of food in schools and restricting 'occasional' food in school, appear to impact on the highest number of system elements, including multiple control parameters. The map also suggests that most system elements are impacted on by more than one intervention. From looking

at Figure 10-2, it seems to support the intervention portfolio as an approach that would impact widely across the school food environment.

Of course, Figure 10-2 depicts a generic system description developed from research literature. If shown instead on the five case study school policy system maps (Chapter 6), the comprehensiveness of the coverage may differ between maps. It seems likely that for some case study schools the coverage of interventions across the system will be less than shown in Figure 10-2. For other schools the coverage may be similar or better. However, there is likely to be some degree of intervention coverage across the food environment systems for all case study schools, as the interventions were identified from analysis of case study school system descriptions in the first place.

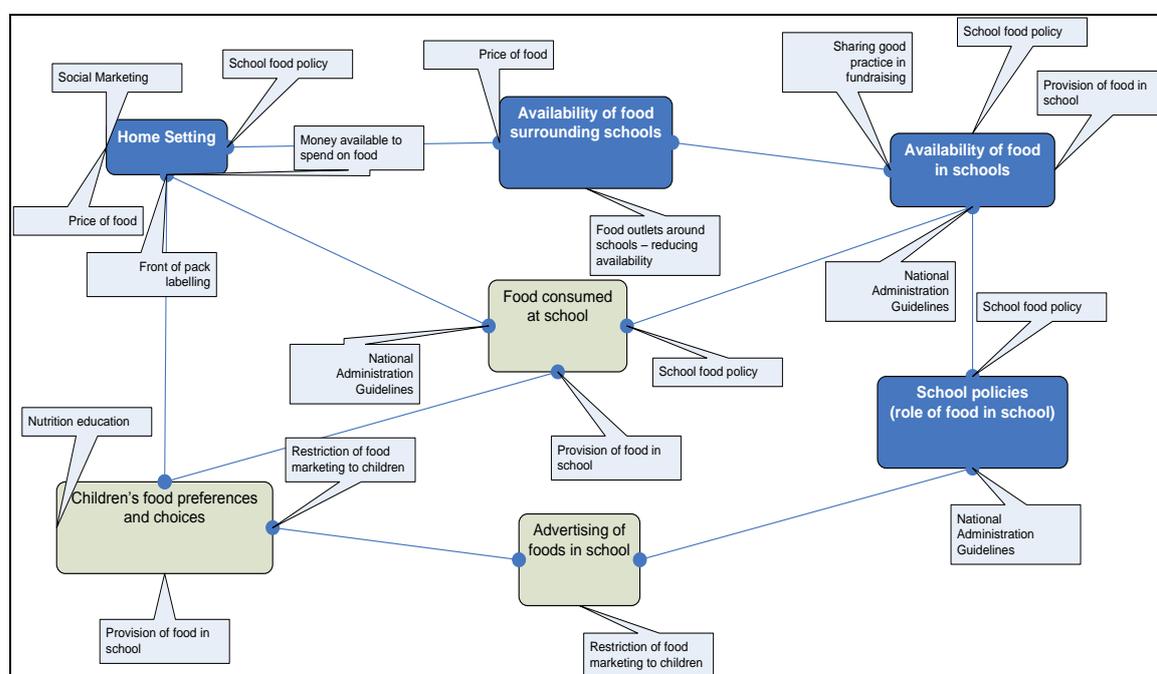


Figure 10-2 – Primary school setting policy system map with identified interventions

A wide coverage of the portfolio interventions across different primary school food environment systems would suggest two things. First, that the portfolio of interventions may be applicable to all primary schools in New Zealand. By impacting so widely across the generic system description, it seems a reasonable assumption that at least some of the interventions will be applicable to most primary school food environment systems. Second, that local flexibility to develop additional

interventions to impact on specific food environment system elements for specific schools may still be required. This is particularly important if the control parameters operating in a school do not appear to be well represented by the results of this study. In other words, there is likely to be a limit to the generalisability of this research, and flexibility may be required to accommodate this. Such a qualification of the generalisability of these research findings appears to be a necessary consequence of taking a complex systems perspective.

The portfolio interventions may also impact on the wider child nutrition system, as outlined in Chapter 5. Figure 10-3 below shows the literature based policy system map of the home environment in relation to children's nutrition, with the portfolio interventions shown. Almost all system elements are potentially impacted on by at least one portfolio intervention, including the two identified control parameters. Whilst there seems to be a reasonable coverage of interventions across the home setting, the coverage is less than that achieved in the school setting. The reasons for this appear to be that interventions focussed within home and community settings are shown to impact within the school policy system map (Figure 10-2), but this is not reciprocated. No school focussed interventions are shown to impact in the home setting, or in fact the community setting (Figure 10-4).

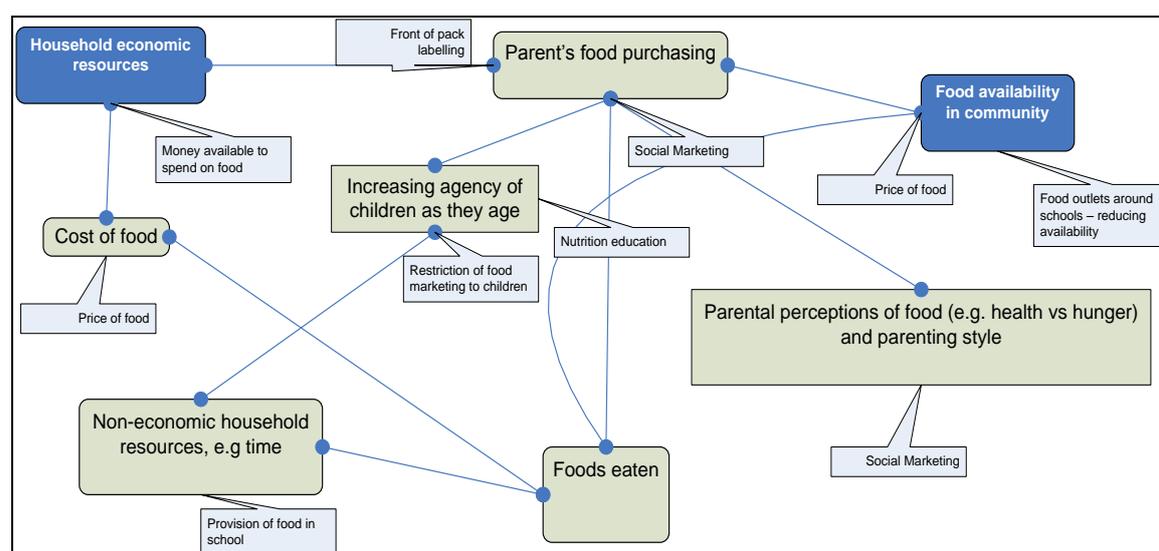


Figure 10-3 - Home setting policy system map with identified interventions

Figure 10-4 shows the literature based community setting policy system map, with identified interventions. This shows only three interventions are likely to impact directly within the community system related to child nutrition. The limited impact of portfolio interventions, as with the limited detail within the community policy system map, may be due to these aspects of the child nutrition system being further away from the research question focus on primary schools. In the discussion below, the issue of system boundaries and implications for knowledge are considered.

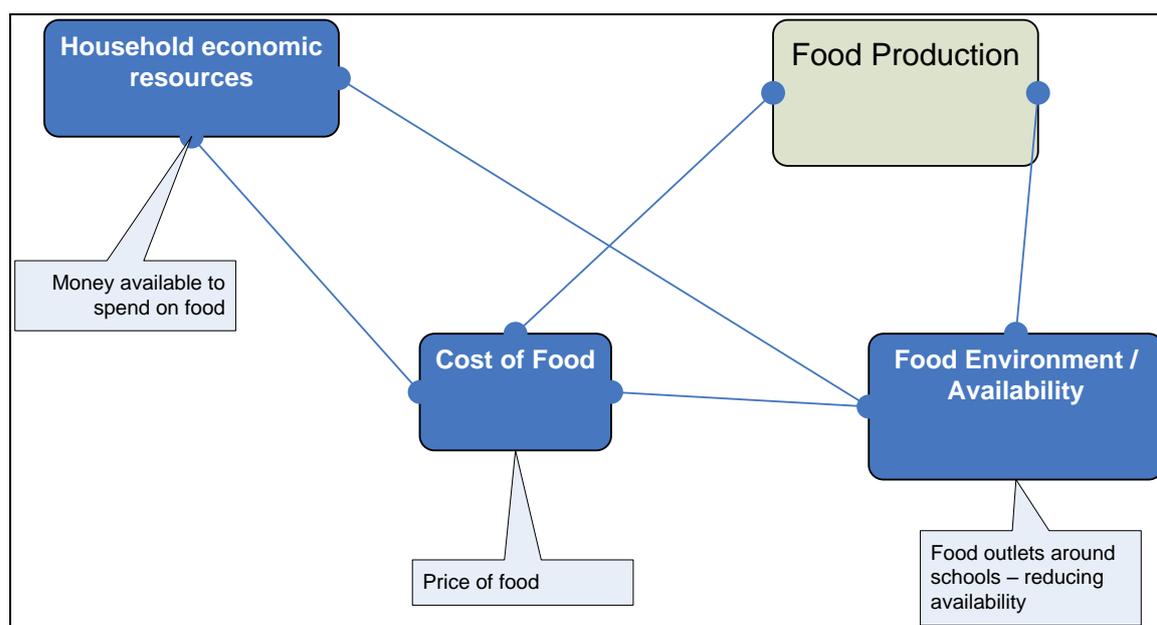


Figure 10-4 - Community setting policy system map with identified interventions

Figure 10-5 shows the child centred literature derived policy system map, with identified interventions. Like the school setting (Figure 10-2), the child centred setting includes elements of school, home and community environments. For this reason interventions focussed across the three environments appear as impacting on the child centred system related to child nutrition.

It is to be expected, given the research question focus on primary schools, that the primary school system (and similar systems such as the child-centred setting) will experience the greatest impact from portfolio interventions. The figures above, however, offer a reminder that the research question places boundaries that help define the system of interest. Research findings are likely to be less relevant as these

system boundaries are met and exceeded. Having said this, a focus on primary schools may also have some impact on the wider child nutrition system, given the relevance of some interventions between settings. Of course this impact is likely to be reciprocal, with interventions aimed at policy areas, such as income adequacy, possibly having an impact on children's diet at school.

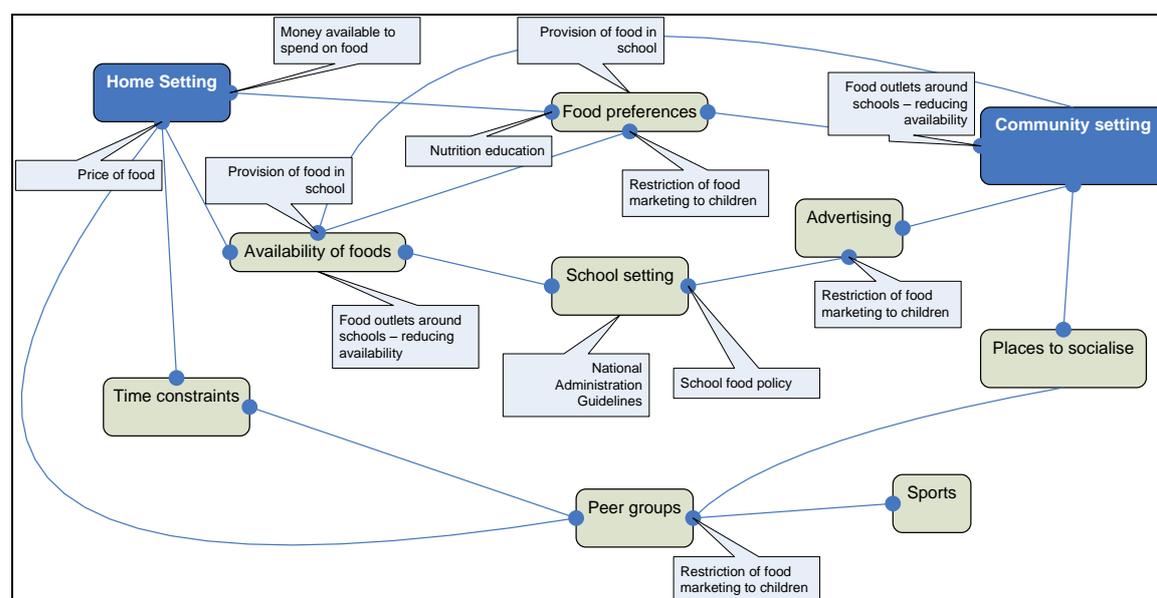


Figure 10-5 - Child centred setting policy system map with identified interventions

10.6 A focus on Māori children

Māori children are over-represented in the obesity statistics (Ministry of Health, 2008a; Parnell et al., 2003). An effort was made within this research to consider how interventions may impact on Māori children. This included Māori advice in developing the research question and method, inclusion of a kura kaupapa in the case study schools, collaboration with a Māori researcher and recruitment of Māori policy informants. This section briefly highlights results of particular relevance to Māori and considers implications for portfolio interventions.

Some interesting differences between Māori and non-Māori views were evident. Food was seen as an important part of teaching within a Māori worldview, or tikanga Māori. All other case study schools seemed to view food within the school as more of

an add-on to the school's job of educating children, even if an important add-on. In general, Māori kura and policy informants were less supportive of policy interventions that would impose restrictions on schools or communities, such as bans on advertising. There was support for meals provided at schools, with a preference for locus of control to rest with the school or community, rather than government. In general, there was a perception amongst the Māori informants that schools should be viewed as an integral part of a community, a community resource, and therefore the community should lead developments within the school.

These results suggest a model for implementing nutrition focussed policy interventions with relevance for Māori children. The kura kaupapa was able to access a range of supports, and due to its decile ranking, more operational funding than some other case study schools. Combined with successfully accessing whānau resources, family members with particular skills such as gardening, the kura appeared to have the resources required to develop a healthy approach to food that suited their purposes. In complexity terms, the resources available allowed for possible system attractor states that enabled a healthy food environment to emerge. It may be that a worldview that integrates food with learning, and the school day more generally, is just as important as the resources in allowing the emergence of a healthy food environment.

As a model of nutrition promotion for other primary schools in New Zealand, the kura findings suggest that three things are required: (i) sufficient economic resources to implement food environment changes; (ii) flexibility in how a school responds to local needs and utilises local resources; and (iii) viewing food as an important component of learning. Most of these components were already in place for most case study schools. A couple of informants suggested that interventions at the general population level have not always had an equal and positive impact for Māori children. This suggests more specificity in intervention design, with Māori involved in the design and implementation, if not leading these processes.

10.7 A focus on Pacific children

Pacific children are also over-represented in obesity statistics (Ministry of Health, 2008a; Parnell et al., 2003). The Pacific voice in this research is not strong. A majority of students at case study school A were identified as being of Pacific ethnicities and one policy informant identified as Pacific. Due to the lack of Pacific voices amongst the informants, some caution is required in interpreting comments regarding Pacific children and families. Given the burden of overweight and obesity amongst Pacific children, the lack of Pacific voice can be seen as a weakness of the research. Further research into interventions that will be effective for Pacific children and families is needed.

More so than other population groups, informants suggested a lack of nutrition knowledge amongst Pacific parents can act as a barrier to healthier diets. In particular the link between healthy diets and overall health was made; with a suggestion that some Pacific people consider having enough food to eat as equivalent to a healthy diet. Part of this understanding may relate to food insecurity, which informants identified as an issue affecting Pacific peoples' diets more so than the general population. The negative effect of food insecurity on Pacific peoples' diet has been shown in a recent Pacific families cohort study (Rush et al., 2007).

Within schools, informants suggested that Pacific parents are less likely to actively engage in policy or intervention development. In developing interventions to target local needs, a lack of engagement by any group jeopardises the effectiveness of interventions. Primary schools may benefit from tailored support to effectively engage Pacific parents. There appears to be little published research on the effectiveness of health policies for Pacific people. When conducting more detailed design of portfolio interventions, ways of effectively engaging and delivering services to Pacific children and families should be considered to enhance effectiveness.

The results related to both Māori and Pacific children highlight an important point for addressing health equity through context sensitive methods. That is the need to consider local variability and flexibility of policies in terms of cultural as well as socioeconomic contexts. To focus on only cultural or socioeconomic context would

likely miss subtleties in their interaction, with impacts on both understanding of the school food systems and identification of intervention options.

10.8 Evaluating a complexity theory approach to health policy analysis

The second aim of this research was to develop and test a method for policy analysis of complex phenomena. Promotion of nutrition within primary schools, and prevention of overweight and obesity, has been used as a test case. By analysing strengths and limitations of this research in identifying policy interventions for promoting healthy nutrition in primary schools, this section will also provide insight into the utility of the method for policy analysis and research more generally.

Consideration of interventions to reduce the prevalence of obesity in populations has markedly increased in sophistication over the last ten years. From the ANGELO framework (Swinburn et al., 1999), through to comprehensive ecological and system dynamic understandings of influences on obesity (Butland et al., 2007; Story et al., 2008), examining policymaker views on interventions (Millstone & Lobstein, 2007), and frameworks for considering policy interventions to impact on obesity (Sacks, Swinburn, & Lawrence, 2009; Sacks et al., 2008). A common feature of these developments is that the amount of information required to have an understanding of the ‘system’ from which obesity emerges increases, while responsibility for policy action is distributed widely across different levels of government and non-governmental organisations. This breadth of information and sites for intervention can lead to confusion around which actions are required to move the ‘system’ in the desired direction, or at worst justify inaction (Shiell, 2008).

This research has sought to develop a method for policy analysis focussed on intervention option identification and analysis, informed by complexity theory. The method aimed to: generate action, rather than inaction, by engaging stakeholders involved within the system of interest; and to identify a manageable list of interventions to support schools to promote healthy childhood nutrition. It was also intended that the scale of the method should be applicable to the resources available within policy based organisations, based on the author’s experience. The strengths

and weaknesses of the method, and the study, are presented under five headings below.

10.8.1 Case study method

In general, the collective case study design used for this study was useful in identifying the degree of similarity and variation that may exist between primary school food environment systems. Understanding the possible variation between schools is important for considering the generalisability of results. As discussed in Chapter 4, understanding variation helps to consider why multiple interventions may be required. Taking into account these stated advantages of a collective case study approach, the degree to which the study picks up similarity and variation between school food environment systems is important for generalisability and reliability.

For this study, the number and range of primary schools for inclusion were based on differences between nutrition practices, overweight and obesity amongst groups of students identified in the literature. The resources available for the study were also a factor. There seems to be a reasonable degree of difference between the case study primary schools along location, socioeconomic status, number of students, ethnic mix of students, and involvement with health promotion programmes. The ‘initial conditions’, related to nutrition within the school, also appear to differ. Some schools had well developed food policies and actions in place; others had only begun to address nutrition related issues.

Because of the differences evident between case study school food environment systems (see Chapter 6), some confidence can be had that the school characteristics used to categorise schools, are useful for considering school food environment systems. The similarities between case study food environment systems suggest that aspects of the research may be generalisable to primary schools outside the sample. The differences between case study school food environment systems, suggest that not all results will be applicable to all schools. For example, fundraising related interventions may be less applicable to low decile schools. It is unlikely that increasing the number of schools in the sample would substantially increase the generalisability of results. This is because every school is likely to have some unique configuration of elements, interactions and historical development of their food

environment system. Having said that, adding a fully rural school, or having one school from every decile, may have provided for a slightly more refined case-comparison.

Utilising a method like cluster analysis (Byrne, 1998) may have identified more definite categories of schools that could have been sampled. However, as BMI or nutrition information is not available for schools in New Zealand, the categories identified in a cluster analysis would not necessarily relate to differences in school food environment systems. In this case, it seems unlikely that the categories would be any more illuminating than the method used here for case study selection, based on differences between schools suggested by the literature.

The case study primary schools were recruited through members of the local public health agency who work with schools to implement programmes such as Fruit in Schools. Not all schools had active programmes in place, but there were personal relationships developed between all case study school principals and members of the agency. This may have biased the participating schools to those more favourable to primary schools having an active role in nutrition promotion. As a result, the indication of support for interventions from case study school principals may be more positive than would be the case of primary school principals more generally.

10.8.2 School food environment system descriptions

System descriptions, in the form of policy system maps, of the school food environments were a key output of the case studies. The literature generated school case study map helped to identify the range of data that may be required from the case studies. The school case study policy system maps were used to identify control parameters and to help identify intervention options for each case study school. Because of the central role the system descriptions played in this research, the accuracy of the descriptions is important for the research conclusions. This is particularly true for the prioritisation amongst the portfolio interventions, where control parameters were used as evaluative criteria.

As discussed in Chapter 4, the accuracy of the system descriptions was likely enhanced by using multiple data sources, including interviews, food sales data, policy

documents and community survey results. Having said this, the school informant interviews provided much more information than the other sources of data, and the results for each school rely heavily on the three interviews. Increasing the number and range of informants in future research, such as parents, may increase the degree of confidence in the system descriptions. It may have been possible to supplement key informant interviews with a focus group of other school staff, to check consistency of views across school personnel. Having a focus group may also have aided triangulation of results, by having another form of data collection (Forman et al., 2008). A brief survey of parents may have been a way of supplementing the one parent informant in each school (with the exception of school A, where no parent was recruited). School E made available the results of a parent health survey conducted by the school, which provided limited information of relevance.

Some strengths can also be highlighted. There was a degree of consistency between case studies and with the literature reviewed. The consistency could be partly explained by a common interview schedule, informed by the reviewed literature. However, the consistency between case studies may suggest that valid data was being reliably collected. As discussed in Chapter 4, the variability between case studies appears to be largely related to socioeconomic and geographic context for schools, a finding consistent with relevant literature (for example Maher et al., 2005; Minaker et al., 2006; Nanney et al., 2008). Variability that can be adequately explained by the context of the school may suggest internal validity of results.

Informed by the research literature reviewed within Chapter 5, school food environment systems were assumed to include elements located within home and community settings, such as parent's food decisions. There is a clear advantage of defining a system more widely, by increasing the likelihood that more influences on the phenomenon of interest are included. The disadvantage is an increase in the data required to understand the system as a whole. The large data requirements can be clearly seen within the Tackling Obesity system maps (Vandenbroeck et al., 2008). Shiell (2008) suggests that the complexity of the Tackling Obesity system maps could themselves reinforce inaction, while also having potential to generate action by helping actors locate their actions within the system.

The amount of data collected directly within the relevant setting may be a weakness of the school food environment system descriptions. Aspects of home and community settings are included within the policy system maps, yet there is little voice from informants from a home or community perspective. Parents involved with the School Board of Trustees were interviewed within three case study schools, and a parent involved in the lunch programme was interviewed within one case study. While this provided some direct information from the perspective of a parent, the questions were largely focussed on the school, and therefore it is difficult to determine how adequately the answers describe influences within the home setting. A study by Williden et al. (2006) looking at nutrition and physical activity in primary school children, found that school principals identified time pressure in the home as a barrier to healthy eating, but parents did not. This suggests that school staff perspectives may differ with those of parents.

The community setting was assessed using the community survey of food outlets and outdoor food advertisements. While this provided some useful information, some key informant data may have added to the depth of the analysis here. At some point boundaries need to be drawn around the system being studied (Midgley, 2000), and limits set on the data to be collected. A tension in this research was a desire to know more about what lies on the other side of the system boundaries, tempered with time and resource constraints.

Informants were not always comfortable talking widely outside their area of expertise. When discussion did range widely the level of detail in answers understandably reduced, or at times was counter to the view of informants with more detailed knowledge. With the example of Fruit in Schools, policy informants who did not have detailed knowledge of the scheme provided different levels of support than those informants with knowledge. However, without asking informants to think across settings, it is unclear how possible linkages and a full system description could be generated. It may be that group procedures for identifying the structure of systems, like those used in soft system methodology and rich pictures (Checkland & Scholes, 1990), could counter some of this problem. By facilitating discussion amongst informants with a depth of knowledge across different areas, the resultant system

description may be more detailed. Finding time for group processes would likely be a practical challenge.

While the amount of data included within the system descriptions may be a limitation, the inclusiveness of the system descriptions is likely to be a strength. There appears to be a trade-off in terms of accuracy of the description, and the conceptual usefulness of the policy system maps. The conceptual usefulness may increase with more inclusive system boundaries. In this research, had aspects of the home and community environments not been included within the school food environment system descriptions, then the identified interventions may have been restricted to those located within the school locus of control. However, the more inclusive the system boundaries are, then the more intensive the data requirements to achieve system description accuracy. Increasing the data collected in this study, to better include home and community environments, would have changed the scope of the research.

The accuracy of the system descriptions could impact on the policy interventions identified. However, the results may suggest that a safety valve exists within the method regarding the accurate identification of policy interventions to effectively impact on the system of interest. Within the suggested intervention portfolio, the interventions located more within the home and community settings generally have less specificity than those located within primary schools. Before implementation of interventions can occur, there will need to be more research, consultation and detailed intervention design. There is an opportunity then for the assumptions behind the interventions to be checked with more data. An example is interventions regarding increasing money available in households to spend on food. While this is identified as an important intervention, there are questions remaining about how much change in the food children bring to school this might create. Interventions located within schools, where more data was collected, tend to have a higher degree of specificity, which may suggest implementation can occur with less additional research.

While the discussion so far has focussed on the primary school case study system descriptions, the literature generated system descriptions also highlighted the impact of limited data. As the elements included within the policy system maps moved

further away from the focus of the literature search, such as food production, the amount of literature supporting the inclusion of a system element reduced. As an indication of the types of system elements that may be operating within connected systems, the literature derived policy system maps achieve their purpose. However, due to the limited data related to some of the identified system elements, the literature derived policy system maps (Chapter 5) should not be viewed as more than indicative.

Two data collection and analysis method issues may slightly reduce certainty in the policy system map accuracy. First, a number of limitations arose from having only one investigator undertake data collection and analysis. The transcription, thematic coding and analysis of the interview data was all undertaken by the author, with the exception of school B case study interviews and initial analysis. While this provides a level of consistency, additional researchers undertaking thematic coding may have provided interesting and different interpretations of the interview data. As discussed in the methods (Chapter 4), well established interview and coding methods were consistently followed, which is likely to minimise inaccuracies (Mays & Pope, 1995; Yin, 2003).

The data collection of food outlets and outdoor food advertisement for case study schools was also all undertaken by the author. While a systematic method of scanning streets was used, it is possible that locations were missed and not recorded. It seems unlikely that this would have changed the overall direction of results as missed data will under report the number of food outlets and outdoor food advertisements. A second researcher collecting data for one or two schools may have provided an indication of food outlet and advertisement data reliability.

10.8.3 Identifying interventions

The first aim of this research was to identify policy interventions to support the role of primary schools in promoting healthy childhood nutrition. To be of use, the method obviously had to arrive at some recommendations regarding intervention options. Of course, many other methods, including a brief literature review, could have identified a number of intervention options. The test for this method needs to be that the identified interventions are likely to have the effect of changing school nutrition practices of children, emergent from school food environment systems. To do this,

the method assumes that control parameters should be impacted upon by interventions, and that interventions have some support from actors involved within the system.

The intervention options were identified from analysis of case study primary schools. Two sources of data were used, key informant interviews and the literature reviewed in Chapter 5 that appeared relevant to the policy system map for the school. The majority of interventions identified were located within a school locus of control, or based within the school setting. This is likely a result of the key informants being most familiar with the school setting, the literature search being focussed on children, and the research question. There were also a number of interventions identified with a government locus of control and located outside of schools. This suggests that the methods for identifying interventions provided a focus wider than only schools, which is likely an advantage of the study.

There is no claim here, however, that the identification of possible interventions was exhaustive. There may be other interventions that would positively contribute to the portfolio of interventions. The portfolio suggested in this research should not be considered the final word on the issue. In fact, as described, it is expected that interventions will develop as further research and deliberative processes between stakeholders are undertaken.

For the purpose of considering how the portfolio of interventions may impact on school food environment systems, the idea of control parameters was important. There is relatively little discussion of control parameters within the social science related complexity literature. The use of control parameters as the focus of policy interventions has been suggested by other authors (Blackman, 2006), but with less emphasis than presented here. There are two risks of the use of control parameters in this thesis. The first is that they do not have the impact on the system of interest that is theorised here. The second is that the identification of control parameters was inaccurate.

In a way the resolution of these two risks are similar. It seems that further theoretical work on the influence of control parameters on social systems, and the ability to

influence control parameters is required. Within this work, procedures for identifying control parameters could be considered. As a working solution in this research, two aspects of control parameters were used for identification: (i) that they act to bring external resources into the system (Rickles et al., 2007); and (ii) it was theorised that they are likely highly connected within a system, to enhance their ability to distribute feedback and resources and therefore create change. In this sense they were considered similar to leverage or tipping points in systems theory (Hammond, 2009; Vandebroek et al., 2008). Determining the degree to which these two criteria accurately identify control parameters is a key aspect to further developing this research method.

Another limitation of this research relates to uncertainty regarding the efficacy of targeting policy interventions at control parameters to generate change in a system's attractor state. This limitation is managed to a degree by recommending a multi-intervention portfolio. As shown in Figure 10-2, the interventions within the portfolio may impact widely across the system. This suggests that control parameters are likely to be impacted on by some of the interventions, even if by chance rather than design.

While the range of interventions identified within this research seems appropriate for the research question and method, the limitations of these interventions should be noted. What can be seen from the policy system maps in section 10-4, when placing identified policy intervention options against the literature derived policy system maps, is that there are gaps where interventions do not appear likely to impact, such as food production in the community map. This is most likely a reflection of the focussed nature of the research question on primary schools, compared to the wide influences on children's diets and obesity. When communicating the possible impact of the intervention portfolio, it would be good practice to identify limitations. For this research, the interventions seem likely to have some impact on primary school food environment systems, and not necessarily the 'child nutrition system' (see Chapter 5) as a whole. This is not necessarily a weakness of this method for policy analysis. Applying the results of any policy analysis method, outside of the issue of focus, should be avoided without further work.

An important aspect of prioritising interventions for implementation was the range and degree of support, expressed by actors within the system, for an intervention. The assumption is that effective implementation of interventions is more likely to occur if there is some support from actors who will be involved in the implementation. Resistance to an intervention being implemented may act as a form of negative feedback, and limit change (Houchin & MacLean, 2005). To effectively consider the degree of support for an intervention from actors within the system, the research method needs to reliably access perceptions of support from a wide variety of actors. Of course, based on comments above, there will always be limits on the boundaries of peoples' knowledge of an issue. As knowledge limits are reached, it could challenge the quality of evidence for intervention support or otherwise.

In this research there was direct questioning of school principals during research feedback meetings of support for some of the 28 identified interventions. Notes were taken in the feedback session rather than audio recording and transcription. While it is considered that notes were adequate for this task, audio recording may have provided a richer set of information to judge support. Also, not all identified possible options were discussed with every school, as the feedback session was kept semi-structured and discussion of school specific results took up a substantial part of the session.

A more structured approach, where every option is discussed, may have generated better information to consider case study school support for policy options. A more structured approach could be considered in any future use of this method. Another possible approach would have been a longer focus group session with all case study school informants. This may have made it easier to compare support between case study schools, but would likely be practically more difficult to arrange given time constraints of informants and distance between some schools. In this research, teachers may have spoken less freely in a focus group if school principals were also present. A focus group approach may work well in some settings.

While the policy informants seemed to represent a reasonable variety of actors within the policy community concerning nutrition in primary schools, the discussion and identified interventions suggest that a wider range of policy informants may have

been required. The lack of detailed knowledge around the implications of changes to GST, for example, highlights this. Of course, if no active investigation of GST focussed interventions is occurring within the policy community, it is difficult to find an expert. The lack of knowledge in some areas could also be a consequence of using a complexity theory frame. As discussed above, by being inclusive of intervention areas wider than the specific role of primary schools, walking the line between inclusiveness and data overload becomes a challenge.

The recommendations are designed to inform ongoing deliberation and dialogue about intervention design, as an iterative process of implementation, evaluation and redesign is likely required (see Chapter 3). This provides future opportunities to cast the net wider in terms of informants, without necessarily disregarding the current findings for lack of certain voices, or some uncertainty regarding level of support from particular actors. The policy informants also ranged in level of seniority, experience and influence within their respective organisations. For this research a range of seniority seemed appropriate, to represent a wider range of actors within the policy aspect of the system. Future research accessing views of policymakers might consider if aspects such as seniority influences results.

A note of caution should be expressed regarding the information gathered from policy informants. While the informants appear to represent a range of positions within a widely defined primary school and nutrition policy community, over half of the informants were identified through suggestions of other informants. This may have led to more informants with similar views being included than would have been the case with a more randomised sampling method. Having said this, analysis of interviews showed more similarity between informants from similar professional backgrounds compared to networks they identified with. Suggestions for people to approach from informants tended to be across organisations and often disciplines, rather than within.

Future research using this, or a similar method, may expand the assessment of support for interventions through experimenting with different forms of data collection – such as survey based response to intervention options, to allow for a wider range of informants to be included. Methods such as Q-methodology (Durning, 1999) or multi

criteria mapping (Stirling, Lobstein, Millstone et al., 2007) may have a role to play here.

10.8.4 Generating action and change

As discussed in Chapter 3, the aim of policy analysis and research is often to identify strategies to change a situation in a certain way, rather than only achieving a better understanding of an issue. This fits well with an aggregate form of complexity theory (Manson, 2001), and a realist version as advocated by Byrne (1998). By incorporating elements of participatory policy theory (Fischer, 2003) and critical systems thinking (Midgley, 2000), the role of researcher in facilitating dialogue between actors within the system has been emphasised in the method. In this study the dialogue has been indirect, by dissemination of results from the author. However, the method was developed to help promote action during the research process, as discussed below. As stated several times, there is a need for further research and design in most of the portfolio intervention areas. This presents an opportunity for a more direct form of deliberation and dialogue.

The interviews with case study primary school informants asked them to reflect on what actions they could take, and what they thought would have an impact. Results from primary school case studies were provided to school principals during feedback sessions, which once again sought a conversation regarding actions that could be taken. The interview process with policymakers directly provided results of the case-comparison analysis of case study primary schools, and focussed conversation on what interventions would have a positive impact on children's nutrition within primary schools.

Appendix F shows a summary of research results that has been sent to all informants. This may act as a prompt for action. The summary will also be sent widely to policymakers not included in this research to date. Two conference presentations of the results have been made to New Zealand audiences during the course of the study. The project advisory group, including an academic, health promoters and a government official, have been kept informed of results as they develop. Together, these actions seek to feed ideas, literature, and the range of views gathered from informants, to an audience that can act on findings.

This is not to say that, to date, action has definitely been generated by this research. However, the method as intended, is far from a passive collector of information. The final results, an integration of literature based information, real life case studies, and policymaker perspectives, provides a useful stepping off point for detailed policy or intervention development. This is not a research method designed solely to satisfy academic curiosity, nor only to identify areas for further research. However, it is hoped that the research contributes to both of these outcomes.

One improvement may be greater use of the policy system maps. In discussing the Tackling Obesity system diagrams, Shiell (2008) suggests that showing how broad the contributions to obesity are, that people can see how they fit into the system. Informants in this research were not shown the policy system maps, as they were only used as an analytical tool. They have, however, been shown during conference presentations and helped to generate discussion. The author also developed policy system maps in another project looking at food security, and presented these in a series of workshops designed to generate intervention ideas (Bowers, Carter, Gorton et al., 2009). If a focus group or some kind of workshop had been used in this research, the policy system maps may have been a useful tool to generate discussion. Using a qualitative systems (Woog et al., 2006), or soft systems method (Checkland & Scholes, 1990) to help generate policy system maps, may also have acted as a form of deliberation amongst informants in this process.

10.8.5 Implications for policy practice

10.8.5.1 The use of theory

This research is partly premised on an assumption that current policy practice is not well placed to manage complex issues. This has been noted by several authors when considering complex ‘wicked problems’ (Blackman et al., 2006; Devaney & Spratt, 2009; Durant & Legge, 2006). While in practice there is likely to be a wide variety of policy practices in operation within New Zealand policy communities, there is limited research which suggests practice is dominated by rational and reductionist methods (Durning, 1999; Morçöl, 2001a).

It could perhaps be argued that the HEHA Strategy (Ministry of Health, 2003b), a multi-component and multi-sector strategy, shows that policymakers are already grappling with complex problems around nutrition and obesity. However, it seems unclear what policy theory is behind such approaches. In the case of the HEHA strategy, it may have been informed more by health theory and the Ottawa Charter (World Health Organization, 1986), than by policy theory. Of course, the theory underpinning intervention strategies may not matter if the end result is adequate. However, using the HEHA strategy as an example, it may be more effective if the interaction between interventions and a complex understanding of nutrition, obesity and physical activity were included. It is currently too early to accurately judge, with a completed evaluation of the strategy not due until 2011.

The theoretical perspective underpinning the method developed for this research appears to be a strength of the approach. The theory has provided a rationale for the methods used. The theory also hints at processes outside the scope of this research, such as implementation of the intervention portfolio using deliberative processes, collaboration and iterative stages of evaluation, as discussed in Chapter 3.

10.8.5.2 Specificity of interventions

An observation, which could have interesting implications for the method, is that the specificity of interventions not only decreased as the focus moves from within schools, to within home and communities. The specificity also decreases as the stages of research progress from case study analysis, to discussion with policy informants, to the final portfolio, as shown in Table 9-1. There appear to be two reasons likely to explain the reducing specificity.

The first reason for reducing specificity, as already discussed, may be associated with the lack of detailed knowledge of informants, as interventions move away from schools. This is most clearly illustrated with interventions regarding the price of food and money available in households to spend on food. Informants identified these as important issues for children's nutrition, but generally were not able to discuss intervention options in any detail.

The second reason for reducing specificity may be partly due to the largely bottom-up nature of intervention identification. For an individual school, the actions that may make a difference to the food environment could be relatively clear. The variation between school food environment systems, however, mean that at an aggregated level, the intervention descriptions have to be less specific to accommodate the variation between schools. Incorporating policy informant views introduces more variation, and the intervention descriptions again reduce in specificity of language.

As already discussed, to address the first reason for reducing intervention specificity, the research could collect more data and include more informants, or reduce the boundaries of the system of interest to exclude wider issues. The later solution seems unlikely to lead to better policy development, as aspects of a system that could have important bearings on the system as a whole, may be excluded. The former solution will be limited by time and resource. It is likely that there will always be some missing data, and therefore, a need for subsequent data collection during more detailed intervention design.

The second reason for reducing specificity suggests a need for interventions to be designed at a more local level, within a national framework of action to provide appropriate resources. For example, it may be that the mix of interventions appropriate to support a given school in developing and implementing a school food policy could vary. Specific methods for engaging Pacific parents may be required in some schools, while provision of lunches at school may be more of a priority for a school with a Māori kaupapa. For a low decile school, implementation of interventions to reduce the price of 'everyday' foods may be required before significant changes are seen within a school. This might not be the case for higher decile schools, where support to develop a school food policy may be more important.

To improve equity in health outcomes, flexibility to design interventions relevant to the local cultural and socioeconomic context is vital. From a Government policy perspective, a participatory process with Māori to define and implement policy options may help meet Treaty of Waitangi obligations related to Articles Two and Three. From an equity perspective it was important to define inequity as part of the problem definition at the outset of this research. From the problem definition flowed

the inclusion of case study schools and policy informants able to illuminate cultural and socioeconomic contexts. This was a conscious decision and locates this research squarely within a health promotion framework. There is no inherent equity focus within complexity theory. However, this research shows that the application of complexity theory can be conducted in such a way as to incorporate equity considerations with some success.

Moobela and Price (2008) suggest that a balance is required between too much central control and too much unplanned and local variation. Local flexibility appears to be required for successful interventions to effectively promote healthy childhood nutrition in primary schools. However, a national framework will likely also be needed that clearly communicates the aim of interventions, to guide local action (Levinthal & Warglien, 1999). Some of the interventions included within the portfolio, such as front of pack nutrition labelling, would likely need to be implemented at a national level. In contrast, the NAG 5 is a national level policy, but a local level intervention, as each school independently establishes the best way to meet the requirement.

Before interventions can be tailored to individual schools, there will be a requirement for funding and infrastructure to be available. This will require allocation of resources at a central government level. Providing government funding and support to locally flexible interventions, may require some courage from political actors to move away from 'managerialist' forms of governance (Blackman et al., 2006; Durant & Legge, 2006; Meek, De Ladurantey, & Newell, 2007). Local flexibility may reduce the clarity of accountability lines for public money. Collaborative implementation approaches may also take more time than top-down approaches, as local relationships need to be built (Institute of Policy Studies, 2008; Majumdar, 2006). Within a complex system, uncertainty will always remain, as the ability to predict system changes is limited. Political claims of expected outcomes may need to be muted. Of course, there are numerous examples where local variation currently exists within national policy frameworks, with schools themselves being the most obvious example. Considering existing examples may support a complexity informed governance practice by illustrating both complexity in operation and possible policy solutions.

There is a growing literature considering ‘network governance’, which may be consistent with a complexity theory view (Meek et al., 2007; Mischen, 2007). Network governance considers policy making and implementation as taking place across a network of business, NGO and government actors (Klijn & Skelcher, 2007). However, there appears to be relatively little consideration in this literature of the implications for policy analysis practice. Further development of the method used in this study may require an engagement with both the organisation complexity and network governance literature.

As stated earlier, the design of methods was intended to be achievable within Government agency policy and research units. While small, the size of the current research would likely be useful to both national and more local policy analysis projects. If resources permitted, a larger number of case studies could be included, a greater variety of information within each case study collected, and more policy informants interviewed. Increasing the scope of this research and analysis method would likely increase the specificity of intervention design at this initial stage, and thus potentially reduce the required central agency policy resources required during implementation. No matter the scope of the current method tested here, applying a complexity theory informed policy analysis suggests commitment by Government for an ongoing participatory and reflexive policy development/evaluation cycle. The allocation of policy resources, including the time required for analysis, should reflect this.

10.9 Conclusions on a complexity theory approach to policy analysis

This research into primary school nutrition promotion can be viewed as a case study in applying the developed policy analysis and research method. As this is the only application of the method to date, it is difficult to distinguish between the strengths and limitations of the method more generally, from this particular application of the method. Having said this, an attempt is made below to draw conclusions about the use of the method separately from conclusions about the application of this method to promoting childhood nutrition through primary schools.

Overall, complexity theory has proved useful as a theoretical framework for this study for a number of reasons. Complexity theory provided a framework of how complex systems change. This understanding then allowed for consideration of how policy interventions may contribute to changing complex systems in a desired direction. Focusing on control parameters provided an analytical focus for this research. The development of school food environment system descriptions helped to consider how identified interventions may interact to reinforce change within a system. This method provides one way to address an apparent gap in policy analysis practice, where the interaction of interventions appears to be seldom considered in policy, even within multi-intervention approaches, such as the HEHA strategy (Ministry of Health, 2003b).

Some tensions and uncertainty are also evident within the method. A narrow definition of boundaries for the system of interest may exclude some areas of importance to the emergent phenomenon of focus. However, wider definitions of system boundaries will likely increase demands for data. In this study, the literature derived system descriptions suggested areas connected to school food environment systems, but not included within the system descriptions developed from primary data. This allows for an acknowledgement of excluded areas. Even within the areas included within school food environment system descriptions, some interventions went beyond the expertise of key informants.

With inherent limitations to the inclusiveness of information created by system boundaries, users of these research results should maintain a critical perspective. Tools such as health impact assessments (Scott-Samuel, 1996; Signal, Langford, Quigley et al., 2006) have been shown to make wider connections between policy areas when considering policy options, and may help in this critical view. Conducting a health impact assessment as part of implementation planning is one way that wider perspectives may be brought into policy design to examine the system boundaries used during policy research.

Another tension evident in the method is between government planning and local intervention development. Because of the power attributed to nationally elected representatives, and the revenue gathering ability of central government, there will

likely always be a role for central government to allocate public resources to intervention areas. Complexity suggests that local flexibility is also required, which may challenge some forms of political accountability and institutional structures.

Flexibility of interventions also challenges the generalisability of analysis results using this method. For example, by acknowledging that every primary school is likely to have some variations in their school food environment system, it challenges the applicability of the identified interventions. The solution proposed here is twofold. First, interventions are identified through case comparison of divergent primary schools. Second, multiple interventions are suggested for implementation to impact on a range of control parameters and elements within school food environment systems. This may increase the likelihood that some of the interventions are relevant to a wide range of schools. Overall, study results regarding the range of interventions required to support primary schools to promote healthy nutrition, are likely generalisable more widely to primary schools in New Zealand. There may also be some ability to apply the results to primary schools in similar jurisdictions such as Australia and the UK. The ability to identify interventions that may be applicable to a wide range of primary schools, as well as dealing with local conditions through configuration of multiple interventions, could serve to enhance the attractiveness of the method to policymakers. Notwithstanding the possible challenge the method could pose to some existing policy and political processes, as discussed above.

Some further method developments are also required. In particular, both the theory and practice of considering control parameters within a qualitative system description needs to be advanced. This is because the accuracy of control parameter identification is likely important to effectiveness of identified interventions in changing complex systems. The method used here for identifying control parameters should be viewed as an interim approach. Again, the identification of multiple interventions may reduce the risk of inaccurate control parameter identification.

It is too early to judge whether this complexity informed method for policy analysis of complex policy issue could led to policy change. In fact, change in the New Zealand government during the course of the research is likely moving away from the types of interventions identified in this research. However, from the author's perspective, the

method appears to have largely met the objectives of the research. This is, to identify policy interventions to support primary schools to promote healthy childhood nutrition. For this reason further exploratory use of the method in other areas of public policy appears justified.

10.10 Further Research

Intervention focussed research

This study has raised a number of questions regarding the identified interventions, which could be explored in future research. Amongst the policy interventions identified, there is very little research evidence available on the impacts of free school breakfast and lunches on child nutrition, food security, and household food practices. New Zealand, where there is currently very little provision of breakfast and lunch in primary schools, offers an opportunity to systematically trial and evaluate different models of provision to inform future policy decisions. A recent Health Research Council project grant to trial school breakfasts and assess their impact on academic and health outcomes will be a useful addition to the evidence base (Clinical Trials Research Unit, 2009).

There is also sparse evidence of the impact on child nutrition of interventions aimed at food price or money available in households to spend on food. Again, there is opportunity to investigate impacts of different types of intervention on child dietary outcomes, food security and food practice within schools. Compared to the provision of food in schools, it will likely be more difficult to trial any interventions that include tax or income changes, although modelling and feasibility work could be conducted.

Reducing the availability of ‘occasional’ food around primary schools was identified as a driver of children’s diets by more informants than supported this as an area of intervention. There was uncertainty about how much can be done to alter existing patterns of availability. The ability to use urban planning frameworks and rules was raised, but there appears to be very little investigation of the ability to influence food availability in the literature. Investigating the feasibility of using urban planning to reduce children’s exposure to ‘occasional’ food is another possible area for investigation.

There is also a need for more research to examine how the identified interventions may impact on Māori and Pacific children. Results suggested that the place of food within the one kura included in the primary school case studies, differed to some degree from other case study schools. This could be explored further. This research was relatively silent on interventions of relevance to Pacific children and families, besides suggestion that Pacific parents may be less likely than some other parents to engage with some school nutrition interventions. Issues around engagement of Pacific children and families with nutrition interventions should be further explored.

Complexity theory and policy analysis focussed research

Applying a complexity theory method to policy analysis highlighted the need for mechanisms to support identification of local system configurations, collaborative and flexible implementation, and ‘real-time’ evaluation methods. While research has been conducted on the mechanisms of each of these areas, there has been little research considering effectiveness from a complexity perspective, and linking back to central government policy analysis and planning. This would be a fruitful area of investigation.

In promoting the research method for use in policy analysis work, it would be useful to consider the knowledge held by policy researchers and analysts of complexity theory, systems theories, and sympathetic relational sociological theories. The limited research available suggests that reductionist methods dominate in New Zealand (Durning, 1999). Current practice may limit the attractiveness of the method developed here, and hinder understanding of results.

The areas of limitation in the method stemmed largely from uncertainty regarding accuracy of system descriptions, control parameters, and support for interventions from actors within the system. To better gauge support for interventions, future research could explore the use of Q-methodology (Durning, 1999) or multi-criteria mapping (Stirling et al., 2007), to involve a wider range of actors, in a more standardised format. The use of ‘rich pictures’ and other aspects of soft systems methodology (Checkland & Scholes, 1990), could be considered in the development of system descriptions.

Improving the identification of control parameters may require a comparison between different methods applied to a common system. It may be possible to build off an existing survey, with follow up interviews across categories of respondents in a case-comparison method. In New Zealand, the living standards research (Jensen et al., 2006) may be an example, where the survey data could be compared to interview data to explore household social and economic systems from which economic deprivation emerge. If similar control parameters are identified by different methods, it may provide more certainty about how these can be identified.

10.11 Conclusion

Childhood nutrition, overweight and obesity are significant public health issues in New Zealand, and in much of the world. According to the 2006/07 New Zealand Health Survey, 20.1 percent of boys and girls aged 5 to 14 years were overweight, with 8.1 percent of boys and 8.7 percent of girls classified as obese (Ministry of Health, 2008a). This equates to approximately 61,800 children classified as obese and 155,000 children classified as overweight (Ministry of Health, 2008a). Even small changes in the proportion of children in these excess weight categories is likely to impact on a relatively large number of children. The impact would be greater for some portions of the population, such as Pacific children, who experience higher rates of overweight and obesity compared to the general population.

Public policy interventions are an important tool to improve children's diet and help prevent excess weight gain, with primary schools a key setting within which to reach children. The impact of school based intervention may be limited, however, with home and community settings also impacting on children's diet. Tools that can work with the complexity of diet determinants across home, community and school settings are required to identify effective interventions to improve children's diet at and through primary schools. This thesis aimed to identify public policy intervention options to support New Zealand primary schools to promote healthy nutrition, and to explore the use of complexity theory as an analysis and research method to achieve this aim.

The results of this research provide some useful information for both the development of public policies to improve child nutrition, and methods for researching complex policy problems. This research has utilised local primary school case studies, to identify policy interventions to support primary schools in promoting healthy childhood nutrition. These intervention options were then discussed with policymakers to consider feasibility and acceptability. Areas of common support between school and policy informants, and an understanding of complex systems, were used to develop a portfolio of policy options that, taken together, may act to change school food environment systems. Changes in school food environment systems may improve children's diets at school, and help prevent overweight and obesity.

The suggested portfolio of interventions focuses on development of school food policies, with the aim of reducing 'occasional' food available and consumed at school. To support school food policy development a number of interventions are suggested including: reintroduction of the requirement that schools sell only healthy food on site; nutrition focussed programmes, particularly Fruit in Schools; support for 'healthy' fundraising ideas; social marketing campaigns to promote healthy lunch ideas; reducing the price of 'everyday' food compared to 'occasional' food and increasing the money in households to spend on food; and restricting advertising of 'occasional' food to children.

The portfolio of interventions as a whole may be generalisable to many primary schools in New Zealand. However, the precise configuration and detail of interventions will likely need to vary between schools, as subtle but important differences between school food environment systems exist.

The study aimed to be both explicitly theoretically informed and practical, in order to test a research method for policy analysis. Further refinement and testing of alternative methods is required, in particular to ensure a range of voices across the system of interest are included, and in identification of control parameters. However, there appears to be merit in the general approach as an advance over reductionist policy methods. Complexity theory provided a useful methodological frame for

policy research and analysis, and may be usefully refined and tested in a range of policy areas.

To date, it appears that no other study has combined both primary school and policymaker perspectives to research policy interventions to promote healthy childhood nutrition. Among the few studies that have discussed frameworks for developing portfolios of policies to address obesity, few have actually taken the step of populating those portfolios with empirical research (Sacks et al., 2008; Story et al., 2008). The challenge to advancing the interventions identified in this research will likely be effectively engaging school and policy stakeholders to refine and design the interventions. In the process of more detailed intervention design, a complexity informed approach would suggest the focus on a portfolio of interventions, with local flexibility, should be retained.

The results of this thesis are a starting point for detailed policy design and a policy analysis method that deserves further investigation and refinement. The test for policymakers now will be to develop cost effective interventions, which take account of local complexities, within a government system that favours linear programme logic and accountability lines. Developing a method to effectively deal with complex causation of ‘wicked’ problems (Blackman et al., 2006), such as childhood nutrition, overweight and obesity, is an important step for public health. Particularly as non-communicable diseases present an increasing population health burden in many countries, including New Zealand.

References

- Abercrombie, N., Hill, S., & Turner, B. S. (1988). *Dictionary of Sociology*. London: Penguin Books.
- Adler, N. E., & Newman, K. (2002). Socioeconomic disparities in health: pathways and policies. *Health Affairs*, 21(2), 60-76.
- Albrecht, G., Freeman, S., & Higginbotham, N. (1998). Complexity and Human Health: The Case for a Transdisciplinary Paradigm. *Culture, Medicine & Psychiatry*, 22(1), 55-92.
- Alexandra, L., Lauren, L., & Marion, N. (2006). Food Industry Promises to Address Childhood Obesity: Preliminary Evaluation. *Journal of Public Health Policy*, 27(4), 327.
- Anderson, A. S., Porteous, L. E. G., Foster, E., Higgins, C., Stead, M., Hetherington, M., et al. (2005a). The impact of a school-based nutrition education intervention on dietary intake and cognitive and attitudinal variables relating to fruits and vegetables. *Public Health Nutrition*, 8(6), 650-656.
- Anderson, P. M., & Butcher, K. E. (2006). Childhood obesity: trends and potential causes. *Future of Children*, 16(1), 19-45.
- Anderson, R. A., Crabtree, B. F., Steele, D. J., & McDaniel, R. R., Jr. (2005b). Case Study Research: The View From Complexity Science. *Qualitative Health Research*, 15(5), 669-685.
- Andrieu, E., Darmon, N., & Drewnowski, A. (2006). Low-cost diets: more energy, fewer nutrients. *European Journal of Clinical Nutrition*, 60(3), 434-436.
- Ashfield-Watt, P. A. L., Stewart, E. A., & Scheffer, J. A. (2008). A pilot study of the effect of providing daily free fruit to primary-school children in Auckland, New Zealand. *Public Health Nutrition*, 12(5), 693-701.
- Astrup, A. (1999). Macronutrient balances and obesity: The role of diet and physical activity. *Public Health Nutrition*, 2(3 A), 341-347.
- Austin, S. B., Melly, S. J., Sanchez, B. N., Patel, A., Buka, S., & Gortmaker, S. L. (2005). Clustering of Fast-Food Restaurants Around Schools: A Novel Application of Spatial Statistics to the Study of Food Environments. *American Journal of Public Health*, 95(9), 1575-1581.
- Babbie, E. (2001). *The practice of social research*. Belmont: Wadsworth Thomson Learning.
- Backett-Milburn, K. C., Wills, W. J., Gregory, S., & Lawton, J. (2006). Making sense of eating, weight and risk in the early teenage years: Views and concerns of parents in poorer socio-economic circumstances. *Social Science & Medicine*, 63(3), 624-635.

- Ball, J., Watts, C., & Quigley, R. (2005). A Rapid Review of the Literature on the Association Between Nutrition and School Pupil Performance. Wellington: Obesity Action Coalition.
- Bankes, S. C. (2002). Tools and techniques for developing policies for complex and uncertain systems. *Proceedings of the National Academy of Science*, 99(suppl. 3), 7263-7266.
- Bankes, S. C. (2005). Robust policy analysis for complex open systems. *Emergence*, 7(1), 2-10.
- Barabas, J. (2004). How Deliberation Affects Policy Opinions. *American Political Science Review*, 98(4), 687-701.
- Barry, C. L., Brescoll, V. L., Brownell, K. D., & Schlesinger, M. (2009). Obesity Metaphors: How Beliefs about the Causes of Obesity Affect Support for Public Policy. *Milbank Quarterly*, 87(1), 7-47.
- Basdevant, A., Boute, D., & Borys, J. M. (1999). Who should be educated? Education strategies: could children educate their parents? *International Journal of Obesity*, 23(5), s10.
- Bauer, K. W., Yang, Y. W., & Austin, S. B. (2004). "How Can We Stay Healthy when you're Throwing All of this in Front of Us?" Findings from Focus Groups and Interviews in Middle Schools on Environmental Influences on Nutrition and Physical Activity. *Health Education and Behaviour*, 31(34), 34-46.
- Baum, F. (2008). *The New Public Health*. Melbourne: Oxford University Press.
- Befani, B., Lederman, S., & Sager, F. (2007). Realistic Evaluation and QCA: Conceptual Parallels and an Empirical Application. *Evaluation*, 13, 171-192.
- Bell, A. C., & Swinburn, B. A. (2004). What are the key food groups to target for preventing obesity and improving nutrition in schools? *European Journal of Clinical Nutrition*, 58(2), 258-263.
- Ben-Shlomo, Y., & Kuh, D. (2002). A life course approach to chronic disease epidemiology: conceptual models, empirical challenges and interdisciplinary perspectives. *International Journal of Epidemiology*, 31(2), 285.
- Bennett, A., & Elman, C. (2006). Complex Causal Relations and Case Study Methods: The Example of Path Dependence. *Political Analysis*, 14(3), 250.
- Bere, E., Veierod, M. B., Skare, O., & Klepp, K.-I. (2007). Free school fruit - sustained effect three years later. *International Journal of Behavioral Nutrition and Physical Activity*, 4, 5.
- Bhargava, M., & Donthu, N. (1999). Sales Response to Outdoor Advertising. *Journal of Advertising Research*, July-August, 7.
- Bhattacharya, J., Currie, J., & Haider, S. (2004). Poverty, food insecurity, and nutritional outcomes in children and adults. *Journal of Health Economics*, 23, 839-862.

- Blackman, T. (2000). Complexity theory. In G. Browning, A. Halcli & F. Webster (Eds.), *Understanding Contemporary Society* pp. 139-151). London: SAGE Publications Ltd.
- Blackman, T. (2001). Complexity theory and the new public management. *Social Issues*.
- Blackman, T. (2006). *Placing Health. Neighbourhood renewal, health improvement and complexity*. Bristol: Policy Press.
- Blackman, T., Greene, A., Hunter, D. J., McKee, L., Elliott, E., Harrington, B., et al. (2006). Performance Assessment and Wicked Problems: The Case of Health Inequalities. *Public Policy and Administration*, 21(2), 66-80.
- Blisard, N., Stewart, H., & Jolliffe, D. (2004). *Low-income Households' Expenditure on Fruits and Vegetables: United States Department of Agriculture*.
- Block, J. P., Scribner, R. A., & DeSalvo, K. B. (2004). Fast food, race/ethnicity, and income: A geographic analysis. *American Journal of Preventive Medicine*, 27(3), 211-217.
- Bollini, P., Pampallona, S., Kupelnick, B., Tibaldi, G., & Munizza, C. (2006). Improving compliance in depression: A systematic review of narrative reviews. *Journal of Clinical Pharmacy and Therapeutics*, 31(3), 253-260.
- Borra, S. T., Kelly, L., Shirreffs, M. B., Neville, K., & Greiger, C. J. (2003). Developing health messages: Qualitative studies with children, parents, and teachers help identify communications opportunities for healthful lifestyles and the prevention of obesity. *Journal of the American Dietetic Association*, 103(6), 721-728.
- Borrelli, F., Ponsiglione, C., Iandoli, L., & Zollo, G. (2008). An inquiry on the collective memory of industrial networks: a simulation tool for policy makers. In L. Dennard, K. A. Richardson & G. Morçöl (Eds.), *Complexity and Policy Analysis* pp. 339-354). Goodyear: ISCE Publishing.
- Bourdieu, P. (1998). *Practical Reason*. Cambridge: Policy Press.
- Bowers, S., Carter, K., Gorton, D., Lanumata, T., Maddison, R., Ni Mhurchu, C., et al. (2009). *ENHANCING food security and physical activity for Māori, Pacific and low-income peoples*. Wellington: Clinical Trials Research Unit, University of Auckland; GeoHealth Laboratory, University of Canterbury; Health Promotion and Policy Research Unit, University of Otago; Te Hotu Manawa Māori.
- Boyatzis, R. E. (1998). *Transforming Qualitative Information: Thematic analysis and code development*. Thousand Oaks: SAGE Publications.
- Boyd, S., Dingle, R., Campbell, R., King, J., & Corter, A. (2007). *Taking a bite of the apple: The implementation of Fruit in Schools*. Wellington: New Zealand Council for Educational Research.
- Brescoll, V. L., Kersh, R., & Brownell, K. D. (2008). Assessing the Feasibility and Impact of Federal Childhood Obesity Policies. *The ANNALS of the American Academy of Political and Social Science*, 615, 178-193.

- Britten, N. (1995). Qualitative interviews in medical research. *British Medical Journal*, 311, 251-253.
- Brown, K. M., Akintobi, T. H., Pitt, S., McDermott, R., Berends, V., Agron, P., et al. (2004). California School Board Members' Perceptions of Factors Influencing School Nutrition Policy. *Journal of School Health*, 74(2), 52-58.
- Brownson, R. C., Haire-Joshu, D., & Luke, D. A. (2006). Shaping the context of health: A Review of Environmental and Policy Approaches in the Prevention of Chronic Diseases. *Annual Review of Public Health*, 27(1), 341-370.
- Brug, J., Tak, N. I., te Velde, S. J., Bere, E., & de Bourdeaudhuij, I. (2008). Taste preferences, liking and other factors related to fruit and vegetable intakes among schoolchildren: results from observational studies. *British Journal of Nutrition*, 99(SupplementS1), S7-S14.
- Brunner, R. D. (2006). A paradigm for practice. *Policy Sciences*, 39, 135-167.
- Burnes, B. (2004). Kurt Lewin and complexity theories: back to the future? *Journal of Change Management*, 4(4), 309-325.
- Burton, P. (2006). Modernising the policy process: Making policy research more significant? *Policy Studies*, 27(3), 173-195.
- Butland, B., Jebb, S., Kopelman, P., McPherson, L., Thomas, S., Mardell, J., et al. (2007). Tackling Obesities: Future Choices - Project Report 2nd Edition. London: Foresight Government Office for Science.
- Byrne, D. (1998). *Complexity Theory and the Social Sciences: An introduction*. New York: Routledge.
- Byrne, D. (2001a). Complexity Science and Transformations in Social Policy. *Social Issues*.
- Byrne, D. (2001b). What Is Complexity Science? Thinking as a Realist About Measurement and Cities and Arguing for Natural History. *Emergence*, 3(1), 61-76.
- Byrne, D. (2002). *Interpreting Quantitative Data*. London: Sage.
- Byrne, D. (2005a). Complexity, Configurations and Cases. *Theory Culture Society*, 22(5), 95-111.
- Byrne, D. (2005b). *Social Exclusion*. Maidenhead: Open University Press.
- Byrne, D., & Uprichard, E. (2007). Crossing levels: The potential for numerical taxonomy and fuzzy set approaches to study multi-level longitudinal change. *Methodological Innovations Online*.
- Campbell, K., Crawford, D., Jackson, M., Cashel, K., Worsley, A., Gibbons, K., et al. (2002). Family food environments of 5-6 year old children: Does socioeconomic status make a difference? *Asia Pacific Journal of Clinical Nutrition*, 11(Suppl), s553-s561.

References

- Campbell, R., Pound, P., Pope, C., Britten, N., Pill, R., Morgan, M., et al. (2003). Evaluating meta-ethnography: a synthesis of qualitative research on lay experiences of diabetes and diabetes care. *Social Science & Medicine*, 56(4), 671-684.
- Capra, F. (2005). Complexity and Life. *Theory Culture Society*, 22(5), 33-44.
- Caraher, M., & Coveney, J. (2004). Public health nutrition and food policy. *Public Health Nutrition*, 7(5), 591-598.
- Caraher, M., & Cowburn, G. (2005). Taxing food: implications for public health nutrition. *Public Health Nutrition*, 8(8), 1242-1249.
- Caraher, M., Landon, J., & Dalmeny, K. (2006). Television advertising and children: lessons from policy development. *Public Health Nutrition*, 9(5), 596-605.
- Carter, K., Lanumata, T., & Signal, L. (2009). Full and correct benefit entitlements. In S. Bowers, Carter, K., Gorton, D., Lanumata, T., Maddison, R., Ni Mhurchu, C., O'Dea, D., Pearce, J., Signal, L. and Walton, M (Ed.), Final report: ENHANCING food security and physical activity for Māori, Pacific and low-income peoples. Wellington: Clinical Trials Research Unit, University of Auckland; GeoHealth Laboratory, University of Canterbury; Health Promotion and Policy Research Unit, University of Otago; Te Hotu Manawa Māori.
- Carter, M. A., & Swinburn, B. (2004). Measuring the 'obesogenic' food environment in New Zealand primary schools. *Health Promotion International*, 19(1), 15-20.
- Casey, P. H., Simpson, P. M., Gossett, J. M., Bogle, M. L., Champagne, C. M., Connell, C., et al. (2006). The association of child and household food insecurity with childhood overweight status. *Pediatrics*, 118(5), e1406-1413.
- Castellani, B., & Hafferty, F. W. (2009). *Sociology and Complexity Science*. Berlin: Springer.
- Cawley, J. (2006). Markets and Childhood Obesity Policy. *The Future of Children*, 16(1), 69-88.
- Centre for Social Research and Evaluation (2007). Pockets of significant hardship and poverty. Wellington: Ministry of Social Development.
- Chapman, J. (2002). *System Failure*. London: Demos, www.demos.co.uk.
- Chapman, K., Nicholas, P., Banovic, D., & Supramaniam, R. (2006). The extent and nature of food promotion directed to children in Australian supermarkets. *Health Promotion International*, 21(4), 331-339.
- Checkland, P. (1994). Systems Theory and Management Thinking. *American Behavioral Scientist*, 38(1), 75-91.
- Checkland, P., & Scholes, J. (1990). *Soft Systems Methodology in Action*. Chichester: John Wiley and Sons.

- Checkland, P. B., & Casar, A. (1986). Vickers' concept of an appreciative system: A systemic account. *Journal of Applied Systems Analysis*, 13, 3-17.
- Chesters, G., & Welsh, I. (2005). Complexity and Social Movement(s): Process and Emergence in Planetary Action Systems. *Theory Culture Society*, 22(5), 187-211.
- Cilliers, P. (1998). *Complexity and Postmodernism: Understanding complex systems*. New York: Routledge.
- Clark, H. (2006). Speech notes for address at launch of the Mission-On package, Aotea Centre, Auckland. New Zealand Government, www.beehive.govt.nz/.
- Clinical Trials Research Unit (2009). Breakfast in schools. Auckland: University of Auckland, (Access date 6/10/2009), <http://www.ctr.u.auckland.ac.nz/index.php/research-programmes/nutrition-physical-activity/228-breakfast-in-schools>.
- Cockerham, W. C., Rutten, A., & Abel, T. (1997). Conceptualizing Contemporary Health Lifestyles: Moving Beyond Weber. *The Sociological Quarterly*, 38(2), 321-342.
- Cole, T. J., Bellizzi, M. C., Flegal, K. M., & Dietz, W. H. (2000). Establishing a standard definition for child overweight and obesity worldwide: international survey. *BMJ*, 320(7244), 1240-.
- Cooper, H., & Geyer, R. (2008). Using 'complexity' for improving educational research in health care. *Social Science & Medicine*, 67(1), 177-182.
- Coveney, J. (2005). A qualitative study exploring socio-economic differences in parental lay knowledge of food and health: implications for public health nutrition. *Public Health Nutrition*, 8(3), 290-297.
- Cram, F., Phillips, H., Tipene-Matua, B., Parsons, M., & Taupo, K. (2004). A 'parallel process'? Beginning a constructive conversation about a Maori methodology. *Journal of Bioethical Inquiry*, 1(1), 14-19.
- Crawford, D. A., Timperio, A. F., Salmon, J. A., Baur, L., Giles-Corti, B., Roberts, R. J., et al. (2008). Neighbourhood fast food outlets and obesity in children and adults: the CLAN Study. *International Journal of Pediatric Obesity*, iFirst DOI: 10.1080/17477160802113225.
- Critical Appraisal Skills Programme (CASP) (1998). Questions to help you make sense of qualitative research. (Access date 10/11/2006), http://www.phru.nhs.uk/Doc_Links/Qualitative%20Appraisal%20Tool.pdf.
- Cruickshank, J. (2003). Critical Realism The difference that it makes. In M. Archer, R. Bhasker, A. Collier, T. Lawson & A. Norrie (Eds.), *Routledge Series in Critical Realism*. London: Routledge.
- Cummins, S., & Macintyre, S. (2006). Food environments and obesity--neighbourhood or nation? *International Journal of Epidemiology*, 35(1), 100-104.

- Danielzik, S., Pust, S., Landsberg, B., & Muller, M. J. (2005). First lessons from the Kiel Obesity Prevention Study (KOPS). *International Journal of Obesity*, 29 Suppl 2, S78-83.
- Darling, H., Reeder, A. I., McGee, R., & Williams, S. (2006). Brief report: Disposable income, and spending on fast food, alcohol, cigarettes, and gambling by New Zealand secondary school students. *Journal of Adolescence*.
- Datar, A., & Sturm, R. (2006). Childhood overweight and elementary school outcomes. *International Journal of Obesity*, 30(9), 1449-1460.
- de Sa, J., & Lock, K. (2008). Will European agricultural policy for school fruit and vegetables improve public health? A review of school fruit and vegetable programmes. *European Journal of Public Health*, 18(6), 558-568.
- Dennard, L., Richardson, K. A., & Morçöl, G. (2008). Introduction: Science, Theory, Models, and Modeling. What does complexity do? In L. Dennard, K. A. Richardson & G. Morçöl (Eds.), *Complexity and Policy Analysis* pp. 1-18). Goodyear: ISCE Publishing.
- Dennard, L. F. (2008). The Budget Process as Complex Civic Space: Wildavsky and Radical Incrementalism. *Administration Society*, 40(6), 645-658.
- Department of Health (2004). *Choosing Health: Making healthy choices easier*. London: HM Government.
- Department of Human Nutrition (2006). Information package for users of the estimated food costs. Dunedin: University of Otago (11/12/2006), <http://nutrition.otago.ac.nz/index.php?section=56>.
- Devaney, J., & Spratt, T. (2009). Child abuse as a complex and wicked problem: Reflecting on policy developments in the United Kingdom in working with children and families with multiple problems. *Children and Youth Services Review*, 31(6), 635-641.
- Devine, C. M., Jastran, M., Jabs, J., Wethington, E., Farell, T. J., & Bisogni, C. A. (2006). A lot of sacrifices: Work-family spillover and the food choice coping strategies of low-wage employed parents. *Social Science & Medicine*, 63(10), 2591-2603.
- Dixon-Woods, M., Agarwal, S., Jones, D., Young, B., & Sutton, A. (2005). Synthesising qualitative and quantitative evidence: A review of possible methods. *Journal of Health Services Research and Policy*, 10(1), 45-53.
- Doak, C. M., Visscher, T. L. S., Renders, C. M., & Seidell, J. C. (2006). The prevention of overweight and obesity in children and adolescents: a review of interventions and programmes. *Obesity Reviews*, 7, 111-136.
- Dooris, M. (2006). Healthy settings: challenges to generating evidence of effectiveness. *Health Promotion International*, 21(1), 55-65.

- Dowler, E. (2008). Symposium on 'Intervention policies for deprived households' Policy initiatives to address low-income households' nutritional needs in the UK. *The Proceedings of the Nutrition Society*, 67(3), 289.
- Drewnowski, A. (2004). Obesity and the food environment: dietary energy density and diet costs. *American Journal of Preventive Medicine*, 27(3 Suppl), 154-162.
- Drewnowski, A., & Darmon, N. (2005). Food choices and diet costs: an economic analysis. *Journal of Nutrition*, 135(4), 900-904.
- Drewnowski, A., & Rolls, B. J. (2005). How to modify the food environment. *Journal of Nutrition*, 135(4), 898-899.
- Drewnowski, A., & Specter, S. (2004). Poverty and Obesity: the role of energy density and energy costs. *American Journal of Clinical Nutrition*, 79, 6-16.
- Durant, R. F., & Legge, J. S., Jr. (2006). "Wicked Problems," Public Policy, and Administrative Theory: Lessons From the GM Food Regulatory Arena. *Administration Society*, 38(3), 309-334.
- Durie, M. (1998). Whairoa Maori Health Development. Auckland: Oxford University Press.
- Durie, R., & Wyatt, K. (2007). New communities, new relations: The impact of community organization on health outcomes. *Social Science and Medicine*, 65(9), 1928-1941.
- Durning, D. (1999). The transition from traditional to postpositivist policy analysis: A role for Q-methodology. *Journal of Policy Analysis and Management*, 18(3), 389.
- Dye, T. (1978). Understanding public policy. Englewood Cliffs NJ: Prentice-Hall.
- Easthope, G., & White, R. (2006). Health and Wellbeing: How do young people see these concepts? *Youth Studies Australia*, 25(1), 42-49.
- Education Review Office (2008). Schools' Progress Towards Meeting National Administration Guideline (NAG) 5 on Food and Nutrition. Wellington: Education Review Office.
- Egger, G., & Dixon, J. (2009). Should obesity be the main game? Or do we need an environmental makeover to combat the inflammatory and chronic disease epidemics? *Obesity Reviews*, 10(2), 237-249.
- Egger, G., & Swinburn, B. (1997). An "ecological" approach to the obesity pandemic. *British Medical Journal*, 315(7106), 477.
- Eisenmann, J. C. (2006). Insight into the causes of the recent secular trend in pediatric obesity: Common sense does not always prevail for complex, multi-factorial phenotypes. *Preventive Medicine*, 42(5), 329-335.
- Eleven, B. (2009). Hefty price as Kiwis get too fat. Christchurch: The Press, (Access Date 17/7/2009), <http://www.stuff.co.nz/national/health/2587332/Hefty-price-as-Kiwis-get-too-fat>.

References

- Elliott, E., & Kiel, L. D. (1997). Nonlinear Dynamics, Complexity and Public Policy: use, misuse, and applicability. In R. A. Eve, S. Horsfall & M. E. Lee (Eds.), *Chaos, Complexity, and Sociology: myths, models, and theories*. Thousand Oaks: SAGE Publications.
- Engestrom, Y. (1993). Developmental studies of work as a testbench of activity theory: The case of primary care medical practice. In S. Chaiklin & J. Lave (Eds.), *Understanding Practice: Perspectives on activity and context*. Cambridge: Cambridge University Press.
- Erhardt, E., & Molnár, D. (2004). Is type 2 diabetes mellitus a significant problem in European adolescents? *Scandinavian Journal of Nutrition*, 48(4), 155-160.
- Esterberg, K. G. (2002). *Qualitative methods in social research*. Boston: McGraw-Hill.
- Evans, A. E., Wilson, D. K., Buck, J., Torbett, H., & Williams, J. (2006). Outcome Expectations, Barriers, and Strategies for Healthful Eating. *Family & Community Health*, 29(1), 17-27.
- Evans, W. D. (2008). Social marketing campaigns and children's media use. *Future of Children*, 18(1), 181-203.
- Eve, R. A., Horsfall, S., & Lee, M. E. (1997). *Chaos, Complexity, and Sociology: myths, models, and theories*. Thousand Oaks: SAGE Publications.
- Faith, M. S., Fontaine, K. R., Baskin, M. L., & Allison, D. B. (2007). Toward the Reduction of Population Obesity: Macrolevel Environmental Approaches to the Problems of Food, Eating, and Obesity. [Article]. *Psychological Bulletin*, 133(2), 205-226.
- Feeding our Futures (2009). Feeding our futures home page. Wellington: Health Sponsorship Council, (3/3/2009), <http://www.feedingourfutures.org.nz/>.
- Fernandes, M. M. (2008). The Effect of Soft Drink Availability in Elementary Schools on Consumption. *Journal of the American Dietetic Association*, 108(9), 1445-1452.
- Fetterman, D., & Wandersman, A. (2007). Empowerment Evaluation: Yesterday, Today, and Tomorrow. *American Journal of Evaluation*, 28, 179-198.
- Finegood, D. T., Karanfil, O., & Matteson, C. L. (2008). Getting from analysis to action: framing obesity research, policy and practice with a solution-oriented complex systems lens. *HealthcarePapers*, 9(1).
- Finkelstein, D. M., Hill, E. L., & Whitaker, R. C. (2008). School Food Environments and Policies in US Public Schools. *Pediatrics*, 122(1), e251-259.
- Finkelstein, E., French, S., Variyam, J. N., & Haines, P. S. (2004). Pros and cons of proposed interventions to promote healthy eating. *American Journal of Preventive Medicine*, 27(3, Supplement 1), 163-171.
- Fischer, F. (1993). Reconstructing Policy Analysis: A postpositivist perspective. *Policy Sciences*, 25, 333-339.

- Fischer, F. (1995). *Evaluating Public Policy*. Chicago: Nelson-Hall.
- Fischer, F. (1998). Beyond empiricism: Policy inquiry in postpositivist perspective. *Policy Studies Journal*, 26(1), 129.
- Fischer, F. (2003). Beyond empiricism: policy analysis as deliberative practice. In M. Hajer & H. Wagenaar (Eds.), *Deliberative Policy Analysis: Understanding governance in the network society*. Cambridge: Cambridge University Press.
- Fitzpatrick, R., & Boulton, M. (1994). Qualitative methods for assessing health care. *Quality in Health Care*, 3, 107-113.
- Fleischhacker, S. (2007). Food Fight: The Battle Over Redefining Competitive Foods. *The Journal of School Health*, 77(3), 147.
- Flynn, M. A. T., McNeil, D. A., Maloff, B., Mutasingwa, D., Wu, M., Ford, C., et al. (2006). Reducing obesity and related chronic disease risk in children and youth: a synthesis of evidence with 'best practice' recommendations. *Obesity Reviews*, 7 Suppl 1, 7-66.
- Forester, J. (1999). *The Deliberative Practitioner: Encouraging participatory planning processes*. Cambridge: MIT Press.
- Forman, J., Creswell, J. W., Damschroder, L., Kowalski, C. P., & Krein, S. L. (2008). Qualitative research methods: Key features and insights gained from use in infection prevention research. *American Journal of Infection Control*, 36(10), 764-771.
- Fox, M. K., Dodd, A. H., Wilson, A., & Gleason, P. M. (2009). Association between School Food Environment and Practices and Body Mass Index of US Public School Children. *Journal American Dietetic Association*, 109 supplement, s108-s117.
- Frank, D. A., Neault, N. B., Skalicky, A., Cook, J. T., Wilson, J. D., Lvenson, S., et al. (2006). Heat or Eat: The Low Income Home Energy Assistance Program and Nutritional and Health Risks Among Children Less than 3 Years of Age. *Pediatrics*, 118, e1293-e1302.
- French, S. A., & Wechsler, H. (2004). School-based research and initiatives: fruit and vegetable environment, policy, and pricing workshop. *Preventive Medicine*, 39(Supplement 2), 101-107.
- Gare, A. (2000). Systems Theory and Complexity Introduction. *Democracy and Nature*, 6(3), 327-339.
- Gatenby, L. A. (2007). Nutritional content of school meals in Hull and the East Riding of Yorkshire: A comparison of two schools. *Journal of Human Nutrition and Dietetics*, 20(6), 538-548.
- Gatrell, A., & Löytönen, M. (Eds.) (1998). *GIS and Health*. London: Taylor & Francis.
- Gatrell, A. C. (2005). Complexity theory and geographies of health: a critical assessment. *Social Science & Medicine*, 60, 2661-2671.

References

- Gatrell, A. C., Popay, J., & Thomas, C. (2004). Mapping the determinants of health inequalities in social space: can Bourdieu help us? *Health & Place*, 10(3), 245-257.
- Gerritsen, S. (2005). Children, Food and Poverty: Food insecurity among primary school students in the Wellington region. Social Science Research. Wellington: Victoria University of Wellington.
- Giampietro, M., & Ulgiati, S. (2005). Integrated Assessment of Large-Scale Biofuel Production. *Critical Reviews in Plant Sciences*, 24(5/6), 365-384.
- Gibbs, G. R. (2002). *Qualitative Data Analysis: Explorations with NVivo*. Buckingham: Open University Press.
- Gibbs, M. (2001). Toward a strategy for undertaking cross-cultural collaborative research. *Society and Natural Resources*, 14(8), 673-687.
- Giddens, A. (1984). *The Constitution of Society*. Cambridge: Polity Press.
- Giddens, A. (1987). *Social Theory and Modern Sociology*. Cambridge: Policy Press.
- Giles-Corti, B., & Donovan, R. J. (2002). The relative influence of individual, social and physical environment determinants of physical activity. *Social Science & Medicine*, 54(12), 1793-1812.
- Gittelsohn, J., & Kumar, M. B. (2007). Preventing childhood obesity and diabetes: Is it time to move out of the school? *Pediatric Diabetes*, 8(SUPPL. 9), 55-69.
- Godfrey, K. M., Lillycrop, K. A., Burdge, G. C., Gluckman, P. D., & Hanson, M. A. (2007). Epigenetic Mechanisms and the Mismatch Concept of the Developmental Origins of Health and Disease. [Miscellaneous Article]: *Pediatric Research* May 2007;61(5, Part 2) Supplement:5R-10R.
- Golan, M. (2006). Parents as agents of change in childhood obesity--from research to practice. *International Journal of Pediatric Obesity*, 1(2), 66-76.
- Goldstein, J. (1999). Emergence as a Construct: History and Issues. *Emergence*, 1(1), 49-72.
- Gonzalez, W., Jones, S. J., & Frongillo, E. A. (2009). Restricting Snacks in U.S. Elementary Schools Is Associated with Higher Frequency of Fruit and Vegetable Consumption. *J. Nutr.*, 139(1), 142-144.
- Goodin, R. E., & Dryzek, J. S. (2006). Deliberative Impacts: The Macro-Political Uptake of Mini-Publics. *Politics & Society*, 34(2), 219-244.
- Goran, M. I., Reynolds, K. D., & Lindquist, C. H. (1999). Role of physical activity in the prevention of obesity in children. *International Journal of Obesity*, 23(4), s18.
- Green-Pedersen, C., & Wilkerson, J. (2006). How agenda-setting attributes shape politics: Basic dilemmas, problem attention and health politics developments in Denmark and the US. *Journal of European Public Policy*, 13(7), 1039-1052.

- Green, L. W., Poland, B. D., & Rootman, I. (2000). The settings approach to health promotion. In B. D. Poland, L. W. Green & I. Rootman (Eds.), *Settings for Health Promotion: Linking theory and practice*. London: Sage.
- Grunert, K. G., & Wills, J. M. (2007). A review of European research on consumer response to nutrition information on food labels. *Journal of Public Health*, 15(5), 385-399.
- Haby, M. M., Vos, T., Carter, R., Moodie, M., Markwick, A., Magnus, A., et al. (2006). A new approach to assessing the health benefit from obesity interventions in children and adolescents: the assessing cost-effectiveness in obesity project. *International Journal of Obesity*, 30(10), 1463-1475.
- Hackbarth, D. P., Schnopp-Wyatt, D., Katz, D., Williams, J., Silvestri, B., & Pflieger, R. M. (2001). Collaborative research and action to control the geographic placement of outdoor advertising of alcohol and tobacco products in Chicago. *Public Health Reports*, 116(6), 558-567.
- Hajer, M. A., & Wagenaar, H. (Eds.) (2003). *Deliberative Policy Analysis: Understanding Governance in the Network Society*. Cambridge: Cambridge University Press.
- Hammond, R. A. (2008). *A Complex Systems Approach to Understanding and Combating the Obesity Epidemic*. Washington DC: The Brookings Institution.
- Hammond, R. A. (2009). Complex systems modeling for obesity research. *Preventing Chronic Disease*, 6(3).
- Harper, C., Wood, L., & Mitchell, C. (2008). *The provision of school food in 18 countries*. London: School Food Trust.
- Harre, R., & Bhaskar, R. (2001). How to Change Reality: Story vs. Structure - A debate between Rom Harre and Roy Bhaskar. In J. Lopez & G. Potter (Eds.), *After Postmodernism: An introduction to critical realism*. London: The Athlone Press.
- Harris, K. C., Kuramoto, L. K., Schulzer, M., & Retallack, J. E. (2009). Effect of school-based physical activity interventions on body mass index in children: A meta-analysis. *Canadian Medical Association Journal*, 180(7), 719-726.
- Hart, K. H., Herriot, A., Bishop, J. A., & Truby, H. (2003). Promoting healthy diet and exercise patterns amongst primary school children: A qualitative investigation of parental perspectives. *Journal of Human Nutrition and Dietetics*, 16(2), 89-96.
- Hastings, G. (2007). *Social Marketing: Why should the devil have all the best tunes?* Oxford: Elsevier.
- Hastings, G., Stead, M., McDermott, L., Forsyth, A., MacKintosh, A. M., Rayner, M., et al. (2003). *Review of research on the effects of food promotion to children: Final Report prepared for the Food Standards Agency*. Glasgow: Food Standards Agency.
- Hawe, P., Shiell, A., & Riley, T. (2004). Complex interventions: how "out of control" can a randomised controlled trial be? *BMJ*, 328(7455), 1561-1563.

References

- Hayne, C. L., Moran, P. A., & Ford, M. M. (2004). Regulating Environments to Reduce Obesity. *Journal of Public Health Policy*, 25(3/4), 391.
- Health Select Committee (2007). Inquiry into Obesity and Type 2 Diabetes in New Zealand. Wellington: New Zealand House of Representatives.
- Health Sponsorship Council (2009). The HSC approach. Wellington: Health Sponsorship Council, (Access Date 12/8/2009), <http://www.hsc.org.nz/socialmarketing.html>.
- Hill, S., & Smith, S. (2002). Connecting Actor Network Theory and Policy Analysis. *New Zealand Sociology*, 17(1), 74-90.
- Hogwood, B. W., & Gunn, L. A. (1984). Policy Analysis for the Real World. New York: Oxford University Press.
- Horne, P. J., Hardman, C. A., Lowe, C. F., Tapper, K., Le Noury, J., Madden, P., et al. (2008). Increasing parental provision and children's consumption of lunchbox fruit and vegetables in Ireland: the Food Dudes intervention. *European Journal of Clinical Nutrition*.
- Horowitz, C. R., Colson, K. A., Hebert, P. L., & Lancaster, K. (2004). Barriers to Buying Healthy Foods for People With Diabetes: Evidence of Environmental Disparities. *American Journal of Public Health*, 94(9), 1549-1554.
- Houchin, K., & MacLean, D. (2005). Complexity Theory and Strategic Change: an Empirically Informed Critique. *British Journal of Management*, 16(2), 149-166.
- Humpage, L. (2005). Experimenting with a 'whole of government' approach. *Policy Studies*, 26(1), 47-66.
- Inglis, V., Ball, K., & Crawford, D. (2005). Why do women of low socioeconomic status have poorer dietary behaviours than women of higher socioeconomic status? A qualitative exploration. *Appetite*, 45(3), 334-343.
- Innes, J. E., & Booher, D. E. (2003). Collaborative policymaking: governance through dialogue. In M. Hajer & H. Wagenaar (Eds.), *Deliberative Policy Analysis: Understanding governance in the network society*. Cambridge: Cambridge University Press.
- Institute of Policy Studies (2006). Local Government, Strategy and Communities. Wellington: Victoria University of Wellington.
- Institute of Policy Studies (2008). Better connected services for kiwis. Wellington: Institute of Policy Studies, Victoria University.
- International Obesity Taskforce (2007). Childhood Overweight (including obesity) statistics by WHO region. (Access date 21/8/2008), www.ionf.org/database/childhoodoverweightglobal.htm.
- Jaime, P. C., & Lock, K. (2009). Do school based food and nutrition policies improve diet and reduce obesity? *Preventive Medicine*, 48(1), 45-53.

- Jain, A., Chamberlin, L. A., Carter, Y., Powers, S. W., & Whitaker, R. C. (2001). Why Don't Low-Income Mothers Worry About Their Preschoolers Being Overweight? *Pediatrics*, 107(5), 1138.
- James, W. P. T., Nelson, M., Ralph, A., & Leather, S. (1997). The contribution of nutrition to inequalities in health. *British Medical Journal*, 314, 1545-1549.
- Jenkin, G., Wilson, N., & Hermanson, N. (2008). Identifying unhealthy food advertising on television: a case study applying the UK Nutrient Profile model. *Public Health Nutrition*, 12(5), 614-623.
- Jensen, J., Krishnan, V., Hodgson, R., Sathiyandra, S. G., Templeton, R., Jones, D., et al. (2006). New Zealand Living Standards 2004 Nga Ahuatanga Noho o Aotearoa. Wellington: Ministry of Social Development.
- Joffe, M., & Mindell, J. (2006). Complex Causal Process Diagrams for Analyzing the Health Impacts of Policy Interventions. *American Journal of Public Health*, 96(3), 473-479.
- Kauffman, S. (1995). At home in the universe: the search for the laws of self-organization and complexity. New York: Oxford University Press.
- Kearney, J. M., & McElhone, S. (1999). Perceived barriers in trying to eat healthier ? results of a pan-EU consumer attitudinal survey. *British Journal of Nutrition*, 81(Supplement 1), S133-S137.
- King, A. (2005). Media Release: King launches \$40 million first phase for Cancer Control Action Plan. Wellington: Ministry of Health.
- King, L., Turnour, C., & Wise, M. (2007). Analysing NSW state policy for child obesity prevention: strategic policy versus practical action. *Australia and New Zealand Health Policy*, 4(22).
- Kirkpatrick, S. I., & Tarasuk, V. (2007). Adequacy of food spending is related to housing expenditures among lower-income Canadian households. *Public Health Nutrition*, 10(12), 1464-1473.
- Klepp, K.-I., Pérez-Rodrigo, C., Bourdeaudhuij, I. D., Due, P., Elmadfa, I., Haraldsdóttir, J., et al. (2005). Promoting Fruit and Vegetable Consumption among European Schoolchildren: Rationale, Conceptualization and Design of the Pro Children Project. *Annals of Nutrition & Metabolism*, 49(4), 212-220.
- Klijn, E.-H., & Skelcher, C. (2007). Democracy and Governance Networks: Compatible or not? *Public Administration*, 85(3), 587-608.
- Krieger, N. (1994). Epidemiology and the web of causation: Has anyone seen the spider? *Social Science & Medicine*, 39(7), 887-903.
- Kubik, M. Y., Lytle, L., & Fulkerson, J. A. (2005a). Fruits, vegetables, and football: findings from focus groups with alternative high school students regarding eating and physical activity. *Journal of Adolescent Health*, 36(6), 494-500.

References

- Kubik, M. Y., Lytle, L. A., Hannan, P. J., Perry, C. L., & Story, M. (2003). The Association of the School Food Environment With Dietary Behaviors of Young Adolescents. *American Journal of Public Health*, 93(7), 1168-1173.
- Kubik, M. Y., Lytle, L. A., & Story, M. (2005b). Schoolwide food practices are associated with body mass index in middle school students. *Archives of Pediatrics & Adolescent Medicine*, 159(12), 1111-1114.
- Kubik, M. Y., Lytle, L. A., & Story, M. (2005c). Soft drinks, candy, and fast food: what parents and teachers think about the middle school food environment. *Journal of the American Dietetic Association*, 105(2), 233-239.
- Kuchler, F., Tegene, A., & Harris, J. M. (2005). Taxing Snack Foods: Manipulating Diet Quality or Financing Information Programs? *Review of Agricultural Economics*, 27(1), 4-20.
- Kvale, S. (2007). *Doing Interviews*. London: SAGE.
- Lang, T., Dowler, E., & Hunter, D. J. (2006). *Review of the Scottish Diet Action Plan: Progress and Impacts 1996-2005*. Glasgow: Health Scotland, http://www.healthscotland.com/uploads/documents/3158-SDAP_Review_Report_Full.pdf.
- Lang, T., & Rayner, G. (2005). Obesity: a growing issue for European policy? *Journal of European Social Policy*, 15(4), 301-327.
- Lang, T., & Rayner, G. (2007). Overcoming policy cacophony on obesity: an ecological public health framework for policymakers. *Obesity Reviews*, 8 Suppl 1, 165-181.
- Lasswell, H. D. (1970). The Emerging Conception of the Policy Sciences. *Policy Sciences*, 1(1), 3-14.
- Latour, B. (2003). Is re-modernization occurring - And if so, how to prove it? A commentary on Ulrich Beck. *Theory, Culture and Society*, 20(2), 35-48+159.
- Latour, B. (2005). *Reassembling the Social: An introduction to Actor-Network Theory*. Oxford: Oxford University Press.
- Law, J. (2009). Actor Network Theory and Material Semiotics. In B. S. Turner (Ed.), *The New Blackwell Companion to Social Theory*. Chichester: Wiley-Blackwell.
- Law, J., Mol, A., & Editors (2002). *Complexities*. Durham and London: Duke University Press.
- Lawes, C., Stefanogiannis, N., Tobias, M., Paki Paki, N., Ni Mhurchu, C., Turley, M., et al. (2006). Ethnic disparities in nutrition-related mortality in New Zealand: 1997-2011. *N Z Med J*, 119(1240), U2122.
- Levinthal, D. A., & Warglien, M. (1999). Landscape Design: Designing for Local Action in Complex Worlds. *Organization Science*, 10(3), 342-357.
- Leviton, L. C. (2008). Children's healthy weight and the school environment. *Annals of the American Academy of Political and Social Science*, 615(1), 38-55.

- Levy, D. T., Bauer, J. E., & Lee, H. (2006). Simulation Modeling and Tobacco Control: Creating More Robust Public Health Policies. *American Journal of Public Health*, 96(3), 494-498.
- Lieblich, A., Tuval-Mashiach, R., & Zilber, T. (1998). Narrative Research Reading, Analysis, and Interpretation. Thousand Oaks: Sage.
- Lissau, I. (2007). Prevention of overweight in the school arena. *Acta Paediatrica Supplement*, 96(454), 12-18.
- Livingstone, M. B. E., McCaffrey, T. A., & Rennie, K. L. (2006). Childhood obesity prevention studies: lessons learned and to be learned. *Public Health Nutrition*, 9(8A), 1121-1129.
- Lobstein, T., Baur, L., & Uauy, R. (2004). Obesity in children and young people: a crisis in public health. *Obesity Reviews*, 5(s1), 4-85.
- Lobstein, T., & Baur, L. A. (2005). Policies to prevent childhood obesity in the European Union. *Eur J Public Health*, 15(6), 576-579.
- Lobstein, T., & Jackson-Leach, R. (2006). Estimated burden of paediatric obesity and co-morbidities in Europe. Part 2. Numbers of children with indicators of obesity-related disease. *International Journal of Pediatric Obesity*, 1(1), 33 - 41.
- Lobstein, T., Millstone, E., Jacobs, M., Stirling, A., & Mohebati, L. (2006). Policy options for responding to obesity: UK national report of the PorGrow project. Brighton: Science and Technology Policy Research and University of Sussex (16.3.2009), http://www.sussex.ac.uk/spru/documents/uk_english.pdf.
- Longley, C. H., & Sneed, J. (2009). Effects of Federal Legislation on Wellness Policy Formation in School Districts in the United States. *Journal of the American Dietetic Association*, 109(1), 95-101.
- Luckett, K. (2006). An Assessment of the Application of 'Critical Systems Heuristics' to a Policy Development Process. *Systemic Practice and Action Research*, 19, 503-521.
- Lytle, L. A., Kubik, M. Y., Perry, C., Story, M., Birnbaum, A. S., & Murray, D. M. (2006). Influencing healthful food choices in school and home environments: Results from the TEENS study. *Preventive Medicine*, 43(1), 8-13.
- Maani, K. E., & Cavana, R. Y. (2000). Systems Thinking and Modelling: Understanding change and complexity. Auckland: Pearson Education New Zealand Limited.
- Mackenzie, A. (2005). The Problem of the Attractor: A Singular Generality between Sciences and Social Theory. *Theory Culture Society*, 22(5), 45-65.
- Maher, A., Wilson, N., & Signal, L. (2005). Advertising and availability of 'obesogenic' foods around New Zealand secondary schools: a pilot study. *New Zealand Medical Journal*, 118(1218), U1556.

References

- Maher, A., Wilson, N., Signal, L., & Thomson, G. (2006). Patterns of sports sponsorship by gambling, alcohol and food companies: an Internet survey. *BMC Public Health*, 6, 95.
- Mair, J. S., Pierce, M. W., & Teret, S. P. (2005). *The City Planner's Guide to the Obesity Epidemic: Zoning and Fast Food*. Baltimore: The Center for Law and the Public's Health at Johns Hopkins and Georgetown Universities.
- Majchrzak, A. (1984). *Methods for Policy Research*. Newbury Park: Sage Publications.
- Majumdar, D. (2006). Collaboration among government agencies with special reference to New Zealand: A literature review. *Social Policy Journal of New Zealand*(27), 183-198.
- Manson, S. M. (2001). Simplifying complexity: a review of complexity theory. *Geoforum*, 32(3), 405-414.
- Martens, M. K., van Assema, P., & Brug, J. (2005). Why do adolescents eat what they eat? Personal and social environmental predictors of fruit, snack and breakfast consumption among 1214-year-old Dutch students. *Public Health Nutrition*, 8(8), 1258-1265.
- Mays, N., & Pope, C. (1995). Rigour and qualitative research. *British Medical Journal*, 311(6997), 109.
- Mays, N., Pope, C., & Popay, J. (2005). Systematically reviewing qualitative and quantitative evidence to inform management and policy-making in the health field. *Journal of Health Services Research & Policy*, 10, S6.
- McAleese, J. D., & Rankin, L. L. (2007). Garden-Based Nutrition Education Affects Fruit and Vegetable Consumption in Sixth-Grade Adolescents. *Journal of the American Dietetic Association*, 107(4), 662-665.
- McMurtry, A. (2006). Linking complexity with cultural historical activity theory. *International Journal of Research and Method in Education*, 29(2).
- Meadows, D. (1999). *Leverage Points Places to Intervene in a System*. Hartland: The Sustainability Institute (16.3.2009), www.sustainabilityinstitute.org.
- Medd, W. (2001). What Is Complexity Science? Toward an "Ecology of Ignorance". *Emergence*, 3(1), 43-60.
- Medd, W. (2002). Complexity and the Social World. *Social Research Methodology*, 5(1), 71-81.
- Meek, J. W., De Ladurantey, J., & Newell, W. H. (2007). Complex systems, governance and policy administration consequences. *Emergence: Complexity & Organization*, 9(1/2), 24-36.
- Merry, U. (1995). *Coping with Uncertainty: Insights from the New Sciences of Chaos, Self-Organization, and Complexity*. Westport: Praeger.

- Metcalf, P. A., Scragg, R. K. R., Sharpe, S., Fitzgerald, E. D. H., Schaaf, D., & Watts, C. (2003). Short-term repeatability of a food frequency questionnaire in New Zealand children aged 1-14y. *European Journal of Clinical Nutrition*, 57(11), 1498.
- Mhurchu, C. N., & Ogra, S. (2007). The price of healthy eating: cost and nutrient value of selected regular and healthier supermarket foods in New Zealand. *The New Zealand Medical Journal*, 120(1248).
- Midgley, G. (2000). *Systemic Intervention: Philosophy, Methodology, and Practice*. New York: Kluwer Academic/Plenum Publishers.
- Midgley, G. (2003). *Systems Thinking (four volume set)*. London: Thousand Oakes.
- Midgley, G. (2006). Systemic Intervention for Public Health. *American Journal of Public Health*, 96(3), 466-472.
- Midgley, G., & Richardson, K. A. (2007). Systems Thinking for Community Involvement in Policy Analysis. *Emergence: Complexity & Organization*, 9(1/2), 167-183.
- Millar, A., Simeone, R. S., & Carnevale, J. T. (2001). Logic Models: a systems tool for performance management. *Evaluation and Program Planning*, 24, 73-81.
- Millstone, E., & Lobstein, T. (2007). The PorGrow project: Overall cross-national results, comparisons and implications. *Obesity Reviews*, 8(SUPPL. 2), 29-36.
- Minaker, L. M., McCargar, L., Lambraki, I., Jessup, L., Driezen, P., Calengor, K., et al. (2006). School region socio-economic status and geographic locale is associated with food behaviour of Ontario and Alberta adolescents. *Canadian Journal of Public Health*, 97(5), 357-361.
- Ministry of Education (2001). *Schooling in New Zealand: A Guide*. Wellington: Ministry of Education (Access date 5/10/2006), <http://www.minedu.govt.nz/index.cfm?layout=document&documentid=6169&indexid=11537&indexparentid=1072>.
- Ministry of Education (2006). *Review of Schools' Operational Funding*. Wellington: Ministry of Education.
- Ministry of Education (2007a). *Kura kaupapa Māori and kura teina schools*. Wellington: Ministry of Education, (Access date 7/5/2009), http://www.educationcounts.govt.nz/indicators/quality_education_providers/kura_kaupapa_ma-ori_and_kura_teina.
- Ministry of Education (2007b). *The National Administration Guidelines (NAGs)*. Wellington: Ministry of Education (Access date 20/3/2007), www.minedu.govt.nz.
- Ministry of Education (2007c). *The New Zealand Curriculum: For english-medium teaching and learning in years 1-13*. Wellington: Ministry of Education, <http://nzcurriculum.tki.org.nz/>.

References

- Ministry of Education (2007d). TKI School's Link. Wellington: Ministry of Education, <http://www.tki.org.nz/e/schools/wellington.php>.
- Ministry of Education (2008). How the decile is calculated. Wellington: Ministry of Education, (Access Date 26/8/2008), www.minedu.govt.nz.
- Ministry of Education (2009). Promoting Healthy Lifestyles. Wellington: Ministry of Education, (Access date 14/7/2009), <http://healthylifestyles.tki.org.nz/>.
- Ministry of Health (1997). Food and Nutrition Guidelines for Healthy Children Aged 2-12 Years: A background paper. Wellington: Ministry of Health.
- Ministry of Health (1998). Food and Nutrition Guidelines for Healthy Adolescents: A background paper. Wellington: Ministry of Health.
- Ministry of Health (2000). New Zealand Health Strategy. Wellington: Ministry of Health.
- Ministry of Health (2003a). Food and Nutrition Guidelines for Healthy Adults: A background paper. Wellington: Ministry of Health.
- Ministry of Health (2003b). Healthy Eating - Healthy Action: Oranga Kai - Oranga Pumau A Strategic Framework. Wellington: Ministry of Health, <http://www.moh.govt.nz/moh.nsf/ea6005dc347e7bd44c2566a40079ae6f/6088a42cfaa9ac6fcc256ce0000dae66?OpenDocument>.
- Ministry of Health (2004). Healthy Eating - Healthy Action: Oranga Kai - Oranga Pumau Implementation Plan 2004-2010. Wellington: Ministry of Health.
- Ministry of Health (2006a). An analysis of the usefulness and feasibility of a population indicator of childhood obesity. Wellington: Ministry of Health.
- Ministry of Health (2006b). Food and Nutrition Monitoring Report 2006. Wellington: Ministry of Health.
- Ministry of Health (2007a). Food and Beverage Classification System for Years 1-13: User Guide. Wellington: Ministry of Health, <http://www.moh.govt.nz/moh.nsf/indexmh/heha-foodclassification>.
- Ministry of Health (2007b). Information about the Nutrition Fund. Wellington, (Access date 22/5/2008), <http://www.healthed.govt.nz/resources/informationaboutthenutritionfund.aspx>.
- Ministry of Health (2008a). A Portrait of Health. Key Results of the 2006/07 New Zealand Health Survey. Wellington: Ministry of Health.
- Ministry of Health (2008b). Well Child - Tamariki Ora National Schedule. Wellington: Ministry of Health, (Access date 27/5/2008), www.moh.govt.nz/moh.nsf/by+unid/723BB3963A8BDF3CC256BE20075FAF6?Open.
- Ministry of Health (2009a). Fruit in Schools. Wellington: Ministry of Health, (Access Date 18/7/2009), <http://www.moh.govt.nz/fruitinschools>.

- Ministry of Health (2009b). Health Targets 2009/10. Wellington: Ministry of Health, (Access Date 24/6/2009), <http://www.moh.govt.nz/healthtargets>.
- Ministry of Social Development (2004). Opportunity for All New Zealanders. Wellington: Ministry of Social Development.
- Mischen, P. A. (2007). Complexity Theory and Public Administration: The role of organizations and organizational networks in policy implementation. Conference of the Public Administration Theory Network (p. 35). Harrisburg, PA.
- Molnar, A. (2005). School commercialism and adolescent health. *Adolescent Medicine Clinics*, 16(2), 447.
- Moobela, C., & Price, I. (2008). The potential of complexity theory in understanding urban regeneration processes. In L. Dennard, K. A. Richardson & G. Morçöl (Eds.), *Complexity and Policy Analysis* pp. 339-354). Goodyear: ISCE Publishing.
- Moore, L., & Tapper, K. (2008). The impact of school fruit tuck shops and school food policies on children's fruit consumption: A cluster randomised trial of schools in deprived areas. *Journal of Epidemiology & Community Health*.
- Morçöl, G. (2001a). Positivist beliefs among policy professionals: An empirical investigation. *Policy Sciences*, 34, 381-401.
- Morçöl, G. (2001b). What Is Complexity Science? Postmodernist or Postpositivist? *Emergence*, 3(1), 104-119.
- Morçöl, G. (2002). A New Mind for Policy Analysis: Toward a Post-Newtonian and Postpositivist Epistemology and Methodology. Westport: Praeger.
- Morçöl, G. (2008). A complexity theory for policy analysis: an outline and proposals. In L. Dennard, K. A. Richardson & G. Morçöl (Eds.), *Complexity and Policy Analysis* pp. 23-35). Goodyear: ISCE Publishing.
- Morrison, K. (2005). Structuration theory, habitus and complexity theory: elective affinities or old wine in new bottles? *British Journal of Sociology of Education*, 26(3), 311-326.
- Murphy, J. M. (2007). Breakfast and learning: An updated review. *Current Nutrition and Food Science*, 3(1), 3-36.
- Murray, N. G., Low, B. J., Hollis, C., Cross, A. W., & Davis, S. M. (2007). Coordinated School Health Programs and Academic Achievement: A Systematic Review of the Literature. *The Journal of School Health*, 77(9), 589.
- Mytton, O., Gray, A., Rayner, M., & Rutter, H. (2007). Could targeted food taxes improve health? *Journal of Epidemiology and Community Health*, 61(8), 689-694.
- Nanney, M. S., Bohner, C., & Friedrichs, M. (2008). Poverty-Related Factors Associated with Obesity Prevention Policies in Utah Secondary Schools. *Journal of the American Dietetic Association*, 108(7), 1210-1215.

References

- National Children's Bureau (2004). Highlight no. 206 Breakfast clubs and school fruit schemes. London: National Children's Bureau (8/2/2007), <http://www.whatworksforchildren.org.uk/docs/Nuggets/pdfs/breakfast.pdf>.
- National Health Committee (1998). *The Social, Cultural and Economic Determinants of Health in New Zealand: Action to Improve Health*. Wellington: National Health Committee.
- National Heart Foundation (2008). *The School Food Programme - What is it?* Auckland: National Heart Foundation, (Access Date 20/10/2008), <http://www.nhf.org.nz/index.asp?PageID=2145836824>.
- National Heart Foundation (2009a). *Healthy Food Making a Profit: Fairburn School Lunch Scheme*. Auckland: National Heart Foundation, (Access date 3/3/2009), <http://www.nhf.org.nz/index.asp?PageID=2145821199>.
- National Heart Foundation (2009b). *Heart Foundation Tick Programme*. Auckland: National Heart Foundation, (Access date 12/3/2009), <http://www.pickthetick.org.nz/>.
- Nelson, M., Lowes, K., & Hwang, V. (2007). The contribution of school meals to food consumption and nutrient intakes of young people aged 4-18 years in England. *Public Health Nutrition*, 10(07), 652-662.
- Nestle, M. (2006). Food Marketing and Childhood Obesity - A Matter of Policy. *New England Journal of Medicine*, 354(24), 2527-2529.
- New Zealand Government (2006a). *Media Release: Fruit in Schools programme to double in size*. Wellington: Scoop, (Access date 17/10/2006).
- New Zealand Government (2006b). *Mission-On Information Pack*. Wellington, (Access date 29/3/2007), www.minedu.govt.nz/index.cfm?layout=document&documentid=11700&data=l.
- New Zealand Government (2007). *Government Response to the Inquiry into Obesity and Type 2 Diabetes 2007*. Wellington.
- New Zealand Government (2009a). *Press release 11/3/2000: The first 100 days of the new Government*. Wellington: New Zealand Government, (Access date 2/7/2009), <http://scoop.co.nz/stories/PA0003/S00208.htm>.
- New Zealand Government (2009b). *Press release 26/2/2009: Government completes 100-day action plan*. Wellington: New Zealand Government, (Access date 2/7/2009), <http://scoop.co.nz/stories/PA0902/S00385.htm>.
- New Zealand Red Cross (2008). *Red Cross Breakfast in Schools National Evaluation Report*. Auckland: New Zealand Red Cross.
- Nollen, N. L., Befort, C. A., Snow, P., Daley, C. M., Ellerbeck, E. F., & Ahluwalia, J. S. (2007). The school food environment and adolescent obesity: qualitative insights from high school principals and food service personnel. *International Journal of Behavioral Nutrition and Physical Activity*, 4, doi:10.1186/1479-5868-1184-1118.

- O'Dea, D. (2009). Increasing the statutory minimum wage rate. In S. Bowers, Carter, K., Gorton, D., Lanumata, T., Maddison, R., Ni Mhurchu, C., O'Dea, D., Pearce, J., Signal, L. and Walton, M (Ed.), Final report: ENHANCING food security and physical activity for Māori, Pacific and low-income peoples. Wellington: Clinical Trials Research Unit, University of Auckland; GeoHealth Laboratory, University of Canterbury; Health Promotion and Policy Research Unit, University of Otago; Te Hotu Manawa Māori.
- O'Dea, D., Gorton, D., & Mhurchu, C. N. (2009). Potential uses of economic instruments. In S. Bowers, Carter, K., Gorton, D., Lanumata, T., Maddison, R., Ni Mhurchu, C., O'Dea, D., Pearce, J., Signal, L. and Walton, M (Ed.), Final report: ENHANCING food security and physical activity for Māori, Pacific and low-income peoples. Wellington: Clinical Trials Research Unit, University of Auckland; GeoHealth Laboratory, University of Canterbury; Health Promotion and Policy Research Unit, University of Otago; Te Hotu Manawa Māori.
- O'Neill, M., & Pederson, A. P. (1992). Building a methods bridge between public policy analysis and healthy public policy. *Canadian Journal of Public Health*, 83, S25.
- O'Sullivan, D. (2004). Complexity science and human geography. *Transactions of the Institute of British Geographers*, 29(1), 282-295.
- OECD (2009). OECD Health Data 2009 How Does New Zealand Compare. Paris: Organisation for Economic Development and Co-operation, (Access Date 17/7/2009), <http://www.oecd.org/dataoecd/43/22/40905041.pdf>.
- Ogden, C. L., Yanovski, S. Z., Carroll, M. D., & Flegal, K. M. (2007). The epidemiology of obesity. *Gastroenterology*, 132(6), 2087-2102.
- Ozer, E. J. (2007). The effects of school gardens on students and schools: conceptualization and considerations for maximizing healthy development. *Health Education & Behavior*, 34(6), 846-863.
- Parnell, W., Scragg, R., Wilson, N., Schaaf, D., & Fitzgerald, E. (2003). NZ Food NZ Children: Key results of the 2002 Children's Nutrition Survey. Wellington: Ministry of Health, http://www.moh.govt.nz/moh.nsf/wpg_index/publications-NZ+Food,+NZ+Children.
- Parnell, W. R., Wilson, N. C., Mann, J. I., & Gray, A. R. (2005). Overview of Food Security Status in New Zealand as a Predictor of Nutritional Outcomes. *Proceedings of the Nutrition Society of New Zealand*, 30, 144-149.
- Parsons, W. (1997). Public Policy: An introduction to the theory and practice of policy analysis. Cheltenham: Edward Elgar.
- Patrick, H., & Nicklas, T. A. (2005). A review of family and social determinants of children's eating patterns and diet quality. *Journal of the American College of Nutrition*, 24(2), 83-92.
- Patton, M. Q. (1994). Developmental Evaluation. *Evaluation Practice*, 15(3).
- Pawson, R., & Tilley, N. (1997). Realistic Evaluation. London: Sage.

References

- Pearce, J., Blakely, T., Whitten, K., & Bartie, P. (2007). Neighbourhood Deprivation and Access to Fast-Food Retailing. *American Journal of Preventive Medicine*, 32(5), 375-382.
- Pepperell, S. (2009). Food price hikes lead to health warnings. Sunday Star Times. Auckland.
- Perkins, H., & Thorns, D. (2001). A decade on: reflections on the Resource Management Act 1991 and the practice of urban planning in New Zealand. *Environment & Planning B: Planning & Design*, 28(5), 639-654.
- Perry, B. (2008). Household incomes in New Zealand: trends in indicators of inequality and hardship 1982 to 2007. Wellington: Ministry of Social Development.
- Peterson, K. E., & Fox, M. K. (2007). Addressing the epidemic of childhood obesity through school-based interventions: what has been done and where do we go from here? *Journal of Law, Medicine & Ethics*, 35(1), 113-130.
- Plate, T. (2001). Complexity Science as a New Strategic Tool. *Quarterly Strategy Review by CGEY Strategy and Transformation Practice*.
- Poland, B. D. (1992). Learning to walk our talk: the implications of sociological theory for research methodologies in health promotion. *Canadian Journal of Public Health*, 83, S31.
- Pope, C., Ziebland, S., & Mays, N. (2000). Qualitative research in health care: Analysing qualitative data. *British Medical Journal*, 320, 114-116.
- Powell, L. M., & Chaloupka, F. J. (2009). Food Prices and Obesity: Evidence and Policy Implications for Taxes and Subsidies. *Milbank Quarterly*, 87(1), 229-257.
- Power, C., Manor, O., & Matthews, S. (2003). Child to adult socioeconomic conditions and obesity in a national cohort. *International Journal of Obesity*, 27(9), 1081.
- Priogine, I. (1997). Nonlinear Science and the Laws of Nature. *International Journal of Bifurcation and Chaos in Applied Sciences and Engineering*, 7, 1917-1926.
- Pyle, S. A. (2006). Fighting an epidemic: the role of schools in reducing childhood obesity. *Psychology in the Schools*, 43(3), 361-376.
- QSR International. (2006). NVivo version 7.0. Doncaster.
- Ragin, C. C. (2000). Fuzzy-set social science. Chicago: The University of Chicago Press.
- Ransley, J. K., Greenwood, D. C., Cade, J. E., Blenkinsop, S., Schagen, I., Teeman, D., et al. (2007). Does the school fruit and vegetable scheme improve children's diet? A non-randomised controlled trial. *Journal of Epidemiology & Community Health*, 61(8), 699-703.
- Reckwitz, A. (2002). Toward a Theory of Social Practices A development in culturalist theorizing. *European Journal of Social Theory*, 5(2), 245-265.

- Reed, M., & Harvey, D. L. (1992). The new science and the old: complexity and realism in the social sciences. *Journal for the Theory of Social Behaviour*, 22(4), 353-380.
- Rees, G. A., Richards, C. J., & Gregory, J. (2008). Food and nutrient intakes of primary school children: A comparison of school meals and packed lunches. *Journal of Human Nutrition and Dietetics*, 21(5), 420-427.
- Reid, P. (1999). Te pupuri i te ao o te tangata whenua. In P. Davis & K. Dew (Eds.), *Health and Society in Aotearoa New Zealand*. Auckland: Oxford University Press.
- Reidpath, D. D., Burns, C., Garrard, J., Mahoney, M., & Townsend, M. (2002). An ecological study of the relationship between social and environmental determinants of obesity. *Health & Place*, 8(2), 141-145.
- Reilly, J. J. (2005). Descriptive epidemiology and health consequences of childhood obesity. *Best Practice & Research Clinical Endocrinology & Metabolism*, 19(3), 327-341.
- Reinaerts, E., de Nooijer, J., Candel, M., & de Vries, N. (2007). Explaining school children's fruit and vegetable consumption: The contributions of availability, accessibility, exposure, parental consumption and habit in addition to psychosocial factors. *Appetite*, 48(2), 248-258.
- Reserve Bank of New Zealand (2007). Policy Targets Agreement 2007. Wellington: Reserve Bank of New Zealand, (26/3/2008), www.rbnz.govt.nz.
- Reynolds, K. D., Klepp, K.-I., & Yaroch, A. L. (2004). Public Health Nutrition Strategies for Intervention at the Ecological Level. In M. J. Gibney, Barrie M. Margetts, J. M. Kearney & L. Arab (Eds.), *Public Health Nutrition*. Oxford: Blackwell.
- Ricciuto, L., Tarasuk, V., & Yatchew, A. (2006). Socio-demographic influences on food purchasing among Canadian households. *European Journal of Clinical Nutrition*, 60(6), 778-790.
- Ricciuto, L. E., & Tarasuk, V. S. (2007). An examination of income-related disparities in the nutritional quality of food selections among Canadian households from 1986-2001. *Social Science & Medicine*, 64(1), 186-198.
- Richards, R., Darling, H., & Reeder, A. I. (2005). Sponsorship and fund-raising in New Zealand schools: implications for health. *Aust N Z J Public Health*, 29(4), 331-336.
- Richardson, K. (Ed.) (2005). *Managing organizational complexity: philosophy, theory and application*. Greenwich: IAP.
- Richardson, K. A. (2008). On the limits of bottom-up computer simulation: towards a nonlinear modeling culture. In L. Dennard, K. A. Richardson & G. Morçöl (Eds.), *Complexity and Policy Analysis* pp. 339-354). Goodyear: ISCE Publishing.
- Rickles, D., Hawe, P., & Shiell, A. (2007). A simple guide to chaos and complexity. *Journal of Epidemiology & Community Health*, 61, 933-937.

References

- Roberts, A. (2000). Can We Start to Understand Emergence? *Democracy & Nature: The International Journal of Inclusive Democracy*, 6(3), 447-461.
- Robinson-O'Brien, R., Story, M., & Heim, S. (2009). Impact of Garden-Based Youth Nutrition Intervention Programs: A Review. *Journal of the American Dietetic Association*, 109(2), 273-280.
- Robinson, D. (2003). *Becoming Deliberative: A case study of activities using a deliberative approach in Porirua City, New Zealand*. Wellington: Social and Civic Policy Institute (8/11/2007), <http://www.scpa.org.nz/papers.htm>.
- Rogers, I. S., Ness, A. R., Hebditch, K., Jones, L. R., & Emmett, P. M. (2007). Quality of food eaten in English primary schools: School dinners vs packed lunches. *European Journal of Clinical Nutrition*, 61(7), 856-864.
- Roos, E., Lahelma, E., Virtanen, M., Prattala, R., & Pietinen, P. (1998). Gender, socioeconomic status and family status as determinants of food behaviour. *Social Science & Medicine*, 46(12), 1519-1529.
- Rosenkranz, R. R., & Dziewaltowski, D. A. (2008). Model of the home food environment pertaining to childhood obesity. *Nutrition Reviews*, 66(3), 123-140.
- Runge, C., & Senauer, B. (2007). Ethanol's Real Costs: How Biofuels Could Starve the Poor. *Future Survey*, 29(7), 12-13.
- Rush, E., Paterson, J., & Obolonkin, V. (2008). Food frequency information - relationships to body composition and apparent growth in 4-year-old children in the Pacific Island Family Study. *New Zealand Medical Journal*, 121(1281), 3240.
- Rush, E., Puniani, N., Snowling, N., & Paterson, J. (2007). Food security, selection, and healthy eating in a Pacific Community in Auckland New Zealand. *Asia Pacific Journal of Clinical Nutrition*, 16(3), 448-454.
- Rush, E. C., Puniani, K., Valencia, M. E., Davies, P. S. W., & Plank, L. D. (2003). Estimation of body fatness from body mass index and bioelectrical impedance: comparison of New Zealand European, Maori and Pacific Island children. *European Journal of Clinical Nutrition*, 57(11), 1394.
- Sacks, G., Swinburn, B., & Lawrence, M. (2009). Obesity Policy Action framework and analysis grids for a comprehensive policy approach to reducing obesity. *Obesity Reviews*, 10(1), 76-86.
- Sacks, G., Swinburn, B. A., & Lawrence, M. A. (2008). A systematic policy approach to changing the food system and physical activity environments to prevent obesity. *Australia and New Zealand Health Policy*, 5(13).
- Salis, J. F., & Glanz, K. (2006). The Role of Built Environments in Physical Activity, Eating, and Obesity in Childhood. *The Future of Children*, 16(1), 89-108.
- Sallis, J. F., McKenzie, T. L., Conway, T. L., Elder, J. P., Prochaska, J. J., Brown, M., et al. (2003). Environmental interventions for eating and physical activity: A randomized controlled trial in middle schools. *American Journal of Preventive Medicine*, 24(3), 209-217.

- Salmond, C., & Crampton, P. (2002). NZDep2001 Index of Deprivation User's Manual. Wellington: Department of Public Health Wellington School of Medicine and Health Sciences.
- Sanderson, I. (2000). Evaluation in Complex Policy Systems. *Evaluation*, 6(4), 433.
- Sanderson, I. (2006). Complexity, 'practical rationality' and evidence-based policy making. *Policy and Politics*, 34(1), 115-132.
- Sanigorski, A. M., Bell, A. C., Kremer, P. J., & Swinburn, B. A. (2005). Lunchbox contents of Australian school children: room for improvement. *European Journal of Clinical Nutrition*, 59(11), 1310-1316.
- Sattar, N., & Lean, M. (Eds.) (2007). ABC of Obesity. Oxford: BMJ Books.
- Scaglioni, S., Salvioni, M., & Galimberti, C. (2008). Influence of parental attitudes in the development of children eating behaviour. *British Journal of Nutrition*, 99(SupplementS1), S22-S25.
- School Food Trust (2007). A guide to the Government's new food-based standards for school lunches. London: School Food Trust.
- School Food Trust (2008). The impact of primary school breakfast clubs in deprived areas of London. London: School Food Trust (11/2/2009), www.schoolfoodtrust.org.uk.
- Schwartz, M. B., & Brownell, K. D. (2007). Actions necessary to prevent childhood obesity: creating the climate for change. *Journal of Law, Medicine & Ethics*, 35(1), 78-89.
- Schwartz, M. B., Novak, S. A., & Fiore, S. S. (2009). The Impact of Removing Snacks of Low Nutritional Value From Middle Schools. *Health Education Behaviour*, doi: 10.1177/1090198108329998.
- Scott-Samuel, A. (1996). Health impact assessment. *BMJ*, 313(7051), 183-184.
- Scott, C. (2003). Policy Analysis and Policy Styles in New Zealand Central Agencies. Public Policy Network Conference (p. 17). Wellington.
- Seale, C., & Silverman, D. (1997). Ensuring rigour in qualitative research. *European Journal of Public Health*, 7(4), 379-384.
- Seidell, J. C., & Visscher, T. L. (2004). Public Health Aspects of Overnutrition. In M. J. Gibney, Barrie M. Margetts, J. M. Kearney & L. Arab (Eds.), *Public Health Nutrition*. Oxford: Blackwell.
- Seiders, K., & Petty, R. D. (2004). Obesity and the role of food marketing: a policy analysis of issues and remedies. *Journal of Public Policy and Marketing*, 23(2).
- Sharma, M. (2006). School-based interventions for childhood and adolescent obesity. *Obesity Reviews*, 7(3), 261-269.
- Shaw, C. (2009). (Non)regulation of marketing of unhealthy food to children in New Zealand. *New Zealand Medical Journal*, 122(1288), 76-86.

References

- Shaw, R., & Eichbaum, C. (2008). *Public Policy in New Zealand*. North Shore: Pearson Education New Zealand.
- Shemilt, I., Harvey, I., Shepstone, L., Swift, L., Reading, R., Mugford, M., et al. (2004). A national evaluation of school breakfast clubs: Evidence from a cluster randomized controlled trial and an observational analysis. *Child: Care, Health and Development*, 30(5), 413-427.
- Shiell, A. (2008). The danger in conservative framing of a complex, systems-level issue. *HealthcarePapers*, 9(1).
- Shiell, A., Hawe, P., & Gold, L. (2008). Complex interventions or complex systems? Implications for health economic evaluation. *BMJ*, 336(7656), 1281-1283.
- Signal, L., Langford, B., Quigley, R., & Ward, M. (2006). Strengthening Health, Wellbeing and Equity: Embedding Policy-Level HIA in New Zealand. *Social Policy Journal of New Zealand*, 29, 17-31.
- Signal, L. N., Lanumata, T., Robinson, J., Tavila, A., Wilton, J., & Mhurchu, C. N. (2008). Perceptions of New Zealand Nutrition Labels in New Zealand by Maori, Pacific and Low-income Shoppers. *Public Health Nutrition*, 11(7), 706-713.
- Silverman, D. (1993). *Interpreting Qualitative Data: Methods for analysing talk, text and interaction*. London: SAGE Publication.
- Spatial Planning Unit (2008). *Waltham Forest SPD - Hot Food Takeaway Shops*. London: London Borough of Waltham Forest.
- Sport and Recreation New Zealand (2007). *Mission-On Factsheet*. Wellington Sport and Recreation New Zealand, (Access Date 17/7/2009), <http://www.sparc.govt.nz/filedownload?id=d3effde9-7415-44e7-a357-87380992a776>.
- Sport and Recreation New Zealand (2008a). *Green prescription overview*. Wellington: Sport and Recreation New Zealand, (Access Date 3/3/2009), <http://www.sparc.org.nz/getting-active/green-prescription/overview>.
- Sport and Recreation New Zealand (2008b). *Healthy Fundraising Ideas*. Wellington: Sport and Recreation New Zealand, (Access date 3/3/2009), <http://www.sparc.govt.nz/education/mission-on/fundraising/fundraising-ideas#food>.
- Stafford, M., Cummins, S., Ellaway, A., Sacker, A., Wiggins, R. D., & Macintyre, S. (2007). Pathways to obesity: Identifying local, modifiable determinants of physical activity and diet. *Social Science & Medicine*, 65(9), 1882-1897.
- Stake, R. E. (2003). Case Studies. In N. K. Denzin & Y. S. Lincoln (Eds.), *Strategies of Qualitative Inquiry*. Thousand Oakes: Sage.
- State Services Commission (2007). *Implementing the Code of Conduct*. Wellington: State Services Commission, (Access date 10/7/2009), <http://www.ssc.govt.nz/display/document.asp?docid=6991>.

- Statistics New Zealand. (2004). Household Economic Survey Year ended 30 June 2004 - Standard Tables 2003_2004 (xls). Wellington: Statistics New Zealand.
- Statistics New Zealand (2007). Census 2006 Boundary Maps. Wellington: Statistics New Zealand, <http://www.stats.govt.nz/census/census-outputs/boundary/default.htm?contract=2000045&ParentID=1000009&ss=y&type=ta&scrollLeft=0&scrollTop=627>.
- Statistics New Zealand (2008). Hot off the press - National Ethnic Population Projections: 2006 (base) – 2026. Wellington: Statistics New Zealand, (Access date 3/8/2009), <http://www.stats.govt.nz/~media/Statistics/browse%20for%20stats/nationalethnicpopulationprojections/hotp06-26/nationalethnicpopulationprojections2006basehotp.aspx>.
- Statistics New Zealand (2009). Retail Trade Survey. Wellington: Statistics New Zealand, (Access date 14/7/2009), <http://www.stats.govt.nz/datasets/business/retail-trade.htm>.
- Steenberghen, T., & Lopez, E. (2008). Overcoming barriers to the implementation of alternative fuels for road transport in Europe. *Journal of Cleaner Production*, 16(5), 577-590.
- Stewart, J., & Ayres, R. (2001). Systems theory and policy practice: An exploration. *Policy Sciences*, 34, 97-94.
- Stirling, A., Lobstein, T., Millstone, E., & PorGrow Research, T. (2007). Methodology for obtaining stakeholder assessments of obesity policy options in the PorGrow project. *Obesity Reviews*, 8 Suppl 2, 17-27.
- Story, M., Kaphingst, K. M., & French, S. (2006). The role of schools in obesity prevention. *Future of Children*, 16(1), 109-142.
- Story, M., Kaphingst, K. M., Robinson-O'Brien, R., & Glanz, K. (2008). Creating Healthy Food and Eating Environments: Policy and Environmental Approaches. *Annual Review of Public Health*, 29(1).
- Story, M., Nannery, M. S., & Schwartz, M. B. (2009). Schools and Obesity Prevention: Creating School Environments and Policies to Promote Healthy Eating and Physical Activity. *Milbank Quarterly*, 87(1), 71-100.
- Story, M., Neumark-Sztainer, D., & French, S. (2002). Individual and Environmental Influences on Adolescent Eating Behaviors. *Journal of the American Dietetic Association*, 102(3, Supplement 1), S40-S51.
- Stuart, D. (2005). Educator Responses to Food-Related School business Relationships from a Socio-ecological and Health Promotion Perspective. Wellington: Ministry of Education.
- Summerbell, C., Waters, E., Edmunds, L., Kelly, S., Brown, T., & Campbell, K. (2005). Interventions for preventing obesity in children. *Cochrane Database of Systematic Reviews*(1).

References

- Swinburn, B., & Egger, G. (2002). Preventive strategies against weight gain and obesity. *Obesity Reviews*, 3(4), 289-301.
- Swinburn, B., & Egger, G. (2004). The runaway weight gain train: too many accelerators, not enough brakes. *BMJ*, 329(7468), 736-739.
- Swinburn, B., Egger, G., & Raza, F. (1999). Dissecting Obesogenic Environments: The Development and Application of a Framework for Identifying and Prioritizing Environmental Interventions for Obesity. *Preventive Medicine*, 29, 563-570.
- Swinburn, B., Gill, T., & Kumanyika, S. (2005). Obesity prevention: a proposed framework for translating evidence into action. *Obesity Reviews*, 6(1), 23-33.
- Swinburn, B. A., Jolley, D., Kremer, P. J., Salbe, A. D., & Ravussin, E. (2006). Estimating the effects of energy imbalance on changes in body weight in children. *American Journal of Clinical Nutrition*, 83(4), 859-863.
- The Economist (2008). A worthless currency. Johannesburg: The Economist, (Access Date 29/06/2009), http://www.economist.com/world/mideast-africa/displaystory.cfm?story_id=11751346.
- The Treasury (2009). Performance Information for Appropriations Vote Health. Wellington: The Treasury, (Access date 17/7/2009), <http://www.treasury.govt.nz/budget/2009/ise/v6>.
- Thomas, D. R. (2001). Research Strategies. In P. Davis & T. Ashton (Eds.), *Health and Public Policy in New Zealand*. Auckland: Oxford University Press.
- Thornley, L., Quigley, R., Watts, C., Conland, C., Meikle, R., & Ball, J. (2007). *Health Eating: Rapid Evidence Review of Nutrition Social Marketing Interventions to Prevent Obesity*. Wellington: Health Sponsorship Council.
- Tolley, A. (2009). Press Release: Schools no longer required to be food police. Wellington: New Zealand Government, (Access Date 24.2.2009), <http://beehive.govt.nz/release/schools+no+longer+required+be+food+police>.
- Turrell, G. (1996). Structural, material and economic influences on the food-purchasing choices of socioeconomic groups. *Australian and New Zealand Journal of Public Health*, 20(6), 611-617.
- Turrell, G., & Kavanagh, A. M. (2006). Socio-economic pathways to diet: modelling the association between socio-economic position and food purchasing behaviour. *Public Health Nutrition*, 9(3), 375-383.
- Ulrich, W. (2000). Reflective practice in the civil society: the contribution of critically systemic thinking. *Reflective Practice*, 1(2), 247-268.
- Uprichard, E., & Byrne, D. (2006). Representing complex places: a narrative approach. *Environment and Planning A*, 38, 665-676.
- Utter, J., Schaaf, D., Mhurchu, C. N., & Scragg, R. (2007a). Food choices among students using the school food service in New Zealand. *The New Zealand Medical Journal*, 120(1248).

- Utter, J., Scragg, R., Mhurchu, C. N., & Schaaf, D. (2007b). At-Home Breakfast Consumption among New Zealand Children: Associations with Body Mass Index and Related Nutrition Behaviors. *Journal of the American Dietetic Association*, 107(4), 570-576.
- Utter, J., Scragg, R., & Schaaf, D. (2006a). Associations between television viewing and consumption of commonly advertised foods among New Zealand children and young adolescents. *Public Health Nutrition*, 9(5), 606-612.
- Utter, J., Scragg, R., Schaaf, D., & Fitzgerald, E. (2006b). Nutrition and physical activity behaviours among Maori, Pacific and NZ European children: identifying opportunities for population-based interventions. *Australian & New Zealand Journal of Public Health*, 30(1), 50-56.
- Utter, J., Scragg, R., Schaaf, D., Fitzgerald, E., & Wilson, N. (2007c). Correlates of body mass index among a nationally representative sample of New Zealand children. *International Journal of Pediatric Obesity*, 2(2), 104 - 113.
- van der Horst, K., Oenema, A., Ferreira, I., Wendel-Vos, W., Giskes, K., van Lenthe, F., et al. (2007). A systematic review of environmental correlates of obesity-related dietary behaviors in youth. *Health Education Research*, 22(2), 203-226.
- Van Duyn, M. A., & Pivonka, E. (2000). Overview of the health benefits of fruit and vegetable consumption for the dietetics professional: selected literature. *Journal of the American Dietetic Association*, 100(12), 1511-1521.
- Van Kleef, E., Van Trijp, H., Paeps, F., & Fernández-Celemin, L. (2008). Consumer preferences for front-of-pack calories labelling. *Public Health Nutrition*, 11(2), 203-213.
- Vandenbroeck, I. P., Goossens, J., & Clemens, M. (2008). Tackling Obesities: Future Choices - Building the Obesity System Map. London: Foresight Government Office for Science (12/3/2009), www.foresight.gov.uk.
- Wagenaar, H., & Cook, S. D. N. (2003). Understanding policy practices: action, dialectic and deliberation in policy analysis. In M. Hajer & H. Wagenaar (Eds.), *Deliberative Policy Analysis: Understanding governance in the network society*. Cambridge: Cambridge University Press.
- Walby, S. (2004). Complexity theory, globalisation and diversity. Conference of the British Sociological Association (p. 22). University of York.
- Walby, S. (2007). Complexity Theory, Systems Theory, and Multiple Intersecting Social Inequalities. *Philosophy of the Social Sciences*, 37(4), 449-470.
- Walker, R. (2007). Entropy and the Evaluation of Labour Market Interventions. *Evaluation*, 13(2), 193-219.
- Walker, S., Eketone, A., & Gibbs, A. (2006). An exploration of kaupapa Maori research, its principles, processes and applications. *International Journal of Social Research Methodology*, 9(4), 331-344.

- Wall, J., Mhurchu, C. N., Blakely, T., Rodgers, A., & Wilton, J. (2006). Effectiveness of Monetary Incentives in Modifying Dietary Behavior: A Review of Randomized, Controlled Trials. *Nutrition Reviews*, 64(12), 518-531.
- Walton, D. (2007). Revitalizing the Public Sphere: The Current System of Discourse and the Need for the Participative Design of Social Action. *Systemic Practice and Action Research*, 20, 369-386.
- Wang, Y., & Beydoun, M. A. (2007). The Obesity Epidemic in the United States - Gender, Age, Socioeconomic, Racial/Ethnic, and Geographic Characteristics: A Systematic Review and Meta-Regression Analysis. *Epidemiologic Reviews*, 29, 6-28.
- Wang, Y., & Lobstein, T. (2006). Worldwide trends in childhood overweight and obesity. *International Journal of Pediatric Obesity*, 1(1), 11 - 25.
- Wardley, B. L., Puntis, J. W. L., & Taitz, L. S. (1997). Handbook of Child Nutrition. Oxford: Oxford University Press.
- Wareham, N. J., van Sluijs, E. M. F., & Ekelund, U. (2005). Physical activity and obesity prevention: a review of the current evidence. *Proceedings of the Nutrition Society*, 64(02), 229-247.
- Westley, F., Zimmerman, B., & Patton, M. Q. (2006). Getting to maybe: how the world is changed: Random House Canada.
- Wharton, C. M., Long, M., & Schwartz, M. B. (2008). Changing nutrition standards in schools: The emerging impact on school revenue. *Journal of School Health*, 78(5), 245-251.
- Whelan, A., Wrigley, N., Warm, D., & Cannings, E. (2002). Life in a 'Food Desert'. *Urban Studies*, 39(11), 2083-2100.
- White, J. (2007). The Health Select Committee Inquiry into Obesity and Type Two Diabetes in New Zealand: An initial analysis of submissions. Wellington: Fight the Obesity Epidemic New Zealand Incorporated.
- Whitehead, M. (2007). A typology of actions to tackle social inequalities in health. *Journal of Epidemiology & Community Health*, 61(6), 473-478.
- Wiles, R., Cott, C., & Gibson, B. E. (2008). Hope, expectations and recovery from illness: a narrative synthesis of qualitative research. *Journal of Advanced Nursing*, 64(6), 564-573.
- Williden, M., Taylor, R. W., McAuley, K. A., Simpson, J. C., Oakley, M., & Mann, J. I. (2006). The APPLE project: An investigation of the barriers and promoters of healthy eating and physical activity in New Zealand children aged 5-12 years. *Health Education Journal*, 65(2), 135-148.
- Wills, W., Backett-Milburn, K., Gregory, S., & Lawton, J. (2006). Young teenagers' perceptions of their own and others' bodies: A qualitative study of obese, overweight and 'normal' weight young people in Scotland. *Social Science & Medicine*, 62, 396-406.

- Wilson, N., Quigley, R., & Mansoor, O. (1999). Food ads on TV: A health hazard for children? *Australian and New Zealand Journal of Public Health*, 23(6), 647-650.
- Wilson, N., Signal, L., Nicholls, S., & Thomson, G. (2006). Marketing fat and sugar to children on New Zealand television. *Preventive Medicine*, 42(2), 96-101.
- Wind, M., Bobelijn, K., De Bourdeaudhuij, I., Klepp, K.-I., & Brug, J. (2005). A Qualitative Exploration of Determinants of Fruit and Vegetable Intake among 10- and 11-Year-Old Schoolchildren in the Low Countries. *Annals of Nutrition & Metabolism*, 49(4), 228-235.
- Winkler, E., Turrell, G., & Patterson, C. (2006). Does living in a disadvantaged area entail limited opportunities to purchase fresh fruit and vegetables in terms of price, availability, and variety? Findings from the Brisbane Food Study. *Health & Place*, 12(4), 741-748.
- Wojcicki, J. M., & Heyman, M. B. (2006). Healthier choices and increased participation in a middle school lunch program: Effects of nutrition policy changes in San Francisco. *American Journal of Public Health*, 96(9), 1542-1547.
- Wolf, A. (2004). Research Strategies for Policy Relevance. *Social Policy Journal of New Zealand*, 23(Dec 2004), 65-85.
- Woog, R., Cavana, R. Y., Roberts, R., & Packham, R. (2006). Working at the interface between systems and complexity thinking: insights from a market access design project for poor livestock producers. *Systems Research and Behavioral Science*, 23(6), 727(715).
- World Cancer Research Fund / American Institute for Cancer Research (2009). Policy and Action for Cancer Prevention. Food, Nutrition, and Physical Activity. Washington DC: AICR.
- World Health Organization (1986). Ottawa Charter for Health Promotion 1986. Geneva: World Health Organization.
- World Health Organization (1998). WHO Information series on school health - Healthy Nutrition: An essential element of a health-promoting school. Geneva: World Health Organization (Access Date 28/9/2006), www.who.int/hpr.
- World Health Organization (2003). Diet, Nutrition and the prevention of chronic diseases. Geneva: World Health Organization, <http://www.who.int/dietphysicalactivity/publications/trs916/en/>.
- World Health Organization (2004). Global Strategy on Diet, Physical Activity and Health. Geneva: World Health Organization.
- Wrigley, N., Warm, D., & Margetts, B. (2003). Deprivation, diet, and food-retail access: findings from the Leeds 'food deserts' study. *Environment & Planning A*, 35(1), 151.
- Wynd, D. (2005). Hard to Swallow: Foodbank use in New Zealand. Auckland: Child Poverty Action Group (12/1/2007), www.cpag.co.nz/resources/publications.

References

- Yin, R. K. (2003). *Case Study Research Design and Methods* (Third Edition). Thousand Oaks: Sage Publications.
- Yngve, A., Wolf, A., Poortvliet, E., Elmadfa, I., Brug, J., Ehrenblad, B., et al. (2005). Fruit and Vegetable Intake in a Sample of 11-Year-Old Children in 9 European Countries: The Pro Children Cross-Sectional Survey. *Annals of Nutrition & Metabolism*, 49(4), 236-245.
- Young, L., & Swinburn, B. (2002). Impact of the *Pick the Tick* food information programme on the salt content of food in New Zealand. *Health Promotion International*, 17(1), 13-19.
- Zenk, S. N., & Powell, L. M. (2008). US secondary schools and food outlets. *Health & Place*, 14(2), 336-346.

Appendix A

Case Study Primary School Information Sheets and Ethics Forms



Schools Information sheet for research study:

Promoting Healthy Childhood Nutrition through Primary Schools: A study of barriers, supports, and effective policy options.

Contact Details:

Mat Walton
Assistant Research Fellow
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University of Otago, Wellington

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Dr Louise Signal
Director HePPRU
Department of Public Health
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The aim of this project is to:

- Identify the supports and barriers to the role of primary schools in supporting healthy childhood nutrition practices, and
- Consider what policies, at school, local government, and central government levels, may assist schools to support healthy childhood nutrition practices.

Why is this study important?

The food children eat can affect how well they learn and their behaviour. A child's diet is also a key factor in children being overweight and obese, which poses major risks to health through diabetes, heart disease, and some cancers later in life. The importance of diet and physical exercise has been recognised by the New Zealand Government through the Health and Physical Activity Curriculum, the Mission-on set of policies, and changes to the National Administration Guidelines.

In this study we will work with schools to identify where schools can help promote healthy diets of children, and where there are current barriers or limitations to what schools can do. The research will help identify what can practically be achieved through actions by primary schools, school food policies, and local and central government policies. This information will then be provided to policymakers.

Through this approach we hope to promote public policies that reduce barriers for schools in supporting healthy diets, and which support schools in this endeavour.

How many schools are involved?

Five primary schools in the Wellington Region will be recruited as case study schools. These schools will include two lower decile schools, two medium decile schools, and one upper decile school. A case comparison method will be used to highlight similarities and differences between the experiences of these schools.

What information is being collected?

As this research is focussed on policies, the main information collected will be through interviews with decision makers within the school: Board of Trustees members, school Principal, and Health and Physical Education Curriculum lead teacher.

To place this information within context however, information on the existing school food environment – such as types of food sold in the school, sponsorship arrangements, and teaching resources – will be collected. Similar information will be collected in the community surrounding the school, including the number and location of diaries, food advertising within the community, and the demographic characteristics of the area. We will also be asking for the addresses of students (but no names or identifying information), to map where students live in relation to the diaries, food adverts and community facilities.

How much time will it take?

Each interview will take between forty minutes and one hour. They will be conducted at a time suitable to the participants. An additional day may be required in the school collecting information on the food environment, such as accessing food service sales records.

The information for the five case study schools will be collected between February and June 2008.

What are the benefits to the schools taking part?

For each school, the results of the findings on barriers and supports that exist within each school will be made available to the school. This may be through a presentation at a Board of Trustees meeting, staff meeting, or both. This information can then be used in the development of the school's food policy to comply with National Administration Guideline changes.

In appreciation of the time given for this study by school staff and Board of Trustee members, a book voucher of \$150 dollars will be given to participating schools.

How will the results be used?

The results from the five case study schools will inform the identification of possible options at local and national levels to improve children's diets. These options and the results themselves will then be discussed with policymakers in interviews, including officials from government ministries and politicians.

The interviews with policymakers will be analysed to identify the types of public policy options concerning childhood nutrition that are likely, or unlikely, to have support and why. How policymakers perceive the role of schools in improving children's diets will also be considered.

Who is funding this study?

This study is being funded through a project grant from the National Heart Foundation of New Zealand.

How do we get involved in the study?

Mat Walton will contact you to see if your school would be interested in finding out more about the study or being involved.

February 2008



Promoting Healthy Childhood Nutrition through Primary Schools: A study of barriers, supports, and effective policy options

INFORMATION SHEET FOR RESEARCH PARTICIPANTS

Thank you for showing an interest in this project. Please read this information sheet carefully before deciding whether or not to participate. If you decide not to participate there will be no disadvantage to you of any kind.

Please note that this project has been reviewed and approved by the Department of Public Health, University of Otago, Wellington.

The aim of this project is to:

- To identify the supports and barriers to the role of primary schools in supporting healthy childhood nutrition practices, and
- To consider what policies, at school, local government, and central government levels, may help the role of schools to support healthy childhood nutrition practices.

We are seeking to interview people who:

Are involved in determining aspects of policies to do with access to food by children, funding of nutrition promotion programmes, or delivery of nutrition education and support programmes to children. We are interested in seeking the views of a range of people from teachers, school principals, Board of Trustee members, local politicians, government officials, and politicians.

What is the next step?

Project staff will contact you to see if you wish to take part in the project, and if so to arrange a time for an interview.

What we are interested in your ideas about:

- The influences on childhood nutrition.

- The role of primary schools in supporting healthy childhood nutrition.
- What schools currently do well in supporting healthy childhood nutrition, and how schools may do better.
- What resources and public policies need to be in place in schools, communities, and nationally, to help support healthy childhood nutrition.

How the interviews would be carried out:

The interviews would be face to face, or by phone.

The interview would be about 40 minutes (sometimes more if that is suitable).

This project involves some open-ended questions. These will depend on the way in which the interview develops. Consequently, although the Department of Public Health, University of Otago (Wellington) is aware of the general areas to be explored in the interview, the Department has not been able to review the precise questions to be used.

Right to withdraw

You have the right to decline to answer any particular question(s) and you may withdraw from the research at any stage, without any disadvantage to yourself of any kind.

How we would use the material from the interview:

- The material that we obtain will be made anonymous, to ensure that you are not identified. Your identity will be confidential to the project staff.
- Should you wish, we would be very happy to send you the results of the project.
- The results may be published but any data included will in no way be linked to any specific participant.
- The material collected will be securely stored in such a way that only the research team will be able to gain access to it. No other staff will have access to it.
- At the end of the project any personal information will be destroyed immediately.

What if you have any questions?

If you have any questions about our project, either now or in the future, please feel free to contact:

Dr Louise Signal,
Phone 04 385 5999 ext. 6477
Louise.signal@otago.ac.nz
University of Otago, Wellington

Mat Walton
Phone 04 385 5541 ext 4637
Mathew.walton@otago.ac.nz
University of Otago, Wellington



Research project: Promoting Healthy Childhood Nutrition through Primary Schools: A study of barriers, supports, and effective policy options

CONSENT FORM FOR INTERVIEWEES

I have read the Information Sheet concerning this project and understand what it is about. All my questions have been answered to my satisfaction. I understand that I am free to request further information at any stage.

I know that:-

1. My participation in the project is entirely voluntary;
2. I am free to withdraw from the project at any time without any disadvantage;
3. The interview will audio-recorded and I may choose to have the machine stopped at any time.
4. The record of my name and address will be destroyed at the conclusion of the research, but an anonymous recording and transcript of the interview will be retained in secure storage for five years, after which it will be destroyed;
5. This project involves open-ended questions. The wording of these questions will depend on the way in which the interview develops. In the event that the line of questioning develops in such a way that I feel hesitant or uncomfortable, I may decline to answer any particular question(s) and/or may withdraw from the project without any disadvantage of any kind.
6. The results of the project may be published, but my anonymity will be preserved.
7. This project has been reviewed and approved by the Department of Public Health, University of Otago (Wellington).
8. I agree to take part in this project.

..... (Signature of interviewee)

..... (Date)

February 2008



Promoting Healthy Childhood Nutrition through Primary Schools: A study of barriers, supports, and effective policy options

INFORMATION SHEET FOR CASE STUDY SCHOOL PRINCIPALS

Collection of student address information

Thank you for showing an interest in this project. Please read this information sheet carefully before deciding whether or not to provide information on student addresses.

Please note that this project has been reviewed and approved by the Department of Public Health, University of Otago, Wellington.

The aim of this project is to:

- To identify the supports and barriers to the role of primary schools in supporting healthy childhood nutrition practices, and
- To consider what policies, at school, local government, and central government levels, may help the role of schools to support healthy childhood nutrition practices.

What information is being sought?

Part of the study involves looking at the food that is for sale and advertised in the community surrounding the case study schools, and considering how this might impact on the students of the school. It is intended that maps will be produced that can show the location, number, and type of food outlet and food advertisements in relation to the school. It is also intended that these maps can show food outlets and adverts in relation to where students live, and how they travel to school.

While the food outlet and advertisement information can be easily collected by researchers 'walking' the community, student addresses will need to be collected from the school in order to represent where students live.

For this reason, school principals (for schools who have already agreed to take part in the study as ‘case study schools’), are being asked to provide anonymous addresses of all the school’s students.

Only street addresses are required, and no identifying information of children (e.g. names, age, ethnicity, parent’s names, etc.) is being requested.

How we would use the student address information:

- The student address information will be kept in secure electronic files
- The student address information will be combined with other information collected on the location and type of food outlets and food advertisements in the community. Together this information will be analysed to consider:
- The number and types of food outlets school students are likely to pass on the way to school
- The number and types of food advertisements school students are likely to pass on the way to school
- The distribution of food outlets and advertisements compared to the distribution of where students live.
- The results may be published but any data included will in no way include any specific addresses of students, or any identifying information.
- The material collected will be securely stored in such a way that only the research team will be able to gain access to it. No other staff will have access to it.

What if you have any questions?

If you have any questions about our project, either now or in the future, please feel free to contact:

Dr Louise Signal,
Phone 04 385 5999 ext. 6477
Louise.signal@otago.ac.nz
University of Otago, Wellington

Mat Walton
Phone 04 385 5541 ext 4637
Mathew.walton@otago.ac.nz
University of Otago, Wellington



Research project: Promoting Healthy Childhood Nutrition through Primary Schools: A study of barriers, supports, and effective policy options

CONSENT FORM FOR SCHOOL PRINCIPALS

Collection of student address information

I have read the Information Sheet concerning this project and understand what it is about. All my questions have been answered to my satisfaction. I understand that I am free to request further information at any stage.

I know that:-

1. My agreement to release anonymous student address information is entirely voluntary;
2. That no identifying information of individual students (e.g. names, age, ethnicity), is being requested;
3. That analysis and publications that use student address information will in no way present specific addresses of individual students;
4. This project has been reviewed and approved by the Department of Public Health, University of Otago (Wellington).
5. I agree to provide information on student addresses for this project.

..... (Signature of interviewee)

..... (Date)

Appendix B

Policymaker information and ethics forms



Information sheet for policy participants:

Promoting Healthy Childhood Nutrition through Primary Schools: A study of barriers, supports, and effective policy options.

The aim of this research is to:

- Identify the supports and barriers to the role of primary schools in supporting healthy childhood nutrition practices, and
- Consider what policies, at school, local government, and central government levels, may assist schools to support healthy childhood nutrition practices.

Why is this study important?

The food children eat can affect how well they learn and their behaviour. A child's diet is also a key factor in children being overweight and obese, which poses major risks to health through diabetes, heart disease, and some cancers later in life. The importance of diet and physical exercise has been recognised by the New Zealand Government through the Health and Physical Activity Curriculum, the Mission-on set of policies.

We have worked with five primary schools to identify where schools can help promote healthy diets of children, and where there are current barriers or limitations to what schools can do. We are now seeking policy maker views on this research to date.

Why interview policymakers?

Through the primary school case study research, broad policy options to support primary schools to promote healthy childhood nutrition have been identified. We would like to discuss these broad policy areas with people from a public policy perspective.

The aim of the policymaker interviews is to identify where the views of primary schools and policy makers are similar and different, and why. This information should help identify realistic options for supporting the role of primary schools.

Who do we want to talk to?

We are interested in a range of views from individuals involved in policy areas likely to have an impact on children's nutrition. This includes politicians, policy analysts, advocates, and researchers across education, health, social development, and local government policy areas.

How much time will it take?

Each interview will take approximately 40 minutes. They will be conducted at a time suitable to the participants.

Interviews will be audio-recorded and transcribed for analysis. No comments will be attributed to individuals, and only members of the research team will have access to interview material.

Who is funding this study?

This study is being funded through a project grant from the National Heart Foundation of New Zealand.

How to get involved in the study?

Mat Walton will contact you to see if you would be interested in finding out more about the study or being involved.

Contact Details:

Mat Walton
Assistant Research Fellow
Department of Public Health
University of Otago, Wellington

Phone: 04 385 5541 x 4637
Email: Mathew.walton@otago.ac.nz
Fax: 04 389 5319

Dr George Thomson
Senior Research Fellow
Department of Public Health
University of Otago, Wellington

Phone: 04 385 5541 x 6054
Email: george.thomson@otago.ac.nz



September 2008

Promoting Healthy Childhood Nutrition through Primary Schools: A study of barriers, supports, and effective policy options

INFORMATION SHEET FOR RESEARCH PARTICIPANTS

Thank you for showing an interest in this project. Please read this information sheet carefully before deciding whether or not to participate. If you decide not to participate there will be no disadvantage to you of any kind.

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The aim of this project is to:

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- The influences on childhood nutrition.
- The role of primary schools in supporting healthy childhood nutrition.
- What schools currently do well in supporting healthy childhood nutrition, and how schools may do better.
- What resources and public policies need to be in place in schools, communities, and nationally, to help support healthy childhood nutrition.

We are seeking to interview people who:

Are involved in determining aspects of policies to do with access to food by children, funding of nutrition promotion programmes, or delivery of nutrition education and support programmes to children. We are interested in seeking the views of a range of people including politicians, government officials, members of NGOs, and academics.

What is the next step?

Research staff will contact you to see if you wish to take part in the project, and if so to arrange a time for an interview.

How the interviews would be carried out:

The interviews would be face to face, or by phone.

The interview would be about 40 minutes

This project involves some open-ended questions. The specific questions that are asked will depend on the way in which the interview develops. Consequently, although the Department of Public Health, University of Otago (Wellington) is aware of the general areas to be explored in the interview, the Department has not been able to review the precise questions to be used.

Right to withdraw

You have the right to decline to answer any particular question(s) and you may withdraw from the research at any stage, without any disadvantage to yourself of any kind.

How we would use the material from the interview:

- The material that we obtain will be made anonymous, to ensure that you are not identified. Your identity will be confidential to the research staff.
- Should you wish, we would be very happy to send you the results of the research.
- The results may be published but any data included will in no way be linked to any specific participant.
- The material collected will be securely stored in such a way that only the research team will be able to gain access to it. No other people will have access to it.
- At the end of the project any personal information (such as contact details) will be destroyed immediately.

What if you have any questions?

If you have any questions about our project, either now or in the future, please feel free to contact:

Dr George Thomson,
Phone 04 385 5999 ext. 6054
George.thomson@otago.ac.nz
University of Otago, Wellington

Mat Walton
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Mathew.walton@otago.ac.nz
University of Otago, Wellington



Research project: Promoting Healthy Childhood Nutrition through Primary Schools: A study of barriers, supports, and effective policy options

CONSENT FORM FOR INTERVIEWEES

I have read the Information Sheet concerning this research and understand what it is about. All my questions have been answered to my satisfaction. I understand that I am free to request further information at any stage.

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- I am free to withdraw from the research at any time without any disadvantage;
- The interview will audio-recorded and I may choose to have the machine stopped at any time.
- The record of my name and address will be destroyed at the conclusion of the research, but an anonymous recording and transcript of the interview will be retained in secure storage for five years, after which it will be destroyed;
- This project involves open-ended questions. The wording of these questions will depend on the way in which the interview develops. In the event that the line of questioning develops in such a way that I feel hesitant or uncomfortable, I may decline to answer any particular question(s) and/or may withdraw from the project without any disadvantage of any kind.
- The results of the project may be published, but my anonymity will be preserved.

This project has been reviewed and approved by the Department of Public Health, University of Otago (Wellington).

I agree to take part in this project.

..... (Name)

..... (Signature of interviewee)

..... (Date)

Appendix C

School participant interview guide

Key Informant Interview Schedule

Questions

Context Information:

1. Could you outline any policies around food available in the school, or sponsorship from food companies that currently exist?
 - What do you think the impact of these policies has been?
 - Can I please have copies of the policies?
2. Could you outline any current rules around children leaving school grounds at lunchtime?
3. Please describe any rules around the types of food children can bring to school?
4. Does your school have a school lunch programme?
 - Could you describe it for me please?
 - Is it run for profit or not for profit?
 - Who runs the programme?
 - Is there information regarding sale volumes and volume of food type sold?

Nutrition Questions

5. Can you briefly describe the key challenges faced by the school that you think will impact on quality of education and health of the students?
 - Prompt: crowded curriculum, teacher recruitment, poverty of families, health issues
6. Can you briefly describe any future challenges faced by the school that you think will impact on quality of education and health of the students?

Has nutrition been mentioned?

- Where does nutrition and obesity fit into this? If you were to rank obesity as a challenge facing the school, where would it rank amongst those you have identified?
7. How would you rank the health of the students at this school?

Prompt: Are there any consistent issues brought to your attention by public health nurses, teachers,

How do you view the sickness absences – normal, low, high?

8. How do you view the diets of the children at your school?
9. Do you think there are issues with diet amongst the children at your school?

10. Do you view this as a problem for the school? – Why?
11. Do you view this as a problem for the students? – Why?
12. How big is this problem?
13. Are there any groups of students more affected than others? – Why / Why not?

Prompt: Are there differences between students of different ethnicities?

Are there differences between genders?

14. What do you think the causes of good diets are?
 - Would you rank some causes as more important than others?
15. What do you think the causes of bad diets are?
 - Would you rank some causes as more important than others?
16. What do you think the best way to influence the causes are, to improve diets?
 - Is there anything that needs to happen first?
 - Prompt: any changes required to policies, resources, families, community?
17. Have you noticed any changes in what kids are eating over recent years?

Role of school and resources:

18. What should the role of the school be in influencing the causes of diets?
19. Who should support the school?
20. What resources are needed for the school to influence the causes of diets?
 - Where do the resources come from currently?
 - Where should the resources come from in the future?
21. What is the role of fundraising in the school operations?
 - How much of this comes from food sales?
22. What are the barriers for the school to influence diets?
 - Prompt: resources, families, community
23. Current government policy is that schools reduce availability of unhealthy foods at school.
 - How is the school planning on meeting the NAG
24. Do you think the NAG will make a difference?
 - Why / why not?
25. What do you think will make a difference?
26. How useful are the resources provided to schools?
 - E.g. Food and Beverage Classification System

Appendix D

Policymaker interview guide

Policymaker Interview Schedule:

Two phases of interview:

- Common background questions
- Sector specific intervention questions

Maximum interview length 40 minutes

Audio recorded and transcribed

Common background questions

1. How much have you considered or worked with issues related to children's nutrition or obesity?
2. Can you describe your understanding of the causes of childhood obesity?
3. Can you describe your understanding of the influences on children's diets?
4. How much of a problem do you think children's diets and childhood obesity are in NZ?
5. What do you think the role of primary schools should be in addressing childhood obesity?
6. Besides schools, where else does responsibility for action lie?

Intervention interview questions

Through the schools, there were a number of areas for intervention identified. Some of these may already have work underway, while others may not.

I would like your personal opinion on each broad intervention area: whether you think it will make a difference to childhood nutrition, what specific types of interventions might be trialled, and how likely to succeed each intervention might be.

Think of the policy areas as medium term (5-10 years). I am less interested in information to critique current policy than I am in exploring options for future policy directions.

Support Agencies:

Currently support agencies, such as Health Promoting School teams, seem to be focussed more on working with lower decile schools, where the burden of obesity lies. There were two issues raised by schools around support agencies. For those lower decile schools where there is good engagement from agencies, there was a

sense that agencies can create pressure on school staff by attempting to run multiple programmes within the school at the same time. Some better coordination between agencies was required, while it was even suggested that staff from agencies could actually do more of the work in schools, rather than advising school staff. For higher decile schools, there was a sense that they were trying to make changes with very little expert support, and some more advice from support agencies could be useful.

7. What do you expect the role of support agencies to be in schools?
8. What do you think the role of teachers should be in developing nutrition policies and interventions for their schools?
9. Should there be a difference in the level of support provided to schools based on decile?

Fundraising in schools:

The higher decile schools (4 upwards) increasingly saw fundraising as being vital to the running of the school. Much of the fundraising carried out was based around selling food, much of it unhealthy food, of the sort that schools are now being asked to not provide within the school.

Possible types of interventions discussed ranged from a more coordinated sharing of information between schools on non-food based events that are successful, to guaranteeing a minimum level of income for schools trialling new alternative events, to increasing schools operating budgets to lessen the need to fundraise.

10. Do you see the selling of chocolates, for example, by students, as a problem, or barrier to improving children's diets?
 - why, why not?
11. How actively do you think schools should be supported to move away from selling unhealthy food as a fundraising method?
 - by whom?
12. What alternatives to selling 'unhealthy' foods should be prioritised for fundraising?

Food in schools:

There was some support for the provision of food in schools, funded by government. This ranged from an ongoing commitment to the current Fruit in Schools scheme, increasing the range of schools that receive Fruit in Schools (currently decile 1 and 2), to providing free lunches in schools.

13. In your opinion, whose responsibility should it be for providing food for children during the school day?

14. Is there a case for differential responses across school deciles?

15. What types of interventions in this area would you support?

- why, why not?

16. How widely do you think these types of interventions would be supported?

Influencing food brought into schools:

The changed NAG now means that schools are required to provide only healthy foods, when providing foods on school grounds. Several schools however described how very little food eaten by students is purchased or provided by the school, most comes from home. Some schools suggested that they have trouble influencing the food parents provide for children, and that attempts to limit types of food brought to school have meet fierce resistance.

Policy options discussed here ranged from social marketing campaigns focussed on school lunches, to support agencies such as Health Promoting School teams within District Health Boards to try and work directly with parents, rather than only through schools, to mandatory school policies imposed by government banning certain food items from being brought to school – such as chippies and soft drinks.

17. What do you think the role of schools should be in regulating what food is brought to school?

18. What is the best way of influencing the food provided by parents for school lunches?

The next two areas are not considering policy areas for implementation within schools – but policies that may impact on the home and community – with an assumed downstream effect on the food brought into schools.

Influencing Home Environments:

Schools commonly expressed the lack of influence they seem to have on children's diets within the home. In discussion with schools several drivers of children's diets in homes were identified, from the school's perspective. These included parent's knowledge around nutrition, time pressures within home and the convenience of packaged foods, the cost of healthy food compared to some unhealthy foods, and for low income families the cost of food compared to other living costs.

19. To what extent do you think schools have a role in influencing what happens in homes in relation to provision of food?

20. What do you think the most effective ways are to increase the nutrition knowledge of parents?

- what about social marketing campaigns, are they mentioned?

Influencing community environments:

In a similar theme, schools also commonly cited barriers to healthy diets in the community, such as the pricing of healthy food, marketing of unhealthy food to children, and accessibility of unhealthy food in the community.

21. How much of an impact do you think aspects food pricing and food marketing limits what schools can achieve to improve children's diets?
22. What role, if any, do you think there might be in using the pricing of food to encourage more healthy diets?
23. what type of interventions do you think might work?
24. What do you think the role of marketing of food is likely to be having in children's diets?
25. What scope do you think there is to limit children's exposure to marketing?
26. how would this be achieved?
27. What impact do you think availability of unhealthy foods in dairies and other food outlets near schools might have on children's diets?
28. Is there scope to influence the availability of unhealthy foods?
 - if so, how might this be achieved?

Appendix E

Case study school feedback report

This report has been made anonymous.



**Promoting Healthy Childhood
Nutrition through Primary Schools:
A study of barriers, supports and
effective policy options**

XXX Primary School

Draft Feedback Report

August 2008

Mat Walton
Health Promotion and Policy Research Unit
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Executive Summary

This report provides initial findings of the research study *Promoting healthy childhood nutrition through primary schools: a study of barriers, supports and effective policy options*, to participating case study schools.

Several common barriers to promoting healthy nutrition were identified across case study schools, these included:

- The limited influence schools have on food brought from home
- Parents knowledge of nutrition and ability to provide healthy food
- The cost of food
- ‘Sometimes’ and ‘occasional’ food, where available in schools, outselling ‘everyday’ menu items
- The convenience and appeal of packaged foods
- Limited school resources to develop and implement changes.

Some different barriers were identified between higher and lower decile schools, including:

- Community environment being more supportive of healthy food in higher decile areas
- Home environment generally more supportive of healthy food in higher decile areas
- Lower decile schools generally having greater access to support agencies to help with food policies and initiatives
- Obesity and nutrition being more of an issue in lower compared to higher decile schools.

A range of intervention options to improve the school food environment, and better promote healthy nutrition were identified. The majority of these required action external to the school, by local agencies or central government. School level actions focussed on development and refinement of school food policies to work towards banning some prevalent ‘occasional’ foods from schools such as chippies. For many schools this will require careful engagement with both students and parents, which may in turn require more external support.

Background

This report provides each primary school that has participated in this research study with a summary of results across all schools, and of school specific results.

This research, *Promoting healthy childhood nutrition through primary schools: a study of barriers, supports and effective policy options*, is funded through a project grant by the National Heart Foundation of New Zealand. The aim of this research project is to identify policy interventions that will support primary schools in improving childhood nutrition, and ultimately, reduce rates of childhood obesity.

The study consists of two research phases. The first is to work with primary schools to explore how nutrition is being promoted to children within the school, and identify the range of barriers experienced, and supports required to support each school. Five schools kindly agreed to take part. These schools cover a diverse range of decile, ethnic mix of students, and community setting. The data collected from each school included a range of interviews, school lunch sales, and survey of food outlets surrounding the school.

The second phase of the study is to take the supports and intervention options identified from the schools and discuss these with policymakers. The assumption is that if interventions are identified that are supported by both schools and policymakers, that these should be the starting point for further action.

As this research is ongoing, any feedback or clarification is welcomed from participating schools.

Summary Results for All Schools

An analysis of the barriers and identified interventions to better support the promotion of healthy nutrition in primary schools is presented below.

Barriers

Table one below shows the identified barriers by topic area for each school.

Table One – Identified Barriers to Promoting Healthy Childhood Nutrition

School food environment aspect	School 1	School 2 (XXX School)	School 3	School 4	School 5
School lunch programme	<ul style="list-style-type: none"> ▪ ‘Sometimes’ foods dominate lunch menu and sales ▪ Limited on site food preparation facilities ▪ Influence of parents on lunch menu 	<ul style="list-style-type: none"> ▪ Restricted ‘occasional’ food, but take up high proportion of sales ▪ Influence of parent’s and community environment on lunch menu 	<ul style="list-style-type: none"> ▪ More ‘occasional’ items on menu than ‘everyday’ ▪ ‘occasional’ menu items sell more than proportion of items ▪ Influence of parent’s and community environment on lunch menu 	<ul style="list-style-type: none"> ▪ ‘Sometimes’ menu items dominate sales, even though availability restricted 	<ul style="list-style-type: none"> ▪ ‘Sometimes’ menu items sell more than proportion of availability
Fundraising	<ul style="list-style-type: none"> ▪ Requirement to fund raise and “food sells” 	<ul style="list-style-type: none"> ▪ Requirement to fund raise and “food sells” 	<ul style="list-style-type: none"> ▪ Requirement to fund raise (often using ‘occasional’ foods) for classroom and school equipment 		
Food brought from home	<ul style="list-style-type: none"> ▪ Good diets, but also high amount of pre-packaged foods 	<ul style="list-style-type: none"> ▪ Variable lunch practices ▪ Large amount of packaged foods ▪ Sometimes not enough food 	<ul style="list-style-type: none"> ▪ Amount of packaged foods brought from home 		<ul style="list-style-type: none"> ▪ Amount of packaged foods brought to school ▪ Limited amount of sandwiches and fruit type foods brought to school ▪ Sometimes no or not enough food

School food environment aspect	School 1	School 2 (XXX School)	School 3	School 4	School 5
					brought to school
Home environment	<ul style="list-style-type: none"> ▪Time pressure leads to pre-packaged foods as convenience 	<ul style="list-style-type: none"> ▪Time pressure leads to pre-packaged foods as convenience ▪Cost of healthy food vs less healthy food 	<ul style="list-style-type: none"> ▪Time pressure on parents leads to pre-packaged foods ▪Children's influence on parent's food decisions 	<ul style="list-style-type: none"> ▪Cost of healthy vs less healthy food ▪Mass media marketing of 'occasional' foods to children 	<ul style="list-style-type: none"> ▪Time pressure on parents leads to convenience of packaged foods ▪Low socio-economic context – lack of money ▪Cost of healthy vs less healthy food ▪Value of takeaway/packaged foods
Community Environment		<ul style="list-style-type: none"> ▪Opportunity to buy 'occasional' foods (if not available at school) 	<ul style="list-style-type: none"> ▪Opportunity to buy 'occasional' foods (if not available at school) 	<ul style="list-style-type: none"> ▪Availability of 'occasional' foods ▪Local marketing of 'occasional' foods 	
Children		<ul style="list-style-type: none"> ▪Preferences for less healthy foods 	<ul style="list-style-type: none"> ▪Preferences for pre-packaged foods 		
Parents	<ul style="list-style-type: none"> ▪Some vocal parent opposition to restricting food availability in school 	<ul style="list-style-type: none"> ▪Limited nutrition knowledge ▪Limited lunch ideas ▪Reaction to sudden rule changes or food bans 	<ul style="list-style-type: none"> ▪Limited nutrition knowledge ▪Resistance to school food rules or bans 	<ul style="list-style-type: none"> ▪Limited nutrition knowledge 	<ul style="list-style-type: none"> ▪Limited nutrition knowledge ▪Lack of engagement with school
School resources	<ul style="list-style-type: none"> ▪Changes reliant on parent and teacher energy/time 	<ul style="list-style-type: none"> ▪Limited school staff time to plan and implement changes 	<ul style="list-style-type: none"> ▪Limited teacher time to focus on nutrition and food environment changes ▪Limited 	<ul style="list-style-type: none"> ▪Lack of nutrition education resources in te reo Māori ▪Limited teacher time to develop 	<ul style="list-style-type: none"> ▪Impact on teachers time of making changes to school food environment ▪Lack of

School food environment aspect	School 1	School 2 (XXX School)	School 3	School 4	School 5
			ability to educate parents	resources and initiate changes	school resources to educate parents

Note: ‘Everyday’, ‘Sometimes’, and ‘Occasional’ foods refers to the food item categories of the Ministry of Health (2007) Food and Beverage Classification System for years 1-13.

Table One shows some barriers common across all schools. ‘Sometimes’ and ‘occasional’ food items on school lunch programme (a la carte) menus, tend to account for a higher proportion of sales than their proportion of items on the menu. This can be particularly seen in schools where items have restricted availability (one or two days a week), yet still sell more than items available everyday. All schools expressed concerns over the amount of pre-packaged foods brought into the school. This concern related both to the impact on children’s diets, and the amount of rubbish in the school. All schools expressed some concerns over their ability to plan and implement changes to the school food environment due to competing demands on staff time, and parent time where parents were engaged.

Time pressure in the home environment was consistently suggested as a barrier to more ‘everyday’ type foods being brought into the school. The flip side of this is the convenience of packaged foods, or bought lunches, in a time poor environment. There was quite consistent identification of parent’s knowledge of the nutrition requirements for children, and the nutrition content of various foods, as a barrier to improved practice. A consistent barrier for schools was that the majority of food consumed in the school was brought from home, and that schools have limited influence over this. There was some question as to whether it is appropriate for schools to attempt to influence the home environment, whereas others thought it was appropriate even if only because they could not identify any other institutions that would do this.

There were also a number of barriers that varied across schools. This variation seemed to be largely related to the socio-economic position of the school. Compared to the lower decile schools, the higher decile school participants considered that the home environment was more supportive of healthy childhood nutrition practices, and that nutrition and obesity were less of a problem in the school. There were fewer food outlets and adverts surrounding higher decile schools compared to lower decile schools. Higher decile schools compared to lower decile schools, however, also identified the requirement to fundraise as a barrier to promoting healthy nutrition; and actions restricted by the engagement of parents in school rules and policies.

Compared to the higher decile schools, lower decile schools found it easier to develop policies and implement rules around food in the school due to a lack of engagement of parents, and due to the resources available from local support agencies (governmental and NGO). Low decile school also however perceive nutrition and obesity as more of a problem in the schools compared to higher decile schools, while the home and

community environments are considered to be less conducive to supporting healthy nutrition practices.

Intervention Options

The policy interventions identified across case study schools are presented in Table Two. This table places interventions in the location of action (school, home, or community), by the agency with the locus of control over the action (school, local agencies, central government). The decile of the school where the policy intervention was identified is shown in brackets after the intervention description. Some interventions were identified in multiple cases.

Table Two – Identified Intervention Options for All Case Study Schools by Environment and Locus of Action

Environment	School	Local Agencies/Local Government	Central Government
School	<ul style="list-style-type: none"> ▪ Reducing availability of ‘occasional’ and ‘sometimes’ foods on lunch menu, increasing ‘everyday’ items (10, 7, 3, 4) ▪ Development of formal food rules/policy (4) ▪ Widen scope of food policy to include aspects of school food environment (3, 1) ▪ Engagement of students in improving food environment (7) ▪ Grow ‘everyday’ foods at school (3) ▪ Promote alternatives to banned or discouraged food items (1) ▪ Trial fundraising events without ‘occasional’ foods (10, 7) 	<ul style="list-style-type: none"> ▪ Guarantee any short-fall from school trialling new ‘occasional’ food free fundraising (10) ▪ Evaluate and share information on ‘occasional’ food free fundraising activities (10) ▪ Extending specialist HEHA support to higher decile schools (4, 7) ▪ Supporting development of formal school food rules/policy (4) ▪ Support school’s to grow ‘everyday’ foods at school (3) ▪ Produce nutrition education resources in te reo Māori, reflecting tikanga Māori (3) ▪ Undertake more ‘hands-on’ work within schools (1) ▪ Work to engage parents 	<ul style="list-style-type: none"> ▪ Provision of free or subsidised food at school (4, 3, 1) ▪ Mandatory school policies e.g. ban on chippies (10) ▪ Increase operating budget to reduce reliance on fundraising (10, 7) ▪ Guarantee any short-fall from school trialling new ‘occasional’ food free fundraising (10, 7) ▪ Evaluate and share information on ‘occasional’ food free fundraising activities (10) ▪ Subsidy of ‘everyday’ food items in schools (7) ▪ Continue to fund ‘Fruit in Schools’ (3) ▪ Produce nutrition education resources in te reo Māori, reflecting tikanga Māori (3) ▪ Increase funding to support

Environment	School	Local Agencies/Local Government	Central Government
		around food choices in relation to school (1)	agencies to allow more 'hands-on' work in schools (1)
Home		<ul style="list-style-type: none"> ▪ Social marketing – convenient, affordable 'everyday' lunch options (10, 4, 3, 1) ▪ Extend well-child programme to include child food preference development (4, 7) 	<ul style="list-style-type: none"> ▪ Social marketing – convenient, affordable 'everyday' lunch options (10, 4, 3, 1) ▪ Extend well-child programme to include child food preference development (4, 7) ▪ Increasing household budgets to spend on 'everyday' and 'sometimes' food items (3, 1) ▪ Enforcement of parental responsibilities regarding children's diets (1)
Community		<ul style="list-style-type: none"> ▪ Healthy Eating Zone (4, 3) 	<ul style="list-style-type: none"> ▪ Reducing cost of healthy food compared to less healthy food (4, 7, 3, 1) ▪ Restriction on marketing of 'occasional' food to children (7, 3) ▪ Front of pack nutrition labelling (1)

Interventions were identified in two ways. Firstly, participants were asked what interventions they thought were needed, both inside the school and in the home and community environments. Secondly the barriers and influences identified through the data was used to develop a 'school food system description' for each school. This description was used to identify what influences the school food environment the most, and then consideration given to the range of interventions that could impact on these influences. This process drew on complexity theory and literature on school and policy level interventions to improve childhood nutrition and reduce obesity.

Table Two illustrates quite clearly the limited role schools have in influencing home and community environments. It also shows however that school, local agencies, and central government do all have a part to play in improving the school food environment.

School based actions

For schools, actions focus most on limiting the availability of 'occasional' and 'sometimes' food on school lunch menus, and working towards reducing the regularity and quantity of these foods brought into the school by children. For schools who have successfully done this, it seems that a school food policy helps as a focal point for action. It appears that higher decile schools will need to engage parents in order for a school food policy to be developed. All schools will need to engage parents and caregivers regarding what school food policies mean in terms of the types of foods that can be brought from home, once a school food policy is in place.

Local agency based actions

The proposed actions for local agencies (such as District Health Boards and NGOs), focus around the type of support provided to schools. For the mid to high decile schools, there was little support provided for the development of food policy or improvement to the school food environment. More advice and sharing of experiences from other schools is likely to help here. Likewise, engagement of parents regarding the school food environment is currently left to school staff and some active parents. Local agencies could further support schools by providing information directly to parents. In lower decile schools there was a lot of advice, encouragement, and access to resources. However, the work of policy development, engagement with parents, and monitoring to meet the various requirements for accessing resources still fell to school staff. In these schools, staff from support agencies might be able to actually undertake more of the work in the school, such as working with staff and Board of Trustees to draft and monitor against food policies. Increasing the support currently given to schools is likely to require additional staffing levels for these agencies however.

A sub-theme of interventions here is also to provide support relevant to each school. A high decile school that currently relies on several fundraising activities selling 'occasional' foods is likely to need help identifying effective alternate fundraising activities. A kura kaupapa school is going to require physical resources in te reo Māori, and advice consistent with tikanga Māori. This suggests that local flexibility in how agencies operate is required.

Government based actions

The actions identified at a central government level to directly improve school food environments also focus on increasing the availability and accessibility of 'everyday' type foods in schools through the direct provision of food in schools, and/or subsidisation of foods in schools. For lower decile schools, the popularity of the Fruit in Schools programme suggested that government funding for this should be retained, and possibly expanded to include lunch type foods and higher decile schools (perhaps decile 3-5). While this also may be an effective intervention for higher decile schools (decile 5-10), it may also be possible to subsidise 'everyday' type foods provided by the school, as sales records indicate these foods do not sell as well as 'occasional' and 'sometimes' foods, and a subsidy could make the economics of reducing these foods more agreeable, as lunch programmes operate to break even as a minimum.

The other area for central government action is to reduce the reliance of mid-higher decile schools on fundraising by selling 'occasional' foods, of which the most regular example is selling chocolate. The first means of doing this could be through increasing school's operational funding to reduce the need to fundraise. If fundraising is to continue, which is likely, then guaranteeing a minimum level of income for schools trailing new forms of fundraising could reduce hesitation for schools to move away from the proven money raisers.

Moving from the school to the home environment, Table Two shows that the majority of identified actions lie within central government control, with some implementation likely to be managed at a local agency level. There are two main areas for central government action to influence the home environment: increasing money available within the home to spend on 'everyday' and then 'sometimes' food items; and, helping educate and change behaviour of parents in what foods are provided for school lunches, and how children's food preferences are developed. It is in the education and behaviour change actions that local agencies are likely to have a supporting and implementation role. Both increasing household income and reducing non-food household expenses are suggested as possible areas for intervention.

Within the community environment the majority of identified actions are again within central government control. These include reducing the cost of 'everyday' food compared to 'occasional' and then 'sometimes' food items, providing front of pack nutrition labelling, and restricting marketing of 'occasional' foods to children. These actions are likely to influence both children's food preferences, and parent's food purchasing decisions.

At a more local level, a role was identified for local government action to look at the location of food outlets and outdoor adverts in relation to primary schools. The impact of food outlets in close proximity was mentioned in three of four schools in urban settings. Options for zoning rules should be explored.

School Specific Results

Food Sales

The school lunch programme food sales were provided to the research team for twenty-nine days of term one of 2008. The lunch menu options available change across days of the week, which is reflected in the analysis below.

In the analysis below, each menu item has been categorised as ‘everyday’, ‘sometimes’, or ‘occasional’ against the Ministry of Health (2007) *Food and Beverage Classification System for Years 1-13 User Guide*. As no specific nutrition information was collected for the menu items, the quick reference tables of the guide were used. If the quick reference tables showed more than one classification option for an item, based on a generic description such as ‘pies’, then the more healthy classification was used (e.g. sometimes over occasional).

There were 2300 items sold for the period of data collected, which equates to approximately 9.3 items per student.

Table Three below shows the school lunch menu items placed into Food and Beverage Classification system for schools categories. It shows that for items available four or five days a week, ‘everyday’ and ‘sometimes’ category items are fairly even, with two ‘occasional’ items available (corn chips and Moosies). Of the items available one day a week, the majority are classified as ‘occasional’, due mainly to being deep fried. ‘Sometimes’ food category items make up the majority of items available.

Table Three – School lunch menu items by food category

Food Category	Available four or five days a week	Available one day a week
Everyday	6	0
Sometimes	5	3
Occasional	2	6

It is quite possible that, if nutritional information was collected, the pies and savouries would be classified as ‘occasional’. If this was the case then there would be nine items available one day a week classified as ‘occasional’. The Ministry of Health *Food and Beverage Classification System for Years 1-13 User Guide*, states that ‘occasional’ items should not generally be available more than once a term.

Figure One shows sales of lunch menu items available four or five days by food and beverage classifications. Of particular note is that the two items available categorised as ‘occasional’ take up 26% of sales. The ‘sometimes’ category items also take up a larger proportion of sales than they do menu items.

Figure One –School lunch sales of items available four or five days by food and beverage classification

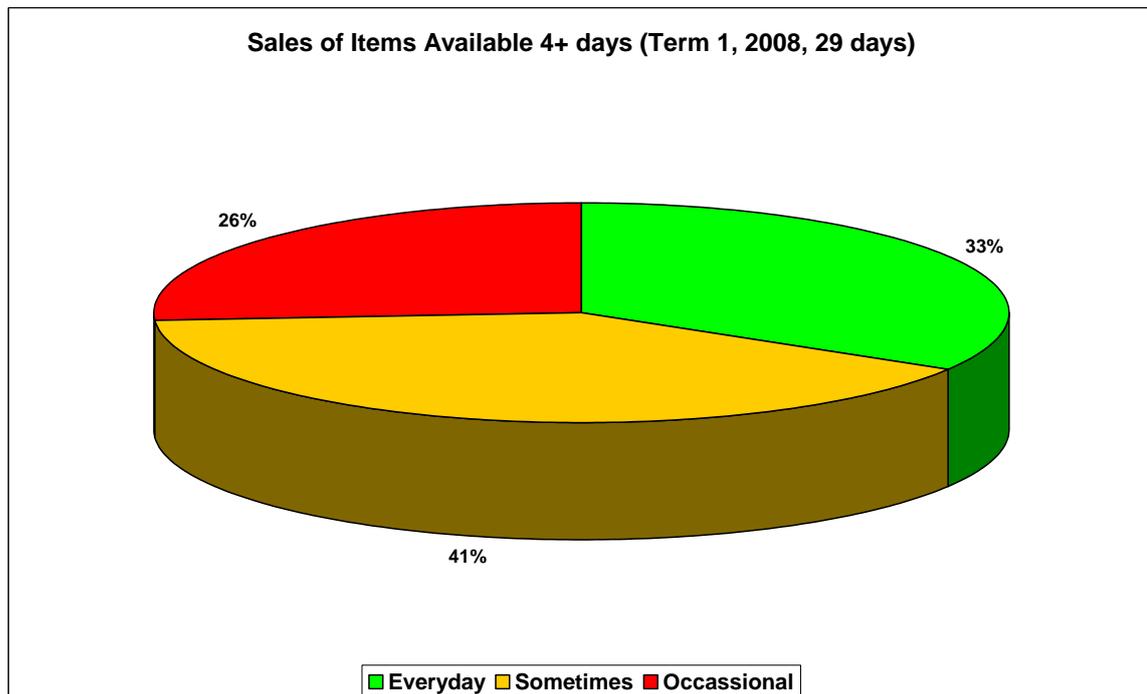
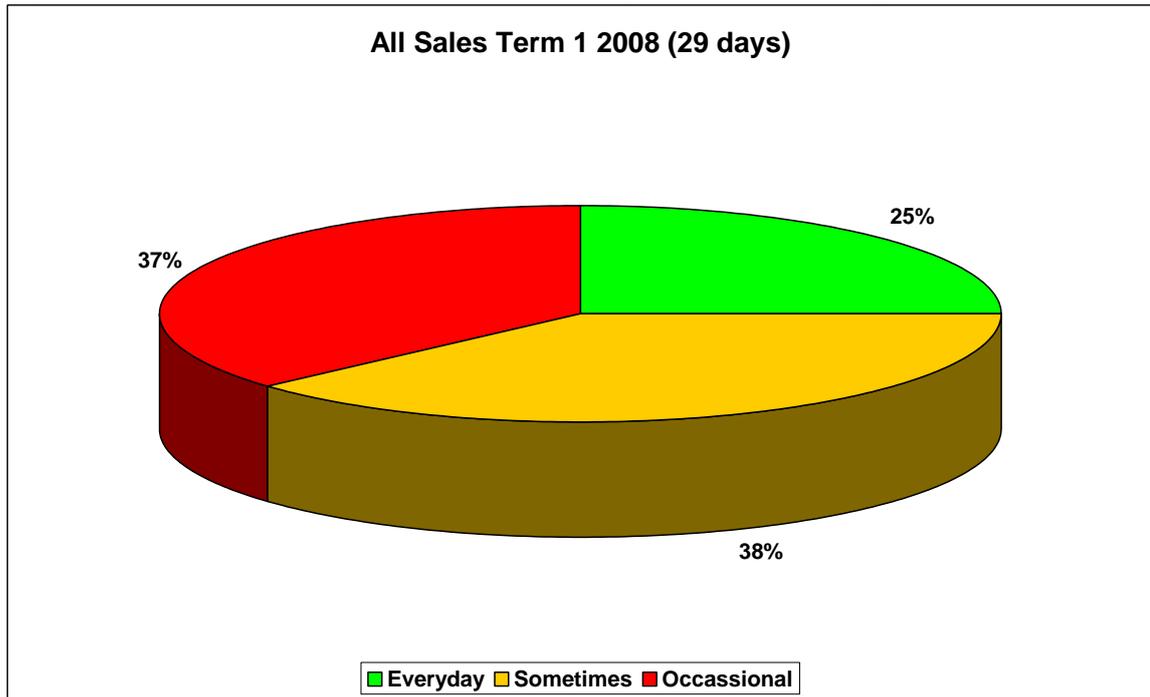


Figure Two below shows the sale of all items, including those available only one day a week. It shows that the ‘occasional’ items available one day per week increase the overall proportion of ‘occasional’ items sold to 37% of total sales. In particular, the fish and chip menu accounts for 17% of all food items sold.

The Ministry of Health *Food and Beverage Classification System for Years 1-13 User Guide* states that ‘sometimes’ category foods are for restricted consumption, and to ‘not let these foods and drinks dominate the choices available’ (pg 8). When looking across the whole week, there are eight ‘sometimes’ category items available compared to six ‘everyday’ items. Of more concern however, in terms of meeting the Ministry of Health guidelines, is the eight ‘occasional’ items available, and how the availability of ‘occasional’ and ‘sometimes’ category foods translate into sales of these items.

While the fish and chip menu suggests that restricting the availability of items does not necessarily produce a proportional drop in sales, reducing the availability of cookies and moosies may well have the biggest impact on the overall proportion of food sales by category, followed by removal of the fish and chip menu.

Figure Two – School lunch sales of all items by food and beverage classification



It is questionable how much of an impact removing items from the lunch menu will directly have on children’s diets, given that sales data suggests purchasing school lunches is not the norm for most children. However, the restriction of foods available on the school lunch menu may act to reinforce nutrition messages being delivered in the classroom, and will aid compliance with the NAG.

Community Environment

Figure Three – School community food environment map

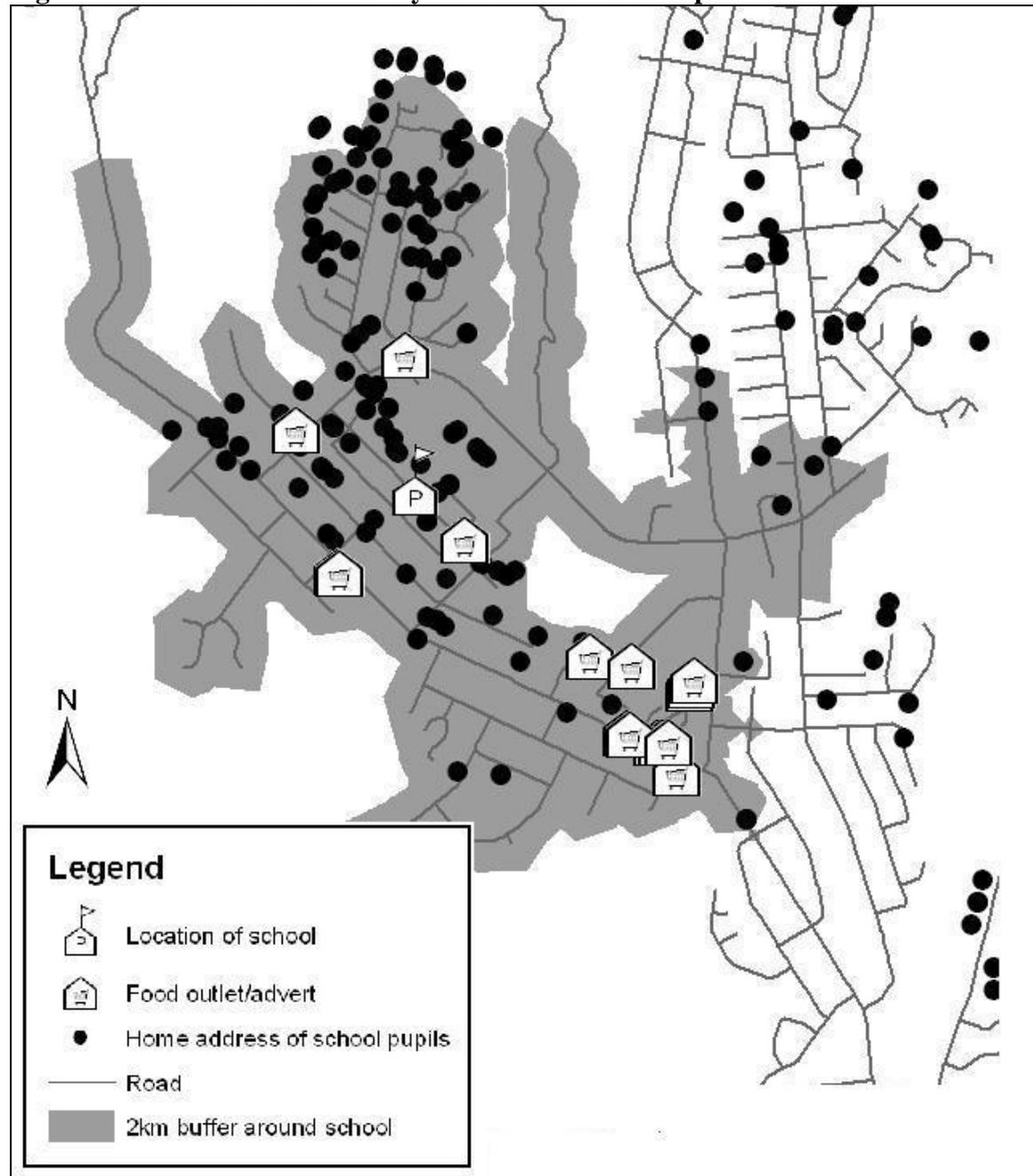


Figure Three above displays the location of XXX Primary School, student home addresses, and food outlets and adverts. A two kilometre buffer zone is also shown, which for the purposes of this analysis can be considered the community zone most likely to impact on the school.

Figure Four – Food outlets within 2 km buffer by outlet type

2 km buffer number of outlets by outlet category	
Café/tearooms/lunch bar	0
local fast food	6
multinational fast food	3
Service Station	2
Dairy	5
Total	16

Figure Five – Outdoor food adverts within 2 km buffer by food and beverage classification category

2km buffer number of adverts by advert category	
Everyday	8
Sometimes	5
Occasional	22
Total	35

Figure Six – Food advert items within 2 km buffer zone

2km buffer number of adverts by food item	
Meat pies	2
Coke	20
Milk	7
Ice cream	4
Cookies	1
Bread	1
Total	35

Figures Four through Six provide details of the food outlets and outdoor adverts within the 2 km buffer zone around the school. There are sixteen food outlets (excluding supermarkets), within 2 km of the school, and thirty-five outdoor food adverts. Figure Three illustrates how there are food outlets (dairies) in multiple directions from the school. This means that most children must walk past at least one food outlet along the route to school. In fact, by analysing the route to school using the road network from student home addresses, it is estimated that 74.05% of students will walk within view of at least one food outlet or advert on the route to school.

It is estimated that the average number of food outlets or food outlets potentially seen by these children is 5.59 for each child. Figures Five and Six show that the majority of food outlets within the 2 km buffer are for food products categorised as ‘occasional’ category foods.

Figures Three through Six support the view from participants, that the ready supply of ‘occasional’ category foods in close proximity to the school, may limit the impact of reducing availability of these types of food items in the school.

Identified Possible School Actions

As indicated in Table Two, the analysis suggests that the majority of actions to improve the food environment in the school rest with external agencies. Identified school level actions focus around reducing the ‘occasional’ and ‘sometimes’ items available on the school lunch menu, and development of a formal food and nutrition policy.

School lunch menu

- This is discussed above and will not be expanded here in any detail. The school lunch menu as it currently stands is unlikely to be positively judged against the NAG requirements, even though there is a restriction of several items to one day a week. Changing the lunch menu is an obvious area for action. Support to do this may be accessed from the Healthy Schools Team at Regional Public Health, or the National Heart Foundation School Food Programme.

School Food and Nutrition Policy

- It is suggested that the school develop a food and nutrition policy.
- Through the interviews, several actions undertaken in the past few years were identified that have already improved the food available in the school for children. Likewise, some of the unwritten rules around dedicated ‘sit-down’ periods for children to eat lunch, and encouraging water only, seem useful in establishing good nutrition habits, but are not captured within a policy or procedure. At first appearance therefore the school looks in a worse position than it actually is.
- The broad vision of a food and nutrition policy is already set by the NAG, but could include food in relation to lunches, social events, fundraising events, and sponsorship.
- Given the concern raised in interviews about staff time in making changes to current practice, the policy could establish actions over a three year period to achieve the policy vision and goals. For example:

Year 1

- Engage parents and agree vision and goals
- Investigate options to change school lunch menu
- Promote healthy eating ideas through school newsletter

Year 2

- Make changes to school lunch menu
- Investigate fundraising options that do not involve ‘occasional’ foods
- Investigate other options for enhancing the school food environment, such as water fountains and vegetable gardens

Year 3

- Move to a maximum of one fundraising event per term that include ‘occasional’ foods.

School Garden

- The possibility of a school garden was mentioned in one interview as a possible action within the school. While this might not be a priority action, there may well be some benefits to this type of activity.
- There are a number of primary and secondary schools around the country running or developing school vegetable gardens, or growing fruit trees.
- Several advantages have been reported of this type of activity, including: providing exposure for students to different types of fruit and vegetables; improving student attitudes to fruit and vegetables; and potentially providing ingredients for lunch items made on site and selling produce to cover costs or even provide a small profit (French & Wechsler, 2004; McAleese & Rankin, 2007; Ozer, 2007).
- While gardens obviously involve set up costs and ongoing maintenance, it may be the sort of project that local business, council, and community can easily contribute to. Establishing school gardens are reportedly the type of activity that the Nutrition Fund, administered by the District Health Board, have been funding.

References

- Ministry of Education (2007). *The National Administration Guidelines (NAGs)*, Ministry of Education, Wellington.
- Ministry of Health (2007). *Food and Beverage Classification System for Years 1-13: User Guide*, Ministry of Health, Wellington.

Appendix F

Summary of results information sheet