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Abortion in young women and subsequent mental health

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Background: The extent to which abortion has harmful consequences for mental health remains controversial. We aimed to examine the linkages between having an abortion and mental health outcomes over the interval from age 15–25 years. **Methods:** Data were gathered as part of the Christchurch Health and Development Study, a 25-year longitudinal study of a birth cohort of New Zealand children. Information was obtained on: a) the history of pregnancy/abortion for female participants over the interval from 15–25 years; b) measures of DSM-IV mental disorders and suicidal behaviour over the intervals 15–18, 18–21 and 21–25 years; and c) childhood, family and related confounding factors. **Results:** Forty-one percent of women had become pregnant on at least one occasion prior to age 25, with 14.6% having an abortion. Those having an abortion had elevated rates of subsequent mental health problems including depression, anxiety, suicidal behaviours and substance use disorders. This association persisted after adjustment for confounding factors. **Conclusions:** The findings suggest that abortion in young women may be associated with increased risks of mental health problems. **Keywords:** Abortion, pregnancy, mental disorder, depression, anxiety, suicidal behaviour, substance dependence.

There have been ongoing debates about the issue of abortion as a response to unwanted pregnancy. These debates have centred around a series of ethical, religious and other issues concerning the rights of the fetus and the mother in circumstances of unwanted pregnancy (Blanchard, 2002; Chen, 2004; Major, 2003). Although much of the debate in this area has focused on ethical issues, it has also involved empirical concerns about the linkages between unwanted pregnancy, abortion and long-term mental health.

Specifically, a number of authors have proposed that abortion may have longer-term adverse mental health effects owing to feelings of guilt, unresolved loss and lowered self-esteem (Ney, Fung, Wickett, & Beaman-Dodd, 1994; Speckhard & Rue, 1992). These concerns have been most clearly articulated by Reardon and colleagues who claim that abortion may increase risks of a wide range of mental disorders, including substance abuse, anxiety, hostility, low self-esteem, depression and bipolar disorder (Cougle, Reardon, & Coleman, 2003; Reardon & Cougle, 2002; Reardon et al., 2003). Despite such claims, the evidence on the linkages between abortion and mental health proves to be relatively weak with some studies finding evidence of this linkage (Gissler, Hemminki, & Lonnqvist, 1996; Reardon & Cougle, 2002; Reardon et al., 2003) and others failing to find such linkages (Gilchrist, Hannaford, Frank, & Kay, 1995; Major et al., 2000; Pope, Adler, & Tschann, 2001; Zabin, Hirsch, & Emerson, 1989). Furthermore, the studies in this area have been marked by a number of design limitations, including the use of selected samples, limited length of follow-up, retrospective reports of mental health prior to abortion, and failure to control confounding (Adler, 2000; Major et al., 2000).

Perhaps the most comprehensive analysis of this topic is provided by an analysis of the National Longitudinal Study of Youth (NLSY) reported by Cougle et al. (2003). This analysis found that women who reported induced abortion were 65% more likely to score in the high-risk range for clinical depression than women whose pregnancies resulted in birth. This association was evident after control for a number of prospectively assessed confounders including pre-pregnancy psychological state. However, there were potential limitations of this study. First, the study failed to provide comprehensive control of pre-pregnancy factors, with the analysis being limited to the data available from the NLSY. Second, there was evidence of substantial under-reporting of abortion in the study, with an estimated 60% of those undergoing induced abortion failing to report this (Cougle et al., 2003).

A threat to study validity in this area arises from uncontrolled confounding (Major, 2003). In particular, evidence linking abortion to higher rates of subsequent mental disorder is consistent with two explanations. The first is that these associations reflect a cause and effect linkage in which exposure to abortion has adverse effects on subsequent mental health. The alternative is that the association arises because abortion is associated with third or confounding factors that are also related to mental health outcomes. There are several potential sources of confounding relating to pre-abortion background. These include: socio-economic factors; childhood and family factors; mental health and personality factors. To date, the control of such factors in studies

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of the mental health effects of abortion has been limited. A further class of factors that may also confound the association may relate to the woman's circumstances at the time of pregnancy, including age, the planning of pregnancy, and the stability of partnerships (Adler, 1992; Major, 2003).

In most studies to date, comparisons have been made between those who became pregnant but did not seek abortion and those who became pregnant and sought an abortion. Those women who were not (yet) pregnant were excluded from the analysis. Whilst it may seem intuitively reasonable to exclude the not pregnant group from analysis, the omission of this group leads to a problem of interpretation. In particular, the finding that rates of mental health problems are higher amongst those women having abortions than those women becoming pregnant and not seeking abortion is consistent with two quite different interpretations. First, the results are consistent with the view that exposure to abortion leads to an increased susceptibility to subsequent mental health problems. However, the alternative explanation is that pregnancy without abortion is beneficial for mental health. To distinguish between these alternatives requires that results for the not pregnant group are included in analysis to provide a reference by which the direction of association may be determined.

Against this background, this paper reports an analysis of the linkages between abortion in young women aged 15–25 and subsequent mental health in a birth cohort of young women studied to the age of 25. The specific aims of this analysis were:

1. To examine the extent to which mental health outcomes in the interval 15–25 years varied between the three pregnancy status groups: not pregnant by age 25; pregnant no abortion; pregnant abortion.
2. To adjust any association between mental health outcomes and pregnancy status groups for confounding pre-pregnancy factors, including social background, childhood and family history; mental health and personality factors.
3. To use the results of a covariate adjustment method to estimate the adjusted rates of mental disorders in the pregnant no abortion and not pregnant groups relative to rates of mental disorders in the pregnant abortion group.

Methods

The data used in this analysis were gathered over the course of the Christchurch Health and Development Study (CHDS). The CHDS is a longitudinal study of a birth cohort of 1265 children born in the Christchurch (NZ) urban region who have been studied from birth to age 25 years. The present analysis is based on the cohort of female participants for whom information on pregnancy history and mental health outcomes was available. The sample sizes used in the analysis range between 506 and 520 depending on the timing of assessment of pregnancy history and mental health. These samples represent between 80% and 83% of the original cohort of 630 females. All data were collected only on the basis of signed consent from research participants. The study had ethical approval from the Canterbury Ethics Committee.

Pregnancy and abortion 15–20 years

In New Zealand, the provision of legal abortion is determined by the Contraception, Sterilisation and Abortion Act, 1977 and overseen by the Abortion Supervisory Committee. The Act requires that certain criteria are met before allowing a woman to undergo a legal abortion. Firstly, women must approach their doctor and are then referred to specialist consultants. Two certifying consultants must then agree: 1) that the pregnancy would seriously harm the life, physical or mental health of the woman or baby; or 2) that the pregnancy is the result of incest; or 3) that the woman is severely mentally handicapped. An abortion will also be considered on the basis of age, or when the pregnancy is the result of rape. Abortions in New Zealand are free, and legal for all ages, and parental consent is not required for women under the age of 16. Counselling is required for all women considering an abortion (Ministry of Health, 1998).

Sample members were interviewed at ages 15, 16, 18, 21 and 25 about pregnancy and abortion occurring since the previous assessment. These reports showed that by age twenty five, 205 women (41% of the cohort) had become pregnant on at least one occasion and 74 (14.6%) reported seeking and obtaining an abortion at least once. In total there were 422 pregnancies reported prior to age 25. Of these, 90 were terminated. To cross-validate self-report data, the study estimates were compared with officially recorded pregnancy and abortion statistics for New Zealand (Abortion Supervisory Committee, 2002). These comparisons suggested some underreporting of abortion. The observed rate of abortion by age 25 in the cohort (178 per 1,000) was 81% of the rate expected based on population figures (220 per 1,000). This difference was statistically significant ($p < .05$).

Mental health 15–25 years

At ages 16, 18, 21 and 25 years, participants were questioned about mental health issues since the previous assessment using questionnaires based on the Diagnostic Interview Schedule for Children (DISC) (Costello, Edelbrock, Kalas, Kessler, & Klaric, 1982) at age 16 years and the Composite International Diagnostic Interview (CIDI) (World Health Organization, 1993) at ages 18–25 years, supplemented by additional measures. From this questioning it was possible to ascertain the proportion of young women who met DSM-IV criteria for the following disorders during the intervals 15–18, 18–21 and 21–25 years: a) major depression; b) anxiety disorders (including generalised anxiety, panic disorder, agoraphobia, social phobia and

specific phobia); c) alcohol dependence; d) illicit drug dependence. In addition, measures of DSM-IV disorders were supplemented by measures of self-reported suicidal ideation and attempts.

Covariate factors

Measures of family socio-demographic background. (a) Maternal education was assessed at the time of the cohort member's birth using a 3-point scale (no formal qualifications/secondary qualifications/tertiary qualifications). (b) Family socio-economic status was assessed at birth using the Elley–Irving revised index of socio-economic status for New Zealand (Elley & Irving, 1976).

Measures of family functioning. (a) Changes of parents (0–15 years): Using detailed information on patterns of family change gathered over the interval from birth to 15 years, a measure of family instability was constructed on the basis of a count of the number of changes of parents experienced by the child by age 15. (b) Parental history of criminality: When sample members were aged 15 years parents were questioned about their involvement in criminal offending. Sample members were classified as having a parental history of criminality if any parent reported a history of offending. (c) Childhood sexual abuse (0–16 years): At age 18 and 21 years, sample members were questioned about their experience of sexual abuse in childhood (<16 years) (Fergusson, Lynskey, & Horwood, 1996). For the purposes of the present analysis, sample members were classified as having experienced childhood sexual abuse if they reported at either age 18 or 21 any episode of abuse involving physical contact with a perpetrator. (d) Childhood physical abuse (0–16 years): At age 18 and 21 years sample members were questioned about the extent to which their parents used physical punishment during childhood (<16 years) using a 5-point scale (Fergusson & Lynskey, 1997). Sample members were classified as having experienced physical child abuse if they reported at either age 18 or 21 that at least one parent had regularly used physical punishment, had used physical punishment too often or too severely, or had treated them in a harsh and abusive manner.

Childhood conduct problems (7–9 years). At age 7, 8, 9 years the extent to which sample members exhibited tendencies to conduct disordered and oppositional behaviours was assessed using a scale that combined items from the Rutter (Rutter, Tizard, & Whitmore, 1970) and Conners (Conners, 1969, 1970) child behaviour rating scales. Separate ratings were obtained from the child's parent and class teacher. Parent and teacher ratings were summed for each year and then averaged over the interval from 7–9 years to provide a robust measure of the child's tendencies to conduct problems. The reliability of the resulting scale, assessed using coefficient α, was .97.

Child educational achievement. At each assessment from age 11–13 years, the child's class teacher was asked to rate the child's performance in each of five areas of the curriculum (reading, handwriting, written expression, spelling, mathematics) using a 5-point scale ranging from very good to very poor. To provide a global measure of the child's educational achievement over the interval from 11–13 years, the teacher ratings were summed across years and curriculum areas and then averaged to provide a teacher rating grade point average for each child. The reliability of this measure was $\alpha = .96$.

Measures of child personality. (a) Child neuroticism was assessed at age 14 years using a short-form version of the neuroticism scale of the Eysenck Personality Inventory (Eysenck & Eysenck, 1964). The reliability of this scale was $\alpha = .80$. (b) Child self-esteem was assessed at age 15 years using the Coopersmith Self-Esteem Inventory (SEI) (Coopersmith, 1981). The reliability of this scale, assessed using coefficient α, was .87.

Measures of adolescent adjustment. (a) Early onset sexual intercourse: At age 18 sample members were questioned about their sexual behaviours, including the age of onset of intercourse. Young people who reported that they had first had sex before age 16 were classified as having early sexual onset. (b) Substance use (15 years): At age 15 sample members were questioned about their use of tobacco, alcohol and cannabis. Tobacco use was assessed on the basis of a 5-point scale reflecting the current frequency of cigarette smoking at age 15. This scale ranged from 'non-smoker' through to 'daily smoker'. The frequency of alcohol use in the past 12 months was assessed using a 6-point scale that ranged from 'never' through to 'almost every day'. In addition, a dichotomous measure of cannabis use was created based on the young person's report of cannabis use in the past 12 months. (c) Mental health problems (15 years): At age 15, young people were administered a mental health interview that combined components of the Diagnostic Interview Schedule for Children (DISC) (Costello et al., 1982) and other measures to assess a range of DSM-III-R disorders in the cohort over the previous 12 months. This information was used to construct DSM-III-R diagnoses of major depression and anxiety disorders, including overanxious disorder, generalised anxiety disorder, social phobia and simple phobia. In addition, sample members were also questioned about the frequency of suicidal thoughts in the previous 12 months.

Young adult lifestyle factors. At each assessment from age 18 onwards participants were questioned about aspects of their living arrangements since the previous assessment including: a) living with parents and age of leaving the family home; and b) entry into cohabiting relationships.

Statistical analysis

The associations between pregnancy/abortion status and mental health at ages 15–18, 18–21, and 21–25 years (Table 1) were tested for statistical significance by fitting random effects models to the repeated measures data. For dichotomous outcomes (depression,

Table 1 Rates of disorder (15–18, 18–21, 21–25 years) by cumulative history of pregnancy/abortion to age 18, 21, 25 years respectively

Measure	Not Pregnant	Pregnant No Abortion	Pregnant Abortion	p
Major depression (%)				
15–18 years	31.2	35.7	78.6	
18–21 years	27.5	34.5	45.1	
21–25 years	21.3	30.5	41.9	
Pooled risk ratio (95% CI)[1]	.35[a] (.20–.59)	.49[a] (.27–.91)	1[b]	<.001
Anxiety disorder (%)				
15–18 years	37.9	35.7	64.3	
18–21 years	15.2	25.0	25.5	
21–25 years	16.9	29.8	39.2	
Pooled risk ratio (95% CI)[1]	.35[a] (.19–.63)	.54[a, b] (.27–1.07)	1[b]	.001
Suicidal ideation (%)				
15–18 years	23.0	25.0	50.0	
18–21 years	12.5	17.9	25.5	
21–25 years	8.0	13.0	27.0	
Pooled risk ratio (95% CI)[1]	.25[a] (.13–.50)	.31[a] (.14–.69)	1[b]	<.001
Alcohol dependence (%)				
15–18 years	5.2	7.1	.0	
18–21 years	4.3	6.0	5.9	
21–25 years	2.7	3.1	6.8	
Pooled risk ratio (95% CI)[1]	.53[a] (.17–1.61)	.56[a] (.15–2.10)	1[a]	.53
Illicit drug dependence (%)				
15–18 years	4.0	3.6	.0	
18–21 years	1.3	7.1	17.7	
21–25 years	1.7	4.6	12.2	
Pooled risk ratio (95% CI)[1]	.10[a] (.03–.32)	.16[a] (.04–.65)	1[b]	<.001
Mean (SD) number of mental health problems				
15–18 years	1.01 (1.13)	1.07 (1.39)	1.93 (.73)	
18–21 years	.61 (.96)	.90 (1.14)	1.20 (1.20)	
21–25 years	.50 (.85)	.81 (1.05)	1.27 (1.30)	
Pooled risk ratio (95% CI)[1]	.57[a] (.45–.72)	.66[a] (.50–.87)	1[b]	<.001
Sample sizes				
15–18 years	478	28	14	
18–21 years	375	84	51	
21–25 years	301	131	74	

[1]The results of planned comparisons of the rate of each outcome across the three groups are indicated by the superscripts ([a, b]). Different superscripts indicate that the groups were significantly ($p < .05$) different on their rates of disorder. Similar superscripts indicate that groups were not significantly different in their rates of disorder.

anxiety, suicidal ideation, substance dependence) logistic regression models were fitted, whereas for the count of number of mental health problems Poisson regression was used. For each outcome (Y) the general model fitted was of the form:

$$G(Yit) = B0 + B1X1it + B2X2it + Ui$$

where G(Yit) was the log odds of Y for the i-th individual in the t-th time interval for dichotomous outcomes or the log of the rate of problems for the i-th individual in the t-th time interval for the count of the number of mental health problems; X1it and X2it were time dynamic design variates reflecting the pregnancy/abortion status of the i-th individual up to the t-th interval, with X1it representing the Never Pregnant group and X2it the Pregnant No Abortion group, respectively, relative to the Abortion group; and Ui was an individual specific random effect. For each outcome a test of the overall significance of the pooled association with pregnancy/abortion history was obtained from a Wald chi squared test of the joint null hypothesis B1 = 0, B2 = 0. Estimates of the pooled risk ratios of disorder (odds ratios for dichotomous outcomes, incidence rate ratio for the problem count) in the Never Pregnant and Pregnant No Abortion groups relative to the Abortion group were given by e^{B1}, e^{B2} respectively.

The associations between pregnancy/abortion history and covariates (Table 2) were tested for statistical significance using the chi squared test of independence. The adjusted associations between pregnancy/abortion history and mental health outcomes (Table 3) were examined by extending the random effects models described above to include the covariate factors in Table 2. Finally, the association between pregnancy/abortion history prior to age 21 years and subsequent mental health problems from 21–25 years (Table 4) was modelled using Poisson regression in which the rate mental health problems was modelled as a log-linear function of pregnancy/abortion history prior to age 21 and covariates.

Results

Associations between pregnancy/abortion history and mental health outcomes

Table 1 shows the associations between pregnancy/abortion history (classified as not pregnant; pregnant no abortion; pregnant abortion) by ages 18, 21 and 25 years and measures of mental health assessed at ages 15–18, 18–21 and 21–25 years respectively. The

Table 2 Profile of social, family and childhood characteristics (0–15 years) and young adult lifestyle factors by pregnancy/abortion status (15–25 years)

Measure	Not Pregnant ($N = 301$)	Pregnant No Abortion ($N = 131$)	Pregnant Abortion ($N = 74$)	p^1
Socio-demographic background				
% Mother lacked formal educational qualifications	41.2	70.2	51.4	<.0001
% Family of semi-skilled, unskilled socio-economic status	15.0	34.4	31.1	<.0001
Family functioning				
% 3+ changes of parents (0–15 years)	10.6	34.4	28.4	<.0001
% Parental history of offending (15 years)	6.3	22.4	17.8	<.0001
% Childhood contact sexual abuse	11.3	31.8	25.7	<.0001
% Childhood physical abuse	7.0	26.9	32.4	<.0001
Childhood behaviour/educational achievement				
% In highest quartile of childhood conduct problems (7–9 years)	21.1	33.9	37.5	.002
% In lowest quartile on grade point average (11–13 years)	22.4	39.3	31.5	.002
Childhood personality				
% In highest quartile on neuroticism (14 years)	20.1	25.2	34.3	.038
% In lowest quartile on self-esteem (15 years)	19.2	32.8	38.0	<.001
Adolescent adjustment				
% Early onset sexual intercourse (<16 years)	13.0	42.3	35.6	<.0001
% Daily smoker (15 years)	3.3	19.0	14.1	<.0001
% Drinking alcohol at least monthly (15 years)	19.6	32.8	38.0	<.001
% Used cannabis (15 years)	4.4	16.4	15.5	<.0001
% Prior history of depression/anxiety disorder (15 years)	13.3	25.2	32.4	<.0001
% Prior history of suicidal ideation (15 years)	6.0	11.5	25.7	<.0001
Time dynamic lifestyle factors				
% Living with parents at				
18 years	88.0	55.7	55.4	<.0001
21 years	49.8	22.1	29.7	<.0001
25 years	21.3	16.8	12.2	.15
% Cohabiting with partner at				
18 years	2.0	18.3	14.9	<.0001
21 years	17.6	43.5	33.8	<.0001
25 years	44.9	66.4	59.5	<.0001
% Ever pregnant by age				
18 years	–	18.5	24.3	.32
21 years	–	60.3	73.0	.07

[1]Chi squared test of independence.

Table 3 Risk ratios[1] (95% CI) of disorder by pregnancy/abortion status after covariate adjustment

Measure	Not Pregnant	Pregnant No Abortion	Pregnant Abortion	p	Significant covariates[2]
Major depression	.48[a] (.27–.84)	.35[a] (.18–.67)	1[b]	.006	1–4, 6–9
Anxiety disorder	.52[a, b] (.27–1.02)	.44[a] (.21–.93)	1[b]	.082	2, 4, 8
Suicidal ideation	.42[a] (.21–.85)	.24[a] (.11–.56)	1[b]	.004	2, 3, 5, 6, 9–11
Illicit drug dependence	.20[a] (.06–.69)	.15[a] (.04–.63)	1[b]	.014	2, 10
Number of mental health problems	.66[a] (.52–.84)	.58[a] (.44–.76)	1[b]	<.001	2–5, 6, 8, 9

[1]The results of planned comparisons of the adjusted rate of each outcome across the three groups are indicated by the superscripts ([a, b]). Different superscripts indicate that the groups were significantly ($p < .05$) different in their adjusted rates of disorder. Similar superscripts indicate that groups were not significantly different in their adjusted rates of disorder.
[2]Significant covariates: 1 = maternal education; 2 = childhood sexual abuse; 3 = childhood physical abuse; 4 = child neuroticism (14 years); 5 = child self-esteem (15 years); 6 = grade point average (11–13 years); 7 = child smoking (15 years); 8 = prior history of depression/anxiety (15 years); 9 = prior history of suicidal ideation (15 years); 10 = living with parents; 11 = living with partner.

measures of mental health include DSM-IV major depression, anxiety disorder, alcohol and illicit drug dependence, suicidal ideation and total number of disorders. All comparisons were tested for overall statistical significance using a random effects model to estimate the association between pregnancy/abortion history and mental health (see Methods). Examination of the table shows:

Table 4 Covariate adjusted incidence rate ratios (95% CI) between number of mental health problems (21–25 years) and pregnancy/abortion history prior to age 21

	Not Pregnant	Pregnant No Abortion	Pregnant Abortion	p
Incidence rate ratio (95% CI)[1,2]	.60[a] (.44–.83)	.67[a] (.46–.97)	1[b]	.008

[1]The results of planned comparisons of the adjusted rate of each outcome across the three groups are indicated by the superscripts ([a, b]). Different superscripts indicate that the groups were significantly ($p < .05$) different in their adjusted rates of disorder. Similar superscripts indicate that groups were not significantly different in their adjusted rates of disorder.
[2]Significant covariates include: childhood sexual abuse; childhood physical abuse; self-esteem (15 years); grade point average (11–13 years).

1. For all outcomes, except alcohol dependence, there were significant ($p < .001$) associations between pregnancy history and rates of disorder. These associations reflected a tendency for rates of mental health problems to be highest amongst those having abortions and lowest amongst those who had not become pregnant, with those who became pregnant but did not have an abortion having rates that were intermediate between these extremes.
2. For all outcomes except alcohol dependence, the results of pairwise comparisons showed a generally similar pattern in which rates of disorder did not vary significantly ($p > .05$) between the never pregnant and pregnant no abortion groups. In all comparisons, those becoming pregnant and seeking abortions had significantly ($p < .05$) higher rates of disorder than the not pregnant group and, with the exception of anxiety disorder, significantly higher rates of disorder than the pregnant no abortion group.

Adjustment for confounding

A limitation of the analysis in Table 1 is that it does not take into account third or confounding factors that might explain the elevated rates of mental disorders amongst those having abortions. This issue is examined in Table 2, which shows the associations between pregnancy/abortion status by age 25 and a range of potential confounding factors. Examination of the table shows evidence of significant tendencies for those who became pregnant by age 25 to exhibit a profile characterised by greater childhood social and economic disadvantage, family dysfunction and individual adjustment problems. In addition, those who became pregnant were more likely to have left the family home at a young age and to have entered a cohabiting relationship.

To take into account the factors in Table 2 the associations between pregnancy/abortion history and mental health outcomes were adjusted by extending the random effects models to include covariate factors (see Methods). The results of this analysis are shown in Table 3, which reports the covariate adjusted risk ratios, the overall test of significance and the results of pairwise comparisons of the adjusted rates. For each analysis the table also reports the significant covariate factors. The table shows:

1. For four of the five outcomes (depression, suicidal ideation, illicit drug dependence, total mental health problems) the association with pregnancy/abortion history remained statistically significant ($p < .05$) after control for confounders. For the remaining outcome, anxiety disorder, the adjusted association was marginally significant ($p = .08$).
2. Pairwise comparisons showed that those who were not pregnant and those who were pregnant without abortion had adjusted rates of disorder that were not significantly different ($p > .05$). However, in all cases, the abortion group had significantly ($p < .05$) higher rates of disorder than the pregnant no abortion group, and with the exception of anxiety disorder, significantly ($p < .05$) higher rates than the not pregnant group.

A prospective analysis

A limitation of the analysis reported in Tables 1 and 3 is that the associations between pregnancy/abortion history and mental health involved the concurrent assessment of pregnancy status and mental health. This raises issues about the direction of any causal association since the results may be interpreted in two ways: (a) mental health problems lead to increased risks of abortion; or (b) abortion leads to increased risks of mental health problems. To address this issue, the analysis was extended to produce a prospective analysis in which pregnancy/abortion history prior to age 21 was used to predict mental health outcomes from 21–25 years. This analysis was limited to the overall number of disorders owing to the relatively sparse data for specific disorders over the interval 21–25 years and the smaller number of women who became pregnant by age 21.

The results of this analysis are summarised in Table 4 which shows estimates of the covariate adjusted incidence rate ratios for the number of mental health problems. The association between pregnancy/abortion history prior to 21 and number of mental health problems from 21–25 years remained statistically significant after covariate adjustment ($p = .008$). In addition, consistent with

the previous analysis, the results show a clear pattern in which, after covariate adjustment, those who were not pregnant and those who were pregnant but did not have an abortion had rates of disorder that were not significantly different ($p > .05$), whereas those having abortions had rates of disorder that were significantly ($p < .05$) higher than both of these groups.

Discussion

In this study we have used data gathered over a 25-year longitudinal study to examine linkages between mental health and exposure to abortion in adolescence and young adulthood. This study produced evidence consistent with the view that in young women, exposure to abortion was associated with a detectable increase in risks of concurrent and subsequent mental health problems. This conclusion is based on the following lines of evidence:

1. On the basis of concurrently assessed data (Table 1), young women reporting abortions had elevated rates of mental health problems when compared with those becoming pregnant without abortion and those not becoming pregnant.
2. These associations persisted after extensive control for a range of confounding factors, suggesting a possible causal linkage between exposure to abortion and mental health problems (Table 3).
3. To examine the direction of causation, a prospective analysis was conducted in which exposure to abortion by age 21 was used to predict subsequent mental health problems (Table 4). That analysis showed that even following control for confounding factors, exposure to abortion prior to age 21 was associated with increased risks of later mental health problems.

In general, these results are consistent with the view that exposure to abortion was associated with increased risks of mental health problems independently of confounding factors. The study estimates suggested that those who were not pregnant or those becoming pregnant but not having an abortion had overall rates of mental disorders that were between 58% and 67% of those becoming pregnant and having an abortion.

In comparison to previous research in this area, the present study has a number of clear strengths which include: a) the use of a longitudinal design in which pregnancy and mental health were assessed throughout adolescence into young adulthood; b) assessment of mental disorders using standardised diagnostic criteria; c) the availability of a range of concurrent and prospectively assessed covariate factors; d) adjusted contrasts between those having abortion and equivalent groups of those becoming pregnant and those not pregnant. To our knowledge, no previous study of this topic has combined all of these features to examine the linkages between abortion and mental health. However, whilst the present study has a number of strengths, there are some limitations that should not be overlooked. In particular, potential threats to study validity include:

1. *Omitted covariates*: Although the study findings show that young women exposed to abortion are at increased risks of mental health problems after adjustment for a range of confounding factors, the possibility that the association reflects sources of confounding that were not controlled should not be overlooked.
2. *Errors in the ascertainment of abortion*: Comparison of the rates of abortion reported by this cohort with a population estimate based on official record data suggested moderate accuracy in the reporting of abortion, with the reported rates for the cohort being 81% of the estimated population rate for women aged 15–25. These estimates suggested some underreporting of abortion in the cohort (see Methods). In turn, this raises the possibility that errors in the reporting of abortion may have distorted the results (Reardon & Cougle, 2002).
3. *The role of contextual factors*: An important threat to study validity comes from the lack of information on contextual factors associated with the decision to seek an abortion. It is clear that the decision to seek (or not seek) an abortion following pregnancy is likely to involve a complex process relating to: a) the extent to which the pregnancy is seen as wanted; b) the extent of family and partner support for seeking or not seeking an abortion; c) the woman's experiences in seeking and obtaining an abortion. It is possible, therefore, that the apparent associations between abortion and mental health found in this study may not reflect the traumatic effects of abortion *per se* but rather other factors which are associated with the process of seeking and obtaining an abortion. For example, it could be proposed that our results reflect the effects of unwanted pregnancy on mental health rather than the effects of abortion *per se* on mental health. The data available in this study was not sufficient to explore these options. However, it is our intention to study this cohort at age 30 and at that time it may be possible to gather further contextual information on the factors associated with decisions regarding abortion.

Notwithstanding the reservations and limitations above, the present research raises the possibility that for some young women, exposure to abortion is a traumatic life event which increases longer-term susceptibility to common mental disorders. These findings are inconsistent with the current consensus on the psychological effects of abortion. In particular, in its 2005 statement on abortion, the American

Psychological Association concluded that 'well-designed studies of psychological responses following abortion have consistently shown that risk of psychological harm is low ... the percentage of women who experience clinically relevant distress is small and appears to be no greater than in general samples of women of reproductive age' (American Psychological Association, 2005). This relatively strong conclusion about the absence of harm from abortion was based on a relatively small number of studies which had one or more of the following limitations: a) absence of comprehensive assessment of mental disorders; b) lack of comparison groups; and c) limited statistical controls. Furthermore, the statement appears to disregard the findings of a number of studies that had claimed to show negative effects for abortion (Cougle et al., 2003; Gissler et al., 1996; Reardon & Cougle, 2002).

On the basis of the current study, it is our view that the issue of whether or not abortion has harmful effects on mental health remains to be fully resolved. Certainly in this study, those young women who had abortions appeared to be at moderately increased risk of both concurrent and subsequent mental health problems when compared with equivalent groups of pregnant or non-pregnant peers. While it is possible to dismiss these findings as reflecting shortcomings in the assessment of exposure to abortion or control of confounders (see above), it is difficult to disregard the real possibility that abortion amongst young women is associated with increased risks of mental health problems. There is a clear need for further well-controlled studies to examine this issue before strong conclusions can be drawn about the extent to which exposure to abortion has harmful effects on the mental health of young women.

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References

Abortion Supervisory Committee. (2002). *Annual Report to Parliament* [*reprinted in 'Demographic Trends 2002': Statistics New Zealand*]. Available: http://www.stats.govt.nz [2004, January 21].

Adler, N.E. (1992). Unwanted pregnancy and abortion: Definitional and research issues. *Journal of Social Issues, 48*, 1–35.

Adler, N.E. (2000). Abortion and the null hypothesis. *Archives of General Psychiatry, 57*, 785–786.

American Psychological Association. (2005). *APA briefing paper on the impact of abortion on women*. Available: http://www.apa.org/ppo/issues/womenabortfacts.html [2005, 31 January].

Blanchard, D.A. (2002). Depression and unintended pregnancy in young women. Readers should bear in mind potential conflict of interest. *British Medical Journal, 324*, 1097; author reply 1097–1098. [serial on the internet]. Available from: http://www.bmjjournals.com/cgi/content/full/1324/7345.

Chen, J. (2004). Campaign 2004: Huge abortion rights rally in DC. CBSNEWS.com 2004 April 26 [cited 2004 October 28]. Available from: http://www.cbsnews.com/stories/2004/02/09/politics/main598867.shtml.

Conners, C.K. (1969). A teacher rating scale for use in drug studies with children. *American Journal of Psychiatry, 126*, 884–888.

Conners, C.K. (1970). Symptom patterns in hyperkinetic, neurotic and normal children. *Child Development, 41*, 667–682.

Coopersmith, S. (1981). *SEI – Self esteem inventories*. Palo Alto, CA: Consulting Psychologists Press.

Costello, A., Edelbrock, C., Kalas, R., Kessler, M., & Klaric, S.A. (1982). *Diagnostic Interview Schedule for Children (DISC)*. Bethesda, MD: National Institute of Mental Health.

Cougle, J.R., Reardon, D.C., & Coleman, P.K. (2003). Depression associated with abortion and childbirth: A long-term analysis of the NLSY cohort. *Medical Science Monitor, 9*, CR105–112.

Elley, W.B., & Irving, J.C. (1976). Revised socio-economic index for New Zealand. *New Zealand Journal of Educational Studies, 11*, 25–36.

Eysenck, H.M., & Eysenck, S.B.G. (1964). *Manual of the Eysenck Personality Inventory*. London: London University Press.

Fergusson, D.M., & Lynskey, M.T. (1997). Physical punishment/maltreatment during childhood and adjustment in young adulthood. *Child Abuse and Neglect, 21*, 617–630.

Fergusson, D.M., Lynskey, M.T., & Horwood, L.J. (1996). Childhood sexual abuse and psychiatric disorder in young adulthood: I. Prevalence of sexual abuse and factors associated with sexual abuse. *Journal of the American Academy of Child and Adolescent Psychiatry, 35*, 1355–1364.

Gilchrist, A.C., Hannaford, P.C., Frank, P., & Kay, C.R. (1995). Termination of pregnancy and psychiatric morbidity. *British Journal of Psychiatry, 167*, 243–248.

Gissler, M., Hemminki, E., & Lonnqvist, J. (1996). Suicides after pregnancy in Finland, 1987–94: Register linkage study. *British Medical Journal, 313*, 1431–1434.

Major, B. (2003). Psychological implications of abortion – highly charged and rife with misleading research. *Canadian Medical Association Journal, 168*, 1257–1258.

Major, B., Cozzarelli, C., Cooper, M.L., Zubek, J., Richards, C., Wilhite, M., & Gramzow, R.H. (2000). Psychological responses of women after first-trimester abortion. *Archives of General Psychiatry, 57*, 777–784.

Ministry of Health. (1998). *Considering an abortion? What are your options?* Available: http://www.moh.govt.nz [2005, 11 January].

Ney, P.G., Fung, T., Wickett, A.R., & Beaman-Dodd, C. (1994). The effects of pregnancy loss on women's health. *Social Science and Medicine, 38*, 1193–1200.

Pope, L.M., Adler, N.E., & Tschann, J. (2001). Post-abortion psychological adjustment: Are minors at increased risk? *Journal of Adolescent Health, 29*, 2–11.

Reardon, D.C., & Cougle, J.R. (2002). Depression and unintended pregnancy in the National Longitudinal Survey of Youth: A cohort study. *British Medical Journal, 324*, 151–152, [serial on the internet]. Available from: http://www.bmjjournals.com/cgi/content/full/324/7330.

Reardon, D.C., Cougle, J.R., Rue, V.M., Shuping, M.W., Coleman, P.K., & Ney, P.G. (2003). Psychiatric admissions of low-income women following abortion and childbirth. *Canadian Medical Association Journal, 168*, 1253–1256.

Rutter, M., Tizard, J., & Whitmore, K. (1970). *Education, health and behaviour.* London: Longmans.

Speckhard, A.C., & Rue, V.M. (1992). Postabortion syndrome: An emerging public health concern. *Journal of Social Issues, 48*, 95–119.

World Health Organization. (1993). *Composite International Diagnostic Interview (CIDI).* Geneva: World Health Organization.

Zabin, L.S., Hirsch, M.B., & Emerson, M.R. (1989). When urban adolescents choose abortion: Effects on education, psychological status and subsequent pregnancy[erratum appears in Fam Plann Perspect 1990 Jan–Feb;22(1):48]. *Family Planning Perspectives, 21*, 248–255.

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