

INEQUALITY IN QUALITY?

The selection and use of quality indicators to investigate ethnic disparities in the quality of hospital care, Aotearoa New Zealand.

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ABSTRACT

There are well documented differences in health outcomes between Māori and New Zealand (NZ) Europeans. Jones (2002) describes differential treatment within the health system as one determinant of ethnic inequalities: is it possible that New Zealand's health services contribute to the differences in health status between Māori and NZ Europeans?

Aim and objectives: This thesis describes an investigation into the quality of care for Māori compared with NZ Europeans in public hospitals nationally. The objectives of this study were:

1. To identify measures applicable to this study context with validity as indicators of the quality of health care.
2. To employ this/these measure(s) to compare the quality of inpatient hospital care between NZ Māori and NZ European patients, with consideration of confounding and mediating factors in order to estimate the net effect of ethnic group on the quality indicator.
3. To offer recommendations in light of the findings of this study.

Methods: Literature review and three 'study context' criteria were used to select two indicators to represent inpatient quality of care - unplanned readmission/death within thirty days of discharge ('readmission') and patient satisfaction.

Phase One of the research used data from the National Minimum Data Set to calculate and compare the rate of readmission for Māori and NZ European inpatients at NZ public hospitals. Characteristics of the two ethnic groups were compared with age-sex adjusted proportions, and variation in the likelihood of readmission with patient and clinical factors was explored with rate ratios. The odds of readmission for NZ Māori compared to NZ European patients (n=89,090) were calculated from a logistic regression model, with variables representing age, comorbidity, index procedure, hospital volume and socio-economic position included.

In Phase Two, Māori and NZ Europeans recently discharged from one of three NZ hospitals were approached to complete the Client Satisfaction Questionnaire-8 (CSQ-8). Descriptive

analyses explored the characteristics of the respondents (n=1103) according to ethnic group and mean satisfaction score. A linear regression model including variables for age and health status estimated the difference in mean CSQ-8 score for Māori compared to NZ European respondents.

Results: The Phase One analyses found 16% higher odds of readmission for NZ Māori compared to NZ European patients (odds ratio (OR) 1.16, 95% CI 1.08 – 1.24; adjusted for age, index procedure, comorbidity, hospital volume, and deprivation), and 19% higher odds (OR 1.19, 95% CI 1.11 – 1.27) when the model did not include a deprivation term. Readmission was also associated with older age (OR 1.33; 95% CI 1.19-1.48, for >79 yrs compared with 18-39 yrs), higher comorbidity (OR 2.08; 95% CI 1.89-2.31 for Charlson score 3+ compared with 0) and higher hospital volume (OR 0.81; 95% CI 0.76-0.86 for lowest volume facility compared with highest). Measurement error of quality of care by readmission was the primary source of bias in this phase; sensitivity analyses suggest the contribution of 'poor quality' to the increased odds of readmission for Māori may be small. That is, unmeasured factors may have a comparatively greater role than quality of care in the ethnic difference of this outcome.

The Phase Two multivariable model showed comparable satisfaction for Māori and NZ European respondents, with the difference in mean scores only -0.02 (95% CI -0.36 - 0.57). However, bias from differential non-response is possible – participation for Māori was 37% compared to 60% for NZ Europeans. These results may also be affected by differential or non-differential measurement error. That is, CSQ-8 score may have lower validity as a measure of health care quality in this setting and population.

Conclusions: A valid measurement of quality by readmission or satisfaction is difficult, as both are highly vulnerable to error. In particular, ethnic differences in readmission may be predominantly influenced by factors other than the inpatient quality of care. However, given supporting evidence and the plausibility of quality as a component cause for health outcomes inequalities, it is likely that the increased odds of readmission for Māori compared to NZ Europeans is in part due to poorer quality of care. This study recommends protocols be developed to guide the calculation and interpretation of readmission as a proxy for quality, and suggests further research to explore the measurement of patient satisfaction in the NZ setting.

PREAMBLE

This study aimed to ‘address the silence’ (Reid, Robson et al. 2000); moving from the description of ethnic health outcomes inequalities, to exploring a potential cause for these health disparities – the differential quality of care. However, over the course of the five years, the research evolved from this comparatively simple public health question to a conceptual dissection of the factors and processes involved in the measurement of health care quality.

The changing emphasis of the study reflects the realisation that *the question of disparities is almost impossible to assess if the very measurement of quality is inherently flawed*. This comprehension opens up a variety of new research questions: How can we improve the validity of these surrogates of quality and robustly compare populations or settings? This thesis employed a structural Directed Acyclic Graph analytical framework to approach the estimation of quality; could this novel and evolving paradigm be applied to refine the measurement of quality? Do composite indicators of multiple proxies have a role? Overall, how blunt is too blunt an instrument?

This thesis describes a journey in which the assumptions made in the beginning (including the premise that the inpatient quality of care is even measurable) are questioned by the end. I hope you will understand and enjoy the evolution of the research, as I ultimately did.

STATEMENT OF PARTICIPATION

This thesis describes a project funded by the Health Research Council of New Zealand. I conceived, planned and carried out the project with help and support from my supervisory team (Dr. Phil Hider, Annabel Ahuriri-Driscoll, Dr. Diana Sarfati, Prof. Tony Blakely, and for a short time Prof. Ann Richardson).

The National Minimum Data Set was the primary data source for both Phase One and Phase Two, and was obtained from the New Zealand Health Information Service. This organisation developed a marker to represent readmission within thirty days of discharge for the Phase One analyses; I then modified this indicator to also include the occurrence of death within the time frame. With the exception of the accuracy of this dataset, I was responsible for all aspects of the research - including applications for ethical approval, development and administration of the survey tool, entry of survey data and its preparation, and the study analyses. As such, I accept full responsibility for the accuracy of the survey data, and for the analyses and findings of both phases of this research.

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This thesis is the culmination of nearly five years of hard work - it has seen the growth of four babies, exams, changes in supervision, major earthquakes, and the destruction of homes and offices. I know that I would not have made it to the end without the support of my supervisors and it is to them that I give my greatest thanks. To Phil Hider, who was there from the beginning, I thank you for your steadfast support, your humour, your solidarity. Annabel Ahuriri-Driscoll: Thank you for taking on this role, and for your helpful and thought-provoking feedback. Patrick Graham, my statistical advisor: Thank you for your consistent availability and assistance.

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This study would not have been possible without the support of the Health Research Council of New Zealand, who generously awarded me a Clinical Training Fellowship and allowed me great flexibility as my last three children were born in close succession. Also, thank you to Dr. Les Toop and Dr. Cheryl Brunton of the Department of Public Health & General Practice in Christchurch. Les, you have been thoroughly supportive of my PhD and of my ongoing education and I am immensely grateful. Cheryl, thank you for your mentorship in 2009 and for your practical help. Thank you also to Yvonne, Alison, Jill and Trish in the Department, who helped me with administrative matters and were always excellent problem solvers.

Thank you to my parents for your input and grammatical corrections. I think it is highly appropriate that I am finishing this thesis just as you are entering retirement and have plenty of time on your hands to read my drafts. Thank you to my husband who although not knowing what this thesis is about, pretends to be interested when I discuss it. And thank you to my four children and two dogs, who sit at my feet while I type (that's the dogs) and bring me muffins and cups of tea.

Finally, thank you to the participants of this research, to the individuals who took the time to complete the survey, and whose experiences are manifest in the data. I hope that this thesis has done justice to your time and support.

DEDICATION

For the robin that is missing,
The conversation that never seems to get to the end,
The kitset home with laughing walls,
And visits in the night.

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ABBREVIATIONS

AE	Adverse event
APP	Appendicectomy
BPH	Minimally invasive procedures for Benign Prostatic Hypertrophy
CABG	Coronary Artery Bypass Graft
CAT	Cataract removal
CCI	Charlson Comorbidity Index
CH	Cholecystectomy
CI	Confidence interval
CPAC	Clinical Priority Assessment Criteria
CS	Caesarean Section
CSQ-8	Client Satisfaction Questionnaire-8
DHB	District Health Board
DRG	Diagnosis Related Group
ESRD	End-stage Renal Disease
HA	Hip arthroplasty
HASBI	Hospital Acquired <i>Staphylococcus aureus</i> Bloodstream Infection
HIV	Human Immunodeficiency Virus
HYST	Hysterectomy
IH	Inguinal hernia repair
ICD	International Classification of Diseases
KA	Knee arthroplasty
MDC	Major Diagnostic Category
NMDS	National Minimum Data Set
NMNP	Non-Māori non-Pacific
NZ	New Zealand
NZDep	New Zealand Deprivation Index
OECD	Organisation for Economic Co-operation and Development
OR	Odds ratio
PEQ	Patient Experiences Questionnaire
PJS	Patient Judgment System
PR	Prevalence Ratio
PSQ	Patient Satisfaction Questionnaire

PTCA	Percutaneous Transluminal Coronary Angioplasty
QPP	Quality from the Patient's Perspective
RAR	Related Adverse Readmissions
RoD	Rate of readmission or death within thirty days of discharge
RR	Relative risk, Risk ratio
SEP	Socio-Economic Position
SF-36	Short Form-36 Health Profile Questionnaire
SHCQ	Satisfaction with Hospital Care Questionnaire
TURP	Transurethral Resection of the Prostate
US	United States
UK	United Kingdom
WHO	World Health Organization

GLOSSARY OF MĀORI TERMS¹

<i>Aotearoa</i>	Land of the long white cloud, New Zealand
<i>Hapū</i>	Kinship group, subtribe
<i>Hauora</i>	Health, wellbeing
<i>Iwi</i>	Extended kinship group, tribe
<i>Kaupapa Māori</i>	Māori ideology – a philosophical doctrine, incorporating the knowledge, skills, attitudes and values of Māori society
<i>Mana whenua</i>	Territorial rights, power from the land, power associated with possession and occupation of tribal land
<i>Pākehā</i>	New Zealander of European descent
<i>Papatūānuku</i>	Earth mother
<i>Pepeha</i>	Tribal saying, proverb, set form of words
<i>Rangi-nui</i>	Sky father
<i>Rangatira</i>	Chief
<i>Tāngata whenua</i>	Indigenous people of the land, local people
<i>Taonga</i>	Property, goods, possessions, treasure
<i>Tauīwi</i>	Non-Māori
<i>Te Ao Māori</i>	The Māori world, Māoridom
<i>Te reo</i>	Māori language, dialect, speech
<i>Te Tiriti o Waitangi</i>	The Treaty of Waitangi
<i>Tikanga/tikaka</i>	Correct procedure, custom, habit
<i>Tūpuna</i>	Ancestors
<i>Wairua</i>	Spirit, soul, quintessence
<i>Whakapapa</i>	Genealogy
<i>Whānau</i>	Extended family, family group
<i>Whare</i>	House, dwelling
<i>Whare tapa whā</i>	Four-sided house

¹ The spelling and translation of these words have been obtained from 'Te Aka Māori-English, English-Māori Dictionary and Index' (Moorfield 2005).

PART ONE

Background

CHAPTER ONE:

INTRODUCTION

*“Whaia e koe te iti kahurangi;
Ki te tuoho koe, me maunga teitei.”
Seek you the little treasure of your heart;
If you bow your head, let it be to a lofty mountain.*
(Traditional Māori proverb, cited in Cowan 1930 p110)

This chapter introduces the research project. Section 1.1.1 gives a brief background to the issue of ethnic disparities in care, outlines the aims and objectives of the research, and describes the structure of this thesis. Section 1.1.2 gives administrative details relating to the research; including funding sources, supervision arrangements, procedures for consultation and ethical approval, and the terms employed in this document. Finally, Section 1.1.3 discusses the role of Pākehā (New Zealander of European descent) in disparities research, and the model of non-Māori involvement applied in this investigation.

1.1 INTRODUCTION TO STUDY

1.1.1 Background

Health care, like every service, exists on a spectrum. The variations in quality may reflect clinical characteristics, the setting and structure of services, or features of the environment. But once these factors are considered, it shouldn't reflect an individual's ethnicity.

But does it? In the US, there is overwhelming evidence that ethnic and racial minority groups receive unequal health care, in a variety of settings and clinical areas. Given control for patient and access-related factors, these differences are 'disparities'², and indicate a poorer standard of care for these groups. The US government annually reports on its progress in eliminating health care disparities, and organisations across the country have instituted quality improvement initiatives targeting the care of ethnic and racial minority groups.

There is an ethical obligation to provide appropriate care according to need for all people; however substandard health care also represents inefficiency - error and omissions in care compromise patient safety and may paradoxically increase morbidity and the load on the health system. Quality of care is amenable to intervention, and research shows improvement of services from a wide range of initiatives.

Māori are the indigenous people of New Zealand, signatories to the Treaty of Waitangi along with representatives of the British Crown. This document declares an obligation to ensure Māori the "*same rights and privileges as British subjects*". Despite this responsibility, significant health status inequalities between the Māori and NZ European populations are evident today.

There are multiple factors that may contribute to these inequalities, including differential care within health services. Certainly, there is some evidence that suggests unequal (and poorer) health care for some groups of Māori, such as those requiring obstetric and cancer care (see Chapter Four). The aim of this study is **to assess the quality of care delivered to NZ Māori inpatients, as compared with that received by NZ Europeans**. It focuses on public hospitals in

² This study employs the definition of 'disparity' advanced by Rathore and Krumholz (2004): "*a disparity in health care use may be considered a difference in appropriate treatment use that is associated with poorer clinical outcomes and is not attributable to patient factors*" (p636).

NZ, a sector of health services that delivers acute inpatient care at no direct financial cost to all NZ residents. To this end, the objectives of the study are as follows:

Objectives:

1. To identify measures applicable to this study context with validity as indicators of the quality of health care.
2. To employ this/these measure(s) to compare the quality of inpatient hospital care between NZ Māori and NZ European patients, with consideration of confounding and mediating factors in order to estimate the net effect of ethnic group on the quality indicator.
3. To offer recommendations in light of the findings of this study.

The study uses a structural analytical approach to these objectives, referencing Directed Acyclic Graphs (DAGs). The use of DAG frameworks to conceptualise the association of patient characteristics (such as ethnicity) with quality of care is an innovative approach, representing new territory in this field. It is also a work in progress, with further exploration planned after the completion of this study, and it is possible that this paradigm may be developed and modified in the future.

The thesis includes eight chapters, structured into five parts. The order and focus of the sections are detailed briefly in the table below:

Table 1.1 Thesis structure

PART ONE: BACKGROUND	Chapter One: Introduction	The remainder of this chapter gives administrative details related to this study, and the role of non-Māori in disparities research involving Māori.
	Chapter Two: Context, rationale and theory	This chapter provides a context to the research, briefly describing relevant historical facts as well as the present day health outcomes inequalities between Māori and non-Māori. Possible contributory factors to these disparities are discussed, in particular the role of health service quality as a determinant.
PART TWO: LITERATURE REVIEW	Chapter Three: Exploring 'quality of care'	This section reviews the concept of quality of care, describing both Māori-developed definitions of quality, and the predominantly Western-derived disaggregated and generic definitions. The assessment of quality with structural, process and outcome indicators is discussed.
	Chapter Four: Ethnic disparities in health care	This chapter examines the current evidence for national and international ethnic disparities in quality of care. Literature pertaining to the US, UK, Australia and Canada is assessed, followed by investigations specific to NZ.
	Chapter Five: Quality indicators and the research question	This chapter considers how best to measure quality in this study, considering the target population and the clinical setting. Indicators used previously in New Zealand research are examined, and two measures (readmission rate and patient satisfaction) are selected for further review. The remainder of the chapter is focused on assessing the scientific soundness of these two indicators, looking first at the evidence for the validity of readmission as a marker of quality, and then considering issues related to the assessment of patient satisfaction.
PART THREE: METHODOLOGY	Chapter Six: Methods	Chapter Six describes the methods of this study; including the choice of study population for the two indicators, data sources, sample size and power considerations, and the a priori selection of covariates.
PART FOUR: RESULTS	Chapter Seven: Results	Chapter Seven describes the results of the study. The results for Phase One are noted first, separated into the descriptive analyses and then the findings from the multivariable logistic modelling. The descriptive and multivariable analyses for Phase Two are described in the second part of this chapter.
PART FIVE: DISCUSSION	Chapter Eight: Discussion	This chapter considers the strengths and weaknesses of the study, and interprets the results in light of the impact of chance, bias and confounding. The factors involved in ethnic disparities in care are discussed, and key strands for intervention suggested.

1.1.2 Administration

1. Funding: This study was primarily funded by the Health Research Council of New Zealand, through a Clinical Research Training Fellowship. The Department of Public Health & General Practice; University of Otago, Christchurch gave additional administrative and financial support.

2. Supervision: Staff of the University of Otago and the University of Canterbury provided supervision for this project. The primary supervisor was initially Professor Ann Richardson (July 2007 – July 2008), followed by Professor Tony Blakely (July 2008 – present). The co-supervisors included Dr. Phil Hider (July 2007 – present), Dr. Diana Sarfati (July 2008 – present), and Annabel Ahuriri-Driscoll, Māori Researcher (April 2009 – present). Prior to April 2009 Ms. Ahuriri-Driscoll was on the advisory panel to this study, along with Dr. Patrick Graham, Biostatistician (July 2007 – present).

3. Consultation: Consultation with members of the community was undertaken throughout the study, with letters of support obtained from the following individuals and organisations (copies available in Appendix One):

- Research Advisory Group – Māori: Capital & Coast District Health Board
- Te Puna Oranga: Waikato District Health Board
- Annabel Ahuriri-Driscoll: Māori Researcher/lecturer, University of Canterbury
- Te Komiti Whakarite: Canterbury District Health Board
- Elizabeth Cunningham: Māori Research Advisor, University of Otago, Christchurch
- Geoff Robinson: Chief Medical Officer on behalf of the Chief Operating Officer, Wellington Hospital.
- Mark Leggett: General Manager, Christchurch Hospital.
- Jan Adams: Chief Executive Officer, Waikato Hospital.

The survey employed in this study was piloted with staff of the Māori Indigenous Health Institute and other members of the Christchurch community.

4. Ethical approval: Approval for this study was initially obtained from the Upper South A Regional Ethics Committee in early 2008. Minor amendments over the following nine months

were also considered and approved by this committee. These documents are available in Appendix Two.

5. Terms employed: 'Aotearoa' is the name given by Māori to this land and in this report is used interchangeably with 'New Zealand'. The indigenous population of this country is known as 'NZ Māori', the preface is used to distinguish this group from Cook Island Māori. In this document, 'Māori' refers to NZ Māori only, and these two terms are used interchangeably. Some quotes and references have not employed macrons in the spelling of certain Māori words; these words have been corrected. Spelling according to the Oxford Dictionary (World English version) (Oxford University Press 2010) has been employed throughout the thesis (for example: 'centre' instead of 'center'); however quotes employing an alternative spelling of words have not been corrected.

1.1.3 Ko wai ahau?

The title of this section asks 'Who am I?' The design of this study, the analyses, and the interpretation of findings reflect the social, cultural, political, and professional context in which I function. *Ko wai ahau? He Pākehā au. Nō Ingarangi ōku tūpuna. He tākuta, he kairangahau hoki ahau, i te Whare Wānanga o Otākou, ki Ōtautahi.* Who am I? I am Pākehā, my ancestors originating from England. I am a medical doctor and a researcher, based at the University of Otago, Christchurch.

THE ROLE OF TAUWI (NON-MĀORI) IN MĀORI-FOCUSED DISPARITIES RESEARCH

This study is concerned with exploring the quality of care experienced by two ethnic groups, specifically the indigenous population (NZ Māori) compared with NZ Europeans. Some consider this 'disparities research involving Māori'; others would define it as 'Māori research' - an *"activity undertaken to increase knowledge and topics and issues relevant to and of concern to Māori people"* (Stokes 1990 p3). The role of tauwi in this type of research is debatable, and considered inappropriate by some. Curtis (1990 p9) states: *"Can a monocultural person who knows only one language do justice to a study which involves observing another person or persons from a different cultural and language background? My initial reaction is No in small capitals!"*

This perspective may also be shared by the community - Cram et al. (2004) found that some Māori refused to participate in their investigation if tauiwi were principally involved. However, it appears that there is support for non-Māori involvement in 'Māori research', although within certain parameters:

- Curtis alludes to issues of supervision (continuing his statement above): *"However, if such an investigator had regular or arranged contacts with appropriate cultural referents, who will act collectively as a sounding board, then the answer could be yes, in small letters only!"*
- Stokes (1990 p99) applies criteria pertaining to cultural and linguistic competence: *"Who better to research the social, cultural and economic dimensions of the issues facing Māori society today, than people who are closely involved with these experiences, people who have knowledge and experience in the Māori world and have appropriate skills to investigate and articulate clearly and communicate the information that is needed to confront these issues. Such researchers may be Māori or Pākehā. The racial or biological origin or skin colour is less important. What is important and essential is that the researcher can operate comfortably in both cultures, is bicultural and preferably bilingual."*
- Linda Tuhiwai Smith (1999 p189) states that non-Māori must have *"ways of positioning themselves as a non-indigenous person"*, and that: *"The wider vision of Māori communities, however, is to include within research approaches to Māori all those researchers who are attempting to work with Māori and on topics of importance to Māori"*.

Smith (1990b p8) recommends researchers ask themselves five questions when performing investigations in a cross-cultural context, to actively consider their motivations and the anticipated outcomes of the research. These questions are discussed below with respect to this study:

1. Who has helped define the research problem? Māori have raised the issue of health care quality as one of importance and priority (Crengle 2000; Cunningham 2006). The research question is also supported by evidence from Aotearoa and internationally, and is a proposed explanation for health outcomes inequalities by experts in this field (Jones 2000).

2. For whom is this study worthy and relevant? Who says so? The study is pertinent to all New Zealanders, but particularly to NZ Māori who experience comparatively worse health outcomes, and who may have concern about the quality of the care they receive. Health care is amenable to improvement, and quality interventions can improve health outcomes for all patients.

3. Which cultural group will be the one to gain new knowledge from this study? Both Māori and non-Māori will gain understanding from this study. Ethnic disparities in hospital quality of care is an issue of social justice (King Jr and Wheeler 2004). It also implicates the efficiency of the NZ health system in its actions to improve health and reduce morbidity. As such, ethnic health care disparities have an impact not only on the individual, but also society as a whole (Agency for Healthcare Research and Quality 2004).

4. To whom is the researcher accountable? The researcher is accountable to a number of individuals and organisations. This study is approved by a Regional Ethics Committee, the Māori research advisory groups of Capital & Coast and Waikato District Health Boards, the Chief Executive Officers of three national hospitals, the New Zealand College of Public Health Medicine, the University of Otago, and the Health Research Council of New Zealand. Experts in this field, of both Māori and non-Māori ethnicity, also actively supervise the research. Finally, my own integrity as an 'objective' researcher helps maintain my accountability.

5. Who will gain most from this study? Taxpayers contribute to the funding of NZ health care and unfair inequalities in quality of care may be a moral issue – accordingly, the results of this study may be of interest to all New Zealanders. However, NZ Māori experience greater morbidity and poorer health outcomes than non-Māori, and this research explores a determinant of health outcomes that is amenable to action.

As a Pākehā researching ethnic disparities in care, I must find “*ways of positioning*” myself (Smith 1999 p189) to ensure my own biases do not unduly influence the study design or interpretation of results. Although the focus of the study is to explore ethnic disparities in care, the four models of tauwi involvement in ‘Māori research’ proposed by Graham Smith (1990a) are useful to consider. Firstly, there is the **Tiaki** model, where the research and investigator are guided and mentored by senior Māori. Secondly, there is the **Whāngai** model: in this scenario, the researcher is ‘adopted’ into an existing Māori research whānau. The community and researcher equally share control over the investigation in the **Power Sharing** model; and

finally, there is the **Empowering Outcomes** model, where the research supplies information of importance to Māori but may be performed and managed by non- Māori.

This research references aspects of the Empowering Outcomes and Tiaki models, such as the importance of the study to Māori (noted in Section 2.3.3) and the mentoring received by Māori researchers. Although not Kaupapa Māori research³, the study incorporates principles from this paradigm; including a commitment to obtaining accurate ethnicity information and equal explanatory power⁴ for statistical analyses where possible. Finally, consultation with Māori research groups, and supervisory input from both Māori and non-Māori experts aim to ensure the cultural safety of the study design and my role as principal investigator.

³ Kaupapa Māori research describes an evolving research paradigm, in which the Māori perspective is maintained and validated as 'normal'. Kaupapa Māori research is concerned with 'the right of Māori to be Māori' (Pihama, Cram et al. 2002 p10), and is intimately connected to Māori principles and tikanga (Smith 1990a).

⁴ Equal explanatory power refers to the need to collect accurate and complete data for Māori to enable the robust analysis of inequalities between Māori and non-Māori (Te Rōpū Rangahau Hauora a Eru Pōmare 2002).

CHAPTER TWO:

CONTEXT, RATIONALE AND THEORY

“You never really understand a person until you consider things from his point of view -until you climb inside of his skin and walk around in it”

(‘To Kill A Mockingbird’ by Harper Lee.)

Why does the quality of care in New Zealand require investigation? This chapter aims to guide the reader through the actions of the past (the colonisation of Aotearoa and its impact on the well-being of Māori), through to the present day health and socio-economic inequalities between Māori and non-Māori, to finally reflect on possible reasons for the perpetuation of these inequalities in our society today (Section 2.1). Over the chapter the rationale for the study is built – that ethnic disparities in health care quality may contribute to the inequalities in health outcomes noted between NZ Māori and NZ Europeans today. This rationale, and the theoretical framework applied in this study, is discussed in Section 2.2.

2.1 MĀORI AND NZ EUROPEANS: THE PAST, PRESENT AND FUTURE

This section is structured into three main parts:

- Section 2.1.1 provides a context for health outcomes disparities in Aotearoa, considering the impact of the colonisation of Aotearoa on the health and well-being of NZ Māori, and discusses the signing of the Treaty of Waitangi between representatives of the British Crown and iwi (tribes) throughout the country.
- Section 2.1.2 focuses on the present. It discusses the relevance of the Treaty of Waitangi for the health of Māori today, and describes current inequalities in health status and socio-economic position between NZ Māori and non-Māori.
- Finally, Section 2.1.3 looks to the future. It presents possible explanations for health outcome disparities between Māori and non-Māori, categorised into three levels according to the framework proposed by Camara Jones (2002): differences in life opportunities and exposures, differences in the ability to access services, and differences in the care received by the two ethnic groups.

2.1.1 The past

Why is the past relevant to this thesis? This section provides an historical context to the present day health and socio-economic inequalities between Māori and NZ Europeans. It describes the colonisation of Aotearoa by European settlers and its far-reaching effects on the health and well-being of Māori, ultimately rendering Māori a minority in their own land. It also reflects on the eventual union of Māori and the British colonisers with the signing of the Treaty of Waitangi.

PRECOLONISATION

Māori are the indigenous people of Aotearoa, whose ancestors emigrated to this country around the 13th century (Ministry for Culture and Heritage 2005). Social organisation of this

population was based on ancestral lines; with whānau (extended family), hapū (sub-tribe), and iwi connected through their common ancestors and descendants. More than forty iwi coexisted throughout Aotearoa; each responsible for the mana whenua (guardianship and ownership) of their defined geographical regions. Collectively these iwi and their rangatira (chiefs) controlled every corner of the country (Rochford 2004). The health of Māori at this time was comparatively good: New Zealand's isolation provided protection from many viral pathogens present in other countries, and the transmission of communicable disease was limited by socio-cultural practices and the physical structure of their settlements. For example, hill-top sites provided ventilated and well-drained whare (dwellings); clean water sources were protected and conserved; and those suffering from infectious disease were routinely isolated (Rice 1992; Durie 1994b).

THE COLONISATION OF AOTEAROA

Abel Tasman, a Dutch explorer, charted the country's west coast in 1642; however European settlement did not begin in earnest until the early 1800s. The early settlers were of primarily British descent (English, Irish and Scottish), and were named by Māori as 'Pākehā' (Ministry for Culture and Heritage 2005). The colonisation of Aotearoa changed the country from one that was owned and governed in entirety by multiple iwi, to a British colony whose descendants would eventually outnumber Māori by more than 6:1.

Reid and Robson (2007 p5) describe colonisation as processes that *"permit the (mis)appropriation and transfer of power and resources from indigenous peoples to the newcomers"* - the interpretation of this period of NZ history is controversial. Some state that any ills experienced by Māori were simply a consequence of misguided paternalism, others have placed the actions of the British colonisers on the same spectrum of *"intentional displacement"* as Nazism (Reid and Cram 2005). However, it is unarguable that the arrival of European settlers had a dramatic impact on the well-being of NZ Māori (Durie 1994b), influencing physical health both directly and through the wider determinants of health.

1. Physical health: The immune systems of early NZ Māori were largely naïve to influenza, mumps, whooping cough, typhoid, scarlet fever, and measles, and the introduction of these diseases by the European colonisers was devastating to Māori, due to their high infectivity and mortality rates in this population (Durie 1994b). Colonisation also introduced Māori to alcohol, tobacco, and western foods; and provided access to more 'efficient' weapons such as muskets,

powder, and shot (Durie 1994b). Although warfare had occurred prior to the advent of the European settlers, the introduction of firearms dramatically increased the scale of injuries (Durie 1994b). Colonisation also added to potential reasons for conflict; competition between iwi for trade with Pākehā often erupted into warfare, and Māori and Pākehā warred to protect environmental assets (Orange 2004).

2. Wider determinants of health: Māori traditionally employ a holistic view of health and wellbeing, with dimensions including *“a strong sense of identity; self esteem, confidence and pride, control of his/her own destiny, leadership, intellectual, physical, spiritual, and whānau (extended family) awareness, personal responsibility, respect for others, knowledge of te reo (the Māori language) and tikaka (custom), economic security, and solid whānau support”* (Rochford 2004 p46). Applying this definition, it is easy to see how colonisation may have indirectly impacted on the health of Māori. Pākehā brought a new language, new products, and new practices to Aotearoa. Inter-marriage, the readiness of Māori to investigate and adopt new cultural practices, and the eagerness (and insistence – often employing legal means) of the colonisers to assimilate Māori, had an inevitable impact on the ability of Māori to maintain tikanga (protocols, culture) (Orange 2004). For example, the speaking of te reo (Māori language) was actively repressed by early governments, and the adoption of Christian religion and morality zealously encouraged by missionaries (Durie 1994b; Orange 2004). The ability of Māori to self-govern, manage, and organise their affairs was also limited, as their traditional societal structure became restricted by British laws and bureaucracy (Orange 2004).

The alienation of Māori from their tribal lands by the Crown and European settlers had particularly far-reaching effects. Through both illegal and legal means, Māori were rapidly dispossessed from their land and environmental resources (Ministry for Culture and Heritage 2005); and from the 26.7 million hectares of the country owned by Māori in 1840, only 10% remained by 1911 (Durie 1994b). The physical environment has great spiritual significance to Māori. Traditional lore notes the intrinsic connection between generations of Māori and the environment through their whakapapa (genealogy), with all Māori descended from Papa-tū-ā-nuku (earth mother) and Rangi-nui (sky father) (Rochford 2004). That is, the environment is inherent to the very identity and ancestry of Māori. This relationship is illustrated in the traditional Māori pepeha (tribal saying/proverb), whereby an individual describes and

introduces themselves with a description of his/her whakapapa, ancestral lands and waters, and tribal affiliations⁵.

However, the dispossession of Māori from their lands also had more tangible social and economic impacts. The immediate environment was the source of food, water, and shelter to Māori - the loss of these resources limited the ability of Māori to provide for themselves and to contribute to trade (Durie 1994b). Loss of tribal lands also restricted the physical access of Māori to their extended whānau, hapū and iwi; and the disruption to social and community networks was perpetuated by the migration of dispossessed Māori to urban and coastal areas in search of employment (Durie 1994b). The following quote (a submission from a member of the public to the Royal Commission on Social Policy, 1988) summarises the injuries felt by Māori at the alienation from their land.

“The results: our tūpuna and their descendents lost land, a place to stand, our livelihood, our homes, our traditional fishing grounds, our lakes, rivers and streams, our bird sanctuaries, our bush, our swamps and our spiritual wellbeing. The psychological situation and its effects on our people had a far more devastating ultimate result than the immediate economic consequences. Māoridom had this feeling of utter despair of justice at the hands of the Pākehā. The result left hapū after hapū, whānau after whānau and in fact, the whole of Tainui, bleeding as we were forced to leave our home” (Royal Commission on Social Policy 1988 vol. 1, p269).

Irrespective of the ‘how’ or ‘why’, the colonisation of Aotearoa had a dramatic impact on the health of Māori (see Figure 2.1 below). The population decline was so striking that some believed *“the white man will replace the Māori”* (Durie 1994b p32, quoting Buller), and that Māori were a *“dying race”* (Miller 1958 p104, quoting Dr. Isaac Featherston).

⁵ An example of this greeting is provided by Rochford (2004 p41): Ko Aoraki te mauka. Ko Makaawhio te awa. Ko Uruao te waka. Ko Te Koeti te takata. Ko Poutini te whenua. Ko Kāti Mahaki te hapū. Ko Māmoe Kāi Tahu te iwi. Tēnā koutou katoa. This pepeha translates to: Greetings to you all, Aoraki is my mountain, Makaawhio is my river, the Uruao is my ancestral canoe, Poutini is my homeland and Te Koeti the ancestor who links me to these things. My tribe is Kāti Mahaki of the Māmoe Kāi Tahu people of the South Island of New Zealand’.

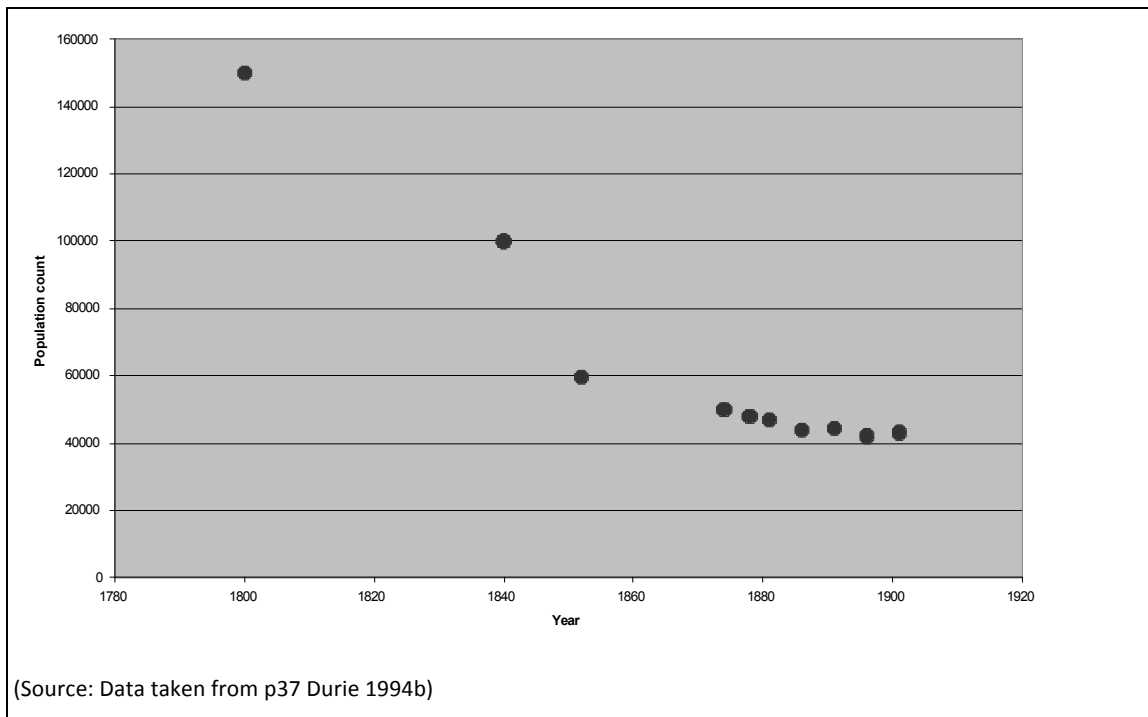


Figure 2.1: Māori population decline 1800-1900

THE 'END' OF COLONISATION?: TE TIRITI O WAITANGI

According to the Crown, Māori sovereignty of Aotearoa officially ceased with the signing of the Treaty of Waitangi in 1840⁶. This document was endorsed by representatives of the British Crown and more than 500 rangatira from iwi from throughout the country. The Treaty led to Britain claiming authority and sovereignty over Aotearoa, and formally gave Māori access to the benefits of British society (Durie 1994b; Orange 2004).

The Treaty of Waitangi had its motivations in both power and protection; Britain sought to curb the lawlessness of its emigrants, as well as to protect the dwindling Māori population (Orange 2004; Rochford 2004). However, the Crown was also imperially competitive, and sought to declare its sovereignty of Aotearoa to other exploring nations, recognising the desirability of the land and its assets (Royal Commission on Social Policy 1988; Durie 1994b; Orange 2004). The Treaty was composed of three articles and a preamble, translated into both Māori and English, detailed briefly below:

⁶ This point has been challenged by Māori, who argue that they ceded *kawanatanga* (governance) as written in the Māori translation of the Treaty, and not sovereignty (Orange 1987).

- Article one: The transfer of “*sovereignty*” (English translation) or “*kāwanatanga*” (governance, Māori translation) from NZ Māori to the British Crown.
- Article two: The retention and possession of lands, villages and “*taonga*” (treasures) by Māori.
- Article three: The transfer of royal protection and the assurance of the “*same rights and privileges as British subjects*” for Māori.

2.1.2 The present

THE TREATY TODAY

Colonisation did not end with the Treaty - Robson and Reid (2007 p4) state that “*colonisation [is] our constant contemporary*” - and the Treaty has evolved to also become a living, contemporary document whose principles are applied and interpreted in multiple arena. The Treaty has particular relevance to the health of Māori:

- Firstly, the Treaty guarantees the same ‘rights and privileges’ for Māori as NZ Europeans. However, since the time of signing, there have been numerous cases where the actions of various organisations (including those of central government) have been deemed illegal under the Treaty of Waitangi. The current health status of Māori, and the uneven distribution of land and resources between Māori and NZ Europeans are seen as direct evidence of the failure of the Crown to fulfil its obligations under Article three. These health and socio-economic outcomes disparities are discussed in detail in Section 2.2.
- Secondly, the Treaty has contributed to both past and current health policy. In 1986 it was recommended that the articles of the Treaty be regarded as “*a foundation for good health in New Zealand*” by the Standing Committee on Māori Health (Durie 1989, citing the Board of Health), and it has featured in the national health strategies of successive NZ governments since this time. Various sets of Treaty principles have been derived, with the three proposed by the Royal Commission on Social Policy (1988) the most commonly applied to the health sector: Participation of Māori at all levels, partnership in service delivery, and protection and improvement of Māori health status. These principles form the basis of the “*relationship between Māori and the Crown in the health and disability*

sector” of Aotearoa, and direct current core health policy and strategy documents (Ministry of Health 2000; Ministry of Health 2001; Ministry of Health 2002a). As such, the Treaty guides the structure of health services, their management, and their intentions in both the present and foreseeable future.

HAUORA MĀORI TODAY

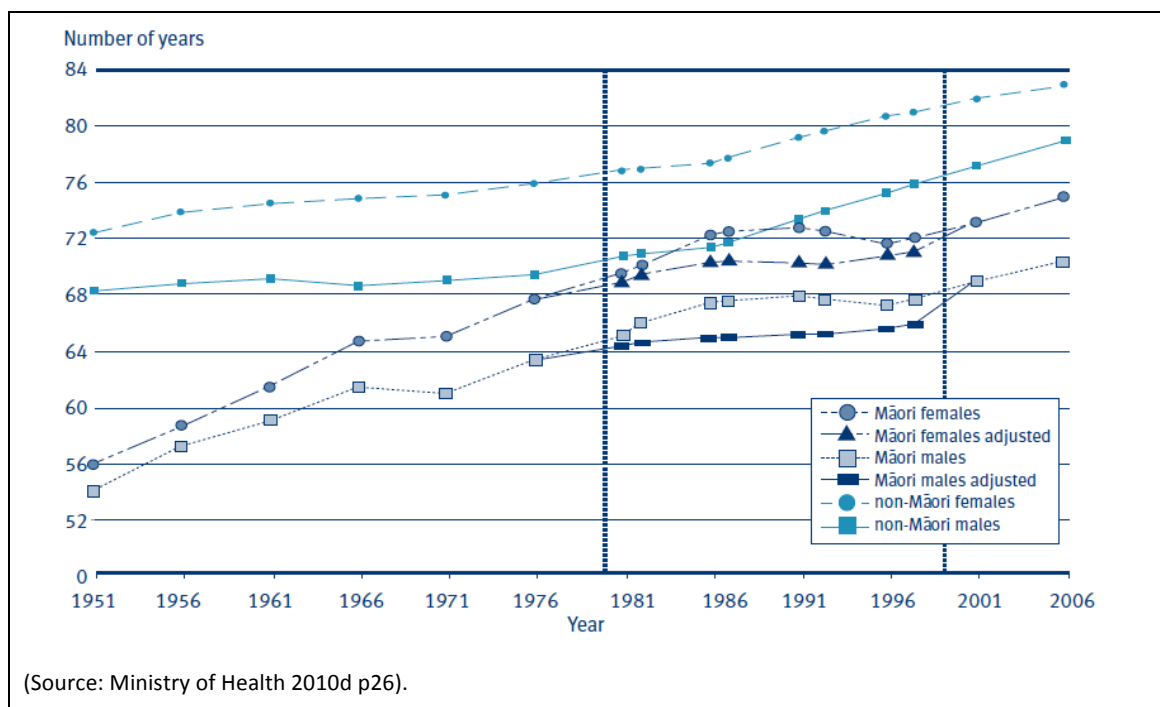
Captain Hobson declared to Māori signatories of the Treaty: “*He iwi tahi tatou*” (sic.), “*we are (now) one people*” (Orange 2004 p34). Despite this statement and the assurances of the Treaty, there are significant inequalities in the wellbeing of Māori compared to non-Māori today. The following section uses indicators of health and socio-economic status to illustrate these disparities.

1. HEALTH OUTCOMES: There are numerous health outcomes and indicators that demonstrate differences between Māori and non-Māori (Ministry of Health 2006b; Ministry of Health 2007a; Robson and Harris 2007). For example, Māori have a greater age-standardised prevalence of **disability** than non-Māori (19% of the Māori population compared to 13% of non-Māori) (Ministry of Health 2010d), and experience **higher mortality from suicide, ischaemic heart disease, cancer, asthma, and stroke** (Ministry of Health 2010d). Māori are also more likely to **suffer from diabetes, bronchiectasis, asthma, rheumatic fever, chronic obstructive pulmonary disease, and poor oral health** (Ministry of Health 2007a; Robson and Harris 2007).

Māori have more than twice the risk of **all-cause mortality** compared to the non-Māori non-Pacific non-Asian population (2001-2004 rate ratio 2.37 and 2.74 for males and females, 95% CI 2.26 – 2.48 and 2.60 – 2.89 respectively) (Blakely, Tobias et al. 2007), Māori are more likely to experience **hospitalisation** (all-cause hospitalisation rate ratio 1.33, 95% CI 1.31-1.34) (Harris, Purdie et al. 2007), and are more likely to **die in infancy** compared to non-Māori (2004 – 2006, rate ratio 1.6, 95% CI 1.36 – 1.77) (Ministry of Health 2010d).

The impact of these consistent inequalities in health status and experience of illness is illustrated in ethnic differences in **life expectancy**. Figure 2.2 below shows the life expectancy at birth for Māori and non-Māori between 1951 and 2006. In 2006, the average life expectancy for a Māori male at birth was 70.4 years, compared to 79 years for a non-Māori male. Non-

Māori women could also expect to live for approximately eight years longer than Māori women (Ministry of Health 2010d).



Adjusted = adjusted for numerator-denominator bias according to estimates derived from the NZ Census Mortality Study (Ajwani, Blakely et al. 2003).

Figure 2.2: Life expectancy at birth, according to gender and ethnicity, 1951 – 2006

2. SOCIO-ECONOMIC POSITION: For most indicators of social and economic functioning, non-Māori compare more favourably than Māori. Māori are less likely to **own their own home** than non-Māori; and more likely to be **unemployed**, **leave school without a formal qualification**, have a lower **income**, and experience poorer **living standards** than non-Māori (Ministry of Health 2004; Jensen, Krishnan et al. 2006; Ministry of Health 2006b; Ministry of Health and University of Otago 2006).

The New Zealand Deprivation Index (NZDep) can be used as a proxy for many of these factors. This measure was first developed using information from the 1991 NZ Census, with three further indices calculated from subsequent censuses (the latest version being NZDep01 based on the 2001 NZ Census). It is a composite measure, using nine material and social variables (see Table 2.1 below) to calculate a deprivation score from one (least deprived) to ten for a particular census mesh-block area. These blocks are geographical units defined by Statistics New Zealand containing approximately ninety people. This index is an indicator of deprivation for the people who live within those small areas, and has been used in research to reflect

socio-economic position (Westbrooke, Baxter et al. 2001; Ministry of Health 2004; Riddell 2005; Davis, Lay-Yee et al. 2006)

Table 2.1: Variables employed in the NZDep 2001 index

Dimension of deprivation	Variable description (in order of decreasing weight)
INCOME	People aged 18-59 receiving a means tested benefit
EMPLOYMENT	People aged 18-59 unemployed
INCOME	People living in equivalised households with income below an income threshold
COMMUNICATION	People with no access to a telephone
TRANSPORT	People with no access to a car
SUPPORT	People aged <60 living in a single parent family
QUALIFICATIONS	People aged 18-59 without any qualifications
LIVING SPACE	People living in equivalised households below a bedroom occupancy threshold

(Source: Salmond and Crampton 2002 p9)

The figure below illustrates the distribution of the NZDep01 according to NZ Māori and non-Māori ethnicity. It shows that NZ Māori are more likely than non-Māori to reside in areas associated with a high level of **deprivation**; in 2001 23% of Māori lived in decile ten areas compared to only 7% of non-Māori. Conversely, only 3% of Māori resided in decile one meshblocks (areas experiencing the least deprivation) compared to 11% of non-Māori (Ministry of Health 2006b).

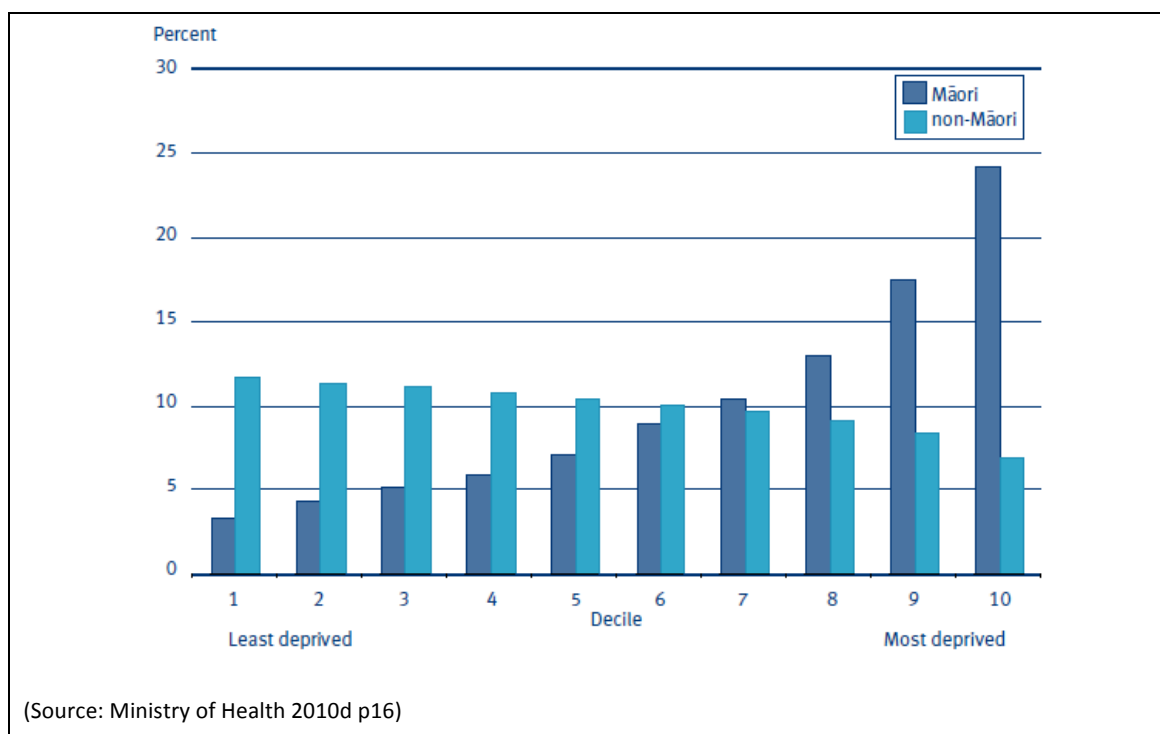


Figure 2.3: Distribution of deprivation (using NZDep01), Māori and non-Māori, 2006

2.1.3 Looking to the future: The determinants of health outcome inequalities

The previous sections have described the effect of past actions on Māori health and well-being, and the present day ethnic inequalities in health and socio-economic position. Section 2.3 considers the factors that may be contributing to these inequalities.

The World Health Organization (WHO) notes: *“While improving health is clearly the main objective of a health system, it is not the only one. The objective of good health itself is really twofold: the best attainable average level – goodness – and the smallest feasible differences among individuals and groups – fairness”* (World Health Organization 2000 pxi). Cram (1993 p28) recommends action against inequities: *“We know about the low socio-economic status of Māori, the high crime and imprisonment rates, the high unemployment and low educational attainments. We now need research that informs solutions.”* This section responds to this edict, asking: what are the factors involved in the differences in health status between Māori and non-Māori? To ensure variables such as discrimination and social class are considered, Krieger (2008) recommends using specific inequalities models to assess health outcomes

disparities. The framework developed by Jones (2002) is similar to those advised by Krieger; and considers factors contributing to inequalities at three levels. These determinants are discussed below, focusing on the differences in health outcomes for Māori compared to non-Māori.

DIFFERENCES IN EXPOSURES AND LIFE OPPORTUNITIES

This level includes the structural factors (such as education, employment, food and housing security) that may impact on an individual's opportunity for health; variables that over past decades have consistently favoured the NZ European population compared to Māori. These differences in life opportunities may contribute to inequalities in health status. As a crude example, NZ Europeans are more likely to succeed in the educational system than Māori and are less likely to experience unemployment and corrective incarceration (Ministry of Health 2006b; Minister of Health and Associate Minister of Health 2008). Both of these factors have an impact on health - prisoners report poorer self-rated health than the general population (Ministry of Health 2006a), and the unemployed experience higher mortality than the employed (Blakely, Woodward et al. 2002). NZ Māori are also more likely to engage in high risk behaviours and activities (occurring within the context of their disparate experience of social and financial disadvantage) such as hazardous drinking, smoking, or recreational drugs (Ministry of Health 2006b; Minister of Health and Associate Minister of Health 2008). These 'exposures' may reduce the ability of Māori to fully participate in society and their opportunities to achieve health and well-being, as well as directly increase the risk of injury, mortality and morbidity.

DIFFERENTIAL ACCESS TO HEALTH CARE

The second level in Jones' framework considers the accessibility of health care services, whereby the ability to financially and physically access appropriate health care may contribute to ethnic and racial inequalities in health. There is some evidence for differential access to care for Māori. For example, the 2006/07 New Zealand Health Survey reported that despite Māori experiencing poorer health than the rest of the NZ population, they have similar rates of General Practitioner utilisation (Minister of Health and Associate Minister of Health 2008). 2003-2005 hospital data demonstrated that Māori were over-represented in admissions for conditions that are potentially preventable in the primary and public health care sector, such as diabetes, dental conditions, asthma, and glue ear (Robson and Harris 2007).

Differential access may be due to social, economic, cultural or geographical barriers to care; and in practice, these two levels ('differences in exposures and life opportunities' and 'differential access to health care') overlap, with their contributing factors (such as education, incarceration, employment, smoking, and income) intertwined. The overall impact of these variables on health is difficult to quantify, although some analyses consider the association between health outcomes and ethnicity while adjusting for some of these factors.

The figures below use the NZDep index to explore the effect of deprivation on health inequalities. As noted in Table 2.1 (p20), this is a composite indicator that incorporates factors such as income and access to a private car - both variables involved in the financial and physical ease of accessing health care. This index also contains markers for employment and educational achievement, so may additionally act as a proxy for factors associated with 'life opportunities'. Figure 2.4 explores life expectancy for Māori, Pacific and NZ Europeans according to the NZDep96 index:

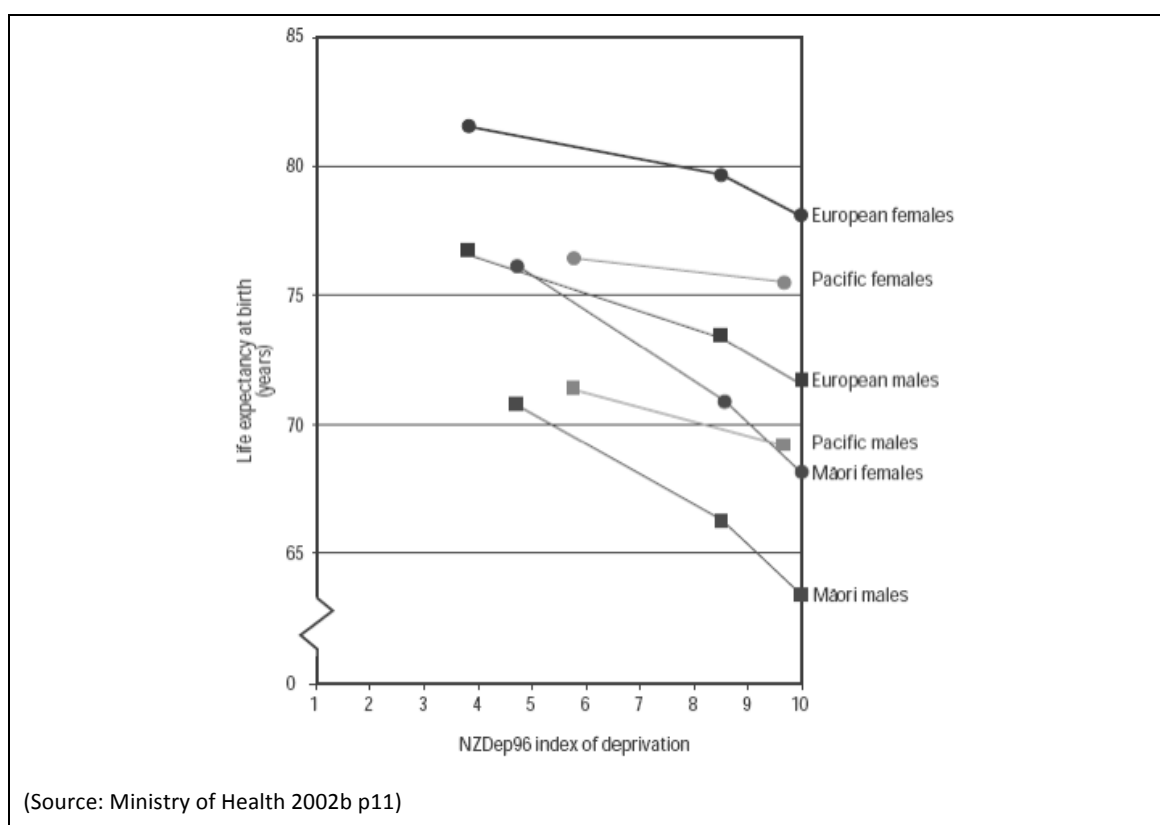


Figure 2.4: Life expectancy at birth by NZDep96 decile for Māori, Pacific and European ethnic groups

The same pattern is demonstrated when mortality data are examined, using NZDep01:

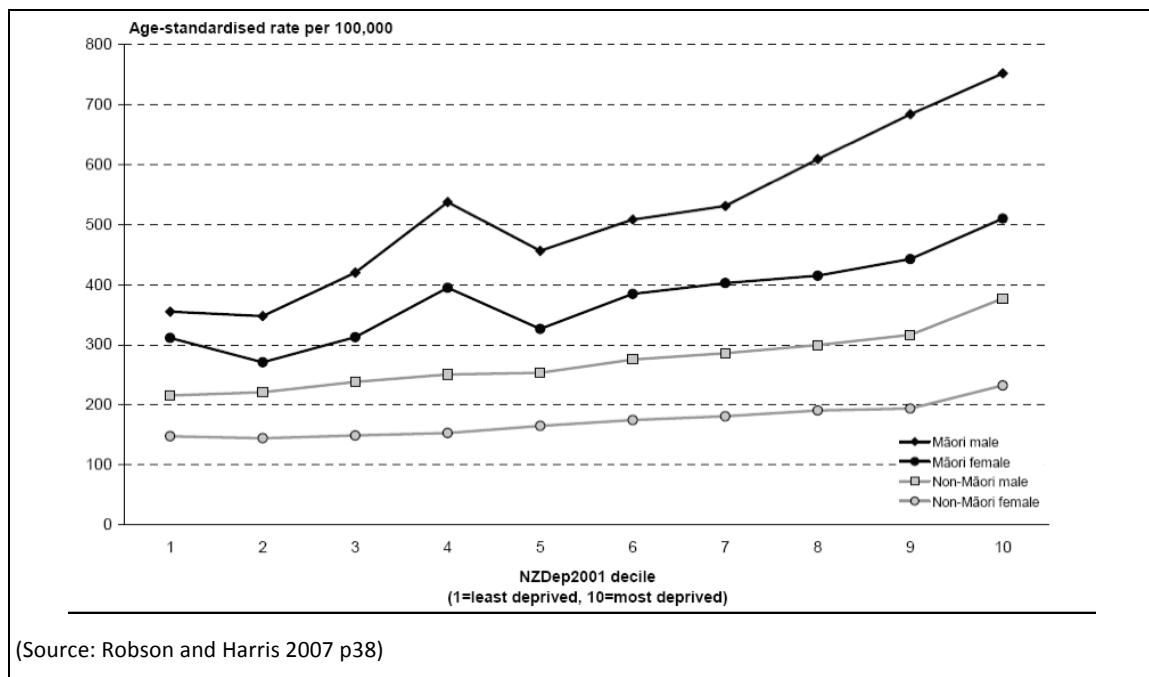


Figure 2.5: Māori and non-Māori deaths by gender and area deprivation, 2000-2004

These two figures illustrate the association between NZDep and health outcomes, with two key implications for the impact of socio-economic position on ethnic inequalities. Firstly, given that a higher proportion of Māori are 'deprived' compared to NZ Europeans, the absolute impact of socio-economic position on health is greater for the Māori population. Secondly, the relative impact of NZDep on health is also higher for Māori, as the rate of increase of mortality as deprivation increases (see Figure 2.5) is greater for Māori compared to non-Māori. This 'gradient gap' suggests that material and financial disadvantage may have a greater impact on the health of Māori compared to that of non-Māori (Reid, Robson et al. 2000).

However, these figures also illustrate health disparities within the lower NZDep deciles; that is, the 'outcome gap' (Reid, Robson et al. 2000) between Māori and non-Māori persists amongst the population that is least deprived, people who may have fewer barriers to accessing adequate health care and comparatively greater 'life opportunities'. Other studies support these findings: while demonstrating the impact of socio-economic factors on the excess mortality and reduced life-expectancy for Māori, these variables do not fully explain discrepancies in health status (Sporle, Pearce et al. 2002; Tobias and Cheung 2003). For example, although Blakely et al. (2006) found a significant contribution of smoking and socio-economic position to ethnic disparities in mortality, they also described a persistent increase risk in mortality for Māori compared to non-Māori non-Pacific (1996 – 1999, rate ratio 1.85

and 2.03 for men and women, 95% CI 1.74 – 1.97 and 1.89 – 2.19 respectively) despite their control for these factors.

While NZDep is just one proxy of socio-economic position (with inevitable measurement error), it is clear that factors occurring within this level are partially responsible for ethnic health status inequalities in NZ. However, there are likely to be other unaccounted-for variables that are also component causes to ethnic disparities in health outcomes.

DIFFERENTIAL CARE WITHIN THE HEALTH CARE SYSTEM

The final level of Jones' framework concerns the quality of care delivered by the health system. There is both indirect and direct evidence that suggests the care received within the health system may differ according to ethnic group, and this variability may translate into differences in health outcomes. Firstly, health services as a theoretical determinant of health is well-established: Lalonde (1981) noted it as one of the four factors in his Health Field Concept in the 1970s. Secondly, there is extensive international evidence for racial/ethnic variations in the quality of care, with consequent detrimental effects on the health outcomes of minority patients (see Chapter Four).

It is possible the NZ health system contributes to health disparities for Māori, by delivering differential quality of care. Both Māori and non-Māori experts (Crengle 2000; Reid, Robson et al. 2000), and members of the Māori community (Cunningham 2006) have voiced concerns about the quality of health care delivered to Māori. There is also some published research that indicates the NZ health system may deliver different (and poorer) care to some ethnic groups (discussed in detail in Chapter Four). For example: Māori receive fewer surgical interventions for cardiac conditions than non-Māori, despite having a greater incidence of the disease (Westbrooke, Baxter et al. 2001; Tukuitonga and Bindman 2002); Māori have a greater risk of experiencing a preventable adverse event whilst in hospital than a comparable non-Māori patient (Davis, Lay-Yee et al. 2006), and there is also evidence that some Māori with cancer receive different and less timely care than non-Māori (Hill, Sarfati et al. 2010b).

In summary, it is likely that all three levels of Jones' framework have a role in the health outcomes disparities between Māori and NZ Europeans in NZ. The following section focuses on the final factor, 'differential care within the health care system', and develops the hypothesis for this study.

2.2 STUDY HYPOTHESIS AND THEORY

This section is structured as follows: Section 2.2.1 defines some key epidemiological concepts and terms. The study rationale is developed into a hypothesis for this research in Section 2.2.2. Finally, the choice of setting and population for this study is discussed in Section 2.2.3.

2.2.1 Epidemiological theory and terms

In this study, Directed Acyclic Graphs (DAGs) were used in the design of the research, the analyses of data, and in the interpretation of the estimates. These causal diagrams are commonly used in epidemiological research to aid the conceptualisation of the relationship between an exposure (X) and outcome (Y). In these DAGs, a single-headed arrow represents a causal effect, and there are no feedback loops (that is, two variables cannot 'cause' each other at the same moment) (Rothman and Greenland 1998). DAGs can also be used to identify and explore the effects of confounders and mediators on an association between X and Y.

Confounding is defined as the *"mixing of effects between an exposure, an outcome, and a third extraneous variable"* (Rothman and Greenland 1998 p120). The confounder is not an intermediary (such as a mediator), but is independently associated with both the exposure in the source population, and the outcome. Estimation of an association between an exposure and outcome may be distorted if these confounding variables are not considered in the study design or analyses.

Mediators – although also associated with both the exposure and outcome – can be conceptualised as *"steps in the casual chain"* between an exposure and outcome (Last 2001 p96). Although mathematically, mediators and confounders are broadly identical and may alter a given association in the same way (and may be attenuated with similar techniques - inclusion in a multivariable model, restriction, or presentation of analyses according to strata of the mediator), a mediator is considered to be a 'causal consequence' of the exposure, whereas a confounder cannot be caused by the predictor variable.

The figure below shows a simple DAG of an exposure and outcome, illustrating the mechanism of a confounder (C) and mediator (M).

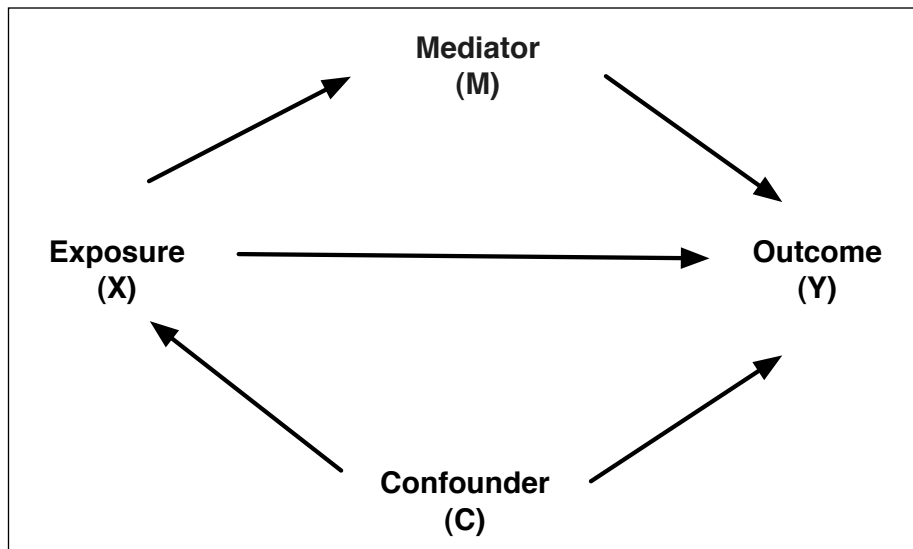


Figure 2.6: Basic exposure-outcome association (DAG)

In DAG theory, the ‘total effect’ of X on Y includes the impact of X as mediated through indirect pathways, whereas an estimate of the association between X and Y independent of those mediated by M or confounded by C is termed the ‘direct effect’.

2.2.2 Developing the study hypothesis

THE STUDY RATIONALE

The previous section discussed the component causes of ethnic inequalities in health outcomes according to three levels: differences in exposures and life opportunities, differential access to health care, and differential care by health services. The figure below uses a simple DAG to illustrate the relationship between ethnic group (the exposure, X) and differences in health outcomes (the outcome, Y), as mediated by the three factors of Jones’ framework:

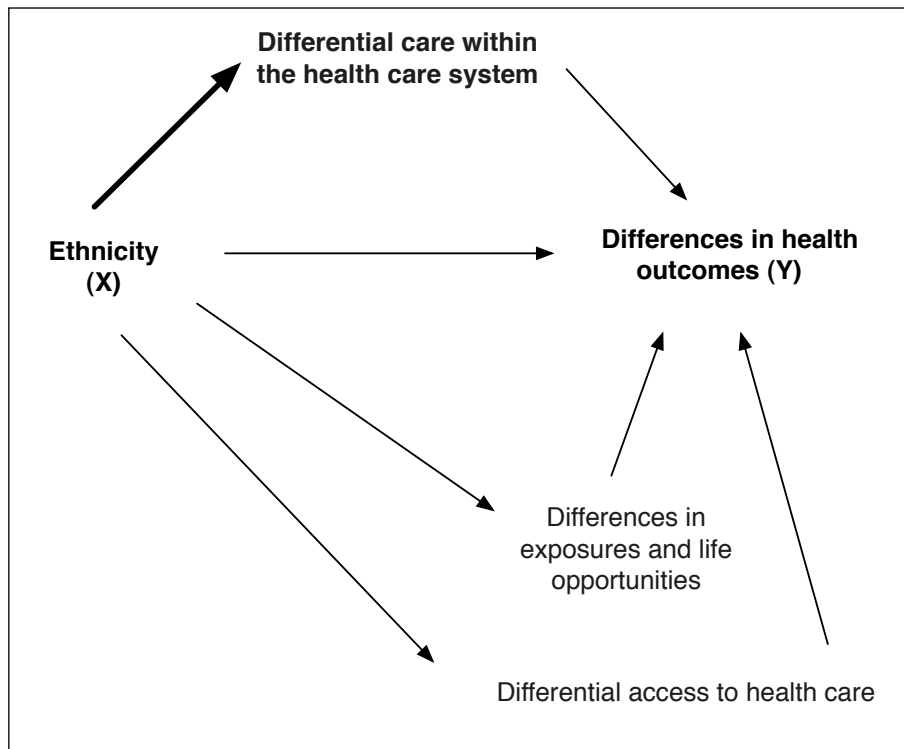


Figure 2.7: Ethnic group and health outcomes inequalities (DAG)

This study focuses on one of the component causes of disparities in health outcomes for Māori, the association between ethnic group and differential care within the health system (pathway noted in **bold** in Figure 2.7 above). Section 2.1.3 briefly noted some evidence of ethnic differences in health care, and this research aims to further explore the association between ethnicity and the quality of care.

THE STUDY HYPOTHESIS

The following study hypothesis is suggested:

‘NZ Māori inpatients receive a lower quality of care than NZ European inpatients at public hospitals within NZ.’

This hypothesis is reflected in objective two of the study: “To employ this/these measure(s) to compare the quality of inpatient hospital care between NZ Māori and NZ European patients, with consideration of confounding and mediating factors in order to estimate the net effect of ethnic group on the quality indicator”.

Figure 2.8 below uses a DAG to illustrate this objective. In this figure, the quality indicator (Y^*) is used as a proxy for the actual quality of care received (this distinction is discussed in Chapter Five). The pathway between X and Y^* as mediated by M^* and confounded by C^* are shown to be 'blocked' (indicated with the rectangular boxes), representing control for these factors through study design or analysis.

The objective above uses the term 'net effect'. While not a classical epidemiological term, it is for all practical purposes is equivalent to the definition of 'direct effect' – that is, this research intends to estimate the association between ethnic group and the quality indicator, independent of confounding and mediating factors. However, because the DAG conceptualises the X - Y^* association as that mediated through the variable 'quality of care' (a factor which would be theoretically be blocked if seeking an estimate of the 'direct effect' of X on Y^*), the term 'net effect' is employed - implying control for all mediating and confounding factors apart from 'quality of care'.

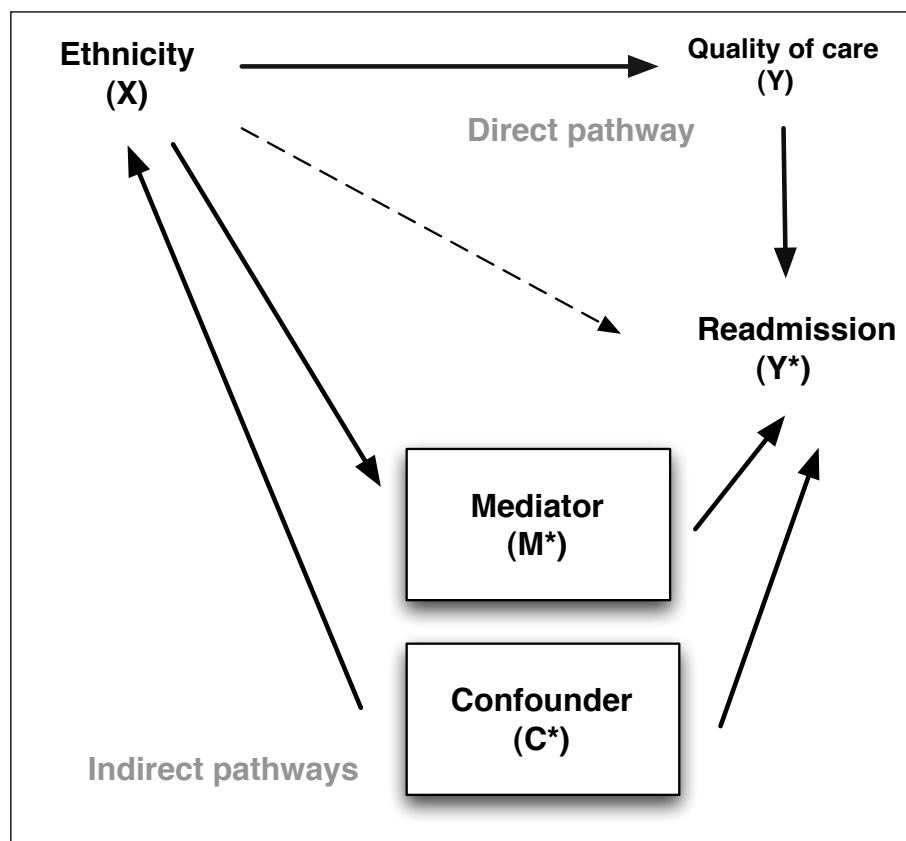


Figure 2.8: Ethnicity and the quality of care, with mediation and confounding (DAG)

Extending this concept: just as there are mediators and confounders in the ethnicity-indicator association, there will be also be factors M and C that affect the ethnicity-quality of care association, and mediators/confounders (D and C**) within the quality of care-indicator association. This structural conceptualisation of these variables is shown in the figure below.

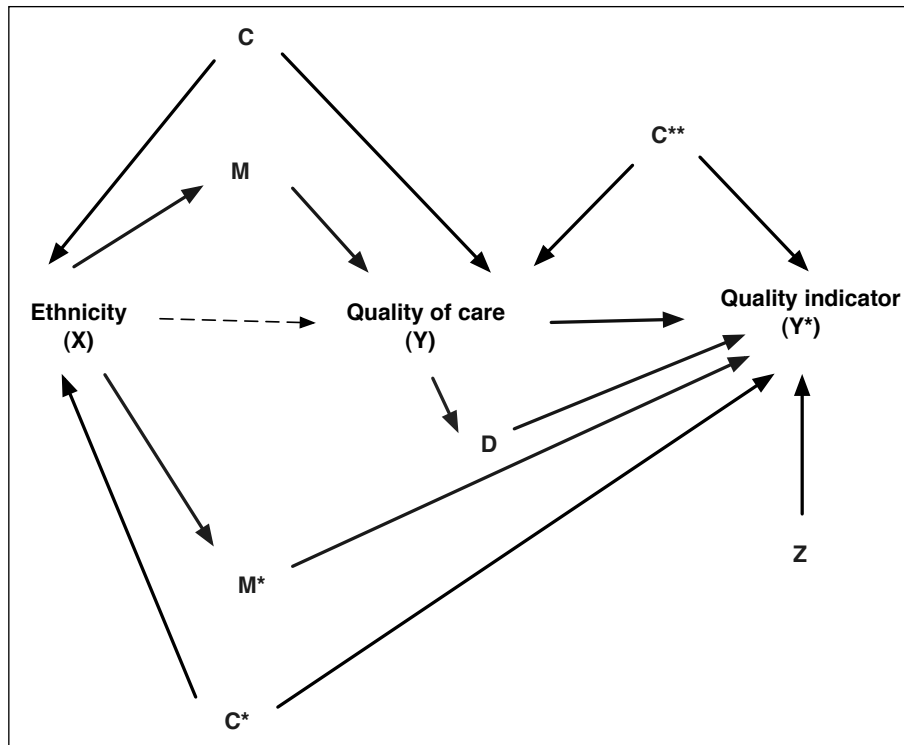


Figure 2.9: Structural conceptualisation of the associations between ethnicity, quality of care, and the proxy for quality with mediation and confounding (DAG)

In this diagram, there are three sets of mediators (M, M* and D) and three sets of confounders (C, C* and C**). Variable Z represents factors that influence Y*, independent of quality of care and ethnicity. This study aims to estimate the X-Y association, using the X-Y* association as its proxy. Accordingly, this diagram has several key implications:

1. Although the sets of mediating and confounding variables may overlap, they will not be identical. In particular, there may be factors that impact on the indicator differentially by ethnicity (such as C* and M* above), such that the validity of Y* as a surrogate of quality alters with ethnic group.
2. Given that quality of care is unobserved, the information regarding C and M must be inferred from findings regarding C* and M* and their associations with the various forms

of Y^* . It is also not possible to explore the distribution of potential confounders and mediators within study data with respect to Y , only Y^* .

3. The objective of this study is to explore the **net** effect of ethnic group on Y , using Y^* as its proxy. Whereas the 'total' effect of ethnic group includes that mediated by factors on other causal pathways (that is, both the X - M - Y and X - Y pathways), the net effect estimates the impact of ethnicity on obtaining quality of care independent of the M mediating variables. A net effect of ethnicity on quality of care may indicate the existence of variables and pathways that are presently unknown or unmeasurable – for example, factors intertwined with institutional racism and the processes of colonisation - that represent targets for future research and intervention. The emphasis on the net effect also reflects that the data on M factors are imprecise, and many of these variables are unknown.

As such, there should be control or consideration (through study design or multivariable adjustment) for factors M , M^* , C , C^* , C^{**} and Z . However, D variables (those on the causal pathway between quality of care and the proxy) should not be adjusted for (or 'conditioned on' in DAG terminology). That is, to determine the impact of X on Y^* through Y , all factors with arrows leading into Y^* *that do not come from Y* should be controlled for (that is, those paths should be 'blocked'), including adjustment for exogenous causes of Y^* (i.e. Z).

These rules form the paradigm for the examination of these associations throughout this thesis, and will be referred to particularly in Chapter Five (when assessing the validity of two quality indicators), Chapter Six (in the conceptualisation of potential covariates), and Chapter Eight (when examining the impact of bias and confounding on the estimates). This structural DAG framework is a novel approach to the measurement of health care quality, and represents new territory in epidemiology and quality research. (It is also an evolving paradigm, which may be modified and developed in future studies.)

2.2.3 Study setting and population

WHY FOCUS ON NZ MĀORI AND NZ EUROPEANS?

Although the DAG above uses the term 'ethnicity' to define the exposure, this study hypothesis is specific to only two ethnic groups, NZ Māori and NZ European. The focus on the outcomes

and opportunities for NZ Māori deliberately emphasises the place of Māori as the indigenous people of New Zealand. Differences in health care between NZ Māori and NZ Europeans form the basis of the study hypothesis for three reasons:

1. NZ Europeans comprise the largest ethnic group in NZ; therefore the care received by this group represents a benchmark according to current standards and expectations.
2. Use of 'non-Māori' or 'non-Māori non-Pacific' comparison groups may underestimate disparities in health care delivery for Māori. These populations incorporate other minority ethnic groups, who may experience inequalities in health care for similar reasons as NZ Māori. As such, their inclusion in the control group may miscalculate the true level of care received by NZ Europeans.
3. The Treaty of Waitangi binds together descendants of the British colonisers and those of the Māori signatories of the Treaty (as discussed in Chapter Three). The factors involved in disparities in health care between these two groups may reflect processes begun 200 years ago. It is appropriate that the comparator group used in this study reflects the impact of colonisation, and the health outcomes inequalities evident between NZ Māori and NZ Europeans today.

WHY FOCUS ON HOSPITAL CARE?

The study setting was restricted to public hospitals for two reasons. Firstly, at present acute hospital services are available at no direct financial cost to the individual. Accordingly, the factors associated with the ability to financially access care may be mitigated by this restriction. Secondly, the primary health and preventive care sectors have undergone significant changes in recent years, with targeted funding now available for the care of NZ Māori. In this health care setting, they are a prioritised population who may be eligible for interventions that are not available to non-Māori: that is, they may appropriately receive unequal treatment. Acute public hospital services represent a more stable environment from which to gather both retrospective and prospective data, and also one in which NZ Māori and non-Māori are expected to receive an equal standard of care according to need.

2.3 SUMMARY

The colonisation of Aotearoa had a dramatic impact on the well-being of Māori. Despite the Treaty ensuring Māori the '*same rights and privileges as British subjects*', significant health and social disparities between the Māori and non-Māori population are evident today. While differences in lifestyle, socio-economic position and access to services may contribute to the poorer health status of Māori, the actions of health services may also influence health outcome disparities. That premise is the foundation of this study, that NZ public hospitals may deliver unequal (and poorer) care to NZ Māori compared to NZ Europeans.

A DAG analytical approach is applied to the measurement of quality throughout this thesis. The framework and its associated rules aid the conceptualisation of variables and processes involved in measuring health care quality, and allow the structural analysis of potential sources of error.

Part Two of the thesis uses the findings of international and national literature to explore the construct of health care quality, and the evidence for ethnic disparities in care. The measurement of quality by selected indicators will also be discussed, with reference to the DAG framework previously described.

PART TWO

Literature review

CHAPTER THREE:

EXPLORING ‘QUALITY OF CARE’

“When I agree to become your patient, you can take away my clothes, my right not to be naked. You can make me look ridiculous in your hospital gown: childlike, undignified, vulnerable. You can put things in my body orifices and veins. You can take away my pills, and give me yours. You can harm me with an error and never tell me. You can read me your rules, but I cannot read you mine.”

(Berwick 2005 p123)

Part One developed the study hypothesis: that NZ Māori inpatients may receive a lower quality of care than NZ European inpatients at public hospitals within NZ. It also developed a structural framework to apply to the assessment of the ethnicity-quality association, employing DAG theory. Part Two expands on the research question, asking:

- 1. What is ‘quality’, and how is it measured? (Chapter Three).**
2. What is the evidence that the quality of care may differ according to ethnicity? (Chapter Four).
3. How should we measure quality in this study? (Chapter Five)
4. Is there evidence for the validity of the chosen indicator(s) as a marker of health care quality? (Chapter Five).

This chapter focuses on the first question, firstly reviewing generic and disaggregated definitions of quality, and discussing quality frameworks specific to Māori (Section 3.1). Section 3.2 considers how health care quality should be measured: structural, process and outcome indicators are reviewed, as are the characteristics of an ‘ideal’ marker of quality. Finally, Section 3.3 provides a brief summary of the chapter.

3.1 WHAT IS ‘QUALITY OF CARE’?

The previous chapter described the rationale for this research, whereby the quality of health care may contribute to inequalities in health outcomes between Māori and NZ Europeans. But what exactly is ‘quality health care’? Is it a cure for an ailment? Or is it a nice bedside manner? Just as ‘health’ should not be defined as simply the absence of disease (World Health Organization 1946), high quality of care is not simply the successful recovery from an illness or accident. Berwick (2005 p121) requests the following from his health care providers: *“Don’t kill me...Do help me, and don’t hurt me...Don’t make me feel helpless. Don’t keep me waiting. And don’t waste resources, mine or anyone else’s”*. His is just one of the numerous circulating ‘definitions’ of high quality care. Although many agree on what quality is **not**; the specification of its dimensions and the creation of a workable definition has produced significant debate (Longo and Daugird 1994).

The differing perspectives of the consumer, provider and funder of health care all contribute to the lack of agreement regarding the dimensions of quality. Cost-efficiency may be the most important component of quality to the funder; consumers may prioritise the interpersonal skills of the clinical staff, whereas providers of health care may rate recovery from illness as the key dimension of quality. Similarly, applying a population perspective may change the emphasis of quality, in that providing optimal care for a community may result in inferior care for some of the individuals within it (Cordero 1964). Individual patients also differ in what they consider high quality of care – for example, some may prioritise private rooms, while others want continuity of staff. The figure below is adapted from a National Health Service advertisement in the UK, and illustrates this point:

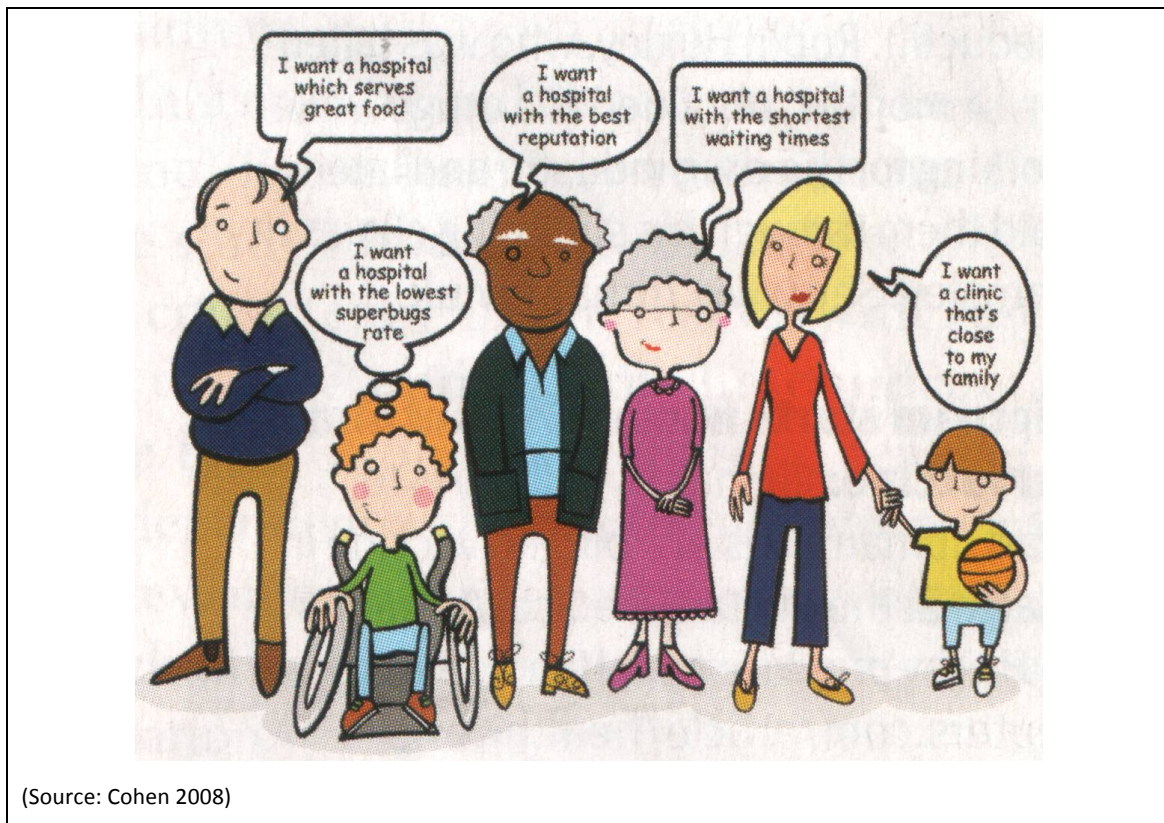


Figure 3.1: The subjective nature of quality in health care

3.1.1 Generic definitions of quality

Many researchers, clinicians, and institutions have attempted to summarise the complex, multi-dimensional nature of health care quality into an easy sound bite. The list below includes some of the generic definitions of quality advanced:

- High quality care *“consistently contributes to the improvement or maintenance of quality and/or duration of life”* (Council on Medical Service 1986).
- *“Quality health care means doing the right thing at the right time in the right way for the right person and having the best result possible”* (Agency for Healthcare Research and Quality 1998).
- Care is effective, such that *“health will be improved as an automatic consequence of using a health service”* (Harris 1994 p8).

- *The “goodness of fit between: the problem..., the desired outcome..., the treatment used, as sensed or experienced by the patient, as judged by the physician and his colleagues, and as measured by outcome studies” (Menninger 1977 p480).*
- *“The degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge” (Institute of Medicine 2001).*

These definitions incorporate some key concepts:

1. The ‘quality spectrum’: The quotes above suggest that quality exists on a continuum, where the care a patient receives may vary from terrible to exemplary. Within this range is the current minimum standard, a level of care that incorporates:

- The medical knowledge and technology of the present time.
- Evidence-based and current practice.
- Feasibility within time and resource constraints.
- Patient preferences.
- Societal expectations.

Given that the minimum standard is dependent on the practices and culture of the time, high quality health care today may be considered substandard in the future. Advances in medical technology, and the costs associated with pharmaceuticals and medical equipment, suggest that the current acceptable level of care for a certain condition may change rapidly. Similarly, the culture of a society and its expectations regarding what constitutes high quality health care may change with time. For example, the process of informed consent is a fundamental part of health care today, yet was relatively unheard of prior to World War II (Weindling 2001). Thus, ‘quality’ is dynamic, in that what constitutes a current minimum standard requires regular reassessment over time.

2. ‘Quality’ should be measurable: An accepted standard of care is irrelevant if it is unknown whether it is being attained. Accordingly, a key implication of the quality spectrum is the inference that quality can be assessed, measured and monitored.

3. Population perspective: The definition by the Institute of Medicine refers to ‘individuals and populations’; however applying a population perspective may cause conflict between individual and social definitions of quality. Egalitarian philosophies would treat all people equally, irrespective of their pathology or demographics. However, the reality of providing ever-expanding health services to growing and ageing populations must be considered, and scarce resources require the prioritisation of services and populations. While the issue of individual rights versus societal restriction for ‘the greater good’ has long been a subject of debate (Colgrove and Bayer 2005; Looker and Hallett 2006), the concepts of efficiency and social good remain important dimensions of quality today.

4. Focus on health: The definitions above demonstrate that the emphasis of quality lies firmly in the improvement of health and well-being, and the definitions advanced by Menninger and the Institute of Medicine state explicitly that the evaluation of quality should be performed using health outcomes. Accordingly, although concerns regarding cost-containment, waste and inefficiency are valid, they should not overshadow the intention of health care - to produce a favourable outcome for the patient.

5. The determinants of health: The definition used by the Institute of Medicine employs the phrase ‘*likelihood of health outcomes*’. This expression indicates acceptance of the factors that lie beyond the providers’ control that may also influence health status, other than the quality of care (Wyszewianski 2003). The Health Field Concept proposed by Lalonde (1981) describes three variables in addition to health services as determinants of health: biological factors, the broader environment, and lifestyle. Accordingly, individual characteristics and behaviours, the socio-political and economic environment may all influence health outcomes, irrespective of the care received. Therefore, it is important to consider these variables when establishing expectations of the quality of care, and when measuring and monitoring quality.

Reflecting the difficulty in developing an accepted generic definition of quality, and a desire to specify the key components of high quality health care, researchers and institutions have moved to emphasise the dimensions of quality. The following section discusses these dimensions, specifically reviewing NZ Māori and non-Māori frameworks of health care quality.

3.1.2 Frameworks of health care quality

This section explores disaggregated definitions of quality from both Māori and non-Māori perspectives, and considers their differences and similarities.

MĀORI FRAMEWORKS OF HEALTH CARE QUALITY

What constitutes high quality care to NZ Māori? Although there has been a significant amount of research in Aotearoa regarding Māori frameworks of health and wellbeing, there is little available on the construct of health care quality from a NZ Māori perspective. However, the definition formed by Harris (1994 p8) was developed after in-depth consultation with Māori. Harris used various research methodologies to investigate the health service priorities of Māori consumers; including interviewing callers to talkback radio and members of focus groups, and consulting with Māori experts in this area. Her research noted that the main expectation of Māori health consumers was that of the ‘effectiveness’ of health care, the reasonable anticipation *“that their health will be improved as an automatic consequence of using a health services”* (p8). The Taura Tieke framework was developed from this research, describing three key dimensions in the construct of quality for the Māori participants (Harris 1994). The table below describes some of the characteristics of each of these domains:

Table 3.1: He Taura Tieke, factors involved in health care effectiveness for Māori

Dimensions of effective service	Key attributes
TECHNICAL AND CLINICAL COMPETENCE	<ul style="list-style-type: none"> ▪ The monitoring and evaluation of the service to maintain technical and clinical competence. ▪ Safety of care, such that harm is minimised. ▪ The ability of the staff to treat Māori patients sensitively.
STRUCTURAL AND SYSTEMIC RESPONSIVENESS	<ul style="list-style-type: none"> ▪ The application of a clear health framework to Māori consumers, such as Te Whare Tapa Whā⁷. ▪ An expectation that providers will contribute to Māori development and the development of a Māori health workforce. ▪ Clear processes to monitor and evaluate service to include and respond to Māori views. ▪ The ability of a service to allow provision of care by Māori practitioners.
CONSUMER SATISFACTION	<p>Reflecting the ability of Māori consumers to:</p> <ul style="list-style-type: none"> ▪ Access culturally appropriate services spatially and financially. ▪ Communicate successfully with Māori, provide information, collect information sensitively and appropriately. ▪ Allow Māori consumers to make informed choices. ▪ Trust and respect for privacy, cultural values, lifestyle and cultural differences, confidentiality. ▪ Participate in the management and provision of health services. ▪ Access continuity of care, that is able to serve both the individual and their whānau as clients.

Adapted from Harris (1994).

NON-MĀORI MODELS OF HEALTH CARE QUALITY

There are multiple dimensions of quality in use by non-Māori researchers; Table 3.2 below illustrates some of these domains:

⁷ Whare Tapa Whā is a Māori model of health, conceptualising wellbeing as a four-sided house (Durie 1985). Each of the four dimensions (spiritual, physical, emotions, and family) is of equal importance, and injury to any of these domains may result in ill health.

Table 3.2 Examples of dimensions of quality used by researchers and institutions

Dimensions	Institute of Medicine ¹	Maxwell ²	OECD health care indicators framework ³	The Canadian Institute for Health Information Performance Framework ⁴	The Seven Pillars of Quality ⁵
SAFETY	X		X	X	
EFFECTIVENESS	X	X	X	X	X
RESPONSIVENESS/ PATIENT-CENTREDNESS	X		X		
TIMELINESS	X				
EFFICIENCY	X	X	X	X	X
EQUITY	X	X	X		X
ACCESS		X	X	X	
CONTINUITY				X	
APPROPRIATENESS				X	
COMPETENCE				X	
LEGITIMACY					X
ACCEPTABILITY		X		X	X
EFFICACY					X
OPTIMALITY					X
RELEVANCE		X			

OECD = Organisation for Economic Co-operation and Development. References: 1= Institute of Medicine 2001, 2=Maxwell 1992, 3=Arah, Westert et al 2006, 4=Canadian Institute for Health Information 1999, 5=Donabedian 1990.

The table above illustrates a lack of consensus on the principle dimensions of quality, producing a 'catalogue' of many over-lapping domains (Reerink 1990). Even factors that appear frequently in the published literature vary in their definitions. For example, Donabedian defines 'effectiveness' as *"the degree to which attainable health improvements are realized"* (Donabedian 1990 p1115), whereas the Institute of Medicine incorporates a

concept of restraint into its description, stating that ‘effective care’ is “*providing services based on scientific knowledge to all who could benefit, and refraining from providing services to those not likely to benefit*” (Institute of Medicine 2001 p6). Nonetheless, some common themes pervade these disaggregated definitions, with a sense of responsiveness demonstrated in the majority of the definitions (through the concept of ‘Acceptability’⁸ or ‘Patient-centeredness’⁹), and ‘Efficiency’ and ‘Effectiveness’ prominent in the domains proposed by many researchers and institutions.

HOW DO MĀORI AND NON-MĀORI FRAMEWORKS COMPARE?

The dimensions supplied by the Western researchers are similar in many respects to those noted in He Taura Tieke. The domains within this model and the concepts they embody overlap with many of the non-Māori disaggregated definitions of quality. The following table subjectively maps the dimensions of He Taura Tieke with those of six commonly used models of quality:

⁸ ‘Care/Service provided meets expectations of client, community, providers and paying organizations’ (The Commonwealth Fund 2004)

⁹ ‘Providing care that is respectful of and responsive to individual patient preferences, needs, and values, and ensuring that patient values guide all clinical decisions’ (Institute of Medicine 2001).

Table 3.3: Relationship between dimensions of quality described in He Taura Tieke and those described by commonly applied frameworks

Frameworks	He Taura Tieke dimensions		
	Technical and clinical competence	Structural and systemic responsiveness	Consumer satisfaction
INSTITUTE OF MEDICINE ¹	Effectiveness Safety	Patient-centeredness Equity	Effectiveness Safety
MAXWELL ²	Effectiveness Acceptability	Equity	Effectiveness Access Acceptability
OECD HEALTH CARE INDICATORS FRAMEWORK ³	Effectiveness Safety	Equity Responsiveness	Access Effectiveness Safety
THE CANADIAN INSTITUTE FOR HEALTH INFORMATION PERFORMANCE FRAMEWORK ⁴	Access Continuity Appropriateness Acceptability		Access Continuity Appropriateness Acceptability
THE SEVEN PILLARS OF QUALITY ⁵	Effectiveness Acceptability	Equity	Effectiveness Legitimacy Acceptability
MINISTRY OF HEALTH, NZ ⁶	Effectiveness Safety Treaty of Waitangi foundation	Access and equity Treaty of Waitangi foundation People-centred	Effectiveness Safety Access and equity Treaty of Waitangi foundation People-centred

OECD = Organisation for Economic Co-operation and Development. References: 1=Institute of Medicine 2001, 2=Maxwell 1992, 3=Arah, Westert et al 2006, 4=Canadian Institute for Health Information 1999, 5=Donabedian 1990, 6=Ministry of Health 2003.

This table illustrates that the priorities for health care effectiveness as proposed by Māori are not dissimilar from those advanced by non-Māori institutions; as such, it is probable that the latent constructs of quality according to Māori and non-Māori have considerable overlap. However, there are several key points of distinction:

- Non-Māori frameworks place a consistent emphasis on the domain 'Efficiency'. This dimension is included in all of the other six frameworks described above, yet does not feature in He Taura Tieke. It is possible that this concept is inherent in the whānau-centred philosophy that embodies Māori health, the interdependence of all individuals with the wider community (Durie 1985; Royal Commission on Social Policy 1988; Durie 1994b). This omission may also be explained by the research methodologies employed, Harris primarily

consulting with health care consumers as opposed to health service managers or funders. It is likely that most consumer-developed quality frameworks would also fail to feature a population perspective or the efficiency domain.

- Although the dimensions of He Taura Tieke overlap with the other models, there is more emphasis on acceptability, patient centredness, and cultural competence. Durie (2003 p408) summarises this expectation, stating that health services need to *“recognise the significance of culture to health and to adopt methods that actively engage patients – through appropriate language, respect for custom, the use of culturally validated assessment protocols and outcome measures, and the employment of indigenous health workers”*. Accordingly, given that ‘quality’ implies a minimum standard of care according to current societal and cultural expectations, there is the expectation from Māori that Māori cultural values be reflected in the delivery of care.

3.2 HOW IS 'QUALITY' MEASURED?

Florence Nightingale was ahead of her time in her desire to *“show subscribers how their money was being spent, what amount of good was being done with it or whether the money was not doing mischief rather than good”* (Nightingale 1863, cited in Perkins et al. 2006). Quality assessment is essential to identify health service outliers, and assess changes in quality over time/place/person. However, the usefulness of quality assessment is dependent on the accuracy of measurement, and the validity of the indicators used. This section focuses on the use of indicators to assess health care quality, and is structured as follows:

- 3.2.1 provides a background to the use of quality indicators, and their employment in health systems internationally.
- 3.2.2 provides an overview of the characteristics of an 'ideal' indicator.
- 3.2.3 examines the classification of indicators according to structure, process and outcome.
- 3.2.4 focuses on the assessment of quality for Māori with indicators.

3.2.1 What are quality indicators?

Quality indicators are *“measurement tools, screens, or flags that are used as guides to monitor, evaluate, and improve the quality of patient care, clinical support services, and organizational function that affect patient outcomes”* (Canadian Council on Health Services Accreditation 1996). That is, given that the 'true' quality of care is unobserved, it must be inferred from indicators or proxies of this construct.

In Ancient Egypt, physicians who delivered poor quality care were physically punished (Reerink 1990); similarly Arabians were known to remove body parts of health workers who administered substandard care (Hammermeister, Shroyer et al. 1995). In these cases, the patient's response to intervention was used as the quality indicator, to reflect the expertise of

their health care worker. Recovery or improvement of health status represented high quality health care; conversely, clinical deterioration implied poor physician performance. Over time, response to treatment as an outcome indicator has driven the advancement of medical technology and research, as well as acting as a form of quality assurance for patients.

Quality indicators (and the consequences of poor performance) have since been refined, and they are now routinely employed to aid the assessment of the quality of health services. The majority of Western governments (including those of the US, UK, Australia, NZ, and Denmark) as well as international bodies (such as the Organisation for Economic Co-operation and Development) employ indicators to assess the quality and performance of their health systems (Kelley and Hurst 2006; Ministry of Health 2007c), although the markers used by these organisations vary. For example, the UK assesses the National Health Service with more than thirty-five categories of indicators (Department of Health 1999). After assessing five distinct quality dimensions, the World Health Organization framework develops a single, composite measure to rank the performance of a health system (World Health Organization 2000). Currently the NZ Ministry of Health uses ten categories of non-financial indicators to assess the performance of District Health Boards¹⁰ (Ministry of Health 2007c). Examples of indicators used to assess quality of care are demonstrated in the following table:

¹⁰ District Health Boards are the regional bodies responsible for providing (or arranging the provision of) health and disability services within a defined geographical region. There are twenty-one throughout New Zealand, and they are entirely government-funded.

Table 3.4: Examples of indicators used to assess the quality of care by governments of New Zealand, Australia and the United Kingdom

Examples of indicators employed in hospital benchmarking, NZ ¹	Examples of indicators employed in the National Health Service High-level performance framework ²	Examples of indicators employed in the assessment of health system performance, Australia ³
AVERAGE LENGTH OF STAY	Standardised all-cause mortality ratio	Unsafe sharing of needles
RATE OF DAY CASE PROCEDURES	% of target population vaccinated	Childhood immunisation
INCIDENCE OF <i>STAPHYLOCOCCUS AUREUS</i> BLOODSTREAM INFECTION	Deaths from malignant neoplasm	Potentially preventable hospitalisations
EMERGENCY TRIAGE RATES	Surgery rates (e.g. hip replacement, knee replacement)	Survival following acute coronary heart disease event
RATE OF ACUTE READMISSION WITHIN SEVEN DAYS	Size of inpatient waiting list per head of population	Waiting times in Emergency Department
PATIENT SATISFACTION	Adults registered with National Health Service dentist	Length of stay in hospital

References: 1= Ministry of Health 2007, 2= Department of Health 1999, 3= National Health Performance Committee 2004.

As demonstrated, there is a wide variety of quality indicators in use – some focusing on discrete facets of the health system (e.g. waiting times in the Emergency Department), others that would require extensive risk-adjustment for patient and clinical factors in their analysis to avoid bias and confounding (e.g. death from malignant neoplasm, length of stay). Therefore, what makes an ideal quality indicator?

3.2.2 What makes an ideal indicator?

The characteristics of the perfect indicator are relatively easy to define; the box below notes some of the properties that should be embodied within the 'ideal' indicator (National Health Ministers' Benchmarking Working Group 1996; Hurst and Jee-Hughes 2000; Mainz 2003; The Commonwealth Fund 2004).

VALID	Accurately reflect the quality of care received by a patient, and predict an outcome of importance (Perera, Dowell et al. 2007).
DEFINED	Based on an agreed, evidence-based definition.
SPECIFIC	Represent the quality of health care only, unrelated to other factors.
RELIABLE	Responsive to differences in the quality of care provided over time, person, and place.
RELEVANT	Represent an issue of importance to the population; in terms of morbidity, quality of life, or expenditure.
ACTIONABLE	Represent structures or processes of care that are amenable to intervention and improvement.
PRACTICAL	Able to be computed from easily accessible data, preferably routinely collected, and with minimum cost.

Unfortunately, many of the indicators in use do not possess all these characteristics. Whereas best practice dictates that the content, construct, and content validity¹¹ of the indicator should be able to be demonstrated in methodologically robust research, many measures are justified by expert opinion alone (Maggard, McGory et al. 2006). Individual indicators may have

¹¹ These terms are defined by Last (2001 p184) as "*the extent to which the measurement corresponds to the theoretical concepts (constructs) concerning the phenomenon under study*" (construct validity), "*the extent to which the measurement correlates with an external criterion of the phenomenon under study*" (criterion validity), and "*the extent to which the measurement incorporates the domain of the phenomenon under study*" (content validity). These concepts are discussed further in Section 5.2.

multiple circulating definitions, which are applied inconsistently by researchers. Quality indicators are also limited by their lack of specificity. As Brook et al. note (2000), a patient who receives no intervention other than analgesia for his heart attack, still has around a 70% chance of leaving hospital to resume normal activities. Thus, a reasonable health outcome can be achieved despite a patient receiving substandard care. A quality indicator may also be vulnerable to confounding, such that it represents not only the standard of care received, but also the impact of factors such as clinical condition and severity of illness. In addition, the relevance of an indicator may be flawed, as the measures that are most useful may be the most difficult to obtain. For example, it is considerably easier to report the number of physicians on staff than it is to describe their individual clinical competence. The Commonwealth Fund Working Group on Quality Indicators (2004) reviewed more than 1,000 currently used indicators, to create a list of measures suitable and valid to compare health system performance internationally. After the application of several criteria¹², only forty were deemed pertinent, as noted in Figure 3.2:

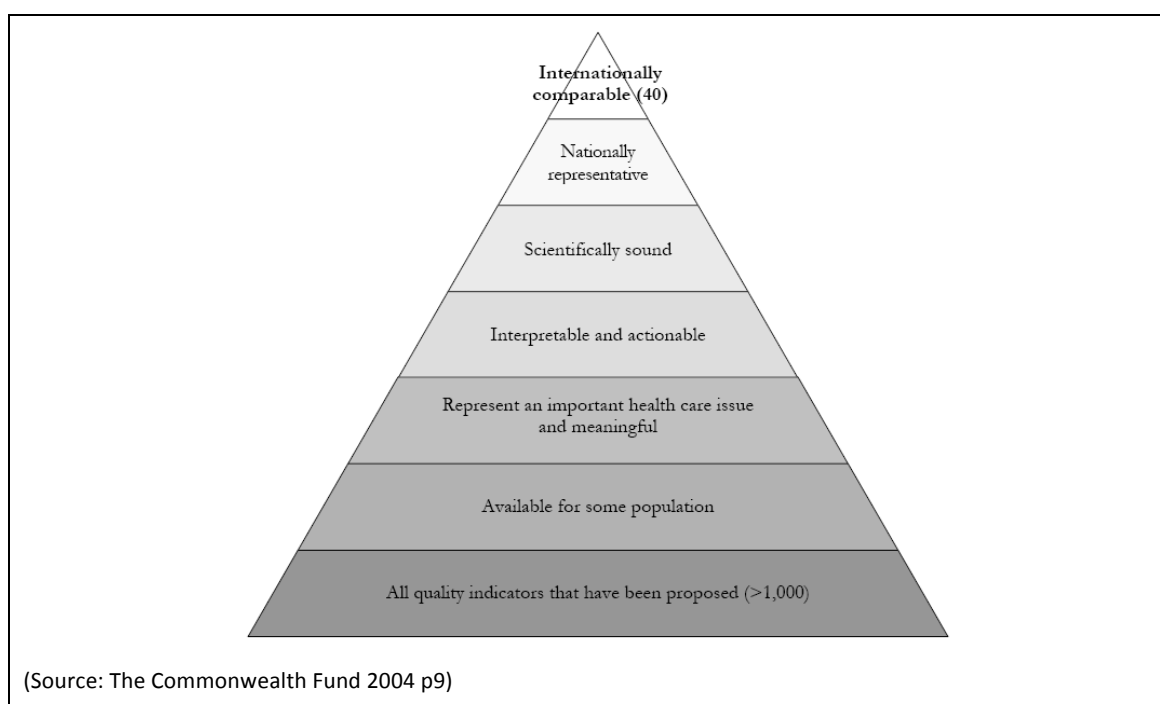


Figure 3.2: The availability of internationally comparable quality indicators

Despite the disadvantages associated with some quality indicators, their use is widespread. The following section discusses the various types of indicators in use, and their characteristics.

¹² The criteria applied were: feasibility, scientific soundness, interpretability, actionability, and importance.

3.2.3 Categorisation of quality indicators

Donabedian (1966) proposed a classification of indicators according to whether they contribute to the structure, process, or outcome of care. This categorisation remains current, and is employed by a number of researchers and institutions (Council on Medical Service 1986; Mainz 2003).

OUTCOME INDICATORS

Outcomes are the *“results of care... (which) can encompass biologic changes in disease, comfort, ability for self-care, physical function and mobility, emotional and intellectual performance, patient satisfaction and self-perception of health, health knowledge and compliance with medical care, and viability of family, job, and social role functioning”* (Council on Medical Service 1986). Examples of outcomes indicators include operative mortality, quality of life, post-procedure complication rates, and clinical symptomatology (e.g. urinary frequency post-prostatectomy). These indicators have several advantages:

- Outcomes are intrinsic to the definition of quality of care. Section 3.1 noted some of the current definitions of quality, all of which referred specifically to an outcome or a measure of effectiveness. These indicators focus on improvements in health and well-being as being the aim of health care delivery (Brook, Davies-Avery et al. 1977); as such these indicators have immediate face validity¹³. For example, there is no dispute that survival is valuable, or that assessment of patient satisfaction is worthy (Birkmeyer, Dimick et al. 2004).
- These indicators are independent and objective. They are unrelated to preconceptions of how care should be provided, which may differ according to available technology, culture and local professional thinking (Hammermeister, Shroyer et al. 1995).
- They are often collected routinely by institution, and can be easily produced and manipulated for sub-group analyses or risk-adjustment.

¹³ Face validity is defined by Last (2001 p68) as *“the extent to which a measurement appears reasonable on superficial inspection”*.

- Some outcomes indicators are also generic measures (such as 30-day mortality), so allow comparison across clinical conditions.

But are outcomes indicators valid and reliable indicators of quality? Although the majority of outcomes indicators have face validity, there may not be evidence for the construct or criterion validity of all measures ('validity' is discussed in further detail in Chapter Five) and many indicators are used primarily for their convenience¹⁴. Similarly, an outcome may be difficult to interpret: is a short or long inpatient length of stay desirable? An outcome, such as mortality, also provides no information on the structures or processes of care that contribute to that outcome. Thus, outcomes indicators may give a relatively narrow perspective on quality, and fail to identify poorly performing aspects that may be amenable to improvement.

It is also important to consider that the appropriate outcome for a clinical condition may not be able to be established for some time following the health care episode. For example, the five-year cancer survival rate ultimately reflects care given many years prior (Brook, McGlynn et al. 2000). The time lag associated with some outcomes requires the follow-up of the population of interest, so risks loss of data. These delayed outcomes, although important, may be sidelined because of these disadvantages, in order to provide evidence of accountability for providers/funders with short political timelines.

Outcomes indicators may also be vulnerable to bias and confounding. Using routinely-collected data to create outcomes indicators is popular, but these measures may be confounded by demographic and clinical variables. Mainz (2003) developed the following figure to demonstrate the factors that should be considered when interpreting an outcome indicator.

¹⁴ For example, one of the indicators used to monitor Crown Heath Enterprises in NZ in the 1990s was a '*positive publicity measure*', an index composed by summing the centimetres of positive press in the newspaper (Perkins, Seddon et al. 2006). While this indicator appears illogical and unscientific (and entirely unrelated to health outcomes), it was nonetheless used as a measure of performance when comparing these facilities throughout Aotearoa.

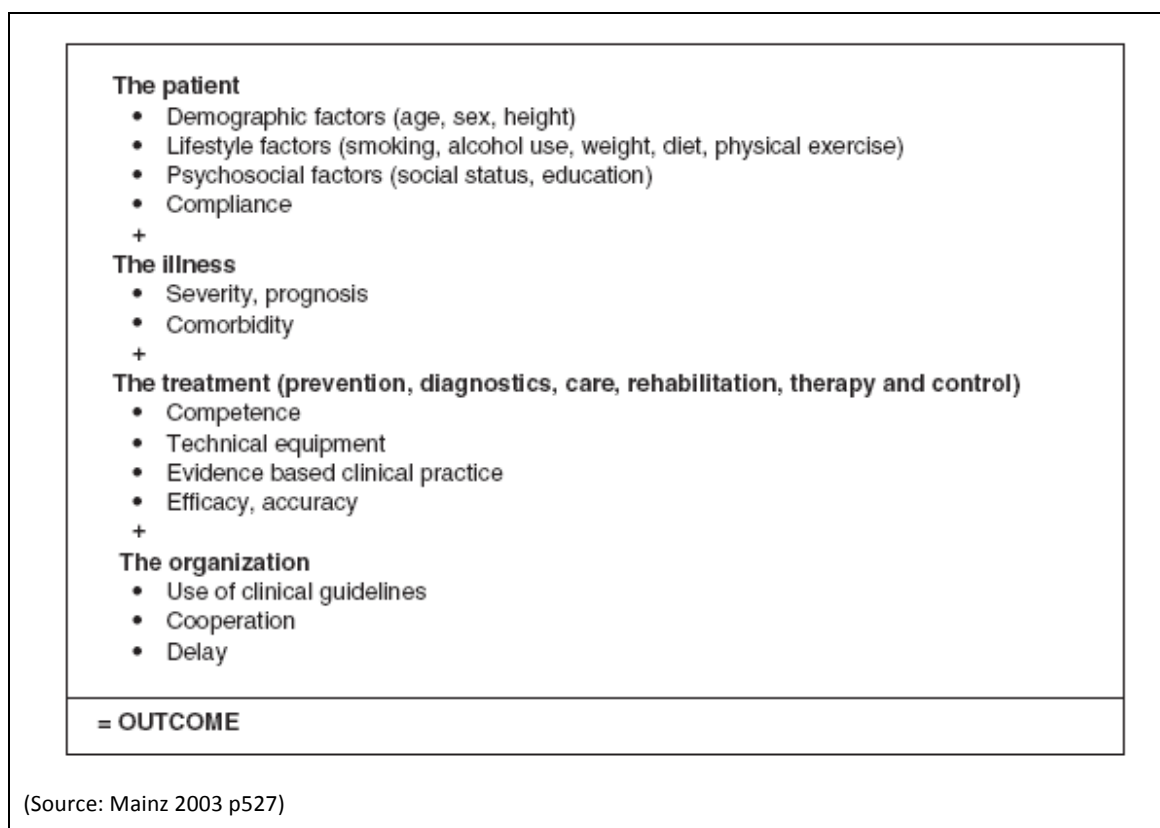


Figure 3.3: Factors determining the outcome of care

This figure demonstrates the importance of risk adjustment in the analysis of an outcome indicator, to minimise the impact of the *“intrinsic risk of the patient”* (Hammermeister, Shroyer et al. 1995 pOS9). That is, if the figure above conceptualises quality of care as the factors associated with ‘the treatment’ and ‘the organization’, research must consider and control for the impact of ‘the patient’ and ‘the illness’ on an estimate of health care quality.

However, the collection of patient data is expensive, and may be methodologically flawed. Similarly, there is no one risk adjustment model that is suitable for all situations, and the creation of new and robust models is time-consuming, with expert statistical input and large numbers of patients required to develop and verify (Rubin, Pronovost et al. 2001). Because some outcome events (such as surgical mortality) occur infrequently, the sample size required to ensure adequate power for comparisons may also be prohibitively large. This suggests that the outcome indicators quoted by some providers may be associated with significant random and systematic error, and therefore a high degree of uncertainty regarding the true value of the indicator (Birkmeyer, Dimick et al. 2004).

PROCESS INDICATORS

The 'process' of care describes *"the content of care, i.e., how the patient was moved into, through, and out of the health care system and the services that were provided during the care episode"* (Council on Medical Service 1986). Process indicators assess what the *"provider did for the patient and how well it was done"* (Mainz 2003 p525). Examples of process indicators include the proportion of patients with cardiovascular disease treated according to clinical guidelines, the amount of time a physician spends with each patient, and the frequency of green prescriptions in a primary health care organisation.

There are three key advantages of process measures:

- These measures provide more information on the care a patient received, allowing the identification of deficient aspects of care, and so better targeting of strategies to improve health care quality (Crombie and Davies 1998). They also allow assessment of providers' adherence to clinical guidelines and evidence-based practices, and identify points in the patient clinical pathway for intervention. They are easily interpreted with regard to the population and services concerned, which may increase buy-in from some clinicians (Crombie and Davies 1998).
- Whereas outcomes indicators were the first quality measures to be used and published widely, their need for extensive risk-adjustment has decreased their popularity. A process measure immediately restricts the eligible population to those within a defined group, such as asthmatic patients or those with heart failure. This restriction acts to minimise the impact of potential confounding factors, decreasing the need to control for these variables in the analysis of indicators.
- Some outcome events – although potentially serious and severe – may be rare, and so not captured for several years. Process measurements assess all eligible patients, and within a shorter period of time (Rubin, Pronovost et al. 2001). Accordingly, they allow deficient processes to be identified earlier. As Crombie and Davies state: *"Better...to monitor and prevent the near misses (using process measurement) than to await a serious adverse event (belatedly picked up through outcomes monitoring)"* (Crombie and Davies 1998 p35).

However, process measures have their disadvantages, in that their validity hinges on whether there is an association between the measure and a favourable health outcome. For example, the proportion of patients prescribed an anti-hypertensive medication is considered a process indicator of quality in patients suffering from myocardial infarction. However, this indicator is only relevant if those patients have a lower subsequent risk of cardiac events, or an improved quality of life. That is, failure of process does not necessarily result in poor outcomes and vice versa. Although some studies have investigated the validity of various process measures, the association between process measures and positive health outcomes is often weak, absent, or inconsistent (Park, Brook et al. 1990; Hammermeister, Shroyer et al. 1995; Rubin, Pronovost et al. 2001).

Process measures also require a judgment of what constitutes 'good' care. In the absence of evidence-based clinical guidelines, the indicator may simply be the result of local consensus, research priorities, or ease of data collection. Although process indicators represent a more patient-centred approach to the measurement of quality, providers and consumers continue to prioritise outcomes measures. The use of process indicators may also be limited by the accuracy of record-keeping and data collection, as clinical records do not detail every transaction involved in patient care.

STRUCTURAL INDICATORS

'Structure' describes the attributes of the health care setting (Donabedian 1988), *"the facilities, equipment, services, and manpower available for care and the credentials and qualifications of the health care professionals involved"*. Examples of structural indicators include the proportion of medical professionals with a current Cardio-Pulmonary Resuscitation certificate, teaching status of a hospital, the presence of an on-site laboratory within a facility, and the number of operating theatres in a hospital.

Although these indicators are easily measured, precise, and inexpensive to obtain, they may be limited in their validity and interpretability as markers of quality. For example, does a teaching hospital confer higher quality of care because it has more experienced and specialised staff, or do these workers deliver lower standards of care because they are overworked with teaching requirements? Wyszewianski (2003) points out that to evaluate quality on the basis of structural factors assumes that qualified staff plus excellent facilities equals high quality care. Although these tangible features increase the likelihood of good health care, there is no

assurance that this is the case. Structural indicators may be most useful when the reverse situation occurs; that is, substandard structural characteristics may be more directly associated with poor quality care. The usefulness of the marker may also be limited, as the variable in question may not be readily amenable to improvement. For example, it is unlikely that a hospital can rapidly change its teaching status, or restructure its intensive care unit (Birkmeyer, Dimick et al. 2004).

In theory, the relationship between process, structure and outcomes is clear. High quality structural factors and high quality process equals high quality of care, as expressed by outcomes indicators. There have been attempts by numerous researchers to prove the associations between processes of care and outcomes, and structures and outcomes (Hammermeister, Shroyer et al. 1995). Zinn et al. (1993) demonstrated a relationship between nursing care facilities and some health outcomes (for example, mortality and the prevalence of pressure ulcers). Similarly, hospital characteristics such as size, location, volume, and teaching status have been examined in relation to their impact on statistics such as mortality and adverse events (Ayanian and Weissman 2002). Although attempts to investigate processes of care may be limited by inadequate documentation, researchers have reported varying levels of association between process factors (such as physician-patient interaction or the frequency of nursing observations), and outcomes for specified clinical conditions (Park, Brook et al. 1990; Hammermeister, Shroyer et al. 1995).

3.2.4 Use of indicators to assess quality of care for Māori

Section 3.2.3 explored the use of indicators to assess quality of health care, the method most commonly applied by health systems internationally. This study focuses on the measurement of hospital care for Māori and NZ Europeans in New Zealand's public hospitals. This section asks 'How is the quality of care of hospitals currently assessed in New Zealand? In particular, how is it assessed for Māori?'

CURRENT EVALUATION OF HEALTH CARE QUALITY IN NEW ZEALAND

The Ministry of Health currently uses fifteen indicators to measure four aspects of performance for public hospitals (Ministry of Health 2010a):

Table 3.5: Hospital Benchmark Indicators

Dimension	Indicators
QUALITY AND PATIENT OUTCOME	Emergency triage rates Acute readmission rate Patient satisfaction Hospital acquired <i>Staph. aureus</i> bloodstream infections
PROCESS AND EFFICIENCY	Average length of stay Day surgery rate Day of surgery admissions Did-not-attend rate for specialist appointments
ORGANISATIONAL HEALTH	Staff turnover Sick leave Workplace injuries or illnesses
FINANCE	Debt: (debt + equity) ratio Revenue: fixed assets ratio Capital expenditure: depreciation ratio Staff cost ratios

The performance of each of the twenty-one District Health Boards according to these indicators is compared three-monthly in a publicly available report. In addition, six health targets are used to prioritise the resources of the District Health Boards. These goals are in fact not 'health targets' (none of them are measured in terms of improved health outcomes for patients), but are instead process and outcomes indicators of health care quality. The targets that pertain to hospital care include:

- Improved access to elective surgery – defined as increasing the volume of elective surgery by an average of 4,000 discharges per year.
- Shorter stays in the Emergency Department – criterion met if 95% of patients are processed through the department within six hours.
- Shorter waits for cancer treatment – defined as the delivery of radiation treatment within four weeks of specialist radiation oncology assessment.

The targets and indicators used in benchmarking by the Ministry of Health focus on the entire eligible population, and are not specific to subgroups of patients. Given the disparate health

status for Māori, and the Treaty obligation to provide equal and equitable care for this group, how is the quality of care for Māori best explored?

ASSESSMENT OF THE QUALITY OF CARE FOR MĀORI

The evaluation of health care quality for Māori in Aotearoa is commonly performed in one of two ways: the sub-analysis of universal quality indicators by ethnicity, or the employment of Māori-specific quality measures.

1. Universal quality indicators: These generic quality indicators include outcome measures such as risk of readmission, patient satisfaction, and post-operative mortality. The calculation of ethnic-specific rates of these indicators allows the comparative assessment of services for Māori against that of a reference group. This method has several advantages:

- The indicators are widely used, so are more likely to have proven validity as proxies for quality.
- The measures are established quality indicators within a health service, with infrastructure in place for their collection and analysis.
- Sub-analysis by ethnicity is a fast and inexpensive method to obtain information on the quality of care for different groups.
- The direct comparison of indicators can identify ethnic differences in the quality of care.

Although the sub-analysis of quality measures according to ethnicity has been performed within research settings (see Chapter Four), the NZ Ministry of Health does not openly publish ethnic-specific analyses of the six health targets or the hospital benchmarking indicators.

2. Māori-specific quality indicators: Durie (2003 p408) states that *“there is a need to frame indicators around Māori perspectives of health”*; this opinion is shared by McPherson et al. (2003 p237), who note that Western-centric indicators may *“fail to address issues which matter most to people of different ethnic origin”*.

Culturally-specific measures may better reflect the latent construct of health care quality for Māori, and there have been efforts to develop Māori-specific quality indicators. However, these have largely been limited to structural or process measures of care. For example, one of the indicators used to assess the performance of Area Health Boards included the 'proportion of doctors and nurses who could perform karakia' (prayer) (Durie 1994a). Currently, hospitals largely use the cultural competency of their workforce (measured by indicators such as proportion of Māori staff members, and staff participation in Treaty of Waitangi workshops) as Māori-specific indicators of health care quality. These types of proxies have some significant disadvantages:

- The conceptualisation of health and health care within a traditional Māori perspective encompasses intangible concepts that may be difficult to measure (Durie, Fitzgerald et al. 2002). For example, is it possible to assess the extent to which a health service addresses imbalances in te taha wairua (spiritual health)?
- It is important that all indicators are valid measures of quality, whether they are Māori-specific or universal. Accordingly, a given measure must be associated with both the construct of health care quality and with patient outcomes. As Durie (1994a) notes, it is difficult to demonstrate a direct relationship between the ability of the staff to perform karakia and Māori health outcomes.
- Those who identify themselves as being of Māori ethnicity come from diverse backgrounds with varying life opportunities. Given this heterogeneity, restricting the assessment of health care quality for all Māori to Māori-specific indicators may not be appropriate or legitimate.
- They prohibit the direct comparison of health care quality for Māori compared to other ethnic groups, making disparities in care for Māori more difficult to identify and monitor.

Therefore, the best choice of indicators to assess health care quality for Māori is debatable. While Māori-specific measures may reflect a uniquely Māori perspective of health and health care, it is possible that focusing on Māori-specific indicators exclusively could be detrimental for Māori, and prohibit the direct comparison of health care quality for different ethnic groups.

3.3 SUMMARY

This chapter has explored 'quality', providing an overview of the definition of this construct and how it is assessed. Generic definitions of quality provide a tidy sound-bite, but are largely incomplete and inconsistent. The disaggregated definitions allow key components of quality to be specified, but vary between researchers and institutions. The Māori-developed framework He Taura Tieke shares some similarities with non-Māori models, although these differ in the emphases placed on the efficiency of services, and the holistic nature of health care. As Reerink states, the use of domains to describe quality of care has disadvantages: *"One can never be complete, and one can never get rid of the odium of pushing one's own ideas and values at the expense of norms and values of others"* (Reerink 1990 p200). Ginzberg (1975 p366) agrees, *"it is impossible to arrive at a definition of quality that is acceptable as well as useful"*. Perhaps it is preferable to simply acknowledge the inadequacies of the definitions, and concentrate on the common themes pervading the construct of quality:

- That the provision of health care concerns both the individual and the population as a whole, and their different prioritisations of the dimensions of quality may be a source of conflict.
- That an acceptable standard of care exists, which is dependent on current professional knowledge, technology, and societal/cultural expectations. Accordingly, this standard may change over time, person, and place.
- That the intention of health care is to improve the health and well-being of the patient concerned, while considering resource restrictions.

The use of quality indicators is a key component of the assessment of health care; process, outcome, and structural measures are used for this purpose. At present, the evaluation of health care quality for Māori is largely performed through the sub-analysis of universal indicators, and only infrequent use of Māori-specific quality measures. Although these latter markers may be useful for encouraging culture competency and appropriate processes of care, they make comparisons of health care quality between ethnic groups more difficult.

CHAPTER FOUR:

ETHNIC DISPARITIES IN THE QUALITY OF CARE

“...the red flowers in the rich soil [grow] full and vigorous and strong, while the pink flowers in the poor soil struggle to survive. And these flowers go to seed. Year after year, the same thing happens. Ten years later the gardener comes to survey her garden. Gazing at the 2 boxes, she says, “I was right to prefer red over pink! Look how vibrant and beautiful the red flowers look, and see how pitiful and scrawny the pink ones are.”

(Jones 2000 p1213)

Part two of this thesis asks four key questions:

1. What is ‘quality’, and how is it measured? (Chapter Three).
2. **What is the evidence that the quality of care may differ according to ethnicity? (Chapter Four).**
3. How should we measure quality in this study? (Chapter Five)
4. Is there evidence for the validity of the chosen indicator(s) as a marker of health care quality? (Chapter Five).

The previous chapter focused on the first question, discussing the construct of ‘quality’ and its measurement. This chapter considers the second question; reviewing the evidence for ethnic inequalities in health care in both international research and studies specific to New Zealand. Section 4.1 discusses ethnic health care disparities in the US, the UK, Canada and Australia. Aotearoa is the focus of Section 4.2, and a narrative review of the NZ literature is performed to assess the evidence for inequalities in inpatient hospital care for Māori. Finally, Section 4.3 provides a summary of the chapter.

4.1 INTERNATIONAL EVIDENCE OF ETHNIC DISPARITIES IN THE QUALITY OF CARE

There is a substantial body of evidence demonstrating ethnic and racial¹⁵ disparities in the quality of health care internationally. Numerous researchers have demonstrated ‘snapshots’ of inequality within specific dimensions of quality (such as access, timeliness, or safety), populations, health care settings (primary care, hospital care), and conditions - Geiger (2002) identified over 600 of these studies published in the last thirty years .

Some of the research elicits ‘differences’ in the care only, as opposed to ‘disparities’. This distinction is discussed by Rathore and Krumholz (2004), who state that ‘differences’ in health care use may not always represent inappropriate practice. A ‘difference’ can only be termed a health care disparity if it is *“associated with poorer clinical outcomes and is not attributable to patient factors”* (p 636). This definition clearly relates health care inequality with outcomes, and emphasises the need to control for possible confounding or mediating factors. (This definition will be revisited in Section 4.2.)

This section begins with an overview of the methods and search terms used in the literature reviews (4.1.1). Sections 4.1.2 - 4.1.5 assess the evidence for ethnic disparities in the quality of health care received in four western countries. Canada, Australia and the UK have been selected for this review because of similarities in their delivery of health services with Aotearoa; like NZ, all three countries provide acute hospital services at no direct cost to the individual. Although the US has a different approach to health care delivery, operating an essentially privatised hospital system, it has been included in this review because of the sizeable amount of evidence on this subject published within this setting.

Canada, Australia, the UK and the US have distinct ethnic populations, and so the results of this section are not directly generalisable to Māori in Aotearoa. However, the experiences of

¹⁵ American research and policy tends to favour the term ‘race’ or ‘racial’ over ‘ethnic’ or ‘ethnicity’. Although this term may not be widespread in New Zealand, it has been employed in this section where it pertains to American findings. Similarly, ‘White’ as an ethnic group is routinely used in American publications, referring to a person having origins in ‘any of the original peoples of Europe, the Middle east, or North Africa’; as is ‘Black’ referring to patients of African-American ethnicity (Smedley, Stith et al. 2003). In this section, the use of these terms reflects the classifications employed by the original researchers.

international health systems provide a context for the investigation of this issue in NZ, and patterns may emerge that are applicable to the NZ population and health care setting.

4.1.1 Methods

The same base search strategy was used to identify published research pertaining to all four countries. Ovid databases Medline (1950 - November 2011) and Embase (1947 – November 2011) were searched using the following terms:

- (ethnic\$¹⁶ or ethnicity or ethnicities) (multi-purpose search)
- (race\$ or racial) (multi-purpose search)
- 'indigenous' (multi-purpose search)
- (aborigine\$ or aboriginal) (multi-purpose search)
- 'minority groups'
- 'quality of health care'
- 'healthcare disparities'
- 'health services, indigenous'
- 'cross-cultural comparisons'
- Country-specific search terms¹⁷

The following sections do not attempt to formally analyse all the studies retrieved for the US, UK, Canada and Australia; focusing instead on describing the salient findings and key methodological issues. Studies were reviewed if they performed analyses of quality indicators with respect to racial or ethnic group, with comparisons against a control population or with respect to established clinical guidelines, and incorporated risk adjustment for patient variables. Unlike the review of NZ literature performed in Section 4.2, the following discussions do not concentrate specifically on hospital care. This is partly because this restriction was not always possible (such as in the reviews of Australian and Canadian literature, due to the small number of published studies), but also to provide a more general overview of the current international evidence for ethnic health care disparities.

¹⁶ '\$' is the truncation symbol used in Ovid – indicating a search for the word prior to the symbol in any form.

¹⁷ Additional search terms included: For the US - 'United States of America', 'USA', 'US', 'American', 'America'; 'Canada' or 'Canadian'; for the UK - 'UK', 'United Kingdom', 'England', 'Scotland', 'Wales', 'Ireland', 'British'; for Australia - 'Australia' or 'Australian'; and for New Zealand - 'New Zealand', 'NZ', 'Māori' (all multi-purpose searches).

4.1.2 United States of America

The US has a growing minority population (numbering more than 100 million people), making up approximately one-third of the entire population. The majority ethnic group is classified as 'White American', those of Hispanic ethnicity are the second largest ethnic group, followed by those of African-American descent (U.S. Census Bureau 2007).

There is a vast body of evidence documenting ethnic differences in the quality of care in the US. While it was not possible to formally analyse all the applicable investigations, this section considers the findings of several systematic reviews and meta-analyses:

- **Pain management** has been the focus of numerous reviews. Cintron and Morrison (2006) examined evidence from thirty-five studies investigating racial differences in the assessment and management of pain, some of which adjusted estimates for the impact of patient and clinical variables. The authors noted differences in the quality of care for African-American and Hispanic patients compared to White Americans, with the former groups more likely to be under-treated with analgesia. A more selective review performed by Green et al. (2003) described similar findings, commenting that *"racial and ethnic disparities in pain perception, assessment, and treatment were found in all settings (i.e. postoperative, emergency room) and across all types of pain (i.e., acute, cancer, chronic non-malignant, and experimental)"* (p277). The findings of these studies are also supported by those of Ezenwa et al. (2006) and Anderson et al. (2009), whose reviews describe consistent racial and ethnic disparities in pain management across multiple settings.
- Steven and Shi (2003) focused on the primary care **experiences of children** in the US, reviewing twelve studies. They considered four core attributes of primary care (first-contact care, longitudinality, comprehensiveness, and coordination) and concluded that despite controlling for socio-economic position, insurance status, and clinical factors, *"race maintained a strong, independent relationship with many aspects of primary care"* (p22), with Asian-Americans experiencing the poorest quality of care. The Committee on Pediatric Research performed a systematic review of 111 studies considering racial and ethnic disparities in health care and health outcomes of US children. They described children from ethnic minority groups as having consistently poorer access to care

compared to White American children, and disparities in the quality of care for African-American and Latino children for a variety of clinical conditions (Flores and Committee On Pediatric Research 2010).

- **Access to medical care** was examined by Mayberry et al. (2000) in a literature review of nearly 400 articles. They found racial differences in access to care for patients with heart disease, stroke, cancer, Human Immunodeficiency Virus (HIV)/Acquired Immune Deficiency Syndrome, and those requiring infant and child health services. Examples included: lower rates of diagnostic and therapeutic interventions for African-Americans suffering from heart disease or stroke (Weitzman, Cooper et al. 1997; Oddone, Horner et al. 1998), reduced access to drug therapy for non-Whites with HIV (Moore, Stanton et al. 1994), and lower rates of surgical treatment for African-American patients with lung cancer (Bach, Cramer et al. 1999). The differences in care could not be accounted for by socio-economic position, clinical factors, patient preferences, or insurance status.
- Kressin and Petersen (2001) examined odds ratios for the receipt of **cardiac interventions** from sixty-one studies, and noted that African-Americans, Hispanics, and Asian-Americans were consistently less likely to receive cardiac catheterisation, percutaneous transluminal coronary angioplasty (PTCA), and coronary artery bypass grafts (CABG) than White Americans, and these findings persisted after adjustment for disease severity. For example, among the studies employing administrative data that identified significant differences, the odds ratios for cardiac catheterization for African-American patients compared to White American patients ranged from 0.41 to 0.94.
- Ethnic differences in care for patients with **diabetes** were assessed by Lanting et al. (2005), examining eighty-five articles published between 1985 and October 2004. They identified some studies finding no racial differences in care, but a greater number that suggested poorer quality of care for ethnic minorities (as assessed with process indicators or measures of access to services). The authors concluded that inequalities in care for Black and Hispanic Americans were likely, and represented a potential focus for interventions to improve the health outcomes of these patients.
- **Cancer treatment** was reviewed by Shavers and Brown (2002), who assessed eighty-seven studies published 1990 – 2001. They found ethnic differences in the treatment of patients with cancers of the breast, cervix, colorectum, lung, and prostate. These inequalities were

evident in the receipt of primary therapies (such as major surgical procedures), adjuvant treatment (for example, adjuvant chemotherapy for small-cell lung cancer), and conservative therapies (such as sphincter-sparing surgery for colorectal cancer), and persisted after control for clinical factors. The results of subsequent investigations support these findings: for example, the systematic review and meta-analysis by Terplan et al. (2009) found consistent evidence for ethnic differences in the treatment of patients with ovarian cancer and their adverse impact on health outcomes for racial minority patients.

The largest US review of health care disparities is that published by the Institute of Medicine in 2003 (the 'Institute'), which conducted a formal evaluation of health care inequalities at the request of American Congress. The Institute reviewed over 100 studies, selecting those that controlled for clinical and non-clinical variables (including the health care setting and the ability of the patient to access care), and those that judged the appropriateness of services relative to clinical guidelines. They commented particularly on the care of patients with cardiac disease, cancer and HIV:

- **Cardiovascular care:** The Institute evaluated both single studies and seven large review articles to assess the impact of race on health care for cardiovascular conditions. It found evidence for racial disparities in the receipt of coronary arteriography, bypass grafting, and revascularisation procedures; administration of cardiac medication (including anti-arrhythmics, anticoagulants, lipid-lowering agents and thrombolysis); and cardiac treatment that complied with standard clinical guidelines. These studies largely focused on the African-American and White American ethnic groups, although some investigations assessed the care received by Hispanic patients. Universally, studies found the minority ethnic group received a lower standard of care. Although no single investigation was able to adequately control for all possible correlates, the Institute stated that the *“collective body of this evidence is robust”*. They concluded: *“The preponderance of studies...find that even after adjustment for many potentially confounding factors – including racial differences in access to care, disease severity, site of care (e.g. geographic variation or type of hospital or clinic), disease prevalence, comorbidities or clinical characteristics, refusal rates, and overuse of services by whites - racial and ethnic disparities in cardiovascular care remain”* (p42).
- **Cancer care:** The studies assessing racial disparities in cancer care were of poorer quality, some giving insufficient consideration for potential confounders or using indicators with

questionable validity for quality of care. Despite these inadequacies, racial disparities in health care were evident, in particular related to the receipt of analgesics and evidence-based cancer treatment. These findings were demonstrated in patients with cancer of the breast, prostate, colon, oesophagus, and skin, with African-Americans consistently more likely to receive poorer quality of care.

- **HIV:** Studies controlling for age, gender, education, insurance coverage, and clinical characteristics consistently found that minority ethnic groups (in particular Hispanics and African-Americans) were less likely to receive antiretroviral therapy than White Americans. They were also less likely to receive protease inhibitors or prophylactic antibiotics for pneumocystic pneumonia compared to non-minority patients.

In addition, the Institute identified convincing evidence for racial disparities in cerebrovascular treatments and renal transplantation. Ethnic differences in asthma care were described, although researchers had not always considered the contribution of socio-economic status, genetic predisposition and other patient factors. The evidence around the care of patients with diabetes, receipt of analgesia, rehabilitative services, maternal and child health, and mental health services was less robust, but also indicative of ethnic and racial disparities in health care. Overall, the Institute concluded that health care disparities according to race were *“remarkably consistent across a range of illness and health care services”* (p5), with the most significant evidence demonstrated in cardiovascular and cancer care, and in the care of patients with HIV (Smedley, Stith et al. 2003).

4.1.3 United Kingdom

The four countries of the UK - England, Wales, Scotland and Northern Ireland - together encompass more than 58 million people. At the 2001 Census, less than 8% of this population identified as an ethnic minority, the remainder classified as ‘White British’. The people of the ‘minority ethnic group’ are diverse, including those of Pakistani, Indian, Bangladeshi, Caribbean, African, and Chinese ancestry (Office for National Statistics 2001). In some locations, the population is relatively ethnically homogeneous; for example, the population of Scotland is approximately 98% White British (Office for National Statistics 2001) .

The national data collected for the Performance Assessment Framework in the National Health Service does not allow for sub-analysis by ethnicity, and the search strategy revealed few UK

studies assessing the quality of care for different ethnic groups. Most of these investigations explored a specific clinical situation within a defined health care setting (whose results are difficult to generalise to other populations) and only one systematic review was found. Examples of higher quality studies (comparative studies with risk-adjustment of estimates) are discussed below.

- Chauhan et al. (2010) employed a cohort design to investigate the **accuracy of clinical records** with respect to ethnic group. These researchers reviewed electronic records of 1,843 cardiac patients in the North West of England. They found that South Asians (8.6% of the study population) were less likely to have their clinical details recorded than White patients, with lower odds ratios calculated for all ten of the patient variables (for example, exercise status) and clinical risk factors (such as body mass index, cholesterol). The ratios were adjusted for age, gender and deprivation.
- Women's experiences of **maternity care** were explored in a survey of 26,325 National Health Service patients from across England (Raleigh, Hussey et al. 2010). Logistic regression was used to estimate the association between socio-demographic characteristics of the respondents and their reports of the care they received. The findings were mixed: the non-White British women (n=4870) were more likely to report that they had been 'treated with dignity and respect' during antenatal and postnatal care (OR 1.24, 95% CI 1.07-1.44 and 1.52, 95% CI 1.34 – 1.72 respectively) and to be given the information they needed compared to the White British women. Conversely, members of the minority ethnic groups were less likely to report that they had received the pain relief they wanted during the labour and birth (OR 0.87, 95% CI 0.76 – 0.99). Although the researchers control for several patient variables (such as age, parity, education), key clinical characteristics (such as comorbid conditions) are not considered, and the response rate of 59% suggests selection bias is possible. The questionnaire was piloted prior to use, however its validity as a measure of health care quality has not been evaluated.
- Mead and Roland (2009) identified lower levels of **satisfaction** in minority ethnic groups in their standardised survey of 188,732 patients attending 1,098 general practices in England. After adjustment for demographic factors, mode of survey administration, and health need; Chinese, Asian and Black ethnic groups described their care more negatively than the White ethnic group. These groups also had to wait longer to get an appointment and

to commence the consultation (all findings statistically significant at the 95% confidence level).

- Bhui et al. (2003) examined care for minority groups at mental health services as part of a systematic review. The researchers examined thirty-eight papers, of which eight were considered 'high quality' (in that they adjusted for possible confounders, and described their methods for ethnic classification). The researchers reviewed the articles and produced a pooled odds ratio for **compulsory admission to mental health facilities**. They noted that compared to White patients, Blacks were more than four times more likely to be compulsorily admitted, calculating an odds ratio of 4.31 (95% CI 3.33 -5.58).
- Udayaraj et al. (2010) examined access to deceased donor **renal transplant** in more than 11,000 patients starting renal replacement therapy across England and Wales, 1997 - 2004. After controlling for patient variables, socio-economic position and facility; they found that South Asians were more likely to be listed on the waiting list than White patients (hazard ratio 1.12, 95% CI 1.00 – 1.25). While there was no significant difference in the likelihood of this outcome between Black and White patients overall, sub-analyses found that Black patients less than fifty years old were nearly 20% less likely to be on the waiting list (hazard ratio 0.82, 95% CI 0.69 – 0.97) than White patients.

The database search identified a number of cross-sectional surveys describing ethnic differences in care. For example, after control for a number of variables (including a measure of clinical need) Morrison et al. (2009) found an inverse relationship between the rates of antidepressant prescription and the proportion of minority patients within a census area. After extensive risk adjustment, Ashworth et al. (2007) showed that medical practices in areas with higher proportions of Afro-Caribbean or south Asian patients prescribed less statins (lipid-lowering agents with proven validity in reducing morbidity and mortality from cardiovascular disease). Similar variations in care at the practice level have been identified in the management of hypertension (Millett, Gray et al. 2008) and diabetes (Hippisley-Cox, O'Hanlon et al. 2004). While these investigations suggest there may be ethnic differences in care, the studies are ecological in nature and so may be vulnerable to the ecological fallacy (such that differences between individuals cannot be inferred from findings relating to the comparisons of groups). Furthermore, these studies are more vulnerable to confounding at the individual level compared to cohort and case-control studies (Mann 2003). Although their exploratory

nature is useful to identify potential associations, hypotheses should be further investigated with more robust study designs.

Overall, the quality and quantity of the research from the UK is less than that from the US. Some of the studies retrieved by the search strategy attempted to control for clinical factors or patient variables, however many included comparatively few patients from minority ethnic backgrounds. These small numbers make it more difficult to conduct methodologically robust and powerful studies that minimise the impact of systematic and random error. The relative invisibility of minority populations in the UK is also reflected in the inaccuracy and unavailability of ethnicity data within the health sector (Morgan and Hamm 2004; Chauhan, Baker et al. 2010). For example, one study from Scotland noted that nearly 70% of the Local Health Care Cooperatives (regional division of health services) make no attempt to collect ethnicity information (Baradaran, Jamieson et al. 2006); Morgan and Hamm found that 25% of their sample had no usable ethnic code recorded in the hospital's electronic database.

4.1.4 Australia

Australia, like NZ, was colonised by Europeans of largely British descent in the 19th century. At the time of the 2006 census, Australia had a population of almost twenty million people, an ethnically diverse country including those of European, Asian, and African descent. The indigenous population of Australia (Aboriginal and Torres Strait Islander people) numbered only 455,031 at the 2006 census (Australian Bureau of Statistics 2010). However, this group suffers from the poorest health in the country (Brameld and Holman 2006), and is more likely to experience socio-economic disadvantage compared to the rest of the population (SCRGSP 2007).

Inaccurate ethnicity denominator data and the inconsistent collection of ethnicity information within the health sector limit the sub-analysis of routinely collected data in Australia (Australian Bureau of Statistics and Australian Institute of Health and Welfare 2005). For example, both New South Wales and Victoria (the most populated states of Australia) are unable to publish indigenous hospitalisation statistics due to poor quality data (SCRGSP 2007). When health service outcomes for this population are examined, the inaccuracy and incompleteness of data limit risk-adjustment of estimates for variables such as socio-economic position and health status. Nonetheless, some researchers have attempted to evaluate ethnic

differences in quality of care received in Australia with consideration for potential bias, and their findings are discussed below.

- The quality of care in the **primary health care sector** was explored by Mak et al. (2004), who compared diabetes management in an Australian indigenous community (n=165) with 102 Northern Saskatchewan aboriginals in Canada over two years. These two groups had comparable age distributions, and were similarly disadvantaged compared to the wider population with respect to socio-economic position and rural location. When assessed against national Canadian clinical practice guidelines, substandard processes of care were found for both these populations. Stamp et al. (1998) used ambulatory sensitive hospitalisations (conditions for which hospitalisation is avoidable, provided there is access to high quality primary care) to assess the performance of primary health care in seven Australian states. They found consistently higher odds of this outcome for Aboriginal and Torres Strait Islanders, the odds ratio of experiencing an indicator event for this group compared to the non-Aboriginal and Torres Strait Islander group ranging from 1.22 in infants (95% CI 0.95 – 1.49) to 5.18 (95% CI 4.58 -5.85) in older women.
- Cunningham (2002) reviewed data from the National Hospital Morbidity Database 1997-1998. After adjustment for age, sex, rurality, private versus public accommodation, type of hospital, and same-day admission; indigenous people admitted to hospital were less likely to have a **principal procedure recorded** than non-indigenous patients. She postulates this finding may represent both a lack of adequate data collection for indigenous peoples, and also a relative disparity in the numbers of therapeutic procedures received by this population.
- Coory and Walsh (2005) attempted to address the limitations of national ethnicity data by conducting a prospective cohort study of indigenous and non-indigenous Australians treated for a myocardial infarction. At the index admission and over the one-year follow-up period, they established that indigenous people were less likely to receive a percutaneous **coronary intervention**, or bypass surgery. This study used the clinical records of 558 indigenous and 14125 non-indigenous people, and adjusted for age, sex, socio-economic status, rural remoteness, comorbid conditions, and hospital characteristics. An investigation by Brown (2010) also explored access to cardiac care (both medical and surgical therapies) for 214 Indigenous and 278 non-Indigenous patients with acute coronary syndrome from the Northern Territory. The researcher used a number of

process and outcome indicators of quality and identified significant differences in some markers (such as lower rates of angiography) for the indigenous patients compared to the non-indigenous patients. However, there was no control for confounding in this study, despite differences between the two groups for age, sex, and in the prevalence of key comorbidities.

- Brameld and Holman (2006) assessed the impact of demographic factors on the likelihood of admission for Australians with **chronic disease**. These researchers accessed hospital records 1994-1999 across Western Australia, and investigated the impact of age, sex, social disadvantage, health insurance status, comorbidity, and indigenous ethnicity. Despite the probable undercounting of indigenous people within the hospitalisation data (indicating that the results may underestimate the true risk for this group); they found a significantly higher rate of admission for these patients, a greater risk of 30-day readmission, and a higher case-fatality rate for the indigenous people compared to the remainder of the population.
- Several investigations have provided evidence of **differential cancer treatment** within the Australian health system. Condon et al. (2006) considered the care of 1,197 Northern Territory patients with cancer of the colon and rectum, lung, breast cervix and non-Hodgkin lymphoma. They found that indigenous people experienced longer delays before treatment for their cancer, and were less likely to be recommended for curative therapy than non-indigenous patients - differences which were shown to contribute to survival inequalities between the two ethnic groups. Valery et al. (2006) performed a cohort study in which patients were matched for age, sex, cancer site, and place of residence. They identified that indigenous people were significantly less likely to have their cancer stage documented in clinical records, or to receive treatment for their cancer; and had longer delays before surgery than non-indigenous patients. Other studies show that indigenous patients with lung or prostate cancer are less likely to experience some types of surgical treatment (Hall, Bulsara et al. 2004) and that indigenous women do not receive breast reconstructive surgery after treatment for cancer at the same rates as non-indigenous patients (Hall and Holman 2003). Collectively, these investigations are indicative of ethnic disparities in cancer care within these populations.
- Correll et al. (2007) explored **reattendance rates** at hospitals and emergency departments within twenty-eight days of an initial visit for 139,043 patients with asthma from New

South Wales and Victoria, July 2000 to June 2003. After controlling for age, sex, socio-economic status, rurality, and English-speaking background; indigenous patients were 15% more likely to return within the observation period than non-indigenous patients (OR 1.15, 95% CI 1.00 – 1.32). Although this study provides some evidence of ethnic differences in the quality of care, it is possible that confounding from clinical variables may be affecting the estimate – for example, smoking status and asthma severity may alter the likelihood of reattendance and may differ according to ethnic group.

- Both Cass et al. (2003) and Yeates et al. (2009) used data from the Australian and New Zealand Dialysis and Transplant Registry to explore the **care for patients with renal disease**. Despite indigenous Australians suffering disproportionately from end stage kidney disease (the prevalence of the condition in this group almost twice that of the non-indigenous population (McDonald and Russ 2003a)), these two investigations found that indigenous patients were substantially less likely to receive a renal transplant. Yeates et al. (2009) analysed the data for nearly 10,000 Australians, and calculated a hazard ratio of 0.23 (95% CI 0.19-0.27) for renal transplant when comparing the two ethnic groups after adjustment for a variety of patient and clinical variables. (This study also explored the data of Canada and NZ, discussed below). Cass et al. (2003) calculated a similar estimate in their analyses of 5,322 patients, developing an odds ratio for renal transplantation for indigenous compared to non-Indigenous patient of 0.32, 95% CI 0.25 -0.40.

4.1.5 Canada

At the 2006 Census there were more than thirty-one million usually-resident Canadians, of which approximately 20% identified as members of a 'visible minority' (16.2% predominantly of Asian ancestry, 3.75% indigenous Aboriginal people) (Statistics Canada 2008). The indigenous population is made up of various subgroups, including First Nation peoples (of North American Indian descent), Inuit, and Métis people, who collectively experience the worst health outcomes in Canada (Health Canada 1999). As with the minority groups in the US, Australia, and NZ, Canada's aboriginal population are also more likely to suffer socio-economic disadvantage than the non-indigenous population (Health Canada 1999).

The Canadian Institute for Health Information does not perform routine sub-analysis of quality indicators by ethnicity. Information regarding the standard of health services for non-White

Canadians in the academic literature is also limited (with studies primarily focused on describing their disparate health outcomes), and there is little research that distinguishes between ethnic health care 'differences' and 'disparities'. Relevant papers retrieved from literature search are considered below.

- Ethnic variation in **health service utilisation** has been investigated in several studies. Quan et al. (2006) used data from the 2001 Canadian Community Health Survey to compare health service use for different ethnic groups. Reports from 7,057 visible minority Canadians were reviewed, and assessed against those from white Canadians. After adjusting for socio-demographic variables (including income and language), the minority population were more likely to have had contact with a general practitioner, yet less likely to be admitted to hospital. Quan et al. (2006) noted that ethnic minorities were also less likely to have received screening investigations for cancer. This finding is supported by that of Lofters et al. (2007), who also described lower rates of cervical cancer screening in visible minorities from Toronto, independent of socio-economic status and demographic characteristics.
- Lasser et al. (2006) analysed data from the Joint Canada/US Survey of Health of 3,505 Canadians and 5,183 Americans. In this sample, the non-White respondents from both countries were more likely to report **unmet health need**, and less likely to state that they were very **satisfied with their health care** or rate the quality of their health care as excellent, compared to the White respondents. These analyses adjusted for key demographic variables, and weighted responses to approximate the US and Canadian census populations (rate of response was 50.2% in Canada and 69.3% in the US). These results were supported by Siddiqui et al. (2009) and Prus et al. (2010) who analysed samples from this same data source, their risk-adjusted estimates also indicated ethnic disparities in the likelihood of unmet health need. Although it is possible selection bias may be present, the collective findings of these three teams suggest there may be ethnic disparities in access to care for the non-White members of these samples.
- Watt et al. (2005) evaluated a new policy in Ontario, whereby women were to be offered a 60-hour **post-partum stay in hospital** following an uncomplicated vaginal delivery. They surveyed 1250 women across five hospitals to ascertain their access to this service. After adjustment for hospital facility and the input of a primary care physician (the only significant predictors identified), White Canadians were 84% more likely to be offered the

60-hour postpartum stay compared to those identifying with a minority ethnic group (OR 1.84, 95% CI 1.26 – 1.70).

- Several teams of researchers have investigated the quality of care for Canadians with renal disease. The data of 835 patients with **end-stage renal disease** in Alberta were investigated by Chou et al. (2006). They used process indicators of care (such as small solute clearance and use of permanent vascular access) to assess health care quality, and concluded that Aboriginal patients received a similar standard of care as non-Aboriginal patients. These findings included control for demographic characteristics and comorbid conditions, although did not consider socio-economic position.

However, these findings are inconsistent with those of other researchers. Tonelli et al. (2004) analysed ten years of data, adjusting their hazard ratios for multiple variables (including demographic, clinical characteristics and socio-economic position) and reported a reduced likelihood of renal transplant after commencing dialysis for Aboriginal patients (hazard ratio 0.43, 95% CI 0.35 – 0.53) compared to non-Aboriginal patients. They discussed the impact of medical suitability (such as donor matching and comorbidity), but concluded that these factors could not be “*exclusively responsible*” for such a substantial difference. Similarly, Yeates et al. (2009) found that indigenous Canadians had reduced rates of renal transplant compared to White Canadian patients (hazard ratio 0.34, 95% CI 0.29 – 0.40). This estimate was calculated from the data of 17,986 Canadians with end-stage renal disease (similar ethnic disparities were also identified in their analyses of US, NZ, and Australian data - hazard ratios comparing rates in indigenous patients to those of White patients 0.44, 0.23, and 0.23 respectively, all significant at the 95% confidence level). Like those of Tonelli et al. (2004), their ratios were also adjusted for a range of socio-demographic and clinical variables. Finally, Gao et al. (2008) explored the data from around 108,000 patients with severe kidney disease in Alberta. They found that despite a higher level of need in the Aboriginal patients (who experienced nearly twice the rates of admission for an ambulatory-care-sensitive condition related to their renal disease), after risk-adjustment the Aboriginal patients were less than half as likely to see a nephrologist for their condition than the non-Aboriginal patients (hazard ratio 0.57, 95% CI 0.39 – 0.83).

- The study by Gao et al. (2008) (discussed above) is an illustration of the ‘inverse care law’, whereby the care received is converse to what is required according to need. Jette et al. (2008) demonstrated the inverse care of Aboriginals with **epilepsy**, exploring health

service use from data of 1,431 Canadians with epilepsy during the period 2001-2002. During this time, Aboriginal patients were more than twice as likely to be admitted to hospital or to visit the Emergency Department for treatment than non-Aboriginals; however, they were 70% less likely to see a neurologist (OR 0.3, 95% CI 0.2 – 0.6, risk adjustment for age and sex only).

- Shah (2008) explored the care for patients with **diabetes**, with analyses of 20,788 respondents of the 1996/97 Ontario Health Survey and the 2000/01 Canadian Community Health Survey. Despite similar use of primary and specialist diabetes care, patients from minority ethnic groups were significantly less likely to receive eye examinations compared to the White population (adjusted OR 0.63, 95% CI 0.46 – 0.85). Conversely, Supina et al. (2004) noted better access to care for the Aboriginal patients in their sample of 392 Canadians with diabetes from northern Alberta. After adjustment for eight patient and clinical variables, Aboriginal patients were more likely to receive anti-hypertensive therapy than non-Aboriginals (OR 1.96), although this ratio was not significant at the 95% confidence level (CI 0.93 – 4.11).`
- The literature search identified two studies investigating ethnic differences in the **care of patients with HIV** in Canada. Eyawo et al. (2011) explored the frequency of drug resistance testing in a sample of 359 patients from British Columbia. This investigation is ‘best practice’ in the management of patients with HIV, and was available free of charge for the eligible population. They found that Aboriginal patients were around 50% less likely to be tested for drug resistance (OR 0.53, 95% CI 0.32 – 0.88), calculated from a model incorporating multiple social and demographic factors. Their findings are particularly noteworthy as this testing can be performed on archived samples (that is, it does not require the patient to access the service), so reflect the actions of physician directly.

Wood et al. (2008) investigated the care of 460 Vancouver residents with HIV, and found that non-White patients were significantly less likely to have regular CD4 cell count monitoring (adjusted for social and demographic characteristics) compared to the White group. Again, care for the patients in this sample was free of charge.

4.1.6 Summary

Although individual investigations and their interpretations may be hampered by the quality of data and analyses, the quantity of research indicating disparities provides compelling evidence for ethnic health care inequalities internationally. Mayberry et al. (2000 p116) agree, stating: *“The methodological inadequacy of an individual study may be a relatively moot point in the context of the body of literature that gives consistent findings, and in which one study, often the more recent study, may overcome the specific failing of a previous investigation”*.

Accordingly, three key points can be taken from this section:

- The quality of health services may differ by ethnicity.
- Differential quality of health care is an international issue.
- Health care disparities may contribute to ethnic health outcome inequalities.

Smedley et al. (2003 p79) conclude in their review: *“Racial and ethnic disparities in health care exist. These disparities are consistent and extensive across a range of medical conditions and health care services, are associated with worse health outcomes, and occur independently of insurance status, income, and education, among other factors that influence access to health care. These disparities are unacceptable”*.

While the results from studies in different countries and populations cannot be directly extrapolated to Aotearoa, this section has provided context for the investigation of health care disparities for NZ Māori.

4.2 ETHNIC DISPARITIES IN QUALITY OF CARE IN NEW ZEALAND

This section describes a literature review assessing the evidence for disparate care for Māori compared to non-Māori within public hospitals in NZ:

- 4.2.1 provides a background to the issue in NZ, and considers how ethnic ‘differences’ in quality indicators are distinct from true ethnic ‘disparities’.
- 4.2.2 outlines the methods and search terms employed in the literature review.
- 4.2.3 details the results of the review. Individual studies are discussed separately, and then summarised in Table 4. 1.

4.2.1 Background

At the 2006 Census, the usually-resident population of NZ totalled approximately four million people (Statistics New Zealand 2007b). Around 14.6% of New Zealanders identified as Māori, with those of European descent being the ethnic majority (Statistics New Zealand 2007b). The New Zealand Health Survey 2006/07 found that despite most of the NZ population (60.6%) rating their health as ‘excellent’ or ‘very good’, more than 25% of the cohort surveyed had attended a public hospital for care in the last twelve months (Minister of Health and Associate Minister of Health 2008). At present, these acute hospital services are available at no direct financial cost to all NZ residents¹⁸.

4.2.2 Methods

IDENTIFICATION AND SELECTION OF STUDIES

The search terms found in Section 4.1.1 were also used for the review of NZ literature. After applying limits regarding English language, a focus on humans, and the availability of an abstract, 299 distinct publications were identified. Restricting the search terms to only three items (‘quality of health care’ in combination with ‘New Zealand’ or ‘maori’) produced an

¹⁸ Apart from a brief hiatus in the 1990s, acute hospital care has been provided to all New Zealand residents free of charge since the passing of the 1938 Social Security Act.

additional 375 articles. NZ researchers in this field were contacted to access unpublished literature related to this topic, and articles were also obtained from the bibliography review of selected studies.

The review performed in this section focuses on inpatient care within the New Zealand public hospital system only (reflecting the objectives of the study). Articles were formally assessed if they explored the quality of *inpatient hospital* care, and compared this outcome for Māori against that of a control group with consideration for potential confounding/mediating factors in the study design or analyses.

A number of articles used multiple indicators in their assessments, some representing inpatient hospital care and others focusing on processes within the outpatient setting. In this review, only results relating to measures specific to inpatient care are formally discussed, although some salient findings of studies employing outpatient indicators are briefly considered in Section 4.2.3.9. However, distinguishing between the two settings was often arbitrary and not always possible. For example, does the receipt of a renal transplant represent inpatient or outpatient care? Although decisions regarding eligibility and suitability may be made in secondary care, the surgery is performed within the inpatient hospital setting, and the ability to access this therapy is a key component of hospital quality for affected patients. Indicators comparing types of treatment may be similarly nonspecific. While a clinical management plan may be formulated in a secondary care setting (such as deciding between surgical or medical treatments), the extent and specific nature of therapies may alter during an admission. As such, it is acknowledged that the categorisation of indicators for inpatient versus outpatient care is subjective, and potentially irrelevant outside of the context of this literature review.

‘DIFFERENCES’ OR ‘DISPARITIES’

Routinely collected data show differences in some dimensions of health care for NZ Māori compared to non-Māori. For example, Māori have lower rates of access to some surgical procedures - such as coronary artery bypass grafting, angioplasty, and major joint replacements (Ministry of Health 2005). Differences in the rates of angioplasty for Māori compared to non-Māori from 1997 to 2004 are illustrated in the figure below:

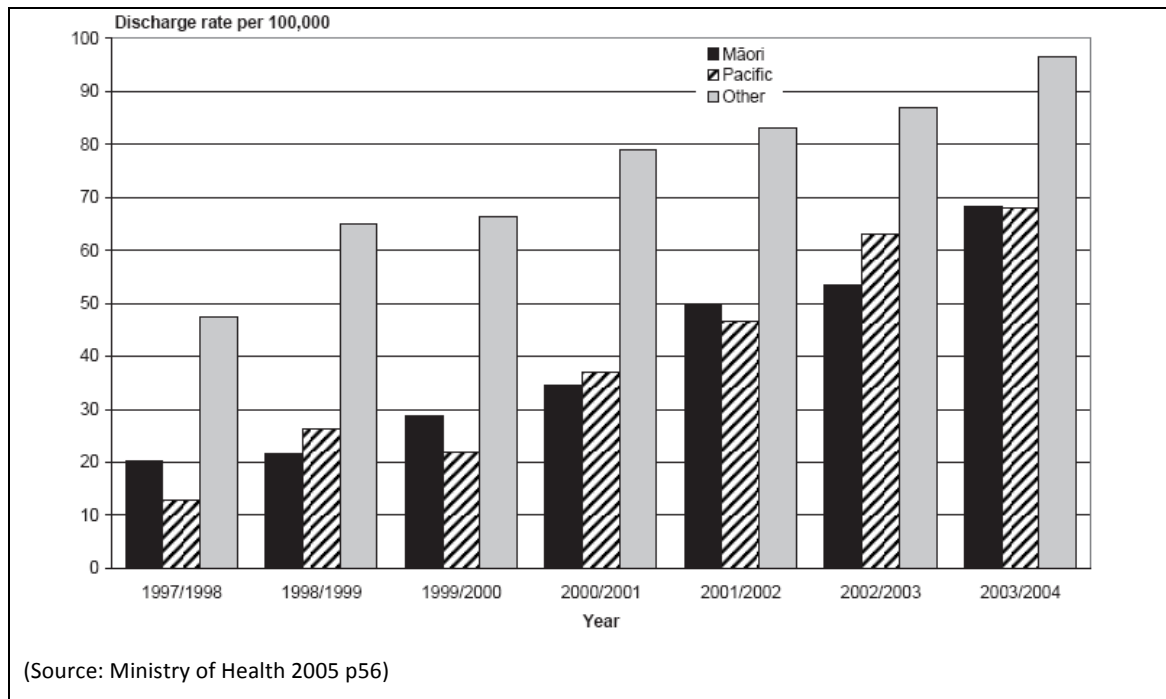


Figure 4.1: Standardised discharge ratios for angioplasty by ethnicity, 1997 – 2004

However, do these differences represent health care disparities? That is, can it be determined that these differences are inappropriate or unfair, and ultimately affect wellbeing? As discussed in Section 4.1, Rathore and Krumholz (2004) propose a definition to discern between a ‘difference’ and a ‘disparity’. They suggest applying five criteria when assessing racial/ethnic differences in the values of quality indicators:

- Eligibility of patients for the intervention.
- Consideration of potential contraindications to the intervention (for example comorbidity).
- Consideration of patient preferences.
- Risk adjustment for patient factors, including demographic, clinical and social variables.
- Association with poorer patient outcomes.

They summarise these concepts in their definition of disparity, stating “*a disparity in health care use may be considered a difference in **appropriate** treatment use that is associated with **poorer** clinical outcomes and is not attributable to **patient factors***” (p636).

Considering the example above, it is possible that Māori receive the appropriate level of surgical input, but that non-Māori comparatively overuse these services. Similarly, the descriptive analysis above does not consider the impact of patient factors (such as disease

severity or presence of comorbidities) on eligibility criteria. Therefore, the differences represent disparities only if it can be shown that the level of care is inappropriate to the level of need, that health and well-being suffer as a result, and that the differences are independent of patient characteristics. (This example is meant to be illustrative only; the mismatch between cardiac 'need' and receipt of care is discussed further in Section 4.2.3.3.)

ANALYSIS OF SELECTED STUDIES

The methods of each investigation were assessed; reviewing the design, data sources, study and comparison populations, choice of indicators, and consideration of potential confounders and sources of bias. Two criteria were applied to ascertain whether findings from each study were indicative of a health care 'difference' or a 'disparity'. These standards were borrowed from the definition advanced by Rathore and Krumholz (2004), detailed above. That is, in the studies that demonstrated ethnic health care differences, were the findings:

- Associated with poorer outcomes?
- Persistent after consideration for patient variables?

4.2.3 Results

The investigations that met the inclusion criteria were few (eighteen studies only) and varied, both in the indicators employed and clinical conditions examined. Accordingly, it was not possible to conduct a formal systematic review or meta-analysis, in which the studies' findings could be collated and quantitatively synthesised. A narrative approach was more appropriate, being able to encompass the diversity of the investigations and provide qualitative conclusions.

The studies varied in quality, some considering the impact of multiple confounding and/or mediating factors, as well as the potential for information bias from the undercounting of Māori within the hospital system. In contrast, others performed few methodological or statistical adjustments for potential sources of systematic error. The details of the investigations are noted in Table 4.1 below, and described further in the following section, grouped according to clinical specialty.

Table 4.1: Methodological features and findings of studies assessing ethnic differences in the quality of inpatient hospital care in New Zealand, Medline (1950-December 2011) and Embase (1947 – December 2011)

Name, year, place of study	Quality of care indicators	Data source and sampling methods	Māori participants and reference group	Control/adjustment for other variables	Findings
MENTAL HEALTH					
KUMAR, NG ET AL. ¹ ROTORUA HOSPITAL, 2000 – 2001.	Process indicators: Use of seclusion/restraint, psychotropic medication, use of Mental Health Act, referral for psychotherapy	Data obtained from review of clinical records. Sampling of 300 consecutive inpatient admissions. Retrospective study.	125 Māori and 175 non-Māori mental health inpatients.	Consideration of age, sex, diagnosis, number of readmissions, time of onset between illness episode and admission.	Māori less likely to be referred for psychotherapy (OR 0.16, 95% CI 0.07 – 0.35), more likely to receive antipsychotic medication (OR 1.90, 95% CI 1.11 – 3.25), and at higher doses. No evidence of an association between ethnicity and readmission rates, use of seclusion or compulsory admission.
OBSTETRIC CARE					
SANGALLI AND GUIDERA ² WELLINGTON HOSPITAL, 2001.	Process of care indicator: Rates of caesarean section	Perinatal Information Management System database, Capital and Coast District Health Board. Retrospective study.	59 Māori and 557 non-Māori non-Pacific women.	Sample limited to nulliparous women gestation ≥ 36 weeks.	No “statistically significant difference” in rates of CS (actual statistics not given).

CI = Confidence Interval, OR = Odds Ratio, CS = Caesarean section. References: 1=Kumar, Ng et al. 2008, 2=Sangalli and Guidera 2004.

Name, year, place of study	Quality of care indicators	Data source and sampling methods	Māori participants and reference group	Control/adjustment for other variables	Findings
SADLER, McCOWAN ET AL. ³ NATIONAL WOMEN'S HOSPITAL, 1992-1997.	Process indicators: Induction of labour, prelabour caesarean section, post-labour caesarean section, operative vaginal delivery.	Obstetric database of National Women's Hospital, Auckland. Retrospective study.	4,361 Māori and 30,809 non-Māori non-Pacific women.	Adjustment for age, parity, small for gestational age, antepartum haemorrhage, gestation and birth-weight at delivery, maternal diabetes, maternal hypertensive disease, transfer of care gestation at booking, booking caregiver. Sample limited to women with singleton deliveries, cephalic presentation, no previous CS.	Māori women less likely to undergo: Induction of labour (OR 0.85, 95% CI 0.78 – 0.93), Prelabour CS (OR 0.57, 95% CI 0.43 – 0.75), Operative vaginal delivery (OR 0.71, 95% CI 0.63 – 0.81). No significant difference in post-labour CS rate (OR 0.93, 95% CI 0.82 – 1.06).
HARRIS, ROBSON ET AL. ⁴ NEW ZEALAND PUBLIC AND PRIVATE HOSPITALS, 1997 – 2001.	Process indicator: Rates of caesarean section	New Zealand Health Information Service. Retrospective study.	51,106 Māori and 192,401 non-Māori delivering at public and private hospitals.	'Ever Māori'* classification to minimise undercounting of Māori. Modelling included consideration of age, DHB, parity, fetal presentation, deprivation (using NZDep96 deciles), gestation at delivery, multiple births, maternal hypertension, maternal diabetes, antepartum haemorrhage.	All non-Māori more likely to undergo: Acute CS (OR 1.38, 95% CI 1.33 – 1.43), Elective CS (OR 1.44, 95% CI 1.36-1.52), Any CS (OR 1.43, 95% CI 1.39-1.48) than Māori (age and deprivation adjusted). Nulliparous non-Māori more likely to undergo: Acute CS (OR 1.13, 95% CI 1.06-1.19), Elective CS (OR 1.36, 95% CI 1.18-1.56), Any CS (OR 1.16, 95% CI 1.10-1.23) (model includes factors for age, deprivation, clinical factors, DHB).

CS= Caesarean Section, OR = Odds Ratio, DHB = District Health Board, CI = Confidence Interval. * =Defined as Māori if subject identified as such in the data source at any point in time.
References: 3 = Sadler, McCowan et al. 2002, 4 = Harris, Robson et al. 2007.

Name, year, place of study	Quality of care indicators	Data source and sampling methods	Māori participants and reference group	Control/adjustment for other variables	Findings
CARDIAC CARE					
TUKUITONGA AND BINDMAN. ⁵ NEW ZEALAND PUBLIC AND PRIVATE HOSPITALS, 1990-1999.	Process indicators: Rates of CABG and PTCA	National Minimum Data Set, New Zealand Health Information Service. Retrospective study.	839 Māori and 26,167 non-Māori non-Pacific patients aged 40 years and over admitted for CABG and PTCA interventions.	Age-standardisation.	Māori have higher age-standardised mortality rates from coronary artery disease but less likely to undergo a CABG (20.5 compared to 51.2 per 100,000) or PTCA (13.9 compared to 48.1 per 100,000). Significance testing not documented.
WESTBROOKE, BAXTER ET AL. ⁶ NEW ZEALAND PUBLIC HOSPITALS, 1996 – 2000.	Process indicators: Rates of CABG and PTCA	National Minimum Data Set, New Zealand Health Information Service. Retrospective study.	8,456 Māori and 31,713 non-Māori admitted to public hospitals with a cardiac or heart failure DRG.	Consideration of age, sex, deprivation (using NZDep96 deciles).	Māori at greater risk of admission for heart failure ('four or more times higher'), yet "one third to a half" less likely to have undergone a CABG or transvascular percutaneous cardiac procedure. Significance testing not documented.
CURTIS ET AL. ⁷ NEW ZEALAND PUBLIC HOSPITALS, 2003 – 2005.	Process indicators: Rates of CABG, angioplasty, and angiography.	National Minimum Data Set, New Zealand Health Information Service. Retrospective study.	2,449 Māori and 28,688 non-Māori aged over 24 years admitted to public hospitals with principal diagnosis of IHD.	Age-standardisation and stratification by sex.	Māori at greater risk of death (RR 2.25, 95% CI 2.16 – 2.35) and hospitalisation from IHD (RR 1.43, 95% CI 1.40 – 1.47). Māori more likely to experience angiography (RR 1.36, 95% CI 1.32 – 1.41) and CABG (rate ratio 1.13, 95% CI 1.13 – 1.30) but less likely to receive angioplasty (RR 0.88, 95% CI 0.82 – 0.95).

CABG = Coronary Artery Bypass Graft, PTCA = Percutaneous Transluminal Coronary Angioplasty, DRG = Diagnosis Related Group, NZDep96 = New Zealand Deprivation Index 1996, CI = Confidence Interval, OR = Odds Ratio, RR= Rate Ratio, IHD= Ischaemic Heart Disease. References: 5 = Tukuitonga and Bindman 2002; 6 = Westbrooke, Baxter et al. 2001; 7 = Curtis, Harwood et al. 2010.

Name, year, place of study	Quality of care indicators	Data source and sampling methods	Māori participants and reference group	Control/adjustment for other variables	Findings
SEDDON ET AL. ⁸ AUCKLAND, 2002 – 2004.	Process indicator: Comparison of clinical priority compared to mean CPAC score.	CBAG booking form provided CPAC score and clinical priority score. Patient characteristics obtained from New Zealand Health Information Service. Retrospective study.	946 non-Māori non-Pacific non-Asians and 117 Māori with completed CPAC form for lone CABG surgery in Auckland.	Adjustment for age, stratification by sex.	Mean CPAC score (both sexes) for Māori 62.2 (standard error 1.3) and for non-Māori non-Pacific non-Asians 60.1 (standard error 0.5). 75% of Māori assessed as 'emergency' clinical priority compared to 71% of non-Māori non-Pacific non-Asians.
EAR, NOSE AND THROAT					
ALLEN, MORTON ET AL. ⁹ SOUTH AUCKLAND HEALTH, 2001.	Outcome indicator: Post-tympanostomy tube patency.	Data obtained from surgical notes. Prospective study. Sampling of consecutive admissions. Blinding unknown.	26 Māori, 54 'Caucasian' children.	Age, clinical factors.	No significant difference between the ethnic groups on logistic regression.
GENERIC					
RUMBALL-SMITH, HIDER ET AL. ¹⁰ NZ PUBLIC HOSPITALS, 2000 – 2004.	Outcome indicator: 30-day risk of readmission/death	National Minimum Data Set, New Zealand Health Information Service. Retrospective study.	892 Māori patients and 20,261 non-Māori non-Pacific patients who had experienced one of five elective surgical procedures*	Age-standardised.	Māori had greater risk of readmission (risk ratio 1.6, 95% CI 1.2 – 2.3).
DAVIS, LAY-YEE ET AL. ¹¹ NZ PUBLIC HOSPITALS, 1998.	Outcome indicator: Preventable adverse events	Data from clinical records. Stratified cluster sampling across thirteen hospitals. Retrospective study.	1,013 Māori and 5,326 non-Māori non-Pacific inpatients.	Consideration of age, deprivation (using NZDep96 deciles), admission type (acute status), length of stay, hospitals, sex.	Māori had a greater risk of an in-hospital adverse event (age-standardised only, difference 3.5% p=0.002) and of a preventable adverse event (OR 1.47, P < 0.05). These events more likely to be 'severe' for non-Māori non-Pacific (age-standardised only, difference 0.24%, p 0.01).

CABG = Coronary Artery Bypass Graft, CPAC = Clinical Priority Assessment Criteria, NZDep96 = New Zealand Deprivation Index 1996, RR= Relative Risk, CI = Confidence Interval, OR = Odds Ratio. * = Transurethral prostatectomy, laparoscopic cholecystectomy, knee arthroplasty, hip arthroplasty, or inguinal hernia repair. References: 8 = Seddon, Broad et al. 2006; 9 = Allen, Morton et al. 2005; 10 = Rumball-Smith, Hider et al. 2009; 11 = Davis, Lay-Yee et al. 2006.

Name, year, place of study	Quality of care indicators	Data source and sampling methods	Māori participants and reference group	Control/adjustment for other variables	Findings
END-STAGE RENAL DISEASE					
STEWART, MCCREDIE ET AL. ¹² NEW ZEALAND PUBLIC HOSPITALS, 1992 – 2001.	Process indicator: Confirmation of diagnosis	Australia and New Zealand Dialysis and Transplant Registry. Retrospective study.	421 Māori and 1787 non-Māori non-Pacific New Zealand patients with ESRD, first treated at a public hospital within study period.	Age and sex standardised.	Māori with glomerulonephritis less likely to have histological confirmation of clinical condition (39% unidentified type compared with 22% non-Māori non-Pacific, rate not calculated).
MCDONALD AND RUSS. ¹³ NEW ZEALAND PUBLIC HOSPITALS, 1991 – 2000.	Process indicators: Renal transplant waiting list, and receipt of graft.	Australia and New Zealand Dialysis and Transplant Registry. Retrospective study.	935 Māori and 12,984 'Non-aboriginal' (non-Māori non-Pacific non-Australian aboriginal non-Torres Strait Islander) patients with ESRD, first treated at a public hospital within study period.	Stratification and age/sex adjustment performed, however OR provided did not employ adjusted ratios.	Greater incidence of ESRD noted in Māori. Lesser proportion of Māori listed on renal transplant list (crude 34% compared to 59%, $p<0.0001$). Māori more likely to receive poorer-matched grafts (unadjusted OR 0.25, 95% CI 0.09 – 0.70).
YEATES ET AL. ¹⁴ NEW ZEALAND PUBLIC HOSPITALS, 1994 – 2005.	Process indicators: Receipt of graft, waiting time for graft.	Australia and New Zealand Dialysis and Transplant Registry. Retrospective study.	1,555 'indigenous' (Māori) and 1,216 'White' (non-Māori) patients with ESRD who commenced renal dialysis during the study period.	Hazard ratios adjusted for age, sex, cause of ESRD, year of diagnosis, comorbidities, smoking status, and region.	Māori less likely to receive renal transplant from living donor (HR 0.26, 95% CI 0.18 – 0.37), deceased donor (HR 0.22 95% CI 0.17 – 0.28) or any source (HR 0.23, 95% CI 0.19 -0.28). No significant difference in waiting time for graft from any source or deceased donor. Longer wait for Māori for graft from living donor (median 0.6 compared to 1.2 years, $p<0.01$).

ESRD = End-Stage Renal Disease, OR = Odds Ratio, HR = Hazard Ratio, CI=Confidence Interval. References: 12 = Stewart, McCredie et al. 2004; 13 = McDonald and Russ 2003b; 14 = Yeates, Cass et al. 2009.

Name, year, place of study	Quality of care indicators	Data source and sampling methods	Māori participants and reference group	Control/adjustment for other variables	Findings
CANCER CARE					
<p>STEVENS ET AL.¹⁵</p> <p>AUCKLAND AND NORTHLAND, 2004.</p>	<p>Process indicators:</p> <p>Type of treatment (curative anticancer, palliative anticancer, or supportive), referral to anticancer service, type of anticancer service, and timeliness of management.</p>	<p>New Zealand Cancer Registry, and regional databases. Outcome data obtained from clinical records.</p> <p>Retrospective study.</p>	<p>95 Māori and 378 NZ Europeans with lung cancer.</p>	<p>Age, sex, comorbidity, deprivation, tumor characteristics, patient declined management.</p> <p>Analyses stratified according to metastatic or non-metastatic disease.</p>	<p>Māori with non-metastatic disease less likely to receive 'curative treatment' (OR 0.30, 95% CI 0.1 – 0.8). Māori more likely to receive palliative anticancer treatment for non-metastatic disease (OR 4.1, 95% CI 1.4 – 12.0). No significant ethnic differences for patients with metastatic disease.</p> <p>No significant difference in rate of referral. Māori less likely to be referred to medical oncology services (OR 0.4, $p < 0.01$) and more likely to be referred to Radiation oncology services (OR 2.3, $p < 0.01$).</p> <p>Māori wait longer between diagnosis and treatment (median 43 days compared to 29 days for NZ Europeans, $p = 0.001$).</p>
<p>MCLEOD, HARRIS ET AL.¹⁶</p> <p>NEW ZEALAND PUBLIC AND PRIVATE HOSPITALS, 1996 - 2006</p>	<p>Process indicator:</p> <p>Type of treatment (total hysterectomy, radical hysterectomy, brachytherapy).</p>	<p>New Zealand Cancer Register. Outcome data obtained from the New Zealand health information Service.</p> <p>Retrospective study.</p>	<p>344 Māori and 1567 non-Māori with cervical cancer (adenocarcinoma, adenosquamous, and squamous cell carcinoma only).</p>	<p>Consideration for age and cancer stage.</p>	<p>No significant differences in the treatment received overall.</p> <p>Māori with stage 1A cancer more likely to have total hysterectomy than non-Māori (HR 1.42, 95% CI 1.01 – 2.00). No significant differences for stages 1B, II-IV, or for those with unknown stage.</p>

HR= Hazard Ratio, OR = Odds Ratio, CI = Confidence Interval. References: 15 = Stevens, Stevens et al. 2008; 16 = McLeod, Harris et al. 2010.

Name, year, place of study	Quality of care indicators	Data source and sampling methods	Māori participants and reference group	Control/adjustment for other variables	Findings
HILL ET AL. ¹⁷ NEW ZEALAND PUBLIC AND PRIVATE HOSPITALS, 1996 - 2003.	<p>Outcome indicator:</p> <p>30-day post-operative mortality.</p> <p>Process indicator: Lymph node resection, time from surgery to chemotherapy, treatment patterns for stage III and IV disease.</p>	<p>New Zealand Cancer Registry. All eligible Māori patients selected, random sample of non-Māori patients.</p> <p>Retrospective study with review of clinical records for process and outcome indicators.</p>	301 Māori patients and 328 non-Māori patients with colon cancer.	Controlled for age, sex; year of diagnosis, tumor characteristics, comorbidity, bowel obstruction/perforation, treatment facility type.	<p>Māori more likely to die within 30-days of surgery (PR 2.97, 95% CI 1.54 – 7.91).</p> <p>Māori less likely to have extensive lymph node resection (≥ 30 nodes removed) than non-Māori (PR 0.32, 95% CI 0.15 – 0.69).</p> <p>Stage III disease: Māori less likely to be offered (PR 0.80, 95% CI 0.62 – 0.98) or receive (PR 0.71, 95% CI 0.53 – 0.96) adjuvant chemotherapy. Māori more likely to wait 8 weeks between surgery and chemotherapy (PR 2.02, 95% CI 1.10 – 3.71).</p> <p>Stage IV disease: Māori less likely to be offered (PR 0.62 p 0.01) or to receive (PR 0.53, p 0.01) (age, sex and year of diagnosis adjusted only) palliative chemotherapy. PR not significant at 95% level when additional cofactors added.</p>
ALEXANDER ET AL. ¹⁸ WELLINGTON HOSPITAL, 1993 – 2003.	<p>Process indicators:</p> <p>Waiting time for radiotherapy, rates of complete tumor resection.</p>	<p>Histology reports used to identify eligible patients. Data obtained from clinical records and New Zealand Cancer Registry.</p>	19 Māori and 276 non-Māori patients with high grade glioma.	Age adjusted	<p>Māori more likely to have complete resection versus partial resection (OR 3.59, p 0.048).</p> <p>No significant differences in the waiting time for Māori compared to non-Māori.</p>

PR = Prevalence Ratio, HR= Hazard Ratio, OR = Odds Ratio, CI = Confidence Interval. References: 17 = Hill, Sarfati et al. 2010; 18 = Alexander, Irwin et al. 2010.

4.2.3.1 Restrictive care practices

Kumar et al. (2008) reviewed the care of 125 Māori and 175 non-Māori mental health patients admitted to Rotorua Hospital, 2000-2001. After adjustment for age, sex, diagnosis, number of readmissions, and time of onset between illness episode and admission, the researchers calculated odds ratios for 'restrictive care practices'. These were defined as the use of legislation for involuntary admissions, readmission, the frequency of restraint and seclusion, and administration of higher doses of medication. They noted that ethnicity was not associated with the first three practices, but that Māori patients were less likely to be referred for psychotherapy (OR 0.16, 95% CI 0.07 – 0.35), more likely to receive anti-psychotic medication (OR 1.90, 95% CI 1.11 – 3.25), and to be prescribed these drugs at higher doses. Given that diagnosis was controlled for in the analyses, the authors concluded that Māori were more likely to receive anti-psychotics for 'non-psychotic diagnoses'.

Ethnic variation in processes of care for patients with mental illness: difference or disparity?

The process of care indicators employed in this study are not directly linked to health outcomes, however it is logical that reduced access to psychotherapy represents comparatively poor quality of care. The administration of higher doses of anti-psychotic medication is more difficult to interpret. While it is possible that Māori are being over-medicated, it is also feasible that Māori are being appropriately managed and that non-Māori are being under-treated for their mental illness in this hospital. It would be helpful to compare treatment regimes with agreed clinical guidelines or defined health outcomes. Without this information, this study provides descriptive evidence of differences in the management of some mental health patients, but cannot determine if these differences are disparities, or whether they represent poorer quality of care for one ethnic group.

4.2.3.2 Obstetric care

Three of the eighteen studies considered outcomes related to obstetric intervention. Ministry of Health documents show that Māori consistently experience lower rates of caesarean section and instrumental delivery than non-Māori (Ministry of Health 1999; NZHIS 2003; NZHIS 2004; NZHIS 2006; NZHIS 2007); despite evidence that Māori may experience higher risk pregnancies (Ministry of Health 1999; Yapa and Simmons 2000; McLeod, Pullon et al. 2003).

Sangalli and Guidera (2004) found no significant ethnic difference in the rate of caesarean section (CS) in their small sample (59 Māori women only) of nulliparous women at term in Wellington Hospital, although they also performed minimal adjustment for other variables. In contrast, the studies by Harris et al. (2007) and Sadler et al. (2002) considered the impact of multiple clinical and non-clinical factors in their analyses.

Sadler et al. (2002) used information from a National Women's Hospital database, 1992 to 1997. The study population was limited to women without previous CS, who delivered a singleton following cephalic presentation at National Women's Hospital during the study period. Factors included in the modelling were age, parity, obstetric risk factors, transfer of care, booking caregiver, and an indication of the chronicity of their antenatal care using gestation at booking. After adjustment for these variables, the Māori women were significantly less likely to undergo induction of labour (OR 0.85, 95% CI 0.78 – 0.93), prelabour CS (OR 0.57, 95% CI 0.43 – 0.75), and operative vaginal delivery (OR 0.71, 95% CI 0.63 – 0.81). The researchers noted that the lower rates of epidural analgesia may explain the reduced frequency of operative vaginal delivery in Māori women - this factor was not included in the multivariable analysis. However, the differences in rates described - despite control for a significant number of possible variables - indicate that Māori in this sample may have received disparate treatment.

Harris et al. (2007) reviewed CS rates nationally, and found similar results. This team used the national hospital database to identify women delivering by CS at public and private hospitals 1997 – 2001. They used the 'Ever Māori' classification technique to minimise under-counting of Māori¹⁹, and obtained data regarding fetal presentation, gestation at delivery, multiple births, maternal hypertension, diabetes, and antepartum haemorrhage. These clinical factors were included in the statistical modelling, as were deprivation (using the NZDep96 index), age, District Health Board, and parity. Of nulliparous women without previous CS, non-Māori were more likely to undergo acute (OR 1.13, 95% CI 1.06 – 1.19), elective (OR 1.36, 95% CI 1.18 – 1.56), and any type of CS (OR 1.16, 95% CI 1.10 – 1.23). Similar significant odds ratios were demonstrated in the analyses of all women regardless of parity.

¹⁹ This technique classifies a participant as Māori if they have been identified in the data source at any point in time as NZ Māori.

Ethnic variation in obstetric intervention: difference or disparity?

The interventions above are not directly linked to health outcomes - it is possible that the disparate rates in the studies above represent overuse of services by non-Māori, as opposed to underuse in Māori. However, the study by Harris et al. (2007) found differences in the rates of acute caesarean section (that is, those occurring after the onset of labour), and so it is unlikely that societal factors (such as convenient day of delivery) had a significant role. In addition, the analyses performed by Sadler et al. (2002) and Harris et al. (2007) considered the impact of need, finding that Māori were less likely to receive the current acceptable standard of care despite clinical indication. These two research teams also considered a large number of demographic and clinical variables in the sampling strategies and statistical techniques employed. As such, the studies by Sadler et al. and Harris et al. provide evidence of health care disparities in this clinical area.

4.2.3.3 Cardiac care

Three studies assessed the rates of coronary artery bypass graft (CABG) and percutaneous transluminal coronary angioplasty (PTCA) interventions at hospitals in NZ, all obtaining their data from the National Minimum Data Set. These are indicators that reflect access to an intervention specific to the inpatient hospital care setting.

Westbooke et al. (2001) compared the hospitalisation rates for Māori with heart failure with their rates of intervention 1996-2000, and noted a discrepancy between apparent clinical need (demonstrated by excess hospitalisation) and access to these procedures. The researchers adjusted for age, sex and deprivation, but did not include clinical variables such as comorbid conditions.

Tukuitonga and Bindman (2002) also reviewed the frequency of these cardiac interventions performed at public and private hospitals 1990 – 1999. They found the age-adjusted rates for CABG and PTCA for Māori men and women were considerably lower than those for non-Māori. The study compared these rates with the age-standardised mortality rates for coronary artery disease, and demonstrated graphically the difference in the clinical need of Māori compared to their receipt of these interventions. Although the analyses did not control for other demographic or clinical factors, the differences between the two groups were large and it is unlikely that unaccounted-for variables could fully explain the apparent association with

ethnicity. Although other factors (such as comorbid conditions that contraindicate surgery) may also contribute to these findings, this study suggests there are inequities in the delivery of these procedures.

Curtis et al. (2010) used more recent data to further explore ethnic differences in access to interventions for patients with ischaemic heart disease, comparing the rate ratios of angiography, angioplasty and CABG procedures to those of hospitalisation and mortality from the condition. Routinely-collected data from 2000 – 2005 were employed to produce age-adjusted rates, the team presenting their findings stratified by sex and adjusting for undercounting of Māori. Overall, they described significantly higher rates of mortality and hospitalisation for Māori compared to non-Māori (rate ratios 2.25, 95% CI 2.16 – 2.35 and 1.43, 95% CI 1.40 – 1.47 respectively). Although Māori were more likely to receive angiography (rate ratio 1.36, 95% CI 1.32 – 1.41) and CABG (rate ratio 1.21, 95% CI 1.13 – 1.30) than non-Māori, their rate of receipt for these procedures was still inadequate when compared to their clinical need. The team also noted a significantly lower likelihood of receiving angioplasty for Māori compared to non-Māori (rate ratio 0.88, 95% CI 0.82 – 0.95).

Seddon et al. (2006) reviewed the Clinical Priority Assessment Criteria (CPAC– used to limit access of patients on to elective surgical waiting lists at District Health Boards) scores of all patients in the Auckland region awaiting CABG surgery (2002-2004), and described these indices according to deprivation, ethnicity, gender, and age. They found that Māori men were judged by their specialist as the same clinical priority as non-Māori men, despite the assessment of Māori patients as higher priority according to CPAC scores (actual statistics and measure of error not given). These findings were not controlled for deprivation, which were also associated with higher CPAC scores. While this study is largely descriptive, it provides insight into a factor that may contribute to ethnic differences in access to surgery.

Ethnic variation in cardiac intervention: difference or disparity?

The articles by Tukuitonga and Bindman (2002), Curtis et al. (2010) and Westbrooke et al. (2001) link health outcomes with utilisation of services by comparing clinical need (using hospitalisation and mortality rates) with access to intervention. Despite consideration of only a limited number of patient factors in the analyses, the findings are indicative of ethnic health care disparities in the rates of cardiac interventions. The study by Curtis et al. (2010) suggests that there may have been improvement in access to these procedures for Māori in recent years; however collectively these three investigations provide evidence of the ‘inverse care

law', in which the care received by a population is in contradiction to their degree of need (Hart 1971).

4.2.3.4 Outcomes post-tympanostomy tube insertion

Allen et al. (2005) reviewed post-operative morbidity for Māori and non-Māori children who underwent tympanostomy tube insertion over three months in 2001. A univariate analysis showed that Māori were at greater risk of having a non-functioning tube (blocked or extruded) post-operatively. However, a logistic regression analysis (incorporating variables for age and clinical factors) used to identify risk factors for blocked tubes (extruded tubes were excluded) found that ethnicity was not a significant factor, although no further information or statistics are given.

Ethnic variation in quality of tympanostomy tube insertion: difference or disparity?

The study by Allen et al. uses a surgical health outcome as an indicator of quality. However the interpretation of the findings is limited by the small number of participants (26 Māori, 54 Caucasian), and the potential for patient factors (for example - compliance with medication postoperatively or household smoking status) to impact on the results. As such, although this study describes differences in outcomes within the study sample, it does not provide robust evidence of ethnic health care disparities.

4.2.3.5 Readmission rate

Rumball-Smith et al. (2009) focused on elderly patients (> 64 years) admitted for one of five specified elective surgical procedures at public hospitals nationally 2000 - 2004²⁰. The authors used the National Minimum Data Set to identify these patients (n=21,398), and assessed the risk of unplanned readmission/death within thirty days of discharge according to patient characteristics. NZ Māori were found to have a 60% increase in the risk of this outcome compared to the non-Māori non-Pacific patients (NMNP, relative risk 1.6, 95% CI 1.2 – 2.3) - these risks were age-standardised employing the 2001 NZ Māori census population as the

²⁰ This paper pertains to research performed prior to the commencement of this PhD. The results of this study suggested differences in the rate of readmission for Māori compared to non- Māori, and provided an impetus for this current project.

external standard. Although the design of the study was intended to minimise the impact of some covariates (variability due to case mix is limited by restricting eligibility to elective surgical patients), no formal control for other confounding or mediating variables was performed in the analyses.

Ethnic variation in rate of readmission: difference or disparity?

Readmission is an adverse health outcome, and has been used as a quality indicator internationally. This study notes a significant increase in the rate of readmission for Māori compared to NMNP, however age was the only confounder considered in the analyses. It is also probable that unmeasured patient characteristics such as comorbidity and deprivation impact on the association between ethnic group and readmission. As such, given the potential for patient, clinical and hospital characteristics to introduce error into the estimate, this study is indicative of ethnic disparities but not conclusive.

4.2.3.6 Preventable adverse events

Davis et al. (2006) conducted a cross-sectional examination of the records of a stratified sample (according to location and hospital type) of 6,579 hospital patients across thirteen hospitals throughout Aotearoa. Clinical notes of all patients admitted in 1998 were examined; excluding psychiatric, rehabilitation-only, and day case admissions. Trained nurses examined the records to identify the occurrence of adverse events (AE), defined as an *“unintended injury that resulted in disability, with any evidence of causation by health-care management rather than the underlying disease”* (p1921). Notes in which an AE occurred were then examined by medical practitioners, in order to confirm the AE and judge its preventability; that is, to identify a failure to follow accepted practice at a system or individual level. After adjusting for age, deprivation, case-mix, length-of-stay and sex, the researchers found that the incidence of in-hospital preventable AEs for Māori was nearly 50% greater than in the non-Māori non-Pacific sample (adjusted OR 1.47, p=0.05).

This study used chart review to ascertain AEs; however patients may receive poor quality of care that does not result in this outcome, representing a lack of specificity common to many quality indicators. The impact of other clinical factors (such as severity of illness, clinical condition, and comorbidities) on the occurrence of AE was not considered; it is possible these variables contribute to the increased odds of this outcome for Māori.

Ethnic variation in preventable adverse events: difference or disparity?

The indicator is in itself an adverse health outcome, fulfilling one part of the definition by Rathore and Krumholz. Although some variables were considered in the statistical analyses, further adjustment for clinical factors may assist in confirming the size of the association between ethnicity and preventable adverse events. However, even without this information, this study provides robust evidence for ethnic disparities in care within the hospital setting.

4.2.3.7 Treatment for end-stage renal disease

Three studies used data from the Australia and New Zealand Dialysis and Transplant Registry, all investigating process of care measures for patients treated for end-stage renal disease (ESRD). McDonald and Russ (2003b) studied both Australians and New Zealanders treated between 1991 and 2000 at national public hospitals. The authors noted that despite the increased incidence of ESRD for Māori compared to the non-indigenous population (NZ non-Māori non-Pacific and Australian non-Aboriginal or Torres Strait Islander), Māori were significantly less likely to be listed on the renal transplant waiting list than the non-indigenous group, a difference that persisted after stratification for age and sex (although the adjusted ratios were not detailed). Overall, indigenous people (including Pacific Islanders, Torres Strait Islanders, and Australian aboriginals in addition to Māori) were also less likely to receive a graft once accepted for transplantation (OR 0.35, 95% CI 0.29 – 0.43). The team provided evidence of 'poorer matched' grafts for the indigenous population, and it is possible that genetic factors play a role in the receipt of transplants. That is, the fewer number of minority patients may make it harder to find a perfectly-matched donor.

The study by Yeates et al. (2009) supports these findings. The reviews performed in Section 4.1 of the Canadian and Australian literature also discussed this investigation, which documented differences in the rates of renal transplantation for indigenous and non-indigenous patients with ESRD from four countries including NZ. This team used data from 1,216 NZ European patients and 1,555 Māori patients who commenced renal dialysis between 1994 and 2005. After adjustment for age, sex, cause of ESRD, year of diagnosis, comorbidity, smoking status and region; NZ Māori were nearly 80% less likely to receive a renal transplant (from either living or deceased donor) than the NZ European group (HR 0.23, 95% CI 0.19 – 0.28). Māori were also more likely to wait longer to receive a transplant from a living donor (0.6 years

compared to 1.2 years for NZ Europeans, $p < 0.01$); however there was no difference between the ethnic groups in the waiting time for a transplant from a deceased donor.

Finally, Stewart et al. (2004) selected 421 Māori patients and 1,787 non-Māori non-Pacific New Zealanders from the same register, again describing a higher incidence and mortality from the disease in the Māori group. While the authors reported that Māori with glomerulonephritis were less likely to have documentation of histological examination of their kidneys, the differences in the proportions were not subject to statistical testing, nor adjusted for factors other than age and sex. However, the findings are reminiscent of those of Robson et al. (2006), who noted that Māori with cancer were less likely to have staging information recorded on registration documents than non-Māori (discussed in Section 4.2.3.9 below).

Ethnic variation in the processes of care for patients with ESRD: difference or disparity?

In this review, the rate of renal transplant and waiting time are considered to reflect hospital inpatient care (representing the 'access' dimension of quality), as is the documentation of histological and clinical details. It is possible that the differences in these process indicators represent disparities in the care for Māori within hospitals. However, the measures used are not directly linked to health outcomes (although they were compared with incidence of ESRD), and unaccounted-for factors (such as the tissue type of organs available for donation) may be distorting the calculated estimates. On balance, these investigations describe ethnic health care differences, and although suggestive, they do not provide conclusive evidence of disparities in the quality of care for Māori.

4.2.3.8 Cancer care

Māori experience both a higher incidence of cancer and a higher mortality from this condition compared to non-Māori (Robson, Purdie et al. 2006). Stevens et al. (2008) reviewed the management of 565 patients with lung cancer from Auckland and Northland who were diagnosed in 2004 (ninety-five Māori patients, 378 NZ Europeans). Although the focus of this study was on outpatient care, the researchers used some indicators which reflect access to inpatient care and its intention. After control for age, sex, comorbidity, deprivation, tumor stage and type, and patient-declined management, the Māori patients with non-metastatic disease were 70% less likely to receive 'curative anticancer treatment' (as opposed to 'palliative' or 'supportive' care) than the NZ European patients (OR 0.3, 95% CI 0.11 – 0.81).

Conversely, Māori were four times more likely to experience palliative anticancer treatment (OR 4.1, 95% CI 1.4 – 12.0). The authors found no ethnic differences in treatment when patients with metastatic disease were assessed, neither were there any significant differences between ethnic groups in rates of referral. However, Māori were less likely to be initially referred to Medical Oncology (OR 0.4, $p < 0.01$) services and more likely to be referred to Radiation Oncology (OR 2.3, $p < 0.01$) than NZ European patients. Māori also experienced longer delays between diagnosis and treatment compared to the NZ European group (median 43 days compared to 29 days, $p = 0.001$).

Hill, Sarfati et al. (2010b) used cancer registry data to identify 301 Māori patients and 329 non-Māori patients diagnosed with colon cancer during the period 1996 -2003, and compared the management received by the two ethnic groups through review of clinical records. The authors reported that although Māori were equally likely to have their cancer surgically resected as non-Māori, the non-Māori patients had a greater likelihood of a more extensive lymph node resection (\geq thirty nodes removed, relative risk Māori: non-Māori 0.32, 95% CI 0.15 – 0.69). This process indicator was adjusted for age and sex; tumor site, grade, and stage; comorbidity, presence of bowel obstruction/perforation, and facility type. The authors also described that Māori with stage III disease were more than twice as likely to have a significant delay before starting chemotherapy (defined as waiting eight weeks or longer, risk-adjusted prevalence ratio Māori: non-Māori 2.02, 95% CI 1.10 – 3.71), and less likely to receive adjuvant chemotherapy than non-Māori (prevalence ratio 0.71, 95% CI 0.53 – 0.96). Māori with stage IV disease were also less likely to be offered chemotherapy (risk-adjusted prevalence ratio 0.67), but this ratio was not significant (95% CI 0.38 – 1.19). When analyses were limited to the 598 patients who experienced surgery, Māori were at substantially greater risk of dying in the 30-day post-operative period (risk ratio 2.97, 95% CI 1.43 – 6.18) compared to non-Māori, an estimate that was also adjusted for patient, clinical, and structural variables.

McLeod et al. (2010) considered the treatments received by Māori ($n=344$) and non-Māori ($n=1567$) women with cervical cancer in a retrospective cohort study. They used data from the NZ Cancer Register 1996 – 2006, and compared the management of the two groups after consideration of age and cancer stage. This team noted that the in-hospital procedures received by Māori and non-Māori were similar, with a significant difference between the two groups noted in one subpopulation only. While Māori at stage IA were 42% more likely to experience a total hysterectomy than the comparable group of non-Māori (hazard ratio 1.42, 95% CI 1.01 – 2.00), the hazard ratios calculated in all other analyses had 95% confidence

intervals that included the null value of one. However, the authors suggest that their study may have been underpowered, limiting their ability to detect differences between the two groups. They also note that misclassification of Māori as non-Māori is likely (given previous work on the undercounting of Māori in this data source), and this may also impact on the accuracy of the estimates.

Alexander et al. (2010) reviewed the management of patients with high-grade glioma (a type of brain malignancy) from Wellington Hospital. Their study is limited by the small numbers of Māori patients involved (nineteen in total, with missing data affecting five of these patients), and the minimal consideration for potential confounders. However, after adjustment for age, they identified one significant difference in the management of the two groups, namely that Māori were more likely to experience a complete resection of their tumor compared to a partial resection 3.59 (95% CI 1.01 – 12.76). Although not statistically significant, the team also described the waiting time from surgery to commencing radiotherapy as 1.33 times longer for Māori compared to non-Māori. The 95% confidence interval around this estimate includes the null value of one (0.98 to 1.79), however only just. Although it is likely that the findings of this study are impacted by confounding/mediation and random error, they are consistent with those of Stevens et al. (2008), and Hill et al. (2010) above (regarding differential cancer care for Māori), and also those of Yeates et al. (2009) who described treatment delays for Māori with ESRD.

Ethnic variation in cancer care: difference or disparity?

The studies discussed above all focus on distinct clinical populations, and their results cannot be generalised to the care of all patients with cancer. The study by Hill et al. (2010) found significant differences in the 30-day post operative mortality rate between the ethnic groups. Although this indicator is a crude measure of hospital quality, it is an outcome of importance and the difference was present after extensive risk-adjustment for patient, clinical and structural variables. The other quality indicators used in these studies (such as extent of lymph node resection, the type of treatment employed, and the waiting time for treatments) are process markers, and are not directly linked to health outcomes. That said, the differences in the procedures and treatments are difficult to explain, and are highly suggestive of ethnic disparities in the cancer care for NZ inpatients.

4.2.3.9 Evidence involving other sectors of the health system

The review also identified research that investigated quality of care with measures that encompass several facets of the health system, such as disease-specific mortality or avoidable hospitalisation. These indicators reflect the performance of the overall health system, including the effectiveness and coordination of care by multiple organisations and individuals across the preventive, primary, secondary and tertiary care sectors. Therefore, the results of studies using these indicators cannot be directly generalised to the care given in public hospitals alone. Similarly, although some investigations used measures (such as patient satisfaction) that may reflect a person's experiences during a hospital admission, the estimates were not specific to this setting. Nonetheless, the findings of studies employing these indicators are helpful to provide a context for this research, and their salient findings are briefly discussed below:

1. AVOIDABLE/AMENABLE MORTALITY AND HOSPITALISATION

These indicators are calculated from the outcome data of a defined sample of patients; those who have experienced one of a series of conditions hypothesised as being 'avoidable' given appropriate therapeutic intervention and population-based prevention strategies (Tobias and Jackson 2001). These measures vary substantially with other factors (such as socio-economic position and comorbidity), requiring extensive risk-adjustment when used to compare populations or settings (Carr-Hill, Hardman et al. 1987; Thomas and Hofer 1998):

- Tobias and Jackson (2001) reviewed the trends of **avoidable mortality** in NZ in their time-series analysis of data 1981-1997 for patients aged 0 – 75 years. To assess ethnic differences, the researchers age-standardised to the Segi's World population and restricted their analyses to 1996/97 data (involving the assessment of 12,886 records). For this time period, Māori and Pacific people experienced significantly higher rates of avoidable mortality than NZ Europeans (rate ratio 2.2 and 1.9 respectively, confidence intervals not given). A strong relationship between deprivation and avoidable mortality was also demonstrated, although this factor was not controlled for in the ethnicity analysis. These findings are supported by those of the Ministry of Health, who reported that Māori 0-74 years have an age-standardised rate of avoidable mortality 2.6 times that of non-Māori (95% CI 2.49 – 2.70), 2004 -2006 (Ministry of Health 2010d).

- **Avoidable hospitalisation** is an indicator used by the Ministry of Health to reflect health systems performance, and incorporates three types of preventable admission (Ministry of Health 2010d p58): preventable hospitalisations (*“hospitalisations resulting from disease preventable through population-based health promotion strategies”*), ambulatory-sensitive hospitalisations (*“hospitalisations resulting from diseases sensitive to prophylactic or therapeutic interventions deliverable in a primary health care setting”*), and injury-preventable hospitalisations (*“hospitalisations avoidable through injury prevention”*).

For the period 2006-2008, Māori aged 0-74 years had 1.77 times the rate of avoidable hospitalisation than those of non-Māori (95% CI 1.76 – 1.79) (Ministry of Health 2010d). These findings are supported by those of Dharmalingham et al. (2004), Jackson and Tobias (2001), and Barnett and Malcolm (2010). All these studies performed minimal control for confounding variables (beyond age and sex); however, the findings are consistent in demonstrating an increase in the risk of this outcome for Māori.

- **Amenable mortality** is a subset of ‘avoidable mortality’, representing deaths due to conditions that are sensitive to medical/surgical intervention (such as tuberculosis and cervical cancer). The latest reports find that male Māori have 2.8 times the risk of amenable mortality of non-Māori (95% CI 2.6-3.1), the risk for Māori women being even higher (Ministry of Health 2010c). The findings of this study are consistent with those of Malcolm and Salmond (1993), and Tobias and Yeh (2007), both of which describe increased rates of this outcome for Māori.

Avoidable/amenable mortality/hospitalisations are in themselves adverse health outcomes, fulfilling the first part of the definition proposed by Rathore and Krumholz (2004). But the researchers above consider few covariates in their analyses; factors such as comorbidity may contribute to the differences between the ethnic groups, and without this information it is not possible to say that these results demonstrate true ethnic disparities in health care quality. Again, these indicators reflect the performance of the entire health system, including primary care and preventive health services, so are not specific to the quality of inpatient hospital services.

2. OUTCOMES FOR PATIENTS WITH HEART FAILURE

Patients with heart failure are diagnosed and managed in primary, secondary and tertiary health care sectors, and so their outcomes reflect the performance and coordination of professionals and institutions throughout the health system. Carr et al. (2002) investigated health outcomes for Māori and non-Māori patients with heart failure over the age of 45 years, using data from the National Minimum Data Set to calculate age-standardised mortality and hospitalisation rates. They discovered that mortality rates for Māori were higher than that of non-Māori, but hospitalisation rates were also greater.

Why would Māori have worse outcomes despite more opportunities for intervention? Although the researchers did not control for clinical characteristics or other demographic variables (which may contribute to the higher mortality rate for Māori), these results are supported by those of Riddell (2005), who found similar findings independent of deprivation. Carr et al. (2002) showed that Māori experienced a greater proportion of these hospitalisations as readmissions (40% versus 33% in non-Māori), defined as unanticipated admission within one year of discharge. Also, 21% of the Māori patients had more than one admission per calendar year compared to only 17% of non-Māori. The authors suggested that *“Māori are disproportionately affected by the failure of health services to implement interventions of known efficacy”*, and that perhaps *“some people get more access to effective intervention than others”* (Carr, Robson et al. 2002 p17).

3. OUTCOMES FOR PATIENTS WITH CANCER

The 2006 report ‘Unequal Impact’ documents the findings of an extensive and meticulous study involving the investigation of Māori cancer statistics 1996-2001 (Robson, Purdie et al. 2006). As with heart failure, the health outcomes for people with cancer involve multiple facets of the health system; including early detection services in primary care, and their management in secondary and tertiary health care facilities. These researchers adjusted the data for the probable undercounting of Māori patients (using the ‘Ever Māori’ classification approach) and for potential inaccuracies in 2001 Census data. Age-standardisation was performed using the Māori population 1996-2000. The team elicited a number of concerning results:

- Māori were 18% more likely to be diagnosed with cancer than non-Māori, but 93% more likely to die from this cancer than non-Māori.

- Māori were less likely than non-Māori to have staging information recorded on registration documents for oesophageal, stomach, colorectal, lung, breast, cervical, uterine, testicular and brain cancer.
- Māori were more likely to be diagnosed at a more advanced stage of disease for cancers of the colon, rectum, melanoma, breast, prostate, lung, and cervix.
- Māori were more likely to die from their cancers when detected at the same stage as non-Māori for cancers of the oral cavity, stomach, oesophagus, testis, bladder, kidney, breast, cervix, uterus, liver, lung, colon and rectum, soft tissue and mesothelium, and bladder.

The findings of this study support those of an earlier publication by Jeffreys et al. (2005) who described significant differences in 5-year survival rates (age- and stage-standardised) between Māori and non-Māori non-Pacific people with multiple types of cancer; and those of Cormack et al. (2007), McLeod et al. (2010), Hill et al. (2010a), and Curtis (2005) whose studies similarly demonstrate poorer outcomes for subpopulations of Māori with cancer.

4. EXPERIENCE OF DISCRIMINATION

Harris et al. (2006b) analysed the responses from the 2002/03 New Zealand Health Survey, assessing the experiences of racial discrimination in multiple situations, including work, housing, and health care settings. After accounting for age, sex, survey design and deprivation, the researchers noted that Māori (n=4108) were significantly more likely to report unfair treatment within a health-related setting than NZ Europeans (n=6269) (4.5%, 95% CI 3.2 – 5.78 versus 1.5%, 95% CI 1.1 – 1.8). These findings highlight the patient-provider interaction as a potential source of differential quality of care for Māori compared to NZ Europeans.

5. PATIENT SATISFACTION

The Public Satisfaction with Service Quality: the Kiwis Count Survey' is a nationwide questionnaire designed to elicit the experiences and perceptions of New Zealanders regarding a range of government services, including the health system. The survey was adapted from the Canadian 'Citizens First' questionnaire, and was designed and analysed by The Nielsen Company for the State Services Commission. It was completed first in 2007, with responses received from 61% of the 6000 people approached to complete the postal survey. Of the sample, 30% had received outpatient services from a public hospital and 15% had stayed in a

public hospital in the last year. After weighting for age, sex and location, the Nielsen Company noted no difference in satisfaction with health services between Māori (n=284) and non-Māori (n=3464) in 2007 (The Nielsen Company 2008), although these results were not repeated when the survey was administered in 2009. At this time, 3724 people completed the questionnaire (in postal and online forms), producing a response rate of 56%. 13.6% of the sample identified as Māori, and these respondents reported lower satisfaction with health services compared to the overall population. This difference was due to the scores for Māori remaining static over the two years, whereas the reports by non-Māori became more favourable in 2009 (The Nielsen Company 2010).

The 2009 Cancer Care Survey employed a standardised prevalidated questionnaire to assess the experiences of 2,221 patients with cancer from eight centres throughout the country (Cancer Control New Zealand 2010). The questionnaire focused on those who experienced outpatient cancer treatment (those who had solely inpatient care were excluded), and achieved a final response rate of 68%. The researchers found that on average (after adjustment for age, sex, income and cancer treatment service), Māori (n= 309) described their experiences more favourably than the NZ European respondents (n = 1693) (actual statistics not given). The interpretation of this finding is limited by the differential response rate for the two ethnic groups, with 51% of the eligible Māori sample participating compared to 74% of the NZ European population, and it is possible that this source of selection bias may impact on the accuracy of the estimates.

4.2.4 Summary

The intention of this section was to assess the evidence for disparities in the quality of inpatient hospital care received by Māori. This review has its limitations, primarily in the few available studies and the probability of publication bias (such that research with positive findings may be more likely to be published than studies that detect no ethnic differences in care). The articles discussed are diverse, in most cases focusing on discrete clinical conditions, and together they employ a variety of quality indicators. As such, it is not possible to summarise these findings into one succinct conclusion. However, the following points can be noted:

1. The quantity of studies exploring quality of inpatient care by ethnicity is minimal in comparison to the exhaustive number of NZ studies describing disparities in health outcomes for Māori.
2. It was not always possible to adequately assess if health care ‘differences’ were in fact ‘disparities’. Some research teams performed admirable statistical manipulation (such as Sadler et al. (2002) and Harris et al. (2007)), but in other studies it was difficult to interpret the findings without knowing the impact of other variables. Due to small numbers of Māori participants, NZ investigators may find it difficult to achieve sufficient statistical power in their studies to detect differences between ethnic groups, or to enable sufficient risk-adjustment.
3. Despite the limitations of this review and the points made above, the findings are relatively consistent. The majority of the investigations reported a difference in the quality of care for Māori compared with non-Māori, where Māori received the poorer treatment according to current standards or clinical need. Given the high quality studies by Sadler et al. (2002), Harris et al. (2007), Davis et al. (2006), and Hill et al. (2010b), there is particularly convincing evidence for disparities in aspects of cancer and obstetric care, and in the frequency of preventable adverse events for Māori in NZ.

4.3 SUMMARY

There is substantial evidence for ethnic disparities in health care delivery in the US; fewer studies were available to assess the health systems of Canada, UK, and Australia in this regard. Review of the NZ literature reveals a small amount of evidence concerning the quality of care for Māori compared to non-Māori. However, these studies noted relatively consistent differences in the quality of care received by Māori compared to non-Māori in Aotearoa, and provided evidence of disparities in some clinical areas.

CHAPTER FIVE:

QUALITY OF CARE AND THE RESEARCH QUESTION

“Indicators should actually measure what they are intended to (validity); they should provide the same answer if measured by different people in similar circumstances (reliability); they should be able to measure change (sensitivity); and, they should reflect changes only in the situation concerned. In reality, these criteria are difficult to achieve, and indicators, at best, are indirect or partial measures of a complex situation.”

(Alberta Heritage Foundation for Medical Research, cited in Harrigan 2000 p155).

The four questions considered in Part Two of this thesis are:

1. What is ‘quality’, and how is it measured? (Chapter Three).
2. What is the evidence that the quality of care may differ according to ethnicity? (Chapter Four).
3. **How should we measure quality in this study? (Chapter Five)**
4. **Is there evidence for the validity of the chosen indicator(s) as a marker of health care quality? (Chapter Five).**

This chapter responds to questions three and four, considering how best to measure the quality of public hospital care in this study. Firstly, Section 5.1 outlines the methods used in selecting potentially suitable indicators for this research. The New Zealand literature was reviewed to create a shortlist of quality measures, and three criteria were applied to assess the suitability of an indicator to the study setting and population. Section 5.2 focuses on the rate of readmission as a marker of quality. It uses the structural DAG framework described in Chapter Two to assess potential sources of measurement error related to its use as a quality indicator, and reviews the findings of literature that assess its validity as a proxy for quality. Section 5.3 looks at patient satisfaction as an indicator of the quality of care. It discusses key ‘validity-threatening factors’, and examines nine questionnaires against four criteria to assess their validity and suitability for this study. Finally, Section 5.4 provides a summary of the chapter.

5.1 HOW TO MEASURE QUALITY IN THIS STUDY?

This study aims to explore the association between ethnicity (the exposure) and the quality of hospital care (the outcome) in NZ Māori and NZ European inpatients. How should the quality of care for these two groups be assessed? The indicator should be a valid measure of the quality of care, while applicable to the study population and setting. This section outlines the three-part process used to select the proxies for quality for use in this study:

1. Literature review to create a shortlist of indicators previously employed for this purpose in NZ research.
2. Assessment of these measures against three criteria reflecting their suitability for use within the study context.
3. Finally, review of the findings of literature assessing the validity of selected measures as proxies for the quality of inpatient hospital care, applying a DAG structural framework.

5.1.1 Indicators employed in New Zealand research

An assumption was made that indicators used in peer-reviewed, published NZ-based investigations were more likely to be valid proxies of quality, with demonstrated applicability to the NZ health environment. Accordingly, a review of NZ research was performed to create a shortlist of indicators for consideration for this study. Publications investigating the overall quality of care featured in the Embase (1988 – 2008 week 06) and Medline (1950 to 2008 week 05) databases for NZ hospital inpatients were selected for review. Policy documents from government agencies were also assessed, as were studies identified from bibliography review. Only generic indicators focused on overall inpatient care were eligible for the shortlist; measures that reflected several facets of the health system (such as avoidable mortality), or that were specific to a defined clinical setting within the hospital (such as emergency triage times) were not assessed further. Six indicators were identified from this process, these are noted in Table 5.1 below and discussed in the following section.

Table 5.1: Indicators selected for review according to study context criteria

Name, year, setting of study	Indicator
DAVIS ET AL. ^{1,2,3} NZ PUBLIC HOSPITALS, 1998.	Adverse events
BISMARK ET AL. ⁴ NZ PUBLIC HOSPITALS, 1998.	Patient complaints
DAVIS ET AL. ⁵ NZ PUBLIC HOSPITALS, 1988 – 2001.	Unplanned readmission rate
MINISTRY OF HEALTH. ⁶ NZ PUBLIC HOSPITALS, ASCERTAINED QUARTERLY AS PART OF DISTRICT HEALTH BOARD BENCHMARKING.	Patient satisfaction
DAVIS ET AL. ⁵ NZ PUBLIC HOSPITALS, 1988 – 2001.	Post-admission mortality rate
DAVIS ET AL. ⁵ NZ PUBLIC HOSPITALS, 1988 – 2001.	Length of stay
MINISTRY OF HEALTH. ⁶ NZ PUBLIC HOSPITALS, ASCERTAINED QUARTERLY AS PART OF DISTRICT HEALTH BOARD BENCHMARKING.	Hospital Acquired <i>Staphylococcus aureus</i> Infection (HASBI)

1 =Davis, Lay-Yee et al. 2002, 2= Davis, Lay-Yee et al. 2003, 3=Davis, Lay-Yee et al. 2006, 4=Bismark, Brennan et al. 2006, 5= Davis, Lay-Yee et al. 2007, 6= Ministry of Health 2007.

5.1.2 Suitability to study context

CRITERIA

Three criteria were developed to assess the suitability of an indicator to the study population and setting:

1. Dimensions of quality: The indicator must be relevant for all members of the study population, such that it reflects quality as defined by both Māori and NZ Europeans. The quality framework He Taura Tieke was discussed in Chapter Three, and the overlap between this Māori-developed paradigm and Western quality philosophies noted. Therefore, it was considered to be pertinent to all participants, and was used to evaluate this criterion. The assessment involved subjectively mapping the indicator (and its associated processes and outcomes) with the dimensions of He Taura Tieke (consumer satisfaction, technical and clinical competence, and structural and systemic responsiveness), with a judgment made regarding its face validity as an indicator of quality according to this paradigm.

2. Statistical power: NZ Māori make up approximately 14.6% of the population compared to 67.6% for NZ Europeans (Statistics New Zealand 2007b). Obtaining sufficient data for some indicators may be difficult, with consequences for the ability of the study to detect significant differences between the two ethnic groups. Accordingly, analyses of the indicators need to be able to identify meaningful results despite disparate counts of Māori and European inpatients. This criterion was assessed by examining the frequency of the event, and the capacity to obtain adequate statistical power in the comparison of the two ethnic groups.

3. Project constraints: The indicator must be compatible with the resource and time constraints for this study. Thus, the data must be able to be collected and analysed within the allowed time period, using the available workforce, and within the study budget. This criterion considered the derivation of each measure, and the feasibility to obtain the information within the study parameters.

RESULTS

The results of the assessment are summarised in Table 5.2 (p111); individual indicators are discussed further below:

1. Adverse events: Davis et al. have published a number of reports that use the frequency of adverse events (AE) to assess health care quality for inpatients, an AE defined as “*an unintended injury that resulted in disability, with any evidence of causation by health-care management rather than the underlying disease*” (Davis, Lay-Yee et al. 2002a; Davis, Lay-Yee et al. 2003; Davis, Lay-Yee et al. 2006 p1921). The data are obtained through the structured assessment of clinical records, the reviewer identifying the occurrence of an AE, and assessing its preventability - the premise being that these events occur as a consequence of substandard care.

In the studies noted above, preventable AEs occurred at a frequency of approximately 5% of hospital admissions. In their 2006 publication, Davis et al. demonstrated a statistically significant difference between Māori and non-Māori non-Pacific hospital patients, with an overall sample size of 6,579. When this indicator is compared to the dimensions of He Taura Tieke, there is face validity for its reflection of ‘technical and clinical competence’.

However, the data collection process for this indicator is labour-intensive, and clinical note reviews at multiple hospitals would be necessary to obtain an adequate sample size. The time and cost associated with gathering these data are beyond the parameters of this project. Also (although not a criterion), the question of inequalities in care for Māori using this outcome has already been investigated within a robust methodologically-sound study, and performing an equivalent investigation is unnecessary.

2. Patient complaints/adverse events: Bismarck et al. (2006b) used patient complaints to the Health & Disability Commission, and their association with hospital-based adverse events to assess health care quality (this study occurred in conjunction with some of the investigations noted above). This combined indicator is useful in its exploratory nature and its reflection of the technical quality of care received by patients during their admission. However, in this study, only 294 complaints associated with a public hospital AE occurred in one calendar year. No significant difference in the rates between Māori and non-Māori could be identified, although it is probable that the study was underpowered, as only fourteen Māori complainants were included in the sample.

The data for this study was derived from descriptive analyses of the complaint information, and clinical note review of 6,579 patients from thirteen public hospitals in NZ. There is face validity for this combined indicator in reflecting the quality dimensions ‘consumer satisfaction’ and ‘technical and clinical competence’. However, this measure required the ascertainment of AEs through chart review, which is beyond the constraints of this project. (Of note, the study cited above was associated with extensive resources, yet did not generate sufficient power to investigate ethnic differences with this combined indicator.)

3. Unplanned readmission rate: Davis et al. (2007) used six generic indicators to assess the impact of hospital bed reduction and health sector reform on quality of care; including length of stay, unplanned readmission rate, and 60-day post-admission mortality rate. These indicators are outcome measures of the quality of care, are easily obtained and manipulated, and are focused on inpatient services.

Unplanned readmission rate is an indicator that “*transcends the patient wall*” (Franklin, Noetscher et al. 1999 p68), reflecting both processes and outcomes of care. The indicator can be calculated from routinely-collected public hospital data at minimum expense. It is a measure that reflects the ‘technical and clinical competence’ of services, but may also

represent the ability of the health system to respond to need. Unplanned readmission occurs relatively infrequently - Davis et al. (2007) calculated a rate of readmission (within thirty days of discharge) of 5.9 per 100 inpatient discharges. Therefore, although it is feasible to elicit true differences between NZ Māori and NZ Europeans (should they exist), several years of data would need to be analysed.

4. Post-admission mortality rate: This indicator, like unplanned readmission rate, is focused on hospital inpatients, and reflects the 'technical and clinical competence' dimension of health care effectiveness. However, the event is infrequent - Davis et al. (2007) calculated a rate of 2.4 per 100 inpatient discharges in 2001. Like unplanned readmission rate, retrospective data would be required to obtain sufficient statistical power to detect true differences between Māori and non-Māori. However, compared to readmission rate, twice as much data would be required to achieve sufficient statistical power to detect a true difference between the two groups.

5. Length of stay: Length of stay is another of the markers used by Davis et al. (2007) in his study to investigate the impact of health sector reform. The information for this indicator is readily accessible from administrative datasets, and its use is feasible within the constraints of this project. By definition length of stay is a frequent event, and all hospital inpatients would be able to be included in the study population. As such, obtaining sufficient statistical power to explore differences between Māori and non-Māori patients with this indicator is likely to be achievable.

However, length of stay as a quality indicator primarily reflects the efficiency dimension of quality, a domain distinctively lacking in He Taura Tieke. It is also ambiguous in its relevance for patients: is a longer or shorter duration of admission preferable? Although a longer length of stay may reflect inadequacies in patient care, a brief admission duration may indicate the premature discharge of patients.

6. Patient satisfaction: Patient satisfaction is one of the indicators employed by the Ministry of Health to monitor the quality of services provided by their public hospitals. It reflects He Taura Tieke dimension 'consumer satisfaction', although depending on the instrument used may also encompass the remaining domains. The sample size required for comparisons of satisfaction between the two groups with high statistical power is feasible to obtain. Depending on the mode of administration (such as interviewing), collecting the data may require significant

resources. However, some techniques (such as using postal questionnaires) would allow the information to be obtained within the resource restrictions.

7. Hospital Acquired *Staphylococcus Aureus* Bloodstream Infection (HASBI): HASBI is considered a marker of inadequate infection control within the hospital. This infection is costly to the provider, and may be fatal or highly debilitating for the patient. The HASBI indicator primarily encompasses the ‘technical and clinical competence’ dimension of hospital care. The measure is labour-intensive to derive, requiring the correlation of laboratory data with information from clinical records. This event also occurs rarely, with some District Health Boards reporting no HASBI incidents over a 3-month period (Ministry of Health 2007c), and it is unlikely meaningful comparisons of the two ethnic groups would be able to be performed.

The suitability of the indicators according to the three study context criteria is summarised in the table below:

Table 5.2: Applicability of a selection of quality indicators within study context

Indicator	He Taura Tieke dimensions of quality	Ability to obtain adequate statistical power	Ability to obtain data within financial and time constraints of study
ADVERSE EVENTS	Technical and clinical competence	Y. Large sample sizes required	N
PATIENT COMPLAINTS (IN CONJUNCTION WITH ADVERSE EVENTS)	Consumer satisfaction Technical and clinical competence	Unknown. Large sample sizes required.	N
UNPLANNED READMISSION RATE	Technical and clinical competence	Y	Y
POST-ADMISSION MORTALITY RATE	Technical and clinical competence	Y. Long study period required	Y
LENGTH OF STAY	Unclear	Y	Y
PATIENT SATISFACTION	Consumer satisfaction May also reflect other dimensions of quality	Y	Y
HASBI	Technical and clinical competence	N	Y

Y=Yes, N =No, HASBI = Hospital acquired *Staph. Aureus* bloodstream infection.

The study's finite resources restricted the use of AEs and patient complaints, and length of stay failed to reflect He Taura Tieke dimensions of care. The HASBI event and post-admission mortality rate were precluded by their infrequency - obtaining adequate statistical power would require decades of data, which may introduce error due to inaccuracies in ethnicity classification, changes in data coding systems, and alterations in quality over the time period.

Unplanned readmission rate reflects He Taura Tieke dimension 'technical and clinical competence', is a comparatively more frequent event, and can be obtained within the resource constraints of the study. Patient satisfaction directly reflects the 'consumer satisfaction' dimension of He Taura Tieke, whilst also fulfilling the other criteria. The administration of a survey has the added advantages of allowing the validation of the participant's ethnicity (and the subsequent assessment of the accuracy of hospital-recorded ethnicity), and facilitating active patient participation in this research.

Accordingly, two indicators – readmission rate and patient satisfaction – were selected for further review, with a view to their employment in this study provided evidence of their validity as indicators for quality of care was obtained. Using more than one measure may also allow a more comprehensive assessment of quality, together encompassing more He Taura Tieke dimensions of health care effectiveness.

The remainder of this chapter assesses the validity of these indicators through detailed literature review (process 3). Section 5.2 focuses on the rate of readmission and Section 5.3 explores patient satisfaction.

5.2 VALIDITY OF READMISSION RATE AS A QUALITY INDICATOR

BACKGROUND

Readmission as an indicator of quality assumes that the standard of care received during an inpatient hospital admission is inversely reflected in the risk²¹ of readmission. It has featured in the academic literature since the early 1950s, and now has widespread use as a proxy for quality by researchers, health care institutions, and government authorities internationally. For example, the rate of readmission within twenty-eight days of discharge has been employed as a measure of hospital performance for the UK National Health Service since 1998 (Department of Health 1998), by the Australian government since 1996 (Miles and Lowe 1999), and the NZ Ministry of Health has used 7-day readmission rate in its hospital benchmarking project since 2006 (Ministry of Health 2007b). Peer Review Organizations in the US screen 25% of all readmissions within thirty-one days of discharge from Medicare-funded hospital services, and the US Department of Health and Human Services uses this measure to publicly rank the quality of hospitals nationally.

The following general terms are used when discussing readmission:

INDEX ADMISSION	The initial inpatient admission of a patient to a given hospital.
READMISSION	The subsequent admission of a patient, within a defined time period from discharge.
READMISSION RATE	= a/b , where:
NUMERATOR (A)	=the number of readmissions within the given time period following discharge from the index admission.
DENOMINATOR (B)	=the corresponding number of patients discharged alive within the reference period.

²¹ This measure is time-bounded, so is correctly referred to as a 'rate'. However when comparing rates of readmission (through the construction of rate ratios), the term 'risk' may be more appropriate. The terminology in this document uses readmission 'rate' and 'risk' interchangeably, reflecting the practices of researchers in this area.

This section assesses the evidence for the validity of readmission as a marker of health care quality. It returns to the structural DAG framework discussed in Chapter Two, drawing on this paradigm to analyse the association between readmission and quality.

WHAT IS VALIDITY?

Validity is *“the degrees to which a measurement measures what it purports to measure”* (Last 2001 p184). There are three broad categories of validity (construct, criterion, and content): construct validity describes *“the extent to which the measurement corresponds to theoretical concepts (constructs) concerning the phenomenon under study”* (ibid.); criterion validity refers to *“the extent to which the measurement correlates with an external criterion of the phenomenon under study”* (ibid.), and content validity is defined as *‘the extent to which the measurement incorporates the domain of the phenomenon under the study’* (ibid.).

As such, studies that explore the ‘validity’ of readmission as a marker for quality are implicitly examining one or more of these domains, and given that readmission is simply an indicator for quality, there will be inevitable measurement error (misclassification bias) when readmission is used to estimate this construct. The DAG employed in Figure 2.9 (p33) showed the complex relationship between quality and its proxies, involving various overlapping sets of confounders and mediators. The following DAG (Figure 5.1 below) highlights one aspect of this over-arching diagram, to illustrate the pathways contributing to the measurement error of quality when using readmission as its surrogate.

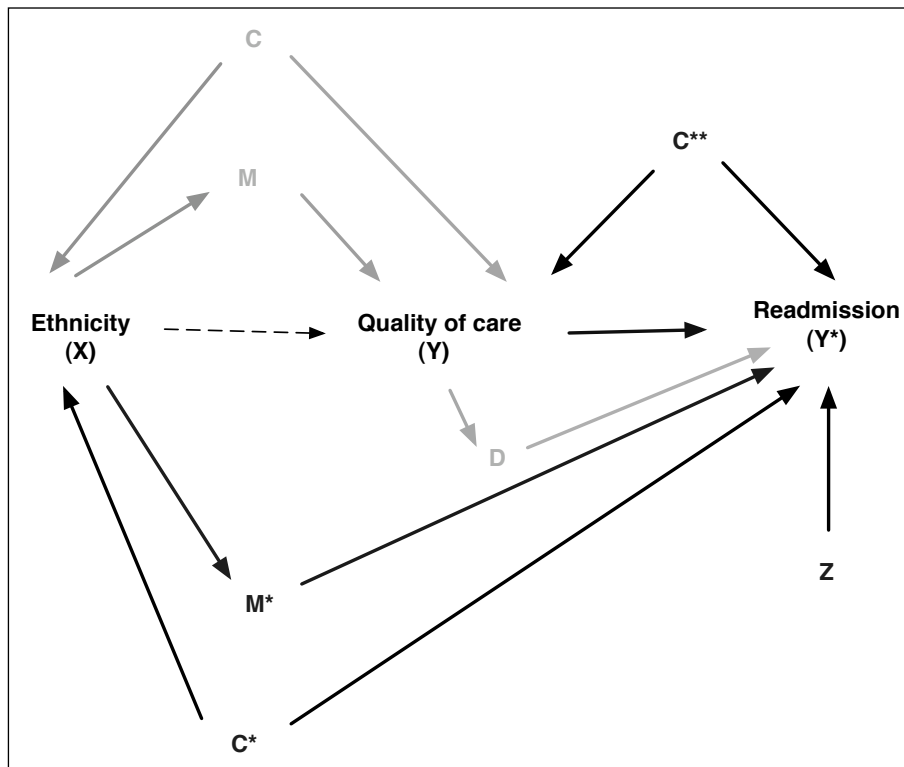


Figure 5.1: Measurement error when using readmission as a proxy for the quality of care

In this DAG, readmission (Y^*) is a proxy for the outcome (quality of care, Y), with other determinants of readmission represented by the variables C^{**} , D , Z , M^* and C^* . Applying this structural framework to the study, there are again several implications:

1. D is an intermediary between quality and readmission - for example, the processes that lead to readmission as an outcome of poor quality care, such as medical error. As such, these factors should not be conditioned (that is, controlled for in study design or data analysis).
2. Z (determinants of readmission unrelated to quality of care or ethnic group, such as the observation period for readmission following discharge) and C^{**} (for example, age) may distort an association between X and Y^* (used as a proxy for the X - Y association of interest), and these pathways should be blocked. Variables C^* and M^* are of particular concern due to their potential to cause differential measurement error according to ethnic group of readmission as a proxy for quality.

3. As discussed in Chapter Two, the identity and impact of factors C and M can only be inferred from studies using proxies (Y^*) for the quality of care. That is, variables acting as C^* and M^* in the ethnicity-readmission association may also operate as C and M in the association between ethnicity and quality of care.

This section explores first the variables involved in the $Z-Y^*$, $Y-C^{**}-Y^*$, $X-M^*-Y^*$ and $X-C^*-Y^*$ pathways (termed 'validity-threatening factors'), and secondly the published evidence for the association of Y with Y^* .

5.2.1 Validity-threatening factors

As discussed above, there will be factors that are correlated with both quality of care and readmission, or independent determinants of readmission, that have the potential to affect the validity of Y^* as a proxy for quality. This section reviews key sources of this measurement error and offers strategies to reduce their impact. Firstly, variables related to the definition of 'readmission' are considered: the length of observation period, all-cause versus disease-specific readmission, unplanned versus arranged readmission, and the death of patients within the study period.

Secondly, the impact of patient characteristics (such as case-mix and discharge destination) on the validity of the marker as a proxy for quality is discussed. While these variables act primarily as confounders (C^{**}) of the quality-readmission association, they may also introduce differential measurement error according to ethnic group through actions along the ethnicity-confounder-readmission pathways (i.e. variables C^*). This possibility is discussed in Section 5.2.1.3.

5.2.1.1 Characteristics of 'readmission'

CHOICE OF OBSERVATION PERIOD

The validity of this measure is intrinsically related to the period of time in which the readmission may occur. Jiminez-Puente et al. (2004) studied the quality of care received by the 363 Spanish inpatients and examined the 'avoidability' of readmission (that is, whether the readmission was related to substandard quality of care) for various observation periods. They

found that the sensitivity for readmission rate as a marker of poor quality of care increased over the time periods studied, from 29% at seven days to 85.5% at ninety days. That is, 29% of all 'potentially avoidable' readmissions were detected using a seven-day observation period, compared to 85.5% at ninety days. As expected, the specificity of the marker decreased over time, in that 79.9% of the readmissions considered to be unavoidable (unrelated to the care received during the index admission) were *not* included when using a seven-day observation period (producing a false positive rate of 20%) compared to only 21.2% when using a ninety-day period. These findings supported those of Heggstad and Lilleng (2003), who calculated hazard curves for 62,264 medical and surgical patients from eight hospitals in Norway, 1996. This team did not measure quality of care per se, but developed a conceptual model to categorise unplanned readmissions as 'related' to the antecedent admission (this association was not defined as being specific to the care they received, so may also include the impact of clinical and patient factors) or 'unrelated'. They applied these assumptions to their sample data, and estimated the probability of experiencing an unplanned readmission at different time periods. As expected, they found that the sensitivity of the indicator to detect 'related' readmissions increased as the time interval increased (28% at ten days to 79% at ninety days), as did the proportion of unrelated readmissions (19% at ten days to 43% at ninety days).

These studies suggest that a longer observation period will increase the sensitivity of this indicator (in detecting potentially avoidable or 'related' readmissions), but will also increase the number of 'false positives' readmissions, thus decreasing its specificity. Conversely, a shorter time period increases the specificity of the measure, but may also decrease its sensitivity. If readmission rate is inversely proportional to the quality of care, the inclusion of 'unrelated' readmissions will overestimate the readmission rate. Similarly, an excessively short observation period may exclude quality-related ('true positive') readmissions, and underestimate the true rate.

What is the preferred observation period? Although the period selected by researchers and institutions in the published literature varies substantially - from one day (Chauhan, Mehrotra et al. 2006) to ten years (Bloomberg, Trinkaus et al. 2003), most researchers recommend an observation period of around four weeks. Sibbritt (1995) suggests twenty-eight days, Henderson et al. (1993) a period of one month, and Tierney and Worth (1995) recommend recording values at seven day intervals over the first month, and then monthly thereafter. Chambers and Clarke (1990) state in their review that there is no evidence to support the use of a time period longer than twenty-eight days, and this observation period represents a

reasonable compromise with respect to its validity. In the conceptual study by Heggstad and Lilleeng (2003), they modelled a sensitivity of 0.50 (that is, the proportion of 'related' readmissions) for patients with surgical diagnoses and 0.47 (medical diagnoses) when employing a time period of thirty days, with corresponding specificities of 0.78 and 0.69. When investigating the relationship between readmission rate and potentially avoidable readmissions, Jiminez-Puentes et al. (2004) calculated a sensitivity of 72.7% and specificity of 55.6% for surgical patients, and for medical patients 62.5% and 32.9% respectively when using a thirty-day observation period.

ALL-CAUSE VERSUS DISEASE-SPECIFIC READMISSION

Some hypothesise that readmissions within the same diagnostic spectrum as the principal diagnosis of the index admission are more likely to reflect the care received during that admission, improving the specificity of the rate for health care quality. That is, using 'all-cause' readmission includes events unrelated to the quality of care, so overestimates the numerator of the rate.

Franklin et al. (1999) discusses this bias and considers three options for defining readmission: returns within the same International Disease Classification (ICD) or DRG code as the index admission; returns with a related ICD code or same Major Diagnostic Category (MDC) as the initial admission; or readmissions for any clinical cause. Ultimately, this team recommends the second category, using DRGs and MDCs to limit readmissions. Jiminez-Puente et al. (2004) support this proposal, noting that the proportion of readmissions deemed 'avoidable' in their Spanish population was higher when MDC were matched between the index admission and readmission. Other investigators concentrate on admissions and readmissions for one diagnosis only, such as asthma (Kelly, Andersen et al. 2000) or congestive heart failure (Philbin and DiSalvo 1998).

However, a significant proportion of researchers and institutions include all readmissions in the numerator, irrespective of the principal diagnosis of admission (Worwag and Chodak 1998; Porter, Pisters et al. 2000; Bernheim, Spertus et al. 2007b). Ashton and Wray (1996) suggest that limiting the numerator of the rate to diagnostically-similar pairs may increase the number of 'false positive' readmissions. These are readmissions unrelated to the standard of care during the index admission, and more likely reflect a relapse of the patients' chronic condition. It is also possible that this restriction may decrease the number of true positive readmissions

included in the calculation. For example, readmission for cerebral haemorrhage secondary to poorly-managed administration of anticoagulant therapy for a heart condition would be missed if readmission was restricted to DRG or MDC-related diagnoses only. Similarly, disruption of fluid or electrolyte-balance in a surgical patient may require readmission under a medical diagnostic code.

The absolute impact of this potential bias will depend on the population being sampled. Victor and Jefferies (1990) noted in their cohort of 386 elderly subjects that 97% of those readmitted were treated by the original speciality of the index admission - in this study there would be little practical difference between an all-cause and speciality-specific definition of readmission. Rumball-Smith (2007) identified a similar association in a review of the data for 501 elderly patients readmitted to NZ public hospitals following elective surgical procedures for one of five specified conditions. Although the assessment was implicit and unstandardised, a logical pathological/physiological association between the 30-day readmission and index admission diagnoses was noted in 99% of cases. Conversely, Adeyemo and Radley (2007) reviewed 161 unplanned general surgical readmissions within twenty-six days of readmission, and classified thirty-three (20.5%) as 'unrelated' on the basis of their principal diagnosis. Engbaek et al. (2006) demonstrated an even greater impact of this bias, defining nearly 50% of readmissions (within sixty days of discharge) as unrelated in their sample of day-surgical patients. However, as with the assessment by Rumball-Smith (2007), the categorisations performed in these two studies were also based on the unstructured review of clinical records by individual health professionals, and their results may be similarly susceptible to bias. The findings of all four of these studies have limited generalisability, given the distinct study populations and settings examined.

What to do? Methods for linking the two admissions in administrative datasets may be flawed, and it is possible that the data source may decide this aspect of the definition. Many organisations (such as the US Centres for Medicare & Medicaid Services) routinely use all-cause readmission rate as a quality indicator, and studies demonstrating the validity of the marker (such as the meta-analyses performed by Ashton et al. (1997) and Soeken et al. (1991), discussed in the following section) have been performed without restricting readmission in this way. It is likely that the error introduced from either all-cause or condition-specific readmission is minimised if patient and clinical factors are considered in the study design and analyses. For example, approaches such as restricting eligibility to defined clinical conditions may reduce the impact of bias from this source.

DEATH WITHIN THE OBSERVATION PERIOD

The numerator of readmission rate is broadly composed of those patients who were readmitted to hospital within a given time period. However, some researchers choose to also include patients who died during the same period (Fonarow, Abraham et al. 2007; Vasilevskis, Meltzer et al. 2008). The arguments to support this inclusion are two-fold:

- Patients discharged alive who subsequently die within the observation period are included in the denominator of the ratio. However, they are no longer eligible for readmission; as such, the calculated rate with these patients excluded may underestimate the true risk of readmission.
- Readmission rate represents avoidable adverse outcomes subsequent to poor quality care. Patients who receive substandard care, such that they experience an adverse health outcome that ultimately results in death, should be reflected by an increase in the numerator of the marker.

These arguments conceptualise death within the observation period as an outcome of quality of care, on the causal pathway between quality and readmission (that is, as D in the DAG above, Figure 5.1 p120), and as an intermediary, this factor should not be controlled for in study design or analyses. Accordingly, it is recommended that readmission rate include in the numerator those patients who were readmitted or deceased within the observation period following discharge (Ashton and Wray 1996; Rumball-Smith and Hider 2009).

In practice, the absolute impact of including these patients is likely to be minimal. Davis et al. (2007) linked 2001 mortality and hospital record data and noted that the age-adjusted incidence of death within sixty days of discharge was only 2.0%. Rumball-Smith (2007) compared the rate of readmission with the rate of readmission or death within thirty days of discharge in a sample of 21,398 elderly patients and found that it altered the ratio from 8.0% (readmission only) to 8.2% when including death. Although mortality data obtained from hospital-generated datasets (such as the National Minimum Data Set) are likely to underestimate the true incidence of death in the community, the inclusion of these data may minimise the impact of this source of measurement bias.

UNPLANNED VERSUS PLANNED READMISSION

This bias results from the inclusion of readmissions in the numerator of the rate which are the result of a planned course of treatment; such as those for the administration of chemotherapy, renal dialysis, or for an elective surgical procedure. These admissions are unlikely to reflect the quality of care during the index admission, and their inclusion may overestimate the numerator of the ratio (Chambers and Clarke 1990; Ashton and Wray 1996).

This factor causes a methodological problem for some international researchers who are unable to distinguish within their data those readmissions that have been scheduled and those occurring acutely (Kossovsky, Perneger et al. 1999); Sibbritt et al. (2006) use readmission direct from casualty as a proxy for 'unplanned' readmissions. However some datasets (such as New Zealand's National Minimum Data Set) provide coding for admission status, distinguishing between an arranged or elective admission, and acute unplanned admissions.

READMISSION TO OTHER HOSPITALS

Ashton and Wray (1996) note that the loss of data from patients readmitted to hospitals other than that of the index admission may decrease the sensitivity of the marker as a proxy of quality. These authors are describing a determinant of readmission unrelated to the antecedent quality of care (that is, variable Z in Figure 5.1, p120), representing a source of measurement error in the use of readmission as a proxy for this outcome. Although this error may be difficult to avoid in some data sources, many geographical regions/organisations (such as the NZ health system) run a centralised hospital information database, linking patient episodes through a unique identifying code. In this way readmissions to any hospital within the organisation are able to be identified, and included in the numerator of the rate.

5.2.1.2 Patient characteristics

CASE-MIX

The studies by Heggstad and Lilleeng (2003) and Jiminez-Puente et al. (2004) (discussed above) investigating the impact of observation period on the validity of the marker also identified case-mix as a source of misclassification bias. The hazard curves calculated by Heggstad and Lilleeng classified medical patients as having a higher proportion of 'false positives' (readmissions categorised as 'unrelated' to the previous admission on the basis of

their conceptual model) at every time interval compared with surgical patients, and a lower proportion of 'related readmissions' at eight of the nine time intervals. Jiminez-Puente et al. (2004) also determined that surgical readmissions were more likely to be classified as 'potentially avoidable' than medical or obstetric readmissions. These findings are supported by those of many other researchers (Anderson and Steinberg 1984; Clarke 1990; Courtney, Ankrett et al. 2003).

Case-mix can be conceptualised as a confounder in the association between quality of care and readmission (C** in Figure 5.1, p120)²². The vulnerability of a patient to poor quality care may be greater in those with more complex conditions (for example, taking multiple medical drugs is likely to increase the chance of medication error), these patients may also be at a higher risk of readmission because of the nature of their condition. Restriction of the study population is the primary technique used by researchers to minimise this source of misclassification error. Patients with some clinical conditions are routinely excluded from readmission analyses: for example, psychiatric readmissions following treatment for mental health conditions are considered to be less specific for the quality of care, due to factors such as patient compliance and social issues (Chambers and Clarke 1990; Durbin, Lin et al. 2007). Similarly, healthy newborns are generally ineligible for readmission analyses (DesHarnais, McMahon et al. 1990). Although babies born in hospital are designated 'inpatients', they are admitted with no specific pathology and usually receive no medical treatment. Accordingly, their readmissions may be less specific for quality of care. Term obstetric patients are also commonly excluded from readmission analyses (Henderson, Graveney et al. 1993; Gonzales 1999). As the process of childbirth is frequently performed outside of hospital, women admitted to hospital for labour and delivery may have different characteristics from the normal obstetric population (such as comorbidity) which place them at higher risk of readmission.

The overall eligible population may also be restricted to patients with one of a defined set of conditions. For example, Coleman et al. (2006) investigated eleven clinical conditions; Billings et al. (2006) created a predictive model for readmission for thirty-two specified medical diagnoses, and Goodney et al. (2003) focused on rates for fourteen cardiovascular and major cancer procedures. Further restricting the study population to surgical patients may increase the specificity of readmission as a proxy for the quality of care (Milne and Clarke 1990), and

²² Case-mix may also be a source of differential measurement error, in that there may be an association between ethnic group and readmission, independent of quality of care (M* in Figure 5.1, p120). This scenario is discussed in Section 5.2.1.3.

this approach has been used by many researchers: Welch et al. (1992) focused their study on those admitted for one of four surgical procedures (appendectomy, caesarean section, cholecystectomy, transurethral prostatectomy), and Roos et al. (1986) investigated rates for only three surgical procedures: cholecystectomy, hysterectomy, and prostatectomy. The Clinical Outcomes Working Group (2002) in Scotland also restrict the population in this way, assessing readmission rates in patients experiencing hip fracture, hysterectomy, and ambulatory surgery.

DISCHARGE DESTINATION

The care a patient receives post-discharge may alter the validity of readmission as a proxy for inpatient quality of care. For example, patients discharged to hospice facilities are unlikely to be readmitted back to an acute care hospital irrespective of the care they received during their admission. Investigations have also identified that patients who are discharged to care facilities (such as nursing homes, rehabilitation units, or other hospitals) may have reduced rates of readmission because of this community care (Reed, Pearlman et al. 1991; Camberg, Smith et al. 1997). While this post-discharge intervention may represent an improvement in the overall quality of care for the patient (that is, the quality of health services as a whole), it is possible that hospital physicians may discharge some inpatients prematurely, reassured about this “*reliable safety net*” (Ashton and Wray 1996 p1537). Researchers minimise the impact of this potential bias by restricting the eligible population to those discharged to home, or excluding discrete subsets of patients (DesHarnais, McMahon et al. 1990; Weissman, Stern et al. 1994).

OTHER

There are other characteristics which are thought to place patients at a higher or lower risk of readmission for reasons independent of the quality of care, including:

1. Admission source: Patients admitted to hospital as a transfer from another health care facility may be a source of ‘adverse selection’ (Cooper, Sirio et al. 1999). Studies on intensive care patients demonstrate worse outcomes for those transferred from another hospital (Rosenberg, Hofer et al. 2001; Rosenberg, Hofer et al. 2003). This phenomenon is thought to reflect the impact of the patient’s clinical characteristics (such that they may be less stable with more complex or severe conditions) and failure to respond to therapy during the initial

hospitalisation. In the same way, patients admitted to hospital by way of transfer may have an inherently higher risk of readmission and are commonly excluded from readmission analyses.

2. Individuals with multiple readmissions: Using the count of all readmissions for the numerator of the rate includes all events for patients who experience multiple readmissions within the given time frame. These admission incidents are assumed to primarily reflect the patient's clinical characteristics (Sibbritt 1995), as opposed to the quality of their health care. Soeken et al. (1991) performed a meta-analysis of thirty-five articles published between 1973 and 1984, involving a range of study designs, all of which investigated readmission rate as an indicator of the quality of inpatient hospital care. In one analysis of nine studies, the authors determined that the risk of readmission increased with prior hospitalisation. Within shorter time frames this bias may not be practically significant, however it is recommended that the individual patient is employed as the unit of analysis (as opposed to the number of discharges) (Thomas 1996; Ashton, Del Junco et al. 1997), and the numerator be limited to allow the inclusion of only one readmission per index within the time period (Chambers and Clarke 1990).

3. Foreign nationals and non-residents: It is possible that the financial arrangements for health care or post-discharge care for these individuals may encourage or dissuade readmission independent of the quality of care they received, and so these subjects are generally ineligible for readmission studies (Halfon, Egli et al. 2006). Secondly, individuals who discharge themselves against medical advice have not completed the recommended management plan, and as such may be more likely to experience readmission. These patients should also be excluded from the eligible population (Ashton and Wray 1996).

5.2.1.3 Differential measurement error according to ethnic group

The section above has discussed sources of measurement error of readmission as a proxy for quality according to various characteristics. Of additional importance in this study is the possibility that the validity of the readmission indicator may differ according to the exposure, such that the impact of measurement error may vary between the two ethnic groups.

Is it plausible that the validity for readmission as a measure of health care quality could be different for NZ Māori compared to NZ Europeans? There is no documented evidence that the

sensitivity/specificity of readmission for quality differs according to ethnic group, and it is difficult to create a plausible argument for a direct effect of ethnicity on the validity of the marker.

However, ethnicity may yet be a source of differential measurement error, due to its association with variables such as socio-economic position and case-mix (that is, variables conceptualised as M^* or C^* in Figure 5.1, p120). Various mechanisms are possible: for example, one ethnic group may have more available or comprehensive support networks than another, which may affect a hospital's decision to readmit. That is, these individuals may be less likely to experience readmission irrespective of the quality of care, making readmission a less sensitive indicator of quality in this ethnic group compared to others. It is also possible that socio-economic position may have a role, in that financially disadvantaged patients may be more likely to be readmitted due to concerns about them being able to access care in the community. That is, it is plausible that the sensitivity of readmission as a measure for quality may be higher in patients with a lower socio-economic position, but the specificity lower. The previous section noted variation in the validity of the measure according to case-mix (surgical compared to medical patients) and in individuals with multiple readmissions. It is likely that members of some ethnic groups may be at greater risk of conditions that necessitate frequent admissions due to disease progression or clinical instability. For example, end-stage renal disease, heart failure and diabetes are conditions that are common causes of admissions in NZ public hospitals, all of which are more prevalent in NZ Māori compared to NZ Europeans (Ministry of Health 2006b). If this assumption were true, we would expect the specificity of readmission as an indicator for quality to be less for Māori compared with NZ Europeans.

The DAG below in Figure 5.2 illustrates two potential mechanisms for differential measurement error of readmission by ethnic group; one due to mediation by the variable socio-economic position, and a second whereby characteristics of patients who experience multiple readmissions within the observation period act as confounders of the ethnicity-readmission association (factors C^* in Figure 5.1, p120)²³, and the ethnicity-quality of care association (variables C in Figure 5.1, p120).

²³ Of note, it is probable that socio-economic position also mediates the association between ethnicity and quality of care. That is, variable M in Figure 5.1 above (p120). This conceptualisation is discussed further in Chapters Six and Eight.

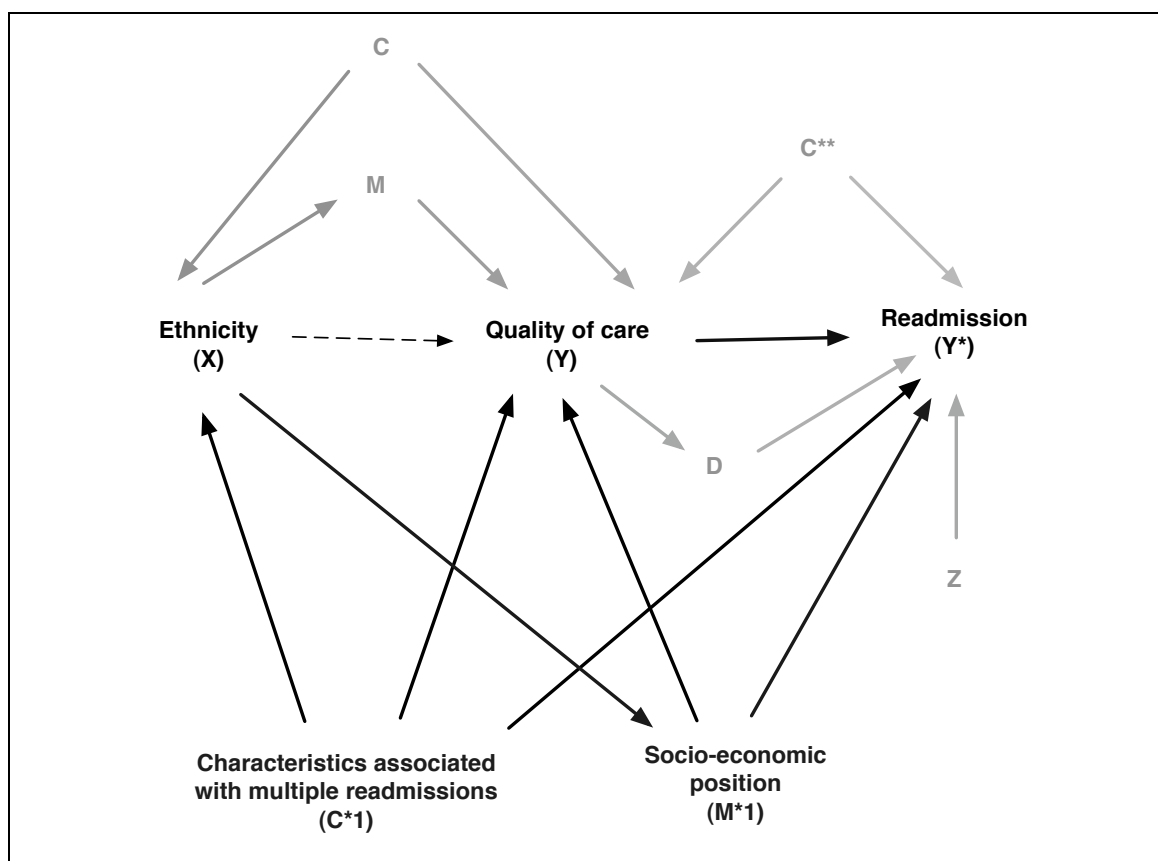


Figure 5.2: Socio-economic position and multiple readmissions as sources of differential measurement error (DAG)

This DAG shows how blocking these pathways (assuming no induced collider bias²⁴) may reduce these sources of error, and help restore the ethnicity-readmission (X-Y*) association as a reasonable proxy for the ethnicity-quality of care (X-Y) association. For example, limiting the numerator of readmission rate to the first readmission in the observation period per patient may reduce the impact of C*1 (and its presumed action as C); as may adjusting for other variables associated with readmission (such as age, case-mix, procedure type) in multivariable models. In the same way, conditioning on the socio-economic variable (that is, controlling for this factor by its inclusion in a multivariable model) may partially block these indirect pathways (X-M*1-Y* and Y-M*1-Y*) and reduce measurement error from this source.

This section has highlighted some of the factors involved in the validity of readmission as a misclassified measure of health care quality. Although the impact of these variables can be

²⁴ A collider is a variable that has two arrow heads going in to it, e.g. $X \rightarrow S \leftarrow Y$ is blocked by the collider 'S'. Such a blocked path transmits no association between the exposure and outcome, and therefore one should not adjust for S in the analysis. Induced collider bias occurs if the collider is conditioned on, so opening the path between X and Y, and producing a spurious association between these two variables (Greenland 2003).

minimised in study design (for example, with exclusion/inclusion criteria), it is likely that measurement error will persist when using readmission rate as an indicator of quality, and should be considered when interpreting the measure.

5.2.2 Validity of readmission: the evidence

The Embase (1988 – 2008 week 06) and Medline (1950 to 2008 week 05) databases were searched using the following OVID Medical Subject Headings:

- 'quality of health care'
- 'quality indicators, health care'
- 'patient readmission'
- (readmission\$ or re-admission\$ or rehospitallisation\$ or rehospitallization\$ or readmit\$)
(multipurpose search)

The dataset was limited to entries published in English and containing an abstract. As with literature reviews performed by other researchers, studies that focused on the quality of care for psychiatric patients and well newborns were excluded (Chambers and Clarke 1990; Soeken, Prescott et al. 1991), the review was also limited to research involving hospital inpatients only.

The search strategy identified more than thirty studies which examined the validity of unplanned readmission rate as a marker of the quality of inpatient care. Of these publications, the majority investigated the association between different standards of care and the risk of readmission (criterion validity), while the others assessed the impact of 'validity threatening factors' (such as the effect of observation period on the validity of the marker – these issues were discussed above in Section 5.2.1).

Six studies were selected for discussion in this section. Two of these are meta-analyses, which featured the majority of the investigations identified in the database search. Of the publications that post-dated these summary studies, investigations were chosen for review if their study population included a comparison group (such as in a cohort or case-control study), and the researchers considered the impact of confounding in their study design or analyses. The six studies are reviewed below:

META-ANALYSES

1. Ashton et al. (1997) assessed twenty-nine cohort or case-control studies, in which the researchers employed modifiable, provider-controlled process of care indicators, reviewing their impact against the 31-day readmission rate. The authors categorised the data sets according to these measures, classifying the quality of care as 'substandard', 'normative' or 'exceptional' when compared to "*accepted standards of routine hospital practice*". The investigations minimised the impact of confounding by adjusting for age (twenty-one of the twenty-two studies), socio-economic position (seventeen studies), and disease severity (nineteen studies). Randomization of patients was performed in thirteen of the twenty-two studies, minimising the impact of unknown confounders. The team researchers performed several distinct analyses:

- Thirteen studies were employed to compare readmission rates after 'substandard' care compared to 'normative' care, resulting in a summary odds ratio of 1.24 (95% CI 0.99 – 1.57).
- Data from nine studies were used to compare readmission rates following 'normative' care compared to 'exceptional' care, producing a summary odds ratio of 1.45 (95% CI 0.90 – 2.33).
- An analysis of the data of sixteen homogeneous studies that performed actual process of care assessments (as opposed to using proxies) resulted in a summary odds ratio comparing care of relatively low quality (that is, care categorised as either 'substandard' or 'normative') to care of higher quality (categorised as either 'normative' or 'exceptional'). This odds ratio was 1.55 (95% CI 1.25 – 1.92), meaning that those who experienced lower quality care were estimated to be 55% more likely to experience readmission, although the true increase in risk may be as low as 25% or as high as 92%.

Although these odds ratios are widely quoted in the literature, only one ratio is statistically significant with the 95% confidence interval excluding the null. However, all three odds ratios are consistently elevated, with the lower limits of the non-significant confidence intervals only just including the null value of one. Therefore it is highly probable that the receipt of relatively lower quality care (as defined in these studies) is associated with an increase in the risk of readmission. However, given the modest size of the odds ratios, quality of care is far from being the sole determinant of readmission.

This meta-analysis analysed the raw data of the studies, at times recalculating rates to employ a uniform definition of readmission and to ensure consistency in the denominator of the rate. They did not perform additional risk adjustment during the calculation of the odds ratios, and it is possible that unaccounted-for variables may have altered the strength of the association.

2. Soeken et al. (1991) performed a meta-analysis using the data from forty-four studies, attempting to identify variables predictive of readmission. However as part of the review, the researchers looked at twelve studies in which readmission rate was used as a criterion to assess the effectiveness of an intervention (such as comprehensive discharge planning or pharmacological counselling), the equivalent of the 'exceptional' classification employed above by Ashton et al. (1997).

They noted that eight of these twelve investigations reported lower rates of readmission in the populations exposed to the intervention, the log-odds ratios for readmission for these studies varying from -0.168 to -2.031. However, when the data from all of the studies were combined, the summary odds ratio was not significant at the $p < 0.05$ level in demonstrating an association between risk of readmission and the receipt of 'extraordinary' care.

This meta-analysis has some limitations: it employs wide inclusion criteria, using the data from studies with differing definitions of readmission rate and various study designs. Publication bias may be relevant for both this study and that of Ashton et al. (1997), as papers demonstrating an association between health care quality and risk of readmission may be more likely to be published than those without. The investigations included in the calculation of the odds ratios also demonstrated substantial heterogeneity, which may have affected the ability of the analysis to detect a significant result.

OBSERVATIONAL STUDIES

The meta-analyses performed by Soeken et al. (1991) and Ashton et al. (1997) incorporated information from many of the studies identified from the database search. Accordingly, the following section assesses investigations published since these two reports only. As with the review by Ashton et al. (1997), only studies including a control group for comparison and consideration for confounders are discussed in this section.

1. Thomas (1996) employed a prospective cohort design to test the association between readmission and quality of care with Medicare claims data from Michigan hospitals 1989-1991. The data from patients admitted with one of twelve defined conditions were used to develop a mathematical model to predict readmission risk within fifteen, thirty, sixty, and ninety days of discharge, with adjustment for patient and clinical factors. This model was employed to predict the risk of readmission for a cohort of patients, who were followed over time and their actual frequency of readmission observed. The ratio of the observed/expected rates were compared with the quality of care received by these patients, as judged by structured implicit assessment of clinical records by blinded medical staff.

Thomas calculated that there were no significant differences in the rates of readmission for patients who experienced 'poor' versus 'acceptable' quality of care for any of the four time periods of readmission. He notes that the models developed for risk adjustment were poor, in some conditions failing to explain even 0.5% variance, and admits that his predictions of readmission "*were only slightly better than those that could be obtained by flipping a fair coin*" (p267). Although it is possible that the models employed by Thomas were inherently flawed, it is clear that the results of this study do not support an association between readmission and quality of care.

2. Polanczyk et al. (2001) conducted a prospective cohort study to investigate the association between health care quality and the risk of readmission within three months of discharge for patients with congestive heart failure. 205 patients were enrolled in the study through consecutive admission at the Massachusetts General Hospital 1997, and the frequency of readmission (among other outcomes) ascertained. Quality of care during the initial admission was assessed through the application of a previously tested set of criteria, based on process of care measures for patients with this condition.

At the conclusion of the study, 30% of the cohort had been readmitted, of which the majority of admissions (68%) were for treatment for heart failure. After risk adjustment for clinical and demographic variables, patients with $\leq 50\%$ of the quality criteria met were more likely to experience readmission (odds ratio 2.5, 95% CI 1.1 – 5.3).

Although this study involved a detailed clinical note review using validated criteria, there is little information provided as to the process of investigation - such as who was involved in the note review, when it was performed, and whether the reviewers were blinded to readmission

status. This study employed only a small sample of patients with a specific condition; accordingly, the generalisability of these results may be limited. Similarly, the variation in 'exposure' (quality of care) within the small sample of patients may have been minimal, limiting assessment of the responsiveness of the indicator.

3. Weissman et al. (1999) conducted a case-control study using the data from 1,758 elderly Medicare patients admitted to hospital in four states of the US (1991-1992) with pneumonia or congestive heart failure. The first stage of the investigation required the readmission diagnoses and time periods to be classified according to their perceived association with quality of care. A panel of six physicians was assembled in each state, who reviewed each combination of heart failure- and pneumonia-related readmission diagnoses with one of six readmission observation periods (<1, 1-3, 4-7, 8-14, 15-30, and 31-60 days) and judged whether substandard care during the index admission was 'likely', 'somewhat likely' or 'unlikely'. Diagnosis and time-period pairs in which three or more of the six physicians agreed that suboptimal care was 'likely' were classified as 'Related Adverse Readmissions' (RAR), the others being 'non-RAR', 'other thirty-one day readmissions', or 'non-readmissions'.

The second part of the study correlated process of care measures according to readmission status. The non-readmission patients acted as the controls, against which the quality of care received by the RAR and non-RAR patients was compared. A random sample of patients for each disease condition (heart failure or pneumonia) and category of readmission status was selected, and the clinical notes pertaining to the index admission reviewed by nurses (n=881 patients with heart failure, n=877 patients with pneumonia). The notes of each patient were then assessed according to validated condition-specific process measures, all of which were related to health outcomes. Finally, two physicians (blinded to readmission status) also examined the clinical notes and gave their subjective judgment of the quality of care received by each patient. Results were risk-adjusted for age, gender, race, length of stay, clinical variables and hospital teaching status. The team noted:

- RAR was negatively correlated with the explicit criteria of quality, the correlation coefficient calculated as -0.25, $p=0.004$ (pneumonia) and -0.17, $p=0.048$ (heart failure) compared to the reference group. That is, as quality of care increased (according to these criteria), the risk of readmission for the two groups decreased.

- A similar association was demonstrated when the risk of readmission was assessed against the implicit criteria, the correlation coefficient calculated as -0.17, $p=0.047$ (for the pneumonia patients) and -0.20, $p=0.017$ (heart failure group).
- Patients classified in the 'other readmission' group tended to experience lower quality of care, although this was significant only for the patients with congestive heart failure.

This study employs implicit review of quality of care based on the subjective opinion of two physicians, and correlations between the implicit and explicit criteria were low (correlation coefficient = 0.17, $p=0.00$ for pneumonia and 0.33, $p=0.00$ for heart failure. Also, the study population was predominantly elderly medical patients, for whom readmissions may be less avoidable due to the impact of comorbidity and clinical condition. However, the study conclusions are based on robust methodology, with large sample sizes, and the employment of two distinct sets of criteria against which to assess quality of care. As such, it provides evidence for an association between substandard inpatient health care and the risk of readmission, albeit in this distinct study population only.

4. Kossovsky et al. (2000) compared the quality of care between ninety-one 'cases' (those readmitted unexpectedly within thirty-one days of discharge) and 351 controls who had experienced an admission at a large hospital in Geneva for the primary treatment of heart failure. Explicit quality criteria were developed by a panel of experts from two hospitals, and a nurse blinded to readmission status retrieved the relevant information from the clinical records. These criteria considered three broad aspects of care: admission work-up, evaluation and treatment during the admission, and readiness for discharge.

After adjustment for demographic and clinical variables, the researchers found no significant differences in the odds of fulfilled criteria in the domains of admission work up and evaluation and treatment between the cases and controls. However, for every 10% decrease in the proportion of fulfilled criteria in the 'readiness for discharge' category, the odds of readmission increased by 16% when considering all-cause readmission (OR 1.16, 95% CI 1.02 – 1.31) and 23% when focusing on heart failure-related readmissions only (OR 1.23, 95% CI 1.06 – 1.42).

Like many others, this study is limited primarily by its use of chart review. That is, some patients may have experienced the processes assessed by the criteria, but not had these events recorded in the notes. However, if it is assumed that this error is non-differential, the

likely impact of the bias would be to under-estimate the odds ratios. The findings are generalisable only to patients with the same clinical condition within similar settings. The researchers noted that patient factors were associated with comparatively much higher odds of readmission than the quality criteria: for example, those aged eighty years or over had four times the likelihood of readmission than those aged less than sixty-five years (OR 4.1 95% CI 1.6 – 11.0). Despite the quality of care being relatively less important than the patient characteristics, the study provides evidence for an association between the quality of discharge preparation and unplanned readmission in this population.

CONCLUSION

This section describes research of varying quality which investigates the responsiveness of readmission to variations in the quality of care. The study by Thomas (1996) failed to demonstrate a relationship between quality of care and the risk of readmission with his predictive model; however the other four investigations discussed in this section produced evidence for the validity of this marker. In particular, the study by Ashton et al. (1997) provides support for the use of readmission rate as a quality indicator. After the review of twenty-nine case-control or cohort studies, their meta-analysis found an association between the receipt of comparatively poor quality care and the risk of readmission. Although in two cases the confidence intervals around their point estimates include the null, it is probable that relatively lower quality of care is associated with an increased risk of readmission in their data. However, the association is modest at best (meaning that the quality of care may be substantially misclassified when using readmission as a proxy), although careful adjustment for covariates in analyses may reduce this error.

5.2.3 Summary

In conclusion, although there is evidence for the validity of readmission as proxy for quality in the literature, there is inevitable measurement error when using readmission in this way. 'Validity-threatening factors' (such as observation period and case-mix) may introduce bias, and alter the accuracy of the exposure-readmission association as a proxy for the exposure-quality association. These variables should be considered when designing studies using readmission as a quality indicator, and when interpreting readmission rates. Finally, it is possible that the validity of readmission as a proxy for health care quality may vary according to ethnicity. That is, the indicator may be more or less accurate as a measure of quality in some ethnic groups. While there is little information available on the differential validity of readmission according to social or ethnic group, it is possible that this error occurs and should be considered when designing studies, conducting analyses, and interpreting their results.

5.3 VALIDITY OF PATIENT SATISFACTION AS A QUALITY INDICATOR

The first part of this chapter identified two indicators for exploration: unplanned readmission rate and patient satisfaction. This section focuses on patient satisfaction, and is structured into two parts. The first provides a background to this indicator, considering its definition and measurement using the standardised questionnaire. The second section (5.3.2) focuses on the validity of patient satisfaction as a marker of quality, reviewing potential sources of measurement error and the properties of nine satisfaction instruments.

5.3.1 Satisfaction: defining and measuring

WHAT IS SATISFACTION?

Satisfaction is a complex concept, reflecting the individual's *"life style, past experiences, future expectations and the values of both individual and society"* (Carr-Hill 1992 p237). Despite a growing body of literature devoted to the measurement and importance of patient satisfaction, there is little consensus amongst researchers as to its construct. Various generic definitions of satisfaction have been employed, including:

- The *"positive evaluations of distinct dimensions of the health care"* (Linder-Pelz 1982 p578).
- *"The patient's perception of how well he/she was treated"* (Kaldenberg 2001 p82).
- *"The degree of congruence between expectation and accomplishment"* (Heidegger, Saal et al. 2006 p332).
- *"An expression of satisfaction or dissatisfaction is ... the patient's judgement on the quality of care in all its aspects, but particularly as concerns the interpersonal process"* (Donabedian 1988 p1746).

Like 'quality', there is general agreement that satisfaction is a multi-dimensional construct, but again its domains vary between researchers. For example, Cheng et al. (2003) described four

dimensions: the technical competence and interpersonal skills of the health care staff, the availability and ease of access to care, the outcome of treatment, and the amenities provided by the health service. When Ware (1983) reviewed the patient satisfaction literature, he developed a taxonomy of eight characteristics including interpersonal manner, technical quality, accessibility/convenience, finances, efficacy/outcomes, continuity of provider, the physical environment, and the availability of medical resources. Finally, the meta-analysis performed by Hall and Dornan (1988) of 221 studies noted twelve distinct dimensions employed by satisfaction researchers.

WHY MEASURE PATIENT SATISFACTION?

The volume of studies published on patient satisfaction has increased substantially over the last two decades (Sitzia and Wood 1997), perhaps reflecting higher expectations of services by consumers (Urden 2002), and the need to monitor and compare the performance of health care providers for funders (Carr-Hill 1992; Hudak and Wright 2000; Urden 2002). Satisfaction ratings are used to assess the success of interventions and health system changes (Rosenthal and Shannon 1997), and to identify aspects of health care delivery that may be amenable to improvement (Sitzia and Wood 1997). It is highly appropriate to use satisfaction to assess health care quality, given that consumers are the very *“definers of quality”*, who set *“the standards by which it is to be judged”* (Donabedian 1992 p247).

Internationally, many hospitals and other provider organisations are required to assess satisfaction to fulfil contract obligations with government and other funders. In the US, Health Maintenance Organisations assess the performance of their health service providers using criteria including satisfaction ratings. A national annual survey on patient satisfaction is performed at each National Health Service Trust in the UK, and results are incorporated into the Trusts’ performance ratings. The NZ government has measured patient satisfaction with hospital services since the 1990s, and currently District Health Boards must report patient satisfaction indices as part of the Hospital Benchmarking Information project. Given the goal in the NZ health system to provide *“people-centred health care”* (Minister of Health 2003), there may also be an obligation for health care quality researchers in this country to acknowledge the voice of the consumer, and incorporate their feedback where possible²⁵.

²⁵ The principles of the Treaty of Waitangi also note the need for *‘active participation’* of NZ Māori, so the ability to provide a voice for Māori consumers is of particular importance to this study.

THE STANDARDISED QUESTIONNAIRE

The patient perspective can be obtained in numerous ways - Ford (2001) notes eighteen different processes in his review; including direct observation, focus groups, feedback or comment cards, and standardised surveys. The latter is the most commonly applied method in comparative research, employed in a wide variety of clinical specialties and health care delivery settings. There are several advantages to a questionnaire tool, including:

1. Standardisation of questions and forced response options: A standardised questionnaire asks all subjects the same items, and (with the exception of open questions) forces subjects to choose one of a finite list of responses. Limiting responses in this way, unlike focus groups or unstructured interviews, allows the direct comparison of answers between subgroups of the sample population, and the quantification of satisfaction scores. Repeat application of the survey also enables variability over time, person and place to be explored.

2. Minimisation of response bias: All satisfaction instruments and feedback methods are vulnerable to this bias, in that patients who experience particularly high or low quality care may be more likely to participate (Bhopal 2002). For example, comment cards may be more likely to be completed by dissatisfied consumers, and patients who voluntarily participate in focus groups may have experienced especially remarkable care. Although questionnaires are also susceptible to this error (response rates as low as 23% feature in the published literature (Wigder, Johnson et al. 2003)), the impact of this bias can be minimized with a robust sampling strategy and careful study design (such as eligibility criteria and techniques to maximize participation).

3. Additional data: A standardised questionnaire can also obtain information on patient and clinical variables such as socio-demographic status or health/functional status. These data may not be available in routine data sources, but important to consider during analyses of results.

However, there are limitations to the standardised satisfaction survey. They are expensive tools to develop and administer: a robust questionnaire requires extensive consultation and research, and substantial testing before it can be considered valid and reliable in a given population. The administration of the survey also requires more time and resources than some other methods, such as feedback cards.

Secondly, although the standardised survey minimises the impact of bias from some sources, vulnerability to systematic error persists. For example, a 'ceiling effect' is commonly demonstrated in satisfaction scores, such that ratings tend to be clustered around the upper range. The skewed nature of the distribution makes it difficult to identify small changes in scores (such as in response to an intervention) or differences in satisfaction between groups (Hudak and Wright 2000). Other forms of response set bias (discussed in Section 5.3.2) may also impact on the validity of the measure.

Finally, results from published studies may not be comparable. Multiple questionnaires exist in the published literature, of which only some have been validated with psychometric testing (Sitzia 1999). Rubin noted in his literature review of 112 studies that *"none of the patient survey systems described has been designed and evaluated so that we know it is comprehensive, reliable and valid for quality measurement"* (Rubin 1990). Of the 181 quantitative satisfaction studies reviewed by Sitzia (1999), only eleven reported evidence of adequate psychometric testing. Researchers also differ in how they define satisfaction, the dimensions of satisfaction their tool is designed to measure, the method and mode of administration, the response formats applied, and the method of analysis. These deficiencies impact both on the accuracy of findings from satisfaction research, and the comparability of their results.

5.3.2 Validity-threatening factors

'Satisfaction' as an indicator of quality assumes that reports of patients' experiences reflect the standard of care they received during their inpatient admission. As with any proxy, there will be measurement error when using patient satisfaction to estimate the overall quality of hospital care. That is, there are variables that may confound the association between quality of care and satisfaction (conceptualised as C^{**} in Figure 5.3 below) or may influence satisfaction ratings independent of the care received (Z in the DAG below). These factors may be sources of measurement error in the use of satisfaction as a proxy for quality, altering the strength of Y - Y^* association. There may also be factors that are associated with ethnicity and satisfaction, independent of the quality of care (variables M^* and C^* in the figure below), such that the validity of Y^* as a quality indicator differs with ethnic group.

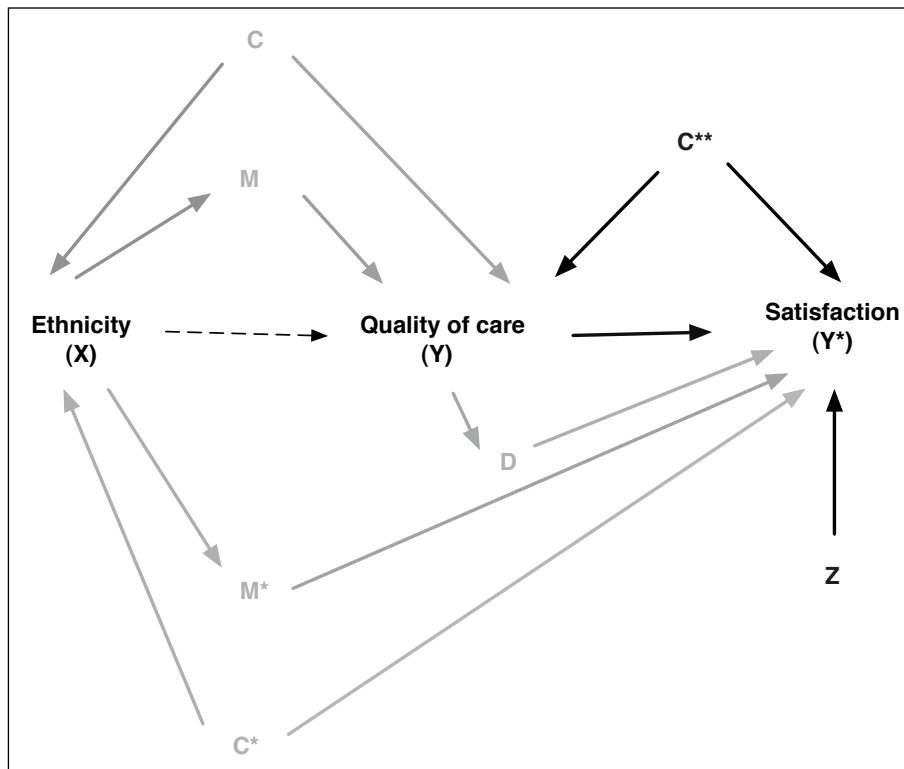


Figure 5.3: Measurement error when using satisfaction as a proxy for quality (DAG)

The following section discusses key sources of measurement error in the use of patient satisfaction as a proxy for quality: firstly, the issue of social desirability bias; secondly, acquiescence response set bias; and thirdly the impact of the mode and timing of administration. Finally, it discusses the potential for differential validity according to ethnic group of patient satisfaction as a proxy for quality.

5.3.2.1 Key sources of measurement error

SOCIAL DESIRABILITY BIAS

This type of error is present in the measurement of satisfaction by all methods, described by LeVois et al. as “clients may report greater satisfaction than they actually feel because they believe that positive remarks....are more acceptable” (LeVois, Nguyen et al. 1981 p140). An interviewer may contribute to this bias, encouraging ‘ingratiating responses’ (LeVois, Nguyen et al. 1981), whereby subjects see it as an opportunity to influence the staff of a program or service. Researchers recommend using neutrally-worded items to minimise this error, and that preserving the privacy and confidentiality of the client may also reduce the impact of this bias (for example, allowing the questionnaire to be self-administered) (Nederhof 1985).

ACQUIESCENCE RESPONSE SET BIAS

In the development of the Patient Judgement System by Ware and colleagues (discussed in detail in Appendix Three), they noted the impact of methodological factors on satisfaction ratings, observing that in some cases score variability was better explained by data-gathering methods than by the content of the questionnaire (Ware 1978). In particular, this team noted the effect of acquiescence response set bias, the *“tendency to agree with statements of opinion regardless of content”* (Ware 1978 p327). Patients were more likely to concur with positively phrased statements - for example, *“Doctors are very thorough”* (p330), and disagree if the item was phrased negatively - *“Doctors aren’t as thorough as they should be”* (p330). This bias is minimised by using neutrally worded items, balancing the number of positively and negatively phrased statements, and avoiding force-choice response scales (Hudak and Wright 2000).

ADMINISTRATION

1. Mode of administration: Satisfaction scores produced by self-administered questionnaire and interviews may differ. Larsson (2000) used the Quality from the Patient’s Perspective (QPP, see Appendix Three) questionnaire with forty-one matched pairs of medical inpatients to compare satisfaction obtained from self-administration of the survey with those from personal interview, finding the interviewed subjects reported less favourable scores on some subscales of the QPP. Conversely, LeVois et al. (1981) and Nguyen et al. (1983) found higher Client Satisfaction Questionnaire-8 scores were obtained by interview compared to self-administration. The results of these latter studies support the hypothesis that interviews may increase the impact of social desirability bias, and so overestimate quality of care (Nederhof 1985). Research has also shown that responses to ‘sensitive questions’ are more likely to be completed in self-administered surveys compared to personal interviews (Siemiatycki 1979). These studies illustrate the importance using the same mode of administration for all members of the study cohort (Hawthorne 2006).

2. Timing of administration: The time between discharge from hospital and the administration of the survey may impact on the validity of this measure. Stevens et al. (2006) reviewed satisfaction scores in 152 orthopaedic patients at discharge and after a time lag (ranging between one and twelve months), finding a significant reduction in satisfaction scores in the delayed survey. A similar finding was described by Hays et al. (1990) when they compared the scores obtained by the Patient Judgment System administered at less than thirty days, or more

than thirty days post-discharge. Conversely, Ley (1976) used a U-shaped curve to describe the relationship with satisfaction and time – reports were more favourable if attained while an inpatient or several months following discharge, as compared to scores obtained during the intervening period of time.

Are the results from a delayed administration of the survey more or less valid than those given at the point of discharge? Castle et al. (2005) suggest that although a shorter time lag between discharge and administration may have less measurement error (due to patients' ability to recall their experiences accurately), it is also possible that additional time allows patients to reflect on their experiences further and give more considered reports. Stevens et al. (2006) postulate that subjects may become more 'detached' with a greater time lag, and less likely to give socially desirable answers. However, it is also possible that improvements in the patient's clinical state over time may act to increase satisfaction independently, reducing the validity of satisfaction as a marker of the quality of care.

While researchers agree that the period of administration may change overall results, the optimal timing is unknown (Hays, Nelson et al. 1990; Westbrook 1993; Lin and Kelly 1995; Stevens, Reininga et al. 2006). There also seems to be no overall consensus in the published literature: in a review by Castle et al. (2005) of twenty-six studies utilising a mail-out survey, the lag time between discharge and posting varied between one week and six months, with the timing of administration evenly spread over this period. However, provided the satisfaction survey is administered within a reasonable time frame following discharge (such that the details of the admission can be adequately recalled), and is delivered to all patients at the defined time point post-discharge, this bias is unlikely to be practically significant.

3. Completion by proxy: The completion of questionnaires by a surrogate (such as a relative or care-giver) may not accurately reflect the experience of the patient. This may be due to social desirability bias, the proxy misinterpreting the patient's responses or behaviour, or may simply reflect the opinion of the surrogate instead of that of the patient. Although it is difficult to estimate the impact of this error, there has been some research to indicate that proxies may under-estimate a patient's true satisfaction (Walker and Restuccia 1984; Showers, Simon et al. 1995).

5.3.2.2 Differential validity according to ethnic group

Calnan (1988) suggested that an individual's evaluation of services included the goals of the patient (their "*images of health*", p927) and their previous experiences with services. He also proposes that the socio-political context of the health care system contributes to patient's satisfaction ratings. For example, a patient who pays out-of-pocket for medical care may expect a higher quality of care than one who receives his/her health care free of charge. In addition, there is evidence that members of some groups may systematically respond differently to questionnaires across a range of topics (Hui and Triandis 1989; Meisenberg and Williams 2008). For example, Ware (1978) reported that satisfaction ratings from participants with lower incomes and levels of education were more likely to be affected by acquiescence response set bias (that is, these social variables may act as M* factors in Figure 5.3, p144).

These observations have several implications. Firstly, results from satisfaction research are not necessarily transferable to other populations of patients, such as those in different countries, institutions or those with different socio-demographic profiles (Rosenthal and Shannon 1997). Secondly, satisfaction studies including patients with diverse backgrounds and characteristics may be vulnerable to differential measurement error. In this study, it is possible that expectations of care and health may differ between NZ Māori and NZ Europeans. If so, there is a plausible mechanism for differential measurement error (according to ethnic group) of satisfaction as an indicator of quality, independent of other variables. There are also processes involving indirect pathways that may introduce this bias, such as those involving socio-economic position or age.

While consideration of these variables in multivariable analyses may mitigate some of the impact of response tendency and other indirect pathways (Murray-Garcia et al. 2000), sources of misclassification bias inherent to ethnic group may be more difficult to identify and minimise. In spite of this, researchers do not tend to re-evaluate the properties of validated questionnaires in different populations, unless they require translation. Thus, although this measurement error may be present, its impact is unknown and is likely to vary with population and setting.

5.3.3 Validity of patient satisfaction: the evidence

The validity of satisfaction as a proxy for quality depends on how 'satisfaction' is defined and measured. That is, the properties of the specific questionnaire - including the method of its development, its items and psychometric characteristics - influence the impact of measurement error for this quality indicator.

This section has two key aims: firstly, to assess the validity of patient satisfaction as a proxy for quality as measured by questionnaire; and secondly, to choose a suitable and applicable survey tool for use in this study. To achieve these objectives, a three-part process was used. Firstly, a database search and literature review²⁶ was performed to create a shortlist of nine questionnaires for further assessment (Section 5.3.4.1). Secondly, four sets of criteria were developed to assess a survey's validity; and its suitability to our study population, setting, and resources (Section 5.3.4.2). Thirdly, these criteria were applied and the questionnaires compared, to select one valid and applicable survey for use in this study (results found in Section 5.3.4.3).

5.3.3.1 Literature review

The Embase (1988 – 2008 week 06) and Medline (1950 to 2008 week 05) databases were searched using the following OVID Medical Subject Headings:

- 'quality of health care'
- 'inpatients'
- 'patient satisfaction'
- 'questionnaires'
- 'health care surveys'
- '(survey\$ or questionnaire\$)' (title search)
- 'inpatients or hospital or in-patient' (multipurpose search)

²⁶ While a de novo questionnaire could be developed (and its properties subsequently assessed), given the finite time and resources of this study it was more practical to examine and compare the characteristics of an established patient satisfaction survey.

References were also obtained from bibliography review, internet search engines, and personal communications with District Health Board staff. Despite the focused terms, this search also retrieved articles and tools pertaining to outpatient or community-based services, and those that assessed patient satisfaction with focus groups or unstructured interview. These articles and those that did not identify a specific satisfaction instrument were excluded (138 references). The remaining 286 references described the use of more than 115 distinct survey tools. Questionnaire tools were selected for further assessment if they fulfilled the following criteria:

1. Patient satisfaction instruments were designed to assess the overall quality of care received. Accordingly, instruments that focused on a specific facet of health care delivery (such as nursing care, physician care, or pain control) were excluded.
2. Information regarding the psychometric properties and development of the tool was available in the primary or cited references.
3. An English translation of the patient satisfaction tool was available.

Nine tools²⁷ were selected for further review. Table 5.3 (p150) describes the dimensions of satisfaction associated with these instruments, and details their developers.

²⁷ Of note, the NZ Ministry of Health Inpatient Satisfaction Survey (currently employed in some District Health Boards) did not fulfil the criteria for this shortlist, as there is no information available regarding psychometric testing of the instrument (Crown Company Monitoring Advisory Unit 2000).

Table 5.3: Nine satisfaction tools selected for further review

Tool	Developer and setting	Items	Dimensions of care/satisfaction assessed
" <i>GENERALLY SPEAKING, WERE YOU SATISFIED BY THE INPATIENT CARE</i> "	S-H Cheng, M-C Yang, T-L Chiang. Taiwan. 1999 – 2000.	One item	General satisfaction.
PATIENT SATISFACTION QUESTIONNAIRE	J.E. Ware, M.K. Snyder, W.R. Wright. Virginia, USA. 1972 – 1984.	50 items. Seven dimensions	Accessibility/Availability/Convenience of care, Financial aspects of care, Technical competence, Interpersonal manner, Overall satisfaction with medical care, Communication, Time spent with doctor.
QUALITY OF CARE FROM THE PATIENT PERSPECTIVE	B. Wilde, B. Starrin, G. Larsson, M. Larsson. Karlstad, Sweden. 1991.	64 items. Four dimensions	Medical-technical competence, Physical-technical conditions, Identity-oriented approach, Sociocultural atmosphere.
CLIENT SATISFACTION QUESTIONNAIRE-8	D.L. Larsen, C.C. Attkisson, W.A. Hargreaves, T.D. Nguyen. San Francisco, USA. 1970s – 1980s.	Eight items	Designed to reflect nine dimensions of quality, but demonstrated to be a uni-dimensional tool to elicit general satisfaction.
PATIENT JUDGMENT SYSTEM	Hospital Corporation of America. Tennessee, USA. 1987 – 1989.	68 items. Nine dimensions	Admissions, Nursing and daily care, Medical care, Ancillary staff and hospital environment, Discharge and billing, Information, Overall quality of care and services, Recommendations and intentions, Overall health outcomes.
PRESS GANEY INPATIENT SURVEY	Press Ganey. Indiana, USA. Unknown*.	62 items. Ten dimensions	Admission, Room, Meals, Nursing care, Tests and therapy, Visitors and family, Doctor care, Discharge, Personal issues, Overall assessment of hospital.
PATIENT EXPERIENCES QUESTIONNAIRE	K.I. Pettersen, M. Veenstra, B. Guldvog, A. Kolstad. Nordbyhagen, Norway. 1996 – 1998.	24 items. Eleven dimensions	Overall quality, Humaneness, Competence, Outcome, Facilities, Continuity of care, Access, Informativeness, Cost, Bureaucracy, Attention to psychosocial problems.
SATISFACTION WITH HOSPITAL CARE QUESTIONNAIRE	Academic Medical Center. Amsterdam, Netherlands. Unknown*, validation study published 2002.	54 items. Twelve dimensions	Admission procedures, Nursing care, Medical care, Other disciplines (e.g. social work), Information, Patient autonomy, Emotional support, 'Hotel' aspects of care, Recreation facilities, Miscellaneous (e.g. rules and regulations), Ease of access to hospital, Discharge and aftercare.
PICKER INSTITUTE INPATIENT SURVEY	Picker Institute. Boston, USA. Unknown, early 1990s.	Eight dimensions. Varying number of items	Access; Respect for patient's values, preferences and expressed needs; Coordination and integration of care; Information, communication, and education; Physical comfort; Emotional support and alleviation of fear and anxiety; Involvement of family and friends; Transition and continuity.

* The developers do not publicly state when these tools were created.

5.3.3.2 Criteria for the assessment of patient satisfaction measurement tools

Four sets of factors were used to assess patient satisfaction instruments: validity (content, criterion, and construct), reliability and responsiveness, applicability to the NZ hospital inpatient, and the feasibility of its use within the study constraints.

VALIDITY

A valid tool is one that reflects and measures the concept under study accurately. As discussed in Section 5.2, researchers discern between content, criterion and construct validity (Sitzia 1999; Heidegger, Saal et al. 2006).

In satisfaction research, an instrument with good content validity “*contains items on all factors important to the trait under study*”, and uses “*appropriate formats to measure those factors*” (Sitzia 1999 p319). In his review, Sitzia (1999) assessed five elements of patient satisfaction surveys as evidence for content validity:

- Strategies used for item generation: Common approaches include literature review, expert opinion, piloting, and focus groups. Heidegger et al. (2006) states that the development of a questionnaire should incorporate input from patients and experts, and the findings of current research.
- Use of a discriminatory scale: Researchers in this field commonly use a Likert²⁸ scale to rate the items. Sitzia (1999) declared in his review that a five-point response scale was the minimum acceptable, such as that employed by Jenkinson et al. (2002c) who asked subjects to rate their care as ‘poor’, ‘fair’, ‘good’, ‘very good’, or ‘excellent’. However, other researchers prefer the benefits of a forced choice scale, such as one using only four points. These scales compel patients to decide if they are on the satisfied or unsatisfied side of the spectrum, and so avoid acquiescent response bias from subjects choosing the middle, ‘safe’ option (Toner 1987). However, forced choice scales may be more likely to suffer from social desirability bias, increasing the likelihood of subjects returning a more favourable score.

²⁸ A Likert or ‘summative’ scale is a unidimensional scale, where responses are graded evenly between the two endpoints. Subjects are asked to indicate their evaluation of a statement using one of the available options.

- Inclusion of open questions for comments: Some researchers believe that an open question allows the subject to draw attention to issues they feel have not been covered by the questionnaire, or to voice a specific concern (O'Cathain and Thomas 2004; Marcinowicz, Chlabicz et al. 2007).
- The number of items: A minimum of three items per subscale is accepted as good practice to maximise the reliability of the tool (Chapko, Bergner et al. 1985). However, Sitzia (1999) also interpreted the total number of items of the questionnaire as evidence of its coverage of the concept of satisfaction.
- Strategies used for content testing: These include assessment of the distribution of the scores, and the ability of the tool to discriminate between subjects with different levels of satisfaction.

Sitzia states that criterion validity is *"the correlation of the new scale with some other measure of the trait under study"* (Sitzia 1999 p320). A common approach to its assessment is the comparison of satisfaction scores with a measure of behavioural intention, such as whether the subject plans to recommend the institution to others, or to return to it in the future. Satisfaction may also be correlated with a future outcome, such as a change in medical practitioner or attendance at appointments. The assessment of criterion validity considers the strength of these correlations as well as the criteria employed.

Finally, Sitzia (1999) cites the ability of a tool to discriminate between known divergent or convergent groups as evidence of construct validity, *'the extent to which an instrument measures an underlying latent construct'* (Hawthorne 2006 p258). A tool with this quality demonstrates variability in scores according to proven correlates: for example, higher satisfaction in older compared to younger age groups (Wilkin, Hallam et al. 1992).

RELIABILITY AND RESPONSIVENESS

Satisfaction researchers (Wilkin, Hallam et al. 1992; Sitzia 1999; Hawthorne 2006; Heidegger, Saal et al. 2006) recommend also assessing the reliability and responsiveness of a tool when

evaluating validity²⁹. Reliability describes the amount of random error inherent in the instrument, such that it produces “*the same results in repeated applications on an unchanged population or phenomenon*” (Wilkin, Hallam et al. 1992 p29). Reliability is commonly assessed by one of two techniques: test-retest measurement, or by calculating the internal consistency of the instrument.

- Test-retest reliability is assessed after administering an instrument to the same population at different times. This property is generally expressed as a correlation coefficient, measuring the relationship between the scores obtained at the two time points.
- The internal consistency of the questionnaire describes the extent to which the items within a dimension measure the same construct, and can be estimated from the calculation of Cronbach’s α scores on the items of the subscale. Generally a score of greater than 0.7 is desirable, although scores more than 0.5 may be considered adequate for group comparisons (Chapko, Bergner et al. 1985; Hawthorne 2006; Heidegger, Saal et al. 2006; Leite, Jerosch-Herold et al. 2006).

In contrast, responsiveness describes the sensitivity of the tool to change, whether to time, place or intervention. There is no agreed protocol for estimating responsiveness (Leite, Jerosch-Herold et al. 2006), and in practice researchers make few and limited attempts to assess this quality when validating an instrument (Wilkin, Hallam et al. 1992).

APPLICABILITY

Aotearoa has a unique health care system. Although some private tertiary health services are available on a fee-for-service basis, the Ministry of Health contracts regional District Health Boards to purchase and provide public hospital care for their populations. Thus, although hospital care may be rationed according to need, acute services are provided at no direct financial cost to the patient. Questionnaires designed for health care systems that incorporate a user-pays aspect may not be applicable for measuring satisfaction with hospital care in Aotearoa. Similarly, the physical process of admission to hospital may be different to those for which the questionnaire was designed (for example, some US hospitals require the completion

²⁹ Although not explicitly assessed in Section 5.2 with regards to readmission, the studies investigating readmission as a proxy for quality gave evidence for responsiveness and reliability, in that they showed variation in the risk of readmission over time, place and person; and the ability of the marker to reflect changes in health care quality.

of extensive paperwork), as might the delivery of care. Some questionnaire tools may have been developed specifically for a defined clinical population (such as cancer patients), requiring the modification or exclusion of items in order to be relevant to general hospital inpatients. Therefore, the items of each of the nine questionnaires were subjectively assessed to consider the applicability of the instrument to the NZ inpatient environment.

FEASIBILITY

The use of some tools may be limited by copyright or commercial controls; others require financial payment, or require the data analyses to be performed by the proprietor. This criterion considered the accessibility of the tool, in terms of its affordability and intellectual property restrictions.

These four sets of factors (validity, reliability and responsiveness, applicability, and feasibility) were examined with respect to each of the nine short-listed patient satisfaction instruments. The scoring system used to assess these criteria is noted in Table 5.4 (p155). The results of the assessment are summarised in the following section, however the details of the individual survey tools can be found in Appendix Three.

Table 5.4: Criteria and scoring system applied in the assessment of satisfaction instruments

Dimension	Criteria applied	Scoring
CONTENT VALIDITY	<p>Two or more methodologies employed for item generation.</p> <p>Minimum five-point response scale.</p> <p>Inclusion of open question.</p> <p>Minimum of three items per subscale.</p> <p>Evidence of scales ability to discriminate between patients with different levels of satisfaction.</p>	<p>'-' one criterion met.</p> <p>'+' two or three criteria met.</p> <p>'++' four or five criteria met.</p> <p>If unable to independently assess associated supporting evidence, the criteria were considered not fulfilled.</p>
CRITERION VALIDITY	Robust evidence of correlation/association between scores and related outcome.	<p>'-' no evidence of testing.</p> <p>'+' evidence of testing but findings inconsistent or methodology flawed.</p> <p>'++' robust evidence.</p>
CONSTRUCT VALIDITY	Robust evidence for association of scores with known correlates; or difference in scores noted between two divergent groups.	<p>'-' no evidence of testing.</p> <p>'+' evidence of testing but findings inconsistent or methodology flawed.</p> <p>'++' robust evidence.</p>
RELIABILITY	Test-retest reliability or internal consistency of scale demonstrated.	'-' no evidence of either reliability or responsiveness.
RESPONSIVENESS	Robust evidence of response of scale to changes in time, place, or intervention.	<p>'+' robust evidence of one of these features.</p> <p>'++' evidence of both of these features.</p>
APPLICABILITY	Need for modification for a non-user pays setting, and availability of validated English translation.	<p>'-' requires modification by removal of items or validation of translation.</p> <p>'+' no modification required or validated English translation exists.</p> <p>'++' no modification required and validated English translation exists.</p>
FEASIBILITY	Cost and/or commercial restrictions placed on survey.	<p>'-' unable to be employed due to copyright/commercial restrictions.</p> <p>'+' associated with a fee for use.</p> <p>'++' no charge or restrictions.</p>

5.3.3.3 Results

This review found that the psychometric properties of the profiled survey tools are often inadequately evaluated or reported, a finding described by other researchers also (Sitzia 1999). However, it is still possible to compare the nine questionnaires according to validity, reliability and responsiveness, applicability and feasibility. The two tables (5.5 and 5.6) below summarise the tools with respect to these criteria.

Table 5.5: Review of satisfaction tools according to content validity

Survey	Item generation method	Response scale	Open question	Items per subscale	Content testing performed	Overall rating
SINGLE-ITEM	Unknown	Three-point	No	1	Yes	-
PSQ-III	Multiple strategies	Five-point	No	2 -12	Yes	+
64-ITEM QPP	Multiple strategies	Four-point	No	2 – 6	Yes	+
CSQ-8	Multiple strategies	Four-point	Yes	8	Yes	++
PJS	Multiple strategies	Five-point	Yes	2-14	Yes	++
PRESS GANEY INPATIENT SURVEY	Multiple strategies, but unable to assess methods	Five-point	Yes	4-9	Unknown	-
PEQ	Multiple strategies	Ten-point	No	2-5	Yes	+
SHCQ	Unknown	Ten-point	No	2-5	Yes	+
PICKER INSTITUTE INPATIENT SURVEY	Multiple strategies, but unable to assess methods	Two-point	No	3-8	Yes	-

PSQ-III = Patient satisfaction Questionnaire III, QPP = Quality from the Patient's Perspective, CSQ-8 = Client Satisfaction Questionnaire-8, PJS = Patient Judgment System, Press Ganey = Press Ganey Inpatient Survey, PEQ = Patient Experiences Questionnaire, SHCQ = Satisfaction with Hospital Care.

Table 5.6: Review of satisfaction tools according to validity, reliability and responsiveness, feasibility and practicality

Tool	Content validity	Criterion validity	Construct validity	Reliability and responsiveness	Applicability	Feasibility
SINGLE ITEM RATING: "GENERALLY SPEAKING, WERE YOU SATISFIED BY THE INPATIENT CARE"	-	+ Inconsistent findings in assessment of criterion validity.	-	-	+ No modification required but English translation not formally validated.	++
PSQ-III	+	++	+ Testing performed but may be impaired by the association between scores and well- being/life satisfaction.	+ Reliability demonstrated with assessments of internal consistency and test-retest. No evidence of assessment of responsiveness.	+ Requires modification but validated in English.	+
64-ITEM QPP	+	-	+ Limited evidence of construct validity beyond variation of scores with known satisfaction correlates.	+ Internal consistency adequate. No evidence of assessment of responsiveness.	+ No modification required, but English translation not formally validated.	++
CSQ-8	++	++	++	++ Internal consistency adequate. Responsiveness demonstrated with ability to distinguish interventions.	++	+

PSQ-III = Patient Satisfaction Questionnaire III, QPP = Quality from the Patient's Perspective, CSQ-8 = Client Satisfaction Questionnaire-8.


Tool	Content validity	Criterion validity	Construct validity	Reliability and responsiveness	Applicability	Feasibility
PJS	++	++	++	+ Reliability demonstrated with assessments of internal consistency and test-retest. No evidence of assessment of responsiveness.	+ Requires modification but validated in English.	++
PRESS GANEY	-	UA Company publication describes criterion validity using 'intention to recommend'.	Unknown	UA Internal consistency reported but unable to independently assess. Unknown if responsiveness has been assessed.	++	+
PEQ	+	++	++	+ Reliability demonstrated with assessments of internal consistency and test-retest. No evidence of assessment of responsiveness.	+ No modification required, but English translation not formally validated.	++
SHCQ	+	++	++	+ Internal consistency adequate. No evidence of assessment of responsiveness.	-	++
PICKER INSTITUTE INPATIENT SURVEY	-	++	++	+ Internal consistency adequate. No evidence of assessment of responsiveness.	++	+

PJS = Patient Judgment System, Press Ganey = Press Ganey Inpatient Survey, PEQ = Patient Experiences Questionnaire, SHCQ = Satisfaction with Hospital Care, UA = Unable to independently assess the methodological detail of the studies concerned.

The Client Satisfaction Questionnaire-8 (CSQ-8) scored the highest out of all nine instruments. Although this instrument is discussed in detail in Appendix Three, the following section provides a brief overview of its development and properties:

CLIENT SATISFACTION QUESTIONNAIRE-8

CSQ-8 UK English



CLIENT SATISFACTION QUESTIONNAIRE

CSQ-8

Please help us improve our service by answering some questions about the help that you have received. We are interested in your honest opinions, whether they are positive or negative. *Please answer all of the questions.* We also welcome your comments and suggestions. Thank you very much. We appreciate your help.

CIRCLE YOUR ANSWERS

1. How would you rate the quality of service you received?

4 <i>Excellent</i>	3 <i>Good</i>	2 <i>Fair</i>	1 <i>Poor</i>
--------------------	---------------	---------------	---------------

2. Did you get the kind of service you wanted?

1 <i>No, definitely not</i>	2 <i>No, not really</i>	3 <i>Yes, generally</i>	4 <i>Yes, definitely</i>
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3. To what extent has our service met your needs?

4 <i>Almost all of my needs have been met</i>	3 <i>Most of my needs have been met</i>	2 <i>Only a few of my needs have been met</i>	1 <i>None of my needs have been met</i>
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4. If a friend were in need of similar help, would you recommend our service to him or her?

1 <i>No, definitely not</i>	2 <i>No, I don't think so</i>	3 <i>Yes, I think so</i>	4 <i>Yes, definitely</i>
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5. How satisfied are you with the amount of help you received?

1 <i>Quite dissatisfied</i>	2 <i>Indifferent or mildly dissatisfied</i>	3 <i>Mostly satisfied</i>	4 <i>Very satisfied</i>
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6. Have the services you received helped you to deal more effectively with your problems?

4 <i>Yes, they helped a great deal</i>	3 <i>Yes, they helped somewhat</i>	2 <i>No, they really didn't help</i>	1 <i>No, they seemed to make things worse</i>
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7. In an overall, general sense, how satisfied are you with the service you received?

4 <i>Very satisfied</i>	3 <i>Mostly satisfied</i>	2 <i>Indifferent or mildly dissatisfied</i>	1 <i>Quite dissatisfied</i>
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8. If you were to seek help again, would you come back to our service?

1 <i>No, definitely not</i>	2 <i>No, I don't think so</i>	3 <i>Yes, I think so</i>	4 <i>Yes, definitely</i>
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Figure 5.4: The Client Satisfaction Questionnaire-8

Background: D.L. Larsen and colleagues developed the CSQ forms in the early 1970s at the University of California, aiming to produce an instrument with adequate variability of scores, enabling robust comparisons between settings and patients. The CSQ was intended to be practical, user-friendly, and applicable to different settings and services.

Validity: The eight-item version of the CSQ was developed after literature review (producing a construct of satisfaction with nine key dimensions), expert opinion (to reduce an initial pool of eighty-one items down to thirty-one), field-testing, and factor analyses. There is a four-point Likert response scale, necessitating a forced choice option, and the CSQ-8 includes a section for subjects to make general comments. The items of the tool are shown in Figure 5.5 above (p153).

With only eight questions, this tool does not measure satisfaction as a multidimensional construct and primarily reflects general satisfaction with services (that is, it is a uni-dimensional tool), and psychometric testing demonstrates good coverage of this concept (Larsen, Attkisson et al. 1979; Attkisson and Greenfield 1996; Hawthorne 2006). Larsen and colleagues (1979) showed its predictive validity with associations between client satisfaction and drop-out rates from a community mental health program; they also described a small correlation between satisfaction and missed appointments and a significant association between the therapist-rated satisfaction (with their work with the client) and client satisfaction ratings. Attkisson and Zwick (1982) reported the use of the CSQ-8 in a sample of mental health outpatients and identified correlations between satisfaction score and remaining in the programme beyond one month (correlation coefficient = 0.57) and with the number of sessions attended during that time period (correlation coefficient = 0.56). There is evidence that CSQ-8 scores vary according to employment status, gender, and ethnicity (Larsen, Attkisson et al. 1979; Gamst, Aguilar-Kitibutr et al. 2003; Jayadevappa, Johnson et al. 2007).

Reliability and responsiveness: The initial testing of the CSQ-8 on a sample of 248 mental health clients demonstrated high internal consistency, with a Cronbach's α score of 0.93 (Larsen, Attkisson et al. 1979). Subsequent testing by the developer in a smaller outpatient population yielded similar results, and other researchers have also reported high internal consistency (Gamst, Aguilar-Kitibutr et al. 2003; De Wilde and Hendriks 2005). Responsiveness has been demonstrated by the developers by comparing patient scores before and after an intervention (Attkisson and Zwick 1982).

Applicability: The CSQ-8 has been used extensively by clinicians and researchers throughout general practice, mental health and inpatient settings; including countries in which the care is provided at no cost to the patient. For example, there is published research documenting its use in Australia (Unwin and Sheppard 1995), Canada (Oxorn, Ferris et al. 1997) and the UK (Kucheria, Sahai et al. 2005); the developer has also supplied the survey to researchers in NZ (Attkisson 2007).

Feasibility: Despite the survey being in the public domain, permission must be formally obtained to use this tool and a fee per survey applies (Attkisson and Greenfield 1996). However, this fee is moderate and within the resource constraints of this study.

COMPARISON OF INSTRUMENTS

As stated, the CSQ-8 was the highest scoring tool in this review. Other high-scoring surveys were the Patient Judgment System (PJS), the Satisfaction with Hospital Care tool (SHCQ), and the Patient Experiences Questionnaire (PEQ).

The **SHCQ**, **PEQ** and **Quality from the Patient's Perspective** (QPP) surveys were originally developed in a language other than English, and have had limited use in a English-speaking populations. Although translations of these questionnaires exist, the properties of the modified instruments have not been extensively evaluated and cannot be assumed to perform comparably in a different language. Sitzia (1999) asserts that *"even well-tested instruments should be re-evaluated if the subject group or study context is different to that in which the instrument was tested"*. (Sitzia 1999 p325-326)

Assessment of the **Press Ganey** and **Picker Institute inpatient instruments** was limited, as the methodological details of the psychometric testing were inaccessible due to commercial sensitivities. Therefore, it was not possible to independently assess some evidence pertaining to the properties of the instruments; this issue particularly affected the evaluation of the Press Ganey tool. The **single-item questionnaire** employed by Cheng et al. (2003), although inherently efficient, was associated with insufficient evidence of validity and reliability, and scored poorly in this review.

CSQ-8, **PJS**, and the **Patient Satisfaction Questionnaire-III** (PSQ-III) have all been thoroughly tested; and in their original forms display adequate validity and reliability. While the PJS and

PSQ-III are freely available, the use of the CSQ-8 is associated with a moderate fee. The CSQ-8 is considered to be a uni-dimensional tool only, reflecting general satisfaction with care. The longer PJS and PSQ-III surveys may better represent the multidimensional construct of satisfaction, and provide information about aspects of health care quality that may be deficient. (Although not a criterion in this review, the greater coverage of these tools reflects their higher number of items; it is possible that their scores may be more vulnerable to bias due to missing items or poor response). The PJS would require significant modification and removal of items (as would the PSQ-III) to be applicable to a free-of-charge hospital service. Although the CSQ-8 refers to 'program' or 'services' where the term 'hospital' would be more appropriate, some researchers provide an explanatory paragraph to guide the patients, and so mitigate the need for modification. The adaptation required by the PJS and PSQ-III to ensure their applicability may impair the validity of the tool, and the psychometric properties of a modified version should be tested prior to use.

SUMMARY

The objectives of this section were to assess the validity of patient satisfaction as a proxy for quality as measured by questionnaire, and choose a suitable and valid instrument for use in this study - one that would be able to compare satisfaction ratings between samples of NZ Māori and NZ European inpatients.

The review found that none of the nine profiled instruments were perfect for application in the NZ publicly-funded hospital environment. It also concluded that all of the questionnaires were flawed in the extent and quality of their psychometric testing. This review has limitations - some relevant literature may not have been located in the search, which was largely limited to three databases of published research, and the selection and assessment of instrument qualities (although criteria-based) included some subjectivity. However, other researchers have made similar conclusions. In his examination of nine patient satisfaction instruments, Hawthorne (2006) similarly concluded that none was sufficiently validated to justify its unreserved use in the Australian health system. Sitzia (1999) assessed 195 studies containing patient satisfaction instruments and found that the tools used in only 6% of the studies fulfilled their criteria for validity and reliability. Carr-Hill recommends researchers accept this situation, advising that *"the search for the 'holy grail' of a standardized patient satisfaction questionnaire should be discouraged"* (Carr-Hill 1992 p248).

Overall, the criteria applied to assess the nine questionnaires in this section found the CSQ-8 to be the highest-scoring satisfaction tool; with evidence for content, criterion and construct validity of its ratings for the overall quality of care. The review also concluded the CSQ-8 was applicable to the populations and settings of this study. Although a fee is required for its use, this is moderate in comparison to those charged by Press Ganey and the Picker Institute, and is feasible within the study budget.

5.3.4 Summary

The standardised questionnaire has many advantages, not the least is its ability to produce a mathematical score to compare populations, settings and changes over time. There are multiple circulating satisfaction surveys available; however many of these are unsuitable for use in the NZ 'free-of-charge' public hospital system. More importantly, the majority of these tools have had limited psychometric testing to assess their validity as an indicator for health care quality.

The literature review in this section examined the characteristics of nine pre-validated surveys, many of which minimised the impact of common 'validity threatening factors' (such as social desirability or acquiescence response set bias) in their design. The CSQ-8 was one of these tools, with research supporting its criterion, construct and content validity as a marker of the overall quality of care. It was also the highest scoring instrument out of the nine assessed, according to the criteria applied in this review (validity, reliability and responsiveness, applicability to the study context, and feasibility of use within study constraints). Overall, the CSQ-8 was assessed as an applicable and valid tool for use in the NZ hospital population, and patient satisfaction as measured by this questionnaire was selected as an indicator for use in this study.

5.4 SUMMARY

Donabedian (1966 p716) likens the pursuit for *“easy ways to measure a highly complex phenomenon such as medical care”* to pursuing a *“will-o-the-wisp”*. Perera et al. (2007) state that finding an evidence-based tool to assess performance is like *“panning for gold”*. It is probable that no perfect indicator exists for this research context, and that no single measure is able to reflect the multi-dimensional nature of quality while also representing the unique perspectives of the population involved.

The rate of readmission has strengths as an indicator of quality, including evidence for its validity and its ability to be calculated from routinely-collected data. As a direct representation of morbidity, readmission is an outcome of importance for patients. It is also of interest for health service funders, due to the extensive resources required to treat patients in hospital. For example, Miles and Lowe (1999) estimated that highly preventable readmissions cost the John Hunter hospital and those hospitals in the surrounding areas Aust\$1.5 million annually, and used 2,112 bed days. Anderson and Steinberg (1984) demonstrated that the 23% of patients who experienced at least one readmission in the four years of their study consumed 80% of the hospital expenditure for that period. However, care must be taken to minimise the impact of bias when using this measure and when interpreting its estimates.

Patient satisfaction is an important dimension of the quality of health care, as an indicator of the interpersonal processes involved in the delivery of health services. Numerous satisfaction surveys have been employed in the literature, although proportionally few of these have been adequately tested or validated. The CSQ-8 is a uni-dimensional tool developed for the measurement of satisfaction in community mental health patients, but has been used for the assessment of hospital patients internationally. It is a survey suitable for the NZ inpatient, with demonstrated content, criterion and construct validity.

PART THREE

Methods

CHAPTER SIX:

METHODS

“A fool-proof method for sculpting an elephant: first, get a huge block of marble; then you chip away everything that doesn't look like an elephant.”

Author Unknown

This study aims to investigate the quality of care for Māori and NZ Europeans at public hospitals in Aotearoa. Part Three is comprised of only one chapter, and describes the methods used to obtain, calculate and analyse the two selected indicators in order to compare the quality of hospital care for NZ Māori and European inpatients.

The chapter is structured into two parts. Section 6.1 describes how the odds of readmission for the two ethnic groups was calculated and compared ('Phase One'); including data sources, eligibility criteria, and sample size. The structural DAG framework discussed in Chapters Two and Five is used to identify and explore the role of potential confounders and mediators, and the methods used in the descriptive and multivariate analyses are given.

'Phase Two' is discussed in Section 6.2, describing how patient satisfaction scores were obtained and analysed. The development of the survey is described, along with the sampling strategy and inclusion/exclusion criteria. Again, the DAG paradigm guides the choice of potential covariates, and their positioning in multivariable models. Finally, Section 6.3 gives a brief summary of the chapter.

6.1 CALCULATION OF READMISSION RATE

Chapter Five discussed the validity of readmission rate as an indicator of the quality of care. This section describes how this measure was applied to a NZ population, in order to assess the association between patient ethnicity and the quality of care (Phase One of this study). This section is structured into five parts:

- 6.1.1 describes definitions and data sources employed in Phase One of the study.
- 6.1.2 considers the study population and inclusion/exclusion criteria.
- 6.1.3 discusses sample size, power and study duration.
- 6.1.4 identifies potential confounders and mediators.
- 6.1.5 describes the data analyses (both descriptive and multivariable) performed.

6.1.1 Definitions and data sources

Taking the findings of Chapter Five into consideration, the following definitions were formed:

Table 6.1: Definitions employed in Phase One of the study

Exposure	Outcome
ETHNIC GROUP: Dichotomised into NZ Māori and NZ European.	THE RISK OF READMISSION (A PROXY FOR THE QUALITY OF CARE), DEFINED AS: The number of distinct patients experiencing an unintended acute public hospital admission or death in the community within thirty days of discharge following an index admission, divided by the number of distinct patients discharged alive within the reference period. Denoted as 'RoD'

The definition of 'readmission or death' (for ease, the term will be shortened to 'RoD' in the remainder of this document) is consistent with that used by many researchers, and reduces measurement error of the outcome 'quality of care' in a number of ways.

1. The choice of observation period aims to maximise the sensitivity of the proxy, while maintaining an adequate specificity for quality of care.
2. It includes community deaths in the numerator, and excludes those who died while in hospital from the denominator.
3. It specifies 'unintended' admissions only, avoiding the false positive readmissions due to planned events in the management of a condition.
4. Readmissions are not restricted to those occurring at the same hospital as the index admission, but the numerator includes those to all public hospitals nationwide.
5. Finally, it specifies the numerator as the 'number of distinct patients...' experiencing RoD, as opposed to the number of discharges, reducing the bias that may arise from patients who have multiple readmissions during the observation period.

The National Minimum Data Set was the primary data source for Phase One. This resource contains data about patients admitted to all public hospitals in NZ, compulsorily submitted by these facilities since 1993. The New Zealand Health Information Service supplied the data as collected from public hospitals throughout the country, including a readmission indicator.

6.1.2 Study population

ELIGIBILITY FOR STUDY POPULATION

The criteria for inclusion in the study population were defined as:

- Age: 18 years and over at time of index admission³⁰
- Discharged to home from index admission³¹
- Length of stay > 1 night (index admission)³²

³⁰ The National Minimum Data Set age field refers to age at discharge. In this study, subjects aged over 17 years at discharge were identified initially, with a manual check is performed to confirm that all patients were 18 years or over at the time of admission to hospital.

³¹ This event end-type excludes patients who were discharged to another health care facility, those who self-discharged, those who were discharged to another service within the same hospital, and those who died during their admission.

- New Zealand resident status (index admission)
- Admission for one of nine defined surgical procedures (index admission)
- Routine admission source (index admission)³³

These criteria sought to further improve the validity of readmission as a proxy for quality of care. Firstly, the impact of discharge destination was reduced by restricting eligibility to patients discharged to home; and secondly, foreign nationals and non-residents (whose financial arrangements for health care may act to encourage or dissuade readmission) were excluded. Thirdly, the criterion 'routine admission source' excluded patients who were transferred from other facilities, who were considered a source of 'adverse selection'. Fourthly, the minimum length of stay criterion excluded uncomplicated day-stay patients who may have an inherently lower risk of readmission, due to clinical factors.

Finally, the criteria restricted eligibility according to clinical characteristics. As discussed in Chapter Five, case-mix has an impact on the validity of this marker as a proxy for quality, and some researchers choose to limit readmission analyses to discrete diagnoses to enhance its specificity for the quality of care. For example, the US Department of Health and Human Services uses readmissions following admissions for myocardial infarction, heart failure and pneumonia only to rate the performance of hospitals. Given that readmissions occurring after a surgical index admission are thought to be more 'avoidable', with a greater specificity for quality than those occurring after medical admissions (Heggestad and Lilleeng 2003; Jimenez-Puente, Garcia-Alegria et al. 2004); some researchers further restrict eligibility to patients experiencing surgical procedures only. Examples of sets of procedures employed for this purpose include:

- Appendicectomy, caesarean section, cholecystectomy, transurethral prostatectomy (Welch, Larson et al. 1992).
- Hysterectomy, repair of hip fractures, and ambulatory surgical procedures (Clinical Outcomes Working Group 2002).

³² Length of stay equates to 'midnights spent in hospital'. i.e. a length of stay of two may include portions of four days, but only two overnight stays.

³³ The 'Routine' code represents patients admitted from the community, so excludes those transferred from other hospital facilities.

- Cholecystectomy, hysterectomy, and prostatectomy (Roos, Cageorge et al. 1986).
- Transurethral prostatectomy, hysterectomy, major joint replacement, cholecystectomy, herniorrhaphy (Kable, Gibberd et al. 2004).

This study also applied this approach, and eligibility for this phase of the study was restricted to patients who experienced one of a defined set of surgical procedures only. The selection of diagnoses was based on two factors: the frequency of these procedures, and those used by researchers in this capacity. After review of published literature and the most commonly performed procedures at public hospitals in NZ 2001/02, and the elimination of surgeries primarily associated with the treatment of malignancy or which were investigatory only, the following conditions were selected for inclusion in the study (the International Classification of Disease-10 (ICD-10-AM) codes for these procedures are documented in Appendix Four):

- Coronary artery bypass graft (CABG)
- Hip arthroplasty (HA)
- Repair of inguinal hernia (IH)
- Cholecystectomy (CH)
- Hysterectomy (those not associated with malignancy) (HYST)
- Knee arthroplasty (KA)
- Appendicectomy (APP)
- Cataract removal (CAT)
- Minimally invasive procedures for Benign Prostatic Hypertrophy (BPH, defined in Appendix Four)

The fields and codes of the National Minimum Data Set corresponding to the inclusion criteria are given in the following table:

Table 6.2: Inclusion criteria for study population as identified in the National Minimum Data Set

Inclusion criteria	NMDS domain	Coded as:
> 17 YEARS	Age at discharge	">17"
DISCHARGED TO HOME	Event end type	"DR"
ADMISSION SOURCE	Admission source code	"R"
LENGTH OF STAY	Length of stay	">0"
NEW ZEALAND RESIDENT	New Zealand resident	"Y"
EXPERIENCED ONE OF THE DEFINED PROCEDURES DURING THE ADMISSION	Operation codes (01-10)	ICD-10-AM codes, noted in Appendix Four.
PUBLIC HOSPITAL ADMISSION	Facility type	"01"
NZ MĀORI OR NZ EUROPEAN	Prioritised ethnicity	"21" or "11"

ICD-10-AM = International Classification of Disease version 10, NMDS = National Minimum Data Set, 'R' = Routine admission source, DR = Routine discharge, Y=Yes.

READMISSION CRITERIA

Subjects who satisfied the eligibility criteria for inclusion were included in the numerator of the ratio if they were readmitted/deceased within thirty days of discharge from the index admission, provided this readmission was unplanned (so excluding patients whose readmission were arranged or elective – noted in the National Minimum Data Set admission field with 'AC' or 'ZC'). 'All-cause readmission' was employed, with no restrictions placed on the principal diagnosis of the admission (this choice is discussed in Appendix Six). The readmission indicator was supplied by the New Zealand Health Information Service, whereas a death marker was calculated from the fields noting the date of death and date of discharge. These two criteria were combined to create the indicator 'RoD'.

6.1.3 Sample size, power and study period

The following information was considered to calculate the required sample size for this phase of the study:

1. The frequency of readmission in the study population: The rate of readmission may vary with patient characteristics; such as age, case-mix, and disease severity; as well as aspects of its definition (such as observation period) and features of the hospital (these factors are all discussed further in Section 6.1.4). In an adult NZ medical and surgical sample, Davis et al. (2007) reported a 30-day rate of unplanned readmission of 5.4 -5.9% (1990 – 2001). Rumball-Smith et al. (2009) described a higher rate in NZ elective surgical patients of 7.9 – 8.5% (2000 – 2004); however, this study was restricted to elderly patients (who may have an increased likelihood of this outcome) and also included death within thirty days of discharge in the numerator. In Manitoba, Roos et al. (1995) showed rates of readmission within thirty days of discharge as low as 1.7% in women post-elective hysterectomy.

2. The effect size to detect: In her study of elderly elective surgical patients, Rumball-Smith et al. (2009) found that NZ Māori had approximately a 60% increase in risk of readmission (this estimate adjusted for age only). However, researchers in the US detect significant differences of only 10-20% in the ratios between ethnic groups (Jiang, Andrews et al. 2005; Menachemi, Chukmaitov et al. 2007).

3. The proportion of inpatients in the study population who identify as NZ Māori: In two studies performed by Davis et al. (2006; 2007), 14-15% of their inpatient samples identified as NZ Māori; and the Ministry of Health reported around 16% of their inpatient hospital discharges over 2006/2007 were patients who identified as Māori (Ministry of Health 2010b). Clearly, the proportion will differ with eligibility criteria: for example, Māori made up only 4.2% of a sample of elderly elective surgical patients in the study by Rumball-Smith et al. (2009).

4. Power: In accordance with common practice, the probability of a type II error (β , the likelihood of the test failing to reject the null hypothesis when it is false) is set at 0.2, with power defined as $1 - \beta = 0.8$. That is, there is an 80% chance that the test will detect a difference in the risk of RoD between the two ethnic groups if this difference exists.

5. Level of significance: The probability of rejecting the null hypothesis if it is in fact true (α), was defined as 0.05, in accordance with common practice.

To reduce some of the uncertainty around estimates of readmission frequency and the proportion of Māori in the eligible population, the inclusion/exclusion criteria above were applied to data from 2003/04. Of the 15,706 eligible patients, 13.8% were coded as being of NZ Māori ethnicity, and readmission occurred at a frequency of 8.4%. Using this information, the sample size needed to identify a difference in the rate of readmission between two ethnic groups (should a difference exist) was estimated with the following conservative scenario:

$\alpha = 0.05$, $\beta = 0.2$. If the difference in proportions is very small (i.e. 10%), the risk of readmission is moderate (7%), and the ratio of NZ European to NZ Māori in the study population approximately 6:1; Fisher's exact test (two-sided) for comparing the proportions of an outcome between two independent groups estimates the total sample size required as 76386³⁴.

Given approximately 15,000 eligible patients annually, it was estimated that six years of data were required to demonstrate a difference in readmission rates between the two groups, should it exist. Accordingly, the study period was defined as July 1 2002 – June 30 2008.

6.1.4 Selection of covariates

This phase of the study aims to explore the net effect of ethnic group (the exposure, X) on quality of care (the outcome, Y), using a proxy (RoD, Y*) as a substitute for Y. Accordingly, variables that lie on indirect or backdoor pathways between ethnicity and quality of care or between ethnicity and readmission (that is, those mediating or confounding these associations) should be controlled to minimise their impact. This is illustrated in the following DAG, where potential confounders and mediators of the ethnicity-RoD and ethnicity-quality associations are given in **bold**:

³⁴ (Dupont and Plummer 1990)

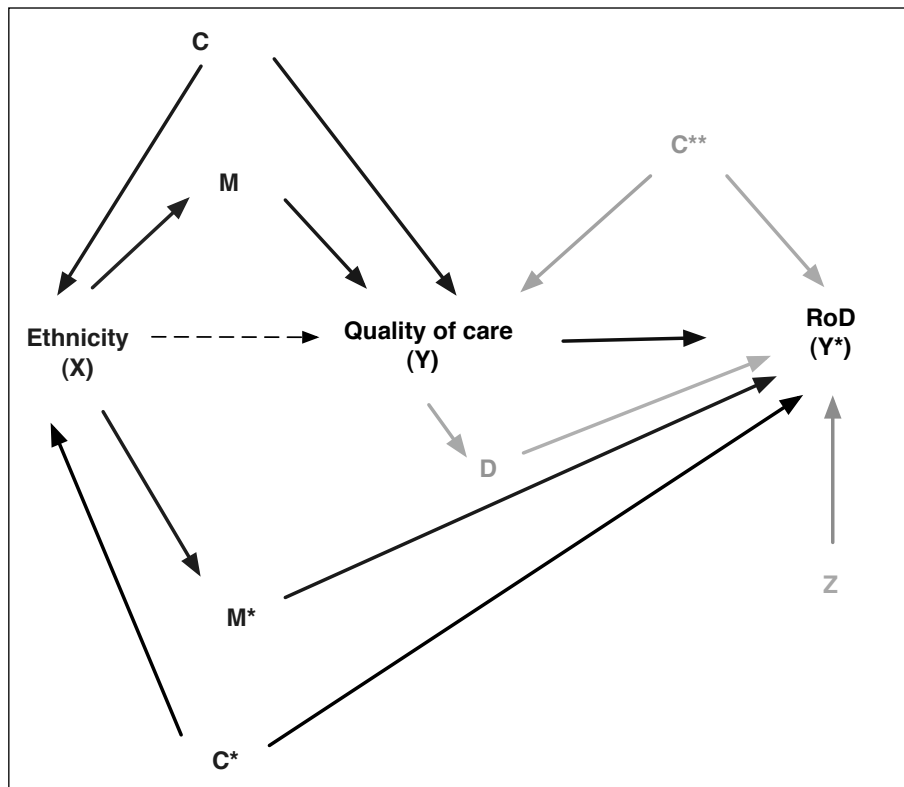


Figure 6.1: Confounding and mediation in the ethnicity-quality of care association and ethnicity-RoD association (DAG)

This graph highlights a key shortcoming of DAGs in their application to research in which ethnic group is defined as the exposure. By definition, variables traditionally considered confounders – such as age and sex - cannot determine ethnic group at an individual level, and so cannot fulfil the DAG definition of confounders. However, this is a theoretical constraint only, and in practice this issue can be circumvented by including a new pathway and variable. For example, in the case of age/sex, the factor ‘demography of NZ’ could be inserted as a confounder between ethnic group and age/sex, to represent a backdoor association between these factors and the exposure. However, for the sake of simplicity, these and other variables were conceptualised as potential confounders without diagramming this additional pathway, and their associations with both ethnicity and RoD explored.

A second limitation of this structural framework is that ‘quality of care’ is by definition unobserved, with its characteristics having to be inferred from indicators. Accordingly, it is difficult to determine from the literature whether variables act as C or C* or both, or M, M* or both, in the associations depicted above. Similarly, when exploring the potential for confounding or mediation in the descriptive analyses of this study (that is, variation of the

factor according to both exposure and outcome), we are restricted to the proxy outcome (i.e. RoD or satisfaction). As such, for clarity this section discusses the selection of covariates with respect to the X-Y* association only; making an assumption that the variables and processes operate similarly within the X-Y association.

The literature provided information about common sources of confounding and mediation in the assessment of hospital quality of care using readmission as its indicator. After consideration of this evidence and the characteristics of the two ethnic groups, variables were selected a priori for exploration as potential covariates. The factors and their categorisations are described below, and given in Table 6.3 (p185).

CONFOUNDING VARIABLES: ETHNICITY-READMISSION ASSOCIATION

This section discusses the potential impact of ‘pure confounders’ (age and sex) and ‘practical confounders’ (clinical characteristics and hospital volume) on the ethnicity-readmission association, including the conceptualisation of the variable ‘length of stay’. (The distinction between ‘pure’ and ‘practical’ confounders is given below, p177 -8).

‘Pure confounders’

1. AGE: The meta-analysis by Soeken et al. (1991) (discussed in Section 5.2.2.2) found variation in the risk of readmission with age in twenty-two of the reviewed studies, calculating a significant linear association between increasing age and the rate of readmission. The authors concluded that this effect was independent of clinical condition, a finding inconsistent with that of other researchers (Wray, DeBehnke et al. 1988), although the relative impact of the association was minimal.

At the population level, NZ Māori have a more youthful age structure than NZ Europeans, the median age of NZ Māori (twenty-two years) being fifteen years younger than the latter (Statistics New Zealand 2007a), and it is probable that the age distribution of hospital patients from the two ethnic groups will also differ. Accordingly, this variable has the potential to distort estimates of the association between the exposure and the outcome, and its impact was explored in the descriptive and multivariable analyses.

2. GENDER: Some of the studies assessed in the review by Soeken et al. (1991) reported an association between gender and readmission. However, the correlations between these

variables ranged between -0.086 to 0.191; indicating evidence for both an increase and a reduction in the risk of readmission due to this factor. When the studies were combined and outliers excluded, the authors concluded there was no overall significant association between patient sex and readmission. It is possible that there may be some variation in gender distribution by ethnicity in the study sample for Phase One; accordingly, as with age, the potential for this factor to distort the estimates was investigated in the analyses.

‘Practical confounders’

The conceptualisation of clinical variables in the association between ethnic group and quality (or its proxy) is arguable. Comorbidity, case-complexity and even case-mix are considered by some to operate on the causal pathway between this exposure and outcome, representing the historic processes that contribute to the disparate distribution of some clinical conditions (such as diabetes) and unequal health outcomes between ethnic groups. As such, they suggest that these variables should be identified as mediators, and explored as such in the analyses and interpretation of results.

However, while there may be a pathway from ethnicity through (for example) health status to substandard quality of care and/or RoD (making health status a mediator, M and/or M*), the aim of this study is to assess the **net** effect of ethnic group on quality, independent of that through indirect or backdoor pathways. These factors have the potential to alter the calculated measure of association due to differences in their distribution between the NZ Māori and NZ European cohorts, and their impact on RoD. So, while some researchers may class such factors as mediators, for all practical purposes they will act as confounders in the Phase One analyses, and their impact should be controlled for in the same way.

Accordingly, these variables are called ‘practical confounders’ in this thesis (‘nuisance mediators’ is another possible term), and were treated identically to the ‘pure confounders’ above (both conceptualised as C* variables in Figure 6.1 above, p176). That is, the distribution of the factors according to ethnic group and RoD were explored to identify any potential associations between the variables, and it was included in the multivariable model if ‘confounding’ was confirmed³⁵.

³⁵ The one variation to this approach relates to socio-economic position. Mediation of the ethnicity-readmission association by this factor was explored such that the relative impact of deprivation could be identified. This approach is discussed further in the following section.

1. CASE-MIX: The rates of readmission vary substantially with clinical condition; the estimates calculated by Thomas (1996) demonstrate the wide range of rates associated with different clinical pathologies (see figure below):

Condition	Number of cases	15-day readmits (%)	30-day readmits (%)	60-day readmits (%)
Angina	14,590	10.41	16.28	23.58
Angioplasty	2,325	8.95	13.67	20.64
Arrhythmias	2,971	9.13	14.41	20.50
CABG	4,261	9.88	14.60	18.53
CHF	14,405	15.04	24.06	34.12
Cholecystitis	4,567	5.01	8.10	12.54
COPD	3,571	3.36	22.85	33.35
Pacemaker	2,097	7.15	11.88	18.17
Pneumonia	10,549	9.53	15.19	22.29
Prostatectomy	9,504	4.86	7.77	11.89
Respiratory failure	1,163	13.67	21.84	29.93
Stroke	9,371	8.45	12.95	19.39

(Source: Thomas 1996 p262)

Figure 6.2: Readmission rates by condition group

This patient-level variable is important to consider in the design and analysis of research, as comparisons of readmission according to patient groups (such as those defined by hospital or ethnicity) may reflect the distribution of clinical conditions between the study cohorts. In particular, the consistent association between ethnicity and conditions such as obesity, diabetes, and heart disease in the general NZ population (Ministry of Health 2006b) warn of its potential to distort estimates in this study.

2. CASE-COMPLEXITY: The patient's clinical state may impact on the risk of readmission, due to the pathologies involved and their associated therapies (DesHarnais, McMahon et al. 1990). In general, researchers attempt to control for these factors by risk adjusting for the patient-level variables comorbidity and/or clinical severity. Comorbid conditions are largely considered by incorporating a composite indicator such as the Charlson Comorbidity Index (Goodney, Stukel et al. 2003; Halfon, Egli et al. 2006; SooHoo, Lieberman et al. 2006), the number of comorbidities (Marcantonio, McKean et al. 1999; Ahmed, Allman et al. 2003), or the number of diagnoses at discharge (Davis, Lay-Yee et al. 2007) into a multivariable model. Proxies for clinical severity may also be included, such as the DRGSCALE (Weissman, Stern et al. 1994), body systems counts (DesHarnais, Kobrinski et al. 1987), Patient Management Categories

(PMC) (Thomas and Holloway 1991), or weighted indices for Diagnosis Related Groups or Major Diagnostic Categories (DesHarnais, Kobrinski et al. 1987; Heggstad 2002).

This study considers case-complexity a 'practical confounder'. That is, while some may perceive a causal association between ethnic group and clinical characteristics at the population level, a number of techniques were used to minimise the impact of this variable as per a confounder. Firstly, the one-night minimum length of stay eligibility criterion acted to exclude day-case patients. This group of patients are likely to be clinically stable, such that they can experience a hospital procedure or therapy without requiring an overnight admission. That is, they represent one end of the 'case-complexity spectrum' and are unlikely to be representative of the general hospital population. Secondly, the Charlson Comorbidity Index was employed to explore and control for case complexity, categorized into four strata (0, 1, 2, 3+) as a proxy for overall comorbidity. Charlson et al. (1987) derived this composite index from the previously demonstrated associations of nineteen conditions (or categories of conditions) with one-year mortality (scored from one to six) among general medical patients³⁶. In this study, ICD-10-AM data from ten diagnosis fields of the National Minimum Data Set at the index admission was used to calculate this indicator for each individual. Thirdly, patients in this study who experience more than one of the defined procedures during their admission may be at greater risk of readmission, and the potential of this factor to confound the association between ethnic group and readmission was also explored.

3. CHARACTERISTICS OF THE FACILITY: Some researchers have shown that high volume hospitals have lower surgical mortality rates (Dudley, Johansen et al. 2000; Birkmeyer, Siewers et al. 2002), postulating that higher-volume hospitals may deliver better quality of care, due to greater access to resources (such as specialists and clinical technology). That is, they consider it a 'systems-level' factor, representing the responsiveness of the overall hospital system to the needs of the individual patient. Rationale aside, the association between risk of readmission and structural variables (independent of case-mix and case-complexity) is largely inconsistent and unknown.

Nevertheless, given that characteristics of the health services facility may be associated with ethnicity (for example, Māori are more likely to live in highly rural areas and so may be more likely to receive care at smaller, lower volume hospitals), it is possible that this factor may be a

³⁶ The appropriateness of the Charlson Comorbidity Index to this research is discussed in Section 8.1.2.

potential source of confounding in this study. Accordingly, mean discharge rates for the specified procedures were calculated for each facility appearing in the dataset, and three hospital stratum categories derived (this categorisation is further described in Appendix Five.) The distribution of this variable according to ethnicity and RoD was then explored in the descriptive analyses, and its impact on the odds ratio of RoD according to ethnic group assessed in logistic regression models.

4. LENGTH OF STAY: There are two broad interpretations of the role of this variable. Firstly, some researchers simply consider length of stay as a potential confounder that may alter an association between an exposure and readmission. Accordingly, these investigators may include length of stay as a factor in their multivariable analyses, to calculate the strength of an association independent of its impact. However, the evidence to support this stance is mixed. Although Soeken et al. (1991) noted an overall “*small but significant relationship*” between length of stay and readmission in their meta-analysis (p274), where patients with a longer length of stay experienced a greater rate of readmission, their modelling included only three other variables (age, gender, and previous admissions) with no consideration for the effects of clinical variables. That is, their observed association may more likely reflect the impact of case-mix, comorbidity and clinical complexity. Supporting this theory, the multivariable model including nineteen patient and structural variables employed by Anderson and Steinberg (1984) found that length of stay was not a significant predictor of sixty-day readmission. The evidence for an association between length of stay and ethnic group (independent of clinical and demographic variables, and with consideration of other related outcomes such as in-hospital mortality) is also limited and mixed, with variation in the strength and direction of an association with clinical condition, study population, and hospital setting (Lee, Shekherdian et al. ; Parikh, Jeremias et al. ; Monane, Kanter et al. 1996; Taylor, O'Brien et al. 2005).

However, length of stay is also used as an outcome of the quality of care, operating as a proxy for quality in the same way as readmission (Thomas, Guire et al. 1997; Jimenez, Lopez et al. 1999; Kossovsky, Sarasin et al. 2002; Davis, Lay-Yee et al. 2007). In this construct, substandard care may manifest as either an increase or reduction in the length of stay, depending on the nature of the ‘defect’ in care. For example, medical errors that result in adverse events may cause a prolonged length of stay, whereas poor care resulting in premature discharge results in a relatively reduced duration of admission (Heggestad 2002). In both cases, an increase in the risk of readmission would be the expected outcome.

If these associations are considered structurally in a DAG, it is clear that error may result from controlling for this variable.

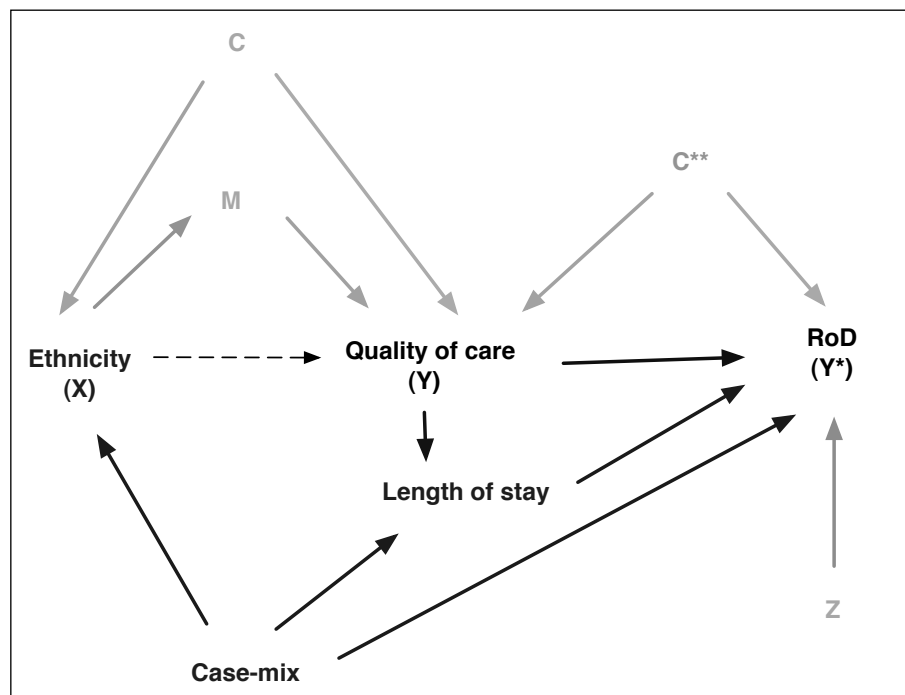


Figure 6.3: Length of stay, readmission and quality of care (DAG)

Figure 6.3 shows length of stay as a mediator between case-mix (as an example) and RoD. The DAG illustrates that there may be correlations between ethnic group and length of stay, which in part reflect associations between ethnicity and factors such as case-mix, comorbidity or age. As such, adjusting for these ‘upstream’ variables (those associated with both length of stay and ethnic group) will theoretically block the backdoor pathway from X to Y* (X-case-mix-Y*), and that which goes through length of stay (X-case-mix-length of stay-Y*). The DAG also shows length of stay as a mediator between quality of care and RoD, operating as a ‘D’ variable (Figure 6.1, p176). Controlling for an intermediary factor between Y and Y* would ultimately under-estimate an association between ethnic group and RoD, by over-adjusting the model. Therefore, while the ‘upstream’ factors associated with length of stay should be conditioned, length of stay itself should not be included as a covariate in the multivariable model.

MEDIATING VARIABLES: ETHNICITY-READMISSION ASSOCIATION

SOCIO-ECONOMIC POSITION: This term can be crudely employed to summarise the multiple impacts of social, economic, and cultural factors that may affect an individuals’ ability to

negotiate and achieve a health outcome or a high quality health care experience. Although most researchers conceptualise socio-economic position as a demographic variable, others consider these as 'system-level' factors - a product of society, including the effects of institutional racism (Hill 2009). In NZ, socio-economic position is inherently and historically linked to ethnicity, such that ethnic group can be conceptualised as a component cause of an individual's material means and social group. In this study, socio-economic position is considered a true mediator variable, occurring on the causal pathway between the ethnicity and the readmission (M* in Figure 6.1, p176) and with potential to have a causal role between ethnic group and quality of care (M in Figure 6.1, p176).

The literature around the impact of socio-economic position on readmission is inconsistent, and it is likely that the association varies with the population studied and the organisation of hospital services. Like some other investigators (Alter, Austin et al. 2005; Bernheim, Spertus et al. 2007a; Kim, Ross et al. 2010), Weissman et al. (1994) demonstrated increased odds of readmission for patients with lower socio-economic status. This team used a logistic regression model to identify risk factors for 60-day readmission rate in a cohort of 12,000 patients admitted to four Massachusetts hospitals in 1987. After controlling for age, gender, hospital, severity of illness, and diagnosis, they found that patients with a lower socio-economic position (as assessed by income, occupation, home ownership, and years of education) were around 25% more likely to experience readmission ($p < 0.05$). However, other investigators show no association between socio-economic status and readmission (Chen, Stewart et al. 2004; Pilote, Tu et al. 2007), or describe a correlation for some observation periods but not others (Lyratzopoulos, Havelly et al. 2005).

In practice, researchers may stratify estimates by insurance status and report stratum-specific or pooled statistics to reduce the impact of this variable, or incorporate socio-economic position within a multivariable model. The study population can also be restricted: Ludke et al. (1993) focused on patients within Veteran Affairs Hospitals in the US (who deliver care to members at minimal personal cost), while Weissman et al. (1999) and others investigated the population eligible for Medicare. The health systems of some countries (such as the UK and NZ) offer acute hospital care at no direct financial cost to the individual, and so analyses assessing the association between ethnic group and readmission in these settings may be less vulnerable to mediation by socio-economic position. However, it is still relevant to consider the impact of this variable within these populations; it is possible that the risk of readmission may differ for people of varying social backgrounds for reasons other than the ability to

directly financially access care. The effect of socio-economic position is of inherent interest in this study, as it contributes to the ‘total’ impact (that is, including the effect of mediating variables) of ethnic group on the odds of RoD.

One method for estimating socio-economic position in NZ is the linkage of an individual’s residential address with a small-area census meshblock, which is in turn associated with a previously calculated measure of deprivation (NZDep – see Chapter Two p19-20). Although it is unlikely any proxy can encompass entirely the multiple factors entwined with socio-economic position, this index is commonly used to estimate this construct in NZ research (including the readmission analyses performed by Davis et al. (2007)). In this study, the NZDep01 measure was supplied as part of the dataset by the New Zealand Health Information Service. The variation of this factor with ethnic group and RoD was explored in the descriptive analyses, and the multivariable modelling structured so its impact could be assessed independent of other covariates.

The table below gives the factors analysed in Phase One. These variables were explored in the descriptive analyses and included in multivariable analyses if confounding/mediation was present.

Table 6.3: Variables employed in Phase One analyses

Variable	Conceptualisation	Values	Comments
ETHNICITY	Exposure	NZ Māori NZ European	Described according to proportion identifying as NZ Māori, otherwise the two groups are analysed separately.
AGE AT ADMISSION	'Pure confounder'	18 – 102 years	Divided into quintiles, distribution also described with mean age at discharge and the difference in means.
SEX	'Pure confounder'	Male or female	
SOCIO-ECONOMIC POSITION	Mediator	NZDep01 1 – 10	Divided into quintiles.
MEAN ANNUALISED HOSPITAL VOLUME FOR THE SELECTED PROCEDURES	'Practical confounder'	1 – 4617 per year	Proportion experiencing index admission in stratum 1 hospital (facilities performing on average >1500 of the selected procedures per year over the study period) Proportion experiencing index admission in stratum 2 hospital (facilities performing on average 500 - 1500 of the selected surgical procedures per year over the study period) Proportion experiencing index admission in stratum 3 hospital (facilities performing on average < 500 of the selected surgical procedures per year over the study period)
CHARLSON COMORBIDITY INDEX	'Practical confounder'	0 – 11	Derived from information from index admission, four categories (0, 1, 2, ≥ 3).
INDEX PROCEDURE	'Practical confounder'	Inguinal hernia repair Removal of cataracts Coronary artery bypass graft Cholecystectomy Hysterectomy Procedures for benign prostatic hypertrophy Knee arthroplasty Hip arthroplasty Appendectomy	Defined according to the occurrence of ICD-10-AM codes in one of the ten operation code domains in the National Minimum Data Set. Procedures and corresponding codes noted in Appendix Four.
> 1 INDEX PROCEDURE	'Practical confounder'	Yes or no	Experience of more than one of the defined procedures during index admission.
READMISSION OR DEATH WITHIN THIRTY DAYS OF DISCHARGE	Outcome (as a proxy for the quality of care)	Yes or no	

ICD-10-AM – International Classification of Disease version 10, NZDep01 = NZ Zealand Deprivation Index 2000.

6.1.5 Data analyses

The data were received from the New Zealand Health Information Service as multiple Access© databases. Eligible patients were selected from each year according to the inclusion and exclusion criteria, and the combined dataset imported into the STATA© statistical programme. The table below summarises the descriptive and multivariable analyses performed in Phase One of this study.

Table 6.4: Analyses and statistical methods for Phase One

Analysis	Variables	Statistical methods
COMPARISON OF PATIENTS ACCORDING TO ETHNICITY	Age, sex, SEP, CCI, index procedure, number of procedures, hospital volume.	Age-sex standardised proportions.
COMPARISON OF PATIENTS ACCORDING TO RoD	Age, sex, SEP, ethnicity, CCI, index procedure, number of procedures, hospital volume.	Relative risk of RoD, standardised for age and sex.
ASSOCIATION BETWEEN ETHNICITY AND RATE OF RoD	Multivariable regression modelling	<p>Logistic regression to calculate OR for RoD according to ethnicity, four models:</p> <ol style="list-style-type: none"> 1. Age, sex (Demographics) 2. Demographics + index procedure, CCI, >1 procedure (Clinical factors) 3. Demographics + Clinical factors + Hospital volume 4. Demographics + Clinical factors + Hospital volume + SEP <p>Sensitivity analyses considering the impact of measurement error on the OR for RoD according to ethnicity*</p>

OR=Odds ratio, RoD = Rate of readmission or death within thirty days of discharge, CCI= Charlson Comorbidity

Index, SEP = Socio-economic position. * These sensitivity analyses are performed in Chapter Eight, when discussing the impact of measurement error of the outcome.

DESCRIPTIVE ANALYSES

These analyses aimed primarily to discern factors that may vary with ethnicity and the rate of RoD (i.e. to identify potential confounders and mediators). The distribution of patient, clinical, and hospital volume factors for the two ethnic groups was compared with age-sex standardised proportions; the 1996-2000 NZ Māori population according to the 2001 NZ

census used as the external standard, and a hypothetical sex distribution of 1:1 males and females assumed. Relative risks (also age-sex standardised) were used to identify the variation of RoD with key covariates, calculated as the ratio of the risk of RoD in the category of interest against that of the reference group. In some analyses, one stratum of subjects is used as the reference group against which the others are compared, in other analyses 95% confidence intervals and two-sided p-values (from chi-squared tests) were used to assess differences between groups.

MULTIPLE VARIABLE ANALYSES

As discussed in Chapter Two, the second objective of this study was to use the selected indicators (in this phase, RoD) 'to compare the quality of inpatient hospital care between NZ Māori and NZ European patients, with consideration of confounding and mediating factors in order to estimate the net effect of ethnic group on the quality indicator'.

The frequency of RoD in the study population is likely to be relatively rare (Davis et al. (2007 found a rate of only 5.9 per 100 discharges in their NZ study), as such RoD as an outcome satisfies the 'rare disease assumption' (Last 2001) and justifies the use of odds ratios as measures of association. Variables were included in Phase One multivariable models to control for confounding ('pure' or 'practical'), or to explore mediation of the association through indirect pathways between ethnicity and the quality indicator. In this way, the crude association between ethnic group and RoD (as a proxy for the ethnicity-quality association) was adjusted to best approximate the net effect of the exposure on the outcome.

The choice and placement of the covariates within the logistic regression model considered three sources of information:

1. Evidence from the published literature regarding potential confounders and mediators when investigating the association between ethnic group and the rate of readmission (for example: age, sex, case-mix and comorbidity (DesHarnais, McMahon et al. 1990; Soeken, Prescott et al. 1991; Thomas 1996)).
2. Structural conceptualisation of the variables involved in the ethnicity-quality and ethnicity-RoD associations, as per Figure 6.1 (p176).

3. Findings from descriptive analyses, identifying the variation of patient and system-level factors in the study population, and their impact on the likelihood of RoD.

The placement of factors in the multivariable models primarily reflects the structural conceptualisation of the ethnicity-RoD association as a proxy for the ethnicity-quality association, as illustrated in the DAGs of Chapters Five and Six. The initial factors entered were the ‘pure confounders’ – age and sex – both unmodifiable and biologically-determined characteristics that may distort estimates of the association. The model was then adjusted step-wise with the addition of ‘practical confounders’: the patient-level variables were inserted first (clinical factors: index procedure, comorbidity, and experiencing more than one procedure), followed by the ‘systems-level’ variable hospital volume. Finally, deprivation was placed at the end of the model, allowing the impact of socioeconomic position on the ethnicity-RoD association to be assessed independently.

Some factors have the potential to also act as effect measure modifiers, in that the odds ratio of RoD for Māori compared to NZ Europeans may vary according to the level of a variable. For example, comorbidity may compound the risk of readmission for a given ethnic group – those with multiple conditions may be clinically less stable, and less able to advocate for their needs compared to those with fewer comorbidities. Their opportunities for high quality care may also be limited through their eligibility for certain interventions and therapies, and the impact of this may be relatively greater for Māori compared with NZ Europeans. Similarly, hospital volume may act as an effect modifier. Hospitals located in different geographical regions (and as such with different structural characteristics and varying volumes of patients) may be more or less culturally competent in the delivery of care to patients of different ethnicities - those serving a higher proportion of Māori may deliver higher levels of care for this ethnic group, and vice versa. Finally, socio-economic position may also act in this way: material and social barriers may limit the patient’s ability to comply with management plans, disproportionately affecting the odds of readmission for a given ethnic group. These variables (comorbidity, deprivation, and hospital volume) and their potential to modify the odds of RoD by ethnicity were explored in the multivariable analyses.

6.2 ASCERTAINMENT OF PATIENT SATISFACTION

Chapter Five detailed the selection of the CSQ-8 as a suitable and valid tool to compare patient satisfaction in a NZ public hospital setting. This section describes the development of the final questionnaire and the data sources employed in this phase of the study, defines the study period and population, calculates the required sample size, and describes strategies to minimise the impact of bias. It is structured as follows:

- 6.2.1 discusses the mode and timing of administration of the CSQ-8.
- 6.2.2 defines key terms and the data sources used for this phase.
- 6.2.3 considers the study population and the inclusion/exclusion criteria employed.
- 6.2.4 performs sample size calculations, and notes the study period of Phase Two.
- 6.2.5 considers key covariates, their coding and categorisation, using a structural DAG approach.
- 6.2.6 describes the methods used in the descriptive and multivariable analyses of Phase Two.

6.2.1 Administration of the CSQ-8

MODE OF ADMINISTRATION

The CSQ-8 has been administered both as an interview (telephone or face-to-face) and as self-completed questionnaire. Although the developers of the CSQ-8 state that the questionnaire was designed to be administered by the patient (Attkisson, Larsen et al. 2000); it has been offered in both this modality (Momeni, Padron et al. 2005; Jayadevappa, Chhatre et al. 2006) and by way of interview (Bull, Hansen et al. 2000; Sahai, Kucheria et al. 2006).

Compared to interview, self-administration requires substantially fewer resources. Completing questionnaires at a time/place chosen by the participant maintains their privacy, and may reduce the impact of social desirability response bias. Questionnaire self-administration may also minimise selection bias from some sources (for example, some subjects without access to a telephone or car may be under-represented in interview surveys); although conversely, self-administration may discourage responses from patients with lower levels of literacy.

An interview allows the subject to clarify questions or receive help in filling out a questionnaire (thus potentially minimising incomplete responses), however it may also introduce variability due to differences in interviewer technique (Heidegger, Saal et al. 2006). The primary advantage of employing interviewers over self-administration is the potential for a higher response rate. For example, Walker and Restuccia (1984) demonstrated a difference of almost 10% in the rate of response of self-administered questionnaires compared with a telephone interview. However, when Westbrook assessed this aspect in her review, she concluded that response rates for these two modes of administration are “*generally similar*” (Westbrook 1993 p79), and that the advantages of self-administration exceed that of a possible reduction in response rate. A similar finding was concluded by Sitzia and Wood (1998) in their review of 210 studies.

Some Māori place importance on ‘*kanohi ki te kanohi*’, preferring a research method in which information is obtained ‘face-to-face’. Certainly, many studies performed with Māori have employed this strategy, such as the Hauora Tāne project (Jones, Crengle et al. 2006) and the national Te Hoe Nuku Roa longitudinal study. In a survey of members of a Ngāi Tahu hapū in NZ, Pitama et al. (2003) found that self-administration was the favoured mode for this study group, speculating that the Māori participants preferred this approach for reasons of privacy and time-management.

FOLLOW-UP METHODS

Follow-up techniques are advocated to improve participation rates (Ware and Davies 1983). Reminder notices are commonly used (Hendriks, Vrieling et al. 2001; Fera, Sarrazin et al. 2003), although other techniques (such as incentives) are also employed. Perneger et al. (2005) contacted eligible subjects four times to minimise non-response; sending postcard reminders to subjects ten days after mailing the initial questionnaire, followed two weeks later by the re-delivery of the full survey pack, and a further mail-out after another three weeks. Nelson et al. (1990) assessed response rate with two types of incentives, and postal/telephone follow-up techniques in a sample of 2,113 patients from ten hospitals across the US. They showed an incremental improvement in response rate with reminder postcards, then the mailing of additional questionnaires and finally a telephone call, achieving a cumulative participation rate of 67% with this protocol. Although the response rate increased by 10% with a telephone follow-up, the cost of these additional telephone calls (in 1987) was estimated at US\$94 per additional questionnaire received.

After considering the advantages and limitations of self-administration and interview methods, the limited evidence available regarding the administration of surveys with Māori, and the resource constraints of this study, the CSQ-8 was chosen to be administered as a mail-back survey, with follow-up techniques employed to maximise response rate. The protocol for follow-up was modelled on that employed by Feria et al. (2003); that is, a reminder note was sent ten days following the initial mailing, and a repeat pack of survey documents sent three weeks after the initial mailing.

TIMING OF ADMINISTRATION

The timing of administration of the CSQ-8 in the literature varies, ranging from the point of discharge (Hawthorne, Green et al. 1999) to twelve months post-discharge (Jayadevappa, Chhatre et al. 2006). Response rate seems to be unaffected by time lags; in their literature review Rubin et al. (1990) found no association between the date of discharge and probability of response, and concluded that *“for the two-week to three-month interval between discharge and survey...no gains in response rate will result from rushing to contact patients as soon as possible from discharge”* (Rubin, Ware et al. 1990 p S20).

As discussed in Chapter Five, there is no agreed optimal point in time to administer a satisfaction survey to enhance its validity, however all patients should be approached after the same interval to avoid the potential for measurement error. For this study, data were obtained from the New Zealand Health Information Service on a monthly basis, providing details of patients who have been admitted in the previous calendar month. Surveys were sent to eligible participants within a day of receipt of this information from the New Zealand Health Information Service, such that there was a maximum delay of two months in the mail-out of the self-administered questionnaire.

6.2.2 Definitions and data sources

Phase Two of the study employed a retrospective cohort design to assess the association between the exposure (Māori ethnic group) and the outcome of interest (quality of care, employing the indicator ‘satisfaction’), according to the following definitions:

Table 6.5: Definitions employed in Phase Two of this study

Exposure	Outcome
SELF-IDENTIFIED ETHNIC GROUP: Dichotomised into NZ Māori and NZ European.	SATISFACTION (A PROXY FOR THE QUALITY OF CARE), DEFINED AS: Mean CSQ-8 score.

The data sources for Phase Two were:


1. National Minimum Data Set: As with Phase One, the National Minimum Data Set was employed to identify eligible subjects. The New Zealand Health Information Service supplied the requested information on a monthly basis.

2. Study survey documents: These documents included the CSQ-8, additional survey items, a cover letter, and a reminder note. The development of the latter three documents involved the following steps:

- Literature review to ascertain potential confounding and mediating factors (see Section 6.2.5).
- Drafting of questionnaire documents, and ascertainment of feedback from study supervisors.
- Piloting of questionnaire documents with members of the Christchurch community and the Māori/Indigenous Health Institute (University of Otago, Christchurch), with subsequent modification.
- Ascertainment of support and approval from Te Puna Oranga (Waikato District Health Boards) and the Research Advisory Group – Māori (Capital & Coast District Health Boards). Their correspondence is included in Appendix One.
- Submission of documents to the regional ethics committee (correspondence noted in Appendix Two), with subsequent modification.

- Approval of study documents by the developer of the CSQ-8, Dr. C. Attkisson, USA.

The survey documents (see Appendix Seven) obtained information on age, sex, and self-rated health status. Although ethnicity data are included in the National Minimum Data Set (and this data source was employed to identify potentially eligible NZ Māori and NZ European patients), the questionnaire also asked participants to self-identify with one or more ethnic groups. There is evidence to suggest inaccuracy in hospital ethnicity data, largely concluding a significant degree of undercounting of Māori (Te Rōpū Rangahau Hauora a Eru Pōmare 2000; Swan, Lillis et al. 2006; Harris, Purdie et al. 2007). Obtaining this information directly from survey participants ensured the accuracy of this variable, while also allowing the quality of the National Minimum Data Set in this field to be assessed. The phrasing employed in the survey documents was that of the ethnicity question of the 2001 NZ Census (see Figure 6.4 below). This is the recommended format for the collection of ethnicity data (Cormack 2007; Tan, Blakely et al. 2010), and allows an individual to record multiple ethnic groups.



Which ethnic group do you belong to?
Mark the space or spaces that apply to you.

☐ New Zealand European

☐ Māori

☐ Samoan

☐ Cook Island Māori

☐ Tongan

☐ Niuean

☐ Chinese

☐ Indian

☐ other (such as DUTCH, JAPANESE, TOKELAUAN). Please state:

(Source: Statistics New Zealand 2001)

Figure 6.4: 2001 NZ Census ethnicity question

6.2.3 Study population

While a national sampling strategy would have been preferable, resource constraints necessitated restricting the sample size to patients from only three hospitals in NZ. After considering characteristics of the facilities, data source restrictions, and the throughput of NZ

Māori and NZ European patients; Waikato, Christchurch, and Wellington hospitals were selected (this process is discussed in Appendix Eight). Equal numbers of potential study participants from the three hospitals were identified after applying the eligibility criteria to the National Minimum Data Set, and these patients were selected in order of their discharge day until the required sample was reached. The subjects were then approached with the survey materials and followed-up according to the protocol outlined above. The New Zealand Health Information Service provided updates to the dataset monthly, enabling the addresses of eligible subjects to be checked, and to ensure patients approached to participate had not died subsequently.

The eligibility criteria for Phase Two of the study were as follows:

- Age: patients aged eighteen years or over at admission³⁷
- Routine discharge to the community³⁸
- Antecedent admission for any medical or surgical condition
- NZ Māori or NZ European self-identified ethnicity³⁹
- Routine admission source⁴⁰
- Length of stay greater than 1 night⁴¹
- New Zealand resident status
- Antecedent admission at one of the three specified public hospitals - Waikato, Wellington, or Christchurch 1 November 2008 to July 31 2009
- Alive at the time of survey dissemination (January 11 2009 and November 30 2009)

³⁷ The National Minimum Data Set age field refers to age at discharge. In this study, subjects aged over 17 years at discharge were identified initially, with a manual check performed to confirm that all patients were 18 years or over at the time of admission to hospital.

³⁸ This event end-type excludes patients who were discharged to another health care facility, those who self-discharged, those who were discharged to another service within the same hospital, and those who died during their admission.

³⁹ Although subjects were initially identified according to the ethnicity recorded in the National Minimum Data Set, the ethnicity inclusion criterion was based on their self-identified ethnic group from the survey. As such, some patients were excluded from eligibility if their ethnic group was not identified NZ European or NZ Māori on the survey documents.

⁴⁰ This field excludes patients who have been admitted to the hospital as a transfer from another hospital facility.

⁴¹ Length of stay equates to 'midnights spent in hospital'. i.e. a length of stay of two may include portions of four days, but only two overnight stays.

The fields and codes of the National Minimum Data Set corresponding to these inclusion criteria are noted in the following table:

Table 6.6: Inclusion criteria as identified in the National Minimum Data Set

Inclusion criteria	NMDS domain	Coded as:
> 17 YEARS	Age at discharge	">17"
ROUTINE DISCHARGE	Event end type	"DR"
MEDICAL OR SURGICAL PRINCIPAL DIAGNOSIS	Purchase unit	Not "W10.01" Not "D01.01"
ALIVE AT TIME OF SURVEY DISSEMINATION	NHI date of death	"Is null"
ADMISSION SOURCE	Admission source code	"R"
LENGTH OF STAY	Length of stay	>"0"
NEW ZEALAND RESIDENT	New Zealand resident	"Y"
ETHNICITY		
NZ MĀORI OR NZ EUROPEAN	Prioritised ethnicity	"21" or "11"
HOSPITAL FACILITY		
CHRISTCHURCH	Facility code	"4011"
WAIKATO	Facility code	"5311"
WELLINGTON	Facility code	"5811"

NMDS = National Minimum Data Set, DR = Routine discharge, "Not W10.01 Not D01.01" = These codes exclude obstetric and dental patients, R= Routine admission source, Y=Yes, NHI = National Health Index.

Exclusion criteria included:

- Unable physically/mentally to complete the survey
- Unable to recall admission
- Invalid address

These factors were identified following survey dissemination. That is, participants who were unable to recall the admission, or lacked physical/mental capacity to complete the documents (as noted by the individual or a caregiver on return of the survey documents) were excluded from the study population. Similarly, individuals with an invalid address (as indicated with the receipt of survey documents marked 'returned to sender') were excluded.

6.2.4 Sample size, power and study period

In calculating the sample size needed for Phase Two, the following information was considered:

1. CSQ-8: The standard deviations around the means, and differences in means obtained when comparing two groups reported in the literature (noted in Appendix Nine).

2. Power: Power of 0.8 is considered a minimum standard for statistical testing, where power = $1 - \beta$. β is the probability of a type II error (concluding that the scores of the two groups are the same, when there is in fact a difference), and was defined as 0.2 as per common practice.

3. Level of significance: The probability of rejecting the null hypothesis (that the scores are comparable), if it is in fact true (α), was defined as 0.05, in accordance with common practice.

Using this information, the sample size needed to identify a difference in CSQ-8 scores between two ethnic groups (should a difference exist) was estimated using the following conservative scenario:

Given $\alpha = 0.05$, $\beta = 0.2$. If the difference in means is very small (i.e. 1.6, the minimum difference identified in the literature⁴²) and the standard deviation is very large (i.e. 5.94, the maximum value identified), use of a two-sided t-test for comparing the means of independent groups estimates the sample size per ethnic group required as 217⁴³.

Given imperfect rates of response, 660 participants per ethnic group were initially approached to complete the survey at each facility. However, NZ Māori were eventually over-sampled by approximately one-third in order to maintain equal explanatory power.

6.2.5 Selection of covariates

This section discusses the variables that may impact on the relationship between ethnic group (the exposure) and patient satisfaction (measured by the CSQ-8 score, as a proxy for quality of care, the outcome). There is evidence that satisfaction may be correlated with patient and structural characteristics: for example, those with better self-rated health tend to report greater satisfaction with the quality of care, as do older patients. These factors may act as confounders, an external variable that distorts the relationship between an exposure and the outcome; or as mediators, such that they lie on the causal pathway between these factors. Again, we can refer to the overarching DAG for this study (see Figure 6.5 below) to conceptualise these factors and guide the selection of covariates.

⁴² While there is information in the literature about the validity of the CSQ-8 with respect to other criteria (for example, missed appointments, drop-out rates – see Chapter Five), the metrics employed in these studies are primarily correlation coefficients. The data given in Appendix Nine are those differences in means between groups that have been documented in the published literature as being statistically significant. Given that the standard deviation of CSQ-8 scores within a population may be as great as six, and that scores are generally clustered towards the upper range, it is probable that any difference in mean CSQ score between groups is likely to be numerically small. However, any statistically significant difference between ethnic groups should be considered clinically important from an ethical standpoint.

⁴³ (Dupont and Plummer 1990)

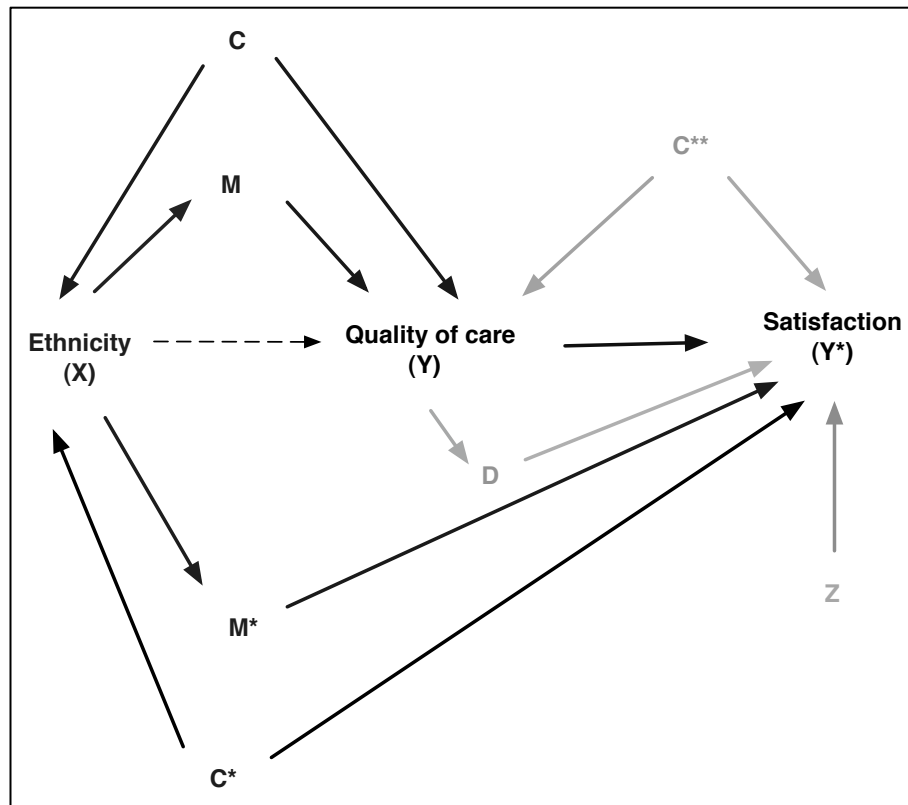


Figure 6.5: Confounding and mediation in the ethnicity - patient satisfaction association (DAG)

The following section discusses key covariates in the Phase Two analyses, and their conceptualisation in this study. As in Phase One (see pages 167-169):

- Confounders and mediators of the ethnicity-satisfaction association will be assumed to operate in a similar way within the ethnicity-quality of care association, and so this section will refer to the X-Y* association (and M* and C*) only.
- Age and sex are designated patient-level confounders in the relationship between ethnic group and satisfaction (despite the limitations of DAG theory, see p176) reflecting their unmodifiable and biologically-determined nature.
- It is acknowledged that researchers may differ in whether they classify some clinical factors (such as health status) as confounders or mediators. However, given that the objective in this study is to estimate the **net** effect of ethnicity on satisfaction (this indicator employed as a proxy for quality), these variables will be considered as

confounders ('practical confounders', as in the conceptualisation of several variables in Phase One) and explored/adjusted for as such.

- Socio-economic position is conceptualised as a mediator in the ethnicity-readmission association (and likely also the ethnicity-quality of care association).

CONFOUNDING VARIABLES: ETHNICITY-SATISFACTION ASSOCIATION

'Pure confounders'

1. AGE: Socio-demographic variables are commonly analysed in patient satisfaction studies, with the most consistently demonstrated relationship (and that with the greatest strength) described between satisfaction and age (Hall and Dornan 1988). Satisfaction ratings increase in parallel with respondents' age, a finding reported by numerous researchers using various tools and methods, and one that is supported with results from review articles and meta-analyses (Hall and Dornan 1990; Carr-Hill 1992; Sitzia and Wood 1997). Danielsen et al. (2007) wondered if older patients may have "*a greater appreciation for the care that they receive*" and that younger patients may have "*a more consumerist outlook*" (Danielsen, Garratt et al. 2007 p76). Carr-Hill (1992) suggest it may be due to the improvement of health services over time, such that older patients are more satisfied with the quality of care compared to that experienced on previous occasions. Given the consistency of this relationship and the differences in age structures of the NZ Māori and NZ European populations, it is important to consider the impact of age in the analyses of satisfaction and to adjust for this factor should confounding be present.

2. SEX: While many studies report lower levels of satisfaction in women (Cleary, Edgman-Levitan et al. 1991; Tucker and Kelley 2000; Nguyen Thi, Briancon et al. 2002), others (including meta-analyses) describe the opposite finding or no difference at all (Hall and Dornan 1990; Young, Meterko et al. 2000; Rahmqvist 2001). Overall, the influence of gender on patient satisfaction within a defined study population requires exploration, and the incorporation of this factor within a multivariable model should confounding be present.

'Practical confounders'

1. HEALTH STATUS: Self-perceived health status features consistently in the literature as a correlate of satisfaction, with those reporting higher levels of self-rated health also rating their

satisfaction with health care more favourably (Cleary, Edgman-Levitan et al. 1991; Young, Meterko et al. 2000; Danielsen, Garratt et al. 2007). Given the differences in the health status of Māori and NZ Europeans at the population level (as noted in Chapter Two), there is potential for this factor to distort an estimate of the association between ethnic group and patient satisfaction.

Self-reported health can be assessed with a variety of measures. A single-item question is frequently employed by researchers, is advantageous in its brevity, and in its known associations with mortality (Idler and Benyamini 1997; Heidrich, Liese et al. 2002), satisfaction (Young, Meterko et al. 2000), and physiological biomarkers (Jylha, Volpato et al. 2006). Although the exact wording of the single-item question may vary, the intention and phrasing of the statement is relatively consistent between investigations. For example: *“All in all, would you say your health is...?”* was used by Kaplan and Camacho (1983), and *“How would you rate your health at the present time?”* by Idler and Kasl (1991) and Schoenfield et al. (1994). The phrase *“Would you say your health in general is..?”* has been employed by numerous researchers including Idler and Angel (1990), Rakowski et al. (1991; 1993), and Wolinsky and Johnson (1992). In the review of twenty-seven community studies performed by Idler and Benyamini (1997), this latter statement was the most commonly used, with the research teams involved all adopting a five-point response scale. Accordingly, this same wording (*“Would you say your health in general is”*) has been chosen for this study, with the available responses being: *‘Excellent’, ‘Very good’, ‘Good’, ‘Fair’, ‘Poor’*.

2. CLINICAL SPECIALTY: In this study, all patients with medical and surgical conditions were eligible for participation. It is possible that the distribution of Māori and NZ Europeans may differ between these two groups of conditions, reflecting differences in the prevalence of some pathologies (such as diabetes) between ethnic groups at the population level. Although the impact of clinical characteristics (such as condition, comorbidity and case-severity) may in part be reflected in a patient’s self-rated health status, the potential for confounding by clinical specialty was also investigated in this study, with variation in CSQ-8 scores and differences in the ethnic distribution of patients between surgical and medical groups explored in the descriptive and multivariable analyses.

3. HOSPITAL CHARACTERISTICS: The literature is inconsistent in its findings of associations between structural variables (system-level factors such as the size of the hospital, its location and teaching status) and satisfaction. Danielsen et al. (2007) noted differences in scores for

hospital size and teaching status, but involving only some of the dimensions of satisfaction. Finkelstein (1998) found that hospital characteristics were associated with satisfaction in his study of 16,051 obstetric patients, but the magnitude of the differences was small. Sjetne used the Patient Experiences Questionnaire in 21,445 patients from fifty hospitals in Norway to assess the impact of size and teaching status. They described associations with satisfaction on some of the ten scales of the survey, but stated that *“hospital category was not a major determinant of patient experiences during hospitalization”* (Sjetne, Veenstra et al. 2007 p252).

Although the sampling strategy aimed for equal numbers of NZ Māori and NZ Europeans from each facility, it is possible there may be residual bias from this source. Accordingly, the possibility that the facility may alter an association between ethnic group and satisfaction was explored in the multivariable analyses.

MEDIATOR VARIABLES: ETHNICITY-SATISFACTION ASSOCIATION

SOCIO-ECONOMIC POSITION: Some researchers describe a positive association between increasing social status and satisfaction; this finding was noted in the meta-analysis performed by Hall and Dornan (1990). However, this team also reported the paradoxical finding that those with fewer years of education were more likely to have higher satisfaction scores. Danielsen et al. (2007) noted both higher and lower scores for different dimensions of satisfaction in subjects with fewer years of education. Given the significant differences in the experience of deprivation for NZ Māori and NZ Europeans in the wider NZ population, it is important to investigate the potential for mediation from this factor in the study sample for Phase two. As with the readmission analyses, this phase of the study utilises the NZDep01 measure as an indicator of socio-economic position, as supplied by the NZ health Information Service.

SUMMARY

Overall, there is evidence for the association of satisfaction with patient characteristics, in particular age and health status. However, the relative impact of socio-demographic, clinical and structural variables on satisfaction scores is probably small (Young, Meterko et al. 2000). For example, Finkelstein et al. (1998) estimated their effect on the variance of satisfaction indices as only 2% - 3%. Tucker (2000) echoed this finding, noting that these factors explained less than 5% of the variability in his study. Accordingly, while it is important to assess their

effects, it is possible that the collective impact of these variables is minimal. Table 6.8 gives the factors selected as potential covariates in this phase of the study.

Table 6.7: Variables employed in Phase Two analyses

Variable	Conceptualisation	Values	Comments
ETHNICITY	Exposure	NZ Māori or NZ European.	Defined according to self-identified ethnicity as per survey.
AGE AT ADMISSION	'Pure confounder'	>17 (years)	Divided into quintiles in some descriptive analyses, distribution also described with mean, median and standard deviation.
SEX	'Pure confounder'	Male or female.	
SOCIO-ECONOMIC POSITION	Mediator	NZDep01 deciles 1 – 10	Divided into quintiles.
HEALTH STATUS	'Practical confounder'	Excellent, very good, good, fair, poor.	Explored as five categories and as a dichotomised variable (Excellent, very good, good, fair or poor).
CLINICAL SPECIALTY	'Practical confounder'	Medical or surgical.	Derived from information in the NMDS.
HOSPITAL FACILITY	'Practical confounder'	Waikato, Christchurch or Wellington.	
CSQ-8 MEAN SCORE	Outcome (as a proxy for quality of care')	8 - 32	Sum of CSQ-8 items for specified group of respondents, divided by the number of respondents in the group.

NZDep01 = New Zealand Deprivation Index 2001, NMDS = National Minimum Data Set, CSQ-8 = Client Satisfaction Questionnaire-8.

6.2.6 Data analysis

Survey data were entered by the author into an Access© database, checked for consistency (matching the survey date-of-birth field against that provided by the National Minimum Data Set), and outlying values verified. All analyses were done using STATA© statistical program, summarised in the table below.

Table 6.8: Statistical methods employed in Phase Two analyses

Analysis	Variables	Statistical methods
COMPARISON OF RESPONDENTS ACCORDING TO ETHNICITY	Age, sex, health status, hospital, clinical speciality, deprivation.	Age-sex standardised proportions.
COMPARISON OF RESPONDENTS ACCORDING TO SATISFACTION SCORES	Age, sex, health status, hospital, clinical speciality, ethnicity, deprivation.	Mean satisfaction score, standardised for age and sex.
COMPARISON OF RESPONDENTS AND NON-RESPONDENTS	Age, sex, ethnicity, hospital, clinical speciality, deprivation.	Age-sex standardised proportions. Sensitivity analyses considering the potential variation of the CSQ-8 scores of the non-respondents*.
ASSOCIATION BETWEEN ETHNICITY AND SATISFACTION	Multivariable modelling	Four models: 1. Age, sex (Demographics) 2. Demographics + health status, clinical speciality (Clinical factors) 3. Demographics + Clinical factors + Hospital 4. Demographics + Clinical factors + Hospital + Socio-economic position.

CSQ-8 = Client Satisfaction Questionnaire-8. * The sensitivity analyses are performed in Chapter Eight, when discussing the impact of non-response bias.

DESCRIPTIVE ANALYSES

Direct age-sex standardisation was performed in the comparison of groups: the 1996-2000 NZ Māori population according to the 2001 NZ census was used as the standard, and a hypothetical sex distribution of 1:1 males and females assumed. The proportions of NZ Māori and NZ Europeans experiencing a given characteristic were compared with 95% confidence intervals and two-sided p-values from chi-squared tests. To explore variability in satisfaction scores, the CSQ-8 totals were age-sex standardised and mean scores (with associated confidence intervals) assessed according to patient characteristics.

MULTIPLE VARIABLE ANALYSES

1. Statistical method: The association between satisfaction and ethnicity was evaluated by comparing the risk-adjusted mean CSQ-8 scores for the two ethnic groups, using linear regression modelling. Logistic regression modelling was also an option for the analyses (after

dichotomising satisfaction into 'not satisfied' and 'satisfied', or creating multiple categories of satisfaction), producing an odds ratio as a measure of association. However, the logistic methods depend on differences in satisfaction large enough to enable their categorisation, and result in a significant loss of information. Linear regression modelling, although less intuitive in its interpretation, is a more efficient use of data. The estimates produced represent the impact of Māori ethnicity per 'unit change' of satisfaction, that is, the point difference in mean CSQ-8 score between the two ethnic groups.

2. Approach to missing data: Missing data may arise from incomplete questionnaires or non-response. It is best practice to explore the characteristics of the missing data:

- Are the data *Missing Completely At Random*? Such that the likelihood of data being missing is unrelated to its value, and is not correlated to any other variable.
- Are the data *Missing at Random*? The likelihood that the data are missing is related to its value, but only through its association with another variable. As such, once that variable is controlled for, the 'missingness' of the data is not dependent on its value.
- Are the data *Missing Not at Random*? Such that the value of the missing data is intrinsically associated with its 'missingness'; and is neither Missing at Random or Missing Completely At Random.

In general, there are two options in dealing with these data: firstly, exclusion (i.e. perform complete case analysis), and secondly, imputation. Exclusion of subjects on the basis of missing answers may introduce selection bias, in particular if the association between ethnic group and satisfaction is different for those who responded compared to those who did not participate. Imputation can be simple (such as substitution of the missing CSQ-8 field with a mean score, or with the score of a correlated item) or multiple, in which the characteristics of a patient and the population are used to predict their response.

While imputation ameliorates the effect of missing data on analyses, these methods also have their limitations. Simple mean substitution may reduce the variability of the data, and so obscure relationships between satisfaction and the covariates. Multiple imputation methods require skill and understanding of the possible approaches and software, and may introduce error if statistical assumptions are not fulfilled or the models are less than robust (Barnard and

Meng 1999). As such, imputation is not necessarily superior to complete case analysis, with researchers documenting varying degrees of bias in comparisons of both approaches (Van der Heijden, Donders et al. 2006; White and Carlin 2010). In fact, White and Carlin (2010) state that when the data are missing in a univariate fashion, multiple imputation and complete case analysis are approximately equivalent analyses and will yield similar estimates. In this phase of the study, participants with missing data were excluded from analyses and complete case analysis performed (the potential for bias due to this decision is discussed in Chapter Eight).

3. Model variables: As discussed with reference to the Phase One analyses, the development of the multivariable models incorporates both theoretical assumptions (primarily related to the structural conceptualisation of the factors and pathways involved when using the ethnicity-satisfaction association as a proxy for the ethnicity-quality of care association), as well as the findings from the descriptive studies of the data.

As with Phase One, 'pure' confounders were placed at the beginning of the model, followed by 'practical confounders' with patient-level factors preceding the system-level variables. That is, age and sex were placed first, clinical factors incorporated subsequently, followed by the facility variable. Socio-economic position was placed as the final term, enabling its potential for mediation of the ethnicity-satisfaction association to be independently assessed.

6.3 SUMMARY

This chapter explained the design of this study, including the data sources, study populations, and timing of data collection. It also described techniques used to reduce misclassification and selection bias, details of the survey administration, and the choice of covariates for exploration in the two phases. The following chapter shows the results of the descriptive and multivariable analyses. It focuses on the rate of readmission first, followed by analyses of patient satisfaction.

PART FOUR

Results

CHAPTER SEVEN:

RESULTS

“Ka kahi te toi, ka whai te māramatanga.”

(If knowledge is gathered, enlightenment will follow)

Author unknown

This chapter gives the findings of the data analyses, focusing first on the Phase One analyses (7.1, those exploring the ethnicity-RoD association) and then describing the Phase Two results (7.2, the investigation of the ethnicity-satisfaction association).

The descriptive analyses of each phase are given first, whereby the distribution of key covariates was assessed according to exposure (ethnic group) and then outcome (RoD or satisfaction). The Phase Two analyses also include a description of the respondents compared to the non-respondents. The second half of each section describes the results from multivariable modelling, with logistic regression utilised in Phase one and linear regression in Phase Two. The chapter finishes with a summary of the main findings for each phase.

7.1 PHASE ONE: THE RISK OF READMISSION/DEATH

This phase of the study explored the risk of unplanned readmission/death within thirty days of discharge for 89,658 patients, all of whom had experienced one of a defined set of surgical procedures⁴⁴ at a public hospital in New Zealand between 2002 and 2008.

- 7.1.1 describes analyses of key covariates according to ethnic group.
- 7.1.2 gives the results of descriptive analyses according to the risk of RoD.
- 7.1.3 gives the results of multivariable logistic modelling to ascertain the odds of RoD for Māori compared to NZ European patients.
- 7.1.4 explores potential interaction variables.
- 7.1.5 presents a summary of the main findings.

7.1.1 Descriptive analyses according to ethnicity

Age-sex-standardised proportions were calculated to compare the characteristics of the NZ Māori cohort with those of the NZ European patients, using direct standardisation against the 2001 NZ Māori census population. The significance of differences between the two cohorts was assessed with 95% confidence intervals, and two-sided p-values from chi-squared tests. (Age-sex standardised prevalence ratios were also calculated to aid the comparison between the ethnic groups, these are given in Appendix Ten.) In this chapter, the demographic features of the patients are considered first (age and sex, the potential ‘pure confounders’), followed by clinical variables (comorbidity, index procedure and the number of procedures, categorised as ‘practical confounders’), and finally the characteristics of the cohorts at the system level are compared (hospital volume and socio-economic position; respectively conceptualised as ‘practical confounder’ and mediator).

⁴⁴ Procedures included coronary artery bypass graft, hip arthroplasty, repair of inguinal hernia, cholecystectomy, hysterectomy (those not associated with malignancy), knee arthroplasty, appendicectomy, cataract removal, and minimally invasive procedures for benign prostatic hypertrophy (defined in Appendix Four).

7.1.1.1 Demographics: Age and sex

As anticipated, the crude age distribution of the two ethnic groups differed, with comparatively more NZ European patients in the older age groups, and NZ Māori patients having a lower mean age at discharge (47.2 years compared to 58.3 years for the NZ European patients). The two groups also varied slightly in their sex distribution: after age standardisation the NZ Māori group consisted of marginally more women (65.6%) than the NZ European patients (62.3%). These results highlight the importance of standardising for age and sex when comparing the characteristics of the two groups, and this adjustment is performed throughout the descriptive analyses.

Table 7.1: Age and sex according to ethnic group

Variable	NZ Māori		NZ European		p
	n	%	n	%	
AGE AT DISCHARGE					
18-39	4,351	34.5	14,084	18.3	< 0.0001
40-59	4,779	37.8	20,989	27.2	< 0.0001
60-79	3,315	26.2	34,479	44.8	< 0.0001
>79	184	1.5	7,477	9.7	< 0.0001
MEAN AGE AT DISCHARGE (YEARS)		47.2		58.3	
DIFFERENCE IN MEANS (95% CI)			11.1 (10.1 – 12.1)		
SEX					
FEMALE	7,650	65.6	40,747	62.3	< 0.0001
PROPORTION FEMALE NZ MĀORI : NZ EUROPEAN (95% CI)			1.05 (1.03 – 1.08)		

The proportions in the sex comparisons have been adjusted for age, using direct standardisation against the 2001 Māori census population. The age comparisons are unadjusted. CI = Confidence interval. P-values from two-sided chi-squared test.

7.1.1.2 Clinical characteristics

COMORBIDITY

The table below shows that a greater proportion of the NZ Māori men and women in the study population had Charlson comorbidity indices of ≥ 3 , 2, and 1 compared with the NZ European patients. These differences were all significant at the 95% confidence level, with non-overlapping confidence intervals around the estimates of the two ethnic groups in all strata (and significant p-values). As expected, the reverse was also illustrated, with the proportion of NZ Māori with a Charlson Comorbidity Index of zero significantly lower than the NZ European group.

Table 7.2: Distribution of comorbidity according to ethnic group

Charlson Comorbidity Index	NZ Māori			NZ Europeans			p
	n	%	95% CI	n	%	95% CI	
0	10,006	88.1	(87.50 – 88.63)	62,129	92.5	(92.30 – 92.76)	< 0.0001
1	1,571	7.4	(6.91 – 7.84)	8,220	4.5	(4.26 – 4.64)	< 0.0001
2	528	2.4	(2.15 – 2.71)	4,043	1.8	(1.64 – 1.86)	< 0.0001
3 OR MORE	524	2.1	(1.95– 2.31)	2,637	1.3	(1.18 – 1.35)	< 0.0001

Proportions (%) adjusted for age and sex, using direct standardisation against the 2001 Māori census population, CI= Confidence interval. P-values from two-sided chi-squared test.

The distribution of comorbidity in the study sample differed from that described in other research. 80.5% of the eligible population⁴⁵ in this study were classified as Charlson comorbidity index zero – the research by Davis et al. (2002b) involving 1,326 patients from three Auckland hospitals categorised less than 70% in this same stratum. The patients eligible for this study were those who had experienced one of the defined set of surgical procedures, they were also predominantly of the NZ European ethnic group (85%) - both of these factors may select for patients with fewer comorbidities. This assumption is supported by the findings of Brewer et al. (2011): their sample of 2,323 patients with cervical cancer had an even higher proportion of subjects with a Charlson comorbidity index of zero (89.4%), probably reflecting the demographic and clinical characteristics of the study population.

⁴⁵ Note: this percentage differs from those in the table above, as the latter have been age-sex standardised against the 2001 NZ Māori census population.

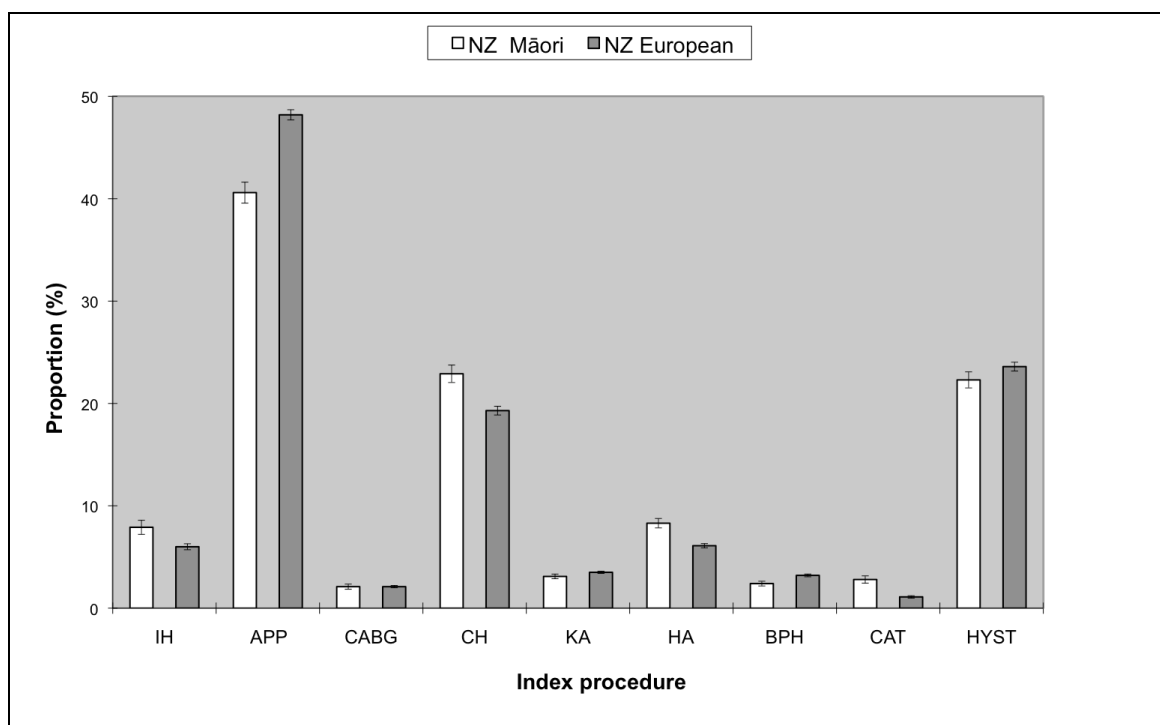
INDEX PROCEDURE

Table 7.3 and Figure 7.1 below compare the type of surgical procedure experienced by the patients in the two ethnic groups during the index admission. Of those who had a single procedure only (n=89,346, 99.7% of the total sample), NZ Māori were more likely to have experienced inguinal hernia repair, cholecystectomy, hip arthroplasty, and removal of cataract operations; and less likely to have undergone appendicectomy, knee arthroplasty and procedures for benign prostatic hypertrophy. There were no significant differences between the two ethnic groups in the likelihood of coronary artery bypass grafting or hysterectomy.

Table 7.3: Distribution of index procedures according to ethnic group, single procedure only

Index procedure	NZ Māori			NZ Europeans			p
	n	%	95% CI	n	%	95% CI	
INGUINAL HERNIA REPAIR	820	7.9	(7.21 – 8.58)	5,353	6.1	(5.76 – 6.34)	< 0.0001
APPENDICECTOMY	2,710	40.6	(39.56 – 41.61)	12,342	48.2	(47.70– 48.74)	<0.0001
CORONARY ARTERY BYPASS GRAFT	438	2.1	(1.85 – 2.34)	3,762	2.1	(1.98 – 2.20)	0.99
CHOLECYSTECTOMY	2,930	23.0	(22.08 – 23.83)	13,847	19.3	(18.92 – 19.77)	< 0.0001
KNEE ARTHROPLASTY	932	3.1	(2.92 – 3.38)	10,284	3.5	(3.38 – 3.59)	< 0.0001
HIP ARTHROPLASTY	1,720	8.3	(7.89 – 8.88)	12,359	6.4	(6.15 – 6.56)	< 0.0001
PROCEDURES FOR BENIGN PROSTATIC HYPERTROPHY	425	1.2	(1.08 – 1.31)	6,754	1.6	(1.51 – 1.64)	0.001
REMOVAL OF CATARACTS	368	2.4	(2.47 – 3.18)	1,836	1.1	(0.98 – 1.21)	< 0.0001
HYSTERECTOMY	2,243	11.4	(11.05 – 11.83)	10,223	11.8	(11.57 – 12.00)	0.26

Proportions (%) have been adjusted for age and sex, using direct standardisation against the 2001 Māori census population. CI= Confidence interval. P-values from two-sided chi-squared test.



IH = Inguinal hernia repair, APP = Appendicectomy, CABG = Coronary Artery Bypass Graft, CH = Cholecystectomy, KA = Knee arthroplasty, HA = Hip arthroplasty, BPH = Procedures for Benign Prostatic Hypertrophy, CAT = Removal of cataracts. Error bars represent 95% confidence intervals.

Figure 7.1: Distribution of index procedure according to ethnic group

4. NUMBER OF PROCEDURES

312 patients (0.3%) experienced more than one of the defined surgical procedures during their index admission, for example both an inguinal hernia repair and a hip arthroplasty. There was no significant difference in the proportions of the two groups experiencing more than one procedure for NZ Māori compared to NZ Europeans, as evidenced by the overlapping 95% confidence intervals.

Table 7.4: Number of procedures according to ethnic group

Number of index procedures	NZ Māori			NZ Europeans			p
	n	%	95% CI	n	%	95% CI	
>1	43	0.3	(0.19 – 0.44)	269	0.2	(0.18 – 0.28)	0.02

Due to small numbers, this analysis was standardised for age only, using direct standardisation against the 2001 Māori census population, CI= Confidence interval. P-values from two-sided chi-squared test.

7.1.1.3 Systems-level characteristics

HOSPITAL VOLUME

The proportion of patients of each ethnic group within each stratum of hospital volume is compared in Table 7.5. A significantly greater proportion of NZ Māori attended stratum two hospitals (those performing 500 – 1500 of the selected procedures on average per year) than NZ Europeans (38.3% compared to 31.4%, $p < 0.0001$); and stratum three hospitals (those performing < 500 procedures) compared to the NZ European patients (30.0% of NZ Māori and 23.9% of NZ Europeans, $p < 0.0001$).

Table 7.5: Hospital volume strata according to ethnic group

Hospital volume stratum	NZ Māori			NZ European			p
	n	%	95% CI	n	%	95% CI	
1 (HIGHEST VOLUME)	3,933	31.7	(30.62 – 32.83)	30,894	44.7	(44.07 – 45.33)	<0.0001
2	4,812	38.3	(37.11 – 39.42)	25,408	31.4	(30.81 – 31.98)	<0.0001
3	3,884	30.0	(28.93 – 31.07)	20,727	23.9	(23.40 – 24.41)	<0.0001

Proportions (%) have been adjusted for age and sex, using direct standardisation against the 2001 Māori census population, CI= Confidence interval. Stratum 1 includes hospitals with the highest mean annualised discharge rates for the selected procedures; stratum 3 represents hospitals with the lowest discharge rates. P-values from two-sided chi-squared test.

SOCIO-ECONOMIC POSITION

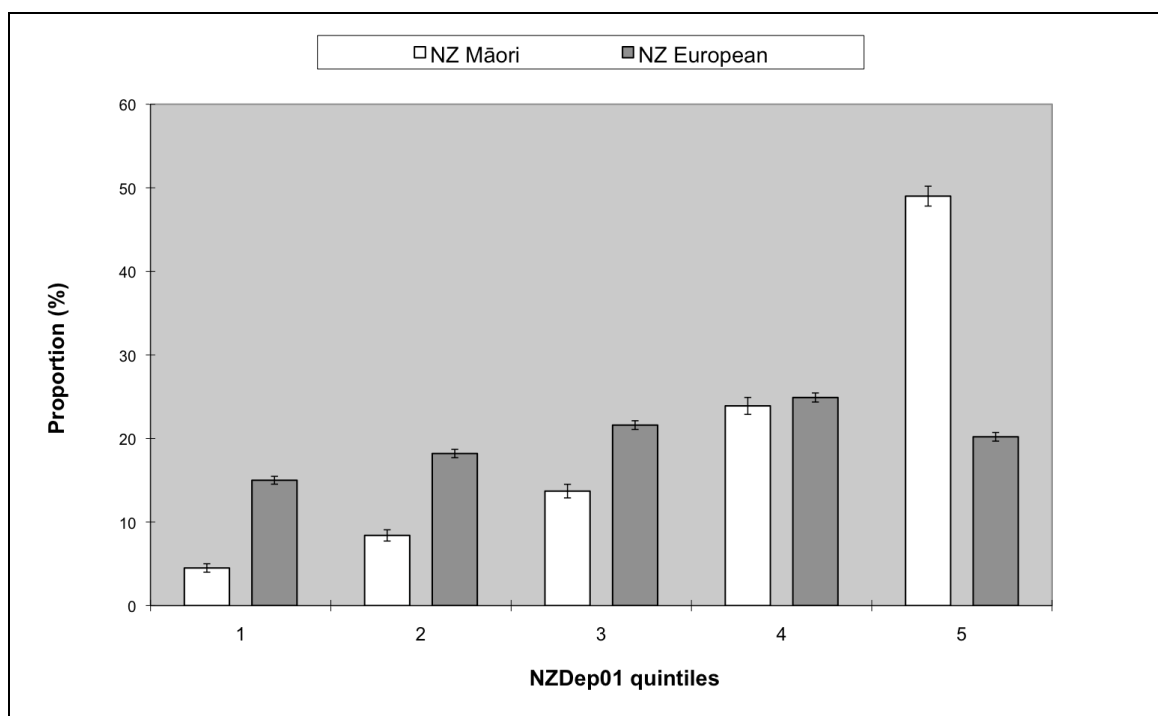
NZ Māori were more than twice as likely to reside in areas coded as NZDep01 deciles nine and ten than the NZ European group (49.1% on NZ Māori compared to 20.2% of NZ Europeans, $p < 0.0001$). Significant differences in proportions were also observed in NZDep01 quintiles one, two, and three with comparatively fewer NZ Māori patients residing in the lesser deprived quintiles compared to NZ European patients.

This analysis excluded 257 patients (0.29%) who did not have an NZDep01 decile noted in the primary data source. Of the patients who had this missing variable, 77% were NZ European and 23% were Māori.

Table 7.6: Distribution of deprivation according to ethnic group

NZDep01 quintile	NZ Māori			NZ European			p
	n	%	95% CI	n	%	95% CI	
1 (LEAST DEPRIVED)	540	4.5	(4.02 – 5.03)	10,174	15.0	(14.60 – 15.53)	<0.0001
2	1,028	8.5	(7.79 – 9.13)	13,602	18.2	(17.74 – 18.73)	<0.0001
3	1,706	13.9	(13.04 – 14.67)	17,064	21.6	(21.06 – 22.10)	<0.0001
4	2,981	24.0	(23.03 – 25.05)	20,828	24.9	(24.34 – 25.43)	0.033
5 (MOST DEPRIVED)	6,316	49.1	(47.93 – 50.31)	15,162	20.2	(19.73 – 20.76)	< 0.0001

Proportions (%) have been adjusted for age and sex, using direct standardisation against the 2001 Māori census population. NZDep01 = New Zealand Deprivation Index 2001. Quintile 1 = NZDep01 deciles 1 and 2, quintile 2 = NZDep01 deciles 3 and 4, quintile 3 = NZDep01 deciles 5 and 6, quintile 4 = NZDep01 deciles 7 and 8, quintile 5 = NZDep01 deciles 9 and 10. CI= Confidence interval. P-values from two-sided chi-squared test.



NZDep01 = New Zealand Deprivation Index 2001. Error bars represent 95% confidence intervals. Proportions (%) have been adjusted for age and sex, using direct standardisation against the 2001 Māori census population.

Figure 7.2: Distribution of deprivation according to ethnicity

7.1.2 Descriptive analyses according to RoD

In Chapter Six, RoD was defined as ‘the number of distinct patients experiencing an unintended acute public hospital admission or death in the community within thirty days of discharge following an index admission, divided by the number of distinct patients discharged alive within the reference period’. Overall, 8057 of the total study sample experienced this outcome (9.0%).

This section reviews the characteristics of the Phase One population according to whether or not they experienced RoD. The first part of the analyses explores the distribution of the demographics (age, sex, and ethnic group), clinical characteristics (comorbidity, index procedure, and number of procedures), and system-level variables (hospital volume and socio-economic position) of the sample according to the risk of RoD.

7.1.2.1 Demographic characteristics: Age and sex

The following table gives the risk of RoD according to the age and sex of the study cohort. In the age analyses, the youngest stratum (ages 18 – 39 years) has been designated the reference category, with the risk ratios comparing the likelihood of RoD for each age stratum against this class. It shows a trend of increasing risk of RoD in the older age groups, although this pattern was not noted in the 40-59 years group, and was significant in the oldest category only. On average, those who experienced RoD were about one year older than those not having this outcome. Women had a 15% increase in the age-standardised risk of RoD compared to men, with a risk ratio of 1.15 (95% CI 1.02 – 1.28).

Table 7.7: Risk of RoD according to age and sex

Variable	RoD (n)	RoD (%)	95% CI	RR	95% CI
AGE AT DISCHARGE					
18-39	1,639	8.9	(8.5 – 9.3)	1.00 (Reference)	
40-59	2,122	8.2	(7.9 – 8.6)	0.93	(0.87 – 0.99)
60-79	3,404	9.0	(8.7 – 9.3)	1.01	(0.96 – 1.07)
>79	892	11.6	(10.9 – 12.4)	1.31	(1.21 – 1.41)
MEAN AGE AT DISCHARGE (RoD, YEARS)			57.9		
MEAN AGE AT DISCHARGE (THOSE NOT AFFECTED BY RoD, YEARS)			56.7		
DIFFERENCE BETWEEN MEANS (95% CI)			1.2 (0.78 – 1.6)		
SEX					
MALE	3,750	8.1	(7.6 – 8.5)	1.00 (Reference)	
FEMALE	4,307	9.2	(8.8 – 9.6)	1.15	(1.02 – 1.28)

RR= risk ratio of RoD. RoD = Readmission or death within thirty days of discharge (risk, %). In the sex comparison, RoD (risk, %) and risk ratio have been adjusted for age, using direct standardisation against the 2001 Māori census population. CI= Confidence interval.

7.1.2.2 ETHNICITY

This is the first analysis towards evaluating the study hypothesis that ‘NZ Māori receive a poorer standard of hospital care compared to NZ Europeans’. The following table considers two key confounders, age and sex, using direct standardisation and presents the risk of RoD for each ethnic group.

The table shows that a lower age-sex standardised proportion of NZ European patients experienced RoD than NZ Māori (8.4% compared to 9.6%, with non-overlapping 95% confidence intervals). The comparison of the two proportions using a risk ratio (RR) revealed that NZ Māori had a 14% increase in the risk of RoD compared to the European cohort (RR 1.14, 95% CI 1.06 -1.24).

Although this result does not consider the impact of other confounding or mediating variables, it demonstrates a difference between the two groups and its direction, and allows us to consider the consistency of findings between the descriptive and the multivariable analyses.

Table 7.8: Risk of RoD according to ethnicity

Ethnicity	RoD (n)	RoD (%)	95% CI	RR	95% CI
NZ EUROPEAN	6,804	8.4	(8.1 – 8.8)	1.00 (Reference)	
NZ MĀORI	1,253	9.6	(9.1 – 10.1)	1.14	(1.06 – 1.24)

RR= Risk ratio of RoD. RoD = Readmission or death within thirty days of discharge. RoD (risk, %) and risk ratios have been adjusted for age and sex, using direct standardisation against the 2001 Māori census population. CI= Confidence interval.

7.1.2.3 Clinical characteristics

COMORBIDITY

The following table compares the risk of RoD for different strata of comorbidity, using patients with a Charlson comorbidity index of zero as the reference category. It shows a trend for increasing risk of RoD with rising comorbidity. Compared with those with a Charlson score of zero, the ratio for those with a score of one is 1.88 (95% CI 1.75 – 2.02), the ratio for those with a Charlson score of two is 2.23 (95% CI 2.08 – 2.39), and patients classified as Charlson comorbidity score of three or more had nearly three times the risk of RoD compared to patients in the lowest category of comorbidity, with a risk ratio of 2.63 (95% CI 2.45 – 2.81).

Table 7.9: Risk of RoD according to comorbidity

Charlson comorbidity index	RoD (n)	RoD (%)	95% CI	RR	95% CI
0	5,711	7.9	(7.4 – 8.4)	1.00 (Reference)	
1	1,182	14.8	(14.2 – 15.5)	1.88	(1.75 – 2.02)
2	631	17.6	(16.9 – 18.3)	2.23	(2.08 – 2.39)
3 OR MORE	533	20.7	(20.0 – 21.5)	2.63	(2.45 – 2.81)

RR=risk ratio of RoD. RoD = Readmission or death within thirty days of discharge RoD (risk, %) and risk ratios have been adjusted for age and sex, using direct standardisation against the 2001 Māori census population, CI= Confidence interval.

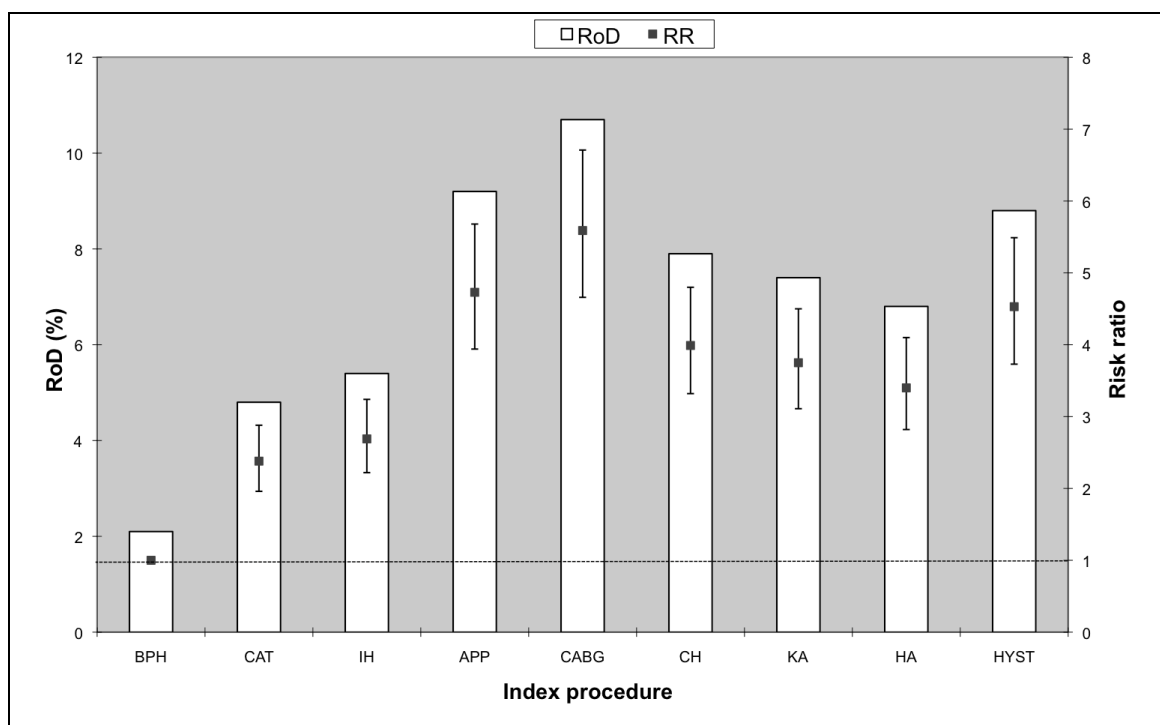
INDEX PROCEDURE

The risk ratios of RoD according to the index procedure were calculated using the procedure category with the lowest risk of RoD as the reference group (this was the stratum of patients experiencing procedures associated with benign prostatic hypertrophy). There was substantial variation in the risk of RoD according to the index procedure, with the highest estimate noted for patients who experienced coronary artery bypass grafting.

Table 7.10: Risk of RoD according to index procedure

Index procedure	RoD (n)	RoD (%)	95% CI	RR	95% CI
PROCEDURES FOR BENIGN PROSTATIC HYPERTROPHY	735	2.1	(1.8 – 2.5)	1.00 (Reference)	
REMOVAL OF CATARACTS	129	4.8	(4.5 – 5.2)	2.38	(1.96 – 2.88)
INGUINAL HERNIA REPAIR	387	5.4	(5.1 – 5.8)	2.69	(2.22 – 3.24)
APPENDICECTOMY	1,382	9.2	(8.7 – 9.7)	4.73	(3.94 – 5.68)
CORONARY ARTERY BYPASS GRAFT	786	10.7	(10.2 – 11.2)	5.59	(4.66 – 6.71)
CHOLECYSTECTOMY	1,390	7.9	(7.4 – 8.3)	3.99	(3.32 – 4.80)
KNEE ARTHROPLASTY	989	7.4	(7.0 – 7.9)	3.75	(3.11 – 4.50)
HIP ARTHROPLASTY	1,141	6.8	(6.4 – 7.2)	3.40	(2.82 – 4.10)
HYSTERECTOMY	1,093	8.8	(8.1 – 9.5)	4.53	(3.73 – 5.49)

These results refer to patients who experienced a single procedure only. RR = Risk ratio of RoD against reference category (defined here as procedures for benign prostatic hypertrophy). RoD (risk, %) and ratios have been adjusted for age and sex, using direct standardisation against the 2001 Māori census population, with the exception of results for those experiencing hysterectomy and procedures for benign prostatic hypertrophy, which have not been adjusted for sex. CI= Confidence interval.



RoD = Readmission or death within thirty days of discharge, RR= Risk ratio, IH = Inguinal hernia repair, APP = Appendicectomy, CABG = Coronary Artery Bypass Graft, CH = Cholecystectomy, KA = Knee arthroplasty, HA = Hip arthroplasty, BPH = Procedures for Benign Prostatic Hypertrophy, CAT = Removal of cataracts. RoD and RR have been adjusted for age and sex, using direct standardisation against the 2001 Māori census population, with the exception of results for those experiencing hysterectomy and procedures for benign prostatic hypertrophy, which have not been adjusted for sex. Error bars represent 95% confidence intervals for risk ratios.

Figure 7.3: Risk of RoD according to index procedure

MORE THAN ONE PROCEDURE

Having more than one procedure during the index admission was paradoxically associated with a slightly lower risk of RoD. It is possible that this estimate incorporates the impact of other patient variables, as those undergoing two or more procedures may be more clinically stable and have fewer comorbidities than those experiencing only one of the operations. However this analysis is limited by the small numbers of the cohort who experienced this outcome (RoD) and exposure (more than one procedure, n=25), and as expected this association was not significant at the 95% confidence level.

Table 7.11: Risk of RoD according to number of procedures

Number of index procedures	RoD (n)	RoD (%)	95% CI	RR	95% CI
1	8,032	8.5	(8.1 – 9.0)	1.00 (Reference)	
>1	25	7.7	(7.1 – 8.4)	0.91	(0.82 – 1.00)

RR = Risk ratio of RoD against reference category (defined here as the experiencing one procedure only). RoD (risk, %) and risk ratios have been adjusted for age and sex, using direct standardisation against the 2001 Māori census population, CI= Confidence interval. Note: age categories were collapsed in the standardisation analyses due to the small numbers of participants in the >1 index procedure category, and sex standardisation was not able to be performed in this group. As such, these estimates are not directly comparable to others in this section, which utilise eighteen age strata.

7.1.2.4 System-level characteristics

HOSPITAL VOLUME

In this analysis, the risk of RoD for patients in the highest volume hospitals (stratum one) was used as the reference. The risk of RoD was shown to decrease with hospital volume stratum, with the lower volume hospitals (those in strata two and three) demonstrating a lower rates of RoD compared to the stratum one facilities. Patients attending stratum two hospitals were 20% less likely to experience RoD compared to the highest volume hospitals (RR 0.80, 95% CI 0.73 – 0.87), and those in stratum three facilities nearly 30% less likely to have this outcome (RR 0.72, 95% CI 0.65 – 0.78). It is probable that the apparent association between hospital volume and risk of RoD also incorporates the impact of other variables; such as casemix, comorbidity and clinical severity.

Table 7.12: Risk of RoD according to hospital volume strata

Hospital volume stratum	RoD (n)	RoD (%)	95% CI	RR	95% CI
1 (HIGHEST VOLUME)	3,711	9.9	(9.3 – 10.4)	1.00 (Reference)	
2	2,456	8.0	(7.6 – 8.5)	0.80	(0.73 – 0.87)
3	1,890	7.2	(6.8 – 7.7)	0.72	(0.65 – 0.78)

RR = Risk ratio of RoD against reference category (defined here as hospital volume stratum one). RoD (risk, %) and risk ratios have been adjusted for age and sex, using direct standardisation against the 2001 Māori census population. Stratum 1 includes hospitals with the highest mean annualised discharge rates for the selected procedures; stratum 3 represents hospitals with the lowest discharge rates. CI= Confidence interval.

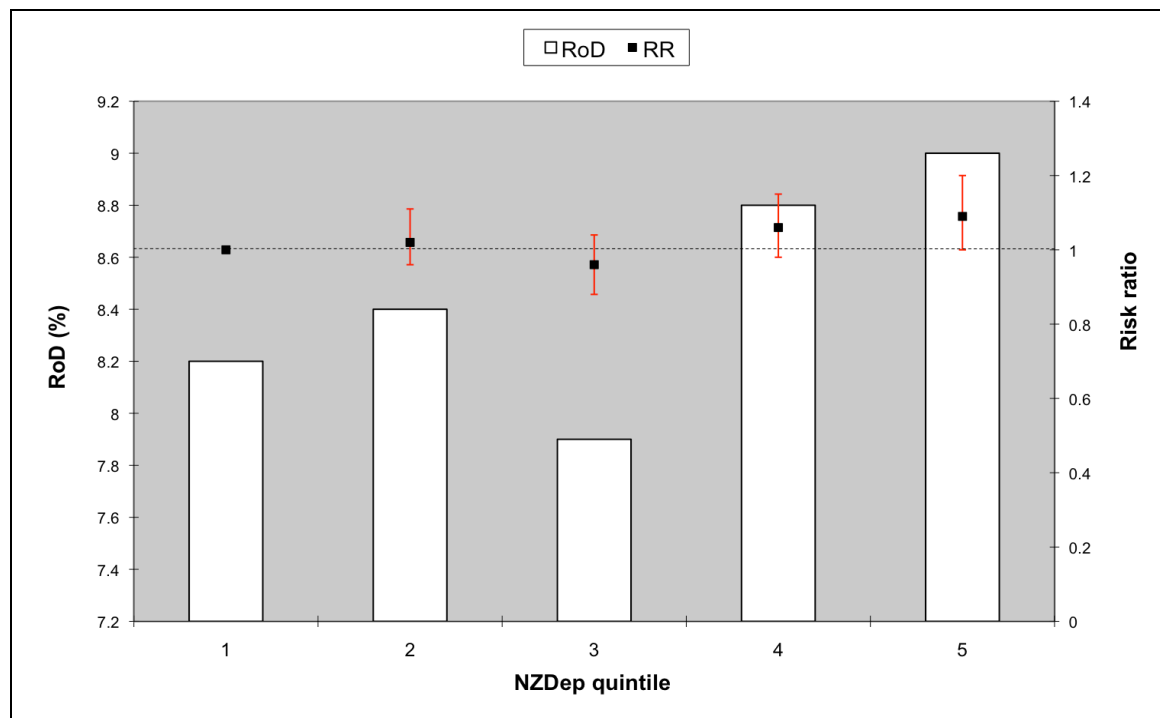
SOCIO-ECONOMIC POSITION

The table below shows the risk of RoD in NZDep01 quintiles compared against the risk for patients in the least deprived category, NZDep01 quintile one. The risk of RoD is highest for those in the most deprived quintile (RR 1.09, 95% CI 1.00 – 1.20); however there is no consistent pattern in the distribution, with a comparatively lower risk of RoD in quintile three (RR 0.96, 95% CI 0.88 – 1.04). The confidence intervals of all these estimates include one. Nonetheless, given the placement of the interval to the right for the most deprived patients (1.00 – 1.20), it is probable that there is a true increase in the risk of RoD for the quintile five patients when compared to the reference group.

Table 7.13: Risk of RoD according to deprivation

NZDep01 quintile	RoD (n)	RoD (%)	95% CI	RR	95% CI
1 (LEAST DEPRIVED)	932	8.2	(7.8 – 8.7)	1.00 (Reference)	
2	1,305	8.4	(7.9 – 8.9)	1.02	(0.94 – 1.11)
3	1,601	7.9	(7.4 – 8.4)	0.96	(0.88 – 1.04)
4	2,172	8.8	(8.3 – 9.3)	1.06	(0.98 – 1.15)
5 (MOST DEPRIVED)	2,033	9.0	(8.5 – 9.5)	1.09	(1.00 – 1.20)

RR= Risk ratio of RoD. RoD = Readmission or death within thirty days of discharge. RoD (risk, %) and risk ratios have been adjusted for age and sex, using direct standardisation against the 2001 Māori census population. NZDep01 = New Zealand Deprivation Index 2001. Quintile 1 = NZDep01 deciles 1 and 2, quintile 2 = NZDep01 deciles 3 and 4, quintile 3 = NZDep01 deciles 5 and 6, quintile 4 = NZDep01 deciles 7 and 8, quintile 5 = NZDep01 deciles 9 and 10. CI= Confidence interval. As with the analysis performed in Section 7.1.1.3, there are 257 missing values for this variable.



RoD = Readmission or death within thirty days of discharge, RR = Risk ratio. Reference category is NZDep01 quintile 1 (least deprived). Error bars represent 95% confidence intervals for risk ratios. RoD and risk ratios have been adjusted for age and sex, using direct standardisation against the 2001 Māori census population.

Figure 7.4: Risk of RoD according to deprivation

7.1.3 Multivariable analyses

This study aims to investigate the hypothesis that NZ Māori patients receive a lower quality of public hospital care than NZ Europeans, and Phase One of the research employs unplanned readmission/death within thirty days of discharge (RoD) as an indicator of quality of care. The previous section of this chapter used stratification to explore the variation of patient, clinical and system characteristics according to ethnic group and the risk of RoD. This section presents the results of multivariable modelling using logistic regression, where the odds of RoD for Māori compared to NZ Europeans was calculated, whilst controlling for the impact of confounding and mediating variables. The structure of this section is as follows:

- 7.1.3.1 focuses on preparing the variables, refining the model, and considers the impact of the exclusion of some subjects.
- 7.1.3.2 discusses the main findings.
- 7.1.3.3 explores the potential for effect modification in these analyses.
- 7.1.3.4 provides a summary of the multivariable analyses.

7.1.3.1 Preparing and refining the model and dataset

FORM OF VARIABLES

1. Age: When the risk of RoD was evaluated according to age, an approximate 'J-curve' was demonstrated with the risk ratio for the second class (ages 40 – 59) being lower than the younger and older age groups. This may represent a threshold effect, whereby the oldest age group has an increased risk of RoD but there is little association between age and RoD below this stratum. Although similar estimates were produced when age was considered as both categorical and continuous variables, the (potentially) non-linear relationship between RoD and age is more efficiently approximated when categories are used. As such, it was included in the final models as a four-class categorical term.

2. Sex and index procedure: These terms were evaluated in two ways - as separate variables, and after fourteen combined sex-Index procedure terms were formed. This latter process aimed to explore the impact of non-overlapping data, such as that produced by sex-specific operations (e.g. procedures for benign prostatic hypertrophy and hysterectomy). The two

different methods produced identical impacts on the odds ratio of RoD for Māori compared to NZ Europeans, and so for efficiency these variables were included in the models independently.

The variables and their final categorisations are noted below:

Table 7.14: Variables and their categorisation (Phase One)

Variables	Categorisation
AGE	Quartiles: 18-39, 40 – 59, 60 – 79, and > 79 years.
SEX	Male or Female.
CHARLSON COMORBIDITY INDEX	Four categories: CCI 0, CCI 1, CCI 2, and CCI 3 or more.
INDEX PROCEDURE	Inguinal hernia repair Removal of cataracts Coronary artery bypass graft Cholecystectomy Hysterectomy Benign Prostatic Hypertrophy* Knee arthroplasty Hip arthroplasty Appendicectomy
> 1 PROCEDURE	Yes or No
HOSPITAL VOLUME	Three categories: Hospital volume strata** 1, 2, 3.
SOCIO-ECONOMIC POSITION	Quintiles: NZDep01 1 and 2 (Q1), 3 and 4 (Q2), 5 and 6 (Q3), 7 and 8 (Q4), 9 and 10 (Q5).
RISK OF RoD (OUTCOME)	Yes or No

CCI = Charlson Comorbidity Index, RoD = readmission/death within thirty days of discharge, NZDep01 = New Zealand Deprivation Index 2001. * Refers to minimally invasive procedures for benign prostatic hypertrophy.

** Stratum 1 = Proportion experiencing index admission in facilities performing on average >1500 of the selected surgical procedures per year over the study period; Stratum 2 = Proportion experiencing index admission in facilities performing on average 500 - 1500 of the selected surgical procedures per year over the study period; Stratum 3 = Proportion experiencing index admission in facilities performing on average < 500 of the selected surgical procedures per year over the study period.

REFINING THE MODEL

The final multivariable model was formed in a stepwise fashion (Models 1, 2, 3, 4 as per Table 6.4 p178). This progression is summarised below:

Odds ratio for RoD (Māori compared to NZ European)

= Māori ethnicity

+ 'Pure confounders' (age, sex)

+ 'Practical confounders' - Patient-level (Clinical factors: comorbidity, index procedure, >1 procedure)

+ 'Practical confounders' – Systems-level (hospital volume)

+ Mediator (Deprivation)

The model was refined during this process, excluding some variables from the final Model 4. The decision to include a covariate to control for confounding or mediation reflected:

- The findings from the literature about potential sources of confounding/mediation with this measure (discussed in Chapter Five).
- Structural and DAG analysis (Chapters Five and Six).
- Evidence from the descriptive analyses for associations between the variable and ethnicity/RoD (Section 7.1.1 and 7.1.2 of this chapter)
- The association of the variable with the outcome in the multivariable analyses; as evidenced by its impact on the beta coefficient and standard error for the principal finding.
- The fit of the data to the expanded model compared to one without the new variable (as shown by the log likelihood ratio test).

During this process, the model was altered in the following ways:

1. Exclusion of the 'more than one procedure' term: It is possible that patients having more than one index procedure may have a greater or lesser risk of readmission; however there was insufficient evidence of an association between this factor and readmission in this study or in

the literature. The descriptive analyses demonstrated no significant relationship between more than one index procedure and ethnic group, and the inclusion of the 'more than one procedure' variable changed the final estimate of the odds ratio of RoD for Māori compared to NZ Europeans in the third decimal place only (Model 4: OR 1.155 without this term, OR 1.152 in the expanded model). The log likelihood test also demonstrated no significant improvement in the fit of the data to the model after the addition of this term, and so this variable was excluded from the final model.

2. Exclusion of the 'sex' term: The evidence regarding an association between sex and readmission in the literature is mixed; and should it exist, its overall impact is likely to be small (see Chapter Six, p178). Although more of the NZ Māori participants were female than the NZ European cohort, and there was a small increase in the age-standardised risk of RoD for women in the descriptive analyses, the term was associated with a non-significant beta coefficient and the log likelihood test showed no improvement in the fit of the data with sex included. Inclusion of the sex term also produced identical estimates to those obtained from models without this variable; it is possible that the age term has also controlled for confounding from this source.

There is an argument for including this factor nonetheless, given the findings of the descriptive analyses, its categorisation as a 'pure confounder', and the large sample size (hence ample statistical power and degrees of freedom for analyses). However, the results demonstrate that in this population, the inclusion of a sex term is unnecessary. Given that its incorporation would not be for any epidemiological purpose, this term was excluded from the final model.

REFINING THE DATASET

A total of 89,658 subjects met our eligibility criteria. However, 568 subjects (0.63%) – including 312 patients (0.3%) who had experienced more than one of the defined index procedures, and 257 (0.29%) patients with missing information for the NZDep01 field in the National Minimum Data Set - were excluded from the final analyses.

In practice, these exclusions were inconsequential. Running the regression models on the three 'datasets' (the total sample; the subset with those participants with missing deprivation information excluded, $n = 89,401$; and a further reduced dataset with those who experienced more than one index procedure during their admission also excluded, $n = 89,090$)

demonstrated that there was minimal difference between the principal findings of the models⁴⁶, irrespective of the stage of its development. The associated 95% confidence intervals around the estimates were also equivalent.

7.1.3.2 Main findings, Phase One

The table below presents the main findings from Phase One, the exploration of the risk of RoD for NZ Māori compared to NZ European patients, using the data from 89,090 patients. The table shows the crude association between ethnicity and RoD, followed by estimates from the logistic regression model as it was developed.

Table 7.15: Odds ratios of RoD for NZ Māori compared to NZ European patients with the stepwise addition of demographic, clinical and system variables

Variable		OR of RoD	95% CI
CRUDE (UNADJUSTED)		1.14	(1.07 – 1.21)
MODEL 1: DEMOGRAPHICS	Age	1.19	(1.12 – 1.27)
MODEL 2: AGE + CLINICAL FACTORS	+ Comorbidity	1.13	(1.06 – 1.21)
	+ Index procedure	1.17	(1.09 – 1.25)
MODEL 3: AGE + CLINICAL FACTORS + HOSPITAL VOLUME	+ Hospital volume	1.19	(1.11 – 1.27)
MODEL 4: AGE + CLINICAL FACTORS + HOSPITAL VOLUME + SOCIO-ECONOMIC POSITION	+ Deprivation	1.16	(1.08 – 1.24)

CI = Confidence interval, OR = Odds Ratio, RoD = Readmission or death within thirty days of discharge.

The crude analysis shows that without consideration for any confounders/mediator, NZ Māori have a 14% increase in the odds of experiencing RoD compared to the NZ European patients. The association strengthened after the step-wise addition of confounders. The estimates produced from the developing model are consistent in their direction, all demonstrating an

⁴⁶ The 'more than one procedure' term was not able to be included in the models run on the dataset that had excluded these participants.

increase in the odds of RoD for NZ Māori patients compared to the remainder of the sample; and are all statistically significant, with the confidence intervals around the estimates excluding the null value of one.

Model 3 considers the impact of patient, clinical and hospital variables, but does not incorporate the effect of socio-economic position. Therefore, this model does not control for the disparate distribution of deprivation for Māori compared to NZ European patients, but instead produces an estimate that reflects the unfair association of socio-economic position with ethnic group present in the study (and wider) population (that is, including the impact of mediation from this factor in the odds ratio). The estimate produced by Model 3 demonstrated a 19% increase in the odds of RoD for Māori compared to NZ European patients. The 95% confidence interval suggests that the true increase in risk may be as high as 27% or as low as 11%.

The findings of Model 4 adjust for the impact of deprivation, showing the effect of ethnicity on the risk of RoD independent of age, index procedure, comorbidity, hospital volume and socio-economic position (that is, the best estimate of the **net** effect of ethnic group on the risk of RoD, given the covariates included). Once these factors were considered, NZ Māori were still more likely to experience RoD. This increase in risk was estimated to be around 16%, but may be as high as 24% and as low as 8% (95% confidence level).

The coefficients (odds ratios of RoD for Māori compared to NZ Europeans) for the individual covariates from Model 4 are shown below in Table 7.16.

Table 7.16: Odds ratio of RoD, individual covariates (Model 4)

Variable	Category	Odds ratio of RoD (Model 4)	95% Confidence interval
ETHNIC GROUP	NZ European	1.00	
	NZ Māori	1.16	(1.08 – 1.24)
AGE (YEARS)	18 – 39	1.00	
	40 – 59	0.88	(0.81 – 0.95)
	60 – 79	0.91	(0.84 – 0.99)
	>79	1.33	(1.19 – 1.48)
CHARLSON COMORBIDITY INDEX	0	1.00	
	1	1.43	(1.33 – 1.54)
	2	1.61	(1.46 – 1.77)
	3 or more	2.07	(1.87 – 2.30)
INDEX PROCEDURE	Procedures for benign prostatic hypertrophy	1.00	
	Appendicectomy	1.11	(0.99 – 1.24)
	Coronary artery bypass graft	1.90	(1.69 – 2.13)
	Removal of cataracts	0.54	(0.44 – 0.65)
	Cholecystectomy	0.99	(0.89 – 1.09)
	Hip arthroplasty	0.98	(0.88 – 1.08)
	Hysterectomy	1.08	(0.97 – 1.19)
	Inguinal hernia repair	0.73	(0.64 – 0.84)
	Knee arthroplasty	1.07	(0.97 – 1.20)
HOSPITAL VOLUME STRATUM	1 (highest volume)	1.00	
	2	0.84	(0.79 – 0.89)
	3	0.81	(0.76 – 0.86)
NZDEP01 QUINTILE	1 (least deprived)	1.00	
	2	1.04	(0.95 – 1.14)
	3	0.98	(0.90 – 1.07)
	4	1.07	(0.99 – 1.16)
	5	1.12	(1.03 – 1.22)

RoD = Risk of readmission/death within thirty days of discharge, NZDep01 = New Zealand Deprivation Index 2001. Hospital volume stratum 1 = Proportion experiencing index admission in facilities performing on average >1500 of the selected surgical procedures per year over the study period; stratum 2 = Proportion experiencing index admission in facilities performing on average 500 - 1500 of the selected surgical procedures per year over the study period; stratum 3 = Proportion experiencing index admission in facilities performing on average < 500 of the selected surgical procedures per year over the study period. Quintile 1 = NZDep01 deciles 1 and 2, quintile 2 = NZDep01 deciles 3 and 4, quintile 3 = NZDep01 deciles 5 and 6, quintile 4 = NZDep01 deciles 7 and 8, quintile 5 = NZDep01 deciles 9 and 10.

This table supports the findings of the descriptive analyses, showing a higher risk of RoD for patients in the oldest age group, and a pattern of rising odds of RoD as the level of comorbidity increases. As expected, there is no obvious pattern with regards to index procedure and the odds of RoD, with some categories having higher or lower odds compared to the reference group (patients experiencing minimally invasive procedures for benign prostatic hypertrophy). Patients admitted at the highest volume hospitals had the greatest likelihood of RoD, with the odds reducing as hospital volume decreased. The odds ratio for RoD according to level of deprivation was mixed, however patients residing in the most deprived areas (NZDep01 quintile five) had a significant increase in their likelihood of the outcome compared to those in quintile one.

7.1.3.3 Effect modification

The results above demonstrate a consistent and statistically significant association between ethnicity and RoD after consideration for key covariates. The final model estimated that NZ Māori were 16% more likely to experience RoD compared to the NZ European patients (odds ratio for RoD 1.16, 95% CI 1.08 – 1.24). This section explores the potential for effect measure modification in the analyses, such that the association between ethnicity and RoD varies according to the level of the third factor. A priori, it was considered that comorbidity, socio-economic position, and hospital volume might behave in this fashion (as discussed in Chapter Six, p180).

METHODS

Three processes were performed to investigate potential interactions:

1. The odds ratios of RoD *for each ethnic group* were stratified according to the levels of the possible modifier, and their variability assessed.
2. The odds ratios of RoD for *Māori as compared to those of NZ Europeans* were stratified according to levels of the potential modifier, and their variability assessed.
3. Multiplicative interaction terms were created for each variable, considering the potential effect modifier in combination with the exposure variable. These interaction factors were inserted into the model and their individual coefficients and standard errors examined, along with their influence on the odds ratio of RoD for ethnicity. The fit of the data to the model after the addition of the interaction terms was assessed with the log likelihood ratio test.

DEPRIVATION AND HOSPITAL VOLUME

For the deprivation and hospital volume variables, there were no significant differences between the odds ratios of the strata of interaction terms, no evidence of an improvement in the fit of the model following the inclusion of these terms (as evidenced by the log likelihood test), and there was minimal variation in the odds ratios of RoD at each level of the variable. Therefore, it was concluded that there were no significant interactions between RoD and Māori ethnic group due to deprivation and hospital volume, and effect modification terms for these factors were not included in the final models.

COMORBIDITY

1. Stratification according to level of comorbidity: Two tables are used to show the variation in the odds of RoD for Māori and NZ Europeans with respect to comorbidity.

The first (Table 7.17, next page) compares the odds ratios of RoD at each level of comorbidity against that of a reference group, defined as NZ European patients with Charlson Comorbidity Index of zero. This table allows the strength of association for each ethnic group and category of comorbidity to be seen simultaneously.

It shows that at the lowest level of comorbidity (CCI 0), Māori have a 10% increase in the odds of RoD compared to the equivalent group of NZ Europeans. A dose-response trend is identifiable for both ethnic groups, with an increasing odds ratio for RoD as the level of

comorbidity rises. However, the odds of RoD for the NZ Māori patients increases disproportionately to that of the NZ Europeans, with NZ Māori patients having an odds ratio for RoD of 2.77 at the highest level of comorbidity, compared to only 1.99 for the NZ European patients. Put another way, the apparent odds ratio for NZ Māori with a comorbidity index of three or more compared to the reference group is $2.77/1.10 = 2.52$, a stronger association than that seen in the equivalent group of NZ Europeans (OR 1.99).

Table 7.17: Odds ratios of RoD for NZ European and NZ Māori patients, stratified by comorbidity

Charlson comorbidity index	Odds ratio for RoD			
	NZ European	95% CI	NZ Māori	95% CI
0	1.00 (Reference)		1.10	(1.02 – 1.20)
1	1.41	(1.30 – 1.52)	1.72	(1.47 – 2.01)
2	1.57	(1.41 – 1.73)	2.09	(1.65 – 2.64)
3 OR MORE	1.99	(1.78 – 2.23)	2.77	(2.22 – 3.46)

RoD = readmission/death within thirty days of discharge (risk, %), CI= Confidence interval. The reference category is defined as the odds ratio of RoD for NZ Europeans with Charlson index of zero.

The second table (Table 7.18, next page) shows the marginal odds ratios by ethnicity. That is, the odds of RoD for NZ Māori *compared* to that of NZ Europeans, calculated as the ratio for NZ Māori divided by that of the NZ European group by strata of comorbidity. For example, for patients with a comorbidity score of three or more only, the odds ratio of RoD for Māori compared to NZ Europeans was 1.39 (calculated as $2.77/1.99$ from Table 7.17 above), meaning that NZ Māori were nearly 40% more likely to experience RoD compared to NZ Europeans at this level of comorbidity.

Table 7.18: Ratio of the odds ratio of RoD for NZ Māori according to level of comorbidity

Charlson comorbidity index	Ratio of the OR (RoD) for NZ Māori compared to NZ European patients	95% Confidence interval
0	1.10	(1.02 – 1.20)
1	1.22	(1.03 – 1.44)
2	1.33	(1.04 – 1.70)
3 OR MORE	1.39	(1.09 – 1.77)

OR = Odds ratio, RoD = Risk of readmission/death within thirty days of discharge.

The table shows an increasing ratio of the odds of RoD for Māori compared to NZ Europeans as the level of comorbidity rises. Māori with comorbidity scores of zero are nearly 10% more likely to experience RoD compared to the same group of NZ Europeans, but this risk rises to a 39% increase in the odds of RoD for Māori compared to NZ Europeans at the highest level of comorbidity. All of the 95% confidence intervals overlap, raising questions about the statistical significance of the inter-stratum variability. However, a dose-response trend over the levels of comorbidity is suggested, with the ratio of the odds of RoD increasing from 1.10 to 1.22 to 1.33 and finally to 1.39 at CCI 3.

2. Multiplicative interaction terms: The variable for comorbidity (the Charlson comorbidity index, a four-class categorical variable in this study) was multiplied with the variable representing Māori ethnic group, creating a new term with four categories – one reflecting the impact of Māori ethnicity on RoD at comorbidity level zero, another the impact of Māori ethnicity on the odds of RoD at comorbidity level one, and so on. Table 7.19 shows the odds ratios associated with each interaction term, along with the principal findings for Model 4 with respect to ethnicity and strata of comorbidity.

Table 7.19: Odds ratio of ROD with categorical interaction terms (comorbidity x Māori ethnicity)

Variable	Category	Odds ratio for ROD	95% Confidence interval
MODEL 4: AGE + CLINICAL FACTORS + HOSPITAL VOLUME + SOCIO-ECONOMIC POSITION			
ETHNIC GROUP	NZ European	1.00	
	NZ Māori	1.16*	(1.08 – 1.24)
*Impact of Māori ethnicity on odds of RoD (pooled across all strata of comorbidity)			
CHARLSON COMORBIDITY INDEX	0	1.00	
	1	1.43**	(1.33 – 1.54)
	2	1.61**	(1.46 – 1.77)
	3 or more	2.07**	(1.87 – 2.30)
**Impact of defined level of comorbidity on odds of RoD (pooled across both ethnic groups)			
EXPANDED MODEL 4 (I.E. MODEL 4 PLUS INCLUSION OF CATEGORICAL COMORBIDITY-ETHNICITY INTERACTION TERMS; COEFFICIENTS FOR OTHER COVARIATES NOT SHOWN)			
ETHNIC GROUP	NZ European	1.00	
	NZ Māori	1.10+	(1.02 – 1.21)
+Impact of Māori ethnicity on odds of RoD amongst those with CCI 0			
CHARLSON COMORBIDITY INDEX	0	1.00	
	1	1.41++	(1.30 – 1.52)
	2	1.57++	(1.41 – 1.73)
	3 or more	2.00++	(1.78 – 2.23)
++ Impact of defined level of comorbidity on odds of RoD (pooled across both ethnic groups)			
INTERACTION TERMS	CCI 0 x NZ Māori ethnicity	1.00	
	CCI 1 x NZ Māori ethnicity	1.12+++	0.93 – 1.34
	CCI 2 x NZ Māori ethnicity	1.21+++	0.93 – 1.57
	CCI 3 x NZ Māori ethnicity	1.26+++	0.98 – 1.68
+++Impact of defined level of comorbidity on odds of RoD for Māori compared to NZ Europeans			

CCI= Charlson Comorbidity Index, categorised as those with scores of 0, 1, 2, and 3 or more. OR = Odds ratio, RoD= risk of readmission/death within thirty days of discharge. #Includes age, sex, deprivation, CCI, IP, hospital volume.

Visually, there is a convincing dose-response relationship for these interaction terms. Although the confidence intervals for the interaction terms are not significant at the 95% level, they are close to being so, and increase consistently at each level of comorbidity. However, when the estimates of Model 4 were compared with those obtained after the inclusion of the interaction terms, the log likelihood ratio was not significant - indicating that the inclusion of comorbidity as an effect modifier in its categorical form did not improve the fit of the model.

On the basis of the apparent linear trend of the interaction terms and the essentially ordinal nature of the comorbidity variable (ranging from zero to three), a continuous interaction term (Māori ethnic group x Charlson comorbidity index in a continuous form) was created. The results of the logistic regression modelling once this term was included are shown in the table below:

Table 7.20: Odds ratio of RoD with continuous interaction term (comorbidity x Māori ethnicity)

Model	Variable	Odds ratio of RoD	95% Confidence interval
MODEL 4: AGE + CLINICAL FACTORS + HOSPITAL VOLUME + SOCIO-ECONOMIC POSITION#			
ETHNIC GROUP	NZ European	1.00	
	NZ Māori	1.16*	(1.08 – 1.24)
*Impact of Māori ethnicity on odds of RoD (pooled across all strata of comorbidity)			
CHARLSON COMORBIDITY INDEX	CCI (continuous)	1.28**	(1.25 – 1.32)
**Impact of comorbidity on odds of RoD (pooled across both ethnic groups)			
EXPANDED MODEL 4 (I.E. MODEL 4 PLUS INCLUSION OF CONTINUOUS COMORBIDITY-ETHNICITY INTERACTION TERM)			
ETHNIC GROUP	NZ European	1.00	
	NZ Māori	1.11+	(1.03 – 1.20)
+Impact of Māori ethnicity on odds of RoD for those with CCI 0			
CHARLSON COMORBIDITY INDEX	CCI (continuous)	1.27++	(1.23 – 1.31)
++Impact of comorbidity on odds of RoD in the reference ethnic group (i.e. NZ Europeans)			
INTERACTION TERM	CCI x Māori ethnic group	1.09+++	(1.01 – 1.17)
+++ Impact of every unit change of comorbidity on the odds of RoD for Māori compared to NZ Europeans			

CCI= Charlson Comorbidity Index, OR = Odds ratio, RoD= risk of readmission/death within thirty days of discharge.

#Includes age, sex, deprivation, CCI, IP, hospital volume.

This table shows that for every unit increase in comorbidity (such as from a Charlson score of one to two), the odds ratio of RoD for Māori compared to NZ Europeans increases by 9% (95% CI 1.01 – 1.17). When Model 4 was compared to an expanded model that included this interaction variable, the log likelihood ratio test demonstrated an improved fit of the data in the latter version.

In statistical terms, it is justified to include the continuous interaction variable in the model, and present the findings of this expanded model as the study's final results. However, this research was designed to compare the risk of RoD for NZ Māori against that of NZ Europeans,

independent of confounding factors (as per study objective two: to ascertain the net effect of ethnic group on the indicator of quality). Although the exploration of comorbidity as an effect modifier aids our understanding of the relationship between RoD, ethnicity and comorbidity; the intent of this study was to determine the overall (pooled) effect of ethnicity across all levels of comorbidity. Including an interaction term in the model references the impact of ethnic group amongst the reference comorbidity stratum (CCI 0), making it more difficult to interpret the estimates in light of the study hypothesis. Therefore, in this thesis the continuous comorbidity-ethnicity interaction term is not presented as part of the final model. Instead, the findings of Model 4 are given alongside those produced when the data are stratified by comorbidity. In this way, the impact of comorbidity on the odds ratio of RoD for Māori is easily illustrated, and the overall findings of the regression modelling can be interpreted with respect to the study objectives.

7.1.3.4 Summary

This section has described the main findings of Phase One of the study; the calculation of the odds ratio of RoD for Māori compared to NZ Europeans using a logistic regression model. The principal results are as follows:

- The findings of Model 3 reflect the odds of RoD for Māori against that of NZ Europeans once key confounders (age, index procedure, comorbidity, and hospital volume) are considered. It estimates that Māori are 19% more likely to be readmitted/die within thirty days of discharge (odds ratio 1.19, 95% CI 1.11 – 1.27). This result does not control for the impact of socio-economic position, so incorporates the influence deprivation may have on an individuals' risk of readmission.
- The final Model 4 (including covariates age, comorbidity, index procedure, hospital volume and deprivation) generated estimates that demonstrate a 16% increase in the risk of RoD for Māori compared with NZ Europeans (odds ratio 1.16), with a 95% chance of the true odds ratio being between 1.08 and 1.24.
- Descriptive and multivariable manipulation of the data revealed the presence of effect measure modification due to comorbidity. That is, the odds ratio of RoD for Māori compared to NZ European increases from 1.10 (95% CI 1.02 – 1.20) among those with no

comorbidity to 1.39 (95% CI 1.09 – 1.77) for those with Charlson comorbidity scores of three or more.

- An interaction term created from a continuous comorbidity variable in combination with Māori ethnicity, produced an odds ratio of RoD of 1.09 (95% CI 1.01 – 1.17), representing a 9% increase in the odds ratio of RoD for Māori compared to NZ Europeans for each unit increase in comorbidity.

7.2 PHASE TWO: PATIENT SATISFACTION

Phase Two of the study involved administering the CSQ-8 survey to NZ European and NZ Māori patients recently discharged from Wellington, Christchurch and Waikato hospitals November 1 2008 – July 31 2009. This section is structured in the following way:

- 7.2.1 compares demographic and clinical characteristics between the respondents and non-respondents.
- 7.2.2 presents the results of descriptive analyses according to ethnic group.
- 7.2.3 shows the distribution of respondent characteristics according to mean satisfaction score.
- 7.2.4 provides the results of multivariable linear regression modelling.
- 7.2.5 explores effect measurement modification by health status.
- 7.2.6 presents a brief summary of the Phase Two analyses.

7.2.1 Descriptive analyses according to response

7.2.1.1 Outcome of offer of participation

Questionnaires were disseminated to 2,541 eligible subjects, with equal numbers sent to each of the three hospitals. Crudely, **43.4%** of the eligible population responded to the survey, and this rate was approximately the same across the three facilities. The response rate increased slightly to **46.3%** after exclusion of patients:

- Who had died within six weeks of the initial survey being sent.
- With an invalid address.
- Who reported an alternative ethnicity (other than NZ Māori or NZ European) as their primary ethnic group.
- Who stated they were unable to physically or mentally complete the questionnaire.
- Whose questionnaire had been completed by a proxy.

Table 7.21: Outcome of the offer of participation for each facility

	Christchurch	Wellington	Waikato	Total
NUMBER SENT	840	838	863	2,541
EXCLUDED				
DEATH ⁺	7 (0.8%)	6 (0.7%)	9 (1.0%)	22
INVALID ADDRESS *	29 (3.4%)	34 (4.1%)	47 (5.5%)	110
OTHER ETHNICITY #	3 (0.4%)	5 (0.6%)	2 (0.2%)	10
OTHER PERSON †	0	1 (0.1%)	1 (0.1%)	2
UNABLE TO MENTALLY OR PHYSICALLY COMPLETE SURVEY ‡	3 (0.4%)	3 (0.4%)	9 (1.0%)	15
NO RESPONSE OR UNWILLING TO PARTICIPATE	413 (49.2%)	428 (51.1%)	438 (50.8%)	1,279
RESPONDED	385 (45.8%)	361 (43.1%)	357 (41.4%)	1,103
TOTAL ELIGIBLE (TOTAL SENT LESS EXCLUDED SUBJECTS)	798	789	795	2,382
OVERALL RESPONSE RATE (LESS EXCLUSIONS)	48.2%	45.8%	44.9%	46.3%

* As determined by the return of the unopened questionnaire (i.e. marked 'returned to sender'). + As determined by the direct notification of the death to the investigator by those associated with the subject, or by the date of death in subsequent datasets occurring within 6 weeks of the administration of the initial postal survey. # Incorrect coding of the primary ethnicity in the National Minimum Data Set, such that their self-identified ethnicity was other than NZ European or NZ Māori. † Survey completed by someone other than the intended subject (as determined by different demographic information, or the offering of this information). ‡ As determined by the receipt of this information from caregivers or the individual.

7.2.1.2 Demographic and clinical characteristics of respondents and non-respondents

The following table compares the characteristics of those subjects who completed the questionnaire with those that did not participate. These analyses use information from the National Minimum Data Set only; and are age-sex standardised using the NZ Māori 2001 census population as the external standard, and assuming a hypothetical sex distribution of 1:1 males and females. There were 111 missing items in the dataset for NZDep01 field; these values were obtained independently by linking the patients' address to a census meshblock and corresponding NZDep01 index (Statistics New Zealand 2011). The table shows the demographic and clinical characteristics of the sample population, according to their participation. The columns in **bold** (labelled as '%') represent the age-sex adjusted proportions of the respondents and the non-respondents sharing the characteristic; p-values were calculated using two-sided chi-squared tests.

Respondents were older than the non-respondents, with an approximate 10-year difference in the mean age of the two groups (95% CI 8.7 – 11.7 years). Respondents were also more likely to be female and of NZ European ethnicity - NZ Māori were around 20% less likely to return the questionnaire. Compared to the non-respondents, a significantly greater proportion of respondents lived in areas classified as NZDep01 quintiles one and two; and conversely they were less likely to reside in quintile five areas (most deprived). Respondents were slightly less likely to have been admitted to a surgical service, although the absolute difference in proportions was less than 3% and not significant ($p=0.14$). Evaluation of the facility type demonstrated similar rates of response across the three hospitals.

Table 7.22: Demographic and clinical characteristics of the respondents and non-respondents

Characteristic	Respondents			Non-respondents			p
	n	%	95% CI	n	%	95% CI	
AGE	1103			1279			
MEAN AGE (YEARS)	57.1			46.9			
DIFFERENCE IN MEANS (95% CI)			10.2 (8.7 – 11.7)				
SEX							
FEMALE	589	61.2	(56.04 – 66.35)	667	51.8	(48.58 – 55.10)	<0.0001
ETHNICITY							
NZ MĀORI	522	57.9	(52.65 – 63.12)	885	74.6	(71.80 – 77.44)	<0.0001
NZDEP01 QUINTILE							
1 (LEAST DEPRIVED)	181	18.2	(14.44 – 21.99)	154	12.0	(10.02 – 14.03)	<0.0001
2	205	19.0	(15.25 – 22.83)	194	14.2	(12.05 – 16.32)	0.001
3	212	17.6	(13.95 – 21.21)	208	16.8	(14.51 – 19.17)	0.62
4	242	20.4	(16.68 – 24.19)	292	21.7	(19.24 – 24.19)	0.43
5 (MOST DEPRIVED)	263	24.7	(20.63 – 28.82)	431	35.2	(32.16 – 38.31)	<0.0001
ADMISSION TYPE (CLINICAL)							
SURGICAL	561	60.9	(55.53 – 66.20)	719	63.1	60.13 – 66.15	0.14
FACILITY							
CHRISTCHURCH	385	34.5	(29.47 – 39.50)	413	32.3	29.22 – 35.37	0.45
WAIKATO	357	32.0	(26.90 – 37.15)	438	33.4	30.34 – 36.51	0.47
WELLINGTON	361	33.5	(28.11 – 38.87)	428	34.3	31.15 – 37.41	0.66

For the purposes of these analyses, the evaluation of ethnicity (like all other variables) employs data from the National Minimum Data Set – this is to allow the comparison between the respondents and non-respondents – however, in respondent-specific analyses, ethnicity data from the survey are preferentially employed. α =Defined as patients cared for by a medical or surgical team, under the purchaser unit code of the National Minimum Data Set. As with sex and ethnicity, this is a dichotomous variable and as such only one category is listed, the other being its complement. Proportions (%) have been adjusted for age and sex, using direct standardisation against the 2001 Māori census population, with the exception of the sex analysis (age-adjusted only) and age analysis (unadjusted). Due to small cell counts, the age categories were collapsed in the analyses of deprivation - as such these results are not directly comparable to others in this table. NZDep01 = New Zealand Deprivation Index 2001. Quintile 1 = NZDep01 deciles 1 and 2, quintile 2 =NZDep01 deciles 3 and 4, quintile 3 = NZDep01 deciles 5 and 6, quintile 4 = NZDep01 deciles 7 and 8, quintile 5 = NZDep01 deciles 9 and 10. P-values calculated from two-sided chi-squared tests. CI = Confidence interval.

7.2.2 Descriptive analyses of respondents according to ethnicity

7.2.2.1 Comparison of ethnic identity from the National Minimum Data Set and survey sources

The following table explores the accuracy of the ethnicity field from the National Minimum Data Set in comparison to the self-identified ethnicity information collected from the survey. Of the 522 NZ Māori (as identified from the National Minimum Data Set) that responded to the survey with a completed answer to this question, twenty-one (4.0%) reported a different self-identified ethnic group. This was a similar proportion to the NZ European respondents, twenty-six (4.4%) of whom were misclassified in the National Minimum Data Set compared to their survey-identified ethnicity.

Table 7.23: Comparison of ethnic identity from the National Minimum Data Set and survey sources

	NZ Māori	NZ European
RESPONDENTS ACCORDING TO NMDS ETHNICITY*	526	587
MISSING ANSWER IN SURVEY ETHNICITY FIELD	4 (0.8%)	4 (0.7%)
OTHER ETHNICITY NOTED IN SURVEY +	4	6
REVERSE CLASSIFICATION	17 NZ Māori (as identified in NMDS) recorded NZ European on the survey	20 NZ Europeans (as identified on the NMDS) recorded NZ Māori on the survey
RATE OF DISCORDANCE BETWEEN NMDS AND SURVEY ETHNICITY	4.0%	4.4%
TOTAL RESPONDENTS OF EACH ETHNIC GROUP**	525	578

NMDS= National Minimum Data Set. *Less those excluded as not physically or mentally capable, or those surveys completed by a proxy. ** Classifying respondents according to self-identified ethnicity such that those of other ethnic groups are excluded, those misclassified by the NMDS are re-categorised, and those with missing answers in the self-identified field imputed using the back-up classification sources of the NMDS and National Health Index. + Neither NZ Māori nor NZ European options recorded.

NZ Māori patients were over-sampled compared to the NZ European patients, with approximately one-third more patients approached to participate. When all three hospitals are considered, the non-eligible subjects excluded, and the ethnicity of the participants classified according to the survey information: 525 out of 1410 NZ Māori patients responded to the survey (**37.2%**), compared to 578 out of 972 NZ Europeans (**59.5%**) (see Figure 7.5 below).

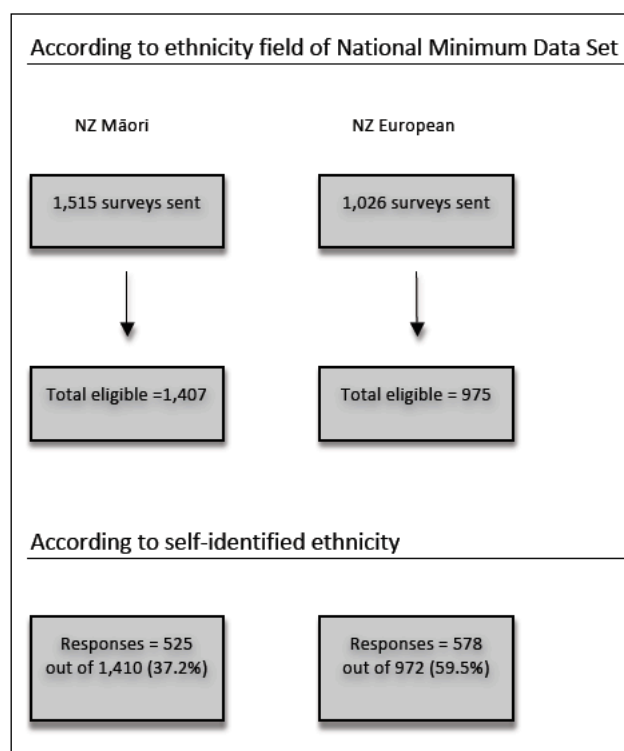


Figure 7.5: Response rate according to ethnic group

The analyses in the remainder of this chapter employ the self-identified ethnicity information obtained from the survey document and incorporate direct age and sex standardisation (as previously, the 2001 NZ Māori census population was used as the external age standard, and a sex distribution of 1:1 males and females assumed). The demographic characteristics of the patients are considered first (age and sex), followed by clinical features (health status, medical or surgical speciality), and finally socio-economic position. Prevalence ratios were also calculated to aid the comparison of the two ethnic groups; these are given in Appendix Ten.

7.2.2.2 Demographic characteristics: Age and sex

The NZ Māori subjects were younger than the NZ European respondents, with a mean difference in age of 8.5 years (95% CI 6.4 – 10.6). The NZ Māori cohort also had a lower proportion of women compared to the NZ European group (ratio of female NZ Māori: female NZ European = 0.92, 95% CI 0.89 – 0.94).

Table 7.24: Age and sex of respondents according to self-identified ethnicity

Variable	NZ Māori		NZ European		p
	n	%	n	%	
AGE AT DISCHARGE					
18-39	114	21.7	86	14.9	
40-59	213	40.6	153	26.5	
60-79	179	34.1	245	42.4	
>79	19	3.6	94	16.3	
MEAN AGE AT DISCHARGE (YEARS)		52.6		61.1	
DIFFERENCE IN MEANS (95% CI)		8.5 (6.4 – 10.6)			
SEX					
FEMALE	290	59.1	299	64.3	0.07
PROPORTION FEMALE NZ MĀORI : NZ EUROPEAN (95% CI)			0.92 (0.89 – 0.94)		

The proportions (%) in the sex comparisons have been adjusted for age, using direct standardisation against the 2001 Māori census population. The age comparisons are unadjusted. CI= Confidence interval. P-values calculated from two-sided chi-squared tests.

7.2.2.3 Clinical characteristics

In this section the age-sex standardised proportions of NZ Māori and NZ European patients experiencing a characteristic within a given stratum were calculated. Differences in these estimates between the two groups were then assessed using 95% confidence intervals and the two-sided chi-squared test to calculate p-values.

MEDICAL OR SURGICAL CLINICAL CONDITION

Although a greater proportion of NZ Māori respondents were admitted under a surgical team (and conversely fewer admitted for a medical diagnosis) than the NZ European group, these differences were not statistically significant (as evidenced by $p=0.33$ and overlapping 95% confidence intervals).

Table 7.25: Clinical speciality of respondents according to self-identified ethnicity

Clinical speciality	NZ Māori			NZ European			p
	n	%	95% CI	n	%	95% CI	
MEDICAL	245	38.3	(31.72 – 44.88)	288	41.2	(35.21 – 47.15)	0.33
SURGICAL	280	61.7	(55.12 – 68.28)	290	58.8	(52.85 – 64.79)	0.33

Proportions (%) have been adjusted for age and sex, using direct standardisation against the 2001 Māori census population. CI = Confidence interval. P-values calculated from two-sided chi-squared tests.

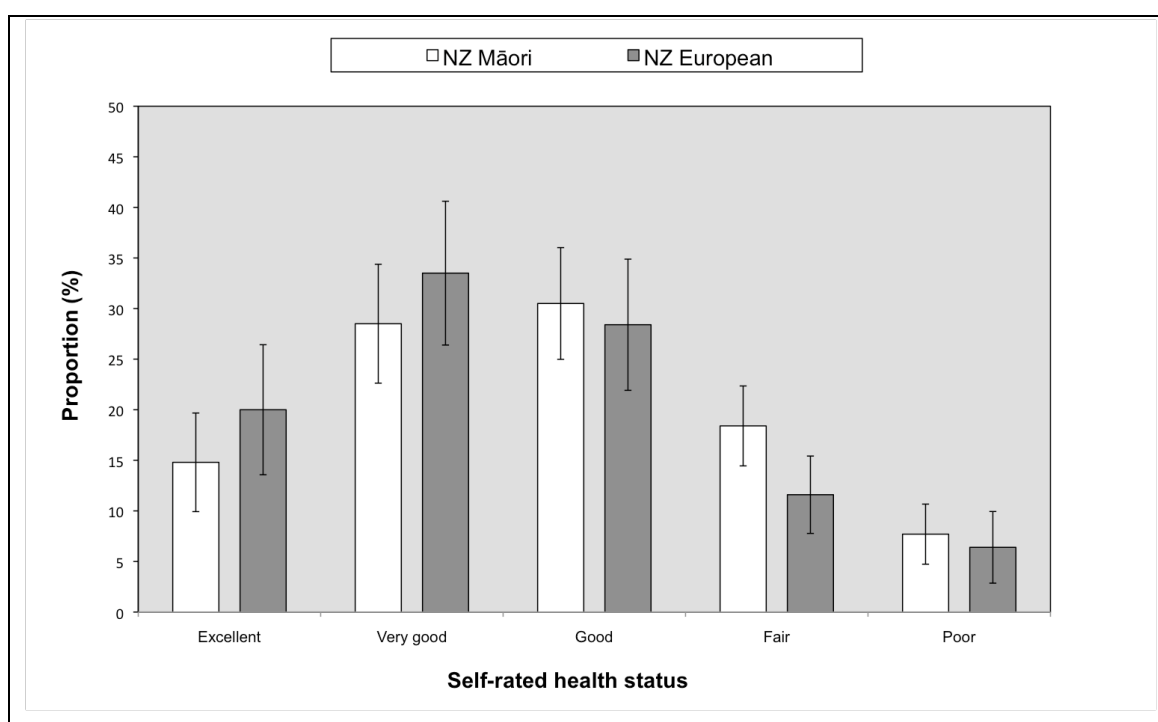
SELF-RATED HEALTH STATUS

This information was missing for six of the 525 NZ Māori respondents and four of the NZ European participants. The table and figure below show the proportions of the two ethnic group categorised in a given stratum of health status. Although the differences in the distribution of this characteristic between the two groups were largely not significant, the analyses suggest that NZ Māori were more likely to report their health as being ‘poor’, ‘fair’, or ‘good’ than the NZ European patients; and conversely less likely to rate their health as ‘excellent’ or ‘very good’. This finding is in keeping with the higher rates of comorbidity, chronic disease, and other morbidity for Māori compared to NZ Europeans in the wider NZ population (see Section 2.2).

Table 7.26: Distribution of self-rated health status according to self-identified ethnicity

Self-rated health status	NZ Māori			NZ European			p
	n	%	95% CI	n	%	95% CI	
POOR	55	7.7	(4.74 – 10.69)	41	6.4	(2.89 – 9.97)	0.42
FAIR	125	18.4	(14.47 – 22.37)	116	11.6	(7.78 – 15.42)	< 0.01
GOOD	187	30.5	(25.00 – 36.03)	209	28.4	(21.87 – 34.84)	0.46
VERY GOOD	106	28.5	(22.64 – 34.39)	160	33.5	(26.42 – 40.64)	0.08
EXCELLENT	46	14.8	(9.96 – 19.71)	48	20.0	(13.65 – 26.51)	0.02

Proportions (%) have been adjusted for age and sex, using direct standardisation against the 2001 Māori census population. Due to small cell counts, the age categories were collapsed in the analyses and employed only four strata. CI= Confidence interval. P-values calculated from two-sided chi-squared tests.



Error bars represent 95% confidence intervals around the proportions. Proportions (%) have been adjusted for age and sex, using direct standardisation against the 2001 Māori census population.

Figure 7.6: Distribution of self-rated health status according to ethnic group

The association between ethnic group and health status was further illustrated when health status was dichotomised, with the proportion of NZ Māori in the Poor/Fair category 40% higher when compared to NZ European participants (25.5% and 17.4% respectively, $p < 0.001$).

Table 7.27: Distribution of self-rated health status according to ethnic group, health status dichotomised

Self-rated health status	NZ Māori			NZ European			p
	n	%	95% CI	n	%	95% CI	
POOR OR FAIR	180	25.5	(20.36 – 30.64)	157	17.4	(12.65 – 22.22)	0.001
EXCELLENT OR VERY GOOD OR GOOD	339	74.5	(69.36 – 79.64)	417	82.6	(77.78 – 87.35)	0.001

Proportions (%) have been adjusted for age and sex, using direct standardisation against the 2001 Māori census population. CI= Confidence interval. P-values calculated from two-sided chi-squared tests.

7.2.2.4 Systems-level characteristics

SOCIO-ECONOMIC POSITION

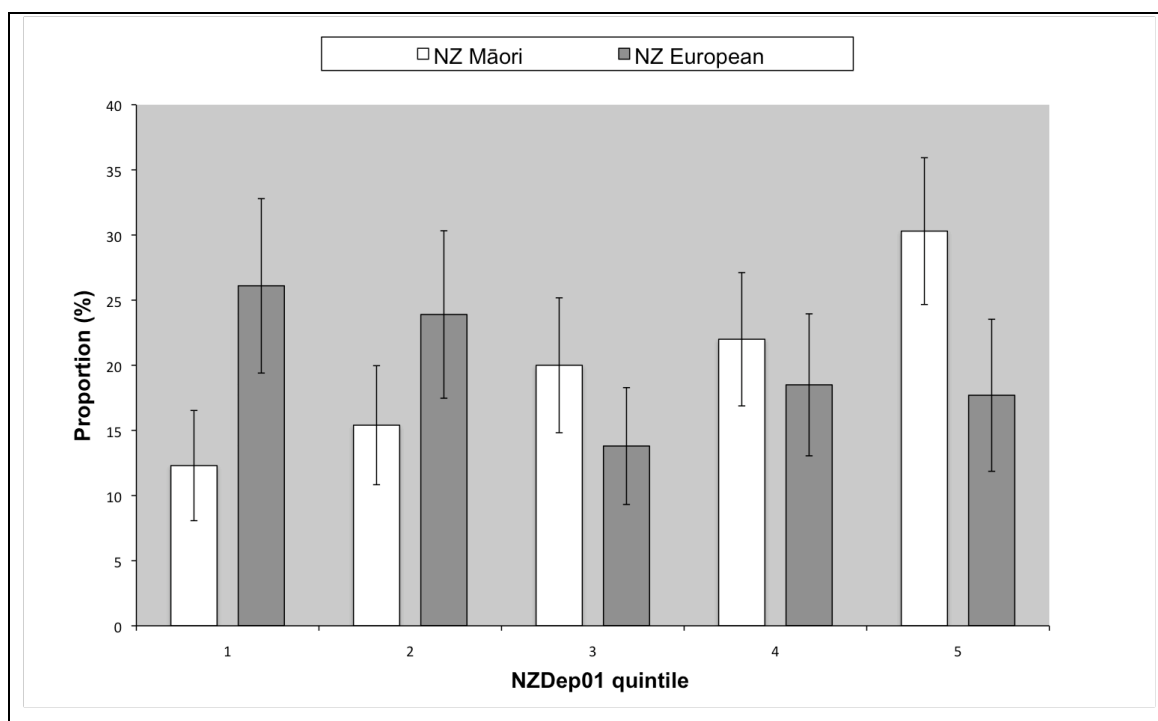
NZ Māori participants of the survey were almost twice as likely to reside in the most deprived NZDep01 quintile (30.3% compared to 17.7% for the NZ Europeans, $p < 0.0001$) and less than half as likely to reside in the least deprived quintile than their NZ European counterparts (12.3% and 26.1% respectively, $p < 0.0001$). There were also significant differences in the proportions of the two ethnic groups residing in quintile two and three areas.

Table 7.28: Distribution of deprivation according to self-identified ethnicity (Phase Two)

NZDep01 quintile	NZ Māori			NZ European			p
	n	%	95% CI	n	%	95% CI	
1 (LEAST DEPRIVED)	53	12.3	(8.12 – 16.58)	128	26.1	(19.41 – 32.80)	<0.0001
2	76	15.4	(10.79 – 19.93)	129	23.9	(17.44 – 30.30)	0.0004
3	97	20.0	(14.86 – 25.21)	115	13.8	(9.30 – 18.27)	0.006
4	127	22.0	(16.89 – 27.12)	115	18.5	(13.04 – 23.94)	0.16
5 (MOST DEPRIVED)	172	30.3	(24.67 – 35.94)	91	17.7	(11.91 – 23.59)	< 0.0001

Proportions (%) adjusted for age and sex, using direct standardisation against the 2001 Māori census population.

Due to small cell counts, the age categories were collapsed and employed only four strata. NZDep01 = New Zealand Deprivation Index 2001. Quintile 1 = NZDep01 deciles 1 and 2, quintile 2 = NZDep01 deciles 3 and 4, quintile 3 = NZDep01 deciles 5 and 6, quintile 4 = NZDep01 deciles 7 and 8, quintile 5 = NZDep01 deciles 9 and 10. CI = Confidence interval. P-values from two-sided chi-squared tests.



NZDep01 = New Zealand Deprivation Index 2001. Error bars represent 95% confidence intervals. Proportions (%) have been adjusted for age and sex, using direct standardisation against the 2001 Māori census population.

Figure 7.7: Distribution of deprivation according to self-identified ethnicity (Phase Two)

7.2.3 Descriptive analyses of respondents according to satisfaction score

This section examines the distribution of demographic and clinical characteristics of the respondents according to mean satisfaction score. The CSQ-8 questions are shown below, and are also available as part of the complete survey document in Appendix Seven. As noted in Chapter Five, this questionnaire is a uni-dimensional tool, in that it is designed to give an overall measure of general satisfaction with services. As such, the individual questions cannot be mapped to distinct dimensions of quality.



CLIENT SATISFACTION QUESTIONNAIRE CSQ-8

Please help us improve our service by answering some questions about the help that you have received. We are interested in your honest opinions, whether they are positive or negative. *Please answer all of the questions.* We also welcome your comments and suggestions. Thank you very much. We appreciate your help.

CIRCLE YOUR ANSWERS

1. How would you rate the quality of service you received?

4 <i>Excellent</i>	3 <i>Good</i>	2 <i>Fair</i>	1 <i>Poor</i>
--------------------	---------------	---------------	---------------

2. Did you get the kind of service you wanted?

1 <i>No, definitely not</i>	2 <i>No, not really</i>	3 <i>Yes, generally</i>	4 <i>Yes, definitely</i>
-----------------------------	-------------------------	-------------------------	--------------------------

3. To what extent has our service met your needs?

4 <i>Almost all of my needs have been met</i>	3 <i>Most of my needs have been met</i>	2 <i>Only a few of my needs have been met</i>	1 <i>None of my needs have been met</i>
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4. If a friend were in need of similar help, would you recommend our service to him or her?

1 <i>No, definitely not</i>	2 <i>No, I don't think so</i>	3 <i>Yes, I think so</i>	4 <i>Yes, definitely</i>
-----------------------------	-------------------------------	--------------------------	--------------------------

5. How satisfied are you with the amount of help you received?

1 <i>Quite dissatisfied</i>	2 <i>Indifferent or mildly dissatisfied</i>	3 <i>Mostly satisfied</i>	4 <i>Very satisfied</i>
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6. Have the services you received helped you to deal more effectively with your problems?

4 <i>Yes, they helped a great deal</i>	3 <i>Yes, they helped somewhat</i>	2 <i>No, they really didn't help</i>	1 <i>No, they seemed to make things worse</i>
--	------------------------------------	--------------------------------------	---

7. In an overall, general sense, how satisfied are you with the service you received?

4 <i>Very satisfied</i>	3 <i>Mostly satisfied</i>	2 <i>Indifferent or mildly dissatisfied</i>	1 <i>Quite dissatisfied</i>
-------------------------	---------------------------	---	-----------------------------

8. If you were to seek help again, would you come back to our service?

1 <i>No, definitely not</i>	2 <i>No, I don't think so</i>	3 <i>Yes, I think so</i>	4 <i>Yes, definitely</i>
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Figure 7.8: Client Satisfaction Questionnaire-8, individual items

The proportion of surveys with missing answers to the CSQ-8 questions ranged from 0.8 – 2.2% for the individual items. Overall, there were 1,022 questionnaires with items one – eight completed, out of the possible 1,103 (92.7%). Given that the proportion of missing answers

was low and relatively consistent across the eight questions, the complete cohort only was employed as the denominator in the descriptive analyses of satisfaction score (the potential for bias from this decision is discussed in Chapter Eight).

Table 7.29: Proportion of missing answers for CSQ-8 questions

Item	Number of participants with missing item	Proportion of total (%)
1	14	1.3
2	12	1.1
3	13	1.2
4	24	2.2
5	9	0.8
6	14	1.3
7	9	0.8
8	23	2.1
1 OR MORE MISSING ANSWER	81	7.4

7.2.3.1 Distribution of satisfaction

The following table shows the range of CSQ-8 scores for the respondents. Scores are skewed towards the upper values, with nearly 25% of participants recording the maximum possible score of 32. Overall, the mean CSQ-8 score was 27.54 and the median was 29. High internal consistency of the scale was demonstrated with Cronbach's alpha calculated as 0.94.

Table 7.30: Distribution of CSQ-8 score for respondents

Item	Mean	Median	Minimum	Maximum	Standard deviation	n
1	3.32	3	1	4	0.76	1089
2	3.33	3	1	4	0.71	1091
3	3.36	3	1	4	0.73	1090
4	3.51	4	1	4	0.69	1079
5	3.36	4	1	4	0.80	1094
6	3.47	4	1	4	0.72	1089
7	3.39	4	1	4	0.80	1094
8	3.59	4	1	4	0.64	1080
ALL ITEMS*	27.54	29	8	32	4.8	1022

* This analysis used data from the 1022 subjects who had completed all questions.

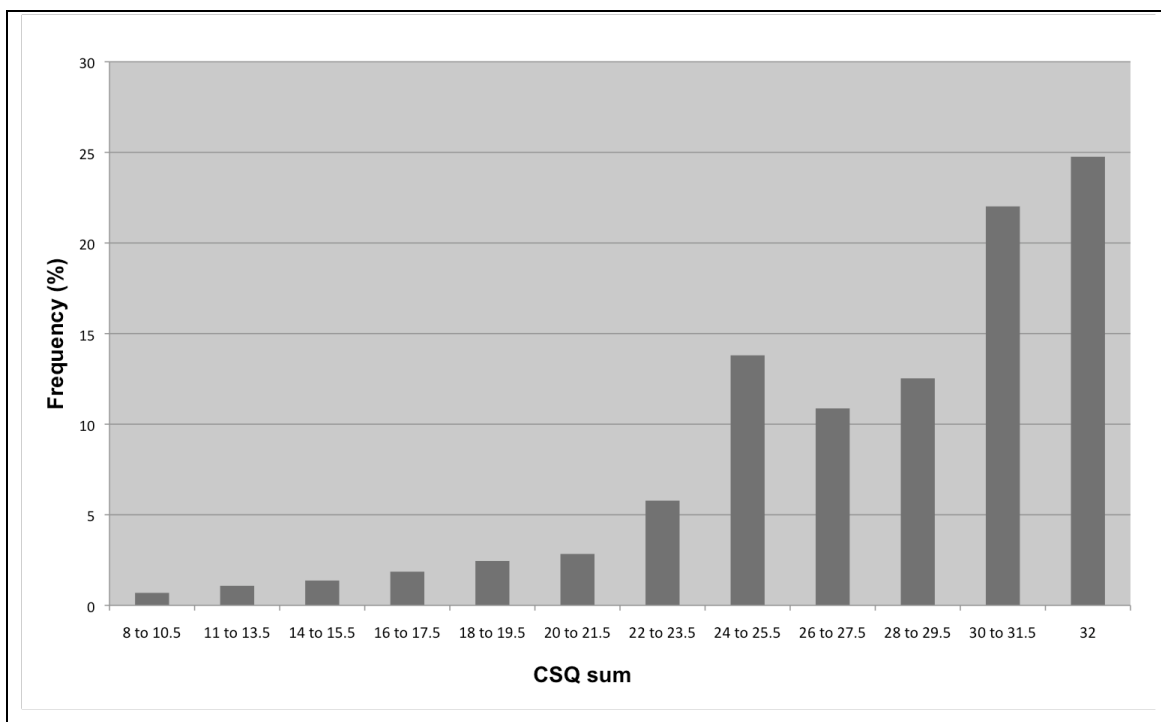


Figure 7.9: Distribution of total CSQ-8 score for respondents

7.2.3.2 Demographic characteristics: Age and sex

The table and graph below show the distribution of satisfaction score according to age and sex. They demonstrate a pattern of increasing satisfaction with rising age, with significant differences for each age category when their means were compared to the youngest age class. Analysis of the age-adjusted satisfaction scores according to sex showed no significant difference between the means of men (26.61, n=484) and women (26.63, n=538), with the 95% confidence interval around the difference including zero (difference in means 0.02, 95% CI -1.06, 1.10).

Table 7.31: Satisfaction score according to age

Age at discharge (years)	Mean	Difference in means	95% CI
18-39	26.01	0 (Reference)	
40-59	27.13	1.12	(0.22, 2.02)
60-79	28.42	2.41	(1.61, 3.21)
>79	28.35	2.34	(1.16, 3.52)

18 – 39 years is the reference class. CI = confidence interval.

7.2.3.3 ETHNICITY

This analysis was the first step in evaluating satisfaction scores for NZ Māori compared to NZ Europeans, and considered two key confounders, age and sex, using direct standardisation against the 2001 NZ Māori census population and assuming a hypothetical 1:1 male:female distribution.

The table below shows that after adjustment for these variables, NZ Māori had a slightly lower level of satisfaction, although the difference between the means of the two ethnic groups was very small (-0.37) and not significant at the 95% level (with the confidence interval including the null value of zero, -0.56 to 1.29). Although this result does not consider the impact of other factors, it provides evidence for a lack of difference between the two groups.

Table 7.32: Satisfaction score according to self-identified ethnicity

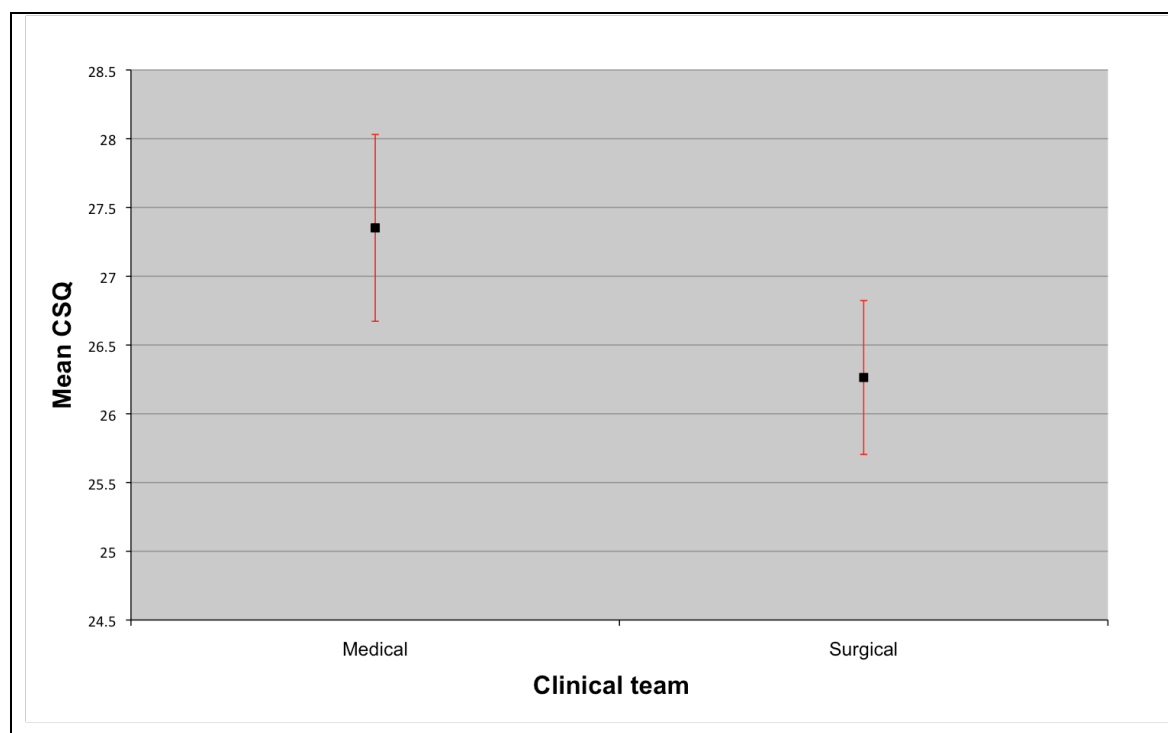
Ethnic group	Mean	Difference in means	95% CI
NZ EUROPEAN	26.82	0 (Reference)	
NZ MĀORI	26.45	-0.37	(-1.29, 0.56)

Scores directly age and sex standardised against the 2001 Māori census population. CI = Confidence interval.

7.2.3.4 Clinical characteristics

MEDICAL OR SURGICAL CONDITION

Patients who were admitted under a medical team reported higher levels of satisfaction (mean CSQ-8 score 27.35, 95% CI 26.67 – 28.03) compared to those participants who were cared for by surgical teams (mean CSQ-8 score 26.26, 95% CI 25.70 – 26.82). Although there was a slight overlap in the 95% confidence intervals, the result indicates satisfaction scores may be lower for surgical patients compared to medical patients.



Error bars represent 95% confidence intervals around the means. Scores adjusted for age and sex, using 2001 Māori census population as external standard.

Figure 7.10: Satisfaction score according to clinical team

SELF-RATED HEALTH STATUS

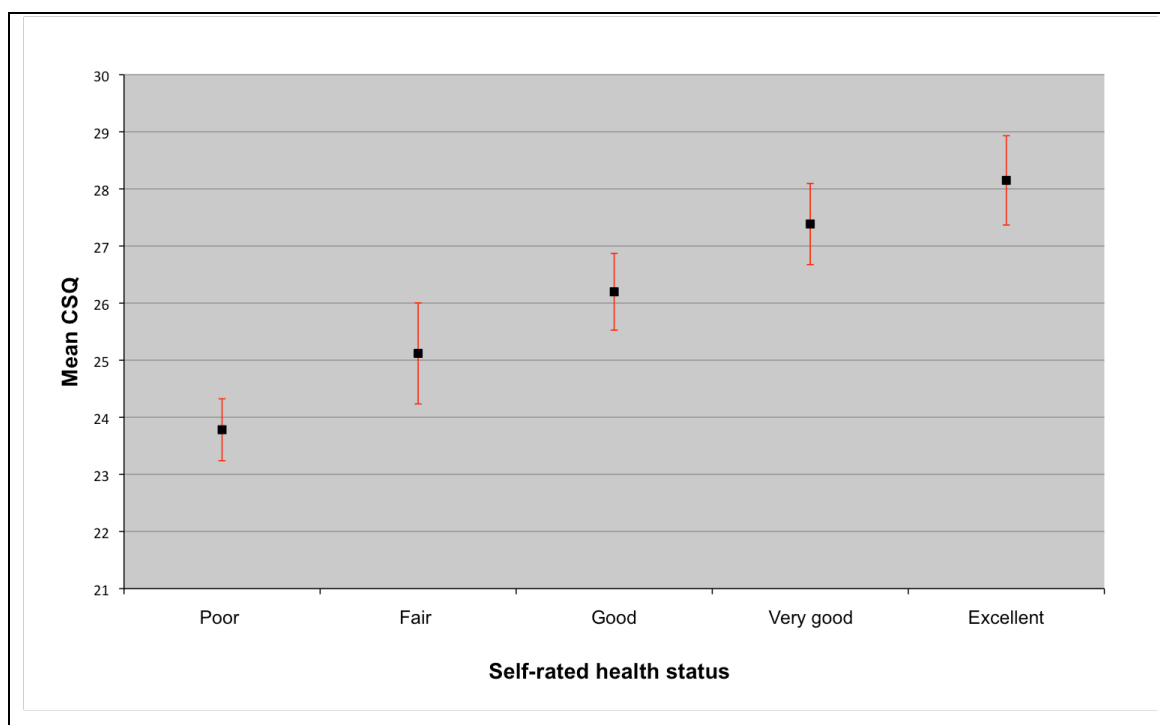
These analyses employed the ratings of the 'Poor' group as the reference. The figure below illustrates a pattern of increasing satisfaction with improving self-rated health, with those reporting 'excellent' health having a mean CSQ-8 score of more than four points greater than those with 'poor' self-rated health (CSQ-8 score 28.15 and 23.78 respectively).

The table shows the difference in mean scores for each stratum of health status, compared to that of the 'Poor' group, and demonstrates a linear trend of steadily increasing differences in scores as health status increases. With the exception of the comparison of the 'Fair' to the 'Poor' group, all of the differences in means were significant at the 95% confidence level.

Table 7.33: Satisfaction score according to self-rated health status

Self-rated health status	Mean	Difference in means	95% CI
POOR	23.78	0 (Reference)	
FAIR	25.12	1.34	(-0.13, 2.81)
GOOD	26.20	2.42	(1.01, 3.83)
VERY GOOD	27.39	3.61	(2.37, 4.85)
EXCELLENT	28.15	4.37	(3.40, 5.34)

The mean satisfaction scores have been adjusted for age and sex, using direct standardisation against the 2001 Māori census population. CI = Confidence interval. The 'Poor' category is used as the reference group.



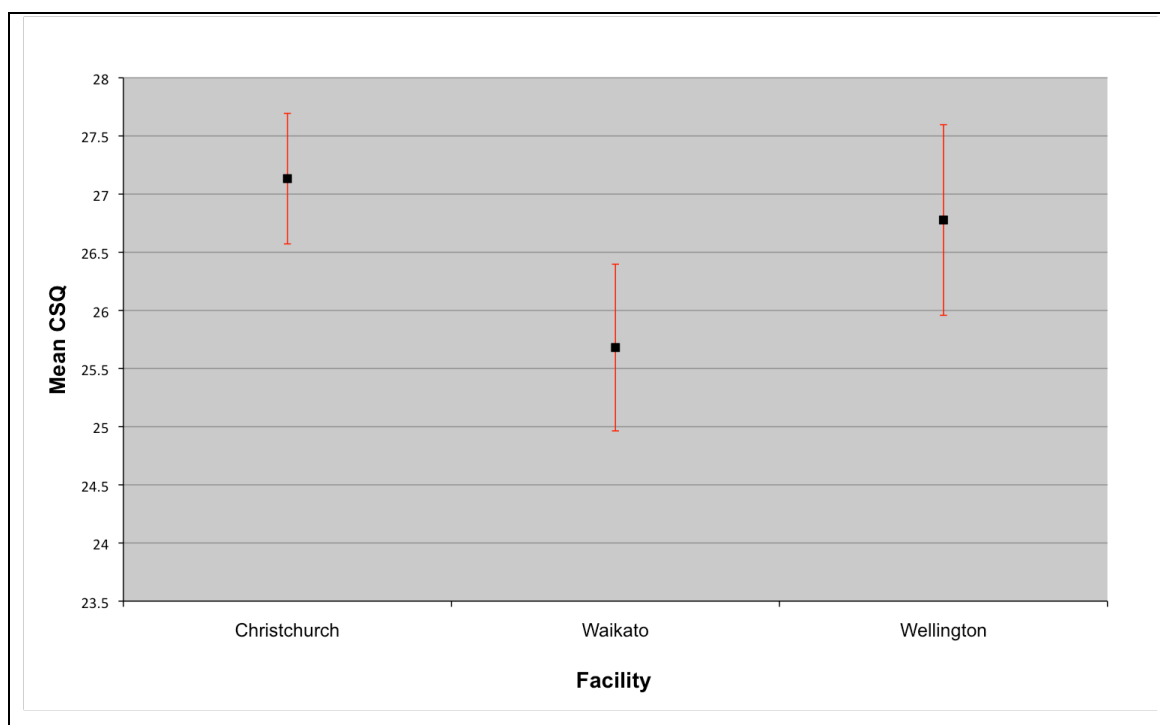
Error bars represent 95% confidence intervals around the difference in means. Scores adjusted for age and sex, using 2001 Māori census population as external standard.

Figure 7.11: Satisfaction score according to self-rated health

7.2.3.5 Systems-level characteristics

FACILITY

Satisfaction score was lowest for participants from Waikato hospital (25.68, 95% CI 24.96 – 26.40) and highest from respondents at Christchurch hospital (27.13, 95% CI 26.57 – 27.69). The confidence intervals around these two means did not overlap, and there was a statistically significant difference between the two means. Satisfaction for Wellington hospital patients (26.78, 95% CI 25.96 – 27.60) was between the scores of Waikato and Christchurch hospitals, with a confidence interval overlapping those of the other two facilities.



Error bars represent 95% confidence intervals around the difference in means. Scores adjusted for age and sex, using 2001 Māori census population as external standard.

Figure 7.12: Satisfaction score according to facility

SOCIO-ECONOMIC POSITION

The analysis of satisfaction according to level of deprivation showed no obvious pattern. Whereas those participants categorised in quintile two appeared to have higher levels of satisfaction (mean CSQ-8 score 27.4) compared to the more deprived quintiles, those residing in quintile one areas (the least deprived) reported comparatively low levels of satisfaction (mean CSQ-8 score 25.9). However, the 95% confidence intervals surrounding the means in the five quintiles overlap, and the intervals around the estimated differences in means (with the mean score of quintile one defined as the reference) all include the null value of zero. Therefore, it was not possible to draw any meaningful conclusions in the association of satisfaction with deprivation using these data.

Table 7.34: Satisfaction score according to NZDep01 index

NZDep01 quintile	Mean	Difference in means	95% CI
1 (LEAST DEPRIVED)	25.9	0 (Reference)	
2	27.4	1.46	(0.36, 2.56)
3	25.5	-0.40	(-1.70, 0.89)
4	26.7	0.75	(-0.55, 2.05)
5 (MOST DEPRIVED)	26.9	0.98	(-0.37, 2.33)

The mean satisfaction scores have been adjusted for age and sex, using direct standardisation against the 2001 Māori census population. CI = Confidence interval, NZDep01 = New Zealand Deprivation Index 2001. NZDep01 quintile 1 is used as the reference.

7.2.4 Multivariable analyses

This phase of the research uses mean satisfaction score as an indicator of the quality of care. Sections 7.2.2 and 7.2.3 of this chapter employed stratification techniques to explore the distribution of demographic and clinical characteristics of the study population according to ethnic group and satisfaction score. This section presents the results of linear regression modelling used to calculate the difference in mean satisfaction score between the Māori and NZ European patients, after controlling for the impact of confounding and/or mediating variables. The structure of this section is as follows:

- 7.2.4.1 discusses the preparation of variables, the refining of the model, and considers the impact of missing data.
- 7.2.4.2 gives the main findings of Phase Two.
- 7.2.4.3 explores potential interaction variables.
- 7.2.4.4 provides a brief summary of the Phase Two analyses.

7.2.4.1 Preparing and refining the model

FORM OF VARIABLES

1. Age: The age of the respondents was approximately normally distributed with a mean of 56.8 years (standard deviation 18.03 years) and a median of 59 years. Evaluation of models with age included as a categorical term (four strata) and as a continuous variable demonstrated significant beta coefficients for the impact of age on satisfaction according to ethnicity, and an improved fit of the model after the addition of age in each case (as evidenced by the log likelihood ratio test).

However, the descriptive analyses suggested a non-linear relationship between satisfaction and age in this population, with the pattern of rising satisfaction with increasing age seen in the younger three strata but not evident in the oldest age group. For this reason, age was included as a four-category variable in the multivariable modelling, using the same parameters as employed in the descriptive analyses.

2. Health status: This factor was investigated as a dichotomous variable (Excellent/Very good/Good versus Fair/Poor), a term with five individual categories, and as a continuous variable. Health status for all respondents was approximately normally distributed, the Excellent and Poor strata containing around 8.5% of the data each, the Fair and Very Good categories having 22% and 24% of the population respectively, and the middle Good stratum representing 36.5% of the group. The descriptive statistics demonstrated a consistent pattern of increasing satisfaction with improving self-rated health, and significant differences in the proportions of NZ Māori compared with NZ Europeans in some strata of health status. The multivariable model showed a similar trend of decreasing CSQ-8 score as health status decreased. Given the linear association between health status and satisfaction over the five classes, the normal distribution of health status in the study population, and the similar effects on the final estimates when included as a categorical or as a continuous variable, for maximum efficiency this variable was included as a continuous term.

3. Other variables: The remainder of the factors – deprivation, sex, clinical specialty and facility – were included as categorical variables and coded naturally (see Table 7.35 below).

Table 7.35: Variables, their categorisation and conceptualisation within the framework (Phase Two)

Variables	Categorisation
AGE	Quartiles: 18-39, 40 – 59, 60 – 79, and > 79 years.
SEX	Male or Female.
SELF-RATED HEALTH STATUS	Continuous variable.
CLINICAL SPECIALITY	Medical or surgical.
FACILITY	Three categories: Christchurch, Waikato or Wellington.
SOCIO-ECONOMIC POSITION	Quintiles: NZDep01 1 and 2 (Q1), 3 and 4 (Q2), 5 and 6 (Q3), 7 and 8 (Q4), 9 and 10 (Q5).
SATISFACTION (OUTCOME)	Mean satisfaction (CSQ-8) score.

CSQ-8 = Client Satisfaction Questionnaire-8, NZDep01 = New Zealand Deprivation Index 2001.

REFINING THE MODEL

A linear regression model was employed to evaluate the difference in satisfaction score for NZ Māori compared to NZ European ethnicity. The final model was created with the addition of variables in a stepwise fashion:

Difference in CSQ-8 mean for NZ Māori compared to NZ European patients

=Māori ethnicity

+ 'Pure confounders' (age, sex)

+ 'Practical confounders' - Patient-level (Clinical factors: health status, clinical specialty)

+ 'Practical confounders – Systems level (Facility)

+ Mediator (Deprivation)

As the variables were added to the model, their individual beta coefficients were examined for significance at the 95% confidence level and the impact of their inclusion on the overall fit of the data to the model assessed using the log likelihood ratio test. As discussed with respect to the development of the model for the analysis of RoD (Section 7.1.3.1, p225), the decision to include a covariate in the model reflects the findings of the literature (is there pre-existing

evidence to support the role of a given variable as a confounder/mediator?), information from the descriptive analyses (are there associations between a given variable and both ethnicity and satisfaction in this population?), the evaluation of the model after inclusion of the factor (as discerned by the beta coefficient and standard error for the new variable, and its impact on the beta coefficient for the principal finding), and finally as to whether the fit of the data to the model was improved by the variable's inclusion (using the log likelihood ratio test). These processes led to the exclusion of the following terms:

1. Sex: There is no consistent evidence to suggest there is a difference in how men or women report satisfaction. Although the NZ Māori group included a slightly higher proportion of men, there was no evidence that satisfaction score varied according to sex in the descriptive analyses. On the basis of this information, the non-significant beta coefficient associated with the inclusion of a sex term, and a negative log likelihood ratio test, this term was not included in the final model.

2. Facility: All three hospitals included in the survey were similar in terms of their size and teaching status, and NZ Māori were sampled approximately equally from each site. Although the descriptive analyses showed some differences in the mean CSQ-8 scores at each facility, the addition of this variable to the model was associated with non-significant beta coefficients and no improvement in the fit of the data (as evidenced by the log likelihood ratio test). As such, this variable was not included in the final model.

3. Deprivation: There is no consistent relationship between socio-economic position and satisfaction in the published literature. Despite the analyses indicating that NZ Māori participants were more likely to reside in the deprived NZDep01 deciles, there was no evidence that satisfaction was associated with deprivation in this sample of patients. The addition of a deprivation variable to the model produced four dummy terms, all associated with beta coefficients that were not significant at the 95% confidence level. The log likelihood ratio test (comparing the expanded model with one without the deprivation terms) was negative; accordingly this term was excluded from the final model.

4. Clinical specialty: The descriptive analyses demonstrated that after adjustment for age and sex, medical patients reported higher levels of satisfaction compared to surgical patients; but there was no significant difference in the proportions of NZ Māori and NZ Europeans cared for by a medical team. The beta coefficient associated with the term was not significant when it

was included in the model, and the log likelihood ratio test was negative. The inclusion of the variable also had no effect on the beta coefficient or standard error for the principal finding. Given the lack of evidence for this variable as a confounder, this term was not included in the final model.

DATASETS

There were eighty-one subjects who did not complete one or more fields of the survey – either the CSQ-8 questions (seventy-nine missing responses) or the health status item (ten missing responses). The small number of participants in this group meant that it was not possible to compare their characteristics with those who completed all fields with any statistical precision, and so it was difficult to discern if the data were Missing Completely At Random, Missing At Random or Missing Not At Random (as discussed in Chapter Six, p204). In this study, complete case analysis ($n = 1,014$) was the preferred method for dealing with this potential bias for the following reasons:

- The number of missing responses is small (representing 8% of total respondents).
- The content of the missing answers is unlikely to deviate dramatically from the remainder of the respondents, and so it is improbable that the absence of these patients would impact on the final result in any significant way.
- Some researchers state that when the data are missing in a univariate fashion, (which is essentially the case in this study, with eighty-one subjects with missing CSQ-8 items, but only an additional eight patients with missing health status answers), multiple imputation and complete case analysis are approximately equivalent analyses and will yield similar estimates (White and Carlin 2010).

7.2.4.2 Main findings, Phase Two

This section describes the main findings for Phase Two, the comparison of satisfaction scores for NZ Māori and NZ European patients at three tertiary hospitals in New Zealand. The results employ the data from 1,014 participants. The tables below show the unadjusted difference in mean CSQ-8 score for NZ Māori compared to NZ Europeans, and the estimates obtained from the linear regression modelling:

Table 7.36: Difference in mean CSQ-8 score for NZ Māori compared to NZ European respondents

Model	Variable	Difference in mean CSQ-8 score for NZ Māori compared to NZ European patients	95% Confidence interval
CRUDE (UNADJUSTED)		-0.61	(-1.20, -0.01)
MODEL 1: DEMOGRAPHICS	Age*	-0.27	(-0.87, 0.34)
MODEL 2: AGE + HEALTH STATUS	Health status#	-0.02	(-0.62, 0.58)

*Age is a four-category variable. # Health status is a continuous variable. CI = Confidence interval.

The difference in mean CSQ-8 score between Māori and NZ Europeans reduces from -0.61 in the unadjusted estimate (just significant at the 95% confidence level), to -0.27 when age was included in the model (95% CI -0.87 to 0.34), to only -0.02 (95% CI -0.32 to 0.58) in Model 2 (incorporating both age and health status variables). That is, the best estimate for this study population is that there is a 0.02 reduction in the CSQ-8 score for Māori compared to NZ European patients, although the true difference may range from 0.58 higher to 0.62 lower.

Table 7.37: Difference in mean CSQ-8 score for individual covariates, Model 2

Class	Variable	Difference in mean CSQ-8 score	95% Confidence interval
ETHNIC GROUP	NZ European	0	
	NZ Māori	-0.02	(-0.62, 0.58)
AGE (YEARS)	20 – 39	0	
	40 -59	1.63	(0.79, 2.47)
	60 -79	2.98	(2.15, 3.82)
	> 79	3.16	(1.99, 4.32)
HEALTH STATUS	Self-rated health status*	0.93	(0.65, 1.21)

* Continuous variable. CSQ-8 = Client Satisfaction Questionnaire-8.

Table 7.37 supports the findings of the descriptive analyses, demonstrating a pattern of increasing satisfaction with age and improving health status. The results of the modelling suggest that although there is a significant difference in the satisfaction scores between Māori and NZ European in the unadjusted model, this difference is likely to be due to the effects of age and health status. Once these factors are considered, there is no significant difference in reported satisfaction between the two groups in this study population.

7.2.4.3 Effect modification

The results above showed that once age and health status are considered, NZ Māori and NZ Europeans in this study sample reported comparable levels of satisfaction. The descriptive statistics indicated that NZ Māori were more likely to report poorer health compared to NZ Europeans, and health status appeared to have a linear association with satisfaction. In this way, health status acts as a ‘practical confounder’, altering the relationship between ethnic group and satisfaction. However it is also possible that health status could act as an effect modifier in these analyses, whereby the difference in means between the two ethnic groups varies according to the level of self-rated health. That is, the difference in satisfaction for Māori compared to NZ Europeans may alter as health status increases from Poor to Excellent.

To investigate the potential for interaction by health status, the differences in CSQ-8 score between the Māori and NZ European groups were stratified according to class of health status (see Table 7.38 below). This analysis showed no linear pattern in the difference in scores between the two groups over the categories of health status, and the confidence intervals surrounding the estimates were wide.

Table 7.38: Difference in satisfaction between ethnic groups within stratum of health status

Self-rated health status	Difference in mean CSQ-8 score for NZ Māori compared to NZ European patients	95% Confidence interval
POOR	-0.08	(-2.07, 1.90)
FAIR	-0.19	(-2.62, 2.25)
GOOD	-0.31	(-2.62, 2.00)
VERY GOOD	0.59	(-1.90, 3.09)
EXCELLENT	-0.08	(-3.00, 2.84)

The lack of effect modification was further confirmed by the assessment of interaction terms in the multivariable model. A model was created that included dummy variables for the interaction between Māori ethnicity and categories of health status, with four coefficients generated to reflect the difference in mean CSQ-8 score for Māori with 'Fair' health status, 'Good' health status, and so on (with the NZ Māori categorised as 'Poor' used as the reference). There was no clear dose-response relationship in the difference in mean CSQ-8 score over the strata of interaction terms. The standard error around the beta coefficient for the principal finding was also found to increase after the inclusion of the interaction terms (from 0.30 in Model 2 to 1.01), and there was no improvement in the fit of the data to the expanded model (as evidenced by a negative log likelihood ratio test).

The potential for interaction due to clinical speciality, deprivation and facility was also explored. In each case, after stratifying the ethnic difference in mean satisfaction by the level of the factor and assessing the impact of the inclusion of interaction terms in the model (and their individual beta coefficients and standard errors) on the fit of the data, no evidence for an

interaction with ethnic group was found, and these effect modification terms were not included in the final model.

7.2.4.4 Summary

This section describes the results of Phase Two of this study, the exploration of satisfaction scores for NZ Māori and NZ European patients from three hospitals in New Zealand. The main findings are as follows:

- The multivariable models indicate that although there is a lower mean CSQ-8 score for NZ Māori compared to NZ European patients in the crude model, this estimate is likely to reflect the impact of age and health status.
- The best estimate for the Phase Two analyses was obtained with a model that incorporated age (as a four-category variable) and self-rated health status (as a continuous variable); it finds that the difference in reported satisfaction between the two ethnic groups is negligible (0.02), and not statistically significant at the 95% confidence level.

7.3 SUMMARY OF ALL RESULTS

7.3.1 Phase One

The descriptive analyses for Phase One found that the NZ European subjects were more likely to be older, male, and reside in the least deprived areas compared to the NZ Māori group. They were also more likely to have a lower level of comorbidity, and be admitted at the lowest volume hospitals. NZ Māori and NZ European patients had different patterns in the distribution of index procedure, with proportionally more NZ Māori experiencing inguinal hernia repairs, removal of cataracts, cholecystectomy and hip arthroplasty operations; and fewer having appendicectomies, minimally invasive procedures for benign prostatic hypertrophy or knee arthroplasty.

The risk of RoD varied with demographic, clinical and facility characteristics. RoD was more likely in older age groups, those living in areas represented by NZDep01 deciles nine and ten, and patients with longer durations of admission or higher comorbidity scores. The risk of RoD also varied with index procedure, and was higher in the higher volume hospitals.

Data from 89,090 patients were used to compare the odds of RoD for NZ Māori compared to NZ European patients in a logistic regression model, with variables representing age, comorbidity, index procedure, hospital volume and socio-economic position included.

The evaluation of this model showed 16% higher odds of RoD for NZ Māori compared to NZ European patients (odds ratio 1.16, 95% CI 1.08 – 1.24). This ratio controls for key confounding and mediating factors, and represents the best estimate of the net effect of **Māori ethnicity** on the odds ratio of RoD.

When the deprivation term was not included in the model, there was 19% higher odds of RoD for Māori compared to NZ Europeans (odds ratio 1.19, 95% CI 1.11 – 1.27). This estimate considers the impact of key confounders, but does not control for deprivation, incorporating the effect of socio-economic position on the likelihood of RoD, and acknowledging the disparate experience of deprivation for NZ Māori. As such, this odds ratio reflects the ‘total’ impact of ethnic group on the outcome, including **the socio-economic position of Māori**.

The odds of RoD also varied according to stratum of comorbidity; for example Māori with a Charlson Comorbidity Index of three or more had an odds ratio for RoD of 1.39 (95% CI 1.09 – 1.77), compared to the equivalent group of NZ Europeans patients. Even at the lowest levels of comorbidity, NZ Māori had 10% higher odds of RoD than NZ Europeans (OR 1.10, 95% CI 1.02 – 1.20).

Effect modification of the estimate due to the relationship between ethnic group and comorbidity was confirmed by including a continuous interaction variable (comorbidity x Māori ethnic group) in the model. This analysis demonstrated that for every unit increase in Charlson comorbidity index, Māori experienced a 9% increase in the odds of RoD compared to NZ Europeans (OR 1.09, 95% CI 1.01 – 1.17). The principal findings of Phase One are summarised in the table below, all of the estimates are significant at the 95% confidence level:

Table 7.39: Main findings for Phase One, the odds ratio of RoD for NZ Māori compared to NZ Europeans

Model	Odds ratio for RoD	95% Confidence interval
UNADJUSTED	1.14	(1.07 – 1.21)
MODEL 1: DEMOGRAPHICS	1.19	(1.12 – 1.27)
MODEL 2: AGE + CLINICAL FACTORS*	1.17	(1.09 – 1.25)
MODEL 3: AGE + CLINICAL FACTORS* + HOSPITAL VOLUME	1.19	(1.11 – 1.27)
MODEL 4: AGE + CLINICAL FACTORS* + HOSPITAL VOLUME + SEP	1.16	(1.08 – 1.24)
ACCORDING TO LEVEL OF COMORBIDITY (MODEL 4)		
CCI 0	1.10	1.02 – 1.20
CCI 1	1.22	1.03 – 1.44
CCI 2	1.33	1.04 – 1.70
CCI 3	1.39	1.09 – 1.77
MODEL 4 PLUS CONTINUOUS INTERACTION TERM (COMORBIDITY X MĀORI ETHNIC GROUP)		
NZ MĀORI: NZ EUROPEAN	1.11	1.03 – 1.20
CCI (CONTINUOUS)	1.27	1.23 – 1.31
CCI X MĀORI ETHNIC GROUP CONTINUOUS INTERACTION TERM	1.09	1.01 – 1.17

OR = Odds Ratio, RoD = Readmission or death within thirty days of discharge, SEP = Socio-economic position, CCI = Charlson Comorbidity Index, categorised as those with scores of 0, 1, 2, and 3 or more. * Clinical factors include index procedure and comorbidity terms.

7.3.2 Phase Two

Of the 2,382 questionnaires sent to eligible patients, the data from 1,014 surveys were utilised in the multivariable analyses, producing an effective response rate of 43%. The likelihood of participation varied by ethnic group (Māori had a response rate of 37% compared to 60% for

NZ Europeans⁴⁷), and respondents were more likely to be older, female, have a higher socio-economic position, and be cared for by a medical team (as opposed to a surgical clinical specialty). The rate of response was approximately the same across the three hospitals.

The characteristics of all the respondents (n= 1,103) were compared according to ethnic group and age-sex-standardised mean satisfaction scores calculated. The ethnicity data were taken from the self-identified ethnic group field of the survey. Interestingly, the rate of discordance between the National Minimum Data Set ethnicity field and the self-identified information of the questionnaire was 4.0% for NZ Māori and 4.4% for NZ Europeans. This demonstrates the accuracy of the National Minimum Data Set in this aspect for the study population, and is contrary to reports of differential misclassification of ethnic group in hospital records (Swan, Lillis et al. 2006).

The NZ Māori respondents were younger than the NZ European patients, included proportionally more men, and were more likely to live in areas represented by the more deprived NZDep01 quintiles. NZ European subjects reported more favourable self-rated health status than the NZ Māori patients.

The mean satisfaction scores also differed according to patient and clinical characteristics. Older patients reported greater satisfaction, as did those with higher self-rated health and medical patients. The results were mixed when satisfaction was reviewed according to deprivation, with no consistent pattern. The scores for Christchurch patients were higher than those for Waikato, with Wellington patients reporting a mean score between these two other facilities. As commonly demonstrated in satisfaction research, the overall distribution of CSQ-8 scores was skewed towards the upper ranges.

The multivariable modelling used a complete case analysis approach, excluding eighty-nine subjects with missing fields in the CSQ-8 or health status items. Step-wise addition of variables and removal of redundant factors (those with non-significant beta coefficients and whose inclusion did not improve the fit of the data to the model) produced a final model that included only two predictors – age (in categories) and self-rated health (continuous variable).

⁴⁷ When the data from those with missing information are excluded, the overall response rate for Māori reduces to 35%, and 57% for NZ Europeans.

The final linear regression model found a **negligible difference** in the mean CSQ-8 score between NZ Māori and NZ Europeans of -0.02. This decrease was not significant at the 95% confidence level (95% CI -0.62 – 0.58).

Investigation of potential interactions between ethnic group and satisfaction according to facility, deprivation, clinical speciality, and health status demonstrated no significant sources of effect modification in these analyses. The table below summarises the principal findings for Phase Two:

Table 7.40: Main findings for Phase Two, difference in mean CSQ-8 score for NZ Māori compared to NZ Europeans

Model	Difference in mean CSQ-8 for NZ Māori compared to NZ European patients	95% Confidence Interval
CRUDE (UNADJUSTED)	-0.61	(-1.20, -0.01)
MODEL 1: AGE*	-0.27	(-0.87, 0.34)
MODEL 2: AGE + HEALTH STATUS#	-0.02	(-0.62, 0.58)

*Age is a four-category variable. # Health status is a continuous variable.

The following chapter discusses these results and their interpretation after consideration of potential bias.

PART FIVE

Discussion

CHAPTER EIGHT:

DISCUSSION

“The important thing in science is not so much to obtain new facts as to discover new ways of thinking about them”

William Lawrence Bragg

This study aimed to compare the quality of hospital care for NZ Māori and NZ European inpatients. Chapters Two through Five gave the rationale for this research, selected patient satisfaction and readmission as indicators of quality applicable to the study population and setting, and explored the validity of these markers. The methods used to calculate and compare RoD and satisfaction for the two ethnic groups were detailed in Chapter Six, and Chapter Seven gave the results of the analyses. In brief, Phase One of this study examined the odds of readmission in 89,090 people throughout NZ, calculating a 16% increase in the odds of RoD for NZ Māori compared to NZ Europeans from a logistic regression model including age, comorbidity, index procedure, hospital volume and deprivation as covariates. Phase Two evaluated satisfaction scores from 1,014 patients from Waikato, Christchurch and Wellington hospitals; its analyses found comparable levels of satisfaction between the two groups, with no significant difference in mean satisfaction score once confounders (age and health status) were considered.

This chapter is structured into six parts:

- Section 8.1 discusses the strengths of the study methodology and data.
- Section 8.2 considers the internal validity of the study; discussing the impact of selection bias, information bias and confounding.
- 8.3 interprets the findings of Phases One and Two in light of their vulnerability to error.
- Section 8.4 gives the three main conclusions of the study.
- Section 8.5 discusses the implications of these conclusions, offering recommendations for the use of readmission and satisfaction as proxies for quality in the future. It also gives an overview of factors that may contribute to ethnic disparities in NZ hospital care.
- Finally, a summary of the chapter, and of the study overall, is presented in the Section 8.6

8.1 STRENGTHS OF THE STUDY

The key strengths of this study include the indicators employed, the replicability of the research and generalisability of its findings, the response rate to the survey in Phase Two, and the statistical power of the two Phases.

QUALITY INDICATORS

The internal validity of this research was enhanced in two key ways: firstly, by actions taken to reduce measurement error of the indicators; and secondly, by using two measures in combination - these features represent a key strength of the research.

1. Methods to improve the validity of Individual measures: International research gives some evidence for the validity of patient satisfaction and readmission in the assessment of health care quality. This study sought to improve their validity as proxies for quality through their definitions and the use of inclusion/exclusion criteria. For example, in the Phase One analyses:

- To improve the specificity of the marker for quality, 'readmission' was limited to a 30-day period post discharge, restricted to unplanned admissions only, and expanded to include death within the observation period. To increase the proportion of 'avoidable readmissions', eligibility was also restricted to those experiencing one of a defined set of surgical procedures.
- Readmissions were not limited to those occurring at the same hospital as the index admission, as is often the case in international research. Readmissions to any NZ hospital were included in the numerator of the rate, enhancing the sensitivity of the marker.
- Mismeasurement of quality by RoD was further minimised by excluding foreign nationals, non-residents, those who self-discharged from hospital following the index procedure, those who experienced more than one index procedure, and limiting the number of readmissions per patient to one per 30-day period.

The Phase Two analyses also used inclusion and exclusion criteria (listed in Chapter Six) to minimise bias, although the validity of the satisfaction indicator was primarily maximised with a pre-validated standardised questionnaire. The CSQ-8 was selected after extensive literature

review – it was assessed as applicable and appropriate for the study context, with demonstrated content, criterion and construct validity.

2. The indicators in combination: This study uses two markers of health care quality to make its assessment. Patient satisfaction and readmission reflect distinct dimensions of quality, and their use together offers a more comprehensive appraisal of hospital quality of care than a single indicator.

REPLICABILITY

The study is easily and cheaply replicable. RoD can be calculated from routinely collected data, with adjustment for confounding/mediating factors easily performed. The large volume of data available from National Minimum Data Set also allows analyses of subpopulations with high precision.

At present, there are a variety of patient satisfaction surveys in use throughout the country, with the psychometric properties of many instruments not formally tested. The CSQ-8 is a short, pre-validated questionnaire that is applicable in a wide variety of settings. Although there are aspects of the CSQ-8 that may be less suited for use in the NZ hospital population (discussed in Section 8.2.2.1); provided there is adequate response rate, the survey could be repeated within populations to monitor changes in satisfaction over time or following interventions.

GENERALISABILITY

While the discussion of external validity - how readily the findings of a study can be extrapolated to the broader population - should be preceded by ensuring internal validity is strong (discussed in much of the remainder of this chapter), the generalisability of the Phase One findings is a strength of this study.

The Phase One analyses employed a large dataset (n= 89,090) of hospital inpatients throughout New Zealand between 2002 and 2008. Eligible subjects were those who experienced one of a defined set of surgical procedures, this criterion improving the specificity of RoD as an indicator for quality. However, it is possible that the results could be considered less applicable to other patients because of this restriction, such as those admitted with medical problems.

The literature describes a lower risk of readmission in surgical patients than those admitted to medical specialties (Chambers and Clarke 1990; Thomas 1996). The measure is also more vulnerable to error in medical patients, with readmission having a lower specificity for quality of care in this population (Courtney, Ankrett et al. 2003; Jimenez-Puente, Garcia-Alegria et al. 2004). This type of research has not been performed in NZ, and it is not known how the odds of readmission for Māori compared to NZ European patients may have differed had medical or other surgical patients been included.

However, while the patients involved in the Phase One analyses all experienced a surgical procedure, their pathologies and clinical teams were varied - including gynaecology, urology, orthopaedic, general surgery, ophthalmology, and cardiology specialities. Given this diversity and the large national sample used for Phase One, the processes contributing to the comparatively higher risk of RoD for NZ Māori are unlikely to be specific to this cohort of patients. That is, the same factors that contribute to this increase in risk are likely to also affect other inpatients, irrespective of their pathology.

RESPONSE RATE TO THE CSQ-8

The overall response rate to the survey in Phase Two was 46%. Although clearly a source of selection bias (discussed in detail in Section 8.2.1.2), the participation rate is paradoxically also one of the study's strengths. Zwier (2009) noted in his review of patient satisfaction surveys employed in District Health Boards during 2008 that the level of participation at one organisation was as low as 20%, and the rate for all District Health Boards averaged at around 35%. As such, achieving a response rate of nearly 50% is considered a success, and an improvement on previous satisfaction surveys performed with the same population.

POWER

The power of the two phases, with its minimisation of type II error, is a strength of the study. The sample size calculations for Phase One were based on conservative estimates (see Chapter Six), and the analyses eventually involved data from 89,090 participants, more than that required. This large study cohort and the narrow 95% confidence intervals around the estimates suggest that this phase of the study was well powered, and provides results with high precision.

The calculations in Chapter Six estimated the required sample size for Phase Two as $n=434$ (217 participants per ethnic group) to detect a minimum difference in CSQ-8 difference of 1.6. After determining NZ Māori were less likely to participate, this group was oversampled (in order to maintain equal explanatory power) and the ultimate sample for these analyses included the data from 1,014 participants, well in excess of that needed. The final model employed only two covariates (one continuous factor, the other a four-category variable) in addition to the predictor. It detected a difference in satisfaction score of 0.02 with an associated p-value of 0.95, the confidence interval indicating that the true difference in CSQ score may lie anywhere between -0.62 and 0.58. The narrow interval indicates that the analyses were sufficiently powered, and we can have confidence that the risk of type II error is low.

8.2 LIMITATIONS OF THE STUDY

The results of this research may be affected by chance (considered above in the discussion of ‘Power’) and systematic error. This section examines the internal validity of the study, exploring the impact of selection bias, information bias, and confounding:

- 8.2.1 discusses selection bias. Three sources of this type of error are examined – the sampling period for Phase Two, the impact of survey non-response, and missing values in the data.
- 8.2.2 considers information bias, including misclassification of the exposure (ethnic group), the outcome (quality of care) and measurement error of covariates.
- 8.2.3 discusses the potential for residual confounding.

8.2.1 Selection bias

Selection bias may arise if there are differences in how the exposed (NZ Māori) and unexposed (NZ Europeans) were selected for inclusion in the study; differences in follow up between these two ethnic groups; or differential participation rates, which alter the association between ethnicity and quality of care among those included in the study compared to those excluded. Potential sources of selection bias in this research include the sampling period, the high proportion of non-respondents in the Phase Two analyses, and missing data in both phases of the study.

8.2.1.1 Sampling period

Phase Two of this study surveyed NZ European and NZ Māori patients who had experienced a surgical or medical admission from one of the three selected facilities, with the first eligible patients discharged from the hospital in November 2008. However, due to the differing population counts of these two groups and the oversampling of NZ Māori (to maintain study

power), the NZ Māori patients were identified over a period of seven months, whereas there were sufficient numbers to sample all the NZ European patients at the start of the study.

It is possible that the patients sampled towards the end of the time period may have experienced different hospital conditions, such that there is an externally-influenced difference in the quality of care experienced by the two ethnic groups. If the care for all patients improved over time, this bias would act to underestimate any difference in satisfaction scores between the two groups. That is, the calculated scores for the NZ Europeans would be systematically lower than if they were obtained at the end of the sampling period. Conversely, if hospital quality of care decreased over time, the equal estimates of satisfaction for the two groups may represent comparatively lower quality of care for the NZ European patients.

In practice, this theoretical bias – whether differential or non-differential – is unlikely to be significant. The period of time is short; it is improbable that substantial improvements or declines in health care quality would manifest over such a brief duration. Also, the study sample includes patients from three distinct hospitals. Quality initiatives (or declines – such as the ending of specific programmes or services) over this short period are likely to be isolated to one facility; once the data from all three hospitals are combined, the relative impact of the bias would be minimal. Accordingly, it is unlikely that this source of error has affected the estimates in any meaningful way.

8.2.1.2 Non-response bias

In general terms, non-response leads to inaccurate results only if there are differences between the respondents and non-respondents that alter the association between ethnic group and outcome (in this case, satisfaction). If the two groups are similar, selection bias does not occur and the respondents are a representative sample of the eligible population. However, the descriptive analyses of Phase One found that there were differences in the demographic and clinical characteristics of the non-respondents compared with those who participated, ethnic group being the strongest factor (Māori had a response rate of 37% compared to 60% for NZ Europeans). These results are consistent with those of other patient satisfaction surveys carried out in New Zealand, which demonstrate an over-representation of

NZ European participants (Zwier 2009). (See Appendix Eleven for further details on the differences between the respondents and non-respondents.)

The potential for selection bias due to the ethnic identity of the non-responders was explored with a simple sensitivity analysis, examining how differences in satisfaction between the non-responders and respondents may affect the calculated estimates. Published studies employing the CSQ-8 were assessed to explore the variation of scores across subgroups. This review showed that the absolute size of differences in scores between groups were small, in some cases as low as 1.6 (Hawthorne, Green et al. 1999) (see Appendix Nine). On the basis of this review, a range of -2 to +2 for the scores of the non-respondents compared to the participants was assumed. Weighted means were calculated for the four age strata for each ethnic group, on the basis of whether the CSQ-8 score for the non-respondents compared to the respondents varied by -2, 0, or +2 CSQ-8 points. The four means were then combined using the age distribution of the Māori eligible sample population as the direct standard, applied to both Māori and the NZ European cohorts.

The table below shows the differences in mean CSQ-8 score between Māori and NZ Europeans according to the assumptions around the non-respondents’ scores. The notation ‘-2’ indicates that the specified group of non-respondents scored a mean of two points less than the comparable group of respondents; ‘+2’ means that they are assumed to have scored two points higher than the respondents; and ‘0’ indicates that the respondents and non-respondents of the defined ethnic group reported the same mean scores.

Table 8.1: Sensitivity analysis, the difference in means between NZ Māori and NZ Europeans according to assumptions around the CSQ-8 scores of the non-respondents

Difference in CSQ-8 score for the non-responders compared to the respondents		NZ European		
		-2	0	+2
NZ Māori	-2	-0.61	-1.53	-2.46
	0	0.69	-0.24	-1.17
	+2	1.98	1.06	0.12

CSQ-8 = Client Satisfaction Questionnaire-8. These assumptions were applied within strata of age, and directly standardised against the distribution of the Māori eligible sample population.

Assuming the non-respondents of the two ethnic groups deviated from the respondents in the same direction, the table shows that NZ Māori would have been more satisfied than NZ Europeans if the mean scores of the non-respondents were two CSQ-8 points higher; but only by a trivial 0.12. Conversely, NZ Māori would have had lower satisfaction than the NZ Europeans if the non-respondents were less satisfied than the participants, by 0.61.

If the non-respondents of the two ethnic groups deviated in opposite directions, such that NZ Māori non-respondents had lower mean CSQ-8 scores by two points and NZ European non-respondents had higher scores by two points, it is possible that the true difference in mean CSQ-8 between the two ethnic groups was as great as 2.46. The reverse scenario (where Māori non-respondents have higher mean CSQ-8 scores by two points and NZ European non-respondents have lower scores by two points) results in a mean CSQ-8 score for Māori of 1.98 points higher than the NZ European patients. This range (-2.46 to 1.98) represents the extreme scenarios, and the bounds of this sensitivity analysis. If we assume that the random error around these estimates is similar to that around the regression output of -0.24 (Model 1, 95% CI -0.87, 0.34), the range may be as wide as -3.09 to 2.61, or as small as -1.83 to 1.35.

It is not possible to say whether the non-respondents would have completed the CSQ-8 differently from those who participated. However, this exercise demonstrates that the calculated estimates may be inaccurate due to this source of systematic error, and variation in the CSQ-8 scores of the non-respondents (had they been able to be included) could alter both the direction and magnitude of the difference in mean satisfaction between the two ethnic groups. That said, these are still relatively small differences in satisfaction, in particular when compared to the standard deviation (4.8) of the distribution of CSQ-8 scores amongst the respondents. There are also numerous studies in which researchers have shown only minimal changes in estimates after exploring non-response (Visser, Krosnick et al. 1996; Lasek, Barkley et al. 1997; Curtin, Presser et al. 2000), and we cannot assume that the non-respondents would have behaved differently from those who participated. Any study in which participation is less than 100% may be affected by this bias, and the response rate is only an indication of the potential for error from this source. As demonstrated by the sensitivity analyses, even the most extreme scenarios do not represent large absolute differences in the mean CSQ-8 scores between the two ethnic groups, particularly when considered in the context of the standard deviation.

8.2.1.3 Missing values

Both phases of the study were affected by missing data. Phase One analyses involved the exclusion of 0.6% of the initial cohort, 568 out of 89,658 – in this case the proportion of missing values is minimal and the exclusion is unlikely to impact on the final estimates. When the models were run on the full dataset and compared with the reduced cohort, the change in estimate was less than 0.01.

The Phase Two analyses were more vulnerable to this bias as its dataset was significantly smaller (1,103 respondents prior to the exclusion) and the proportion of subjects with missing values is higher (8.1%). In general terms, the approach to this issue is four-fold (as discussed in Chapter Six):

- Assess the proportion of data that are missing.
- Consider whether the data are *Completely Missing at Random*, *Missing at Random*, or *Missing Not at Random*.
- Explore imputation methods and exclusion.
- Assess the impact of this bias with sensitivity analyses.

The missing information in Phase Two was confined to two fields only: mean CSQ-8 score (due to one or more missing CSQ-8 items, n=81 subjects), and self-rated health (n=8 additional subjects). The ethnic mix of this group was approximately equal (53% NZ Māori, 47% NZ European), so it is reasonable to assume that the bias is non-differential according to the exposure. It is difficult to gain an assessment of the ‘randomness’ of the data; comparisons between the cohort with complete answers and those with missing fields were imprecise with large confidence intervals, so it was not able to be determined if ‘missingness’ was associated with any particular variables.

In essence, this is the same problem as non-response bias, and the sensitivity analysis performed above included the data from these patients in the non-respondents group. This analysis found that the observed association was reversed if the non-respondents had a +2 increase in CSQ-8 score relative to the respondents, although the various assumptions produced small absolute differences in the magnitude of the estimates. However, in light of the potential impact of non-response bias, it is unlikely that the additional exclusion of

participants due to missing data (n=89, compared to n=1190 of 'pure' non-respondents) has significantly altered the estimates, or their vulnerability to selection bias.

8.2.2 Information bias

Information bias may occur if the exposure (ethnic group), outcome (quality of care), or covariates are mismeasured or misclassified. The most important source of information bias in this study is that resulting from the approximation of health care quality by the indicators RoD and satisfaction. The section below also considers error that may arise from the misclassification of ethnic group or poorly measured covariates.

Due to the structural DAG approach applied to the measurement of quality, the concepts of information bias and confounding in this study are interrelated (that is, measurement error of the outcome 'quality of care' may in part arise due to confounding of the quality-indicator association). Therefore, although 'confounding' per se is the subject of Section 8.2.3 and information bias is explored below, the discussions of these forms of error are overlapping.

8.2.2.1 Misclassification of outcome

THE RISK OF READMISSION AS A PROXY FOR QUALITY

While there is some evidence for an association between readmission and the quality of hospital care (Section 5.2.2.4), readmission is not specific for health care quality, and it is certain that some of the readmissions experienced by the study sample were unrelated to the care received in the antecedent admission. This section applies the DAG framework employed throughout this thesis to explore the impact of this misclassification bias on our estimates. This is an innovative approach, representing a departure from the classical sensitivity analyses (such as that performed in Section 8.2.1.2 with respect to non-response) that are usually applied to this type of investigation.

The study hypothesis was re-conceptualised according to the following DAG:

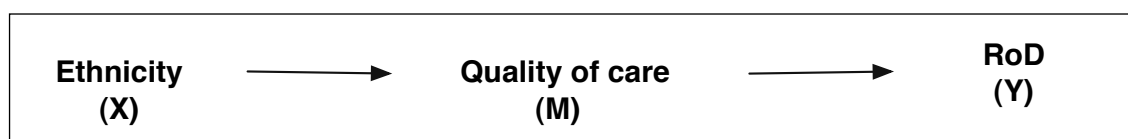


Figure 8.1: Quality of care as an unmeasured mediator in the ethnicity-RoD association (or RoD as a descendant of quality, DAG)

In this figure, RoD is redefined as the outcome and quality of care as an unmeasured mediator. The estimate obtained from Model 4 of the analyses (OR 1.16) represents the association between X and Y; independent of the impact of age, comorbidity, index procedure, hospital volume and socio-economic position. That is, it is the best estimate of the indirect effect of X on Y, as mediated through M (quality of care). This conceptualisation allows us to ask: ‘does substandard quality of care plausibly explain the ethnic difference in RoD?’, providing an indirect test of the role of quality of care. This question was explored in three simple sensitivity analyses:

1. ADJUSTMENT FOR THE UNMEASURED MEDIATOR ‘QUALITY OF CARE’: If quality of care fully mediates the ethnicity-RoD association, we would expect that controlling for this intermediary variable (disregarding other biases) would reduce the ethnicity-RoD association to the null. To explore whether such a premise is plausible, a revised, adjusted odds ratio - one corrected for the unmeasured mediator quality of care - was calculated. The crude data of a subset of patients from this study (those aged between 40 and 79 years; $n=63,143$, 71% of the total cohort) were manipulated after applying a number of assumptions. This sample was selected as it represented a significant proportion of the Phase One data, with the upper and lower age limits reducing the impact of confounding by age.

Firstly, the distribution of ‘poor quality of care’ in NZ Māori and NZ Europeans was posited. These proportions came from the robust study performed by Weissman et al (1999), discussed in detail in Section 5.2.2 (p131). This team examined the clinical records of 1,758 hospital patients with pneumonia and congestive heart failure, using both implicit and explicit criteria to rate the care received during the admission. From their raw data, the overall prevalence of ‘poor quality’ in their study was calculated as 16.1% and 13.8% for patients with congestive heart failure and pneumonia respectively, with variation in subgroups⁴⁸ from 12.8% to 17.1%

⁴⁸ These were estimates of the prevalence of poor quality care in three subsets of readmission - those considered ‘likely to be related to poor quality of care’, ‘unlikely to be related’, and ‘nonreadmissions’ on the basis of implicit review by two physicians.

(these latter estimates were provided in the publication). Accordingly, the prevalence of ‘poor quality’ in the Phase One data was posited to range between 10% and 20%. Secondly, an estimate of the association of quality of care with RoD was taken from the meta-analysis by Ashton et al. (1997) (also discussed in Section 5.2.2, p133-4). This team calculated an odds ratio of 1.55 when estimating the association between relatively poor quality care and the risk of readmission.

In the sample of patients aged 40 – 79 years, the crude odds ratio between ethnic group and RoD was 1.21 (95% CI 1.12 – 1.30). The table below shows how this odds ratio changes when adjusted for the unmeasured mediator ‘quality of care’, and the distribution of poor quality in the two ethnic groups. That is, it demonstrates the *direct* effect of ethnicity on RoD after controlling for that mediated by quality of care (given defined parameters for the frequency of poor quality care in the two ethnic groups).

Table 8.2: Sensitivity analysis of adjusted odds ratio for association between RoD and ethnic group, according to the distribution of ‘poor quality care’ between the two ethnic groups

Prevalence of poor quality		NZ Māori					
		0.10	0.12	0.14	0.16	0.18	0.20
NZ Europeans	0.10	1.21	1.19	1.18	1.17	1.16	1.15
	0.12	1.22	1.21	1.19	1.18	1.17	1.16
	0.14	1.23	1.22	1.21	1.19	1.18	1.17
	0.16	1.24	1.23	1.22	1.21	1.19	1.18
	0.18	1.26	1.24	1.23	1.22	1.21	1.19
	0.20	1.27	1.26	1.24	1.23	1.24	1.21

An absolute difference of 10% in the prevalence of poor quality care between the two ethnic groups (such that the proportion of Māori who receive poor quality care is 20%, compared to 10% for NZ Europeans) represents the bounds of this sensitivity analysis. (This equates to an odds ratio for the association of ethnicity with quality of care of $(0.2 \times 0.9) / (0.1 \times 0.8) = 2.25$.) On this assumption, the corrected odds ratio between ethnic group and RoD falls to 1.15 (in **bold** above).

The DAG below illustrates this scenario: the path mediated by quality of care is now blocked, producing an adjusted estimate of 1.15. In absolute terms, this suggests that of the crude odds ratio (1.21), **only 29% of the increase in risk of RoD for Māori is due to poor quality care.**

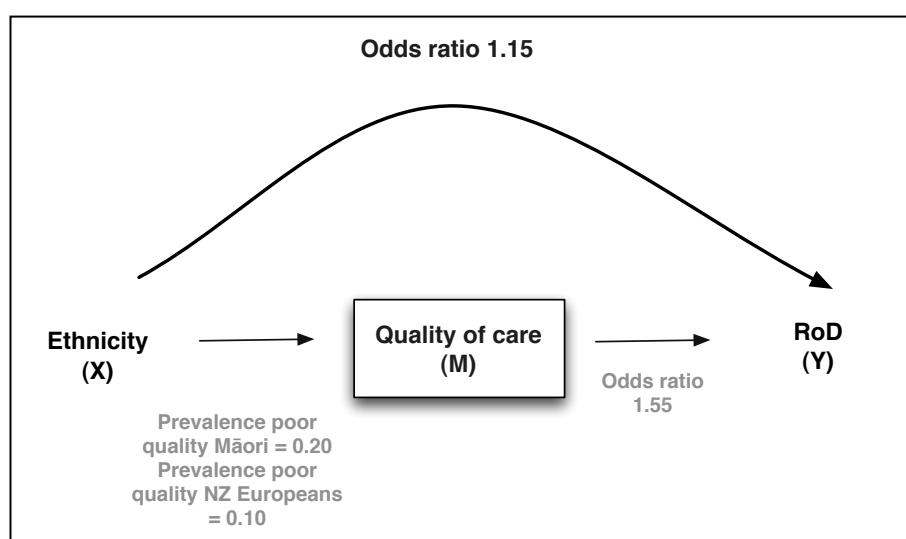


Figure 8.2: Odds ratio of RoD according to ethnic group, adjusted for the missing mediator ‘quality’ (DAG)

If a more conservative estimate of the ethnic differences in quality is applied (using the maximal differences of the distribution of this outcome as described by Weissman et al. (1999) above), and the likelihood of poor quality care for NZ Europeans is 12% and NZ Māori is 17% (equating to an odds ratio for the association of ethnicity with quality of care of $(0.17 \times 0.88) / (0.12 \times 0.83) = 1.50$), the corrected odds ratio is calculated as 1.17. That is, only 19% of the crude increase in odds of RoD for Māori is due to poor quality care.

This analysis has a number of limitations, including the dichotomisation of quality (with associated loss of information), and the assumptions around the prevalence of poor quality for the two ethnic groups and the odds ratio for the quality-RoD association. These estimates do not control for confounding or mediating factors (e.g. alternative pathways between X and Y), which may affect both the measurement error of RoD for quality and the association between ethnic group and RoD. However, the development of the multivariable model in Phase One showed these backdoor and indirect pathways had a minimal effect on the odds ratio, changing the estimate by only 0.02 (1.14 to 1.16) despite the inclusion of five additional covariates. As such, it is unlikely that adjustment for these factors (or other correlated

covariates) would substantially alter the proportion of the ethnicity-RoD association estimated to be due to quality of care.

Finally, this analysis also assumes that quality of care is a uni-dimensional variable, entirely encompassing of the construct of inpatient health care quality. However, it is probable that there are other ‘quality pathways’ between ethnicity and readmission that also reflect health care quality. This concept is illustrated structurally in the following DAG:

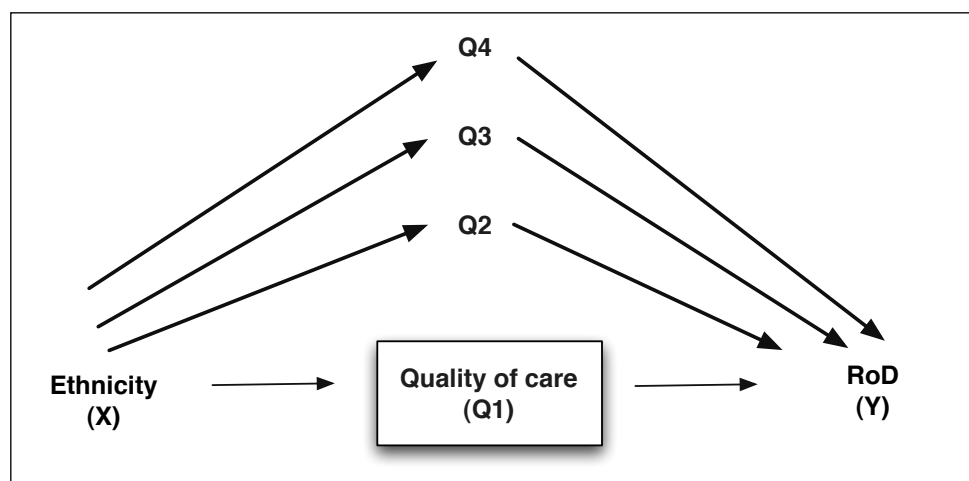


Figure 8.3: Multiple ‘quality pathways’ between ethnicity and RoD (DAG)

These Q2 – Q4 variables represent other facets or dimensions of quality that influence the RoD proxy. For example, the assessment of quality performed by Weissman and colleagues (1999) was based on the care a patient received whilst located inside the hospital facility. That is, the quality of care at the systems level (such as the setting of hospital services, and their cultural and economic accessibility – all of which can be conceptualised as Q2 –Q4 variables) was not considered. It is likely that these factors are some of the unmeasured variables that contribute to the excess risk of RoD for Māori, which are not controlled for in the adjusted odds ratio. As such, had these variables been able to be included in the unmeasured mediator ‘quality of care’, the true contribution of quality on the excess odds of RoD for Māori may have been higher.

However, the first analysis above estimated that potentially only 29% of the excess odds of RoD for Māori compared to NZ Europeans might be due to the quality of care (for the most extreme difference in quality by ethnicity), leaving 71% the result of other factors. For these parallel pathways (essentially ‘residual mediation’ by variables Q2 – Q4) to fully account for

the ethnic differences in RoD - such that the excess odds of RoD for Māori is also due to quality processes - a number of criteria are required. In their simulation study, Fewell et al. (2007) concluded that residual confounding - mathematically identical to 'residual mediation' by Q2-Q4 in this scenario - had the least impact when measurement error in the adjusted confounders was small, the correlations between the adjusted and unadjusted confounders were high (such that the adjusted variables 'capture' much of the confounding due to unmeasured factors), and there was a weak association between the confounder and the exposure (assuming correct model specification). That said, if these criteria are extrapolated to this analysis, for variables Q2 – Q4 to account for the remaining excess odds of RoD for Māori compared to NZ Europeans:

- These factors must not be highly correlated with the mediator 'quality of care' (Q1).
- They must be highly correlated with the exposure ethnic group.

While acknowledging that the assumptions made in the study by Fewell et al. (2007) may be less applicable to the Phase One data, it is unlikely that there are factors Q2-Q4 that sufficiently fulfil these criteria to fully account for the 71% excess odds of RoD for Māori estimated to be unrelated to the mediator 'quality of care' (Q1). As such, it is almost certain that variables - other than those of the quality of care construct - also impact on the ethnicity-RoD association; be they confounders or mediators of the ethnicity-RoD association, or independent/exogenous determinants of RoD.

2.VARIATION IN THE PREVALENCE OF 'POOR QUALITY CARE' ACCORDING TO ETHNIC GROUP: This second sensitivity analysis considered how the odds ratio of the ethnicity-RoD association (corrected for the unmeasured mediator quality of care) may alter as the prevalence of poor quality care for Māori is varied. As above, it assumes: an odds ratio of 1.55 for the quality of care-RoD association, quality of care as a uni-dimensional construct, and holds the prevalence of poor quality care for NZ Europeans stable at 0.17. This value was the maximum estimate from the study performed by Weissman et al. (1999); and is conceptualised as a 'baseline' level for the NZ Europeans (as the reference group in this analysis).

Table 8.3: Variation in the corrected odds ratio of the ethnicity-RoD association with the prevalence of poor quality care amongst NZ Māori, holding the prevalence of poor quality of care for NZ Europeans at 0.17

Assumed prevalence of poor quality care amongst NZ Māori	Odds ratio of ethnicity-RoD association (corrected for the unmeasured mediator quality of care)
0.2	1.19
0.25	1.16
0.3	1.13
0.4	1.08
0.5	1.03
0.6	0.99

Assuming prevalence of poor quality care amongst NZ Europeans is stable at 0.17, and an OR of 1.55 for the readmission-quality of care association.

This table shows that the prevalence of poor quality care for NZ Māori needs to be nearly 60% - an absolute difference of 48% compared to that of the NZ Europeans – before the observed ethnicity-RoD association is driven to the null value of one. This is an implausibly high value, and is inconsistent with current research regarding differences in the quality of care according to patient characteristics (Asch, Kerr et al. 2006).

3. VARIATION IN THE ODDS RATIO OF THE QUALITY-RoD ASSOCIATION: This final analysis explored variation in the third parameter of the structural framework, the odds ratio of the quality of care-RoD association. Assuming a prevalence of poor quality care for Māori of 17% and for NZ Europeans of 12% (the minimum and maximum values reported in the publication by Weissman et al. (1999)), the table below shows the change in the corrected odds ratio for the ethnicity-RoD association (adjusted for the mediator quality of care) for different values of the odds ratio for the quality of care-RoD association.

Table 8.4: Variation in the corrected odds ratio for the ethnicity-readmission association as the odds ratio for the quality of care-RoD association is altered

Odds ratio quality of care-RoD association	Odds ratio ethnicity-readmission association, corrected for the mediator quality of care
1.55	1.18
2.0	1.15
4.0	1.09
8.0	1.01
10	0.99

Assuming a prevalence of 'poor quality care' in NZ Māori of 0.17 and 0.12 in NZ Europeans

This table shows that an improbably high odds ratio (around ten) for the quality of care-RoD association is required to take the odds ratio for the ethnicity-RoD association to the null. That is, according to the structural DAG framework applied to this analysis, for poor quality care to fully account for the observed ethnic differences in RoD, the strength of the association between quality and RoD would have to be almost seven times as strong as that estimated by Ashton et al. (1997). It is possible that their summary odds ratio is an under-estimate, reflecting its derivation from meta-analysis (that is, it is a pooled estimate from the data of multiple studies, which may be similarly affected by measurement error). However, of the studies reviewed in Chapter Five, the maximum measure of association between quality and readmission was an odds ratio of only 2.5 (95% CI 1.1 -5.3, from the study by Polanczyk, Newton et al. 2001).

While acknowledging the limitations of these analyses and their associated assumptions; collectively, they have several key implications:

- Firstly, they suggest RoD is a poor proxy for the quality of care.
- Secondly, in this sample, an unfeasibly strong association of ethnicity with quality of care, or an implausibly strong association of quality of care with RoD, would be necessary to 'explain away' the residual ethnicity-RoD association. The first analysis estimated that with the data and assumptions employed, theoretically around 30% only of the ethnicity-RoD association was due to the inpatient quality of care. As such, these analyses indicate that

the ethnicity-RoD association is also a poor proxy for the ethnicity-quality of care association.

- A propos, this exploration suggests there are factors - other than those of the quality construct – that also contribute to the ethnicity-RoD association. That is, there is measurement error of RoD as a proxy for quality, and this error may in part be differential according to ethnic group.

In summary, it is likely that the ethnic differences in the odds of RoD also reflect the contribution of factors other than the inpatient quality of care. Thus, whilst there is an increase in the odds of RoD for Māori compared with NZ Europeans, only a proportion of this excess risk can be attributed to poor quality of inpatient care.

PATIENT SATISFACTION AS AN INDICATOR OF QUALITY

As with readmission, it is similarly possible that there is measurement error in the use of CSQ-8 score as a proxy for overall quality of care. There are several possible mechanisms for this bias:

1. THE SURVEY MISMEASURES THE CONSTRUCT OF 'QUALITY' USED BY THE PARTICIPANTS OF THIS STUDY: This information bias may operate as both non-differential and differential error according to ethnic group:

Firstly, **the CSQ-8 may capture only some of the dimensions of inpatient quality of care.** For example, patients may be primarily scoring the 'hotel' aspects of hospital care, such as the cleanliness of the rooms and the quality of the meals, and not competency of care or the responsiveness of the health system (two key dimensions of He Taura Tieke). Unlike a longer multidimensional tool, the CSQ-8 cannot assess the contribution of these factors – it may be that there are ethnic differences in specific domains of quality that are not captured by the CSQ-8. However, the literature gives evidence to support the content, criterion and construct validity of this instrument as a proxy for health care quality. The criterion validity of the survey is particularly important in this respect, reflecting the correlation of satisfaction scores with comparatively poor or excellent care. The scores of the CSQ-8 have been shown to be predictive of missed appointments and the dropout rate from community mental-health programmes, and to correlate with changes in self-reported symptoms (see Section 5.3.3.3, p136).

Secondly, the validation studies above were conducted in US populations, and it is possible that **the CSQ-8 may be less valid as an indicator of quality in the NZ setting**. For example, some of the respondents edited the survey form to indicate disapproval for the CSQ-8 items four (*"If a friend were in need of similar help, would you recommend our service to him or her?"*) and eight (*"If you were to seek help again, would you come back to our service?"*). Comments noted on the questionnaire included: *"If I needed urgent help again, of course, I would come back to Chch [Christchurch] Hospital as there is nowhere else to go"* and *"[In} New Zealand we have no choice so I think question 8 is irrelevant"*. These items also had a higher proportion of missing items (2.2% and 2.1%) compared to those of the other six questions (range 0.8 – 1.3%). These CSQ-8 questions may better reflect environments in which there are multiple hospitals within a region, which operate in competition with each other. NZ has a small and geographically-spread population, and although a NZ resident may attend any public hospital in the country, there is generally only one tertiary hospital within a large geographical area. That is, unless a patient is prepared to travel (often great distances - in some cases, hospitals may be more than 400km apart), they are essentially limited to the facility that is most proximate.

Thirdly, **the validity of the CSQ-8 as a measure of quality may differ between the two ethnic groups**, such that its sensitivity and specificity for overall inpatient quality of care varies between NZ Māori and NZ Europeans. This differential measurement error may reflect expectations of care in the two groups, or the diverse constructs of quality. Although cross-cultural validation studies of the CSQ-8 have been performed (namely among the American Hispanic population, Roberts and Attkisson 1983), these results cannot be freely generalised to other ethnic groups, and it has not been the practice of researchers internationally to re-validate survey tools in every specific population (presumably due to the time and expense associated with such an exercise for only the potential of bias). However, given that the CSQ-8 has not been independently validated in this particular population, it is possible that the validity of the CSQ-8 as a measure of quality varies between NZ Europeans and Māori. This variation may reflect differences in expectations of care, or in the constructs of quality or satisfaction employed by the two ethnic groups (discussed further in Section 8.4).

2. DEPENDENT MEASUREMENT ERROR: The association between health status and satisfaction, as seen in the descriptive analyses, demonstrates the possibility for dependent error – that is, it is feasible that **those who report their health positively may also describe their health care favourably** irrespective of its quality, and vice versa. While this bias is plausible (given both

health status and CSQ items are completed subjectively by the participant, and an individual's responses may in part reflect their personality traits), the analysis of health status according to ethnic group in this study is entirely consistent with differences in health outcomes between the two groups at the population level. That is, there is face validity to the distribution of self-rated health status in the two ethnic groups. Accordingly, it is unlikely that this source of error affects the estimates of the ethnicity-satisfaction association. However, it is possible that the association of health status with satisfaction is inaccurate because of this bias. Therefore, the impact of the health status variable on the CSQ-8 score (as calculated from the linear regression model) should be interpreted with caution.

8.2.2.2 Misclassification of ethnicity

Phase One involved the calculation and comparison of the odds of RoD for NZ Māori and NZ European hospital patients. It is possible that ethnic identity as documented in the National Minimum Data Set may be inaccurate for some members of these two groups, and the potential for this misclassification may be higher for NZ Māori compared to NZ Europeans.

The research by Swan et al. (2006) found that Māori were nearly 30% more likely to have their ethnicity misrepresented in hospital records compared to NZ European patients; these patients were most commonly described as NZ European. This risk is minimised by using two admissions for the inclusion criteria (both the index and the 30-day readmission), each of which was associated with a separate ethnicity field in the National Minimum Data Set. However, if it is assumed that there is differential misclassification of this data field according to ethnic group, NZ Māori may be less likely to be recorded as Māori in the hospital records and erroneously classed as NZ European. This bias would act to over-estimate the risk of RoD for NZ Europeans, and so under-estimate the odds ratio of RoD for Māori compared to NZ Europeans.

However, the Phase Two analyses reported that only 4.0% of the NZ Māori identified as such in the National Minimum Data Set had been misclassified in these records, less than that of the NZ European group (4.4%). Some of these Māori participants may be people who identify with multiple ethnic groups, of which one is variously classified as their primary ethnicity. Also, research by Carter et al. (2009) demonstrated that 8% of their cohort of 17,625 adults changed their primary ethnic group over three years. Nonetheless, given the previous evidence of

differential inaccuracies in the recording of ethnicity in hospital datasets, it is encouraging that this discordance is both small, and approximately the same for both ethnic groups.

The low response rate to this survey limits the generalisability of this result to the wider hospital population. However, given that the research performed by Swan et al. (2006) dates back to 2003, and the recent directives by the Ministry of Health (such as those noted in the Health Information Strategy for NZ 2005) to improve the quality of its information systems and to obtain accurate ethnicity data; the findings of this research may represent a true improvement in the accuracy of hospital databases. Overall, it is likely that differential misclassification of ethnicity in hospital records may be a smaller problem than previously thought (Rumball-Smith and Sarfati 2011), and its impact on the results of this study is likely to be minimal.

8.2.2.3 Mismeasured covariates

Key sources of this type of bias include the mismeasurement of socio-economic position and comorbidity by their proxy indicators (NZDep01 and the Charlson Comorbidity Index), and error associated with the hospital volume variable.

CHARLSON COMORBIDITY INDEX

This indicator was developed to reflect the impact of comorbid conditions on mortality, using the associations between nineteen specified categories of conditions and their risk of mortality in 607 medical patients (Charlson, Pompei et al. 1987). Ideally, it is calculated from chart review (as opposed to the administrative data set used in this research), incorporating both recent and historical data.

This study used the Charlson Comorbidity Index in analyses of readmission - both a nonfatal and short-term condition - and calculated the measure from the conditions present at the time of the index admission. These factors may have created an index that is mismeasured, and a poor proxy of comorbidity in this study. However, numerous researchers have used this indicator for precisely this purpose (Fisher, Wennberg et al. 1994; Kossovsky, Sarasin et al. 2000; Polanczyk, Newton et al. 2001; Goodney, Stukel et al. 2003; Halfon, Eggli et al. 2006; VanSuch, Naessens et al. 2006). Although it is best practice to include comorbidity information

from years prior to hospitalisation, the duration of look-back period produces small absolute differences in the performance of the comorbidity index (Preen, Holman et al. 2006).

There are multiple circulating comorbidity measures, including a number of variations on the original Charlson Comorbidity Index. Each of the indices has its own strengths and weaknesses, and a population for which they are best suited. However, it is likely that the choice of comorbidity index is less important than its inclusion in multivariable analyses to control for confounding – as above, absolute differences in the risk adjustment of estimates by the various indices are probably small. For example, Schneeweiss and Maclure (2000) demonstrated that the predictive validity of six different comorbidity indices varied minimally - when the measures were regressed against key outcomes (such as in-hospital mortality, 30-day post-discharge mortality and one-year mortality), their correlation coefficients altered by less than 0.2.

As such, the potential bias introduced by the use of the Charlson index is likely to be equivalent to that associated with other comorbidity indices, and the method of its development justified given the resources allowed for this study. Even if comorbidity is mismeasured, it is unlikely that this bias has altered the estimates substantially.

DEPRIVATION

Like other researchers (Westbrooke, Baxter et al. 2001; Ministry of Health 2004; Riddell 2005), this study employed NZDep as a measure of socio-economic position in its analyses. However, some argue that the NZDep Index is an ecological variable (given that it is based on a small area unit) and so bias may occur when it is applied to an individual. However, there is much to commend the use of NZDep when considering factors that may influence the quality of health services. Firstly, NZDep is a composite index based on ten individual-level census variables (e.g. income, housing tenure), ‘averaged’ out over about 100 people living in the smallest census unit. Given its calculation over such a small grouping of people, it is a good proxy for individual-level deprivation.

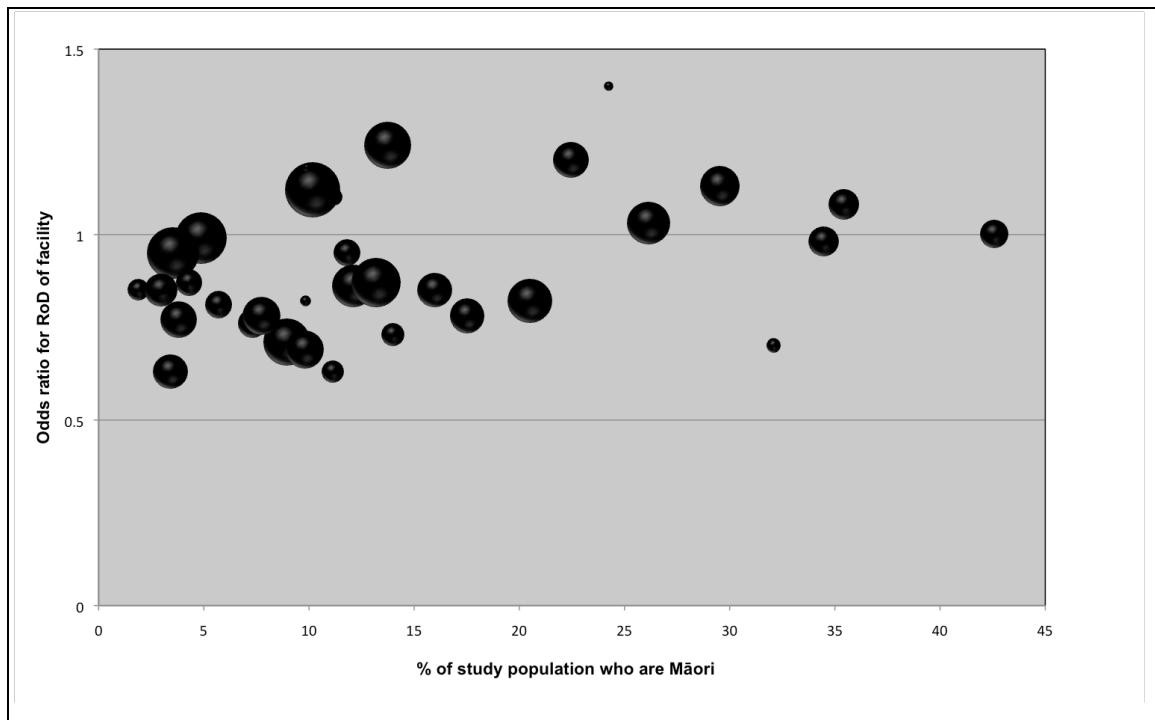
Secondly, multiple indicators would be required to fully capture the complex and multidimensional construct of socioeconomic position, all of which may be similarly affected by misclassification (e.g. income based on self-recalled gross income). While data availability precludes the use of numerous individual-level variables in this study, there is merit in having an area-based measure as the sole measure of socioeconomic position, given that access to

and quality of health services are likely to have contextual determinants as well as individual-level ones. That all said, had it been possible to adjust for multiple measures of socioeconomic position, the association of ethnicity with readmission may have weakened further. But given that the inclusion of NZDep01 reduced the odds ratio by only 0.03, it is unlikely that further adjustment for other measures of socioeconomic position would have taken the estimate to the null.

HOSPITAL VOLUME

The categorisation of facilities into the three hospital volume strata for the Phase One analyses reflected the natural distribution of the frequency of the procedures (see Appendix Five). However, measurement error may be present due to heterogeneity within these strata, or misclassification of this structural variable. These issues are investigated in detail in Appendix Twelve, with a summary of the findings given below:

- Given the wide range of annualised volumes for the forty-two individual facilities (one – 4,617 discharges per year) and the large number of outliers (clustered particularly around the lower end of the range), the characteristics of hospitals within each stratum of hospital volume may vary substantially. To investigate the impact of outlying facilities, the final model was re-evaluated after the exclusion of hospitals with fewer than one hundred subjects admitted for their index procedure over the study period. Although this led to the removal of eight hospitals and 115 participants, no change in the odds ratio of RoD for NZ Māori compared to NZ Europeans was noted after their exclusion (Model 4 OR 1.16, 95% CI 1.08 – 1.24).
- The hospital volume term was intended to represent the structural characteristics of the facility at the systems-level, however the variable included in the model may mismeasure this construct. Post-hoc, it was hypothesised that the hospital volume variable in fact reflects the ethnic identity of the patients served by each facility. To test this theory, the odds ratios of eleven key hospitals (those noted to have a beta coefficient of > 1.3 or < 0.8 when included in the logistic regression model as individual variables) were graphed against the proportion of Māori study participants attending each facility.



The size of the bubbles in this figure represents the amount of data each hospital contributes to the study cohort.

Figure 8.4: Odds ratio of RoD for selected facilities according to proportion of study cohort attending the hospital who identified as Māori

The figure shows that the odds of RoD for each facility increases as the proportion of their study population who are Māori also rises. That is, the likelihood of RoD is lowest for hospitals that serve proportionally more NZ Europeans. This finding was supported by a linear regression analysis of the thirty-three remaining hospitals (forty-one minus the eight outlying low-volume facilities), regressing the beta coefficient for the odds ratio of RoD (Māori compared to NZ Europeans) against the proportion of Māori patients of the study population served at each of the facilities. The analysis found that for a 10% increase in the proportion Māori, there was a 0.06 increase in the odds of RoD for Māori compared to NZ Europeans (95% CI 0.03 – 0.12). This relationship was also present (and significant) when the analysis was weighted according to the amount of data in the cohort for each hospital.

In summary, it is possible that the hospital volume variable may reflect other unmeasured ecologic factors, such as the ethnic mix of the patients. If this research was to be repeated in the future, it is recommended that variables be generated for specific characteristics of facilities (such as teaching status, bed numbers, staffing levels) and investigated individually.

8.2.3 Confounding

Classically, confounding refers to the distortion of an exposure-outcome association by the impact of a third variable; one that is not on the causal pathway but is correlated with the exposure in the source population and is an independent risk factor in the outcome. As discussed previously, in this study there are multiple sets of ‘confounders’. Firstly, those involved in the ethnicity-quality of care association (conceptualised as C variables in Figure 8.5 below); secondly, those confounding the ethnicity-indicator association (C^* variable); and thirdly, those distorting the quality-indicator association (variables C^{**} - the role of these factors was explored in the discussion of measurement error of the outcome, Section 8.2.2.1).

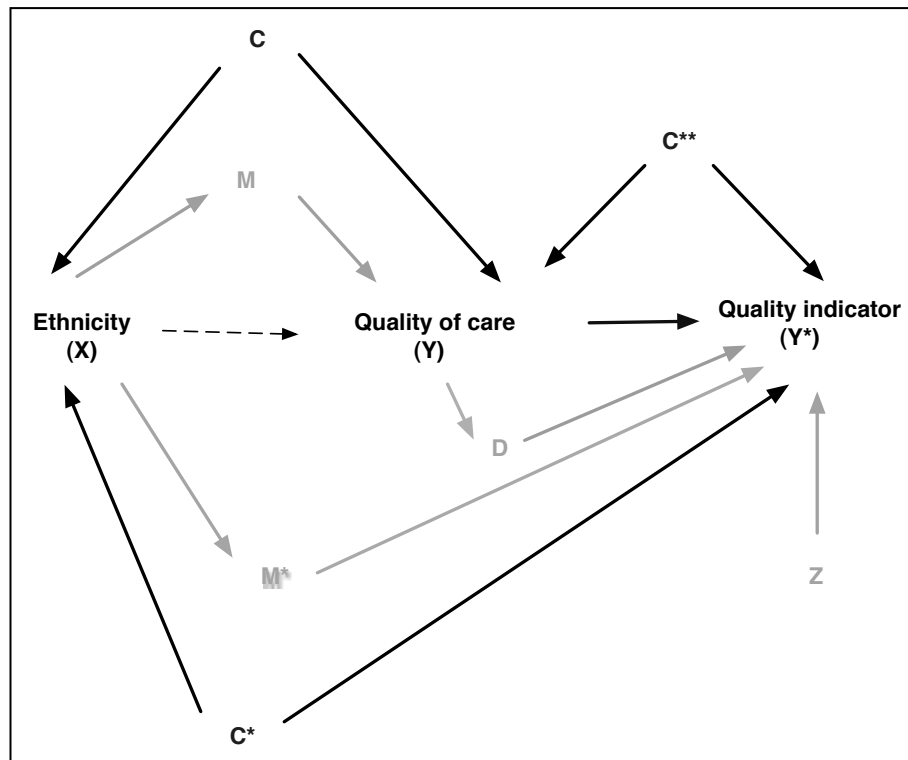


Figure 8.5: Three sets of confounders in this study (DAG)

In Chapter Six, the C^* and C factors were assumed to be broadly overlapping, although not identical. In order to minimise the impact of confounding from these variables in this research, both study design and analytical techniques were employed. For example, with reference to the potential for confounding by age:

1. Literature review identified age as a potential confounder in both Phase One and Two.

2. Age included as an inclusion criterion of Phases One and Two, with a minimum age of eighteen years at the point of admission required for eligibility.
3. The potential for confounding by age in the data of this study was explored in both the descriptive and multivariable analyses. That is, the crude distribution of both the exposure (ethnic group) and indicator (RoD or satisfaction) according to age was investigated, and its impact on the beta coefficient and standard error for the principal finding assessed in the multivariable analyses.
4. Finally, reflecting the findings of the previous processes, this factor was included as a covariate in the Phase One analyses, to reduce distortion of the estimates from this source.

All six factors identified as potential confounders in the Phase One analyses, and five variables in Phase Two were explored with this same approach. Where possible, the descriptive analyses were presented after direct standardisation for age and sex using the 2001 NZ Māori census population as the external standard, and assuming a 1:1 male to female ratio. The age-sex-standardised proportions of these variables were then stratified according to both exposure (Māori ethnic group) and outcome; allowing any association between the variable and exposure/indicator to be assessed free from confounding by age or sex. Finally, multivariable models were developed in both phases to adjust for the effects of confounders. In Phase One, terms for age, comorbidity, index procedure, facility (and deprivation as a mediator) were incorporated into the final model⁴⁹. The Phase Two analyses explored the impact of various factors, but included only age and health status to calculate the final estimate.

The previous section (8.2.2.3) considered the potential for error from mismeasured covariates – it is also possible that there are other unknown or unmeasured variables that should have been included in the multivariable analyses. This assertion is supported by the sensitivity

⁴⁹ Of note, the impact of length of stay was also explored in a subanalysis. The additional inclusion of this factor in Model 4 changed the odds ratio of RoD of the principal finding from 1.16 (95% CI 1.08 - 1.24) to 1.14 (95% CI 1.06 – 1.22); the difference was the same whether it was included as a continuous or categorical variable. However, for the reasons discussed on pages 181-2, this term was not included in the final multivariable model. In brief, the evidence for this variable to act as a confounder in the ethnicity-RoD association is limited, and the literature suggests that the duration of admission may be an indicator of quality in its own right (Thomas, Guire et al. 1997). That is, it may act as a mediator of the quality-RoD association (a 'D' factor from Figure 6.1 p176), and so its inclusion in a multivariable model would act to underestimate the impact of ethnic group on the odds of RoD (RoD being a proxy for quality). As such, the difference in the principal finding noted when length of stay was included is likely to also incorporate some of the independent effect of ethnicity on quality of care.

analyses performed in Section 8.2.2; these indicated that there were other factors that may be impacting on the ethnicity-RoD association other than the quality of care, although whether these are Z factors (determinants of RoD unrelated to ethnic group) or confounders (C*) is unknown.

That said, it is probable that the excess odds of RoD for Māori compared to NZ Europeans in part reflects the quality of care, and is not entirely the result of residual confounding. Firstly, the published literature was comprehensively reviewed to identify key variables correlated with readmission, and their potential for confounding was thoroughly explored in the descriptive and multivariable analyses. Secondly, the included covariates had only a minimal impact on the calculated estimate - the odds of RoD altered from 1.14 to 1.16 only between the crude estimate and that of Model 4, despite the inclusion of five additional variables. It is unlikely there are outstanding factors that could fully account for the 16% increase in risk for Māori compared to NZ Europeans calculated in Model 4. Thirdly, even with highly conservative assumptions, the sensitivity analyses identified quality of care as a component cause of the increase in the odds of RoD for Māori, albeit of proportionally small size.

The Phase Two estimates have not been subject to the same level of exploration as that of Phase One, and it is possible unmeasured confounders may also affect these results. However, as with Phase One, the design and analytical processes of the study aimed to minimise this source of error. That is, the literature was examined to identify potential confounders of the ethnicity-satisfaction association, inclusion/exclusion criteria were employed to minimise their impact, and key covariates were included in multivariable analyses. As the model was developed, the estimates of Phase Two altered from a mean difference in CSQ-8 score for Māori compared to NZ European patients of -0.61 in the crude estimate (only just significant at the 95% level; -1.20, -0.01) to -0.02 (95% CI -0.62, 0.58) once age and health status were included. While this change indicates confounding from these factors, the difference is minimal (0.59) and not clinically significant. That is, it is unlikely that there are sufficient unmeasured confounders to alter our interpretation of this result.

8.2.4 Summary

This section has discussed the vulnerability of the study with respect to chance, bias and confounding in this study. The following box provides a summary of the impact of error in Phase One:

THE ESTIMATES OF PHASE ONE ARE:

1. Unlikely to reflect **RANDOM ERROR**. The confidence interval is narrow and excludes the null value of one (Model 4 OR 1.16, 95% CI 1.08 – 1.24), and the final sample size (n=89,090) is in excess of that calculated as required (n=76,386, see Section 6.1.3 p167).
2. Unlikely to be distorted by **SELECTION BIAS**. The sources of this type of error in Phase One are minimal and not considered to have substantially altered the estimates.
3. Unlikely to be distorted by information bias according to the exposure, but may be substantially distorted by **MEASUREMENT ERROR OF THE OUTCOME**. Although the eligibility criteria and definition of readmission aimed to increase the specificity and sensitivity of RoD as a proxy for quality, the indicator is likely to still mismeasure this construct. Sensitivity analyses explored this measurement error, demonstrating that the proportion of the excess odds of RoD for Māori due to poor quality may be low, and that differentiality of this error according to ethnic group may be present. That is, it is likely there are factors - other than those part of the quality construct – that also contribute to the ethnicity-RoD association.
4. Likely to be affected by **CONFOUNDING**. Confounding in the quality of care-RoD association (causing measurement error of the outcome) is discussed above. However, the sensitivity analyses suggest there are factors other than the quality of care that contribute to the increase in odds of RoD for Māori; these may be confounders of the ethnicity-RoD association. However, it is unlikely that residual confounding accounts entirely for the excess risk of RoD for Māori compared to NZ Europeans.

The validity of the Phase Two analyses are also limited by their vulnerability to error. The potential impact of chance, bias and confounding on the estimates for this phase are summarised in the box below:

THE ESTIMATES OF PHASE TWO ARE:

1. Unlikely to be affected by **RANDOM ERROR**. Although the confidence interval around the estimate includes values that represent both an increase and decrease in satisfaction scores for Māori relative to NZ Europeans (95% CI -0.62, 0.58); the final sample size of 1,014 is in excess of that calculated as required ($n=660$) to detect a minimum difference of 1.6 between the two groups. That is, the chance of type II error in these analyses is low.
2. Potentially affected by **SELECTION BIAS**, in particular that associated with non-response. It is possible that the true difference in means may have been higher or lower than calculated had the non-respondents been able to be included.
3. Unlikely to reflect measurement error of the exposure. Self-identified ethnic group was obtained from the survey, so is considered to be an accurate assessment of the participants' ethnicity. However, they may be affected by non-differential and differential **MEASUREMENT ERROR OF THE OUTCOME**. That is, it is possible the CSQ-8 is less valid as a proxy for quality in the NZ inpatient population, and may function differently in the two ethnic groups.
4. Potentially affected by **CONFOUNDING**. The discussion of measurement error of the outcome incorporated the impact of confounding in the quality-satisfaction association. Although it is possible that there may be unmeasured factors that distort the Phase Two estimates, it is unlikely that they would alter the finding in any meaningful way.

8.3 INTERPRETATION OF RESULTS

This section draws on the findings of Section 8.2 (the vulnerability of the estimates to chance, bias and confounding) to interpret the results of Phase One and Two. For each phase, a summary of results is given first, followed by a discussion of the ethnicity-indicator association and ethnicity-quality association in light of the impact of error.

8.3.1 Phase One

SUMMARY OF RESULTS

Net effect of Māori ethnic group on the odds of RoD: The NZ Māori patients were 16% (odds ratio for RoD 1.16, 95% CI 8 – 24%) more likely to experience readmission or death within thirty days of discharge than the NZ Europeans. This figure is an estimate after adjusting for the effects of age, deprivation, index procedure, comorbidity, and hospital volume. On the basis of the 95% confidence interval, the true increase in odds could be as high as 24% or as low as 8%. Interpreting this estimate in absolute terms, 190 Māori patients in this sample would not have experienced this outcome if they had the same risk of RoD as the NZ European group. This equates to approximately 30 NZ Māori per year over the six-year study period.

Total effect of Māori ethnic group on the odds of RoD: In Chapter Six, the role of socioeconomic position in the delivery of health care was conceptualised as a mediator - a systems-level variable that may increase an individual's risk of readmission (and of poor quality care). Deprivation in NZ is consistently and historically correlated with ethnic group; on average, NZ European patients are more materially and financially advantaged than NZ Māori; this advantage may aid their receipt of high quality care, and reduce the likelihood of readmission.

Accordingly, adjusting for socioeconomic position in multivariable models 'takes away' some of the impact of ethnicity on RoD. Model 3 incorporates the effect of deprivation on the outcome and its unequal distribution in the population, and produces an estimate of the association between ethnic group and RoD that includes its impact (the 'total effect' of Māori ethnic group). As such, the results of Model 3 (the final model with the exclusion of the deprivation term) should be considered with equal importance to those of Model 4. With mediation from socio-economic position included in the estimate, the NZ Māori patients in this study cohort

are estimated to have a 19% higher risk of RoD compared to the NZ European group (OR 1.19), with the true increase in risk between 11% and 27% (95% CI 1.11 – 1.27).

Comorbidity as an effect modifier: The Phase One analyses identified an interaction of the ethnicity-RoD association according to comorbidity. That is, at every level of the Charlson Comorbidity Index, Māori were disproportionately more likely to be readmitted/die within thirty days of discharge than NZ Europeans. For example, Māori patients classified as Charlson Comorbidity Index three or more (the most severe category of comorbidity in this study) had an odds ratio for RoD of 1.39 (95% CI 1.09 – 1.77) compared to the equivalent group NZ European patients; whereas of those with a Charlson score of zero, the odds of RoD for Māori compared to NZ Europeans was 1.10 (95% CI 1.02 – 1.20). These stratified estimates show the compounding effect of comorbidity and ethnic group on their risk of this outcome.

INTERPRETATION OF RESULTS

In Chapter Four a modification of the definition by Rathore and Krumholz (2004) was applied to NZ research to determine whether ‘differences’ in care for Māori could be determined ‘disparities’ – that is, was the ‘difference’ in the value of the quality indicator associated with poorer health outcomes, and independent of patient and clinical characteristics? In light of the findings of Section 8.2 (that is, the impact of chance, bias, and confounding on the results), an interpretation of the Phase One estimates is offered:

What can be concluded about the relationship between RoD and ethnic group? That is, leaving aside the impact of measurement error of RoD as a proxy for quality, is Māori ethnicity causally associated with RoD? The strength of the association is modest only (OR 1.16), and a stronger odds ratio would provide more support for causal inference. However, this finding (an ethnic disparity in RoD) is plausible, and coherent with existing information. The result is also consistent with international studies showing ethnic variation in readmission risk (Friedman and Basu 2004; Jiang, Andrews et al. 2005). Overall, *we can have confidence in the observed association between ethnicity and RoD*⁵⁰.

⁵⁰ This thesis deliberately avoids discussion of ‘causality’ with respect to ethnicity and RoD. Given that ethnicity in New Zealand is considered to be self-defined and not limited to biological/racial boundaries, it cannot inherently ‘cause’ any particular outcome. That is, this thesis assumes that where ethnic group is the exposure, cause-effect relationships cannot be inferred - only associations - which are likely to be mediated by other processes (for example colonization, racism, literacy, ability to advocate, and cultural accessibility). For these reasons, criteria such as those proposed by Bradford Hill (Hill 1965) were not applied to the findings of either Phase of this study.

What can be concluded about the association between ethnic group and the quality of hospital care? It is likely that only a small proportion of the excess risk of RoD for Māori is due to poor quality of care. The sensitivity analyses (Section 8.2.2.1, pp278-286) – while acknowledging their limitations and the assumptions made – suggested this proportion could be less than 30%. Therefore, the ethnic difference in the odds of RoD cannot be entirely attributed to poor quality of care, as it is probable that other unmeasured factors also contribute to this outcome.

In summary, it is likely that the ethnic differences in the odds of RoD also reflect the contribution of factors other than the inpatient quality of care. That is, *only a proportion of the excess odds of RoD for Māori can be attributed to poor inpatient quality of care.*

8.3.2 Phase Two

SUMMARY OF RESULTS

The Phase Two analyses found that NZ Māori patients had approximately the same level of satisfaction as NZ European patients, with a difference of only -0.02 in their mean CSQ-8 score (95% CI -0.62 to 0.34). There was no evidence for mediation of this association by socio-economic position.

INTERPRETATION OF RESULTS

The analyses found no difference in the level of satisfaction between the two ethnic groups. While it is possible that the NZ Māori and NZ European patients in this study are equally satisfied with the quality of their health care, this finding may be affected by systematic error.

What can be concluded about the relationship between ethnic group and patient satisfaction? In this study, non-response bias is the primary limitation in interpreting the ethnicity-satisfaction association. Given that Māori are more likely to experience racism within the health sector than NZ Europeans (Harris, Tobias et al. 2006b) and findings that suggest disparate care for Māori (Chapter Four), the equivalence of the satisfaction scores for NZ Māori and NZ Europeans may have poor face validity.

The consistency of the estimate with other research is also difficult to establish. Although there are studies that document critique of New Zealand's health services by Māori (such as

that by Jansen, Bacal et al. 2008), there are few that assess patient satisfaction according to ethnic group that are not also vulnerable to systematic error. For example, the Kiwis Count Survey' (discussed in Section 4.2.3.9 p102) found that Māori reported lower levels of satisfaction with health service quality in 2009 as compared with the overall population. However, this survey was not specific to hospital care; and its analyses controlled for age, sex and location only, with no consideration for other potential confounders. Zwier (2009) analysed the results of District Health Board satisfaction surveys conducted 2000-2008, also finding lower satisfaction with inpatient services for Māori compared to NZ Europeans. However, there were multiple sources of bias in these analyses: firstly, the surveys employed by the twenty-one centres differed from each other, some District Health Boards including additional questions or rearranging the items. Secondly, the average response rate was 35%, with Māori patients 'under-represented' (actual rates of response by ethnic group not given). Thirdly, the ethnicity analyses were not adjusted for the impact of age or gender, despite evidence for confounding from these variables; nor controlled for the potential impact of confounding from other sources.

The design and analysis of the study administering the 2009 Cancer Control Survey was of higher quality (see p103). The researchers used a pre-validated Picker Institute survey, and adjusted for the impact of age, gender, income and cancer treatment service. However, they also suffered from differential non-response, 51% of the eligible Māori participating compared to 74% of the NZ European group. They found that despite evidence of disparate care for Māori with cancer (Cormack, Robson et al. 2005; Stevens, Stevens et al. 2008; Hill, Sarfati et al. 2010b), Māori reported their experiences with cancer services at least equally (and at times more positively) to those of the NZ European group (Cancer Control New Zealand 2010).

In conclusion, it is possible that the two ethnic groups in this study had truly equivalent satisfaction. Although this interpretation is inconsistent with some of the research above, these studies may be vulnerable to similar sources of bias - notably, the higher quality 2009 Cancer Control Survey reported satisfaction for Māori compared to non-Māori (Cancer Control New Zealand 2010 p28). Nonetheless, considering the extent and differential nature of the potential biases, the incoherence and implausibility of the finding with current theories, and the inability to ascertain the consistency of the result with other research; this study *cannot conclude either ethnic differences or similarities in satisfaction with confidence.*

What can be concluded about the association between ethnic group and the quality of hospital care? Given the uncertainty around the calculated estimates of satisfaction and the ethnicity-satisfaction association, and the potential for measurement error of quality by the satisfaction indicator; this study *cannot conclude ethnic disparities in the quality of care* as measured by this marker.

8.4 STUDY CONCLUSIONS

The previous sections have discussed the strengths of the study; its internal validity after considering random and systematic error; and offered an interpretation of the results of Phases One and Two in light of the study limitations. This section considers the findings of the study overall, suggesting three main conclusions. These statements are based not only on the estimates calculated in each phase, but also consider the results of sensitivity analyses and information from the literature reviews performed in this thesis.

CONCLUSION ONE

Sections 8.2 and 8.3 interpreted the findings of Phase One and Two in light of error, largely concluding that the impact of bias may be substantial. With respect to readmission, there are several published investigations exploring the predictive value of readmission as an indicator of quality, and indirectly examining the sensitivity/specificity of this measure (such as assessing the proportion of readmissions that were avoidable). However, there is no apparent published evidence that uses the structural approach of this study (conceptualising ‘quality’ as a missing mediator) to explore the relative impact of error on this indicator. This thesis represents new knowledge in this area, and further bias analyses would allow a deeper exploration of these issues. While this study has not explored the error associated with satisfaction in the same detail as that of RoD; it is likely that measurement error is also significant, and should be further investigated. As such, the first conclusion of this study is as follows:

This research demonstrates the difficulty in measuring hospital quality of care with readmission and satisfaction, and of the likely inaccuracy of estimates of quality based on these proxies published by researchers and organisations.

CONCLUSION TWO

While the previous section was ultimately unable to conclude with confidence either differences or similarities in the estimates of satisfaction, it did discuss the relative certainty we can have in **an association between ethnic group and RoD**. However, it is undeniable that **only a proportion of these readmissions are likely to be due to quality of care**, and an association between ethnic group and quality of care using this indicator and data can be cautiously inferred only. Returning to our study rationale (discussed in Chapter Two, p28), the results of Phase One and associated sensitivity analyses suggest that ‘differences in exposures and life opportunities’ and ‘differential access to health care’ may have comparatively greater impact on ethnic differences in the readmission outcome than quality of care. This is illustrated in the DAG below, which shows these three levels of Jones’ (2002) framework.

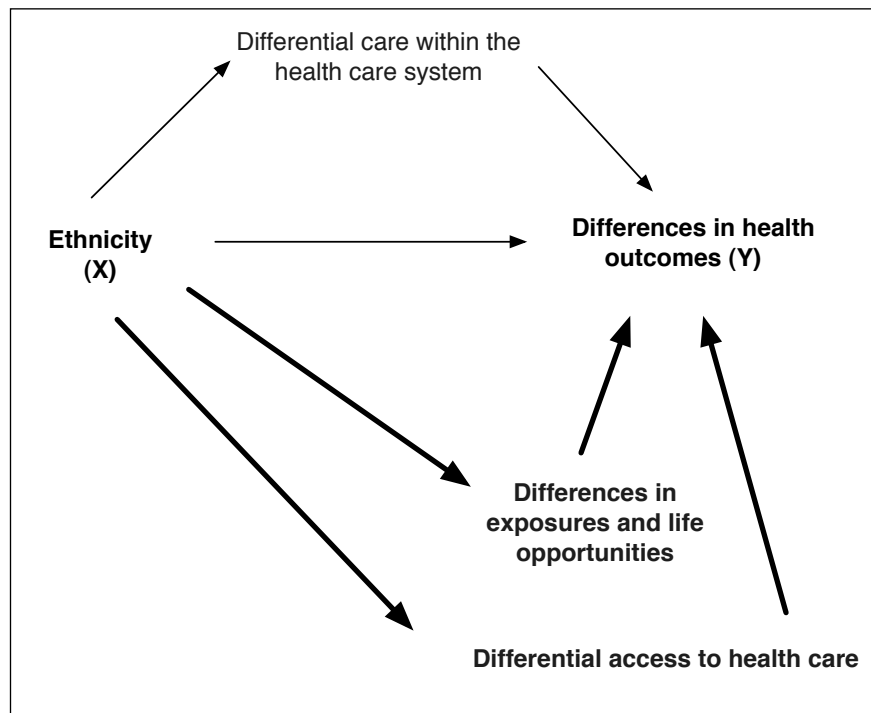


Figure 8.6: Factors involved in ethnic health outcomes disparities (DAG)

Accordingly, the second conclusion of this study is as follows:

It is likely that the comparison of quality of care according to ethnic group using readmission as a proxy is predominantly influenced by factors other than the inpatient quality of care.

CONCLUSION THREE

Do the conclusions above change the interpretation of studies that have been generally accepted as providing evidence for unequal (and poorer) quality of care for members of some ethnic groups? It is certain that the indicators used to assess quality in other studies are similarly vulnerable to error. However, to quote Mayberry et al. (2000 p116) once more: *“The methodological inadequacy of an individual study may be a relatively moot point in the context of the body of literature that gives consistent findings, and in which one study, often the more recent study, may overcome the specific failing of a previous investigation”*. That is, given the extent and consistency of the international evidence regarding ethnic disparities in care in studies involving a variety of proxies for quality, it is unlikely that the conclusions of all of these investigations are erroneous due to bias. Thus, although individual estimates of the disparity may be inaccurate, the collective evidence may stand for itself.

The literature review described in Chapter Four provided a context for this investigation; the findings of this review can be briefly summarised as:

- Ethnic disparities in health care exist, they occur in international settings, and have implications for health outcomes inequalities.
- There is evidence to suggest disparities in the quality of NZ hospital care for NZ Māori compared to NZ Europeans.

These are conservative conclusions compared to Smedley et al. who state (with reference to the US) *“Racial and ethnic disparities in health care exist. These disparities are consistent and extensive across a range of medical conditions and health care services, are associated with worse health outcomes, and occur independently of insurance status, income, and education, among other factors that influence access to health care. These disparities are unacceptable”* (Smedley, Stith et al. 2003 p79).

Accordingly, despite the methodological inadequacies of the indicators employed in this study; given the supporting evidence from NZ research, its coherence with international findings, and the plausibility of poor quality as a component cause to health outcomes inequalities; I conclude that the results of the Phase One analyses are suggestive of unequal and poorer care for Māori compared to NZ Europeans. That is:

Although the contribution of ‘poor quality care’ to the excess risk for Māori is potentially very modest, it is likely that the difference in the odds of RoD for Māori compared to NZ Europeans is in part due to a true disparity in the quality of care. (Nonetheless, it is probable that other factors - unrelated to quality - significantly contribute to these observed differences, as per Conclusion Two).

This disparity cannot be quantified with confidence – and its impact may be comparatively less than that associated with other variables – however, it is concluded that this disparity exists and contributes to ethnic inequalities in the RoD outcome.

8.5 IMPLICATIONS AND RECOMMENDATIONS

8.5.1 Readmission as a quality indicator

While the most significant limitation of the readmission indicator is its lack of specificity for the quality of care, the absolute size of this measurement error has not been established with certainty. The proportion of 'avoidable' readmissions (that is, 'true positive' readmissions as a result of poor quality) reported in the literature varies widely. In one systematic review, Van Walraven et al. (2011) noted that estimates of this fraction ranged between 5% to 79%. When the authors performed this research themselves, using four physicians and standardised implicit criteria to assess the records from nearly 5,000 patients (a superior method compared to those featured in their review), they found that only 20% of the acute readmissions were considered potentially avoidable (Van Walraven, Bennett et al. 2011).

Despite debate about the use of readmission to reflect the quality of inpatient care (Brayer 2011; Daily Health Pulse 2011), readmission rate remains widely employed (its popularity perhaps reflecting its financial implications and ease of measurement) to assess hospital care and identify outliers. The US publish hospital-specific 30-day rates of readmission to enable the public to compare the performance of facilities (Axon and Williams 2011). The NZ Ministry of Health also openly releases its Hospital Benchmarking reports (which include analyses of 7-day readmission rate), allowing the comparison of District Health Boards. Some organisations (including the National Health Service in the UK and some US states) even propose financially penalising hospitals for unplanned readmissions. However, as concluded previously, the use of readmission in this way is inadvisable, for the following reasons:

- Not all readmissions represent substandard care. Although it is not known what proportions of readmissions are truly avoidable (and this fraction is likely to vary with patient and clinical characteristics), considerable mismeasurement of quality by this indicator is likely.
- Even with the most comprehensive and precise corrections of estimates, it is possible that differences or similarities in readmission between populations and settings reflect factors other than inpatient quality of care.

- Finally, readmission as a marker of inpatient quality may fail to incorporate other related aspects of quality, such as system-level factors that contribute to the accessibility of services.

Organisations that apply punitive consequences to ‘failure’ – such as a higher than average readmission rate – give undue importance to this indicator and overstate its validity as a proxy for quality. There may also be unintended consequences in this application of readmission. For example, strategies encouraging the reduction of readmissions may incentivise clinicians to delay discharge and increase a patient’s length of stay (Lloyd 2010). A hospital may choose not to readmit a patient because of its impact on their perceived performance, or (at its extreme) may keep readmission levels low at the expense of increasing the post-discharge mortality rate (Axon and Williams 2011). Werner and Asch (2005) wonder if using quality measures in this way may impair clinical judgment and discourage the provision of patient-centred care. Providers and funders may be reluctant to offer care to patients with a higher chance of this outcome: Bhalla and Kalkut (2010) have particular concern about the impact of policy aimed at reducing readmissions on vulnerable populations (such as those with a lower socio-economic position or members of minority ethnic groups), as hospitals may avoid caring for higher risk patients.

Given the imperfections of readmission as a proxy for quality, and the difficulties that come from having to consider bias in its calculation and interpretation, should we be using this indicator at all? Clarke (2004 p10) states that *“The time must come when we give up measuring unsatisfactory performance indicators simply because they are available and, instead, concentrate harder on allowing for known valid measures of the quality of care to be collected as a matter of routine.”* Axon and Williams (2011 p505) conclude that readmission is but a poor surrogate for the truly important outcomes of health care – *“health, quality of life, and value”*. However, this argument requires that we reject the use of any proxies of quality (such as the rates of readmission, mortality, or post-operative complications) simply because they are incomplete and imperfect. It is also difficult to see how any indicator would not be vulnerable to bias from case-mix or other patient factors. I argue that readmission may have a role in the assessment of quality, albeit with two key caveats:

- Recognition of the impact of measurement error when using this indicator to reflect quality. That is, absolute values of readmission and comparisons of rates should be

cautiously interpreted, as differences in readmission between time, place and person may **not** reflect changes in quality.

- Recognition that the usefulness of this indicator may lie primarily in its ease of calculation, ability to risk adjust, and the economic value of readmission as an outcome. This latter factor is particularly important to the funders of health care, who seek to quantify the costs of 'poor quality' and ameliorate this loss.

This discussion concludes with the first recommendation of this thesis:

RECOMMENDATION ONE

Like Wu (1995) more than fifteen years ago, I also recommend the **formulation and dissemination of protocols on the use of readmission as a quality indicator**. These guidelines should include methods for risk-adjustment, the minimisation of measurement error, and recommendations for the interpretation of the indicator. They should also clearly describe the limitations of readmission when used in this capacity.

8.5.2 Patient satisfaction as a quality indicator

Patient satisfaction is a key dimension of health care quality. However, its measurement is complex and difficult to achieve without introducing bias in some form. This thesis has described the limitations of some quality research using the satisfaction indicator - many studies failing to adjust estimates for confounding or use validated questionnaires. However, the most significant limitations of satisfaction as a quality indicator in this study were its vulnerability to non-response and measurement error; biases also common to many published studies in this area. I suggest that future satisfaction research in NZ focus on these sources of error, with particular emphases on the following two strands:

1. NON-RESPONSE

In this study, Māori had a response rate of 23% less than that of the NZ European group, and this potential selection bias was a significant threat to the validity of the Phase Two analyses. Survey non-response has been a problem for researchers for decades, with papers discussing the issue dating from the 1930s. (There is even an International Workshop of Household

Survey Non-response, held annually since 1990.) Some researchers claim there has been a reduction in the rates of response over time, with potential participants experiencing 'survey fatigue'. In an analysis of questionnaires administered in sixteen countries over seven years, De Leeuw and De Heer (2002) noted declining response rates over time, primarily due to an increase in the number of subjects refusing to participate.

There are several possible reasons why NZ European patients had higher rates of participation. NZ Europeans have higher levels of literacy (Lane 2010), and experience better health than NZ Māori; these two factors could plausibly act to decrease the rate of response. The proportion of surveys that were returned due to an invalid address was higher for NZ Māori (86 surveys out of 1,515 sent) than NZ Europeans (24 surveys out of 1,026 sent): this difference may reflect the geographical mobility of Māori (Sin and Stillman 2005), or differential inaccuracy in the address fields of the data source – both of these variables affecting the ability to participate. The NZ European group also had a higher socio-economic position as measured by NZDep01, and were older on average than the NZ Māori patients; these characteristics may also impact on the rate of response. Another explanation is that despite efforts to borrow from Kaupapa Māori principles, the study design employed a Western medical paradigm with its use of an English language postal questionnaire, and this discouraged response from Māori. Cram et al. (2004) noted in their research that some Māori stakeholders would not engage in research in which Tauwi (non-Māori) were primarily involved, this sentiment may also contribute to the poorer response by Māori in this study.

The design of this study aimed to minimise the major sources of bias in the measurement of satisfaction – employing a standardised, pre-validated instrument to reduce systematic error, avoiding interviewer bias and minimising social desirability bias by administering the survey as a postal questionnaire, and including key confounders in the analyses. However, Jansen et al. (2008) took a different approach in their research exploring Māori experiences of health care. This team used Māori researchers to perform face-to-face interviews, hui (group meetings), and telephone interviews - these authors implicitly chose to minimise non-response and maximise participation at the expense of interviewer, selection, and social desirability response bias. In retrospect, had there been greater resources available for this project, the gain from facilitating the participation of the eligible population with telephone or face-to-face interviews may have outweighed any error introduced from these other modes of administration.

I suggest that disparities research involving patient satisfaction should focus on minimising non-response, in particular that which is differential by ethnic group. It is possible that employing different administration modalities (such as interview compared to self-administration of questionnaires) and drawing on established networks (including kaumātua and local ‘heroes’) may improve the buy-in of Māori (and other communities), and increase participation rates in these groups. Approaching eligible subjects on their day of discharge to offer them the survey may also facilitate response; by reducing the number of patients who are unable to participate because of incorrect address details, and encouraging contributions at a time when experiences are fresh in their mind. Although issues of privacy meant this option could not be used in this study, it is a consideration for future research in this area.

2. SATISFACTION AS A PROXY FOR QUALITY IN THE NZ SETTING

The NZ hospital system involves multiple facilities across a wide geographical area, serving a relatively small population at no direct cost to the patient. It is possible that currently available pre-validated satisfaction surveys are less applicable and/or valid when applied to the NZ setting. As such, there is an indication for research on the measurement of satisfaction within NZ hospitals – potentially involving the creation of a new satisfaction tool, or modifying an existing instrument. For each option, it is important to ensure the tool’s content, construct, and criterion validity in the population, and to ascertain its reliability and responsiveness as an indicator of the quality of care.

However, for disparities- or ethnicity-focused research, it is particularly important to ensure these surveys function similarly across ethnic groups. Scott et al. (2000) found that the standardised, pre-validated health status questionnaire SF-36 performed differently in Māori compared with NZ Europeans, and was less able to distinguish between some domains of health in particular subsets of Māori. That is, like the SF-36, it is possible satisfaction questionnaires may operate differently for NZ Māori and NZ Europeans, such that their sensitivity and specificity for quality of care varies with ethnic group.

One possible mechanism is that NZ Māori may have lower overall expectations of care compared to NZ European patients, such that they report equivalent satisfaction with comparatively poorer quality of care. Although not directly related to satisfaction, Bismark et al. demonstrated that despite more Māori experiencing a preventable adverse event while in hospital (Bismark, Brennan et al. 2006b), they were less likely to subsequently claim Accident

Compensation or report a complaint to the Health and Disability Commissioner (Bismark, Brennan et al. 2006a). Although there may be other factors that can explain this result - such as differences in access to the complaint process and services that facilitate the lodging of ACC claims, the study raises questions about ethnic differences in expectations of care. However, there is no published evidence suggesting that NZ Māori or NZ Europeans consistently over- or under-rate their experiences. As Jansen states (2008 p31): *“An explanation ... based on the different expectations or perceptions of minority groups still leads to a conclusion that health services are not meeting their needs.”*

Nonetheless, research to explore ethnic variation in the definitions of satisfaction and quality is important to establish the validity of satisfaction as a quality indicator in the NZ setting. These studies may be qualitative – exploring the constructs and dimensions of these variables – or quantitative, such as correlating satisfaction with events of poor or high quality to assess the criterion validity of satisfaction in various populations. For example, although set in primary care (and unadjusted for patient demographic or clinical variables), Crengle et al. (2005) found that practitioners spent less time with Māori patients than non-Māori; that Māori were less likely to be referred for investigation, tests or to specialists; and that the doctors described lower levels of rapport with Māori compared to non-Māori. Research that correlated Māori and non-Māori perceptions of these experiences with these process indicators (and adjusted for confounders) would help ascertain if there are differences in how these ethnic groups define high quality care.

This section concludes with the second recommendation of this thesis:

RECOMMENDATION TWO

Prioritise the minimisation of non-response and exploration of measurement error in the use of satisfaction as a proxy for quality in NZ hospital inpatients. Particularly consider the validity of satisfaction instruments and the potential for differential measurement and non-response bias according to ethnic group.

8.5.3 Quality of care for Māori compared to NZ Europeans in NZ public hospitals

While clearly acknowledging the potential for systematic error, and the probability that factors other than quality may be of comparatively greater importance in ethnic differences in RoD, the previous Section 8.4 cautiously concluded that the calculated difference in the odds of RoD for Māori compared to NZ Europeans was indicative of a true disparity in the quality of care.

Overall, the findings of this study are insufficient to make strong recommendations on inpatient quality of care. However, on the basis of the guarded interpretation of the Phase One results and those of the literature review performed in Chapter Four, this section provides a broad summary of the factors that may be involved in the production and perpetuation of disparities in care for Māori in NZ hospitals. It is structured into three parts, based on the three-part framework proposed by the Institute of Medicine (Smedley, Stith et al. 2003): the ‘ecology’ of health care systems and environmental factors (systems-level), clinical appropriateness and patient preferences (patient-level), and finally the role of discrimination within the patient-provider interaction.

8.5.3.1 Health system factors

LOCATION OF SERVICES

International research shows that the geographical location of services has a role in the quality of care, and in ethnic disparities in care (Chandra and Skinner 2003; Smedley, Stith et al. 2003; Fisher, Goodman et al. 2008). In NZ, some specialist level care is available at certain hospitals only (for example, Christchurch Hospital provides the sole specialist paediatric oncology service for the South Island); there are also substantial differences in the ease of access to hospital services between urban and rural settings. That is, the centralised nature of New Zealand’s hospital services may provide less timely (and potentially less effective) care to some patients due to the geographical location of these facilities. The NZ Health Survey noted difficulties obtaining transport as one of the reasons for unmet health need (Minister of Health and Associate Minister of Health 2008); similarly Cormack et al. (2005) found that some patients from isolated regions of NZ were less able to physically access care for their cancer. Given that NZ Māori are more likely to live in highly rural and remote areas than non-Māori

(Fraser 2006), it is possible they may have relatively greater difficulty physically accessing the same quality of services as NZ Europeans. That is, the very organisation of NZ hospitals may disproportionately disadvantage NZ Māori because of their respective physical locations.

FINANCIAL ACCESSIBILITY

Studies from the US indicate that financial factors may have a role in hospital quality of care, with poorer patients more likely to access services through the emergency department, and less likely to receive the input of a specialist (Smedley, Stith et al. 2003). However, these findings may reflect the financial organisation of these services: apart from a few exceptions, hospital care in the US is provided on a fee-for-service basis, with patients covered through health insurance or paying out of pocket. In contrast, acute hospital cares (and some secondary and elective services) are provided to all NZ citizens and residents 'free of charge', minimising the impact of financial capability in accessing these services. In spite of this, studies show the contribution of socio-economic position in achieving hospital care (Westbrooke, Baxter et al. 2001; Davis, Lay-Yee et al. 2006; Harris, Robson et al. 2007), as do the Phase One analyses, which demonstrated mediation of the ethnicity-RoD association by deprivation. Thus, it is likely that there are extraneous costs that may inhibit access to high quality care (such as those incurred for transport, childcare, absences from work) that are more likely to affect Māori than NZ Europeans. This discussion reinforces the importance of the wider determinants of health in achieving high quality care, and of the unfair distribution of financial and material goods between ethnic groups at the population level.

CULTURAL ACCESSIBILITY

Finally, accessing quality health care may be easier for patients who share the cultural paradigm within which services are organised and delivered (Delbanco 2003). When discussing the educational system, Curtis (1990 p4) states *"school is an extension of the Pākehā home, thereby reflecting the many and various aspirations of Pākehā society – its values, social and belief systems etc.- thus readily identifying with Pākehā culture...(It) promotes the English language. Stresses individualism."* This quote could easily describe a NZ hospital, a complex city in which the English language, western medicine diagnoses and treatments, and a biomedical paradigm dominates the delivery of care. Arlidge et al. (2009) state that some Māori families find the hospital environment *"foreign"*. This perception is likely to incorporate education and health literacy factors; however it may also reflect the cultural 'match' between hospitals and these patients, and their different constructs of health and illness. For example,

health care for Māori prior to colonisation focused not only on the physical manifestations of illness, but also emphasised whanau/community and spiritual wellbeing (Lange 2011). These beliefs contrast the biomedical models of diagnosis and treatment – philosophies that assume *“all illness is secondary to disease.....removal or attenuation of the disease will result in a return to health”* (Wade and Halligan 2004 p1398), which form the foundation of medicine in most western countries. While there is increasing acceptance of complementary medicines and non-Western models of care in NZ, the hospitals primarily employ treatments focused on physical therapies for injury and illness. As a result, care may be less culturally accessible for some ethnic groups, particularly for those who subscribe to a more holistic perspective of health and well-being, such as some NZ Māori (Cram, Smith et al. 2003). This premise is supported by international investigations which show more favourable perceptions of care for patients receiving culturally-specific health interventions, and services delivered within culturally familiar settings (such as marae-based programmes) (Griner and Smith 2006).

8.5.3.2 Patient-level factors

CLINICAL CHARACTERISTICS

Individuals with high health needs may require more frequent, timely, and concentrated attention from health care providers. Paradoxically, these patients may find it more difficult to gain this care, due to difficulty accessing health care and advocating for their needs. Studies show the impact of comorbidity and clinical severity on indicators of quality (for example: DesHarnais, Forthman et al. 2000; Goodney, Stukel et al. 2003), and Phase One of this research also revealed comorbidity as an effect modifier. That is, at every level of comorbidity, NZ Māori were disproportionately more likely to experience RoD compared to their NZ European counterparts. It is possible that some individuals who experience poor health status or significant comorbidity may be less able to obtain high quality hospital care due to the compounding effects of their ethnic group and clinical state. Although referring to health status inequalities, the NZ Ministry of Health directs providers to act on the *“feedback effect of ill health”* as a key objective (Ministry of Health 2002b p18). In the same way, strategies addressing this ‘feedback effect’ - the occurrence and experience of illness - represent potential targets for intervention to ensure equitable access to high quality care.

PATIENT PREFERENCES/COMPLIANCE

Some researchers cite patient preferences or lack of compliance as explanations for health care disparities (Schechter, Goldschmidt-Clermont et al. 1996; Sedlis, Fisher et al. 1997). However, findings of intervention refusal or non-compliance may not represent true patient-level differences, and some investigators use this category to rationalise their findings of health care disparities without evidence to support their assertions. For example, Kamalesh et al. (2005 p916) suggested that the lower disease-adjusted rates of cardiac intervention for the Black American population are because *“Black people may feel more healthy and be less inclined for aggressive cardiac procedures”*. In a similar vein, Ghali et al. (1988) question the ability of black patients to recognise the symptoms of heart failure. While there is no NZ evidence of ethnic differences in medical compliance, qualitative research suggests various Pākehā practitioners perceive Māori as less likely to comply with treatment (McCreanor and Nairn 2002b; McCreanor and Nairn 2002a; Penney, Moewaka Barnes et al. 2011).

However, some suggest that explanations that ‘blame the patient’ (King Jr and Wheeler 2004) choose to ignore the institutional bias against minority groups in the organisation and delivery of health care within current hospital systems (Krieger 2003), and overlook the obligation of providers to deliver patient-centred individualised care. It is also important to consider the impact of these perceptions on the patient-provider interaction. The Institute of Medicine discusses a ‘cycle of mistrust’ whereby wariness of the medical profession and health system by ethnic groups is manifested in poor patient compliance. These actions lower physicians’ expectations, and they may be less likely to suggest therapies/services that require higher degrees of adherence. Patients sense this reluctance and reduced expectation, which in turn diminishes their sense of trust in the provider and the system. And so, a cycle of mistrust is formed and perpetuated (Smedley 2009). The US Tuskegee⁵¹ experiment is thought to have left a legacy of suspicion between African-Americans and health services; it is possible that the processes of colonisation have similarly affected the ability of Māori to trust in the health system and in the advice of predominantly Pākehā practitioners.

⁵¹ The Tuskegee experiment refers to a nationally mandated medical experiment in USA 1932-1972, in which the US Public Health Service monitored 399 black men in the late stages of syphilis. These men were not given adequate information on the extent of the experiment, which involved offering no treatment for their syphilis. The men were monitored for more than forty years, the end-point of the experiment being their post-mortem. President Bill Clinton officially apologised for the ‘bad blood’ experiment in 1997, which led to the preventable deaths of twenty-eight men, the infection of forty of their spouses, and the birth of nineteen children with congenital syphilis.

8.5.3.3 Patient-provider interaction

The interaction between the patient and provider influences many of the dimensions of quality; including access (through their role as a gatekeeper to services), effectiveness (reflecting clinical decision-making in treatment plans), and communication. It is possible that provider bias or prejudice (*“an unjustified negative attitude based on a person’s group membership”* (Smedley, Stith et al. 2003)) and stereotyping (the cognitive shortcuts that aid the processing of complex situations) may contribute to ethnic disparities in care. Given that clinicians may have several diagnostic and treatment options available to them, unconscious or conscious bias and stereotyped conclusions may influence their management of a given patient. That is, some providers may simply be less effective in their management of individuals from some ethnic and cultural groups (Kai, Beavan et al. 2007).

The evidence in this area is largely indirect. For example, Van Ryn and Burke (2000) showed that physicians may perceive patients from some ethnic groups (and those of lower socioeconomic position) more negatively - after consideration of key confounders, Black patients were two-thirds less likely than white patients to be rated by the doctor as *“the kind of person they could be friends with”*. Some studies find reports of patient dissatisfaction are higher for patients from minority ethnic groups (Saha, Arbelaez et al. 2003; Blanchard and Lurie 2004; Blendon, Buhr et al. 2007), as is the experience of discrimination within health care settings (LaVeist, Rolley et al. 2003; Johnson, Saha et al. 2004; Trivedi and Ayanian 2006). There is also substantial international evidence that the decision-making of the provider is affected by ethnicity (through studies using simulated patients, surveys, and chart reviews) (Smedley, Stith et al. 2003), and that the minimisation of clinical discretion (for example, by the enforcement of evidence-based guidelines for all patients) may reduce ethnic health care disparities (Owen, Szczech et al. 2002; Cohen, Fonarow et al. 2010).

There is limited research around bias and stereotyping within the clinical encounter in NZ. However, Jansen et al. (2008) found that some Māori patients felt that they were negatively judged by their provider: for example, *“Māori feel [clinicians] think, ‘Oh, there they are again, bludgers’ ”* (p44) and *“They talk to us like we’re simple minded”* (p51). Harris et al. (2006a) showed that Māori were more likely to report discrimination than non-Māori in multiple settings, including those delivering health services. They also showed an association between these experiences and health outcomes, finding the perception of racism to account for some of the health status inequalities between Māori and NZ Europeans (Harris, Tobias et al. 2006a).

Finally, investigations show ethnic differences in treatment independent of patient and system-level factors (Sadler, McCowan et al. 2002; Harris, Robson et al. 2007), and reduced ethnic inequalities in health outcomes following interventions ensuring systematic care for all patients (Agban, Elley et al. 2008; Kenealy, Eggleton et al. 2010). Collectively this evidence suggests factors involved in the patient-provider interaction may contribute to ethnic differences in the quality of care within the NZ hospital setting.

8.5.3.4 Summary

Ethnic disparities in health care quality and their impact on health outcomes – even if small in relative terms - are still important. Any disparity in quality of care is unethical and potentially uneconomic. All NZ citizens have the same rights to health care, irrespective of their ethnic group, and the delivery of high quality health services is a reasonable expectation of taxpayers and funders alike in return for their investment. However, as tāngata whenua Māori have an additional claim on the quality of hospital care within Aotearoa, as they are guaranteed the same rights and privileges as British citizens under the Treaty of Waitangi (Article three), including a right to an equal quality of health care.

Although the findings of this study were insufficient to support strong recommendations regarding the quality of hospital care, this section provided an overview of the factors that may be involved in the delivery of unequal and poorer care for Māori as hospital inpatients. The organisation of services (including the geographical location and cultural accessibility of hospitals), the disparate experience of deprivation across ethnic groups, the impact of patient comorbidity, and the actions of the provider may all contribute to ethnic disparities in the quality of NZ hospital care.

8.6 SUMMARY AND FINAL WORDS

This chapter explored the strengths and weaknesses of the study design, and interpreted the findings within the context of chance, bias and confounding. The Māori and NZ Europeans in Phase Two had approximately equal satisfaction with the care received in hospital, although this result may be affected by systematic error. The Phase One analyses found a 16% increase in the risk of RoD for Māori compared to NZ European patients. Although there is measurement error in the use of RoD as a proxy for quality, poorer quality of care for Māori is likely to contribute to this estimate. Overall, this thesis has drawn three main conclusions:

1. This research demonstrates the difficulty measuring hospital quality of care with readmission and satisfaction, and of the likely inaccuracy of estimates of quality based on these proxies published by researchers and organisations.
2. It is likely that the comparison of quality of care according to ethnic group using readmission as a proxy is predominantly influenced by factors other than the inpatient quality of care.
3. It is probable that the excess odds of RoD for Māori compared to NZ Europeans calculated in this study is in part due to a true disparity in the quality of care.

This thesis also offers two recommendations, aimed at the use of readmission and satisfaction as quality indicators in the future. Firstly, I suggest the development of protocols to guide the calculation and interpretation of readmission rate as a quality indicator. Secondly, I recommend further research to explore the definition and measurement of satisfaction for Māori and NZ Europeans within the NZ hospital setting.

It is a simple thing, to want to receive the same standard of health care as your neighbour, your cousin, or your friend. I would hope my Ngai Tahu nephew was afforded the same quality of care as my Pākehā son. Berwick (2005 p122) states his definition of ‘quality’, and I think it nicely sums up the simplicity of our expectations:

“No needless deaths, no needless pain, no helplessness, no unwanted waiting, no waste ...and achieve these ‘for all’

APPENDICES

APPENDIX ONE: LETTERS OF SUPPORT

A1.1 District Health Board representatives

1. CAPITAL & COAST DISTRICT HEALTH BOARD: MR. GEOFF ROBINSON, CHIEF MEDICAL OFFICER

Office of the Chief Executive
Capital & Coast DHB



25 November 2008

Dr Juliet Rumball-Smith
Research Fellow
Department of Public Health & General Practice
University of Otago
PO Box 4345
CHRISTCHURCH

Dear Dr Rumball-Smith

**Re: Quality of Public Hospital Care for Maori and New Zealand
Europeans in New Zealand**

Thank you for your letter dated 26 October 2008 regarding your proposed study to investigate the quality of inpatient hospital care for Maori and New Zealand Europeans.

Capital & Coast District Health Board fully support this study. Addressing the ethnic disparities within the delivery of health services is very important to all DHBs and this study will help us to ascertain where we will be able to improve on our standard of care for all New Zealanders.

I wish you all the best for the research and look forward to receiving the results of the study

Yours sincerely,



GEOFF ROBINSON
Chief Medical Officer on behalf of the Chief Operating Officer
Capital & Coast DHB

2. WAIKATO DISTRICT HEALTH BOARD: MS. JAN ADAMS, CHIEF OPERATING OFFICER



20 November 2008

WAIKATO HOSPITAL

Dr Juliet Rumball-Smith
Research Fellow
Department of Public Health & General Practice
University of Otago, Christchurch
PO Box 4345
CHRISTCHURCH

Dear Dr Rumball-Smith,

Quality of Public Hospital Care for NZ Maori and NZ Europeans in New Zealand

Thank you for your letter regarding the study you are planning to investigate the quality of inpatient hospital care for Maori and non-Maori patients in New Zealand.

On behalf of Waikato District Health Board I confirm that I offer our full support to the study. I acknowledge the practical importance of the study, in particular, its potential to address inequalities in health care provision and to assist in planning for future health care provision.

Whilst Waikato District Health Board will not be providing funding for the study, I will encourage all relevant health services to collaborate with the study team as required.

I wish you every success with your application, and I look forward to receiving the results of your study.

Yours sincerely,

Jan Adams
Chief Operating Officer

3. CANTERBURY DISTRICT HEALTH BOARD: MR. MARK LEGGETT, GENERAL MANAGER MEDICAL & SURGICAL DIVISION

Canterbury

District Health Board

Te Poari Hauora o Waitaha

*General Manager, Medical & Surgical Division
Lower Ground Floor, Parkside West
Christchurch Hospital, Christchurch*

*Tel: (03) 364 0036
Fax: (03) 364 0453
E-Mail: mark.leggett@cdhb.govt.nz*

21 November 2008

Dr Juliet Rumball-Smith
Research Fellow
Department of Public Health & General Practice
University of Otago - Christchurch
PO Box 4345
Christchurch

Dear Juliet

Thank you for your letter regarding the study 'The quality of public hospital care for NZ Māori and NZ Europeans in New Zealand'.

I am happy to lend my full support to this study, on behalf of the Canterbury District Health Board. The equitable delivery of health services is an important feature of any health system. Disparities in the standard of care received by patients have the potential to contribute to health outcomes inequalities, and as such are pertinent for investigation.

Wishing you well for the remainder of this research, I look forward to your annual updates on the progress of the study.

Yours sincerely




**Mark Leggett
General Manager
Medical & Surgical Division**

A1.2 Māori representatives and organisations

1. RESEARCH ADVISORY GROUP- MĀORI, CAPITAL & COAST DISTRICT HEALTH BOARD

MAORI PARTNERSHIP BOARD

"Ma Tini, Ma Mano, Ka Rapa Te Whai"



"By Joining Together We Will Succeed"

RESEARCH ADVISORY GROUP MAORI (RAG-M)

26 November 2008

Dr Juliet Rumball-Smith
Research Fellow
Public Health & General Practice
University of Otago
CHRISTCHURCH

Tena Koe Dr Rumball-Smith

Re: The quality of care of NZ Maori and NZ Europeans at public hospitals in New Zealand

RAG-M has assessed your research proposal from a Maori research perspective. We provide the following feedback:

1. We commend you on making contact with a Maori advisor and the fact your proposal is designed to produce Maori analysis.
2. The response rate for Maori for the survey would be improved if personal contact was included.
3. We strongly encourage the project and upon completion of your study, where relevant it would be useful if a copy of your findings was sent to RAG-M.

Therefore we are pleased to advise that RAG-M supports your application.

If you have any further questions please direct all enquiries to Cheryl Goodyer, Manager, Whanau Care Services, Ph (04) 385 5999 extn. 4074 or email: cheryl.goodyer@ccdhb.org.nz.

We wish you well with your study.

Naku noa na,



Jack Rikihana
Chair RAG-M

2. ANNABEL AHURIRI-DRISCOLL, MĀORI RESEARCH ADVISOR, CHRISTCHURCH

26.10.2008

To Whom It May Concern,

I have been involved as a member of the Advisory Committee for the study '**The quality of public hospital care for NZ Māori and NZ Europeans in New Zealand**' since August 2006. Since that time my expertise as a Māori Researcher (currently employed by the Institute of Environmental Science and Research (ESR) Ltd, Christchurch and also lecturer in Hauora Māori for the University of Otago, Christchurch) has assisted Dr. Juliet Rumball-Smith in the development of this study, including that of the survey documents.

I offer a letter of support for this research. The investigation into the quality of hospital care for Māori may have implications for Māori health outcomes in the future, potentially addressing ethnic disparities in the delivery of health services. I also support the involvement of other populations of Māori and non-Māori throughout New Zealand, such as those who attend Waikato Hospital, provided that the investigation at this site is undertaken appropriately and with your full support.

Please feel free to contact me if you have any concerns or queries.

Ngā mihi,

Nā Annabel Ahuriri-Driscoll

Annabel Ahuriri-Driscoll,
ESR Christchurch Science Centre,
PO Box 29-181,
Christchurch.
annabel.ahuriri-driscoll@esr.cri.nz
03 351 6019

3. TE KOMITI WHAKARITE, CANTERBURY DISTRICT HEALTH BOARD

01 August 2006

*Te Komiti Whakarite
Annette Finlay
Level 1
33 St Asaph St
Private Bag 4710
Christchurch*

*Juliet Rumball-Smith
23 Locarno Street
Opawa
Christchurch*

Tena koe Juliet,

Thank you for submitting your PhD Proposal: *Readmission rate of elective surgical patients, and qualitative data obtained by questionnaire, as indicators of the quality of public hospital care in Christchurch, New Zealand, with reference to ethnicity*, to Te Komiti Whakarite.

Te Komiti Whakarite has reviewed this study and are pleased to support your work on this important issue. I am also involved in the improvement of ethnicity data collection at Christchurch Hospital and would be happy to give you assistance if you require any.

I will also contact you if there are any hui that take place that I believe could be of value to you in your research.

If you do require further assistance please contact me, I am also happy to be named as the contact person for the committee.

Naku noa

Na Annette Finlay
Chairperson
Te Komiti Whakarite

4. ELIZABETH CUNNINGHAM, RESEARCH MANAGER – MĀORI, UNIVERSITY OF OTAGO, CHRISTCHURCH

UNIVERSITY
of
OTAGO



Te ūhaka Māori o Ōtago

22 August 2006

Juliet Rumball-Smith
23 Locarno Street
Opawa
Christchurch

Tena koe, Juliet

Thank you for meeting with me at the Christchurch School of Medicine and Health Sciences on 14 July and early August to discuss your PhD proposal:

Readmission rate of elective surgical patients, and qualitative data obtained by questionnaire, as indicators of the quality of public hospital care in Christchurch, New Zealand, with reference to ethnicity

Your study encompasses a number of issues that are of concern to Maori; namely the quality of ethnicity data collected by Canterbury District Health Board and in particular, Christchurch Hospital. Do Maori receive the same standard of care as non-Maori? Local iwi have expressed issues regarding cultural safety and quality of public hospital care, and I am hopeful that your work may address their concerns.

I am happy to support this study, and hopeful that its findings may contribute to improve the access to care, workforce development, education and quality care provided for Maori in a mainstream service.


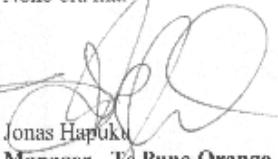
Kia manawanui

Elizabeth Cunningham
Research Manager - Maori

Christchurch School of Medicine and Health Sciences
Research Office, Department of the Dean

PO Box 4345, Christchurch, New Zealand.
Tel 64 3 364 0237 • Fax 64 3 364 0525 • Email research@chmeds.ac.nz
www.chmeds.ac.nz

5. TE PUNA ORANGA (MĀORI HEALTH), WAIKATO DISTRICT HEALTH BOARD


		Waikato District Health Board
	<i>Te Puna Oranga (Māori Health)</i> <i>Waikato District Health Board</i> <i>P.O.Box 934</i> <i>HAMILTON 3240</i> <i>Phone: (07) 834 3644</i> <i>Fax: (07) 834 3619</i>	Waikato Hospital Campus Hocken Building Selwyn St P.O. Box 934 Hamilton 3240, New Zealand
Date: 13 November 2008		
 Dr Juliet Rumball-Smith Dept of Public Health and General Practice Christchurch School of Medicine, University of Otago Christchurch, P.O.Box 4345, Christchurch		
Tena koe Juliet,		
Re: URA/08/12/EXP - The quality of public hospital care for Māori and NZ Europeans in New Zealand		
On behalf of the Kaumatua Kaunihera Research Subcommittee thank you for submitting research material for comment. The subcommittee has considered your research proposal and is pleased to provide you with their support subject to:		
<ol style="list-style-type: none">1. The Kaumatua Kaunihera receiving a copy of the Waikato results being forwarded to the subcommittee at the completion of the study, and2. A report is provided at the end of the study on the total amount of Māori participants vs total participants.		
Thank you for submitting your research to the subcommittee and should you have any further queries please contact me.		
Noho ora mai		
 Jonas Hapuku Manager - Te Puna Oranga		
Cc: Jan Adams - COO, Waikato Hospital		
Te Hanga Whaioranga Mō Te Iwi - Building Healthy Communities		

100502 0480

APPENDIX TWO: ETHICAL APPROVAL

Approval from the Upper South A Regional Ethics Committee was initially obtained in May 2008; however four amendments required additional approval over the subsequent nine months. The letters of approval are given below:

1. 30 MAY 2008

 <p>30 May 2008</p> <p>Dr Juliet Rumball-Smith Department of Public Health and General Practice University of Otago P O Box 4345 Christchurch</p>	<p>Upper South A Regional Ethics Committee Ministry of Health 4th Floor, 250 Oxford Ave PO Box 3877 Christchurch Phone (03) 372 3037 Fax (03) 372 1015 Email: uppersouth.ethicscommittees@mon.govt.nz</p>
--	---

Dear Dr Rumball-Smith

The quality of public hospital care for Maori and NZ Europeans in Christchurch, New Zealand
Investigators: Dr J Rumball-Smith, Dr P Hider, Dr A Richardson
Ethics ref: URA/08/12/EXP

The above study has been given ethical approval by the Chairperson and Deputy Chairperson of the Upper South A Regional Ethics Committee.

Approved Documents
Cover letter dated 14 May 2008
Demographic survey dated 14 May 2008
Client Satisfaction Questionnaire CSQ-8
Reminder note dated 14 May 2008

Progress Reports
The study is approved until **31 December 2019**. The Chairperson will review the approved application annually and notify the Investigator if they withdraw approval. It is the Investigator's responsibility to forward a progress report prior to ethical review of the project in May 2009. The report form is available on <http://www.newhealth.govt.nz/ethicscommittees>. Please note that failure to provide a progress report may result in the withdrawal of ethical approval. A final report is also required at the conclusion of the study.


Amendments
It is also a condition of approval that the Committee is advised if the study does not commence, or is altered in any way, including all documentation eg advertisements, letters to prospective participants.

Please quote the above ethics committee reference number in all correspondence.

It should be noted that Ethics Committee approval does not imply any resource commitment or administrative facilitation by any healthcare provider within whose facility the research is to be carried out. The organisation may specify their own processes regarding notification or approval.

We wish you well with your study.

Yours sincerely


Alieke Dierckx
Upper South A Ethics Committee Administrator

Administered by the Ministry of Health Approved by the Health Research Council <http://www.ethicscommittees.health.govt.nz>



4 December 2008

Dr Juliet Rumball-Smith
Department of Public Health and General Practice
University of Otago
P O Box 4345
Christchurch

Upper South A Regional Ethics Committee

Ministry of Health
4th Floor, 250 Oxford Tce
PO Box 3877
Christchurch
Phone (03) 372 3007
Fax (03) 372 1015

Email: uppersouth_ethicscommittee@moh.govt.nz

Dear Dr Rumball-Smith

The quality of public hospital care for Maori and NZ Europeans in New Zealand

Investigators: Dr J Rumball-Smith, Dr P Hider, Dr A Richardson

Ethics ref: URA/08/12/EXP

Amendments:

To change the study title

To remove the clinical note review aspect of the study

To include National Health Index data

To expand survey sample from 640 to 1920

To include Waikato Hospital and Wellington Hospital

Thank you for your response to the committee's requests. The above amendments have been approved by the Deputy Chairperson of the Upper South A Regional Ethics Committee under delegated authority.

Yours sincerely

A handwritten signature in dark ink, appearing to read 'Alleke Dierckx'.

Alleke Dierckx

Upper South A Ethics Committee Administrator

Alleke_dierckx@moh.govt.nz



Upper South A Regional Ethics Committee

Ministry of Health
4th Floor 250 Oxford Tce
PO Box 5877
Christchurch
Phone (03) 372 5037
Fax (03) 372 1015

Email: uppersouth.ethicscommittees@honi.govt.nz

22 December 2008

Dr Juliet Rumball-Smith
Department of Public Health and General Practice
University of Otago
P O Box 4345
Christchurch

Dear Dr Rumball-Smith

Ethics Reference Number: URA/08/12/EXP

The quality of public hospital care for Maori and NZ Europeans in Christchurch, New Zealand

Amendment(s): providing anonymised data to the developer of the CSQ-8 survey and changes to the formatting of the questionnaire

Thank you for submitting the above amendments to this study. These have now been approved by the Deputy Chairperson of the Upper South A Regional Ethics Committee under delegated authority.

Approved Documents

- Information Sheet dated 22 December 2008
- Survey version 4 dated 22 December 2008

Yours sincerely

pp. Di Rutledge

Di Rutledge

Acting Upper South A Regional Ethics Committee Administrator



19 March 2009

Upper South A Regional Ethics Committee

Ministry of Health
4th Floor, 250 Oxford Tce
PO Box 3877
Christchurch
Phone (03) 372 3037
Fax (03) 372 1015

Email: uppersouth.ethicscommittee@moh.govt.nz

Dr Juliet Rumball-Smith
Department of Public Health and General Practice
University of Otago
P O Box 4345
Christchurch

Dear Dr Rumball-Smith

Ethics Reference Number: URA/08/12/EXP

The quality of public hospital care for Maori and NZ Europeans in Christchurch, New Zealand

Amendment:

To increase number of NZ Maori participants to a total of 480

Thank you for submitting the above amendment, which has been considered by the Chairperson of the Upper South A Regional Ethics Committee, and approved under delegated authority.

Yours sincerely

A handwritten signature in dark ink, appearing to read 'Alleke Dierckx'.

Alleke Dierckx
Upper South A Ethics Committee Administrator
Alleke_dierckx@moh.govt.nz

APPENDIX THREE: REVIEW OF NINE SATISFACTION INSTRUMENTS

Chapter Three selected patient satisfaction as an indicator of health care quality for further review. Nine satisfaction survey tools were chosen for formal assessment of their validity (content, criterion, and construct), reliability and responsiveness, applicability to the public hospital inpatient of Aotearoa, and the feasibility of their use within the study resource parameters. These questionnaires were:

- Single-item rating scales
- Patient Satisfaction Questionnaire
- 64-item Quality of care from the Patient Perspective
- Client Satisfaction Questionnaire-8
- Patient Judgment System
- Press Ganey Inpatient Survey
- Patient Experiences Questionnaire
- Satisfaction with Hospital Care Questionnaire
- Picker Institute Inpatient Survey

These instruments are discussed individually below, with a comparison performed in Table 5.8 (Chapter Five) in the main body of the thesis.

A3.1 Single-item rating scales: “Generally speaking, were you satisfied by the inpatient care?”

(Cheng, Yang et al. 2003)

BACKGROUND

Single-item questionnaires are surveys in which the response to a single question is analysed as the measure of patient satisfaction, for example: “*How satisfied were you with your health care during your admission?*” It is an assessment that is appealing in its simplicity. Researchers have applied the single-item questionnaire in many situations: to evaluate the success of clinical and psychological interventions (Everaert, De Ridder et al. 2000), quality of life (De

Boer, van Lanschot et al. 2004), pain management (Spadoni, Stratford et al. 2004), and health status (DeSalvo, Fisher et al. 2006). It may be used as the satisfaction survey in its entirety (such as that used by Cheng et al., described below), or as part of a longer multi-item questionnaire (Perneger, Kossovsky et al. 2003).

Of the ninety-four studies obtained by the literature review, only one (Cheng, Yang et al. 2003) fulfilled the criteria detailed in Section 5.3 for assessment, with most of the other articles neglecting to provide the actual question used.

In the highly competitive health care market of Taiwan, Cheng et al. aimed to assess factors associated with patient satisfaction and recommendation of a hospital. The researchers conducted a telephone survey three months post-discharge in 4945 patients from 126 hospitals - patients who were admitted for a procedure related to, or had a diagnosis of, stroke, diabetes mellitus, caesarean section, or appendectomy. The researchers asked patients to respond to *“Generally speaking, were you satisfied with the inpatient care?”* using a three-point response scale of ‘satisfied’, ‘fair’, and ‘not satisfied’. The survey also included an item to assess the subjects’ intention to recommend the hospital to family and friends, and six questions focusing on the clinical competence of the hospital staff and the interpersonal skills of the doctor.

The findings of the study by Cheng et al. may be vulnerable to bias: although the response rate was 67%, there were a significant number of incomplete answers to questions of the survey, in particular to the intention to recommend item (16.4% incomplete). Similarly, the interview was performed with either the former patient, or the primary caregiver. The proportion of subjects that came under the latter category is not provided but the use of a proxy to assess satisfaction may introduce information bias into the results (Walker and Restuccia 1984). The authors did not perform an assessment on possible differences between respondents and non-respondents, although did attempt to control for possible confounders such as education level, age, interviewer status, gender and hospital. They assessed also the impact of the interviewer on the results, and minimal bias from this source was identified.

VALIDITY

1. Content validity: The methods to generate the question were not described by Cheng et al. Although they state that the questionnaire was standardised with a small pilot study, there is no information on how the item was chosen, constructed or tested. The three-point response scale was noted as a limitation of the study by the authors, with the distribution of the satisfaction scores significantly skewed (64.2% of subjects stating they were 'satisfied' and only 3.5% declaring they were 'not satisfied').

2. Criterion validity: Cheng et al. assessed the satisfaction rating against two sets of criteria: the intention to recommend the hospital (asked as a single-item also), and patient ratings for the 'interpersonal skills' and 'technical skills' of their physicians. They noted a significant association between general satisfaction and these latter two factors, but not when general satisfaction was compared directly with intention-to-recommend. Approximately 40% of patients were non-concordant, in that they were satisfied with care but would not recommend the hospital or vice versa. While this result is evidence for poor criterion validity, the method of testing is flawed by the use of another non-validated single-item questionnaire (intention to recommend) as the criterion.

3. Construct validity: Cheng et al. did not document any assessment of the construct validity of the single-item rating scale.

RELIABILITY AND RESPONSIVENESS

Neither reliability nor responsiveness of the single-item question were assessed by Cheng et al. Internal consistency cannot apply to a single-item rating, however other assessments such as test-retest reliability were also not performed in this study.

APPLICABILITY

It is probable that this question would be relevant for the NZ hospital inpatient, however this study was conducted in Chinese, and an English translation of the phrase has not been independently validated.

FEASIBILITY

It is improbable that this phrase (*“Generally speaking, were you satisfied with the inpatient care?”*) would be subject to copyright regulations, so is likely that it would be freely available for use.

CONCLUSION

In conclusion, the one study able to be reviewed provided poor evidence for the validity of the single-item format with no evidence of content or construct validity, and discordant results when attempting to demonstrate criterion validity. The reliability and responsiveness of the tool have not been demonstrated by Cheng et al. Although it appears applicable and practical to the Aotearoa inpatient setting, the original question was asked in Chinese, thus the results cannot be directly applied to an English translation.

A3.2 Patient Satisfaction Questionnaire (PSQ)

BACKGROUND

The original PSQ (form I) was developed by Ware and colleagues at Southern Illinois University 1972 – 1976 (Hays, Davies et al. 1987). The authors stated their goal was *“to develop a short self-administered satisfaction survey that would be applicable to general population studies and would yield reliable and valid measures of concepts that had both theoretical and practical importance to the planning, administration, and evaluation of health services delivery programmes”* (Koch and Merz 1995 p28).

The original survey consisted of eighty items, obtained from a pool of 2300 factors gleaned from the literature, a population survey, and the researchers’ experiences. This pool was then analysed and reduced by a group of experts, and 500 items tested on groups of patients (Hawthorne 2006). Factor analysis and other psychometric tests were used to further reduce the item pool to the final eighty items of the PSQ-I. The calculated patient ratings are conceptualised as the product of both the patients’ experience with medical care, and their own preferences (Koch and Merz 1995; Hawthorne 2006).

The PSQ-II was developed after additional field-testing led to further reduction of the number of items, and revision of item phrasing and construction. This 68-item tool encompassed

eighteen subscales and nine global scales, and represented a taxonomy of seven dimensions (Marshall and Hays 1994):

- Accessibility to care
- Continuity of care
- Financial aspects of care
- Availability of resources
- Technical competence
- Interpersonal manner
- Overall satisfaction with medical care

The most recently validated version of this tool (applicable to the assessment of overall quality of care) is the PSQ-III, refined by the RAND Corporation for specific use in their Medical Outcomes Study (Hays, Davies et al. 1987). It contains fifty-one items, each a statement of opinion about which the user is required to respond according to a five-point Likert scale, ranging from ‘strongly agree’ to ‘strongly disagree’.

How strongly do you agree or disagree with each of the following statements?

	Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
I'm very satisfied with the medical care I receive	1	2	3	4	5

(Source: Hays, Davies et al. 1987 p5)

Figure A3.1: Example of an item from the PSQ-III

Hays et al. (1987) state that the intention of this revised tool was to represent the dimensions of satisfaction used in the PSQ-II, include both favourably and unfavourably worded items, be quick to complete, and to include the most reliable and correlated items of the PSQ-II.

VALIDITY

This instrument has been extensively researched and validated, although primarily by its developers and the Rand Corporation.

1. Content validity: The content validity of the PSQ-III is largely implied through the testing and development of the previous two versions. The methodology for item generation included literature review, input by experts and patients, piloting and field-testing, and statistical

analysis. The PSQ-III contains a large number of items, although no open questions, and one subscale includes only two items. There is a five-point response scale. Ross et al. (1995) reviewed seven different measures of patient satisfaction, one of which was a modified version of the PSQ-III. He concluded that the distribution of the scores obtained from this instrument was '*relatively symmetric*' and superior in this respect to several of the other instruments reviewed (Ross, Steward et al. 1995 p397).

2. Criterion validity: Ware and Davies (1983) demonstrated that the items from the general satisfaction subscale of the PSQ-II were significantly associated with the probability of subjects changing their health care provider. They noted that for every 1-point decrease on the satisfaction scale, the likelihood of subjects intending to change medical care providers in the following year increased by 3.4% (Ware and Davies 1983). They demonstrated a similar association between the general satisfaction, technical skills, and interpersonal skills subscales, and prediction of disenrollment in health plans.

3. Construct Validity: Factor analyses demonstrate that the subscales support different dimensions of satisfaction (Ware, Snyder et al. 1983). Roberts et al. (1983) attempted to measure the associations between the scores of a 43-item PSQ and overall life-satisfaction and well-being. They demonstrated that analyses of the PSQ may be biased by this aspect, with over a third of the variance accounted for by these measures, as opposed to the quality of the health services they received.

RELIABILITY AND RESPONSIVENESS

The majority of the information regarding the psychometric properties of this instrument relies on testing conducted on the original versions. Wilkin et al. state that it is expected that the properties of the PSQ-III are "*at least as good and probably an improvement on PSQ-II, particularly in terms of validity*" (Wilkin, Hallam et al. 1992 p235). Reliability estimates (using Cronbach's α statistic) of greater than 0.50 have been demonstrated in 78% of the sub-scales, and responsiveness was demonstrated when tested with subjects who had experienced substandard care (Hawthorne 2006). Ware et al. (1983) demonstrated adequate internal consistency of the PSQ-II, with sixty-eight out of seventy-two estimates exceeding Cronbach's α scores of 0.5. Roberts et al. (1983) described similar results when tested on a sample of outpatients, with a Cronbach's α statistics for the entire PSQ calculated at 0.90. Although test-retest reliability could not be demonstrated sufficiently by Ware et al. (1983), when performed

by Roberts et al. (1987) in his comparison of questionnaires, the scores of the questionnaire when administered at four months and six months post-discharge were correlated with a coefficient of 0.64. There is no evidence of responsiveness in this review of the literature, however Hawthorne (2006) considers that this quality has been proven in his assessment of the tool.

APPLICABILITY

The PSQ-III contains several items that are not applicable to the NZ setting. Statements such as *“the fees doctors charge are too high”* or *“without proof that you can pay, it’s almost impossible to get admitted to the hospital”* would be irrelevant in the assessment of hospital inpatients in Aotearoa. Similarly, there are several items on insurance coverage and the ‘doctors office’, that would require modification or exclusion.

This instrument has been used in other countries and by researchers other than the original developers. Hagedoorn (2003) used the PSQ-III in a Dutch oncology population, to examine the structure and reliability of the tool in this population. The researchers surveyed 1594 adult patients, discharged from eight hospitals in the Northern Netherlands. The instrument was modified by its translation into Dutch, and the removal of questions regarding financial aspects of care. This study demonstrated the presence of significant acquiescent-response bias (13.9% of the sample). Their psychometric testing also revealed that the 5-dimension model did not fit the findings received from their sample, and that a model consisting of fewer dimensions may be more appropriate (Hagedoorn, Uijl et al. 2003; Yildirim 2006).

Roberts et al. (1987) aimed to compare the PSQ-III with the Hulka Satisfaction Questionnaire. Their sample population consisted of fifty-nine patients hospitalised with acute myocardial infarction in a community hospital in Southern Ontario, Canada. The two instruments were modified to remove items related to financial aspects (three from the PSQ-III, two from the Hulka questionnaire). The total scores of the two questionnaires were highly correlated (correlation coefficient = 0.75), and the distributions of scores were approximately the same. The researchers stated that the PSQ-III questionnaire is *“reliable, valid, and acceptable to study subjects”* (Roberts and Tugwell 1987 p648), and supported the use of either of the two questionnaires in the measurement of satisfaction.

Finally, Bene et al. (1998) conducted a study in the Royal Bolton Hospital, UK in 1994. They aimed to assess satisfaction with geriatric services, administering the PSQ-III to 134 patients over the age of seventy-two years. Unlike the studies above, the items pertaining to financial aspects of care were not excluded, and one additional question regarding the state of the National Health Service overall was included.

FEASIBILITY

This instrument is considered to be in the public domain, and is freely available to all users.

CONCLUSION

This well-researched, extensively-validated tool applies a strong theoretical framework to the measurement of patient satisfaction. Although it has primarily been employed by its developers and in American populations, there are examples of its use in other settings. Significant modification would be required to ensure its applicability to the NZ inpatient setting, given the items focused on financial issues. Although other researchers have removed items to improve the applicability of the PSQ, the psychometric properties of these versions have not been fully assessed.

A3.3 Quality of care from the Patient's Perspective (QPP)

BACKGROUND

This questionnaire originated from a grounded-theory approach: Wilde and colleagues (1993) ascertained factors involved in the quality of care using information from thirty-five interviews with hospital patients with infectious diseases. Approximately 900 indicators were developed from these interviews, which were subsequently grouped together into categories and dimensions by experts. Patients assessed a reduced pool of items, and the four dimensions structured into a model, detailed below:

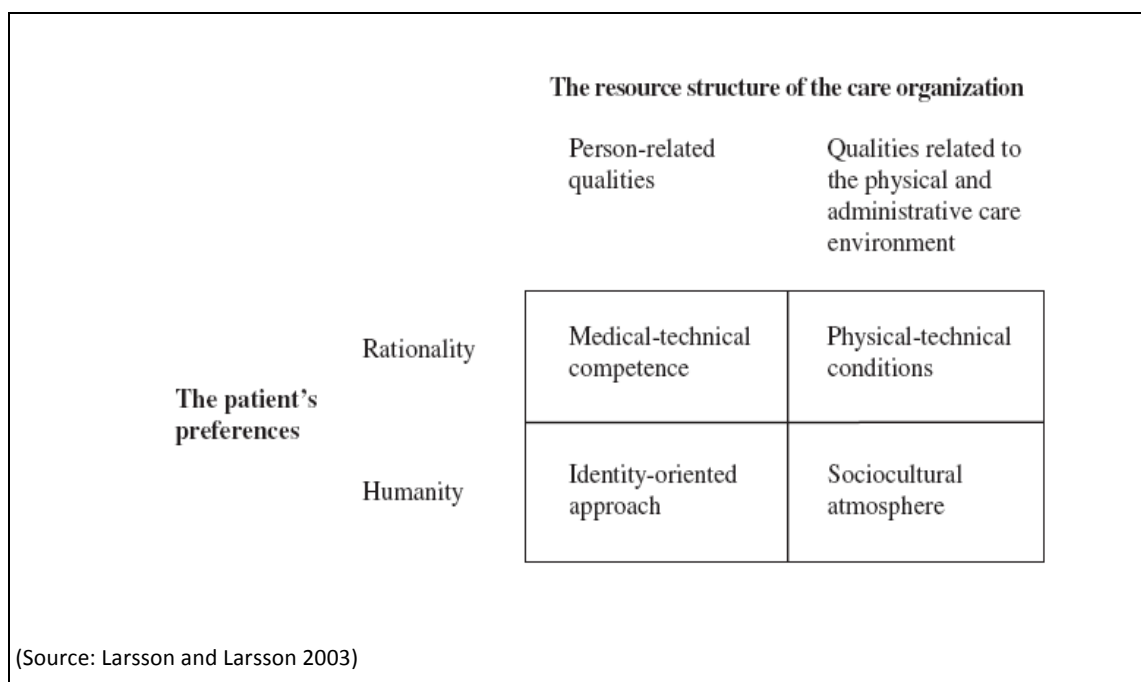


Figure A3.2: The QPP model

The original questionnaire used this model as its framework, constructing 150 items to measure possible permutations of the construct. These items were reduced by experts and patients to sixty-nine statements, each evaluated in two ways by the individual user: in terms of the perceived reality of the experience, and with respect to their preferences and the importance they place on that factor. Each response was originally made on a five-point Likert-scale, although subsequently a four-point scale has been applied. The results from these two ratings are computed to calculate a quality of care index, where the lowest score is obtained if an individual rated an item as of high importance, but gave it the lowest rating for perceived reality.

The questionnaire was first tested in Sweden, 1991, where 266 consecutive patients suffering from an infectious disease were given the survey on the day of discharge, and requested to complete it at home. The final response rate was 55%. Factor analysis was performed on the items, redundant questions excluded, and the survey revised to consist of 56-items grouped into sixteen factors, known as the long version of the QPP. A fifty-item version was also created, after the exclusion of items with low factor loadings, poor discriminability, or those judged to be of lower relevance to the model. These two versions were demonstrated to be highly correlated with each other, with an overall correlation coefficient of 0.9 (Wilde, Larsson et al. 1994). Structural equation modelling by the developers further refined the tool, aiming

to ensure all factors contained at least three items (although this was not possible in four subscales), and the response format on some questions changed to a yes/no design. All new items were generated from the original patient interviews, piloted, and subject to psychometric testing (Larsson, Larsson et al. 1998).

VALIDITY

1. Content validity: The methodology for item generation is comprehensive, and the questionnaire includes open questions. Although initially developed with a five-point response scale, the tool now employs a four-point scale necessitating a forced-choice by the user. Although the number of items is adequate, some scales contain only two items. The distribution of scores is skewed with the majority of responses clustered towards the satisfied end of the spectrum (Wilde, Larsson et al. 1994; Persson and Larsson 2005).

2. Criterion validity: Correlation against a criterion was not performed by the developers, and is not evident in subsequent use of the QPP by other researchers.

3. Construct validity: No discriminant or convergent validity was tested by the developers. However, mean scores of the original testing have been found to be similar to those calculated in later research (Larsson 1999). In subsequent publications QPP scores have been demonstrated to vary with established correlates of satisfaction, such as age and health status (Wilde, Larsson et al. 1994; Larsson 1999).

RELIABILITY AND RESPONSIVENESS

Internal consistency of both the short and long version was demonstrated by Wilde et al. (1994) to be adequate, with Cronbach's α statistics greater than 0.5 in all but one scale (0.43 in the long form). Subsequent analyses in other studies have demonstrated similarly high scores (Larsson 1999; Larsson, Larsson et al. 1999), although Persson et al. (2005) noted a Cronbach's α score of only 0.39 in one scale ('personal necessities'). The revised version was demonstrated to have scores consistently greater than 0.5 (Larsson, Larsson et al. 1998). Responsiveness has not been documented, and no test-retest reliability has been performed by Wilde et al. (1994).

APPLICABILITY

The tool contains no cost or finance items, the statements have face validity for the current hospital system of Aotearoa, and are applicable to inpatient status. However, the published literature regarding this tool in an inpatient population describes studies primarily conducted in Sweden, or performed by the developers. Although a European quality company now uses the questionnaire for assessment of health services throughout Europe, including the UK, there is no evidence that the English translation of the QPP has been formally validated.

FEASIBILITY

The survey is available in English, having been translated from Swedish into English and then back-translated. However, the validity of this version has not been independently tested.

CONCLUSION

The QPP demonstrates good content validity, but there has been little testing with regards to criterion or construct validity. Its reliability appears sufficient, but like other tools, responsiveness has not been tested. Although the instrument appears applicable to the NZ inpatient setting, studies using this tool have not been performed in Australasia before, and a validated English translation of the tool does not exist.

A3.4 Client Satisfaction Questionnaire-8 (CSQ-8)

BACKGROUND

D.L. Larsen and colleagues developed the CSQ forms in the early 1970s at the University of California, motivated primarily by deficiencies in existing satisfaction survey tools. They aimed to produce an instrument that demonstrated adequate variability of scores, and allowed robust comparison between settings and patients. The CSQ was intended to be applicable to different settings and services without requiring modification, and be both practical to administer and user-friendly to minimise sampling bias.

Their literature review identified nine dimensions of satisfaction with services, for which nine items were each written. The nine dimensions are as follows:

- Physical surroundings
- Support staff
- Kind/type of service
- Treatment staff
- Outcome of services
- Quality of service
- Amount, length, or quantity of service
- General satisfaction
- Procedures

Two panels of experts ranked these eighty-one items and reduced the pool to thirty-one, which were then subject to field testing on community mental health patients (Larsen, Attkisson et al. 1979). Factor analysis was performed to produce the CSQ-8, with deletion of unnecessary items and those that exhibited high inter-item correlations. Two other versions have subsequently been produced, the CSQ-18A and CSQ-18B.

The response scale is a four-point Likert format, with variation of the response categories to minimise subjects automatically selecting the same option throughout. The four-point scale creates a forced choice situation, to avoid neutral responses. Scores are added together to produce a single overall rating. Psychometric testing of the CSQ-8 has been performed in the following studies:

1. Larsen and colleagues (1979) performed the original testing in 248 mental health outpatients, after which it was further evaluated in forty-nine outpatients at a community mental health centre (this latter study is unpublished). Unfortunately, information to allow the assessment of the quality of these findings (such as response and completion rate) is not documented. Although descriptive analyses of possible confounding factors were performed in the original study, these variables were not controlled for in subsequent analyses of the data.

2. Attkisson and Zwick (1982) report the use of the CSQ-8 in sixty-two community mental health patients in California. The research was conducted as part of a Masters project performed by Zwick (thesis unavailable for direct review); she compared the psychometric properties of the CSQ-18B and the CSQ-8, and related satisfaction scores to service use and therapy outcome. Although the CSQ-8 and CSQ-18B were highly correlated (correlation coefficient = 0.93), the latter instrument produced a more symmetrical distribution of scores, while the CSQ-8 was demonstrated to have a slightly higher internal consistency (Cronbach's α scores of 0.93 versus 0.91). They concluded *"the excellent performance of the CSQ-8, coupled with the practical advantages of using a shorter measure, suggests that the CSQ-8 is to be preferred as a measure of client satisfaction"*.

3. De Brey (1983) validated a Dutch translation of the CSQ-8 in 110 mental health outpatients in the Netherlands. Analyses for socio-demographic variables were performed, with age noted to be the only significant factor influencing satisfaction scores. The psychometric properties of the modified instrument were comparable to the English version, as were the mean satisfaction scores. The paper describing this study contained inadequate information regarding the sampling strategy employed, response rate, and characteristics of non-respondents; as such the impact of some potential biases cannot be considered.

4. De Wilde et al. (2005) performed a validation study of the instrument in a Dutch substance abuse population, involving 263 subjects. Although results of this study are flawed by its poor response rate (28.3%), there were only minimal differences in the distribution of characteristics between participants and non-respondents. They noted the properties of the instrument to be comparable to other validation studies, with high internal consistency demonstrated (Cronbach's α 0.93) and correlations between the scores of the CSQ-8 and those of another satisfaction survey administered concurrently.

VALIDITY

1. Content validity: Item generation for the CSQ-8 incorporated the results of literature review, expert opinion, field-testing, and factor analysis. However, a clear definition of satisfaction is not described, thus it is difficult to assess whether the survey adequately assesses the desired latent construct. There is a four-point Likert response scale, necessitating a forced choice option, and the CSQ-8 includes a section for subjects to make general comments. Although the questionnaire was designed to avoid the ceiling effect associated with other satisfaction questionnaires, researchers report evidence of a skewed distribution of scores (Pascoe and Attkisson 1983; Attkisson and Greenfield 1996). However, in Hawthorne's comparison of ten patient satisfaction survey tools, he described the CSQ-8 and CSQ-18 as being the least vulnerable to this bias (Hawthorne 2006). With only eight items, this tool does not measure satisfaction as a multidimensional construct (as opposed to how it was intended), and it primarily reflects general satisfaction with services. If this is the intent of its use, then the psychometric testing performed reflects good coverage of this concept (Larsen, Attkisson et al. 1979; Attkisson and Greenfield 1996; Hawthorne 2006). However, it should be considered as a one-dimensional tool without the complexities or benefits associated with multi-dimensional questionnaire.

2. Criterion validity: Larsen and colleagues (1979) describe predictive validity between client satisfaction and drop-out rates within the first month from a community mental health program, with a correlation coefficient of 0.37. They also detail a small correlation between satisfaction and missed appointments (correlation=0.27 $p<0.06$), and note a significant relationship between therapist satisfaction with their work with the client and client satisfaction ratings. Unfortunately, the sample size for this study was small ($n=49$), and minimal information is provided regarding the methodological or sampling detail of this study. Attkisson and Zwick (1982) reported the use of the CSQ-8 in a sample of mental health outpatients and identified that the satisfaction score was correlated with those who remained in the programme beyond one month (correlation coefficient = 0.57), and the number of sessions attended during that time period (correlation coefficient = 0.56). They also describe a relationship between CSQ-8 ratings and change in self-reported symptoms, an association that persisted beyond concurrent ratings of symptoms (Attkisson and Zwick 1982).

3. Construct validity: Although review articles report that the CSQ-8 has proven convergent validity (Wilkin, Hallam et al. 1992; Hawthorne 2006), it appears that the support for this statement comes from the assessment of satisfaction against service outcomes - this thesis would categorise these associations as evidence of criterion validity. However, there is evidence that satisfaction scores vary according to employment status, gender, and ethnicity (Larsen, Attkisson et al. 1979; Gamst, Aguilar-Kitibutr et al. 2003; Jayadevappa, Johnson et al. 2007).

RELIABILITY AND RESPONSIVENESS

The initial testing of the CSQ-8 on a sample of 248 mental health clients demonstrated high internal consistency, with a Cronbach's α score of 0.93 (Larsen, Attkisson et al. 1979). Subsequent testing by the developer in a smaller outpatient population yielded similar results (Cronbach's α = 0.92), and high internal consistency has been reported by other researchers (Gamst, Aguilar-Kitibutr et al. 2003; De Wilde and Hendriks 2005). No evidence of the assessment of its reliability by the test-retest method could be found. There is evidence of some responsiveness of the instrument to intervention (Attkisson and Zwick 1982).

APPLICABILITY

Although validation studies have been primarily performed by the developers, the CSQ-8 has been used extensively by clinicians and researchers throughout general practice, mental health and inpatient settings. It has been used to assess patient satisfaction with anaesthesia, orthopaedic, gynaecologic, general surgical, and urological procedures (Oxorn, Ferris et al. 1997; Pang, Chan et al. 2003; Momeni, Padron et al. 2005; Jayadevappa, Chhatre et al. 2006; Stevens, Reininga et al. 2006).

The literature records its use in countries such as Germany (Momeni, Padron et al. 2005), Japan (Ito and Sederer 2001), the UK (Kucheria, Sahai et al. 2005), Hong Kong (Pang, Chan et al. 2003), Australia (Unwin and Sheppard 1995), Canada (Oxorn, Ferris et al. 1997), and the Netherlands (Stevens, Reininga et al. 2006). The developer has also supplied the survey to researchers in NZ (Attkisson 2007). There are now fifteen translations of the CSQ-8, and psychometrically-validated versions in Dutch (De Brey 1983), Chinese (Pang, Chan et al. 2003), Spanish (Roberts, Attkisson et al. 1984) and French (Attkisson and Greenfield 1996).

Although the CSQ-8 would ideally be modified for its use in inpatients, such as by the replacement of the term 'program' with 'hospital', the developers state that alteration of the wording is prohibited. However, they have produced a UK version of this questionnaire that substitutes the term 'program' with 'service' in three places, and the word 'services' for 'help' in the foreword. Although this version has not been explicitly and independently psychometrically analysed against the US survey, it has had more than 10,000 uses and these minor substitutions are unlikely to be significant (Attkisson 2008).

FEASIBILITY

The developers state that permission must be obtained to use this tool, and a moderate fee per survey applies (Attkisson and Greenfield 1996).

CONCLUSION

In conclusion, the CSQ-8 is a well-validated, extensively tested instrument with evidence of content validity, criterion validity, and reliability. It is a practical tool, short and user-friendly. However, its availability is contingent on permission being granted from the author and the associated costs. It is also primarily valid as a measure of general satisfaction, and does not

provide the same extent of information that would be gained from a longer, multi-dimensional tool.

A3.5 Patient Judgment System (PJS)

BACKGROUND

The Hospital Satisfaction Project was a six-month study conducted by the Hospital Corporation of America, to develop “*patient-centered measurements of hospital performance*” (Rubin, Ware et al. 1990 pS2). They aimed to develop a survey to evaluate patients’ experiences and obtain ratings of hospital performance that accurately reflected patients’ concerns.

The methodology was a multistage process involving literature review, evaluation of existing satisfaction questionnaires, involvement of patients through focus groups and the review of patient comments, interviews with hospital practitioners and administrators, the piloting of a questionnaire, and further psychometric testing.

The first four processes produced a list of patient concerns; from which eight dimensions and around 1000 items were identified. The items were reduced to forty-six ‘core’ questions regarding hospital processes, and sixty other questions covering patient demographics, descriptive information on the hospital stay, and assessing the patients’ intention to return to hospital and recommend the hospital. Each item was associated with a five-point response scale: ‘excellent’, ‘very good’, ‘good’, ‘fair’, ‘poor’ and a ‘don’t know’ category.

On the basis of the results of the pilot study, the instrument was revised to a six-factor solution, involving a new dimension ‘information’, which together accounted for 68% of the variance of the instrument. The revised questionnaire contained sixty-eight items, forty-one of which are core questions that compose nine subscales:

- | | |
|---|--|
| ▪ Admissions (four items) | ▪ Information (four items) |
| ▪ Nursing and daily care (fourteen items) | ▪ Overall quality of care and services (three items) |
| ▪ Medical care (seven items) | ▪ Recommendations and intentions (three items) |
| ▪ Ancillary staff and hospital environment (thirteen items) | ▪ Overall health outcomes (two items) |
| ▪ Discharge and billing (five items) | |

		Excellent	Very Good	Good	Fair	Poor	Don't Know
YOUR NURSES							
39.	SKILL AND COMPETENCE OF NURSES: <i>How well things were done, like giving medicine and handling IVs</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

(Source: Ware and Berwick 1990 p550)

Figure A3.3: Example of an item from the PJS

Validation studies of this instrument include:

1. Rubin and colleagues performed the initial pilot study in 1987 with 2,113 recently discharged patients from ten hospitals in the US (Rubin, Ware et al. 1990). Half of these subjects were interviewed by telephone; the other half received a postal questionnaire. The overall response rate was an adequate 65%, and analyses of respondents and non-respondents demonstrated few significant differences. Outcomes assessed included satisfaction scores, the impact of 'incentives' to response rate (such as the gift of a free pen), the response rate according to the mode of administration, and the influence of patient demographic and clinical factors on response rates.

2. Nelson et al. (1989) (the original development team) tested a modified version of the PJS in 5,625 discharged patients from thirty-two hospitals throughout the US. The response rate for the self-administered questionnaire was 66%, and the completion rate was high (95%). Respondents were likely to be older, female and married; but did not differ from the non-respondents in terms of length of stay or the discharge diagnosis. This study may have been vulnerable to bias in its use of proxies, as parents completed the questionnaire for youth.

VALIDITY

1. Content Validity: The development of the instrument was thorough, with involvement of patients and experts, piloting, and literature review. It is associated with a five-point response scale, and includes three open questions. Of the forty-six core items, forty-five contain at least three questions. Like many surveys, distribution of the scores was found to be skewed by Rubin et al. (1990), with its mean score equivalent to 72.5% of the maximum achievable rating.

2. Criterion validity: The developers used three items in the questionnaire to act as criteria to assess validity (intention to return/recommend, overall quality of care, overall health outcomes). Of these subscales, the scores were most highly correlated with the intention to recommend or return to the hospital (correlation coefficient ranging from 0.51 to 0.75 across the scales) (Hays, Nelson et al. 1990). Nelson et al. (1989) also assessed criterion validity against 'allegiance', this measure consisting of the patients' intentions to recommend the hospital, to use the hospital in the future, and to positively report on the experience to family and friends. The correlation coefficient ranged from 0.42 to 0.69 for this composite measure, and 0.52 to 0.83 for the overall level of care and services.

3. Construct validity: Significant differences in patient satisfaction scores were detected between hospitals by Rubin et al. (1990). The researchers also demonstrated differences according to patient demographics, although these results were significant in four subscales only. Nelson et al. (1989) described a correlation between the ratings of employees and patients, the coefficients ranging between 0.52 and 0.83.

RELIABILITY AND RESPONSIVENESS

Rubin et al. (1990) tested the internal consistency of the instrument, achieving Cronbach's α scores greater than 0.7 for eight of the nine scales. Nelson et al. (1989) confirmed high reliability with Cronbach's α scores ranging between 0.86 – 0.97. Test-retest reliability was evaluated by Nelson et al. (1989) by comparing initial scores with those obtained after a three month time lag, with a difference of only two points on a 100-point scale noted. Responsiveness is not known to have been formally assessed.

APPLICABILITY

The questionnaire was developed for American hospital inpatients in the English language, and items associated with billing and financial access would require modification for the Aotearoa population.

This tool is reported to be in use in "*over 100 hospitals in the US and Canada*" (Hays, Larson et al. 1991 p1), and has been used and modified by researchers other than the initial developers. Two short-form instruments have been developed (Hays, Larson et al. 1991), there is a French translation (Nguyen Thi, Briancon et al. 2002), and some researchers have modified it by

removing the billing and admissions factors (Proctor, Yarcheski et al. 1996) or reducing the number of subscales (Hall, Doran et al. 2003). It has been applied in the UK (Bakalis and Bundy 2001), France (Baumann, Rat et al. 2006), and Canada (Hall, Doran et al. 2003), although there are no reports of its use in an inpatient population in Aotearoa or Australia.

FEASIBILITY

This survey is freely available from the developer.

CONCLUSION

This tool has high content validity, and construct and criterion validity have been demonstrated in two large studies. Reliability is adequate, although like the other tools reviewed, responsiveness has not been assessed. It is a longer tool, which may impact on its completion and response rate, but would also provide more information. The pilot and revised versions are in the public domain, although both would require modification for a NZ inpatient setting.

A3.6 Press Ganey Inpatient Survey

BACKGROUND

Press Ganey are a US-based private company who specialise in quality improvement of health care. They have produced a suite of patient satisfaction surveys, for use in various clinical settings throughout the US, Europe, and Australasia. At the time of writing, Press Ganey were responsible for the patient satisfaction surveys administered by the Capital & Coast and Hutt Valley District Health Boards (Kerr 2007).

Unfortunately, due to commercial sensitivity, the Press Ganey surveys are not in the public domain. The information published by Press Ganey state that their inpatient survey contains sixty-two items assessing ten dimensions of care, and employs a five-point response scale. The dimensions of care are stated as (Press Ganey Associates 2002):

- | | |
|-------------|-----------------------|
| ▪ Admission | ▪ Nursing care |
| ▪ Room | ▪ Tests and therapy |
| ▪ Meals | ▪ Visitors and family |

- Doctor care
- Discharge
- Personal issues
- Overall assessment of hospital.

Press Ganey was unable to supply details about the development and testing of the inpatient satisfaction survey. However, they report that the construction of the survey involved focus groups of patients, providers and/or administrators, reviewing existing health surveys, and literature review. Their publication describes high internal consistency (Cronbach's α scores of 0.80 – 0.94), discriminant validity, and criterion validity using 'intention to recommend' as the measure. Their document states that there was no evidence of assessment of non-response bias, or control for potential distorting variables such as age or health status (Press Ganey Associates 2002).

Despite its widespread use, the psychometric properties of this tool have not been thoroughly reported in the literature. Contact with the organisation revealed that this tool is not available for use without their control; and that they would charge a fee for the distribution, analysis, and reporting of the data.

CONCLUSION

The commercial controls on this product do not allow an independent assessment of the methodology of the survey's development, nor scrutiny of its psychometric properties. This survey would also be impractical for this study, as the company performs all the analyses of the data, and charges a high fee per survey.

A3.7 Patient Experiences Questionnaire (PEQ)

BACKGROUND

This tool was developed by Pettersen et al. in Norway, with the aim to employ it in local and national health care surveillance activities (Pettersen, Veenstra et al. 2004). The latent construct for patient satisfaction was based on eleven dimensions identified from a meta-analysis by Hall and Doman (1988). These researchers reviewed 221 studies to identify and rank key factors associated with patient satisfaction with medical care. The dimensions were classified and rated as follows:

1. Overall quality
2. Humaneness
3. Competence
4. Outcome
5. Facilities
6. Continuity of care
7. Access
8. Informativeness
9. Cost
10. Bureaucracy
11. Attention to psychosocial problems

Pettersen and colleagues searched the literature for items pertaining to these dimensions, selecting those that were relevant to at least 25% of general surgical or medical patients, or that focused specifically on hospital care or medical/nursing aspects. Subjects were asked to rate their agreement with statements within a ten-point scale: an example of the items and their response anchors are demonstrated in the figure below.

Item	Text	Anchoring phrases	
		Negative (1)	Positive (10)
1	Considering everything, do you have confidence in the hospital?	I have little confidence in the hospital	I have complete confidence in the hospital
2	How satisfied are you, all in all, with the nursing and the medical or surgical treatment you received in the hospital?	Not particularly satisfied	Completely satisfied

(Source: Pettersen, Veenstra et al. 2004 p461)

Figure A3.4: Two items from the PEQ with their response anchors

The questionnaire was trialled in 20,890 patients between 1996 and 1998 from fourteen hospitals across Norway. The sample was stratified according to hospital size and geographical location. All medical and surgical inpatients over the age of sixteen years were sent a questionnaire six weeks post discharge. The crude response rate was 57%, reduced to 53% once incomplete or erroneously completed questionnaires were excluded. Exploratory factor analysis determined a six-factor model, however only twenty-six of the thirty-five items were included in this analysis. Items were grouped together on the basis of their factor loadings, and further testing performed on these categories. On the basis of the factor analyses, Pettersen et al. constructed ten rating scales containing six factors, with eleven items excluded to produce a twenty-four item questionnaire (Pettersen, Veenstra et al. 2004).

The developers state that the impact of non-response bias was assessed in the analyses of the initial questionnaire, declaring the results from the respondents as generalisable to the wider population. However no detail regarding this analysis is provided in the published paper, and the initial report is not available in English. Similarly, analyses of demographic and clinical characteristics of the subjects is stated as being performed by Pettersen et al. (2004), but the results themselves are not specified in the published paper.

VALIDITY

1. Content validity: The construction of this tool included literature review; consultation with patients, clinicians, and administrators; and piloting of a first-generation questionnaire. The instrument was revised by removing redundant items, and modifying the question phrasing and response scale. The final version is a thirty-five item questionnaire, with between two and five items per dimension. Although the methodology for its construction appears sound, there is insufficient detail available in the English published literature. The distribution of the scores is clustered in the top half of the scale, with a mean score overall of 79.3 and a mean standard deviation of 23.8.

2. Criterion validity: Pettersen et al. (2004) described the relationship between *“fulfilment of expectations”* and satisfaction, hypothesising that patients who had a less positive experience were more likely to have unfulfilled expectations regarding their hospital stay. The item *“So far, have your expectations been met regarding the medical treatment in the hospital?”* was used as the criterion against which satisfaction scores were compared. Significant differences in mean scores were noted between those who had unfulfilled expectations (defined as having a score for the above item in the lower half of the response scale), and those with scores for the item in the upper half of the response scale.

3. Construct validity: Pettersen et al. (2004) state that construct validity was confirmed by the correlation of satisfaction scores with socio-demographic factors. The differences between the populations was small (range of mean score difference was between two and eight points) but was significant in all scales and in all sub-populations.

This relationship was also reported by Danielsen and colleagues (2007) who used the tool in 26,398 subjects of sixty-two hospitals in Norway. These researchers demonstrated significant associations between lower PEQ scores in all ten dimensions and patients who felt they had

received incorrect treatment: for example, lower PEQ scores in six subscales were reported by subjects who had experienced a night in a corridor bed. PEQ scores in various subscales were also able to be associated with hospital characteristics, such as size, location and teaching status.

Sjetne et al. (2007) noted similar results in their research involving 10,626 patients from fifty hospitals throughout Norway. They described a significant association with five of the ten subscales with hospital size and teaching status, although the actual differences in satisfaction were small.

RELIABILITY AND RESPONSIVENESS

Internal consistency of the scale was reported by Pettersen (2004), with all scales based on the six-factor model demonstrating Cronbach's α scores of greater than 0.70, and the four theoretical scales returning estimates of greater than 0.6. Test-retest reliability was assessed using a sub-sample of 242 respondents two weeks post the initial sampling. This test calculated correlations coefficients of 0.62 – 0.85 over the ten subscales. Pettersen (2004) states that responsiveness has been demonstrated in a local study assessing changes in patient satisfaction following reorganization of health care services (although this investigation has not been published).

APPLICABILITY

The tool was designed for inpatients in Norway, however the items would not require significant modification to apply to the NZ hospital system. As far as the literature attests, the PEQ has not been used outside of Norway, and only one reference could be found that described its use in the inpatient population by researchers other than the original developers (Oterhals, Hanestad et al. 2006).

FEASIBILITY

Although the tool is freely available, a validated English translation of the tool does not exist (Danielsen 2007).

CONCLUSION

The PEQ appears to be a reasonably well-validated tool with psychometric testing performed on data obtained from studies with large sample sizes. It has been used predominantly by the original developers, has not been employed outside Norway, and has been validated in Norwegian only. Unfortunately, the document providing the detail of its original development and testing is not available in English, limiting the ability to appraise the qualities of the PEQ.

A3.8 Satisfaction with Hospital Care Questionnaire (SHCQ)

BACKGROUND

This tool was developed by the Academic Medical Center in Amsterdam, after modifying an existing Dutch instrument. The original tool contained forty-seven items reflecting thirteen aspects of care, of which the researchers selected eleven aspects and thirty-four items that they felt reflected the qualities of the institution. Some items were reformulated for clarity, or to expand the concept of care examined, and four additional questions were incorporated to assess discharge and aftercare. The final tool includes fifty-four items, encompassing twelve dimensions of care⁵² (Hendriks, Vrieling et al. 2001):

- Admission procedures
- Nursing care
- Medical care
- Other disciplines (e.g. social work)
- Information
- Patient autonomy
- Emotional support
- 'Hotel' aspects of care
- Recreation facilities
- Miscellaneous (e.g. rules and regulations)
- Ease of access to hospital
- Discharge and aftercare

⁵² Some variation in the number of items and dimensions is featured in the literature. One study describes a 55-item questionnaire (an additional item under the 'Admission procedure' dimension) (Hendriks, Vrieling et al. 2001), another has included the dimension 'Outpatient's clinic', consisting of 4 items (Hendriks, Oort et al. 2002).

The psychometric properties of the SHCQ were investigated in the following studies:

1. Hendriks and colleagues (2002) performed a validation study of this tool using a sample of 275 patients and eighty-three staff members from the American Medical Center. The subjects were recruited from eighteen hospital wards; including patients with internal medicine, surgical, neurological and obstetric diagnoses. The overall response rate of the study was 63%, and although non-respondents were not analysed, the demographics of the participants were not dissimilar to that of the general population. Staff members were asked to subjectively estimate how patients who had been hospitalised on the ward over the previous three months would have evaluated their care. 26% of the patient surveys were returned incomplete; the researchers used only the completed observations for their analysis and as such, information bias may be significant. The impact of possible confounding factors such as length of stay or health status was also not assessed.

2. Hendriks et al. (2001) used the fifty-five item SHQC to assess the impact of three different item-response formats. The sample consisted of 784 discharged subjects from eight hospital wards of the American Medical Center. The response rate was 65%, leaving 514 subjects against which to review the impact of a ten-point evaluation scale ('very poor' to 'excellent'), a five-point evaluation scale ('poor' to 'excellent'), or a five-point satisfaction scale ('dissatisfied' to 'very satisfied') on patient scores and response rate. Three items regarding the overall rating of care, intention to return to the hospital in the future, and the intention to recommend the hospital were included to assess criterion validity. Four items were also incorporated to assess the subjects' opinions of the survey. Like the study above, no assessment of non-respondents was performed, and there was a large proportion of missing values, 21% of all scores. The researchers established that there was little evidence to prefer one response format over another, in terms of validity, patient preference, or reliability. However, they conceded that the power of the study may have been adversely affected by the large number of missing values, and relatively small numbers of subjects completing each response format.

3. Hendriks and colleagues (2004) further assessed the impact of response format in this study, sending a questionnaire within a few days of discharge to 1184 patients from six wards in a hospital in the Netherlands. The surveys were formatted with one of two response styles: a ten-point evaluation scale ranging from 'very poor' to 'excellent', or a five-point satisfaction scale ranging from 'dissatisfied' to 'very satisfied'. There were no significant differences

between respondents (62% of sample) and non-respondents with respect to sex, age and length of hospital stay; the response rate and patient characteristics for each format were approximately the same. The researchers concluded that the 5-item satisfaction scale was favoured by patients, produced fewer missing responses, and had a more symmetrical distribution of scores than the ten-point evaluation scale.

VALIDITY

1. Content validity: The document describing the properties of the original tool, including the methodology of its construction and refinement, is available only in Dutch. Accordingly, the framework of the SHQC cannot be assessed, nor the methodology used for item generation. No open questions are incorporated into the questionnaire. The SHQC uses between two and five items per subscale, and employs a ten-point response scale (although other response formats have been subsequently evaluated). Hendriks and colleagues (2002) noted that the discriminatory power of the questionnaire was sufficient for overall satisfaction, but not powerful enough to discern between patients in all subscales. As with other satisfaction surveys, the distribution of scores is clustered towards the top end of the scale (Hendriks, Oort et al. 2002).

2. Criterion validity: Criterion validity was not assessed by the researchers in the initial validation study, but was examined in subsequent trials (Hendriks, Vrieling et al. 2001; Hendriks, Vrieling et al. 2004). The developers reviewed the correlations between subscale scores and the subjects' responses to an overall rating of care ("*overall, how would you rate your stay in the [American Medical Center]?*") and to indications of behavioural intention. In the larger study, Hendriks et al. (2004) noted significant correlations between these three variables and eleven of the twelve dimensions of care.

3. Construct validity: In the 2002 published study, the developers tested validity by comparing patient ratings to those of staff (Hendriks, Oort et al. 2002). Although the absolute values of scores differed between the two populations, there was a correlation coefficient of 0.78 in the ranking of the items. Convergent validity was poor in several scales however, leaving the authors to conclude that items may need to be replaced or excluded.

RELIABILITY AND RESPONSIVENESS

Hendriks et al. (2002) demonstrated high inter-rater reliability, and the 2001 and 2004 published studies by Hendriks and colleagues noted reasonable internal consistency: the former study achieved Cronbach's α scores of greater than 0.7 in all but five subscales, and the latter study demonstrated similar results (Hendriks, Vrielink et al. 2001; Hendriks, Vrielink et al. 2004). Internal consistency was also reported in their 2006 publication, with Cronbach's α scores of greater than 0.7 in the majority of the subscales, although lacking in three dimensions ('recreation facilities', 'other disciplines', and patient autonomy'). There is no evidence of responsiveness having been assessed.

APPLICABILITY

The majority of items are applicable to the NZ inpatient setting, with the exception of those pertaining to outpatient clinics (removed in many applications of the SHCQ). At the time of writing, there are apparently no published reports of the study being used outside the Netherlands in an inpatient setting, or by researchers other than the original developers. Apart from the three studies detailed above containing psychometric testing, only one other study could be found that described its use in an inpatient setting. Also undertaken by Hendriks and colleagues (2006), the study assesses the impact of personality on satisfaction, using the fifty-five item SHCQ. Like the earlier trials, it was conducted at the American Medical Center, and employed two different response formats.

FEASIBILITY

The developers have provided permission to use the instrument (with no fee); however the English translation of the SHCQ has not been independently validated.

CONCLUSION

The authors concede that this instrument was largely constructed on the basis of face validity, employing the opinion of experts to determine the key dimensions of satisfaction. Although the tool from which it was modified may have been more extensively researched, information about this original questionnaire is published in Dutch only. Criterion and construct validity have been investigated, however the studies involved have significant limitations. Reliability testing demonstrates some inadequacies associated with some subscales. The instrument has

not been used in the inpatient setting outside of the American Medical Center in Amsterdam, and has not been employed by researchers other than the developers. Although the tool is available in English, the psychometric properties of this translation have not been assessed.

A3.9 Picker Institute Inpatient Survey

Like Press Ganey, the Picker Institute is a private company that owns and administrates a large number of survey tools, including numerous patient satisfaction instruments. This multinational organisation is involved in the assessment of health services in Europe, the US, and Canada, stating that they are dedicated to “*the advancement of the principles of patient-centered care...*” (Picker Institute). The initial inpatient survey produced by this organisation was the result of a fifteen-year collaboration between the Picker Institute and the Harvard Medical School, producing the tool in 1987 (Picker Institute). The Institute states their survey distinguishes between eight dimensions of patient-centred care⁵³:

- Access
- Respect for patient’s values, preferences and expressed needs
- Coordination and integration of care
- Information, communication, and education
- Physical comfort
- Emotional support and alleviation of fear and anxiety
- Involvement of family and friends
- Transition and continuity

These dimensions were created following a literature review; input from focus groups containing patients, their families, and experts; and patient interviews (Gerteis, Edgman-Levitan et al. 1993; Jenkinson, Coulter et al. 2002c). An initial questionnaire was piloted nationally in subjects recently discharged from fourteen hospitals across the US, and refined with the removal and addition of items and improvement of wording. The revised instrument was further piloted (Cleary, Edgman-Levitan et al. 1993), creating a tool that produces forty

⁵³ However, other publications report that the survey describes seven dimensions only, those detailed above with the exception of ‘Access’ (Cleary, Edgman-Levitan et al. 1991; Jenkinson, Coulter et al. 2002c).

dichotomous 'problem scores'. These ratings indicate the presence or absence of a problem, and may be summed to produce subscale and overall ratings.

However, commercial sensitivity and copyright restrictions limit public access to the tool, and it is presumed that these concerns explain the vague accounts of the content of the survey in publications. Consequently, it is difficult to assess whether the instrument employed by different researchers is the same, limiting the generalisability of results. For example, Peytremann-Bridevaux et al. (2006) refer to a fifty-item Picker questionnaire for 'acute inpatient somatic care', while Yen et al. (2004) applied the Picker Institute 'Patient assessment of Hospital Care' instrument, and Jenkinson et al. (2002b) describe the Picker 'Adult In-Patient Survey'.

Validation studies of the 'Picker Institute inpatient survey' elicited in the literature include:

1. Cleary et al. (1991) report the findings of a national telephone survey on 6,455 adult patients recently discharged from sixty-two hospitals across the US. The Picker Institute cite this study as providing validation information for the Picker inpatient survey, however the paper does not refer to the Picker Institute, or the production of a self-administered questionnaire. Instead it describes interviews with patients using a fifty-two item survey encompassing nine dimensions of care. The main findings of this study were the variation in patient ratings with self-reported health status, income, ethnicity, age and gender. It is assumed the survey employed in this study was modified to become the Picker inpatient questionnaire, but it is not known how or what items of the original questionnaire were altered. Neither the study, nor its cited reference (Cleary, Edgman-Levitan et al. 1993), contain information to enable the assessment of the reliability or validity of the survey.

2. Jenkinson et al. (2002c) describe the validation of a 40-item, seven dimension Picker Institute Inpatient Survey in Scotland. They received questionnaires from 3592 recently discharged subjects from five hospitals, representing a 65% response rate. No evidence of investigation of non-respondents was documented; similarly the completion rate of the survey is unknown. Analyses included the impact of demographic characteristics such as age and self-reported health status on satisfaction.

VALIDITY

1. Content validity: It is stated that development of the survey included literature review, consultation with patients, their families and health professionals, and pilot interviews (Cleary, Edgman-Levitan et al. 1993; Gerteis, Edgman-Levitan et al. 1993), although it is not possible to verify these assertions from primary publications. The response format is limited to 'yes/no/don't know', and there is inconsistency in the published studies regarding the number of items in the tool. However, it appears that both the forty-item and thirty-five-item surveys contain between three and eight items per dimension (Jenkinson, Coulter et al. 2002a; Hays, Eastwood et al. 2006). Like other tools, the distribution of the scores is clustered towards the upper end of the scale (Jenkinson, Coulter et al. 2002c).

2. Criterion validity: Jenkinson and colleagues (2002c) noted significant correlations between all subscales and the total score with overall satisfaction and willingness to recommend the institution. No other evidence of criterion validity is noted in the published literature.

3. Construct validity: Coulter et al. (2001) describe variation in satisfaction scores between different hospitals and countries. Fremont et al. (2001) noted an association between satisfaction scores and health outcomes in their sample of subjects discharged following an acute myocardial infarction. Finally, Jenkinson et al. (2002c) describe significant differences in satisfaction score with age and health status, although the magnitude of the differences was minimal.

RELIABILITY AND RESPONSIVENESS

Hays et al. (2006) describe Cronbach's α scores of 0.56 – 0.90 in their study of 1207 general medical inpatients from an American hospital. There is no evidence of test-retest reliability or responsiveness having been assessed.

APPLICABILITY

This instrument has been used in multiple settings, including the National Health Service in the UK, a health system with similarities to the delivery of public hospital care within New Zealand. This survey is currently employed in the Cancer Patient Satisfaction Survey in Aotearoa, although its performance in this study has not yet been evaluated.

FEASIBILITY

The survey is available with a significant fee per use.

CONCLUSION

In conclusion, it is difficult to assess the validity and reliability of this tool, because of restrictions on access to the original documents and to the tool itself. However, its use amongst researchers internationally is widespread, with translations into several languages. It has not been used in the hospitals of Aotearoa at this time, but has been used extensively in the UK public hospital sector. The purchase price of the survey represents a significant limitation for its application in this study.

Section 5.4 of Chapter Five (in the body of the thesis) presents a summary table of these nine instruments, considers what tool would be the best choice for use in this study, and the validity of the selected questionnaire as a marker of the quality of care.

APPENDIX FOUR: PROCEDURES AND ICD-10 CODES

The following table notes the operation codes used to identify eligible patients for the calculation of readmission rate.

Table A4.1: Surgical procedures and corresponding ICD-10 codes

Surgical procedure	ICD-10 code
REPAIR OF INGUINAL HERNIA	3060902 OR 3060903 OR 3061402 OR 3061403
CHOLECYSTECTOMY	3044300 OR 3044500 OR 3044600 OR 3044800 OR 3044900 OR 3045401 OR 3045500
MINIMALLY INVASIVE PROCEDURES FOR BENIGN PROSTATIC HYPERTROPHY ⁵⁴	3720300 OR 2720301 OR 3720302 OR 3720000 OR 3720001 OR 3720002 OR 3720006 OR 3720700 OR 3720701
HYSTERECTOMY	3565300 OR 3565301 OR 3565302 OR 3565303 OR 3565700 OR 3567300 OR 3567301 OR 3575000 OR 3575300 OR 3575301 OR 3575600 OR 3575601 OR 3575602
ARTHROPLASTY OF HIP ⁵⁵	4931200 OR 4931500 OR 4931800 OR 4931900
ARTHROPLASTY OF KNEE ⁵⁵	4951700 OR 4951800 OR 4951900 OR 4952100 OR 4952101 OR 4952102 OR 4952103 OR 4952400 OR 4952401 OR 4953400
APPENDICECTOMY	3057100 OR 3057200
CORONARY ARTERY BYPASS GRAFT	3849700 OR 3849701 OR 3849702 OR 3849703 OR 3849704 OR 3849705 OR 3849706 OR 3849707 OR 3850000 OR 3850300 OR 3850001 OR 3850301 OR 3850002 OR 3850302 OR 3850003 OR 3850303 OR 3850004 OR 3850304 OR 9020100 OR 9020101 OR 9020102 OR 9020103
REMOVAL OF CATARACT	4269800 OR 4270200 OR 4270201 OR 4269801 OR 4270202 OR 4270203 OR 4269802 OR 4270204 OR 4270205 OR 4269803 OR 4270206 OR 4270207 OR 4269804 OR 4270208 OR 4270209 OR 4269805 OR 4270210 OR 4270211 OR 4273101 OR 4271600

⁵⁴ Transurethral resection of prostate, Transurethral needle ablation of prostate, Transurethral electrical vaporisation of prostate, Cryoablation of prostate, Microwave thermotherapy of prostate, High intensity focused ultrasound (transrectal) of prostate, Other closed prostatectomy, Endoscopic laser ablation of prostate, Endoscopic laser excision of prostate.

⁵⁵ Excluding revisions

APPENDIX FIVE: STRATIFICATION OF HOSPITAL ACCORDING TO VOLUME

Data obtained from the New Zealand Health Information Service was employed to calculate an average annual discharge volume (for the specified procedures) for each public hospital facility featured in the index dataset. The mean throughput for hospitals opened or closed during the study period was calculated for the years for which the data were available only.

The figure below depicts the distribution of these rates.

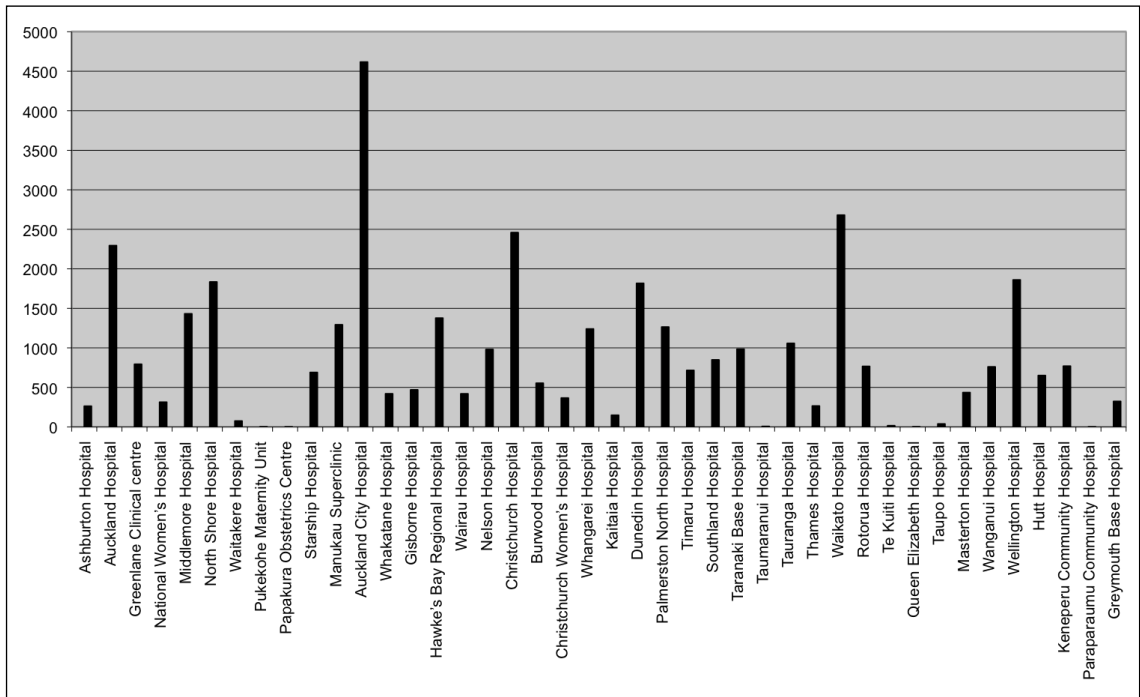


Figure A5.1: Mean annual discharge rate for facilities, 2002 – 2008

The following table shows the average annual discharge rates for each facility during the study period, for the specified procedures, 2002 – 2008.

Table A5.1: Hospital mean annual discharge rates during the study period

Stratum	Facility	Mean annual discharge rate 2002-2008
STRATUM 1: MEAN ANNUAL DISCHARGE RATE >1500	North Shore Hospital	1834
	Auckland City Hospital	4617
	Christchurch Hospital	2459
	Waikato Hospital	2680
	Wellington Hospital	1860
	Dunedin Hospital	1816
STRATUM 2: MEAN ANNUAL DISCHARGE RATE 500 - 1499	Middlemore Hospital	1432
	Hawke's Bay Regional Hospital	1377
	Manukau Superclinic	1293
	Palmerston North Hospital	1264
	Whangārei Hospital	1239
	Tauranga Hospital	1057
	Taranaki Base Hospital	983
	Nelson Hospital	980
	Southland Hospital	848
	Greenlane Clinical centre	793
	Kenepuru Community Hospital	769
	Rotorua Hospital	766
	Wanganui Hospital	760
	Timaru Hospital	715
	Starship Hospital	689
	Hutt Hospital	650
	Burwood Hospital	553

Stratum	Facility	Mean annual discharge rate 2002-2008
STRATUM 3: MEAN ANNUAL DISCHARGE RATE <500	Gisborne Hospital	469
	Masterton Hospital	435
	Whakatāne Hospital	419
	Wairau Hospital	419
	Christchurch Women's Hospital	366
	Greymouth Base Hospital	323
	National Women's Hospital	313
	Thames Hospital	265
	Ashburton Hospital	262
	Kaitaia Hospital	148
	Waitakere Hospital	75
	Taupō Hospital	38
	Te Kuiti Hospital	15
	Taumaranui Hospital	6
	Pukekohe Maternity Unit	2
	Queen Elizabeth Hospital	2
	Papakura Obstetrics Centre	1
	Paraparaumu Community Hospital	1

APPENDIX SIX: ALL-CAUSE VERSUS CONDITION-SPECIFIC READMISSION

In Phase One of this study, the definition of ‘readmission’ was not restricted by the principal diagnosis of the admission – that is, ‘all-cause’ readmission was employed. This appendix explores whether using ‘disease-specific’ readmission in this data source and for this study population has face-validity.

Eligibility for Phase One was defined by index procedure according to International Classification of Disease version 10 (ICD-10) operation codes, each of which map to an ICD-10 ‘chapter’. For example, the operation code for a coronary artery bypass grafting falls within the ICD-10 chapter IX ‘Diseases of the circulatory system’. A readmission with a primary diagnosis of unstable angina has an ICD-10 code that maps to the ICD-10 Chapter IX. This ICD-10 chapter admission-readmission pair can define the readmission as ‘disease-specific’.

My investigation found that the coding of the primary diagnosis of the readmission in the National Minimum Data Set did not always map to a clinical area. For example, an infected skin wound following a surgical procedure would be coded as ICD-10 Chapter XII ‘Disease of the skin and subcutaneous tissue’, and would therefore not be linked with the chapter of the index procedure. Similarly, disorders in fluid-electrolyte balance secondary to inappropriate fluid replacement pre-and post-operatively would not meet the criteria as being of the same chapter as the index, as it would be coded under ICD-10 Chapter XVIII, ‘Symptoms, signs, and abnormal clinical and laboratory findings, not elsewhere classified’. This failure to link the index admission and readmission chapter occurred frequently with the Phase One data, as noted in the table below. (This analysis includes data from 7,977 subjects who experienced a readmission; this subset reflects the exclusion of eighty patients who experienced death within thirty days of discharge).

Table A6.1: Number of readmissions according to the ICD chapter of the readmission and its index admission

Chapter	Description	Number of readmissions	Same chapter as Index (%)
I	Certain infectious and parasitic diseases	110	0
II	Neoplasms	72	0
III	Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism	67	0
IV	Endocrine, nutritional and metabolic diseases	93	0
V	Mental and behavioural disorders	48	0
VI	Diseases of the nervous system	52	0
VII	Diseases of the eye and adenexa	25	20 (80)
VIII	Diseases of the ear and mastoid process	9	0
IX	Diseases of the circulatory system	786	200 (25.4)
X	Diseases of the respiratory system	364	0
XI	Diseases of the digestive system	1077	744 (69.1)
XII	Diseases of the skin and subcutaneous tissue	110	0
XIII	Diseases of the musculoskeletal system and connective tissue	367	300 (81.7)
XIV	Diseases of the genitourinary system	484	311 (64.3)
XV	Pregnancy, childbirth and the puerperium	26	0
XVI	Certain conditions originating in the perinatal period	0	0
XVII	Congenital malformations, deformations and chromosomal abnormalities	2	0
XVIII	Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified.	1328	0
XIX	Injury, poisoning, and certain other consequences of external causes	2771	0
XX	External causes of morbidity and mortality	0	0
XXI	Factors influencing health status and contact with health services	186	0
Total		7977	1575 (19.7)

After review of these data, it was determined that disease-specific readmission has limited face validity in this study context. The reasons for this are as follows:

- The exclusion of the seemingly-unrelated readmissions is restricted by the qualities of the data set. In the majority of the unrelated pairs, it is not that the readmission fails to match to the clinical area of the index procedure, but rather that the readmission is coded to a chapter that may not correspond to an index procedure. Accordingly, it is probable that a large proportion of 'true positive' readmissions (i.e. those in which the readmission is truly related to the care received during the index hospital stay) would be excluded, in addition to the false positives. It is important to balance the need for a 'specific' marker (one that does not include patients with readmission unrelated to quality of care), with that of a 'sensitive' marker (one that includes all of the patients that experienced an avoidable admission because of the care they received in hospital). On balance, the exclusion of 80% of the readmissions in order to increase the specificity of the marker may not be justified when the impact on the sensitivity of the indicator is considered.
- As noted in Chapter Five, the international evidence for this restriction to increase the specificity of the marker is inconsistent, and its impact on the validity of the marker may vary depending on the population sampled.
- Patients who experience death within thirty days of discharge are included in the numerator of the RoD ratio. Extrapolating the condition-specific criteria to these patients requires excluding those with an unrelated cause of death. The face validity of this restriction is limited, in particular because the information pertaining to cause of death may be highly inaccurate (as autopsies are not commonly performed), and reliant on the subjective opinion of the certifying clinician.

APPENDIX SEVEN: SURVEY DOCUMENTS

There were three versions of the survey documents, differing only in their reference to Christchurch, Wellington, or Waikato Hospitals. The documents following are those sent to patients discharged from Christchurch hospital: firstly the survey itself, and secondly the reminder note.

1. SURVEY DOCUMENT (CHRISTCHURCH)



1

Dear Sir/Madam,

Ngā mihi ki te iwi whānui o te rohe nei, tēnā koutou.

You are invited to participate in a study regarding your recent admission to Christchurch Hospital. The study is called: **'The quality of public hospital care for NZ Māori and NZ Europeans in New Zealand.'**

Please read the information on this page and decide whether you wish to take part in this study. Being in the study is completely voluntary, should you not wish to participate, it will not affect your healthcare at present or in the future in any way.

The study is to look at the standard of hospital care received by patients. It aims to assess whether there are any differences in the quality of health care received by New Zealand Māori compared to New Zealand Europeans. In this part of the study, at least 330 NZ Māori and 330 NZ Europeans are being asked to complete a short questionnaire about their recent admission to Christchurch Hospital.

This study is being carried out by the University of Otago. This organisation is not a part of any hospital or District Health Board. Your individual replies are CONFIDENTIAL and will NOT be passed on to any staff at any hospital, unless you request this. Your answers to the questions will not affect your treatment or healthcare in any way, and no material which could personally identify you will be used in any reports on this study.

Some of the information from this study will be assessed by an independent researcher (the developer of the survey) - again, this data is completely confidential and anonymous. All patient information will be stored confidentially, and the completed surveys will be destroyed at the end of the study.

Your General Practitioner will not be notified of your involvement in this study, unless you request this. Should you like more information about the study or the questionnaire, please contact:

Principal Investigator

*Dr. Juliet Rumball-Smith - Research Fellow,
Department of Public Health & General Practice; University of Otago, Christchurch.
Phone: 03 364 – 3684; Email: juliet.rumball-smith@otago.ac.nz*

Should you be willing to participate in the study, please complete the following questionnaire and return in the postage-paid envelope provided.

*Nāu te raurau, nāku te raurau, ka kī te kete.
With your basket, and my basket, the kete will be full.
Nō rēira, tēnā koutou, tēnā koutou, tēnā tātou katoa.*

The quality of public hospital care for NZ Māori and NZ Europeans in New Zealand. 22.12.2008
Department of Public Health and General Practice
University of Otago, Christchurch
PO Box 4345, Christchurch, New Zealand
Tel +64 3 364 3637 • Fax +64 3 364 3614
www.otago.ac.nz

PART A

1. What is your date of birth? (please use dd/mm/yyyy)

____ day ____ month ____ year

2. What is your gender? (circle your answer)

MALE FEMALE

3. Which ethnic group do you belong to? (circle the answer or answers that apply to you)

NZ European	Māori	Samoan	Cook Island Maori
Tongan	Niuean	Chinese	Indian
Other (such as Dutch, Japanese, Tokelauan)			
Please state:			

4. What is your iwi affiliation? (if applicable)

5. Would you say your health in general is? (circle your answer)

Excellent	Very good	Good	Fair	Poor
-----------	-----------	------	------	------

The next page of the survey has been specially purchased for this project by an independent researcher. The following questions are focussed on your experience of the quality of health care you received during your recent admission to Christchurch Hospital.

PLEASE PROCEED TO PART B

The quality of public hospital care for NZ Maori and NZ Europeans in New Zealand. 22.12.2008

PART B

Please help us improve our service by answering some questions about the help that you have received. We are interested in your honest opinions, whether they are positive or negative.

PLEASE ANSWER ALL OF THE QUESTIONS.

We also welcome your comments and suggestions. Thank you very much. We appreciate your help.

CIRCLE YOUR ANSWERS

1. How would you rate the quality of service you received?

4 Excellent 3 Good 2 Fair 1 Poor

2. Did you get the kind of service you wanted?

1 No definitely not 2 No, not really 3 Yes generally 4 Yes, definitely

3. To what extent has our service met your needs?

4 Almost all of my needs have been met 3 Most of my needs have been met 2 Only a few of my needs have been met 1 None of my needs have been met

4. If a friend were in need of similar help, would you recommend our service to him or her?

1 No, definitely not 2 No, I don't think so 3 Yes, I think so 4 Yes, definitely

5. How satisfied are you with amount of help you received?

1 Quite dissatisfied 2 Indifferent or mildly dissatisfied 3 Mostly satisfied 4 Very satisfied

6. Have the services you received helped you to deal more effectively with your problems?

4 Yes they helped a great deal 3 Yes they helped somewhat 2 No, they really didn't help 1 No they seemed to make things worse

7. In an overall, general sense, how satisfied are you with the service you received?

4 Very satisfied 3 Mostly satisfied 2 Indifferent or mildly dissatisfied 1 Quite dissatisfied

8. If you were to seek help again, would you come back to our service?

1 No, definitely not 2 No, I don't think so 3 Yes, I think so 4 Yes, definitely

P.T.O.

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PART C

Please write any further comments in the space provided below:

Thank you very much for completing these questions.

Please return your questionnaire in the postage-paid envelope.

All your answers will be kept confidential and will not impact on your present or future health care in any way.

THANK YOU FOR YOUR TIME



The quality of public hospital care for NZ Maori and NZ Europeans in New Zealand. 22.12.2008

2. REMINDER DOCUMENT (CHRISTCHURCH)



Dear Sir/Madam,

Ngā mihi ki te iwi whānui o te rohe nei, tēnā koutou.

You were recently invited to participate in a study regarding your recent admission to Christchurch Hospital. The study is called:

‘The quality of public hospital care for NZ Māori and NZ Europeans in New Zealand.’

We have not yet received your completed questionnaire. If this is because you do not wish to take part in the study, please indicate this on the tear-off form below and return in the envelope provided. Please be assured that it is your choice whether you participate or not, and that this decision will not affect your healthcare at present or in the future in any way.

If you would like to participate in the study, but would like more information or another copy of the survey, please indicate this on the tear-off form below, and return in the envelope provided.

Should you like more information about the study or the questionnaire, please contact:

Principal Investigator

*Dr. Juliet Rumball-Smith - Research Fellow,
Department of Public Health & General Practice; University of Otago, Christchurch.
Phone: 03 364 – 3684; Email: juliet.rumball-smith@otago.ac.nz*

Please check the box(es) that apply to you, and return this portion in the postage-paid envelope provided.

☐☐

I would like to complete the survey, but need another one sent to me.

☐

I would like more information. Please ring me on _____

☐

I don't want to participate in the survey.

The quality of public hospital care for NZ Māori and NZ Europeans in New Zealand. 22.12.2008
Department of Public Health and General Practice
University of Otago, Christchurch
PO Box 4345, Christchurch, New Zealand
Tel +64 3 364 3637 • Fax +64 3 364 3614
www.otago.ac.nz

APPENDIX EIGHT: SELECTION OF HOSPITALS FOR INCLUSION IN SURVEY

Phase Two of this study required the administration of a patient satisfaction instrument to subjects recently discharged from one of three hospitals throughout New Zealand. This restriction was necessary due to resource constraints; ideally patients from all hospitals would be able to be sampled.

When considering which hospitals to include, three broad factors were used as criteria:

1. Generalisability of hospital: Although hospital characteristics (such as high versus low volume) are inconsistent correlates of satisfaction, it is prudent to make the three hospitals selected as comparable as possible, to facilitate a relatively homogenous study population, and to decrease the impact of unknown variables that may be differentially distributed between the hospitals. As all NZ tertiary hospitals provide referral-level services whilst functioning as teaching hospitals, it was decided to restrict eligible hospitals to these six facilities to minimise the impact of this issue.

2. Proportion of Māori in population: This required the assessment of the absolute numbers of Māori patients discharged from the hospitals annually, to maintain statistical validity and study power. The ratio of NZ Māori to NZ European inpatients is also an issue with regards to the time constraints of the study, and the desire to minimise time differences in the data collection for Māori and non-Māori. This information is noted in the table below for the six tertiary hospitals in Aotearoa, using the eligibility criteria for the study population as described in Chapter Six.

Table A8.1: New Zealand tertiary hospitals according to proportion of Māori included in their catchment areas and annual admission rates

Tertiary hospitals	Māori in catchments⁵⁶ (%)	Eligible annual admissions, Māori (2003/04)⁵⁷
DUNEDIN HOSPITAL	11,469 (6.4)	323
CHRISTCHURCH HOSPITAL	33,459 (7.2)	778
AUCKLAND HOSPITALS	29,862 (7.4)	3,260 (includes all 4 hospitals)
MIDDLEMORE HOSPITAL	67,251 (15.5)	3,109
WAIKATO HOSPITAL	67,488 (19.9)	2,875
WELLINGTON HOSPITAL	26,502 (9.9)	995

After review of the above table, Dunedin hospital was excluded as the number of Māori patients annually was considered too small for this study question and the time constraints of the study.

3. Practicality: After discussion with staff at the New Zealand Health Information Service, some additional issues were identified. For example, at present it is not possible to identify individual hospitals in the fields of the National Minimum Data Set for the four facilities located within Auckland city. Accordingly, Auckland hospital was excluded from consideration as we were unable to separate out hospital admissions to this specific facility. Similarly, the geographical proximity between Middlemore and Auckland City hospitals produces some issues. Patients may make a subjective choice regarding which of these institutions they wish to seek care in, a selection that may introduce bias in relation to satisfaction with care. There are also multiple transfers between these two institutions; these patients may be more or less physically stable than those not transferred. Although admissions involving a transfer could be excluded, this action may also introduce selection bias into the study.

After consideration of these points, Christchurch, Wellington, and Waikato hospitals were selected for inclusion.

⁵⁶ Figures refer to information from 2006 Census, obtained from <http://www.Māorihealth.govt.nz/moh.nsf/indexma/population-by-dhb>

⁵⁷ Eligibility criteria: General medical and surgical patients only, age >17, length of stay >1 day, routine admission source, NZ resident, Māori ethnic group. Data obtained from the 2003/04 National Minimum Data Set.

APPENDIX NINE: DISTRIBUTION OF CSQ-8 SCORES

Table A9.1: Selected statistical properties of CSQ-8 from published literature

Reference	Difference in means between two groups ⁵⁸	Standard deviation CSQ-8 scores
GAMST, AGUILAR-KITIBUTR ET AL. 2003	2.01	
DE BREY 1983		4.24
ATTKISSON AND ZWICK 1982		4.94
NGUYEN, ATTKISSON ET AL. 1983		4.01
ITO AND SEDERER 2001		4.3
GREENWOOD, KEY ET AL. 1999		5.94
HAWTHORNE, GREEN ET AL. 1999	1.6	
DE WILDE AND HENDRIKS 2005	1.92	5.12
HOWARD, EL-MALLAKH ET AL. 2003		5.7
ROBERTS AND ATTKISSON 1983		3.95
(ROBERTS, ATTKISSON ET AL. 1983		4.28
GREENFIELD 1989		3.60
GREENFIELD, BEIGEL ET AL. 1995		3.57
SYSTEMA, WUNDERINK ET AL. 2007		4.5, 7.2
OHLENSCHLAEGER, THORUP ET AL. 2007		3.41, 4.4, 3.9
WALKER, OBOLENSKY ET AL. 2010		3.4
BAMM, ROSENBAUM ET AL. 2010		4.33, 4.82
SCHUTTELAAR, VERMEULEN ET AL. 2010	2.7, 3.0, 2.1	4.3, 4.9
OSTERMANN, BERTRAM ET AL. 2010		2.95
STEWART, QUINN ET AL. 2009		3.11, 2.07
GAROS, KLUCK ET AL. 2007		3.94, 4.64

CSQ-8 = Client Satisfaction Questionnaire-8

⁵⁸ Significant results at p=0.05 or less are noted only.

APPENDIX TEN: PREVALENCE RATIOS IN DESCRIPTIVE ANALYSES

A10.1 Phase One

Age-sex-standardised prevalence ratios were also calculated to compare the clinical and systems-level characteristics of the NZ Māori cohort with those of the NZ European patients, using direct standardisation against the 2001 NZ Māori census population. These ratios were developed similarly to proportional mortality ratios, in that the fractions of the cohorts experiencing a variable of interest were compared (Breslow and Day 1987). In some analyses, one stratum of subjects is used as the reference group against which the others are compared; in other analyses 95% confidence intervals (calculated using the Wilson score method) were used to assess differences between groups (Newcombe 1998). Age-sex standardisation was performed in the comparison of cohorts: the 1996-2000 NZ Māori population according to the 2001 NZ census used as the external standard, and a hypothetical sex distribution of 1:1 males and females assumed.

COMORBIDITY

The prevalence ratios in the table and figure below demonstrate that a greater proportion of the NZ Māori men and women in the study population had Charlson comorbidity indices of ≥ 3 , 2, and 1 compared with the NZ European patients. These differences were all significant at the 95% confidence level. As expected, the reverse was also illustrated, with NZ Māori less likely to have a Charlson Comorbidity Index of zero compared to the NZ European group (PR 0.95, 95% CI 0.94 – 0.96).

Table A10.1: Distribution of comorbidity according to ethnic group

Charlson comorbidity index	NZ Māori		NZ European		PR	95% CI
	n	%	n	%		
0	10,006	87.7	62,129	92.5	0.95	0.94 – 0.96
1	1,571	7.3	8,220	4.5	1.62	1.46 – 1.78
2	528	2.4	4,043	1.8	1.33	1.12 – 1.54
3 OR MORE	524	2.3	2,637	1.3	1.76	1.46 – 2.07

PR= Prevalence ratios for NZ Māori compared to the NZ European population. Prevalence (%) and ratios have been adjusted for age and sex, using direct standardisation against the 2001 Māori census population, CI= Confidence interval.

INDEX PROCEDURE

The table below compare the type of surgical procedure experienced by the patients in the two ethnic groups during the index admission using prevalence ratios. Of those who had a single procedure only (n=89,346, 99.7% of the total sample), NZ Māori were more likely to have experienced inguinal hernia repair, cholecystectomy, removal of cataracts and hip arthroplasty operations; and less likely to have undergone appendicectomy, or procedures for benign prostatic hypertrophy. There were no significant differences between the two ethnic groups in the likelihood of coronary artery bypass grafting, hysterectomy or knee arthroplasty.

Table A10.2: Distribution of index procedures according to ethnic group, single procedure only

Index procedure	NZ Māori		NZ European		PR	95% CI
	n	%	n	%		
INGUINAL HERNIA REPAIR	820	7.9	5,353	6.1	1.30	1.14 – 1.48
APPENDICECTOMY	2,710	40.6	12,342	48.2	0.84	0.82 – 0.86
CORONARY ARTERY BYPASS GRAFT	438	2.1	3,762	2.1	1.00	0.73 – 1.15
CHOLECYSTECTOMY	2,930	23.0	13,847	19.3	1.19	1.13 – 1.24
KNEE ARTHROPLASTY	932	3.1	10,284	3.5	0.91	0.79 – 1.03
HIP ARTHROPLASTY	1,720	8.3	12,359	6.4	1.36	1.25 – 1.48
PROCEDURES FOR BENIGN PROSTATIC HYPERTROPHY	425	1.2	6,754	1.6	0.75	1.08 – 1.67
REMOVAL OF CATARACTS	368	2.4	1,836	1.1	2.54	2.44 – 2.64
HYSTERECTOMY	2,243	11.4	10,223	11.8	0.94	0.86 – 1.02

PR= Prevalence ratios for NZ Māori compared to the NZ European population. Prevalence (%) and ratios have been adjusted for age and sex, using direct standardisation against the 2001 Māori census population. CI= Confidence interval.

NUMBER OF PROCEDURES

312 patients (0.3%) experienced more than one of the defined surgical procedures during their index admission: for example, both an inguinal hernia repair and a hip arthroplasty. Although there was no significant difference in the likelihood of experiencing more than one procedure for NZ Māori compared to NZ Europeans, this comparison may be underpowered (as evidenced by the wide confidence interval around the estimate, 95% CI 0.87 – 2.40).

Table A10.3: Number of procedures according to ethnic group

Number of index procedures	NZ Māori		NZ European		PR	95% CI
	n	%	n	%		
1	12,586	99.7	76,760	99.8	1.00	0.99 – 1.01
>1	43	0.3	269	0.2	1.44	0.87 – 2.40

PR= Prevalence ratios for NZ Māori compared to the NZ European population. Prevalence (%) and ratios have been adjusted for age and sex, using direct standardisation against the 2001 Māori census population, CI= Confidence interval.

HOSPITAL VOLUME

A greater proportion of NZ Māori attended stratum two hospitals (those performing 500 – 1500 of the selected procedures on average per year, PR 1.22, 95% CI 1.18 – 1.26) and stratum three hospitals (those performing < 500 procedures respectively, PR 1.25, 95% CI 1.20 – 1.30) compared to the NZ European patients.

Table A10.4: Hospital volume strata according to ethnic group

Hospital volume stratum	NZ Māori		NZ European		PR	95% CI
	n	%	n	%		
1	3,933	31.7	30,894	44.7	0.71	0.69 – 0.73
2	4,812	38.3	25,408	31.4	1.22	1.18 – 1.26
3	3,884	30.0	20,727	23.9	1.25	1.20 – 1.30

PR= Prevalence ratios for NZ Māori compared to the NZ European population. Prevalence (%) and ratios have been adjusted for age and sex, using direct standardisation against the 2001 Māori census population, CI= Confidence interval. Stratum 1 includes hospitals with the highest mean annualised discharge rates for the selected procedures; stratum 3 represents hospitals with the lowest discharge rates.

SOCIO-ECONOMIC POSITION

The age-sex-standardised prevalence ratios demonstrated that NZ Māori were more than twice as likely to reside in areas coded as NZDep01 deciles nine and ten than the NZ European group (PR 2.43, 95% CI 2.30 – 2.57). Significant differences in the ratios were also observed in NZDep01 quintiles one, two, and three with comparatively fewer NZ Māori patients residing in the lesser deprived quintiles compared to NZ European patients. This analysis excluded 257 patients (0.29%) who did not have an NZDep01 decile noted in the primary data source.

Table A10.5: Distribution of deprivation according to ethnic group

NZDep01 quintile	NZ Māori		NZ European		PR	95% CI
	n	%	n	%		
1 (LEAST DEPRIVED)	540	4.5	10,174	15.0	0.30	0.26 – 0.34
2	1,028	8.5	13,602	18.2	0.47	0.43 – 0.52
3	1,706	13.9	17,064	21.6	0.64	0.59 – 0.69
4	2,981	24.0	20,828	24.9	0.96	0.91 – 1.02
5 (MOST DEPRIVED)	6,316	49.1	15,162	20.2	2.43	2.30 – 2.57

PR= Prevalence ratios for NZ Māori compared to the NZ European population. Prevalence (%) and ratios have been adjusted for age and sex, using direct standardisation against the 2001 Māori census population. NZDep01 = New Zealand Deprivation Index 2001. Quintile 1 = NZDep01 deciles 1 and 2, quintile 2 = NZDep01 deciles 3 and 4, quintile 3 = NZDep01 deciles 5 and 6, quintile 4 = NZDep01 deciles 7 and 8, quintile 5 = NZDep01 deciles 9 and 10. CI= Confidence interval.

A10.2 Phase Two

CHARACTERISTICS OF THE RESPONDENTS AND NON-RESPONDENTS

The following results explore the characteristics of those subjects who completed the questionnaire, compared with those that did not participate. These analyses employ information from the National Minimum Data Set only, and are age-sex standardised using the NZ Māori 2001 census population as the external standard. There were 111 missing items in the dataset for NZDep01 field; these values were obtained independently by linking the

patients' address to a census meshblock and corresponding NZDep01 index (Statistics New Zealand 2011).

The table below shows the demographic and clinical characteristics of the sample population, according to their participation. The columns in **bold** (labelled as '%') represent the percentage of the respondents and the non-respondents sharing the characteristic; these two proportions are compared in the ratio of Respondents (R): Non-respondents (NR).

Table A10.6: Demographic and clinical characteristics of the respondents and non-respondents

Characteristic	Respondents (R)		Non- respondents (NR)		Ratio R:NR	95% CI
	n	%	n	%		
AGE						
N	1103		1279			
MEAN AGE (YEARS)	57.1		46.9			
DIFFERENCE IN MEANS (95% CI)			10.2 (8.7 – 11.7)			
SEX						
FEMALE	589	61.2	667	51.8	1.18	1.14 – 1.22
ETHNICITY						
NZ MĀORI	522	57.9	885	74.6	0.78	0.76 – 0.79
NZDEP01 QUINTILE						
1 (LEAST DEPRIVED)	181	18.2	154	12.0	1.51	1.42– 1.60
2	205	19.0	194	14.2	1.34	1.27 – 1.42
3	212	17.6	208	16.8	1.04	0.99 – 1.10
4	242	20.4	292	21.7	0.94	0.90 – 0.99
5 (MOST DEPRIVED)	263	24.7	431	35.2	0.70	0.68 – 0.73
ADMISSION TYPE (CLINICAL)						
SURGICAL	561	60.9	719	63.1	0.97	0.95 – 0.98
FACILITY						
CHRISTCHURCH	385	34.5	413	32.3	1.06	1.03 – 1.10
WAIKATO	357	32.0	438	33.4	0.96	0.93 – 0.99
WELLINGTON	361	33.5	428	34.3	0.98	0.94 – 1.01

For the purposes of these analyses, the evaluation of ethnicity (like all other variables) employs data from the National Minimum Data Set – this is to allow the comparison between the respondents and non-respondents – however, in respondent-specific analyses, ethnicity data from the survey are preferentially employed.^a Defined as patients cared for by a medical or surgical team, under the purchaser unit code of the National Minimum Data Set. As with sex and ethnicity, this is a dichotomous variable and as such only one category is listed, the other being its complement. CI = Confidence interval, R=Respondents, NR=Non-respondents. Proportions (%) and ratios have been adjusted for age and sex, using direct standardisation against the 2001 Māori census population, with the exception of the sex analysis (age-adjusted only) and age analysis (unadjusted). Due to small cell counts, the age categories were collapsed in the analyses of deprivation - as such these results are not directly comparable to others in this table. NZDep01 = New Zealand Deprivation Index 2001. Quintile 1 = NZDep01 deciles 1 and 2, quintile 2 = NZDep01 deciles 3 and 4, quintile 3 = NZDep01 deciles 5 and 6, quintile 4 = NZDep01 deciles 7 and 8, quintile 5 = NZDep01 deciles 9 and 10.

Prevalence ratios were also calculated to compare the proportions of NZ Māori and NZ European patients experiencing a characteristic within a given stratum; 95% confidence intervals (using the Wilson score method) are employed to assess the significance of differences between the ethnic groups (Newcombe 1998).

MEDICAL OR SURGICAL CLINICAL CONDITION

NZ Māori respondents were more likely to have been admitted under a surgical team (prevalence ratio 1.05, 95% CI 1.02 – 1.07), whereas the NZ European participants were around 7% more likely to have experienced a medical condition as their primary diagnosis.

Table A10.7: Clinical speciality of respondents according to self-identified ethnicity

Clinical specialty	NZ Māori		NZ European		PR	95% CI
	n	%	n	%		
MEDICAL	245	38.3	288	41.2	0.93	0.90 – 0.96
SURGICAL	280	61.7	290	58.8	1.05	1.02 – 1.07

PR= Prevalence ratios for NZ Māori compared to the NZ European population within each clinical stratum. Proportions (%) and ratios have been adjusted for age and sex, using direct standardisation against the 2001 Māori census population. CI = Confidence interval.

SELF-RATED HEALTH STATUS

This information was missing for six of the 525 NZ Māori respondents and four of the NZ European participants. The prevalence ratios in the table and figure below compare the proportion of the NZ Māori group categorised in a given stratum of health status with the corresponding proportion of NZ European patients.

The analyses find that NZ Māori were more likely to report their health as being 'poor', 'fair', or 'good' than the NZ European patients; and conversely less likely to rate their health as 'excellent' or 'very good'. This finding is in keeping with the higher rates of comorbidity, chronic disease, and other morbidity for Māori compared to NZ Europeans in the wider NZ population (see Section 2.2).

Table A10.8: Distribution of self-rated health status according to self-identified ethnicity

Self-rated health status	NZ Māori		NZ European		PR	95% CI
	n	%	n	%		
POOR	55	7.7	41	6.4	1.20	1.10 – 1.31
FAIR	125	18.4	116	11.6	1.59	1.49 – 1.69
GOOD	187	30.5	209	28.4	1.08	1.04 – 1.12
VERY GOOD	106	28.5	160	33.5	0.85	0.82 – 0.88
EXCELLENT	46	14.8	48	20.0	0.74	0.70 – 0.78

PR= Prevalence ratios for NZ Māori compared to the NZ European population within each stratum of health status. Proportions (%) and ratios have been adjusted for age and sex, using direct standardisation against the 2001 Māori census population. Due to small cell counts, the age categories were collapsed in the analyses and employed only four strata. CI= Confidence interval.

The association between ethnic group and health status was further illustrated when health status was dichotomised, with the proportion of NZ Māori in the Poor/Fair category 40% higher when compared to NZ European participants (PR 1.41, 95% CI 1.32 – 1.50).

Table A10.9: Distribution of self-rated health status according to ethnic group, health status dichotomised

Self-rated health status	NZ Māori		NZ European		PR	95% CI
	n	%	n	%		
POOR OR FAIR	180	25.5	157	17.4	1.41	1.32 – 1.50
EXCELLENT OR VERY GOOD OR GOOD	339	74.5	417	82.6	0.90	0.89 – 0.92

PR= Prevalence ratios for NZ Māori compared to the NZ European population. Proportions (%) and ratios have been adjusted for age and sex, using direct standardisation against the 2001 Māori census population. CI= Confidence interval.

SOCIO-ECONOMIC POSITION

The age-sex-standardised ratios indicated that the NZ Māori participants of the survey were 70% more likely to reside in the most deprived NZDep01 quintile (PR 1.70, 95% CI 1.63 – 1.73) and only than half as likely to reside in the least deprived quintile than their NZ European counterparts (PR 0.47, 95% CI 0.45 – 0.50). The differences between the two ethnic groups in all strata were significant at the 95% level.

Table A10.10: Distribution of deprivation according to self-identified ethnicity (Phase Two)

NZDep01 quintile	NZ Māori		NZ European		PR	95% CI
	n	%	n	%		
1 (LEAST DEPRIVED)	53	12.3	128	26.1	0.47	0.45 – 0.50
2	76	15.4	129	23.9	0.64	0.61 – 0.68
3	97	20.0	115	13.8	1.45	1.37 – 1.54
4	127	22.0	115	18.5	1.19	1.13 – 1.25
5 (MOST DEPRIVED)	172	30.3	91	17.7	1.70	1.63 – 1.78

PR= Prevalence ratios for NZ Māori compared to NZ European within stratum of deprivation. Proportions (%) and ratios adjusted for age and sex, using direct standardisation against the 2001 Māori census population. Due to small cell counts, the age categories were collapsed and employed only four strata. NZDep01 = New Zealand Deprivation Index 2001. Quintile 1 = NZDep01 deciles 1 and 2, quintile 2 = NZDep01 deciles 3 and 4, quintile 3 = NZDep01 deciles 5 and 6, quintile 4 = NZDep01 deciles 7 and 8, quintile 5 = NZDep01 deciles 9 and 10. CI= Confidence interval.

APPENDIX ELEVEN: EXPLORATION OF THE CHARACTERISTICS OF THE RESPONDENTS AND NON-RESPONDENTS

The descriptive analyses of Phase One noted that there were differences in the demographic and clinical characteristics between the non-respondents and those who participated. The non-respondents were more likely to be male and reside in the areas represented by the more deprived NZDep01 quintiles than the respondents, and were approximately ten years younger. Ethnic group was the strongest factor associated with non-response - Māori had a response rate of 37% compared to 60% for NZ Europeans. These results are consistent with those of other patient satisfaction surveys carried out in New Zealand, which demonstrate an over-representation of older and NZ European participants (Zwier 2009). The patient and clinical factors associated with non-response in this sample, and their potential to impact on the results are explored individually below:

1. Deprivation: Although the respondents were more likely to reside in the least deprived areas than the non-respondents, it is uncertain whether this difference would have had any impact on the calculated estimates of satisfaction. The literature notes no clear association between deprivation and satisfaction, and the descriptive analyses of the study population similarly demonstrate mixed results. The modelling of the data in the multivariable analyses also showed that deprivation had an inconsistent impact on satisfaction scores with varying beta coefficients associated with each quintile, none of which were significant at the 95% level. Therefore, it is unlikely that this variable is responsible for significant selection bias in these analyses.

2. Age: The literature is consistent in its reports that older age groups tend to rate their hospital experiences more favourably than younger patients, and when age was regressed against satisfaction as a continuous variable in the modelling (incorporating variables for health status and ethnicity), a one-year increase in age was associated with a 0.06 improvement in the CSQ score (95% CI 0.05 – 0.08). Given that the non-respondents were ten years younger than those who participated in the survey, it is possible that the calculated satisfaction scores are higher than they would have been if the non-respondents had been able to be included.

However, this potential bias may be more complex, as the age distribution of the non-respondents also varies with ethnic group. Māori participants were on average 8.5 years younger than the NZ European patients, but the Māori non-respondents were disproportionately younger than the NZ European non-respondents, with a mean age difference of eleven years between the two ethnic groups. As such, it is possible that the ethnicity/satisfaction relationship estimated in this study may have altered if these non-respondents had participated. This bias is explored in more detail in sensitivity analyses performed later in this section. These analyses consider the age and ethnicity of non-respondents, and identify how the estimates may have changed had the non-respondents participated in various scenarios.

3. Heath status: There is reliable evidence in the published literature for a linear relationship between satisfaction and self-rated health status. A pattern of increasing satisfaction in parallel with health status is demonstrated also in the descriptive and multivariable analyses of Phase Two. When health status was included as a categorical variable in a linear regression model of satisfaction against Māori ethnicity (with control for age), it was associated with steadily increasing beta coefficients, significant at the 95% level for four of the five categories. When health status is regressed against satisfaction as a continuous variable (with the inclusion of factors for age and ethnicity), a reduction of health status category (such as from 'excellent' to 'very good') reduced the estimated CSQ score by -0.9 ($p = 0.00$).

Although there is information about the demographic characteristics of the non-respondents, their self-rated health status is not available and it is possible that this characteristic may be responsible for selection bias. Is there an association between health status and response, such that those with poorer health status may be more or less likely to participate? Some researchers note no differences in the health status between the responders and non-responders, and dissuade researchers from expending exceptional time or money on achieving high response rates (Davern, McAlpine et al. 2010)⁵⁹. Conversely, one interview project by Rockwood et al. (1989) noted that the non-responders experienced poorer health and utilised more health resources than those who participated. This form of self-selection bias would

⁵⁹ As an academic exercise, the Charlson Comorbidity Index was calculated for the respondents of the study, and regressed against their health status (as a dichotomised outcome, categorised as Poor/Fair and Good/Very good/Excellent) with control for age (as a four strata categorical variable) and ethnicity. This logistic regression noted a 56% increase in the likelihood of reporting comparatively poorer health status for every unit increase in comorbidity; odds ratio 1.56 (95% CI 1.322 – 1.85). That is, although beyond the scope of this project, it may be possible to use the Charlson index as a proxy for health status to investigate its association with response.

produce overall higher estimates of satisfaction than they would have been if the rest of the sample had responded.

Can the direction of this potential bias be determined in this study? Although the health status of the non-respondents is unknown, we know that Māori experience poorer health compared to NZ Europeans, both in this study and in the wider population. As such, it is possible that this bias is differential in nature, with the health status of the Māori non-respondents worse than the comparable group of NZ Europeans, producing a satisfaction score for Māori that was erroneously high. That is, the comparability of scores for Māori and NZ Europeans may be an inaccurate representation of the true association.

4. Clinical specialty: The non-responders were slightly less likely to be surgical patients than medical patients (prevalence ratio 0.97, 95% CI 0.95 – 0.98). The association between clinical team and satisfaction was small (an increase in CSQ score of 0.5 between medical and surgical patients) and was not significant at the 95% level ($p = 0.08$). As such, it is unlikely that selection bias from this source would substantially alter the estimates of satisfaction calculated for the two ethnic groups.

5. Ethnicity: In this study NZ Māori were approximately 20% less likely to participate compared to NZ Europeans, and oversampling of this ethnic group was required to maintain study power. Given that the Māori patients are younger than the NZ European participants and more likely to have a lower socio-economic position, it is probable that the characteristics of the non-responders as a group (such as the distribution of age, sex, and deprivation) reflect the disproportionate number of Māori in this group.

The potential for selection bias due to the ethnic identity of the non-responders was explored with a simple sensitivity analysis, examining the impact of possible differences in satisfaction between the non-responders and respondents on the calculated estimates. This analysis can be found in Section 8.2.1.2.

APPENDIX TWELVE: MEDIATION BY HOSPITAL VOLUME, PHASE ONE

Phase One involved the calculation of RoD for 89,090 patients from forty-two public hospitals throughout the country. The final multivariable model controlled for some of the structural characteristics of these hospitals – they were categorized according to the mean number of annualized discharges associated with each facility, and a three-class variable representing hospital volume included in the model. However, there remains the potential for residual mediation from this source, due to heterogeneity within the hospital volume strata.

The following figure demonstrates the frequency of patient admission according to hospital in this study:

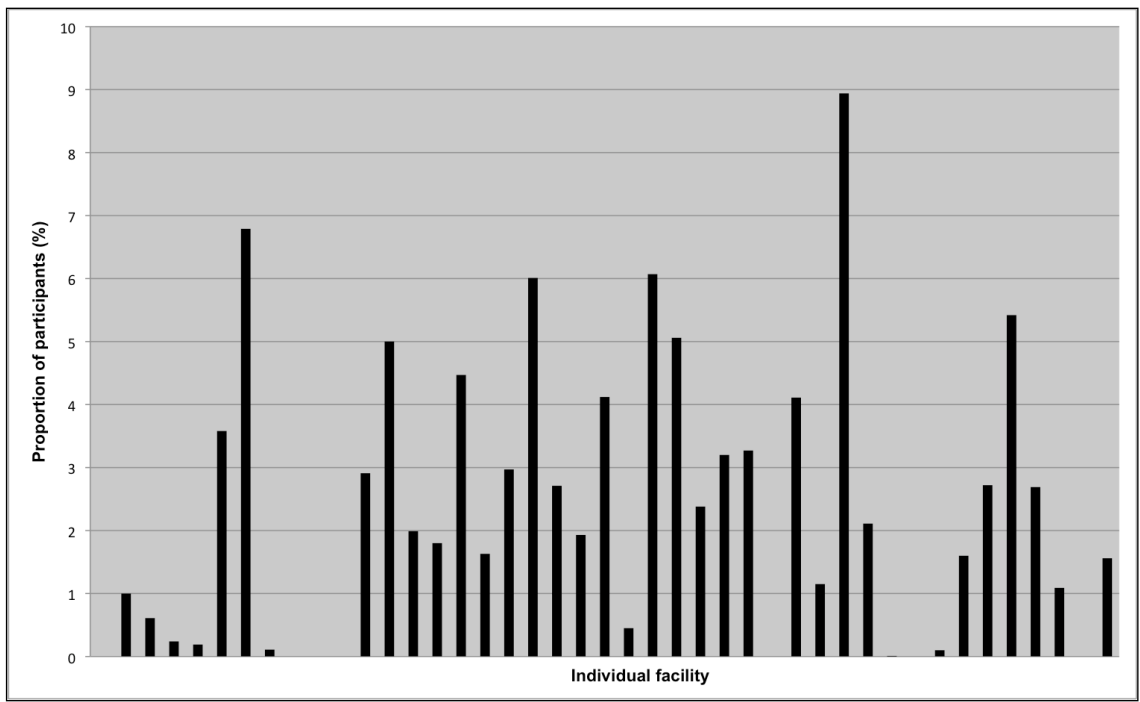


Figure A12.1: Distribution of individual hospitals according to the proportion of participants

The figure demonstrates the large number of outliers, in particular those clustered at the lower end of the range. To investigate the impact of these facilities, the final model was re-evaluated after hospitals with fewer than one hundred subjects admitted for their index procedure were excluded. This led to the removal of eight hospitals and 115 participants,

however no significant change in the odds ratio for RoD according to ethnicity was noted after their exclusion.

To explore the impact of heterogeneity within the strata, the analysis was performed with hospital facility included as individual variables, with the hospital with the largest number of study participants selected as the reference. This model produced thirty-three individual terms, of which eleven hospitals had associated betas of ≥ 1.3 or ≤ 0.8 (a value of one representing null effect), demonstrating their impact on the odds ratio of RoD. However, it is possible that these estimates are in fact reflecting another unmeasured factor – could hospitals produce higher or lower odds ratios because of the ethnic mix of patients that they serve? The following figure demonstrates the distribution of the odds ratios for these individual facilities against the proportion of the study cohort that identify as Māori that each of the hospitals treat. The size of the bubbles represents the amount of data each hospital contributes to the overall study cohort, giving an idea of the precision of the estimates.

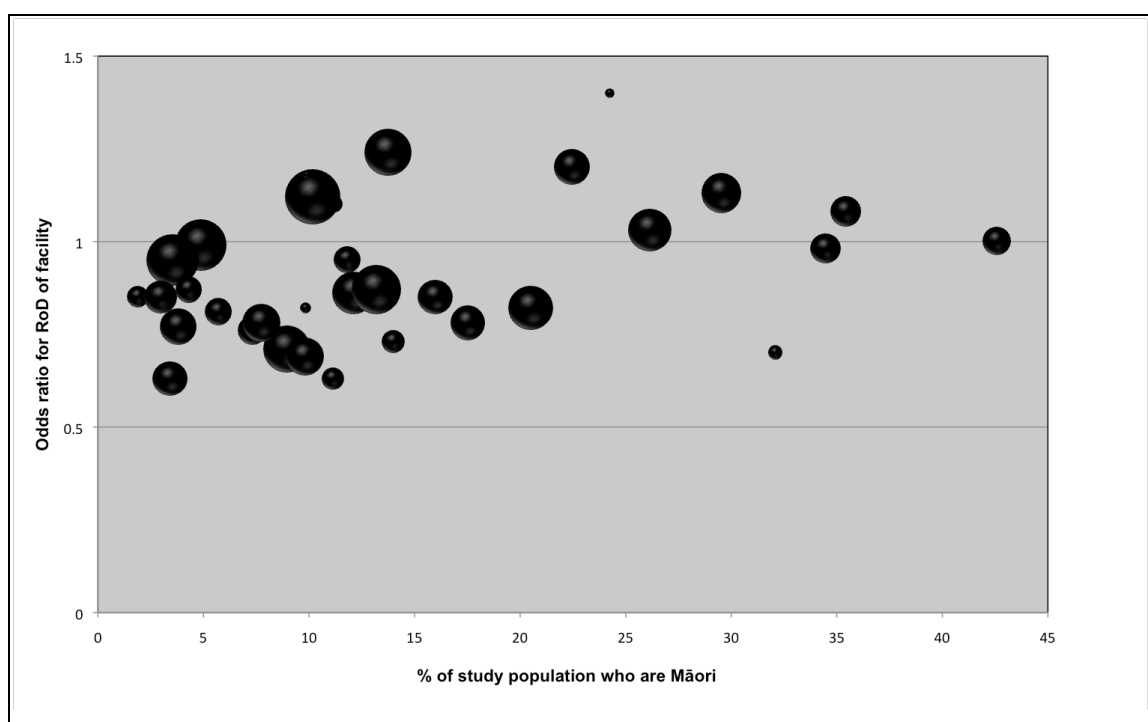


Figure A12.2: Odds ratio (RoD) of facility according to proportion of study cohort attending the facility who identified as Māori

The figure suggests that those hospitals serving a larger proportion of Māori patients may be more likely to have higher odds of RoD. That is, hospitals caring for proportionally more NZ

European patients may be more likely to deliver higher quality of care, as measured by the odds of RoD.

To investigate this relationship further, a linear regression analysis was performed to assess the association between the proportions of the cohort of Māori ethnicity for each individual hospital, versus the beta of the facility. That is, a regression of the thirty-three remaining hospitals (forty-one minus the eight outlying low volume facilities) was run, comparing the beta for the odds ratio of readmission for Māori against that of NZ European, with the proportion of Māori patients for each of the facilities examined. The results demonstrated that for every 10 percentage point increase in the proportion Māori, there was a 0.06 increase in the odds of RoD for Māori compared to NZ Europeans (95% CI 0.03 – 0.12), $p=0.04$.

This relationship was also present when the analysis was weighted according to the amount of data in the cohort for each hospital: a significant association between the hospital and the proportion of Māori served was noted ($p=0.007$), and again a 0.06 (95% CI 0.03 – 0.12) increase in the log odds of RoD for Māori compared to NZ Europeans for a 10 percentage point increase in the proportion of Māori patients served at the facility. That is, as the proportion of Māori patients at the facility increased, so did the disparity in the quality of care received by Māori compared to NZ Europeans.

In summary, it is possible that the hospital volume variable is a poor proxy for the structural characteristics of the hospital (such as number of specialists, availability of technologies, teaching status). If this current research was to be repeated in the future, it is recommended that variables be generated for specific characteristics of facilities (such as teaching status, bed numbers, staffing levels) and investigated individually. It is also possible that this variable is mismeasured and acts as a poor proxy for the structural characteristics of the hospital.

APPENDIX THIRTEEN: DISSEMINATION OF RESULTS

To date, this research has been disseminated in articles, presentations and interviews (copies of the publications are provided in the following pages):

PUBLICATIONS

1. Rumball-Smith J, Sarfati D, Hider P, Blakely T. *Ethnic disparities in the quality of hospital care in New Zealand, as measured by 30-day rate of unplanned readmission/death*. International Journal for Quality in Health Care, under review (requested to resubmit following minor revision).
2. Rumball-Smith J, Sarfati D. (2011). *Improvement in the accuracy of hospital ethnicity data*. Letter. New Zealand Medical Journal, 124(1340).
3. Rumball-Smith J. (2009). *Not in my hospital? Ethnic disparities in quality of hospital care in New Zealand: A narrative review of the evidence*. New Zealand Medical Journal, 122(1297), 68-83.
4. Rumball-Smith J, Hider P. (2009). *The validity of readmission rate as a marker of the quality of hospital care, and a recommendation for its definition*. New Zealand Medical Journal, 122(1289), 32-9.

PRESENTATIONS

AcademyHealth Annual Research Meeting; Orlando, Florida, June 2012. *Inequality in quality – An international problem. Ethnic disparities in readmission in New Zealand*. (poster presentation).

Hui Whakapiripiri (Health Research Council of NZ); Auckland, March 2009. *The quality of public hospital care for Māori and NZ Europeans in New Zealand: A study in progress*.

MEDIA

2009 19.06.2009 Media release.

Pre-recorded interviews with Newstalk ZB (19/06), Radiolive (19/06), National radio (23/06).

Live interviews with Radio Waatea (Willie Jackson, 22/06), National radio (Kathryn Ryan, 23/06).

Written interview HRC News (Issue 65 Sep 2009). *Ethnic disparities in hospital care highlighted*

2007 Written interview HRC News (Issue 55, March 2007). *Māori hospital readmission rates to be examined.*

2006 Written interview The Press (17.12.2006). *Equity of healthcare for Māori studied, readmission rates examined.*

Ethnic disparities in the quality of hospital care in New Zealand, as measured by 30-day rate of unplanned readmission/death.

Running title: Ethnic disparities in readmission rate

Objective: To compare the quality of hospital care for New Zealand (NZ) Māori and NZ European adult patients, using the rate of unplanned readmission or death within 30 days of discharge as an indicator of quality.

Design: Retrospective cohort study.

Setting: New Zealand public hospitals.

Participants: Data from 89,658 patients who were admitted for one of a defined set of surgical procedures at NZ public hospitals 2002 – 2008 were obtained from the NZ Ministry of Health.

Outcome: The odds of readmission for NZ Māori compared to NZ European patients were calculated using logistic regression, incorporating variables for age, sex, comorbidity, index procedure, hospital volume and socio-economic position.

Results: NZ Māori had 16% higher odds of readmission or death compared to NZ European patients (OR=1.16; 95% CI 1.08 – 1.24) after adjusting for all covariates. Readmission or death was also associated with being female (OR=1.09; 1.03-1.15), older age (OR =1.33; 1.19-1.48, for >79 yrs compared with 18-39 yrs), higher comorbidity (OR= 2.08; 1.89-2.31, for Charlson score 3+ compared with 0) and higher hospital volume (OR= 0.81; 0.76-0.86, for lowest volume compared with highest).

Conclusion: This study suggests ethnic disparities in the quality of hospital care in New Zealand using unplanned readmission rate as an indicator of quality. There are well-documented differences in health outcomes between Māori and NZ Europeans, it is possible that differential treatment within the health system contributes to these health status inequalities.

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 Cross cultural comparison/

INTRODUCTION

There is robust evidence for ethnic/racial disparities in the quality of care. However, much of this research comes from the U.S., which has a particular organizational approach to the provision of health care. U.S. hospitals primarily employ fee-for-service schemes, with co-payment required by insurance providers or the individual patient. Consequently, ethnic disparities in hospital-based quality of care may in part reflect the impact of material disadvantage on the accessibility of hospital care at the systems level. If so, ethnic disparities in hospital care may be less evident in countries that provide this care at no direct cost to their patients. This study considers NZ public hospitals, which deliver acute inpatient services 'free of charge' to all NZ residents. This approach to hospital care is also employed by other health systems, such as those of the United Kingdom, Australia, and Canada. The existence of ethnic health care disparities within NZ hospitals may indicate the influence of underlying cross-contextual factors, which are independent of the funding arrangements of hospital care.

Specifically this study investigates the quality of care for Māori compared to the European population in public hospitals of New Zealand. Māori are the indigenous people of NZ, who make up approximately 15% of the four million population; ¹ recent studies suggest unequal (and poorer) treatment for this group, in particular for those requiring obstetric and cancer care ²⁻⁴ and in the incidence of preventable adverse events.⁵

We use unplanned readmission/death as an indicator of the quality of care. An association between readmission rate and quality of care has been shown in a range of epidemiological studies.^{6, 7} As a direct representation of morbidity, readmission is an outcome of importance for patients. It is also of interest for health service funders: Anderson and Steinberg demonstrated that the 23% of patients who experienced at least one readmission in the four years of their study consumed 80% of the hospital expenditure for that period,⁸ and Medicare estimate that potentially preventable readmissions cost them \$12 billion annually.⁹

METHODS

The average rate of readmission in NZ adults, and the population counts of the Māori and NZ European ethnic groups were used to estimate the required sample size. On the basis of this calculation, we obtained a subset of the National Minimum Data Set (NMDS, routinely collected data on all patients admitted to hospitals nationally) from the New Zealand Health Information Service (NZHIS) for July 2002 – June 2008.

We identified patients who had experienced one of a defined set of surgical procedures as part of a public hospital admission (coded as '01' in 'facility type' field of the NMDS): Inguinal hernia repair, appendicectomy, coronary artery bypass graft, cholecystectomy, knee arthroplasty, hip arthroplasty, minimally invasive procedures for benign prostatic hypertrophy, removal of cataracts, and hysterectomy (International Classification of Disease-version 10 codes noted in Appendix one). These procedures were selected to improve the validity the indicator as a proxy for quality (surgical readmissions being more 'avoidable' than medical readmissions)¹⁰,¹¹; and reflected the most commonly-performed procedures at NZ public hospitals 2001/02 (excluding those that were investigatory only, and those related to the treatment of malignancy).

Other inclusion criteria included: NZ Māori or NZ European ethnicity, age 18 years or over, NZ residents, minimum one night length of stay, 'routine admission source' (excludes patients transferred from other facilities), and discharge to home (coded as 'DR' in the 'event end type' field of the NMDS). Patients who self-discharged against medical advice were excluded.

Key variables

Ethnicity data are collected from all individuals on admission to hospital, and several ethnic groups can be nominated. The NZHIS supplied the ethnic group identified at the index admission using a prioritization approach –an individual was considered to be Māori if any of their nominated ethnic groups was Māori, and the NZ European group included those who had identified only as NZ European. While there have been reports of inaccurate ethnicity data in hospital records,¹² previous work has shown this source correlates well with ethnic identity obtained by self-administered survey.¹³ The **index admission** was the first relevant inpatient admission during the period of observation. **Readmission** was the subsequent unplanned admission within 30 days of discharge ('unplanned' indicated by 'AC' or 'ZC' in the 'admission type' field of the NMDS). **Readmission rate** was calculated as the number of distinct patients experiencing an unplanned public hospital admission or death in the community within 30 days of discharge following an index admission, divided by the number of distinct patients discharged alive within the reference period. **Socio-economic position** was estimated with the NZDep2001 indicator. This measure uses nine material and social variables to calculate a deprivation score from one (least deprived) to ten (most deprived) for a particular census mesh-block area.¹⁴ These blocks are geographical units containing approximately 100 people, as defined by Statistics New Zealand. This index is a proxy indicator of deprivation for the people who live within those small areas, and has been used in research to reflect socio-

economic position.⁵ **Comorbidity** was estimated using the Charlson Comorbidity Index. This measure is formed from the previously demonstrated associations of nineteen conditions (or categories of conditions) with 1-year mortality, each allocated a weight of 1 to 6 and summed to give an overall score.¹⁵ We used ICD-10-AM codes from the ten diagnosis fields available in our dataset at index admission to calculate a Charlson comorbidity score for each individual, and categorized it into four strata (0, 1, 2, 3+). **Hospital volume** was a three-category variable based on the hospital's annualized discharge volume for the specified procedures.

Data analysis

Descriptive analyses

The distribution of characteristics between the two ethnic groups was compared with age-sex standardized proportions (p-values calculated with the Pearson's chi-squared test). The 1996-2000 NZ Māori population according to the 2001 NZ census was used as the external standard, and a hypothetical sex distribution of 1:1 males and females assumed.

Multivariable analyses

Logistic regression models were created to investigate the association between ethnicity and unplanned readmission/death, with variables added stepwise to control for the impact of confounders. The choice of the covariates reflects evidence from the published literature regarding correlates and confounders of readmission risk (for example: age, sex, case-mix and comorbidity^{16, 17}). Although investigated as a potential covariate, length of stay was not included in the final model. The literature suggests this variable may be an indicator of quality in its own right.¹⁸ As such, including this term may 'over-control' the model, and underestimate the impact of ethnic group on the outcome.

RESULTS

A total of 89,658 subjects met our eligibility criteria. However, 312 patients (0.3%) who had experienced more than one of the index procedures were excluded, as were an additional 256 patients with missing information for the deprivation variable, leaving a final sample of 89,090 for the multivariate analyses (total excluded=568, 0.63%). NZ European patients were older (mean difference in age 11.1 years); and more likely to be male and reside in the least deprived areas compared to the NZ Māori group. They were also more likely to have a shorter stay in hospital, a lower level of comorbidity, and be admitted at the highest volume hospitals. NZ Māori and NZ Europeans had different patterns in index procedure, with proportionally

more NZ Māori experiencing inguinal hernia repairs, cholecystectomies and hip arthroplasty operations; and less having appendicectomies, knee arthroplasty, procedures for benign prostatic hypertrophy or cataract operations. (See Table one.)

Table one: Characteristics of the study cohort by ethnic group

Characteristics, n (%)	Strata	% Māori (n=12,629)	% NZ European (n=77,029)	p*
Age (y)	18-39	4351 (34.5)	14084 (18.3)	< 0.001
	40-59	4779 (37.8)	20989 (27.2)	
	60-79	3315 (26.2)	34479 (44.8)	
	>79	184 (1.5)	7477 (9.7)	
Sex	Female	7650 (65.6)	40747 (62.3)	< 0.001
Socio-economic position^a	1	540 (4.5)	10174 (15.0)	< 0.001
	2	1028 (8.4)	13602 (18.2)	
	3	1706 (13.7)	17064 (21.6)	
	4	2981 (23.9)	20828 (24.9)	
	5	6316 (49.0)	15162 (20.2)	
Length of stay (days)	1-2	4488 (44.9)	26422 (49.5)	< 0.001
	3-4	3279 (26.2)	17742 (26.9)	
	5-6	2228 (13.9)	14378 (12.3)	
	>6	2634 (14.4)	18487 (11.2)	
Charlson comorbidity index	0	10006 (87.7)	62129 (92.4)	< 0.001
	1	1571 (7.3)	8220 (4.4)	
	2	528 (2.4)	4043 (1.8)	
	3 or more	528 (2.1)	2637 (1.2)	
Index procedure^b	IH	820 (7.9)	5353 (6.1)	< 0.001
	APP	2710 (40.6)	12342 (48.2)	
	CABG	438 (2.1)	3762 (2.1)	
	CH	2930 (23.0)	13847 (19.3)	
	KA	932 (3.1)	10284 (3.5)	
	HA	1720 (8.3)	12359 (6.4)	
	BPH	425 (1.2)	6754 (1.6)	
	CAT	368 (2.4)	1836 (1.1)	
	HYST	2243 (11.4)	10223 (11.8)	
Hospital volume^c	1	3933 (31.6)	30894 (44.7)	< 0.001
	2	4812 (38.1)	25408 (31.4)	
	3	3884 (30.0)	20727 (23.9)	

Proportions (%) adjusted for age and sex, using direct standardisation against the 2001 Māori census population, with the exception of the age (unadjusted) and sex (adjusted for age only) comparisons.

^a Analyses exclude 257 subjects who did not have NZDep01 Index information complete in the National Minimum Data Set. Quintile 1 = NZDep01 deciles 1 and 2 (least deprived), quintile 2 = NZDep01 deciles 3 and 4, quintile 3 = NZDep01 deciles 5 and 6, quintile 4 = NZDep01 deciles 7 and 8, quintile 5 = NZDep01 deciles 9 and 10 (most deprived). ^b Analyses exclude 312 subjects who experienced more than one index procedure. IH = Inguinal hernia repair, APP = Appendicectomy, CABG = Coronary Artery Bypass Graft, CH = Cholecystectomy, KA = Knee arthroplasty, HA = Hip arthroplasty, BPH = Procedures for Benign Prostatic Hypertrophy, CAT = Removal of cataracts, HYST= Hysterectomy. ^c Hospital volume stratum 1 = Proportion experiencing index admission in facilities performing on average >1500 of the selected surgical procedures per year over the study period; stratum 2 = Proportion experiencing index admission in facilities performing on average 500 - 1500 of the selected surgical procedures per year over the study period; stratum 3 = Proportion experiencing index admission in facilities performing on average < 500 of the selected surgical procedures per year over the study period. * p-values calculated from Pearson's chi-squared test.

Overall, 9.0% of sample (8,018 of 89,090) experienced unplanned readmission/death; the crude rate was 8.8% for NZ Europeans and 9.9% for NZ Māori. Table two gives the association between ethnic group and unplanned readmission/death for two logistic regression models. The first includes only pure confounders (age and sex - Model 1), the second also incorporates variables for socio-economic position, comorbidity, index procedure, and hospital volume (Model 2).

Table two: Odds ratio of unplanned readmission or death within 30-days of discharge

Variable	Categories	Model 1	95% Confidence interval	Model 2	95% Confidence interval
Ethnic group	NZ European	1.00		1.00	
	NZ Māori	1.19	1.12 – 1.27	1.16	1.08 – 1.24
Age (years)	18 – 39	1.00		1.00	
	40 – 59	0.93	0.87 – 1.00	0.88	0.81 – 0.95
	60 – 79	1.04	0.98 – 1.11	0.91	0.84 – 0.99
	>79	1.40	1.29 – 1.53	1.33	1.19 – 1.48
Sex	Male	1.00		1.00	
	Female	1.00	0.96 – 1.05	1.09	1.03 – 1.15
Socio-economic position^a	1 (least deprived)			1.00	
	2			1.04	0.95 – 1.14
	3			0.98	0.90 – 1.07
	4			1.07	0.99 – 1.16
	5			1.12	1.03 – 1.22
Charlson Comorbidity Index	0			1.00	
	1			1.43	1.34 – 1.54
	2			1.61	1.47 – 1.77
	3 or more			2.08	1.89 – 2.31
Index procedure^b	APP			1.00	
	BPH			0.94	0.84 – 1.05
	CABG			1.75	1.56 – 1.96
	CAT			0.48	0.40 – 0.59
	CH			0.87	0.80 – 0.95
	HA			0.88	0.80 – 0.97
	HYST			0.93	0.84 – 1.02
	IH			0.69	0.60 – 0.78
	KA			0.96	0.87 – 1.07
Hospital volume^c	1			1.00	
	2			0.84	0.79 – 0.88
	3			0.81	0.76 – 0.86

Model 1: covariates included ethnic group, age and sex. Model 2: covariates included ethnic group, age, sex, socio-economic position, comorbidity, index procedure, hospital volume. OR = Odds ratio. ^a Quintile 1 = NZDep01 deciles 1 and 2 (least deprived), quintile 2 = NZDep01 deciles 3 and 4, quintile 3 = NZDep01 deciles 5 and 6, quintile 4 = NZDep01 deciles 7 and 8, quintile 5 = NZDep01 deciles 9 and 10 (most deprived). ^b IH = Inguinal hernia repair, APP = Appendicectomy, CABG = Coronary Artery Bypass Graft, CH = Cholecystectomy, KA = Knee arthroplasty, HA = Hip arthroplasty, BPH = Procedures for Benign Prostatic Hypertrophy, CAT = Removal of cataracts, HYST= Hysterectomy.

^c Hospital volume stratum 1 = Proportion experiencing index admission in facilities performing on average >1500 of the selected surgical procedures per year over the study period; stratum 2 = Proportion experiencing index admission in facilities performing on average 500 - 1500 of the selected surgical procedures per year over the study period; stratum 3 = Proportion experiencing index admission in facilities performing on average < 500 of the selected surgical procedures per year over the study period.

Unplanned readmission/death was more likely in older age groups, women, those with higher comorbidity scores, lower socio-economic position, and those attending higher volume hospitals. There was significant variation in the odds ratio of unplanned readmission/death according to index procedure; ranging from 0.48 (95% CI 0.40 – 0.59) for the removal of cataracts to 1.75 (95% CI 1.56 – 1.96) for those experiencing coronary artery bypass grafting when compared to that of the reference group (appendicectomy).

The age-sex-adjusted analysis shows 19% higher odds of unplanned readmission/death for Māori compared to NZ Europeans (odds ratio 1.19, 95% CI 1.12 – 1.27). The association weakened as clinical and hospital variables were added (indicating confounding from these factors), producing a final odds ratio of unplanned readmission/death for Māori of 1.16 (1.08-1.24). The inclusion of length of stay into this model reduced the odds ratio of unplanned readmission/death of the principal finding to 1.13 (95% CI 1.05 – 1.21); however for the reasons discussed above, this term was not included in the final model.

DISCUSSION

This study has some key strengths, including its replicability and the high degree of precision in its findings. We considered several sources of bias that may operate when using readmission to assess healthcare quality. In particular, the validity of the readmission indicator was enhanced through its definition. Readmission was limited to a 30-day period post-discharge and restricted to unplanned acute admissions. This reduced the impact of ‘false positive’ readmissions – that is, unavoidable events unrelated to the quality of care, so improving the specificity of the indicator as a proxy of quality.¹⁰ Case-mix also affects the validity of this marker (with readmissions occurring after surgery having a greater specificity for quality than those occurring after medical admissions^{10, 11}) and so, like some other researchers,¹⁹⁻²¹ eligibility was restricted to patients experiencing one of a defined set of surgical procedures only. It is not known how the estimates may have differed had medical or other surgical patients been included. However, the conditions and clinical teams implicated in the study sample were varied - including gynaecology, urology, orthopaedic, general surgery,

ophthalmology, and cardiology specialities. Given this diversity and the large national sample, the processes contributing to the comparatively higher risk for NZ Māori are unlikely to be specific to this cohort of patients. That is, the same factors that contribute to this increase in readmission/death are likely to also affect other inpatients, irrespective of their pathology. As recommended²², death is included in the numerator of the rate and readmissions were not restricted to the same hospital as the index admission. Sources of selection and information bias were additionally minimized with exclusion criteria, the use of full population data, and by limiting the number of readmissions per person to one per 30-day period.

The primary limitation of this study reflects the use of unplanned readmission/death to approximate inpatient quality of care. Although the eligibility criteria and definition of readmission aim to increase the specificity and sensitivity of readmission as a proxy for quality, the indicator is still likely to mismeasure this construct. That is, there will be factors unrelated to quality that also contribute the ethnicity-readmission association. For example, Māori patients may have less social support (although there is no evidence to suggest this) and hospital readmission practices may rightly consider the availability of social support when deciding to readmit. Similarly, there may be residual confounding by disease severity or case complexity. This study considered the impact of this factor through its minimum length of stay criterion (excluding uncomplicated day-stay patients who may have an inherently lower risk of readmission), and the adjustment of 'upstream' factors associated with case severity (age, comorbidity and case-mix). Nonetheless, it is possible that clinical severity may contribute to the increased odds of this outcome for Māori.

The NZDep, while technically an ecological variable based on a small area unit, is an appropriate indicator to use when considering factors that may influence the quality of health services. First, the NZDep is a composite index based on ten individual-level census variables (e.g. income, housing tenure), 'averaged' out over about 100 people living in the smallest census unit. Given its calculation over such a small grouping of people, it is likely to be a good proxy for individual-level deprivation. Further, when you consider the potential for misclassification in traditional measures of socioeconomic position (e.g. income based on self-recalled gross income), there is much to commend NZDep to reflect socioeconomic position if only one measure can be used. (Ideally, one would adjust for NZDep and multiple individual-level indicators to fully capture the complex and multidimensional construct of socioeconomic position, but data availability precludes this.) Second, there is some merit in having an area-based measure as the sole measure of socioeconomic position, given that access to and quality

of health services is likely to have contextual determinants as well as individual-level ones. That all said, had we been able to adjust for multiple measures of socioeconomic position, the association of ethnicity with readmission may have weakened further. But given that adjusting for NZDep reduced the odds ratio by only 0.03, it is unlikely that further adjustment for other measures of socioeconomic position would have taken the estimate to the null.

It is difficult to quantify the impact of residual confounding in our analyses. However, on balance, we consider that the increased risk of unplanned readmission/death for Māori compared to NZ Europeans is unlikely to be completely the result of bias. Firstly, this finding is consistent with research suggesting ethnic disparities in NZ hospital care, studies that employ a variety of quality indicators in diverse clinical populations.^{2, 3} Secondly, the covariates had a minimal impact on the calculated estimate - the odds of unplanned readmission/death altered from only 1.19 to 1.16 between Model 1 and 2 despite the inclusion of four additional variables. Although other factors may have a role in altering the ethnicity-readmission association independently of quality, it is unlikely that the collective impact of these variables could be responsible for the disparity in readmission.

The extent to which the ethnicity-readmission association observed in this study represents a causal and underlying ethnicity-quality of care association is difficult to determine. Quality of care is problematic to measure directly – hence the need for indicators of this construct – yet, readmission as a proxy is also determined by factors other than quality. However, reflecting on the findings of this study and that of other research, it seems highly probable that the NZ Māori patients in this study experienced a poorer quality of hospital care compared to NZ Europeans, and that this is in part responsible for the increased odds of unplanned readmission/death among Māori. The findings of this research are also consistent with studies from the U.S.,²³ Canada,²⁴ and Australia.²⁵ One issue that may be common to health systems internationally is the familiarity of a patient with the language, bureaucracy, services, and setting of the health care institution - achieving quality health care may be easier for patients who share the cultural paradigm within which services are organized and delivered. Countries with a history of colonization or bureaucratic dominance by one ethnic group - such as the U.S., Canada, NZ and Australia - may have developed health services that primarily reflect the cultural context of the majority White population. That is, hospitals may deliver disparate care to members of minority ethnic and racial groups in part because the diagnoses, treatment modalities, care settings, and staff are more responsive to the lifestyles and health philosophies of the majority population.

Equity is a key dimension of health care quality, with the monitoring and comparison of quality indicators by ethnicity important to promote equitable health services. Disparities in care are unethical, and potentially uneconomic. The occurrence of ethnic disparities in hospital care in unrelated populations and dissimilar health systems across the globe indicates there may be cross-contextual factors, independent of health system organization and funding arrangements, that make disparate care on the basis of ethnicity more likely.

CONCLUSION

This study used a commonly used indicator of quality, and sought to minimize the impact of random and systematic error in its design and analyses. A 16% increase in the likelihood of unplanned readmission/death for NZ Māori compared to NZ Europeans is a substantial increase in risk for this group. While there may be error associated with the use of readmission to measure quality of care, the results suggest that the NZ Māori in this study received a lower standard of hospital care.

The measurement of quality is a challenging empirical task, and there is an urgent need for better indicators of healthcare quality to use in research and monitoring. There is also an indication for research exploring how to best assess ethnic health care disparities while minimizing measurement error of quality of care. The investigation of factors that may contribute to ethnic disparities in care across international settings would also help our understanding of this issue.

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Improvement in the accuracy of hospital ethnicity data

Improving the quality of ethnicity data within health and disability organizations is an issue of both international and national concern. Ethnicity information aids in the planning and evaluation of services, the monitoring of health status and disparities, and is used in the funding models for some Primary Health Organisations (PHOs). Improving the accuracy and completeness of ethnicity data is of particular importance to NZ Māori, who have been systematically undercounted in numerous health datasets over the past decades,^{1,2} and providing accurate ethnicity data is an ethical and legal obligation under the Treaty of Waitangi.

Recent studies have described inaccuracies in the recording of ethnicity information in primary care. Riddell et al³ assessed the quality of ethnicity data in primary care medical records, with the comparison of self-identified ethnic group obtained through questionnaire with administrative records in 665 members of a large Auckland Primary Health Organisation. They described concordance between the PHO records and the survey answer for only 64.9% of Māori, compared with 90.9% of NZ Europeans.

In 2003 Swan et al⁴ compared the self-identified ethnicity of 3,500 Waikato patients with diabetes (obtained via survey) with their hospital-recorded ethnic group. There was concordance between the two sources for 99.3% of non-Māori patients, but only 71.2% of Māori participants had their ethnic groups accurately documented.

We assessed the accuracy of ethnicity recorded in routine hospitalisation data identified through the National Minimum Data Set (NMDS) by comparing them with data collected by patient survey. We identified 2541 NZ Māori and NZ European patients discharged from Christchurch, Waikato, and Wellington hospitals between November 2008 and August 2009 using NMDS data. These data includes the primary ethnicity of the healthcare user (the most highly prioritised of up to three ethnic groups) as recorded by the facility. Over 2009, the study population was sent a standardised questionnaire, including the ethnicity question employed in the 2001 NZ Census, as per current recommendations regarding ethnicity data collection.^{5,6}

Of the 1105 eligible subjects (47.2% Māori and 52.8% NZ European) who returned this questionnaire with completed ethnicity information, there was concordance between the NMDS and self-identified ethnic group in 95.7% of patients. When the data are analysed according to ethnic group, the rates of misclassification for Māori and NZ European patients are approximately the same (4.0% and 4.3% respectively). Of the 26 people who were recorded as NZ European in the NMDS data but chose an alternative ethnicity in the survey, 20 self-identified as NZ Māori and 6 as another ethnic group in the questionnaire. The majority of 21 participants who were classified as NZ Māori in the NMDS but did not identify as such in the survey selected NZ European (n=17) as their primary ethnic group in the latter.

The low response rate to this survey limits the generalisability of this result to the wider hospital population. However, given the previous evidence of differential

inaccuracies in the recording of ethnicity in hospital datasets, it is encouraging that this discordance is both small, and approximately the same for both ethnic groups. It is also likely that some of the individuals who were Māori and misclassified as NZ European in the NMDS (and vice versa) represent people who identify with multiple ethnic groups, of which one is variously classified as their primary ethnicity. Research by Carter et al. demonstrated that 8% of their cohort of 17,625 adults changed their primary ethnic group over 3 years.⁷

Given the recent directives by the Ministry of Health (such as those noted in the Health Information Strategy for NZ 2005) to improve the quality of its information systems and to obtain accurate ethnicity data, it is probable that the findings of this research represent a true improvement in the quality of the hospital databases since that study, and that differential misclassification of ethnicity in hospital facilities may be a smaller problem than previously thought.

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Not in my hospital? Ethnic disparities in quality of hospital care in New Zealand: a narrative review of the evidence

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Abstract

There are well-documented differences in health outcomes between Māori and New Zealand Europeans, some of which persist despite adjustment or control for socioeconomic status and demographic variables. Lalonde defined the health system as being a determinant of health: is it possible that the services that are designed to improve health and well-being may be contributing to the ethnic health disparities in New Zealand?

This narrative review studied the evidence for disparities in the quality of public hospital care for Māori and non-Māori in New Zealand. Medline and Embase databases were employed to identify studies assessing quality of care within the New Zealand hospital setting, with the analysis of ethnic groups. The studies obtained from the search were few and varied, using an array of indicators and assessing multiple discrete clinical conditions. Investigators also exhibited differing levels of commitment to the consideration of potential confounding factors. However, there is robust evidence for the existence of healthcare disparities for Maori, in particular related to obstetric intervention and the incidence of potentially avoidable adverse events.

At the 2006 Census, 67.6% of the New Zealand population self-identified as a member of the New Zealand European ethnic group, the second largest ethnicity being NZ Māori (14.6%, total Māori ethnic group).¹ However as of 2000–2002, NZ Māori men could expect to live on average 8 years less than a non-Māori male.²

At all levels of deprivation, NZ Māori experience greater rates of mortality than non-Māori, and a greater reduction in life expectancy.^{3,4} Socioeconomic variables contribute to these health outcomes inequalities, but are only one consideration when investigating health differences between ethnic groups. Inequalities are noted to persist after epidemiological control for these variables; this phenomenon has been termed the 'outcome gap'.⁵

Why does this gap occur? Lalonde developed the Health Field Concept to describe the broad and varied determinants of health.⁶ Health status was conceptualised as the result of a complex interplay between the biological characteristics of the individual, lifestyle factors, the wider environment (including socioeconomic factors), and the structure and actions of the health system.

It is possible that the health disparities between NZ Māori and NZ Europeans may be contributed to by health services, including the actions of those who work within it.⁷ There is substantial evidence regarding health care disparities in other countries, and despite differences in cultural and historical context, it is useful it is useful to look at the findings of this international research.

The United States (US) has multiple minority populations, totalling more than 100 million. There is a multitude of published studies documenting ‘racial’ disparities in the quality of care in the US, including several systematic reviews. The largest of the meta-analyses is *Unequal Treatment*, a document produced by the Institute of Medicine at the behest of US Congress, encompassing the review of more than 600 articles. The Institute focussed on studies in which factors that impacted on the patients’ financial ability to access treatment were controlled, potential confounding variables were considered, and were those that compared the appropriateness of services against established clinical guidelines.

The Institute concluded in its report that health disparities according to race were ‘remarkably consistent across a range of illness and health care services’ (p5). Although the investigators found evidence for ethnic disparities in the receipt of quality care for numerous conditions, the most significant evidence was demonstrated in cardiovascular and cancer care, and in the care of patients with human immunodeficiency virus.⁸

The evidence for disparities in the quality of care in the US is so firmly established that the *National HealthCare Disparity* report is produced annually to provide information regarding the progress of the health system in providing equitable care to minorities.

There is a large amount of information available regarding differences in health care use for NZ Māori as compared to non-Māori; for example, NZ Māori have lower rates of access to some elective surgical procedures, including angioplasty and major joint replacements.⁹ However, do these differences represent health care disparities?

Rathore and Krumholz propose five formal criteria against which to assess racial differences, in order to ascertain if they may be classified as ‘disparities’:¹⁰

- Eligibility of patients for intervention.
- Accounting of potential contraindications to intervention (e.g. comorbidities).
- Consideration of patient preferences.
- Robust risk adjustment of patient factors, including demographic, clinical, and social variables.
- Association with poorer patient outcomes.

They summarise these concepts in their definition of disparity, stating that ‘a disparity in health care use may be considered a difference in *appropriate* treatment use that is associated with *poorer* clinical outcomes and is not attributable to *patient factors*’ (p636). This statement clearly relates health care inequality with health outcomes, and emphasises the need to control for possible confounding and mediating factors. While their criteria must be considered with caution (is differential treatment for those of differing socioeconomic position acceptable?), the definition provides a useful framework against which evidence may be assessed.

Considering the information above, it is theoretically possible that NZ Māori actually receive the appropriate level of elective surgical input, and non-Māori may over-use these services. Therefore, the differences in care use represent disparities only if it can be demonstrated that the level of care is inappropriate to the level of need, and that

health and well-being suffer as a consequence. Similarly, rates of use do not consider the impact of patient factors; such as patient preference, severity of illness, or impact of comorbidities on eligibility criteria.

This study aimed to review the evidence for disparities in the quality of care received by NZ Māori within New Zealand. It is focussed on the quality of care received at public hospitals, which is provided at no financial charge to all New Zealand residents.

Methods

A literature review was conducted of Ovid databases Medline (1950–2008 week 32) and Embase (1947–2008 week 32) using the following search terms: ethnic\$ or ethnicity, race\$ or racial\$, quality of health care/, Māori, New Zealand, health status disparities/, minority groups/, cross-cultural comparisons/.

This initial combination yielded only 49 studies. Subsequently, the search was expanded to the combination of two separate searches involving only two search terms each, quality of health care/ or ethnic differences/ in combination with (New Zealand or Māori). New Zealand researchers were also contacted to obtain unpublished 'grey literature' pertaining to this topic. After applying limits regarding English language, human, and availability of abstract, this strategy revealed 266 distinct publications. Studies were reviewed if they involved the assessment of the quality of inpatient care, were set within the publicly-funded hospital environment, and involved comparative analysis according to ethnicity.

The methodology of each study was assessed; reviewing its design, data sources, study and comparison population, choice of indicators, and consideration of potential confounders and sources of bias. Two criteria were applied to ascertain whether findings from each study were indicative of a healthcare 'difference' or a 'disparity'. These criteria were borrowed from the definition advanced by Rathore and Krumholz,¹⁰ as detailed above. That is, were the findings of the studies examined that demonstrated healthcare quality differences:

- Associated with poorer outcomes?
- Persistent after consideration for patient variables?

Results

Studies that employed quality indicators that were specific to inpatient care were few; totalling 11 only. These documents were varied, both in the indicators employed, and in the clinical conditions examined. Accordingly, it was not possible to conduct a formal systematic review, in which the studies' findings could be collated and quantitatively synthesised. A narrative approach was considered to be more appropriate, being able to encompass the diversity of the investigations and provide qualitative conclusions.

The 11 studies varied in quality, some considering the impact of multiple confounding factors, as well as potential statistical bias from undercounting of Māori; others performing few methodological or statistical adjustments for these factors.

The details of the investigations are noted in Table 1; and described further below, grouped according to clinical condition:

Table 1. Articles reviewed regarding the quality of inpatient hospital care for Maori in New Zealand

Quality of care indicators	Data source and sampling methodology	Māori participants and reference group	Control/adjustment for other variables	Findings	Notes
Process of care indicator for obstetric care: Rates of caesarean section, instrumental delivery.	Review of Antenatal and delivery suite clinical records. Prospective cohort. Sampling unknown. Blinding unknown.	1181 Māori and 1242 European women.	Nil	Lesser proportion of Māori women undergo CS (6.8% compared with 11.9%, p=0.0004), instrumental delivery (4.1% compared to 13.3%, p not given). Less proportion of Māori undergo epidural analgesia (13.2% compared to 31.8%, p=0.001) (note: sample size for this analysis limited to 1 month cohort).	Middlemore Hospital, 1992/1993. ¹⁸
Process of care indicator for obstetric care: Rates of caesarean section	Perinatal Information Management System database, Capital and Coast DHB. Retrospective study.	59 Māori and 557 non-Māori non-Pacific women.	Sample limited to nulliparous women gestation ≥36 weeks.	No 'statistically significant difference' in rates of CS.	Wellington Hospital, 2001. ¹⁹
Process of care indicators for obstetric care: Induction of labour, prelabour caesarean section, post-labour caesarean section, operative vaginal delivery.	Obstetric database of National Women's Hospital, Auckland. Retrospective study.	4361 Māori and 30,809 non-Māori non-Pacific women.	Adjustment performed for age, parity, small for gestational age, antepartum haemorrhage, gestation and birthweight at delivery, maternal diabetes, maternal hypertensive disease, transfer of care gestation at booking, booking caregiver. Sample limited to women with singleton deliveries, cephalic presentation, no previous CS.	Māori women less likely to undergo: Induction of labour (OR 0.85, 95% CI 0.78–0.93), Prelabour CS (OR 0.57, 95% CI 0.43–0.75), Operative vaginal delivery (OR 0.71, 95% CI 0.63–0.81). No significant difference in post-labour CS rate (OR 0.93, 95% CI 0.82–1.06).	National Women's Hospital, 1992–1997. ²⁰

Quality of care indicators	Data source and sampling methodology	Māori participants and reference group	Control/adjustment for other variables	Findings	Notes
<p>Process of care indicator for obstetric care:</p> <p>Rates of caesarean section</p>	<p>New Zealand Health Information Service.</p> <p>Retrospective study.</p>	<p>51,106 Māori and 192,401 non-Māori delivering at public and private hospitals.</p>	<p>‘Ever Māori’ classification to minimise undercounting of Māori.</p> <p>Modelling included consideration of age, DHB, parity, fetal presentation, deprivation (using NZDep96 deciles), gestation at delivery, multiple births, maternal hypertension, maternal diabetes, antepartum haemorrhage.</p>	<p>All non-Māori more likely to undergo:</p> <p>Acute CS (OR 1.38, 95% CI 1.33–1.43),</p> <p>Elective CS (OR 1.44, 95% CI 1.36–1.52),</p> <p>Any CS (OR 1.43, 95% CI 1.39–1.48) than Māori (age and deprivation adjusted).</p> <p>Nulliparous non-Māori (no previous CS) more likely than to undergo:</p> <p>Acute CS (OR 1.13, 95% CI 1.06–1.19),</p> <p>Elective CS (OR 1.36, 95% CI 1.18–1.56),</p> <p>Any CS (OR 1.16, 95% CI 1.10–1.23) (model includes adjustment for age, deprivation, clinical factors and DHB).</p>	<p>New Zealand public and private hospitals, 1997–2001.²¹</p>
<p>Preventable adverse events</p>	<p>Review of hospital clinical records.</p> <p>Stratified cluster sampling across thirteen hospitals.</p> <p>Retrospective study.</p>	<p>1013 Māori and 5326 non-Māori non-Pacific inpatients.</p>	<p>Consideration of age, deprivation (using NZDep96 deciles), admission type (acute status), length of stay, hospitals, sex.</p>	<p>Māori had a greater risk of an in-hospital preventable adverse event (OR 1.47, p 0.05).</p>	<p>New Zealand public hospitals, 1998.²³</p>

Quality of care indicators	Data source and sampling methodology	Māori participants and reference group	Control/adjustment for other variables	Findings	Notes
<p>Process of care indicator for cardiac care:</p> <p>Rate of CABG and PTCA</p>	<p>National Minimum Data Set, New Zealand Health Information Service.</p> <p>Retrospective study.</p>	839 Māori and 26,167 non-Māori non-Pacific patients aged 40 years and over admitted for CABG and PTCA interventions.	Age-standardisation.	<p>Māori noted to have higher age-standardised mortality rates from coronary artery disease.</p> <p>Māori less likely to undergo a CABG (20.5 compared to 51.2 per 100,000) or PTCA (13.9 compared to 48.1 per 100,000).</p> <p>Significance testing not documented.</p>	New Zealand public and private hospitals, 1990–1999. ²⁵
<p>Process of care indicator for cardiac care:</p> <p>Rate of CABG and PTCA</p>	<p>National Minimum Data Set, New Zealand Health Information Service.</p> <p>Retrospective study.</p>	8456 Māori and 31,713 non-Māori admitted to public hospitals with a cardiac or heart failure DRG.	Consideration of age, sex, deprivation (using NZDep96 deciles).	<p>Māori had a greater risk of admission for heart failure ('four or more times higher'), yet were 'one third to a half' less likely to have undergone a CABG or transvascular percutaneous cardiac procedure.</p> <p>Significance testing not documented.</p>	New Zealand public hospitals, 1996–2000. ²⁴
<p>Process of care indicators for ESRD:</p> <p>Renal transplant waiting list.</p>	<p>Australia and New Zealand Dialysis and Transplant Registry.</p> <p>Retrospective study.</p>	935 Māori and 12,984 'non-aboriginal' (non-Māori non-Pacific non-Australian aboriginal non-Torres Strait Islander) patients with ESRD, first treated at a public hospital within study period.	Stratification and age/sex adjustment performed, however OR for Māori provided did not included adjusted ratios.	<p>Greater incidence of ESRD noted in Māori.</p> <p>Lesser proportion of Māori listed on renal transplant list (34% compared to 59%, $p < 0.0001$). Adjusted odds ratio after stratification and age/sex adjustment not given.</p> <p>Māori were more likely to receive poorer-matched grafts (OR 0.25, 95% CI 0.09–0.70). Adjusted odds ratio not given.</p>	New Zealand public hospitals, 1991–2000. ²⁶

Quality of care indicators	Data source and sampling methodology	Māori participants and reference group	Control/adjustment for other variables	Findings	Notes
Process of care indicators for ESRD: Confirmation of diagnosis	Australia and New Zealand Dialysis and Transplant Registry. Retrospective study.	421 Māori and 1787 non-Māori non-Pacific New Zealand patients with ESRD, first treated at a public hospital within study period.	Age and sex standardised.	Higher incidence and mortality rates noted in Māori. Māori with glomerulonephritis less likely to have histological confirmation of clinical condition (39% unidentified type compared with 22% non-Māori non-Pacific, rate not calculated due to small numbers).	1992–2001, national public hospitals. ²⁷
Surgical outcome: Post-tympanostomy tube insertion morbidity.	Data obtained from surgical notes. Prospective study. Sampling of consecutive admissions. Blinding unknown.	26 Māori, 54 'Caucasian' children.	Univariate analysis noted ethnicity associated with outcomes, in addition to age and clinical factors.	Māori had a greater risk of having a non-functioning tube postoperatively (p=0.04). However, ethnicity not noted as significant factor for presence of blocked tube postoperatively on logistic regression analysis.	South Auckland Health, 2001. ²⁸
Process of care indicators for mental health: Use of seclusion/restraint, psychotropic medication, use of Mental Health Act, referral for psychotherapy	Data obtained from review of clinical records. Sampling of 300 consecutive inpatient admissions. Retrospective study.	125 Māori and 175 non-Māori mental health inpatients.	Consideration of age, sex, diagnosis, number of readmissions, time of onset between illness episode and admission.	Māori less likely to be referred for psychotherapy (OR 0.1695, 95% CI 0.07–0.35), more likely to receive antipsychotic medication (OR 1.90, 95% CI 1.11–3.25), and at higher doses. No evidence of an association between ethnicity and readmission rates, use of seclusion or compulsory admission.	2000–2001, Rotorua Hospital. ²⁹

ESRD = End-Stage Renal Disease, CABG = Coronary Artery Bypass Graft, PTCA = Percutaneous Transluminal Coronary Angioplasty, DRG = Diagnosis related Group, DHB = District Health Board, CS = Caesarean Section, NZDep96 = New Zealand Deprivation Index 1996, CI = Confidence Interval, OR = Odds Ratio.

Obstetric intervention

Studies—Four of the 11 studies considered outcomes related to obstetric intervention. Ministry of Health documents note that Māori undergo lower rates of these procedures than non-Māori;^{11–15} yet it has been suggested that Māori may experience higher risk pregnancies than non-Māori.¹¹ Certainly, there is evidence of greater rates of maternal diabetes and smoking during pregnancy in Māori,^{16,17} both factors associated with a higher risk of clinical intervention.

Johnson et al noted lower rates of caesarean section (CS) and instrumental delivery in their cohort of Māori women at Middlemore Hospital, yet these findings did not consider any potential confounding factors, including age and parity.¹⁸

Sangalli and Guidera limited their population to nulliparous women at term, and described no significant ethnic difference in the rate of CS in their small sample (59 Māori women only) at Wellington Hospital, although also performed minimal adjustment for other variables.¹⁹

Sadler et al used information from a National Women's Hospital (NHW) database, 1992–1997. The study population was limited to women without previous CS, who delivered a singleton following cephalic presentation at NWH during the study period.²⁰ Factors included in the modelling were age, parity, obstetric risk factors, transfer of care, booking caregiver, and an indication of the chronicity of their antenatal care using gestation at booking.

After adjustment for these variables, the Māori women were significantly less likely to undergo induction of labour, pre-labour CS, and operative vaginal delivery. The researchers note that the lower rates of epidural analgesia may contribute to the lower rate of operative vaginal delivery in Māori women (this factor was not included in the multivariate analysis). However, the differences in rates described—despite control for a significant number of possible variables—indicate that Māori in this sample may have received disparate treatment.

Harris et al reviewed CS rates nationally, and noted similar results. This team of researchers used the national hospital database to identify women delivering by CS at public and private hospitals 1997–2001.²¹ They used the 'Ever Māori' classification technique to minimise under-counting of Māori, and obtained data regarding fetal presentation, gestation at delivery, multiple births, maternal hypertension, diabetes, and antepartum haemorrhage.

These clinical factors were included in the modelling, as were deprivation (using NZDep96 deciles), age, DHB, and parity. Of nulliparous women without previous CS, non-Māori were more likely to undergo acute, elective, and any type of CS (all significant results). Similar significant odds ratios were demonstrated in women regardless of parity.

Ethnic variation in obstetric intervention: difference or disparity?—Obstetric and perinatal outcomes are known to be poorer for Māori women and their babies compared to NZ European patients.²² The studies by Sadler et al. and Harris et al. provide evidence of ethnic health care disparities. Although the differences in interventions are not directly linked to these health outcomes (and it is possible that CS is 'over-employed' in non-Māori women), their analyses consider the rate of

services delivered in comparison to clinical need. The two research teams also considered the impact of a large number of demographic and clinical variables in the sampling strategies and statistical techniques employed.

Preventable adverse events

Study—Davis et al conducted a cross-sectional examination of the records of a stratified sample (according to location and hospital type) of 6579 hospital patients across thirteen hospitals throughout New Zealand.²³ Records of all patients admitted in the year 1998 were examined, excluding psychiatric, rehabilitation-only, and day case admissions. Trained nurses examined the clinical notes initially, to identify the occurrence of Adverse Events (AE), defined as the ‘unintended injury that resulted in disability, with any evidence of causation by health-care management rather than the underlying disease’ (p1921).

Records in which an AE occurred were then subsequently examined by medical practitioners, in order to confirm the AE and form a judgment regarding its preventability; that is, to identify if there was evidence of failure to follow accepted practice at a system or individual level.

After controlling or adjusting for age, deprivation, admission type, length-of-stay, and sex, the researchers noted that the incidence of in-hospital preventable AE for Māori was nearly 50% greater than in the non-Māori non-Pacific sample (adjusted odds ratio 1.47).

This study used the ‘gold-standard’ of chart review to ascertain the quality of care; however patients may still receive poor quality of care that does not result in an AE. This lack of sensitivity is common to many quality indicators, and requires consideration when interpreting results. The study did not account for misclassification of Māori, however numerator-denominator bias is unlikely to have a significant impact given the comparisons were made internally within the cohort. However, this study did not consider the impact of clinical factors such as severity of illness, clinical condition, and comorbidities on the occurrence of AE; control of these variables may assist in assessing the distinction between an ethnic healthcare ‘difference’ and ‘disparity’ in this context.

Ethnic variation in preventable adverse events: difference or disparity?—The indicator used in this study is in itself adverse health outcome, fulfilling one aspect of the definition by Rathore and Krumholz. Although some patient variables were considered in the statistical analyses, adjustment for clinical factors may assist in further clarifying the association between ethnicity and incidence of preventable adverse events. However, even without such information, this study provided some evidence for ethnic disparity in the incidence of this indicator within the hospital setting.

Rate of cardiac interventions

Studies—Two studies assessed the comparative rates of coronary artery bypass graft (CABG) and percutaneous transluminal cardiac angioplasty (PTCA) interventions at hospitals in New Zealand, both employing the National Minimum Data Set.

Westbrooke et al compared the hospitalisation rates for Māori with their rates of intervention 1996–2000), and noted a discrepancy between apparent clinical need (demonstrated by excess hospitalisation) and their access to these interventions.²⁴

The researchers adjusted or controlled for age, sex, and deprivation, but did not include clinical variables such as comorbid conditions. The results of statistical analyses were not quoted in this paper; as such it is not possible to draw conclusions regarding the statistical significance of the findings. However, it is probable that given the large sample size (more than 40,000), it is unlikely that differences of the magnitudes quoted would be due to chance.

Tukuitonga et al similarly reviewed the rates of these cardiac interventions performed at public and private hospitals 1990–1999.²⁵ They noted that age-adjusted intervention rates for CABG and PTCA for Māori men and women were considerably lower than those for non-Māori.

The study compared these rates with that of age-standardised mortality rates for coronary artery disease, and graphically demonstrated the difference in the perceived clinical need of Māori compared to their receipt of these interventions. Although the analyses did not control for other demographic or clinical factors, the differences between the two groups were so large that it is unlikely that consideration for these variables would have significantly altered the observed association with ethnicity. This study provides an indication of possible inequities in the delivery of these interventions, although it is possible that other factors may play a role in the apparent inverse care of Māori in this respect.

Ethnic variation in cardiac intervention: difference or disparity?—These studies attempted to link health outcomes with utilisation of services by comparing clinical need (using hospitalisation and mortality rates) with access to intervention. After applying the criteria of Rathore and Krumholz, the findings of the studies are indicative (but not conclusive) of ethnic health care disparities in the rates of cardiac interventions.

Treatment for end-stage renal disease

Studies—Two studies used information from the Australia and New Zealand Dialysis and Transplant Registry, assessing the records of patients first treated for End-Stage Renal Disease (ESRD) at a public hospital in Australia and New Zealand, to examine processes of care for these patients.

McDonald and Russ assessed the records of those treated during 1991–2000, noting the difference in the incidence of ESRD between Māori and the non-indigenous population (New Zealand non-Māori non-Pacific and Australian non-Aboriginal or Torres Strait Islander).²⁶

The authors noted that Māori were statistically significantly less likely to be listed on the renal transplant waiting list than the non-indigenous group, a difference that persisted after stratification for age and sex although the adjusted ratios were not detailed. Indigenous people were also less likely to receive a graft once accepted for transplantation, although the OR calculated (0.35, 95% CI 0.29–0.43) also included Pacific Islanders, Torres Strait Islanders, and Australian Aboriginals.

It is possible that genetic factors may play a role in the receipt of transplants, as they also provided evidence of ‘poorer matched’ grafts for the indigenous population. That is, sheer numerical factors make it harder to find a donor for minority group patients. Factors such as socioeconomic status, clinical severity and condition, and geographical location were not included in the analysis.

Stewart et al selected 421 Māori patients and 1787 non-Māori non-Pacific New Zealanders from the same register, noting a higher incidence and mortality from the disease in the Māori group.²⁷ While the authors noted that Māori with glomerulonephritis were less likely to have undergone histological examination of their kidneys, the differences in the proportions noted were not subject to statistical testing, nor controlled for factors other than age and sex.

However, the differences described are reminiscent of the findings of Robson et al, who noted that Māori with cancer were less likely to have staging information recorded on registration documents than non-Māori. It is possible that these process indicators reflect disparities in the care for Māori within hospitals.

Ethnic variation in the processes of care for patients with ESRD: Difference or disparity?—It is possible that the differences in these process indicators reflect disparities in the care for Māori within hospitals. However, the indicators used are not linked to health outcomes (although they were compared with incidence of ESRD), and there was limited control or consideration of other variables in the two studies. As such, these investigations describe ethnic health care differences, but do not provide conclusive evidence of disparities in the quality of care for Māori.

Outcomes post-tympanostomy tube insertion

Study—Allen et al reviewed postoperative morbidity for Māori and non-Māori children who underwent tympanostomy tube insertion over three months in 2001.²⁸ Although they noted that Māori were at greater risk of having a non-functioning tube post-operatively, ethnicity was not assessed as an independent variable with other factors of influence controlled.

Ethnic variation in quality of tympanostomy tube insertion: difference or disparity?—This study demonstrates the use of surgical health outcomes as indicators of the quality of care. However it is possible that the small sample sizes involved (26 Māori, 54 Caucasian), and the impact of unaccounted for clinical factors (such as ear condition at time of surgery) and patient factors (such as compliance with medication postoperatively and socioeconomic status) limit the interpretation of the results of this investigation. As such, this study describes differences in outcomes following this procedure within the study sample, but cannot provide robust evidence of health care disparities for different ethnic groups.

Restrictive care practices

Study—Kumar et al reviewed the care of 125 Māori and 175 non-Māori mental health patients admitted to Rotorua Hospital, 2000–2001.²⁹ After adjustment for age, sex, diagnosis, number of readmissions, and time of onset between illness episode and admission, the researchers calculated odds ratios for restrictive care practices. These were defined as including the use of legislation for involuntary admissions,

readmission rates, the use of restraint and seclusion, and administration of higher doses of medication.

They noted that ethnicity was not associated with the first three practices, but discovered that Māori patients were less likely to be referred for psychotherapy, more likely to receive anti-psychotic medication, and at higher doses. Given that diagnosis was controlled for in the analysis, the authors concluded that Māori were more likely to receive anti-psychotics for 'non-psychotic diagnoses', and that they did not experience the same quality of care as non-Māori with regards to access to psychotherapy.

Ethnic variation in processes of care for patients with mental illness: difference or disparity?—The process of care indicators employed in this study are not directly linked to health outcomes, however it is logical that reduced access to psychotherapy may represent poor quality of care. However, the administration of anti-psychotics is less intuitive. While it is possible that Māori are being over-medicated, it is also possible that Māori are being appropriately treated and that non-Māori are being under-treated for mental illness in this hospital.

It would be helpful to be able to compare treatment regimes with agreed clinical guidelines or discrete health outcomes. Without this information, this study provides descriptive evidence of differences in the management of some mental health patients; however it is unknown whether these differences are disparities, and whether they represent poorer quality of care for one ethnic group.

Other

The review revealed several pieces of research that investigated the quality of care using measures that reflected several facets of the health system. Indicators such as avoidable or disease-specific mortality reflect the performance of all sectors of the health system, including public health, primary, secondary and tertiary care. The measures reflect the effectiveness and coordination of care provided over prolonged periods of time, and by multiple organisations and individuals. As such, it is not possible to directly extrapolate the results of studies using these indicators to the discrete performance of public hospitals.

However, the consistency of findings by multiple researchers in the detection of healthcare disparities using these broad indicators warrants mention. For example, studies using the following indicators have universally demonstrated disparities for Māori: disease-specific mortality,³⁰⁻³³ avoidable hospitalisation,^{34,35} avoidable or amenable mortality,^{7,36,37} involuntary psychiatric admission,³⁸ and perception of unfair treatment by a health professional.³⁹

The evidence for disparities in cancer outcomes and processes of care is particularly significant.^{40,41} Although not assessed directly in this study, it is important to note the differences in health services received by Māori with cancer, despite statistical control for stage at diagnosis, comorbidities, and socioeconomic variables.⁴²

Discussion

The intention of this review was to assess literature evidence for disparities in the quality of inpatient hospital care received by Māori. This study has its limitations,

primarily in the few available studies and the probability of publication bias. The articles discussed in this paper are varied, in most cases focussing on discrete clinical conditions, and together they employ a variety of quality indicators. As such, it is not possible to sum up their findings into one succinct conclusion. However, it is worth noting the following points:

- The quantity of evidence in this area is minimal in comparison to the exhaustive number of New Zealand studies describing disparities in health outcomes for Māori.
- It was not always possible to adequately assess if health care ‘differences’ were in fact ‘disparities’. Some research teams performed admirable statistical manipulation (such as Sadler et al. and Harris et al.), but in other studies it was difficult to interpret the findings without knowing the impact of other variables. However, as Mayberry et al. state ‘the methodological inadequacy of an individual study may be a relatively moot point in the context of the body of literature that gives consistent findings, and in which one study, often the more recent study, may overcome the specific failing of a previous investigation’.^{43 p116}
- Despite the limitations of this review, and the points made above, the findings are relatively consistent. Each study noted a difference in the quality of care for Māori compared with non-Māori. In the majority of these investigations, Māori received the poorer treatment according to current standards or clinical need. The evidence for disparities in obstetric intervention is particularly consistent and of high quality.

There is little information regarding the causes of potential ethnic healthcare disparities in New Zealand, although Harris et al. note that NZ Māori are more likely to perceive discrimination by health professionals than non-Māori.³⁹ It is likely that multiple factors contribute to healthcare disparities: The Institute of Medicine considers that the actions of the health system, the patients, and the providers themselves all have a role.⁸

New Zealand researchers are fortunate to have access to a national hospital database, which contains a vast amount of variables that can be combined in quantitative analyses. Although the quality of ethnicity information within hospital systems may be improvable, attempts at assessing the impact of healthcare disparities on the health outcomes for Māori should still be made. There may also be a role for the development and validation of Māori-specific quality indicators, as suggested by previous researchers.^{44, 45}

In conclusion, there is some evidence for disparities in the quality of in-hospital care for Māori in New Zealand. As health professionals, it is important to take ownership of this evidence, and use it as a possible area for intervention, to work towards improving health outcomes for Māori.

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The validity of readmission rate as a marker of the quality of hospital care, and a recommendation for its definition

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Abstract

Aim To perform a review of relevant literature regarding the use of readmission rate as a marker of the quality of hospital care, summarise its validity, and recommend a definition for its use.

Methods Literature search was performed on the Embase and Medline databases, with relevant articles extracted and reviewed.

Conclusions Readmission rate as a marker of the quality of hospital care has been used both internationally and nationally, although its validity has only been partially substantiated. While prone to confounding, it remains a valuable indicator due to its ease of collection and its ability to be able to be combined with other variables. Although the definition of readmission rate varies in the literature, it may be defined as 'the number of patients who experienced unintended, acute readmission or death within 30-days of discharge from the index admission, divided by the total number of patients discharged alive within the reference period'.

The need for quality assessment and improvement in the health care system has gained increasing significance both internationally and in New Zealand.¹ Numerous criteria exist for evaluating quality in hospital services, using various indicators, including readmission rate. This rate reflects the impact hospital care has had on the patient's condition up to the point of discharge, and also represents the efficiency of the service; inpatient hospital care being a primary source of expense in the health system, and repeated admission representing a potential source of wasted resources.²

Readmission rate is collected easily by hospital information systems, and can readily be combined with information from other databases to assess the potential impact of different variables, and control for confounders.³ However, there is no agreed definition of readmission rate in the literature, with researchers and states employing multiple time periods, and failing to acknowledge subjects who died following discharge.

Methods

A literature search was undertaken on the Medline (1966–2008) and Embase (1988–2006) databases. Search terms included: 'quality of health care', 'quality indicators, health care', 'patient readmission', 'readmission', 'rehospitalisation', 'readmit\$', 'new zealand'. Searches were limited to English language material and articles with abstracts available.

Discussion

Quality in health care—Quality in health care may be defined as 'the degree to which health services for individuals and populations increase the likelihood of

desired health outcomes and are consistent with current professional knowledge'.^{4p4} Campbell maintains that quality can be viewed as having two simple domains, suggesting that quality of care for an individual can be defined as 'whether individuals can *access* the health structures and processes of care which they need, and whether the care received is *effective*'.⁵

However, the emphasis placed on the quality of health care by the medical profession, the consumer, and the state, is relatively recent. Adverse events and incidents of 'quality failure' are now widely publicised. Consumers may have higher expectations of the health care they receive, and be less trusting of their provider to deliver error-free care. Health care providers need to account for resources and ensure value and efficiency of services. Funders also want to ensure that providers are meeting their expectations, and are performing adequately compared to others.

Readmission rate as an indicator of the quality of health care—Quality indicators are only one of the tools in the 'quality toolbox', but are indispensable in the assessment, monitoring, and improvement of the quality of patient care. Quality indicators explored in the literature include hospital multi-stay rate, length of inpatient stay, hospital mortality rates, and complication rates.^{6,7}

The Maryland Hospital Association's Quality Indicator Project use over 15 measurable, discrete performance indicators upon which value can be placed to describe quality.⁷ The wider international community has embraced the concept of quality monitoring; hospital accreditation programmes feature in over 36 countries using various indicators to ensure a minimum standard of quality.⁸

Readmission rate has been used as a quality indicator in various psychiatric, surgical and medical clinical specialties.⁹⁻¹¹ It is popular as a quality indicator amongst researchers and management, for the following reasons:

- Some early readmissions are avoidable. The proportion of preventable readmissions is widely variable in the literature, ranging from 5% to 50%, however it is agreed that the readmission rate includes a significant fraction of events of ill-health that could have possibly been avoided.¹²⁻¹⁶ Thus, the rate represents an opportunity for savings in both dollars and time, as well as the obvious benefit to the individual.¹¹ One early study discovered that 13% of the inpatients in the United States use more than half of all hospital resources through repeated admissions.¹⁴
- It is data that is routinely collected by most hospitals and can be compared within and between institutions. This makes it a relatively easy, fast, and inexpensive indicator to calculate.
- Ability to be part of multivariate analysis. The combination of readmission rate and ethnicity for example, may highlight groups that are represented disproportionately and allow the development of hypotheses. Readmission rate may be able to be analysed by residential address, presence of lifestyle risk factors, or place of work. There is significant potential for future research in this area.³
- It is an indicator that 'transcends the inpatient wall',^{17p68} and provides information about standards of care provided during the admission. It assumes

that provided the patient had appropriate care while admitted, was discharged in a stable condition, and had access to outpatient treatment and resources, readmission would not occur.^{9,18}

Validity of readmission rate as an indicator of the quality of hospital care—Are those who are readmitted more likely to have experienced lower quality care? And conversely, are those who receive substandard care more likely to be readmitted?

Ashton et al. performed a significant meta-analysis of 29 comparative studies, including both hospital chart and database analyses, and in each study, process-of-care elements were examined in relation to 31-day readmission rate. The authors classified the datasets according to these elements, denoting the quality of care received as being either ‘substandard’, ‘normative’ or ‘exceptional’, when compared to accepted clinical standards of care.

After review of 13 studies, an odds ratio of readmission of 1.24 (95%CI 0.99–1.57) was calculated for those patients who received substandard as opposed to normative care. Sixteen studies were assessed to calculate a summary odds ratio comparing care of relatively low quality (‘substandard’ and ‘normative’ classification) relative to care of higher quality (studies classified as ‘exceptional’) was 1.55 (1.25–1.92), representing an increased risk of early readmission of between 25%–92% for those who experienced lower or normative quality of care.

This article represents substantial evidence for the validity of this indicator, yet is limited by the relatively few studies used to develop the odds ratios. However, this reflects the criteria for inclusion defined by the authors, such that the studies assessed were ostensibly homogeneous and provided robust results.¹⁶

Further information can be gained from cohort studies and case-control studies. Weissman et al reviewed over 1700 admissions in a case-control study, assessing the rate of 31-day readmission for patients hospitalised with pneumonia and congestive heart failure in four states of the US-trained physicians reviewed clinical records and compared the care delivered to patients subjectively, and against explicit clinical criteria. They discovered there were ‘significant but relatively small, differences in initial quality of care between patients who subsequently experienced related adverse readmissions and those who were not readmitted’.^{19p500}, findings that were present after control for demographic and clinical variables, and hospital characteristics. Ashton also performed a case-control study of over 2000 patients who had diabetes, obstructive lung disease or heart failure, reviewing quality of inpatient care and 14-day readmission rate.

Chart review was used to ascertain quality of care, according to specified process-of-care criteria. After adjustment for demographic variables and clinical severity, they discovered a similar significant association between substandard care and subsequent unplanned readmission. This study was conducted within US Veterans Affairs Hospitals, and as such may not be able to be generalised to patients who experience financial restrictions in access to hospital care.²⁰

However, there are few studies that have examined the second question, the issue of ‘false negatives’ in the calculation of readmission rate. This proportion represents those that receive substandard care, but due to other factors (such as death, or recovery) are not readmitted. This data is very difficult to extract, as they do not enter

again into the hospital recording system, and it may be difficult to access information about the health of those in the community. Although many studies ignore the contribution of these false negatives to the validity of the readmission rate, it must be acknowledged that the validity of the rate has not been proven in this respect.²¹

There are other threats to the internal validity of this rate. Given that the rate is made up of a numerator (those that are readmitted to hospital within a given time period) and a denominator (total number of patients discharged alive within a reference period), intervening variables, confounders, demographic, and clinical factors may impact on both these figures.

Intervening variables can be defined as those that are ‘interposed in time in the causal sequence between the proposed independent and dependent variables’.^{18p1539} The most significant intervening variable for readmission rate is death in the community within the reference period, as a result of substandard care.

The impact of this variable is two-fold. Firstly, these patients are technically not eligible to be readmitted, so the overall denominator used to calculate readmission rate is artificially inflated by these absent subjects. Secondly, a patient that receives substandard care but dies in hospital or the community, or has a longer initial admission due to this quality breach, will not change the readmission rate despite substandard care.¹³

A confounding factor is defined as ‘a third variable that indirectly distorts the relationship between two other variables’.²² The literature discusses the following confounding factors with regards to readmission rate:

- **Disease progression:** Despite optimal care, deterioration of clinical condition will increase readmission rate. In some studies, disease progression is further investigated, and readmissions due to this factor coded as ‘unpreventable’ and excluded from analysis.²³
- **Post-discharge care:** The quality of community care acts as an ‘inverse confounder’, in that readmission may be prevented by exceptional community care and vice versa.²⁴ Discharge destination may also impact on the rate: for example, hospice patients are likely to be discharged ‘early’, and are unlikely to be readmitted.²⁴ Patients who reside in nursing homes may be less likely to be readmitted as health care is more accessible.^{18,25}
- **Readmission hospital:** Readmissions may occur at other hospitals and be missed from the numerator.¹⁸
- **Ability to pay:** Uninsured patients may be more likely to be discharged prematurely in health systems where there is a personal financial cost to hospital care. Similarly, different payment schemes, such as stay-based reimbursement systems may act as confounders by providing incentives to decrease length of stay but increase the number of admissions.¹⁸
- **Self-discharge:** Subjects who leave hospital against medical advice cannot be assumed to have completed the treatment protocol as designed by their health professionals, thus may leave the hospital in a lesser clinical state from that intended.¹⁸

- **Demographic variables:** Age, ethnicity, marital status, gender, and socioeconomic status may influence readmission rate. Whilst Ashton and Wray (1996) are not convinced these factors have been proven ‘confounders’, preferring to call them ‘moderator variables’, numerous studies have investigated the implication of individual patient variables such as age^{26; 27}, gender^{27; 28}, and even personality²⁹ on readmission rate.
- **Clinical variables:** These factors have a greater effect on readmission rate than their demographic counterparts. Different disease processes are associated with higher risks, with diagnoses such as heart failure and diabetes increasing the risk of readmission, and medical patients being more likely to be readmitted than surgical subjects.²⁸ Similarly, an increasing number of comorbidities and worsening severity of initial illness are associated with an increased risk of readmission.^{18,30} The recurrence of chronic medical conditions, and worsening functional status also act to increase readmission rate.^{15,27}

The external validity of a quality indicator refers to its generalisability; its ability to yield comparable results over time, and at homogeneous but differing institutions. The public acceptance of the validity of readmission rate is demonstrated by its broad use. Governments and private health purchasers such as US company Blue Cross Blue Shield use it as an indicator of quality.³¹ The New Zealand Ministry of Health has recently added readmission rate to its performance monitoring project.³² However, while these institutions may use the rate to detail trends over time and monitor progress, there is limited external validity due to the multiple definitions of readmission rate employed among institutions and researchers.

Definition of readmission rate

‘Readmission’: Chambers and Clarke define readmission as ‘the next subsequent admission of a patient as an immediate (that is, emergency or unplanned) admission ... within a defined interval of a previous (index) discharge taking place within a defined reference period’.^{33p301} Ashton and Wray (1996) recommend obtaining information on the frequency of death after discharge, and state that the preferable outcome variable is “death at home or readmission within n days”. If death is the worst possible result of poor quality care, then those subjects who die within the time period should be included as part of the readmission indicator. In practice, the number of these patients is small and may change the overall indicator by a negligible amount only. However, if they are not included in the analysis then the result may be biased and produce an indicator that is an under-estimate. Accordingly, it is advised that the indicator be revised to ‘readmission or deaths’ of subjects within the specified time period.

Population: The rate is calculated by dividing the numerator (‘readmissions’) by the ‘corresponding number of patients discharged (alive) within the reference period’.^{33p301}

Time period: Researchers in quality have employed various time periods over which readmission may occur, with intervals of between 2 weeks and 12 months used.³⁴ As mentioned above, this variation threatens the external validity of this indicator, and makes comparison between institutions and populations difficult.

This author recommends the use of a 30-day time period:

- A rapid review examining Medline studies in the last 10 years relating readmission rate as an indicator of quality noted that of 74 studies that defined the readmission rate in the abstract, 43% used a 1-month time period. The second most common period was 1 year or greater (19%), although these studies tended to be reviewing specific outcomes from treatment interventions.
- The 30-day or 1-month period has been used by the government bodies of Canada, Australia, the United Kingdom, and New Zealand, to assess the quality of their health services.^{22,35–37}
- Analyses of the timing of readmissions demonstrate an early peak within a few weeks of discharge, which tapers off over subsequent weeks and months. Tsai et al (2001) observed that 45.7% of readmissions occurred within 5 days of discharge.³⁸ Thus, the time period needs to be long enough to include all the information from this peak, but not so extensive that it includes data from admissions unrelated to the quality of the index stay.
- Heggstad states that a longer time frame is associated with the inclusion of higher numbers of ‘false positives’, or unrelated admissions.³⁴ Given the numerous factors that can impact on readmission rate, it is logical to choose a shorter time frame to minimise the influence of issues such as disease progression. Theoretically, if readmission rate is an indicator of quality of inpatient care, then the longer the time frame, the less meaningful the relationship between the two admissions. It is logical to formulate a definition that includes the data from the early peak of readmissions following discharge, but encompasses the minimum of readmissions that may be unrelated to quality issues. Some authors recommend using a 60-day interval to yield the highest possible capture of preventable readmissions, however, this must be balanced against an increasing false positive rate.^{34,39}

The general consensus of the literature seems to be that a one-month time period provides a logical balance.¹⁴ This assumption is supported by another common indicator used to address inpatient quality, 30-day mortality rate.

Conclusion

This literature appraisal was intended to provide background information on this indicator, as such this article does not offer the same quality of information as a systematic review. However, the review notes that ‘readmission rate’ has some demonstrated internal validity and is widely used in the measurement of the quality of hospital care. It is important to recognise the limitations of this measure, and minimise the influence of possible confounding variables by way of methodological and statistical techniques. Similarly, the adoption of a consistent definition of this rate by researchers will add to its external validity and improve its generalisability. This author recommends the use of the following definition: ‘the number of patients who experienced unintended, acute readmission or death within 30-days of discharge from the index admission, divided by the total number of patients discharged alive within the reference period’.

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