Risk Factors and Life Processes Associated with Teenage Pregnancy: Results of a

Prospective Study From Birth to 20 Years

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ABSTRACT

Data gathered over the course of a 20 year longitudinal study of 533 New Zealand women were used to: a) describe the extent and timing of pregnancies within the cohort up to age 20, and b) examine the extent to which the risk of an early pregnancy was related to a range of social background, family, individual, and peer relationship factors measured over the course of childhood and adolescence. Results showed that by age 20, nearly a quarter of the sample had been pregnant at least once, with the majority of first pregnancies occurring between the ages of 17 and 20 years. The profile of those at greatest risk of a teenage pregnancy (<20 years) was that of an early maturing girl with conduct problems who had been reared in a family environment characterized by parental instability, and maternal role models of young single motherhood. As young adolescents, these girls were characterised by high rates of sexual risk taking and deviant peer involvement. Exposure to social and individual adversity during both childhood and adolescence made independent contributions to an individual's risk of an early pregnancy. These findings were most consistent with a life course developmental model of the etiology of teenage pregnancy. Implications for teenage pregnancy prevention are discussed.

Keywords: teenage pregnancy, risk factors, longitudinal study, sexual behavior

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Prospective Study From Birth to 20 Years

Although teenage pregnancy is not a new phenomenon, issues relating to teenage pregnancy and parenthood have been a major focus of public and political concern in recent years. Much of this concern has been due to increasing levels of non-marital childbearing and welfare dependence amongst teenage mothers (Furstenberg, 1991; McElroy & Moore, 1997), in addition to the growing disparity between teenage mothers and their peers in terms of the developmental timing of parenting onset (Cheesbrough, Ingham, & Massey, 1999).

However, regardless of the source of these concerns, strong evidence now exists to suggest that an early transition to parenthood is associated with wide ranging negative outcomes for young mothers and their children. In particular, compared to older mothers, the life course outcomes of teenage mothers tend to be characterized by fewer life opportunities and higher rates of psychosocial disadvantage, that include: leaving school early; educational under-achievement; prolonged welfare dependence; decreased marital opportunities; less competent and more punitive parenting; maternal depression; and greater exposure to partner violence (Bardone, Moffitt, Caspi, Dickson, & Silva, 1996; Brooks-Gunn & Chase-Lansdale, 1995; Colletta, 1983; Furstenberg, Brooks-Gunn, & Morgan, 1987; Klepinger, Lundberg, & Plotnick, 1995; Woodward & Fergusson, in press). Children born to teenage mothers have also been shown to be at increased risk for a range of adverse developmental outcomes, with these outcomes spanning: higher rates of emotional and behavioral disorders; language delay; learning problems; educational under-achievement; delinquency; and adolescent drug and alcohol problems (Brooks-Gunn, Guo, & Furstenberg, 1993; Fergusson & Woodward, 1999; Keown, Woodward, & Field, submitted; Moore, Morrison, & Greene, 1997). These findings, combined with recent social and economic changes in the context of early childbearing, offer compelling support for the importance of early parenthood as a risk factor for later maternal and child problems.

The establishment of clear and persistent associations between early childbearing and later problematic outcomes for mothers and their children has led to an increased interest in the risk factors and life processes associated with teenage pregnancy and parenthood. Knowledge about the developmental risk factors that contribute to teenage pregnancy risk is important for at least two reasons. First, it is now generally accepted that many of the adverse outcomes associated with teenage pregnancy and early motherhood, may at least in part, reflect the effects of antecedent selection factors that are correlated with teenage pregnancy (Fergusson & Woodward, 1999; Nagin, Pogarsky, & Farrington, 1997). Specifically, there is mounting evidence to suggest that the developmental timing of a young woman's transition to parenthood is quite strongly influenced by her previous life experiences and behavioral adjustment, whereby those young women who are perhaps the least well equipped for parenting, both socially and psychologically, tend to become pregnant at a younger age (Furstenberg et al., 1987; Nagin et al., 1997; Woodward & Fergusson, 1999). These findings highlight the possibility that many of the developmental factors associated with teenage pregnancy may well play a major causal role in explaining the problematic outcomes of younger mothers and their offspring.

A second important reason for developing a better understanding of the risk factors and life processes associated with early childbearing relates to the need for improved treatment and prevention efforts. Despite debates about the extent to which teenage parenthood represents a significant social problem (Furstenberg, 1991), there is now growing agreement that, over and above the effects of selection factors, an early transition to parenthood is likely to place further demands on the limited social and psychological resources of these high risk women, which in turn, may even further constrain their life choices and ability to parent their children (Brooks-Gunn & Chase-Lansdale, 1995; Fergusson & Woodward, 1999; Nagin et al., 1997). These findings highlight the need to develop more effective prevention and treatment programs to reduce rates of teenage pregnancy and improve the life chances of these women and their offspring. Reviews of

pregnancy prevention efforts to date suggest that many programs have had only limited success, with many program evaluations reporting modest or disappointing results (Frost & Forrest, 1995; Maynard, 1995). The development of causal models of the antecedent and concurrent life course factors that place young women at increased risk of early pregnancy and parenthood will likely play an important role in identifying key targets for future intervention and improving the success of programs aimed at these high risk women and children.

For both of these reasons, there is a need to develop a better understanding of the risk factors associated with teenage pregnancy. The goal of this study is to address this need by using data gathered over the course of a 20 year longitudinal study to examine the risk factors and life pathways associated with an early pregnancy. This will involve an examination of the extent to which teenage pregnancy risk is associated with both: a) antecedent childhood factors; and b) time dynamic adolescent factors.   Four major domains of developmental influence are considered, with these domains spanning: social background factors; family relations; individual characteristics; and adolescent peer relationship processes. Although, a well specified theory of the developmental processes associated with teenage pregnancy has yet to be specified, the selection of key developmental domains was strongly guided by emerging developmental models of sexual and other risk taking behaviors (Capaldi, Crosby, & Stoolmiller, 1996; Donovan & Jessor, 1985; Perkins, Luster, Villarruel, & Small, 1998), in addition to previous research linking these factors to early pregnancy and parenthood. A summary and review of existing evidence relating to these four developmental domains is provided below.

Social Background Factors

In agreement with other research concerned with developmental risk, a clear link has been established between socioeconomic adversity and early childbearing. In particular, findings unanimously suggest that young women from socially disadvantaged family backgrounds characterized by poverty, welfare dependence, large family size, early motherhood, academic

under-achievement, and low parental educational aspirations are at an increased risk of becoming pregnant at an early age (Furstenberg et al., 1987; Hardy, Astone, Brooks-Gunn, Shapiro, & Miller, 1998; Haveman, Wolfe, & Peterson, 1997; McCormick & Brooks-Gunn, 1989; Yamaguchi & Kandel, 1987). In addition, clear differences in the rates of teenage pregnancy and parenthood amongst different ethnic and cultural groups have been reported across a number of countries. These trends are mirrored in New Zealand, where rates of teenage pregnancy and parenthood are significantly higher amongst indigenous Maori women, who comprise about 15% of the population, compared to women from Pakeha (New Zealand European) and other ethnic groups (Dickson, Sporle, Rimene, & Paul, 2000).

Family Relations

Interest has also begun to consider the extent to which childhood family experiences influence pregnancy timing. Findings suggest that young people who report distant and problematic relationships with their parents tend to initiate sexual intercourse earlier (Chase-Lansdale & Brooks-Gunn, 1994). There is also mounting evidence to suggest that childhood exposure to coercive child-rearing practices and dysfunctional family relationships may encourage an early pregnancy and premature transition to parenthood (Hardy et al., 1998; Scaramella, Conger, Simons, & Whitbeck, 1998; Serbin, Moskowitz, Schwartzman, & Ledingham, 1991). Similarly, young people raised in family environments characterized by single motherhood and/or multiple parental transitions as a result of marital breakdown have been shown to initiate sexual intercourse earlier and to be at an increased risk of a teenage pregnancy (Capaldi et al., 1996; O'Connor, Thorpe, Dunn, & Golding, 1999; Wu & Martinson, 1993). Finally, sexual abuse is a further factor that has been linked with sexual activity and pregnancy risk (Butler & Burton, 1990; Roosa, Tein, Reinholtz, & Angelini, 1997). Taken together, these findings suggest that problematic parenting practices and disrupted family relationships may act in various ways to place young women at an elevated risk of problematic sexual outcomes such as teenage pregnancy.

Individual Factors

A number of individual factors have been correlated with early pregnancy and parenthood, including sexual factors, psychological adjustment factors, and intellectual/school achievement factors. The first set of factors, not surprisingly, relate to the onset and frequency of sexual activity, in addition to the effectiveness of an individual's contraceptive practices (Morgan, Chapar, & Fisher, 1995). However, biological factors such as the timing of menarche have also been linked with teenage pregnancy risk (Manlove, 1997; Udry, 1979). It has been argued that the timing of sexual development may place early maturing girls at higher risk of forming opposite sex relationships and becoming sexually active, with these patterns of early sexual activity in turn increasing their opportunities for risk exposure (Udry, 1979).

With regard to psychological factors, there is clear evidence to suggest that girls with aggressive and antisocial tendencies are at an increased risk of teenage pregnancy and parenthood (Bardone et al., 1996; Miller-Johnson et al., 1999; Serbin et al., 1991; Woodward & Fergusson, 1999). For example, a recent study revealed a clear link between conduct problems at age 8 years and later pregnancy risk, with girls in the most disturbed 10% of the cohort being over five times more likely to become pregnant by age 18 than girls in the least disturbed 50% of the cohort (Woodward & Fergusson, 1999). Similarly, there is good evidence to suggest that rates of teenage pregnancy are elevated amongst licit and illicit drug users with findings showing that a substantial proportion of young women becoming pregnant in their teen years had a prior history of, or were currently engaged in delinquent and substance using behaviors (Huizinga, Loeber, & Thornberry, 1993; Yamaguchi & Kandel, 1987). These findings are consistent with problem behavior theory which maintains that early sexual risk taking is part of a broader constellation of adolescent problem behaviors that include delinquency, early cigarette smoking, alcohol and illegal drug use and deviant peer involvement (Donovan & Jessor, 1985).

In addition to the well established links between externalizing behavior problems and teenage pregnancy risk, it has also been suggested that emotionally vulnerable individuals may be more prone to seek sexual intimacy and early parenthood (Coley & Chase-Lansdale, 1998). However evidence to support this proposition remains equivocal, with some studies reporting a significant association between depression and early parenthood (Miller-Johnson et al., 1999) and others finding only a weak or non-significant association (Bardone et al., 1996; Yamaguchi & Kandel, 1987).

Finally, strong links have been established between educational under-achievement and early parenthood. In particular, there is clear evidence to suggest that girls who perform poorly in school, who have lower educational abilities, aspirations and motivation are more likely to become pregnant early (Fergusson & Woodward, 2000; Klepinger et al., 1995; Marini, 1984). For example, Marini (1984) in a follow up study of 3,433 young women found that educational attainment had a strong delaying effect on parenthood, suggesting that women with good academic or career prospects were more likely to avoid an early pregnancy perhaps because of the greater personal costs they perceived to be associated with early motherhood. There is some support for this finding from New Zealand research which shows that educational failure typically precedes pregnancy onset (Fergusson & Woodward, 2000).

Peer Relations

A final factor that has been identified as influencing teenage pregnancy risk concerns the kinds of peers young people affiliate with in adolescence. For example, recent evidence suggests that deviant peer involvement increases teenage pregnancy risk, with this relationship being largely mediated by sexual risk taking (Scaramella et al., 1998). These findings are consistent with research relating to problematic behavior in general which shows that involvement with deviant peers and partners during adolescence and early adulthood encourages antisocial and risk taking

behavior in both disordered and non-disordered individuals (Fergusson & Horwood, 1996; Woodward, Fergusson, & Horwood, submitted).

Collectively, these findings suggest that teenage pregnancy represents a selective process in which girls raised in socially disadvantaged and dysfunctional families, and who are characterized by antisocial tendencies, risky sexual behavior, deviant peer relations, and poor school achievement are more likely to become pregnant at an early age. However, it is important to note that much of this research has been characterized by a number of methodological limitations (Chase-Lansdale & Brooks-Gunn, 1994; Coley & Chase-Lansdale, 1998). First, much of the research with younger parents has consisted of cross-sectional comparisons of teenage and older mothers. Second, many studies have relied on small selected samples of teenage mothers, limiting the statistical precision and generalizability of study findings. Finally, very few studies have examined the relative contributions of different explanatory factors in determining early pregnancy risk, making it difficult to draw conclusions about the relative importance of various predisposing factors, or the process or processes by which multiple factors combine to determine pregnancy risk (Chase-Lansdale & Brooks-Gunn, 1994).

One of the best ways of addressing this issue is through the use of a longitudinal research design where young people are followed up over time and prospectively assessed on a range of social, family, and individual measures. The Christchurch Health and Development Study (CHDS) which is a prospective longitudinal investigation of a large birth cohort of young New Zealanders is well suited to this purpose. Over the course of this study, extensive information has been collected about young people's family social background, childrearing experiences, and psychological adjustment. In addition the prospective measurement of childhood and adolescent factors, and the large general population nature of the sample avoids many of the methodological limitations of previous research. Given these advantages, this study offers an important opportunity to advance

previous research concerned with the life course pathways leading to teenage pregnancy and parenthood. The aims of the study were as follows:

1. To describe the pregnancy history of young women in the cohort over the period from early adolescence (age 13) to early adulthood (age 20).

2. To examine associations between a series of childhood risk factors, most of which were assessed prior to age 14, and subsequent risk of a teenage pregnancy. Childhood factors included measures of social background, the quality of family relations, and child characteristics such as menarchal timing, behavioral adjustment and intellectual ability.

3. To examine how changing (time dynamic) factors assessed over the course of adolescence are associated with the timing of respondent's first pregnancy. Time dynamic factors included measures of adolescent mental health, sexual behavior and deviant peer affiliations.

METHOD

Sample

Participants were members of a birth cohort that has been extensively studied as part of the Christchurch Health and Development Study (CHDS). The CHDS is a longitudinal study of 1,265 children (630 females; 635 males) born in Christchurch, New Zealand. The sample was recruited by contacting mothers giving birth to live born children in all maternity hospitals, both public and private, within the Christchurch urban region over a four month period during mid 1977. Of the 1,310 mothers giving birth during this time, 97% agreed to participate.

Over the course of the study, sample members have been studied at birth, 4 months, 1 year, at annual intervals to age 16, 18 years, and again at 21 years. Data has been collected using a combination of sources, including parent interviews, teacher assessments, child interviews, standardized psychometric tests, and medical and official records. An overview of the study design has been given previously (Fergusson, Horwood, Shannon, & Lawton, 1989).

All analyses reported in this paper are based on the 533 female members of the cohort for whom complete data were available up to the age of 20 years. This sample consisted of 84.6% of the original female cohort. To examine the effects of sample loss on the representativeness of the sample, comparisons were made between the 533 subjects included in the analysis and the remaining 97 subjects on a range of social background measures collected at birth. These analyses showed that sample losses were not associated with maternal age or family size. There were, however, small but statistically detectable ($p<.05$) tendencies for the final sample to under-represent women from single parent, Maori, lower socio-economic status families and families with low maternal educational qualifications. Whilst these results suggest some bias within the present sample towards the under-representation of children from socially disadvantaged backgrounds, it is unlikely that this bias will materially influence results since previous efforts to correct for non-random sample loss have shown these effects to be negligible (Fergusson, Horwood, & Lloyd, 1991).

Measures

Teenage Pregnancy

At age 14, parents were asked whether their daughter had ever been pregnant. From age 15, sample members were interviewed about any pregnancies since the last interview, and if they had been pregnant, how old they were when they became pregnant. By age 20, 115 sample members reported having been pregnant on at least one occasion. For 80 (69.6%) of these women, this was their only pregnancy, whilst a further 35 (30.0%) reported multiple pregnancies during this time. For the purposes of this analysis, the timing of each sample member's first pregnancy was the major variable of interest.

Childhood Factors (birth-14 years)

All childhood factors were assessed prior to 14 years, with the exception of the measures of ethnic identification, childhood physical punishment and sexual abuse.

1. *Social Background*

Five measures of childhood family social background were identified. <u>Maternal age</u> at the time of first childbirth and the type of family each sample member entered at birth were the first two measures. <u>Family type</u> was coded as either a two parent or single parent family. <u>Maternal education</u>, reflected the highest academic qualification obtained by the child's mother and was coded as follows: 1 = no formal qualifications, 2 = high school qualifications; and 3 = tertiary level qualifications. <u>Family socioeconomic status</u> at the time of the child's birth was assessed on the basis of paternal occupation using the Elley & Irving (1976) scale of socioeconomic status for New Zealand. The scale was collapsed into three levels: professional/managerial; clerical/technical/skilled; and semi-skilled/unskilled/unemployed. The fifth social background measure assessed whether sample members identified themselves as being of Maori (1) or other (0) <u>ethnic origin</u> at the 21 year interview.

2. *Family Relations*

Four measures describe the family relationships of sample members. At age 18, sample members were interviewed about the extent to which their mother and/or father had used <u>physical punishment</u> during their childhood years (birth to age 16). These ratings were then combined into a composite four-point scale based on the highest level of exposure to physical punishment reported (Fergusson & Lynskey, 1997). This classification consisted of: 1) parents never used physical punishment; 2) parents seldom used physical punishment; 3) at least one parent regularly used physical punishment; and 4) at least one parent used physical punishment too often or too severely. <u>Inter-parental conflict</u> was assessed on the basis of three items describing the quality of marital relations in the preceding 12 months. These questions were asked annually from the time of birth till the child reached 10 years. Items across this period were summed to form a composite measure of interparental conflict (Fergusson, Horwood, & Lynskey, 1992). Items included: a) whether the parents had engaged in prolonged arguments; b) whether the child's mother reported

being assaulted by her partner; and c) whether the child's mother reported having experienced

sexual difficulties. On the basis of comprehensive life history data collected at annual intervals to

age 13, the total number of parental changes due to separation/divorce, death, remarriage, and

reconciliation was recorded. Finally, at age 18, sample members were interviewed about their

experience of childhood sexual abuse prior to the age of 16 years. On the basis of this questioning,

sample members were classified into four groups consisting of: 1) no sexual abuse; 2) non-contact

sexual abuse; 3) contact sexual abuse not involving attempted or completed intercourse; and 4)

sexual abuse involving attempted or completed oral, anal or vaginal intercourse (Fergusson,

Lynskey, & Horwood, 1996b).

3.   Child Characteristics

The first measure consisted of the age (years, months) that young women experienced their

first menstrual period. The second and third measures were based on the Rutter (Rutter, Tizard, &

Whitmore, 1970) and Conners (1969) parent and teacher rating scales, and provided measures of

each respondent's tendency to conduct and attentional problems at age 13. Conduct problem items

included disobedience and defiance of authority, fits of temper and irritability, aggression or

cruelty to others, destruction of property, lying, stealing, and similar behaviors. Attentional

problem items included inattention, poor concentration, short attention span, distractibility,

restlessness, and hyperactivity. All items were scored on a three point scale ranging from (1) not at

all to (3) a great deal. Parent and teacher scale scores were summed to form measures of children's

tendencies to conduct and attentional problems in early adolescence. The third and fourth

measures assessed children's intellectual ability. At age 8, children's intelligence was assessed

using the Wechsler Intelligence Scale for Children (WISC-R Wechsler, 1974). The reliability of

this scale, assessed using split half methods, was .93. Scholastic ability was assessed at age 13

using the Test of Scholastic Abilities (TOSCA). The TOSCA is a general purpose test designed to

assess "verbal and numerical reasoning abilities deemed to be prerequisite for success in academic

aspects of the school curriculum" (Reid, Jackson, Gilmore, & Croft, 1981 p.4). Test reliability assessed using coefficient alpha was .95.

Adjustment, Peer Relations, and Sexual Behavior During Adolescence (14-20 years)

To examine associations between teenage pregnancy risk and time dynamic measures of adjustment, peer relations, and sexual behavior, the following measures were created for annual intervals between 14 and 20 years.

1. Individual Adjustment

At ages 15 and 16, sample members and their parents were separately interviewed about the young person's behavior during the previous year using structured interviews consisting of items from the Diagnostic Interview Schedule for Children (Costello, Edelbrock, Kalas, Kessler, & Klaric, 1982), the Diagnostic Interview Schedule (Robins, Helzer, Croughan, & Ratcliff, 1981), the Self Report Early Delinquency Scale (Moffitt & Silva, 1988), the Rutgers Alcohol Problems Index (White & Labouvie, 1989), and custom written items based on DSM-III-R symptom criteria (American Psychiatric Association, 1987). Parent and self report data were then used to classify subjects according to DSM-III-R diagnostic criteria for depression, conduct disorder, and substance use disorders (Fergusson, Horwood, & Lynskey, 1993).

At ages 18 and 21 years, sample members were again interviewed about their mental health using items from the Composite International Diagnostic Interview (CIDI: World Health Organization, 1993) and the Self-Report Delinquency Inventory (SRDI: Elliott & Huizinga, 1989). DSM-IV (American Psychiatric Association, 1994) symptom criteria were then used to construct a series of psychiatric diagnoses for each year between the ages of 16 and 20 years. Items from the CIDI were used to assess depression, and substance use disorders, whilst items from the SRDI were used to assess conduct disorder (Fergusson, Horwood, & Lynskey, 1996a).

2. Deviant Peer Relations

At ages 15, 16, 18 and 21 years, young women were questioned about the extent to which their best friends and other friends were involved in a range of behaviors including the use of tobacco, alcohol or other substances, criminal offending and related behaviors. These items were summed to provide an overall index of the extent to which the young person affiliated with delinquent or substance using peers at each age. These scale scores were of moderate reliability, with alpha coefficients ranging from .74 to .85.

3. Sexual Behavior

For annual intervals between the ages of 14 and 21 years, sample members were questioned about their sexual behaviour, including the frequency of consensual sexual intercourse, the number of sexual partners, and their use of contraception. Sexual intercourse frequency was coded for annual intervals on a six point scale ranging from 0 = never had intercourse to 5 = >50 times.

RESULTS

Rates of Teenage Pregnancy Within the Sample

Table 1 shows the life table estimates of the cumulative risk of becoming pregnant between the ages of 13 and 20 years. By age 20, 22% of the sample reported having been pregnant at least once, with most of these pregnancies occurring between the ages of 17 and 20 years. Of the 115 first pregnancies reported, 41 (35.7%) were terminated, 10 (8.7%) were miscarried, and 64 (55.7%) resulted in a live born child, of whom two infants were adopted and 62 were kept by their natural mother.

INSERT TABLE 1 HERE

Childhood Factors Associated with Teenage Pregnancy Risk

Table 2 shows the relationship between pregnancy status by age 20 and a range of social background, family relationship, and individual factors measured during childhood. For ease of data display, all measures were expressed in dichotomous form, with associations between teenage pregnancy and each childhood factor assessed using the chi squared test of independence. A measure of effect size is given by the odds ratio (OR).

The Table shows that an early pregnancy was associated with a wide range of childhood social background, family, and individual factors. Specifically:

1. *Social Background.* Young women reporting at least one pregnancy by age 20 were significantly more likely to have been reared by a single mother who themselves had become a parent at a young age. In addition, pregnant teenagers were significantly more likely to identify themselves as Maori and more often came from families characterized by maternal educational under-achievement and socioeconomic disadvantage.

2. *Family Relations.* Young women who became pregnant by age 20, were significantly more likely to come from families characterized by regular or severe physical punishment, inter-parental conflict, parental change, and contact sexual abuse exposure.

3. *Individual Characteristics.* Compared to their non-pregnant peers, pregnant teenagers had significantly higher rates of early adolescent conduct and attentional problems, lower IQ scores at age 8, and poorer scholastic ability at age 13. In addition, although not significant there was a tendency for girls who became pregnant to have an earlier age of menarche.

INSERT TABLE 2 HERE

Childhood Predictors of Teenage Pregnancy

To identify which of the social background, family, and individual characteristics shown in Table 2 which best predicted the timing of teenage pregnancy onset, the data were reanalyzed using proportional hazards regression methods (Willett, Singer, & Martin, 1998). For the purposes

of this analysis, wherever possible the predictor variables were scored as continuous variables as described in the Method section. Model fitting was conducted using methods of forwards and backwards variable elimination to identify the best fitting and most parsimonious model. The results of this analysis are summarized in Table 3 which shows the proportional hazards regression coefficients for the significant ($p<.10$) childhood predictors of teenage pregnancy, in addition to the corresponding tests of significance based on the ratio of the regression coefficient to its standard error. Also shown is the rate ratio for each predictor variable which can be interpreted as the expected change in the rate of pregnancy for a one unit change in the predictor variable.

Five key predictors of teenage pregnancy risk were identified, with these factors spanning a range of social background, family relationship and personal variables. These factors included: having a mother who first gave birth at a young age; entering a single parent family at birth; exposure to parental change; conduct problems at age 13; and the timing of menarche onset. These results suggest that the risk of a teenage pregnancy was highest amongst young women reared in families characterized by early and single motherhood, disrupted family relationships, who experienced an earlier onset of menarche and who exhibited tendencies to antisocial behavior in childhood.

INSERT TABLE 3 HERE

Time Dynamic Adolescent Predictors of Early Pregnancy

The analyses presented in Tables 2 and 3 describe the way that childhood factors, most of which were assessed prior to pregnancy onset, were related to teenage pregnancy risk. However, this analysis does not take into account the ways in which changing life experiences and behaviors during adolescence also influence an individual's pregnancy risk. To address this issue, the proportional hazards model described in Table 3 was extended to include time dynamic covariate factors measured between the ages of 13 and 20 years. These factors included: annual measures of conduct disorder; depression; substance use disorder (alcohol, cannabis and other illicit drugs);

deviant peer affiliations; frequency of sexual intercourse; number of sexual partners; and the frequency of unprotected sexual intercourse. For the purposes of this analysis, the seven dynamic measures were, as far as possible, assumed to be predictive of pregnancy risk within the same interval. However, experimentation with lagged measures of time dynamic covariates also produced similar conclusions.

The results of this analysis are summarized in Table 4 which shows the regression parameters, standard errors and rate ratio estimates for both the childhood factors shown in Table 3, and the time dynamic factors found to make a significant contribution to the prediction of teenage pregnancy. This table shows the following:

1. Fixed Factors. Four fixed childhood factors continued to significantly predict teenage pregnancy risk up to the age of 20 years. These childhood factors included: entering a single parent family at birth; the number of parental changes in the family from birth to 13 years; the extent of conduct problems at age 13; and the age of menarche. This suggests that independently of later psychological adjustment and lifestyle, young women from problematic family backgrounds involving single motherhood and frequent parental changes, and who themselves showed early behavioral tendencies to conduct problems and an earlier age of menarchal onset, were at elevated risk of a teenage pregnancy. In contrast, the association between mothers' age of entry to parenthood and the timing of daughters' first pregnancy was no longer significant once adolescent adjustment and lifestyle were taken into account, suggesting that the effect of maternal age on pregnancy risk was largely mediated by the adolescent lifestyle factors described below.

2. Time Dynamic Factors. Two time dynamic adolescent factors made significant contributions to teenage pregnancy risk. These included: involvement with deviant peers and the frequency of sexual intercourse. This suggests that in addition to the significant childhood risk factors identified above, engaging in a problematic lifestyle characterized by involvement with deviant peers and sexual risk taking placed young women at an elevated risk of an early pregnancy.

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INSERT TABLE 4 HERE

Whilst the proportional hazards model described in Table 4 clearly identifies a number of key predictors of teenage pregnancy, the extent to which variations in exposure to these multiple risk factors affects pregnancy risk is not intuitively clear. However it is possible to create from the proportional hazards model, a total risk exposure score for each respondent based on the sum of their individual predictor variable scores weighted by the variable's regression parameter. This score can be interpreted as an estimate of each sample member's cumulative exposure to the risk factors shown in Table 4.

Figure 1 shows the relationship between this cumulative risk factor score and teenage pregnancy risk. This figure shows the sample divided into decile groups on the basis of their total risk scores. For each decile group, the figure gives the percentage of young women who became pregnant by age 20. An examination of this figure shows that pregnancy risk was negligible for those with total risk scores placed them at or below the 30th percentile. However, for women whose risk factor scores placed them above the 30th percentile there was evidence of a steady and relatively rapid increase in pregnancy risk, with this risk peaking at 58% for those whose scores placed them in the most at risk 10% of the sample.

INSERT FIGURE 1 HERE

DISCUSSION

In this study we have used data gathered over the course of a 20 year longitudinal study to examine the risk factors and life pathways associated with teenage pregnancy. The major findings of this study, and their theoretical and applied implications are reviewed below.

Prevalence of Teenage Pregnancy

By age 20, nearly a quarter of the young women studied had become pregnant, with approximately one third of these women reporting that they had been pregnant on two or more

occasions. The majority of all first pregnancies occurred when women were aged between 17 and

20 years, with less than 5% of the sample becoming pregnant prior to this time. Comparison with

national birth trend data indicating that the mean age at first child birth for the average New

Zealand woman is 28 to 29 years clearly illustrates the marked disparity in pregnancy timing of

these young women compared to the rest of the population (Statistics New Zealand, 2000).

However, not all of the young women who became pregnant went on to become parents.

From the total number of first pregnancies reported (115), just over half were carried to term and

resulted in a live born child, with the remaining pregnancies being miscarried (9%) or terminated

(36%). Adoption was uncommon, with fewer than 2% of pregnant women opting to place their

child for adoption. These results are highly consistent with a recent analysis of national birth and

abortion data (Dickson et al., 2000) confirming that the rates reported in this study are

representative of those found amongst similarly aged women in the New Zealand population.

Risk Factors and Life Processes Associated with Teenage Pregnancy

Findings suggested that young women characterized by exposure to multiple risk factors

across a number of developmental domains were at an increased risk of teenage pregnancy. Young

women's personal adjustment and family experiences during childhood and adolescence both

contributed to early pregnancy risk, highlighting the importance of conceptualizing teenage

pregnancy within a life course developmental model, rather than simply viewing it as an outcome

of problematic sexual behavior during adolescence. Four key risk factor domains were examined

in this research and their relationships to early pregnancy risk were as follows.

Social Background

Consistent with previous studies (Hardy et al., 1998; Horwitz, Klerman, Sung Kuo, &

Jekel, 1991), there was evidence to suggest that having been reared by a teenage mother was

associated with an earlier timing of first pregnancy amongst daughters. This association appeared

to be explained by a causal chain process, in which teenage motherhood placed daughters at

elevated risk of engaging in problematic adolescent behaviors such as socialising with deviant peers and engaging in frequent sexual intercourse, with these behaviors in turn increasing their risk of an early pregnancy.

In addition to being reared by a younger mother, having been born into a single parent family was also found to place a young woman at an elevated risk of an early pregnancy. This association persisted even after taking into account the effects of other confounding and intervening factors, suggesting that irrespective of other childhood social, family and individual factors, daughters of single mothers are at an elevated risk of teenage pregnancy. This provides support for the notion that exposure to single parent role models may encourage greater acceptance of premarital childbearing and early parenthood amongst daughters. This is consistent with the research of East and colleagues (1992) who report greater acceptance of early parenthood amongst the siblings of early childbearers. The present findings linking the timing of mothers and daughter first pregnancy suggest the presence of intergenerational cycles of teenage pregnancy, whereby high rates of teenage pregnancy are likely to be found in successive generations of the same families. While not all daughters of teen mothers will make the same fertility and family formation decisions as their mothers, they are clearly at an increased risk of following in their mothers footsteps. Given declines in social sanctions against premarital childbirth and increases in single parenthood across many western societies, this finding is of some concern.

Finally, contrary to expectations, family socioeconomic status, maternal educational achievement, and young women's ethnic status did not appear to make an independent contribution to the prediction of teenage pregnancy. Rather, results tended to suggest that the effects of these variables were probably mediated by other intervening family composition variables such as single parenthood and maternal age.

Family Relationship Factors

As hypothesized a significant association was found between childhood exposure to parental change and young women's subsequent risk of an early pregnancy. More specifically, as the number of parental transitions experienced by young women during their childhood years increased the age of pregnancy onset decreased. Even after time dynamic adolescent measures of individual adjustment, sexual behavior, and deviant peer involvement were taken into account, the number of parental changes experienced by respondents continued to independently contribute to the prediction of pregnancy risk suggesting that this link was not completely mediated by adolescent peer and risk taking processes. This finding is consistent with a number of previous studies showing a causal link between disrupted family relations and adolescent sexual risk taking (Capaldi et al., 1996; Scaramella et al., 1998), and also highlights the importance of parental transitions in addition to family structure in determining pregnancy risk.

Several possible mechanisms could account for the independent association between exposure to disrupted family relationships and the timing of first pregnancy. One explanation is that young people who are raised in families characterized by multiple parental transitions are likely to be exposed to parental dating behaviors and conversations about opposite sex relations that are not encountered by their peers from intact families. These experiences, in addition to witnessing the early romantic behaviors between their parents and new partners, may increase their sexual awareness, acceptance of sexual relations, and increase the likelihood that they will model their own sexual behavior on that of their parents (Hetherington et al., 1992). Relatedly, it is also possible that parents who have been previously embroiled in a separation or divorce, or who are in the process of finding or establishing a new relationship may be less effective in monitoring and supervising the behavior of their adolescent children, which in turn may expose their offspring to greater pregnancy risk. Another explanation of the link between parental change and teenage pregnancy could be that childhood exposure to an unstable and changing family environment may

hasten a child's exit from the family, thus removing them from the protection of their parents' supervision, and also possibly encouraging them to seek alternative emotional attachments with a partner or child.

Finally, there has been some speculation about the extent to which childhood exposure to sexual abuse may encourage early and promiscuous sexual activity. Although the present study revealed a significant univariate association between childhood sexual abuse and teenage pregnancy risk, this association appeared to be non-casual, reflecting the effects of social and family factors correlated with both teenage pregnancy and sexual abuse risk. There is some support for this conclusion from a recent study by Roosa et al. (1997) who found that a history of sexual abuse was not a major contributing factor to teenage pregnancy in a sample of 2,003 young women when social background and sexual factors were taken into account.

Individual Characteristics

In addition to evidence linking family composition factors to teenage pregnancy risk, there was also consistent evidence to suggest that young women characterized by educational under-achievement, conduct problems and attentional problems were more likely to become pregnant at a young age than their more advantaged peers. These results are in strong agreement with a growing body of research linking these individual factors to the risks of early pregnancy and parenthood (Fergusson & Woodward, 2000; Marini, 1984; Woodward & Fergusson, 1999). However, when the relative contributions of a number of individual factors were examined using multivariate methods, the extent of conduct problems at age 13 was found to be the strongest independent predictor of subsequent teenage pregnancy risk. In particular, girls with high levels of conduct problems were more prone to becoming pregnant than girls with lower levels of conduct problems, irrespective of their childhood family background and experiences and their adolescent lifestyle and behavior.

This finding is of particular concern given that it is likely that the behavior problems of these young women, and particularly their tendencies to aggressive and antisocial behavior will place them at high risk for parenting problems in the future. These risks are likely to be even further exacerbated by their psychological immaturity and the additional stresses they will encounter as young parents, raising important issues about the social and psychological implications of early motherhood for these young women and their offspring.

With regard to pubertal timing and adolescent sexual behavior, there was evidence to suggest that both the early onset of menarche and adolescent sexual risk taking behaviors contributed to teenage pregnancy risk. Specifically, early maturing girls, and girls who engaged in high rates of sexual intercourse were at increased risk of a teenage pregnancy. These findings are generally consistent with research linking menarchal timing and sexual behavior to pregnancy risk (Morgan et al., 1995; Udry, 1979).

Peer Affiliations

Although there has been a growing interest in the influence of peers on young people's sexual behavior and susceptibility to teenage pregnancy, there have been relatively few prospective studies undertaken which examine the relationship between deviant peer involvement and teenage pregnancy. The present findings revealed that involvement with deviant peers during adolescence was associated with an increased risk of an early pregnancy. This association was found to be independent of other adolescent lifestyle factors such as sexual risk taking.

These findings suggest that socialising with male and female peers who engage in antisocial and substance using behaviors may add further to a young woman's risk of becoming pregnant even after taking into account sexual practices. One explanation of this finding could be that affiliating with deviant male and female friends increases a young woman's risk of exposure to social contexts such as parties and other occasions involving drugs and alcohol, and provides greater opportunity for social contact with male sexual partners who also potentially share these

women's tendencies to sexual risk taking. Exposure to these problematic social and interpersonal contexts will in turn increase these young women's vulnerability to falling pregnant and therefore to an early transition to parenthood. There is certainly some support for this possibility from research linking problematic social contexts to elevated risks of excessive alcohol use, exposure to violence, and other difficulties (Sampson & Lauritsen, 1994). Further research concerned with the process or processes by which deviant peer involvement influences teenage pregnancy risk should help clarify the role of these factors.

Theoretical and Applied Implications

High levels of teenage pregnancy across a number of developed countries have generated considerable interest in the reasons why a substantial number of young women continue to become pregnant during their teenage years despite general social trends towards later childbearing. To date, much of this discussion has tended to focus on issues relating to adolescent sexuality, and in particular sexual practices that increase girls' vulnerability to teenage pregnancy (Christopher, 1995; Morgan et al., 1995). However, the present findings clearly suggest that teenage pregnancy is not solely the result of sexual risk taking, but is also strongly influenced by an individual's childhood experiences and adjustment. In particular, it is clear that early maturing, antisocial girls raised in families characterized by parental instability, early motherhood and maternal role models of single parenthood are at high risk of becoming pregnant during their teen years.

These results imply that exposure to adversity across multiple risk domains (family structure, stability, personal adjustment, pubertal timing) and developmental periods (childhood, adolescence) contributes to teenage pregnancy risk. These findings are most consistent with a cumulative risk factor model in which teenage pregnancy represents the outcome of exposure to multiple risk factors over the life course. An examination of the relationship between risk exposure and subsequent pregnancy risk revealed that at low levels of risk factor exposure ($\leq 30^{th}$ percentile), the risk of a teenage pregnancy was minimal. However, at higher levels of risk

exposure, there was evidence of a rapid and steady increase in rates of teenage pregnancy, with those in the most disadvantaged 10% of the cohort having rates of teenage pregnancy that were 26 times higher than their peers in the most advantaged third of the cohort.

The multi problem nature of the family backgrounds and behavior of pregnant teenager raises serious concerns about their preparedness for parenting and the likely impact of their adverse family histories and behavior problems on the subsequent health and development of their offspring should they choose to become parents. Certainly the present findings add to a growing body of evidence documenting the presence of intergenerational cycles of social disadvantage and poor social functioning. At the very least, it seems that teenage pregnancy and early motherhood are important risk markers for identifying families at high risk of later parenting and child developmental problems (Woodward, Horwood, & Fergusson, in press).

Finally, the present findings have important implications for the development and implementation of programs aimed at reducing the numbers of young women becoming pregnant during their teens. Despite an increased recognition of the importance of individual and family peer influences, most adolescent pregnancy prevention programs have primarily sought to encourage teenagers to either delay or abstain from sexual intercourse, and/or by assisting them in gaining their access to effective contraception. In light of current findings highlighting the importance of antecedent family and personal factors for teenage pregnancy risk, it is perhaps not surprising that many sex education and similar programs have had limited success (Christopher, 1995; Frost & Forrest, 1995). There is clearly a need to address the role of these factors by developing more effective broad based interventions aimed at high risk youth.

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Table 1. Estimated cumulative percentages of young women becoming pregnant between the ages of 13 and 20 years (N = 533).

Age at beginning of interval (year)	Number becoming pregnant at age	Hazard (% becoming pregnant) during interval	Cumulative risk (%) of becoming pregnant by end of interval
13 years	1	0.19	0.19
14 years	1	0.19	0.38
15 years	8	1.51	1.88
16 years	11	2.11	3.95
17 years	22	4.31	8.09
18 years	40	8.33	15.75
19 years	32	7.41	21.99

Table 2. Social background, family relationships, and individual functioning of young women who became pregnant by age 20.

Measure	Pregnancy Status by Age 20		Odds Ratio [1] (95% CI [2])
	Never Pregnant (n = 418)	Pregnant (n = 115)	
Social Background			
% Own mother was a teenage (<20 years) parent	15.9	30.4	2.3 *** (1.5-3.7)
% Born to single parent	5.8	17.4	1.4 *** (1.9-6.2)
% Mother had no formal educational qualifications at birth	48.9	66.1	2.0 *** (1.3-3.1)
% Family of semi-skilled/unskilled socioeconomic status at birth	21.7	40.0	2.4 *** (1.6-3.7)
% Maori ethnicity	8.7	21.9	2.9 *** (1.7-5.2)
Family Relations			
% Parents regularly used physical punishment during childhood (0-16 years)	8.5	18.3	2.4 ** (1.3-4.4)
% In highest quintile of parental conflict score (0-10 years)	19.6	42.9	3.1 *** (1.9-4.9)
% Experienced parental change (0-13 years)	26.3	61.8	4.5 *** (2.9-7.2)
% Contact sexual abuse (0-16 years)	10.7	22.0	2.4 ** (1.4-4.1)
Individual Characteristics			
% Early (<13) menarche	38.3	45.4	1.3 (0.9-2.1)
% Highest decile of conduct problems score (13 years)	7.1	21.3	3.5 *** (1.9-6.5)
% Highest decile of attentional problems score (13 years)	9.1	21.3	2.7 *** (1.5-4.8)
% Lowest quartile WISC-IQ test score (8 years)	21.6	33.7	1.8 * (1.1-3.0)
% Lowest quartile TOSCA scholastic ability test score (13 years)	21.2	35.3	2.0 ** (1.2-3.4)

[1] * p<.05; ** p<.01; *** p<.001

[2] CI denotes Confidence Interval

Table 3. Summary of proportional hazards regression coefficients for significant social background, family, and child factors predicting pregnancy risk between the ages of 13 and 20 years.

Measure	B	S.E.	Rate Ratio
Age of respondent's mother at first childbirth	.05	.03	.95 *
Respondent born into single parent family	.66	.31	1.94 **
Number of parental changes (0-13 years)	.11	.03	1.11 ***
Total conduct problems score (13 years)	.04	.01	1.05 ***
Age of menarche onset	-.19	.09	.83 ***

* p<.10; ** p<.05; *** p<.001

Table 4. Summary of proportional hazards regression coefficients for significant family, individual and time dynamic factors predicting pregnancy risk between the ages of 13 and 20 years.

Measure	B	S.E.	Rate Ratio
Fixed Family and Individual Factors			
Age of respondent's mother at first childbirth	-.03	.03	.98
Respondent born into single parent family	.60	.29	1.82 *
Number of parental changes	.09	.03	1.10 **
Total conduct problems score	.03	.01	1.03 **
Age of menarche onset	-.17	.08	.84 *
Time Dynamic Adolescent Lifestyle Factors			
Extent of deviant peer involvement	.02	.01	1.02 *
Frequency of sexual intercourse	.44	.08	1.55 ***

* p<.05; ** p<.01; *** p<.001

Figure 1. Rate of pregnancy by decile of risk exposure score.