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### **Abortion among young women and subsequent life outcomes**

David M. Fergusson, Ph.D.

Joseph M. Boden, Ph.D.

L. John Horwood, MSc.

Christchurch Health and Development Study

Christchurch School of Medicine and Health Sciences

*Corresponding author:* Prof. David M. Fergusson, Christchurch Health and Development Study, Christchurch School of Medicine and Health Sciences, PO Box 4345, Christchurch, New Zealand  
Phone: +64 3 372 0406 Fax: +64 3 372 0407 Email: [david.fergusson@chmeds.ac.nz](mailto:david.fergusson@chmeds.ac.nz)

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David M. Fergusson is Professor and Executive Director of the Christchurch Health and Development Study. Joseph M. Boden is a Research Fellow, and L. John Horwood a Senior Research Fellow, with the Christchurch Health and Development Study.

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Abstract

**Context:** Young women frequently cite concerns about the effects of unplanned, unwanted, or mistimed pregnancies on future life course outcomes including education, employment, and relationships as reasons for abortion. There is relatively little evidence as to whether abortion leads to improved life course outcomes for young women who choose this option. This study examined whether abortion acted to mitigate the life course disadvantages associated with early pregnancy.

**Methods:** Data were obtained over the course of a 25-year longitudinal study of a New Zealand birth cohort, including the history of pregnancy/abortion for 492 female participants studied over the interval from 15-21 years. Regression models were used to examine the linkages between abortion prior to age 21 and later educational, employment, welfare dependence, and partnership outcomes at ages 21-25.

**Findings:** Young women having an abortion before age 21 differed significantly from women who became pregnant but did not seek an abortion on 6 out of 10 measured life outcomes, spanning education, income, welfare dependence, and domestic violence. Adjustment for confounding factors indicated that most of these differences were explained by family, social, and educational factors that were present prior to pregnancy. Nonetheless, even after adjustment for confounding factors, young women having abortions had higher levels of subsequent educational achievement than those becoming pregnant but not having abortions.

**Conclusions:** The differences in later life outcomes between women who had abortions and those who were pregnant but did not have an abortion were largely due to pre-existing differences in the social, behavioural and educational backgrounds of these groups. However, abortion may mitigate the effects of early pregnancy in terms of completing tertiary educational qualifications.

**Keywords:** Abortion, pregnancy, education, income, welfare dependence, family relationships.

Research into the reasons why young women seek abortions suggests that some of the more frequently given reasons relate to the educational, economic and partnership consequences of unwanted or mistimed pregnancy<sup>1-4</sup>. For example, Broen et al.<sup>1</sup> interviewed women at three time points following an abortion, and found that concerns about the effect of having a child on education, career, finances, and relationships were rated as important reasons for having an abortion. Similarly, Finer et al.<sup>2</sup> reported that young women who had abortions frequently stated that they felt unprepared for motherhood, and cited interference with educational opportunities as a primary reason for abortion. Torres and Forrest<sup>3</sup> found that 75% of abortion patients they surveyed listed interference with education or being unable to afford a baby as primary reasons for having an abortion, while 50% of the respondents listed potential relationship problems as a main reason for having an abortion. Sihvo et al.<sup>4</sup> reported that for younger women (aged < 25 years), concerns about education and relationship status were the most important determinants in women's decision to have an abortion.

These findings raise the issue of the extent to which the decision to have an abortion has advantages for the woman in terms of subsequent life course outcomes. There is indirect evidence that would suggest possible benefits of abortion for subsequent life course outcomes. In particular there is a substantial literature that has linked teenage parenthood with a wide range of adverse outcomes including: educational under-achievement<sup>5-7</sup>; poverty<sup>8-10</sup>; welfare dependence<sup>9,11</sup>; domestic violence<sup>12</sup> and impaired partnership relationships<sup>7,12</sup>. For example, Hofferth et al.<sup>5</sup> found that teenage mothers completed 1.9-2.2 years fewer schooling than women who first gave birth after age 30. Similarly, Moore et al.<sup>8</sup> reported that lower ages at first birth were strongly associated with increasing risks of poverty for women at age 27, while Grindstaff showed that women who gave birth as adolescents were more likely to become welfare dependent<sup>9</sup>. Finally, Harrykisson et al.<sup>12</sup> showed that adolescent mothers were at increased risk for intimate partner violence and relationship problems.

It could be proposed that the adverse outcomes experienced by adolescent mothers are largely or wholly the consequence of mistimed or unwanted pregnancies, and that, as a consequence, the adversities associated with teenage pregnancy may be mitigated by abortion. However, only a limited number of studies have directly examined whether young women who have abortions have improved life course outcomes when compared with young women who become pregnant but do not seek an abortion. A study by Zabin and colleagues<sup>13</sup> of a group of pregnancy clinic attendees found that those who had had abortions were more likely to have completed high school and were more likely to have been employed two years later, than those who had carried their pregnancies to term or those who had had a negative pregnancy test. Similarly, a study by Bailey et al.<sup>14</sup> of a group of Brazilian adolescent women found that those young women having had an abortion were more likely than those not having an abortion to be attending school one year later.

In this paper we explore these issues by examining the consequences of teenage abortion for subsequent life course opportunities in a birth cohort of young women in New Zealand studied to the age of 25. 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<sup>15</sup>.

The aims of this analysis were to examine the extent to which young women having abortions prior to 21 showed advantaged outcomes when compared with women becoming pregnant but not seeking an abortion. It was hypothesised that, when due allowance was made for pre-pregnancy factors, women having abortions prior to 21 would have advantaged educational,

economic and related outcomes when compared with those becoming pregnant but not seeking abortions. The analysis also compares those women having abortion by 21 with those not becoming pregnant by 21. It was hypothesised that when due allowance was made for pre-pregnancy factors, those women having abortions before 21 would have similar educational and related outcomes to those not becoming pregnant by 21.

## Methods

The data used in these analyses were gathered over the course of the Christchurch Health and Development Study (CHDS), 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 analyses were based on the cohort of female participants for whom full information on pregnancy history and educational, income, welfare dependence and employment, and partnership outcomes to age 25 was available ( $n = 492$ ). This sample represented 78% 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*

Sample members were interviewed at ages 15, 16, 18 and 21 about pregnancy and abortion occurring since the previous assessment. These reports showed that by age 21, 125 women (25% of the sample) had become pregnant on at least one occasion. These women reported a total of 172 pregnancies of which 95 (55%) resulted in a live birth, 53 (31%) were terminated by abortion and 24 (14%) were miscarried. For the purposes of the main analysis reported in this paper, participants were classified into three mutually exclusive groups on the basis of their reported pregnancy history by age 21: (a) those having an abortion prior to age 21 ( $n = 48$ ); (b) those who became pregnant but did not have an abortion prior to age 21 ( $n = 77$ ); and (c) those who never became pregnant prior to age 21 ( $n = 367$ ). However, this method of classification is not without its limitations. In particular,

a number of women who had abortions also had other pregnancies that resulted in live births (n = 11). In addition, the classification does not distinguish women whose pregnancy resulted in a live birth from those women whose pregnancy resulted in miscarriage. To address these issues of classification a series of alternative classification schemes were devised to examine the sensitivity of the analysis to alternative representations of the individual's pregnancy/abortion history. These alternative classifications included: (a) a classification based on the outcome of first pregnancy prior to age 21; (b) a classification using two correlated dichotomous variables representing having an abortion and having a pregnancy without abortion prior to age 21 to take into account the overlap between abortion and pregnancy without abortion. In addition, all analyses were conducted including and excluding those women for whom the only outcome of pregnancy was miscarriage (n=11). These alternative classifications are described further in the Statistical Analysis section below.

To cross validate self-report data, the study estimates were compared with officially recorded pregnancy and abortion statistics for New Zealand<sup>16</sup>. These comparisons suggested some underreporting of abortion. The observed rate of abortion by age 21 in the cohort (108 per 1000) was 88% of the rate expected based on population figures (123 per 1000). However, this difference was not statistically significant ( $p>0.05$ ).

### *Outcome measures*

At age 25, cohort members were questioned concerning their history of enrolment in tertiary education and training and any educational/vocational qualifications obtained since age 21. This information was used to classify participants on four dichotomous measures of educational achievement over the interval 21-25 years: attendance at university; completion of a university degree (Bachelor's level or above); enrolment in any form of tertiary education or training; attainment of any tertiary educational/vocational qualification.

Also, sample members were asked at age 25 to estimate their personal gross income from all sources over the previous 12 months. Those participants who were married or living with a romantic partner were also questioned about their partner's gross income for the same period, and an estimate of total family income was obtained by summing personal and partner income estimates. For those participants living alone, or still living with parents or other family members, the measure of total family income was equivalent to the measure of personal family income.

In addition, at age 25 sample members were questioned about their receipt of social welfare benefits during the period 21-25 years. The percentage of cohort members who reported receiving an unemployment benefit, domestic purposes benefit, or a sickness or invalids benefit at any point in the period 21-25 years served as an outcome measure. Participants were also questioned about their current paid employment, if any. Cohort members who reported working a minimum of 30 hours per week were classified as being in full-time employment.

Finally, at age 25, sample members were questioned about their partner relationships over the past 12 months. Participants who reported being in an intimate partner relationship for a period of one month or longer in the past year were further questioned about the quality of their relationship and their experience of interpartner violence victimisation. Partner violence victimisation was assessed using a 22-item scale that incorporated selected items from the Revised Conflict Tactics Scale CTS2:<sup>17</sup>. The selected items spanned the domains of minor psychological aggression, severe psychological aggression, minor physical assault, and severe physical assault. These items were summed to provide a scale measure of the extent of partner violence victimisation ( $\alpha = .85$ )<sup>18</sup>. The measure of relationship quality was derived from the 25-item Intimate Relations Scale<sup>19</sup>. Each item was rated on a 3-point scale ranging from 1 (doesn't apply) to 3 (definitely applies). For the present study, the negative feelings sub-scale was used to assess the level of dissatisfaction with the individual's relationship ( $\alpha = .82$ ). The analysis of partnership outcomes is limited to those participants reporting an intimate partner relationship of one month or longer in the preceding 12 months at age 25.

### *Covariate Factors*

A range of covariate factors were chosen from the database of the study on the basis of: (a) their association with pregnancy history prior to 21; and (b) their associations with educational and achievement outcomes as observed in previous studies of this cohort. Measures of family socio-demographic background included maternal and paternal education, which was assessed at the time of the cohort member's birth using a 3-point scale (no formal qualifications/secondary qualifications/tertiary qualifications). Also, family material living standards were assessed by means of an interviewer rating. Ratings were obtained annually from when the survey child was aged 1-10 years, using a five point scale that ranged from "very good" to "very poor". These ratings were averaged over the 10-year interval to provide a measure of family living standards during this period. Further, family socio-economic status was assessed at birth using the Elley- Irving revised index of socio-economic status for New Zealand<sup>20</sup>. This index ranks families into six groups on the basis of paternal occupation, ranging from 1 = professional occupations to 6 = unskilled occupations.

Measures of childhood behaviour and educational achievement included a measure of childhood conduct problems (7-9 years), assessed via parent and teacher reports of the extent to which the child exhibited conduct disorder and oppositional behaviours were obtained using a scale that combined selected items from the Rutter<sup>21</sup> and Conners<sup>22,23</sup> child behaviour rating scales. For these analyses parent and teacher ratings were summed and then averaged over the interval from 7-9 years to provide an overall measure of the extent of conduct problems in middle childhood ( $\alpha = .97$ )<sup>24</sup>. Also, child cognitive ability (IQ) was assessed at ages 8 and 9 using the Revised Wechsler Intelligence Scale for Children WISC-R:<sup>25</sup>. Total scores were computed on the basis of results on four verbal and four performance subscales. The split half reliabilities of these scores were .93 at age 8 and .95 at age 9. For the purposes of these analyses the observed WISC-R total IQ scores at age 8 and 9 were combined by averaging over the two administrations. In addition, at

age 13 cohort members were administered a measure of scholastic ability: the Test of Scholastic Abilities TOSCA: <sup>26</sup>. This test is designed to assess the extent to which the child exhibits the skills and competencies necessary for academic work in high school. The test was scored as recommended in the test manual to give a total scholastic ability score. The reliability of this score assessed by coefficient alpha was .95. Furthermore, at each assessment from 11-13 years, teacher ratings were obtained of the child's school performance in each of five curriculum areas (reading, handwriting, written expression, spelling, mathematics). Ratings were made using a 5-point scale ranging from very good to very poor. The teacher ratings were summed across years and curriculum areas and then averaged to provide a teacher rating grade point average for each child ( $\alpha = .96$ ).

Problems with school, including issues with teachers, peers, or problem behaviour were assessed at age 15 via parent's ratings of the nature and severity of 5 kinds of school problems. A total school problems score was obtained by summing the number of problems identified by parents. A measure of secondary school achievement was provided by a count of the number of pass (A, B or C) grades attained in School Certificate examinations; School Certificate was a national series of examinations available to all students that was usually undertaken in the 3<sup>rd</sup> year of high school (age 15-16 years). Finally, cohort members who reported having attained no secondary school qualifications by the age 21 assessment were classified as having left school without qualifications.

### *Statistical analyses*

The bivariate associations between the 3-group measure of pregnancy/abortion status and the outcomes were modeled by fitting a series of regression models to the observed data. For continuous outcomes (income, partner relationships) least squares regression models were fitted\*.

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\* These models were of the form:  $Y_i = B_0 + B_1 X_{1i} + B_2 X_{2i} + U_i$ , where  $Y_i$  was the outcome for the  $i$ th participant;  $X_1$  and  $X_2$  were design variates representing pregnancy with abortion and pregnancy without abortion respectively compared to never being pregnant and  $U_i$  was a disturbance term.

For dichotomous outcomes (education, employment, welfare dependence) logistic regression models were fitted <sup>†</sup>.

In each case the parameters of the fitted model were used to derive tests of significance of the overall association of pregnancy history with each outcome and pairwise comparisons between groups <sup>‡</sup>. A similar procedure was used to examine the associations between covariates and the measure of pregnancy/abortion status.

To adjust the observed associations between pregnancy/abortion history and outcomes for confounding, the regression models above were extended to include the covariate factors <sup>§</sup>. In fitting these models both forwards and backwards methods of covariate selection were used to identify the best fitting and most parsimonious model representation for each outcome. From the parameters of final fitted model for each outcome tests of the adjusted association between pregnancy/abortion status and the outcome and tests of pairwise between group differences were constructed for each outcome as described above. Estimates of the adjusted means or percentages for each outcome were obtained using the methods described by Lee<sup>27</sup>.

Finally, as noted above, the complicated pregnancy history of a number of cohort members led to some issues regarding the classification of abortion status. In order to examine the sensitivity of the analysis to the way in which the woman's pregnancy/abortion status had been classified, the data were reanalyzed using a number of alternative representations the woman's pregnancy and

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<sup>†</sup> These models were of the form:  $\text{Logit}(Y_i) = B_0 + B_1 X_{1i} + B_2 X_{2i}$ , where  $\text{Logit}(Y_i)$  was the log odds of the outcome  $Y$  for the  $i$ th participant and  $X_1, X_2$  were design variates.

<sup>‡</sup> Specifically, a test of the joint hypothesis that  $B_1 = B_2 = 0$  led to either an F-test (for continuous outcomes) or a chi squared test (for dichotomous outcomes) of the overall association between pregnancy history and the outcome. Similarly, the test of significance on the parameter  $B_1$  provided a test of the pairwise difference between those having abortion and those who were never pregnant, the test on the parameter  $B_2$  provided a test of the pairwise comparison between the pregnant without abortion and never pregnant groups, and the difference between the parameters  $B_1 - B_2$  provided a test of the pairwise comparison between the abortion and pregnant no abortion groups.

<sup>§</sup> For continuous outcomes these models were of the general form:  $Y_i = B_0 + B_1 X_{1i} + B_2 X_{2i} + \sum B_j Z_{ji} + U_i$ ; and for dichotomous outcomes:  $\text{Logit}(Y_i) = B_0 + B_1 X_{1i} + B_2 X_{2i} + \sum B_j Z_{ji}$ , where  $Z_j$  were the set of covariate factors

abortion history prior to age 21 years. Two alternative classifications of the women's pregnancy/abortion status prior to age 21 were constructed: (a) *First pregnancy* - In this approach the classification of the woman's pregnancy/abortion status was based upon her first pregnancy only; (b) *Two dichotomous variables* - This approach involved using pregnancy without abortion and pregnancy with abortion as correlated dichotomous predictor variables to take into account the possible overlap between abortion and pregnancy without abortion. All analyses were then repeated excluding the 11 women whose only pregnancy had resulted in miscarriage.

## Results

### *Bivariate associations*

Table 1 shows the associations between pregnancy history prior to age 21 and subsequent education, welfare dependence and employment, and partnership outcomes from ages 21-25. The Table shows the following results:

First, in all cases, those becoming pregnant and not seeking abortion had significantly ( $p < .05$ ) disadvantaged outcomes when compared to those not becoming pregnant.

Second, in 6 out of the 10 comparisons, those having an abortion had significantly advantaged outcomes when compared with those becoming pregnant but not seeking an abortion. Those having an abortion were significantly more likely than those who became pregnant but did not have an abortion to have attended university ( $p < .001$ ), to have gained a university degree ( $p < .001$ ), to have gained a tertiary qualification other than a university degree ( $p < .05$ ), and were less likely to be welfare dependent ( $p < .001$ ). Those having an abortion also had significantly higher mean personal income ( $p < .001$ ) and experienced a significantly lower mean level of interpartner violence ( $p < .001$ ) than those who became pregnant but did not have an abortion.

Third, the analyses also revealed that, in 7 out of the 10 comparisons, those becoming pregnant and having an abortion had outcomes that were not significantly different ( $p > .05$ ) from

those not becoming pregnant. Those having an abortion were not significantly more likely than those who did not become pregnant to have attended university, gained a university degree, enrolled in other tertiary study or gained a tertiary qualification. Also, those having an abortion did not differ from those who did not become pregnant on mean family income, exposure to partner violence, or relationship satisfaction.

These results imply that those becoming pregnant and not seeking an abortion were typically disadvantaged in the areas of education, income, and welfare dependence when compared to those having an abortion and those not becoming pregnant.

INSERT TABLE 1 HERE

#### *Covariate factors*

Table 2 shows the associations between pregnancy history prior to age 21 and a range of background, adjustment, and educational attainment factors. The Table shows that those who became pregnant but did not have an abortion prior to age 21 tended to: (a) come from educationally and economically disadvantaged backgrounds ( $p < .05$ ); (b) had lower intelligence scores and levels of educational achievement ( $p < .001$ ); and (c) were more likely to leave school without educational qualifications ( $p < .001$ ). These results clearly show that young women becoming pregnant prior to 21 but not seeking an abortion were an educationally and socially disadvantaged group prior to their pregnancies.

#### *Covariate Adjusted Results*

Table 3 shows the means and percentages for education, income, welfare dependence, and partnership outcomes by age 25, after adjustment for the covariate factors presented in Table 2. The major conclusions drawn from this Table are as follows.

First, after adjustment for background factors, there were no significant differences between those becoming pregnant and having an abortion and those becoming pregnant and not seeking an abortion in the majority of comparisons. The exception to this trend was that those having abortions had significantly ( $p < .05$ ) higher rates of educational achievement than those who became pregnant but did not have abortions. Women having an abortion prior to age 21 had rates of tertiary qualification attainment that were 1.7 times higher (95% CI: 1.1 to 2.6) and rates of university degree attainment that were 2.8 times higher (95% CI: 1.2 to 6.3) than those who became pregnant but did not seek an abortion.

Second, there were consistent tendencies for those not becoming pregnant by 21 to be employed full time and have lower rates of welfare dependence than those becoming pregnant by 21.

The results of these analyses suggest that background and selection factors explained most of the differences in life outcomes between those who had abortion and those who became pregnant but did not have abortions, although there appeared to be some residual advantage in terms of degree or qualification attainment for those who had abortions.

INSERT TABLES 2 AND 3 HERE

#### *Supplementary analysis*

To examine the sensitivity of the results to classification decisions, the data were first re-analysed using the two alternative classifications of the women's pregnancy/abortion status prior to age 21 as described in Methods. The results of this series of analyses were generally consistent with the findings reported in Tables 1 and 3.

First, in all analyses there were significant ( $p < .01$ ) bivariate associations between the pregnancy/abortion classification and all outcomes. In all analyses, pregnancy without abortion was associated with consistently poorer outcomes (reduced educational achievement, lower income,

higher welfare dependence, poorer partner relationships) than was pregnancy with abortion; and never being pregnant was associated with the better outcomes than becoming pregnant, with or without abortion.

Second, in all analyses, adjustment for confounding factors showed that most of the differences between pregnancy with abortion and pregnancy without abortion were explained by the selection factors in Table 2. However, even after covariate adjustment, all analyses produced evidence of significant or marginally significant tendencies for pregnancy with abortion to be associated with improved educational outcomes compared to pregnancy without abortion. Analyses using both alternative classification approaches showed significantly higher ( $p = .04$  to  $.05$ ) levels of degree attainment amongst those having abortions. In addition, analysis approach (b) showed marginally significant tendencies ( $p = .07$ ) toward higher likelihood of gaining any tertiary qualification amongst those having abortions, and significantly ( $p = .03$  to  $.04$ ) lower rates of partner violence than those who became pregnant without seeking an abortion. In all other cases, the differences between those becoming pregnant with or without abortion became non-significant after covariate adjustment.

Third, in all analyses, after covariate adjustment those having abortion had significantly ( $p < .01$ ) higher rates of welfare dependence and lower rates of full-time employment than those who were never pregnant. However, all other comparisons between these groups became non-significant.

Finally, consistent with the findings in Table 3, in all analyses the adjusted results showed that in comparison to those who were never pregnant, those who became pregnant but did not have an abortion had significantly lower income ( $p < .001$ ), higher rates of welfare dependence ( $p < .01$ ), less involvement in full-time employment ( $p < .01$ ), lower levels of degree attainment ( $p < .05$ ) and tertiary qualification ( $p < .05$ ). In addition, the analyses based on alternative classification approach (b) above also suggested significant ( $p < .01$ ) tendencies for pregnancy without abortion to be associated with higher rates of exposure to partner violence.

These results suggest that while there were minor differences between analysis approaches, all analyses led to a similar set of conclusions. These conclusions were: (a) In all analyses, young women who became pregnant but did not have an abortion had more disadvantaged outcomes than those having abortions or those not becoming pregnant; (b) Much of the association between pregnancy status prior to age 21 and later outcomes was explained by the relative disadvantage of the young women who became pregnant but did not have an abortion; (c) There remained evidence to suggest that even following control for confounding factors, abortion was associated with increased rates of educational attainment; (d) After adjustment for selection processes, the outcomes of those having abortions did not greatly differ from those not becoming pregnant. However, those having abortions had significantly higher rates of subsequent unemployment and welfare dependence.

### Discussion

Previous research has suggested that the major reasons that young women seek abortion is to reduce the perceived effects of an unwanted, unplanned, or mistimed pregnancy on life course plans<sup>1-4</sup>. This paper has used data gathered over the course of a 25-year longitudinal study to explore the extent to which abortion prior to the age of 21 mitigated the educational, economic and related disadvantages that have been associated with early pregnancy.

This analysis showed that, compared with those who became pregnant but did not have abortions, prior to adjustment for confounding factors, those having abortions had relatively advantaged outcomes on most measures of educational achievement, income, avoidance of welfare dependence, and partnership relationships. At first sight these findings clearly suggest multiple possible benefits of abortion. However, subsequent analyses suggested that most of the differences between the outcomes of pregnant young women having and not having abortion were explained by the fact that those seeking abortion were a more socially and educationally advantaged group prior to pregnancy. When due allowance was made for pre-pregnancy factors, most of the differences

between pregnant women seeking and not seeking abortion became statistically non-significant. Nonetheless, even following control for pre-pregnancy factors, there was evidence of better educational attainment amongst those young women having abortions than those becoming pregnant but not having abortions. In particular, those having abortions had rates of degree and tertiary qualifications that were between 1.7 to 2.8 times higher than those becoming pregnant and not seeking abortion. Furthermore, those having abortion had rates of educational achievement that were similar to those not becoming pregnant. These results were found using a series of different approaches to classifying pregnancy history.

The results of this study clearly suggest that having an abortion acted to mitigate the educational disadvantage that was associated with early pregnancy but that these advantages were not evident in the areas of income, welfare dependence and partnership relationships. These results are consistent with previous findings suggesting that abortion in young women may protect their educational opportunities<sup>13,14</sup>. It is possible that, for these women, the choice to have an abortion allowed greater freedom to pursue their educational goals. At the same time, these educational advantages did not extend to similar advantages in the areas of income, welfare dependence, and partnership outcomes.

These conclusions should be considered in the light of a number of limitations of the present research. First and foremost, the present study was based on a particular birth cohort studied in a specific social context. In particular, there are specific procedures that must be followed to obtain a legal abortion in New Zealand, described in Methods (above). This implies that the findings of this study may be specific to the New Zealand context and the legal requirements that regulate access to abortion in New Zealand.

A second limitation of the current study is that the comparisons between those having abortions before 21 and those becoming pregnant by 21 but not having an abortion were based on relatively small group numbers. This feature limits the statistical precision of the comparisons

between these groups, and it may be that the study of larger groups would reveal further advantages associated with abortion.

A third limitation concerns the measures of personal and family income. In this study, family income was calculated for those individuals living with a spouse or intimate partner by summing the individual's personal income and the spouse/partner's income. For all other individuals, the measures of personal and family income were equivalent. A number of participants lived with parents or other family members, and may therefore have had greater financial resources than these measures of income might have indicated, thus potentially limiting the precision of these measures.

Finally, although we have taken into account a range of covariate factors, the possibility that the results are further confounded by non-observed confounding factors should not be overlooked (including factors related to the process of obtaining an abortion, noted above). The validity of any causal conclusions drawn regarding the relationship between abortion and educational outcomes may be affected by the existence of non-observed confounding or selection factors that have been omitted from the analyses.

Debates about the advantages and liabilities of abortion have been dominated by the rhetoric and political ideologies of those holding pro-life and pro-choice positions. On the one hand those holding pro-life positions have tended to depict abortion as having few advantages and many disadvantages<sup>28</sup> whereas those holding a pro-choice position have promoted the opposite view<sup>29</sup>. The accumulated findings of this study lead to conclusions that fall between these extremes. In a previous paper we found that exposure to abortion was associated with a moderate increase in risks of subsequent mental health problems even when due allowance was made for confounding factors<sup>30</sup>. The present analysis suggests that abortion may mitigate some of the educational disadvantages that have been linked to early pregnancy, but that similar benefits are not evident for economic or partnership outcomes. The discrepancies between these findings and the rhetoric of both pro-life and pro-choice arguments strongly underlines the need for further research into the risks and

benefits associated with abortion as a means of addressing the issues raised by unwanted or mistimed pregnancies. In general, there is a clear need for further study of the social, educational and related outcomes of the decision to terminate a pregnancy so that women may be properly informed of the potential consequences of this decision for their future life course.

**Authors' Contributions:** DMF, JMB, and LJH designed the study and each contributed to writing the manuscript and editing the final version. JMB and LJH performed the statistical analyses of the data. We declare no conflicts of interest.

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Table 1. Associations between pregnancy history prior to age 21 and subsequent outcomes at ages 21-25.

Measure	Abortion prior to age 21 (n = 48)	Pregnancy but no abortion prior to 21 (n = 77)	Never pregnant by age 21 (n = 367)	$\chi^2$
<u>Education outcomes ages 21-25</u>				
% attending university	29.2	11.7 <sup>†‡</sup>	39.6	18.61***
% gaining university degree	18.8	3.9 <sup>†‡</sup>	31.3	19.54***
% enrolling in any tertiary study	50.0	39.0 <sup>†</sup>	57.8	21.33***
% gaining tertiary qualification	41.7	22.1 <sup>†‡</sup>	52.0	9.20*
<u>Income at age 25</u>				
Mean personal income (NZD \$000) (SD) (range = 0 to 120)	24.2 <sup>†</sup> (13.7)	17.7 <sup>†‡</sup> (15.2)	31.7 (19.2)	20.63***
Mean family income (NZD \$000) (SD) (range = 2.09 to 150)	43.6 (29.3)	35.9 <sup>†</sup> (24.1)	53.1 (34.0)	8.31**
<u>Welfare dependence and employment ages 21-25</u>				
% welfare dependent ever ages 21-25	54.2 <sup>†</sup>	68.8 <sup>†‡</sup>	25.1	55.88***
% full-time employment at age 25	41.7 <sup>†</sup>	30.0 <sup>†</sup>	73.6	56.95***
<u>Partnerships age 25<sup>1</sup></u>				
Mean exposure to partner violence age 24-25 (SD) (range = 0 to 21)	2.00 (2.7)	3.20 <sup>†‡</sup> (3.6)	1.75 (2.5)	11.38***
Mean dissatisfaction with partnership score age 25 (SD) (range = 10 to 29)	13.6 (3.2)	14.4 <sup>†</sup> (4.8)	12.5 (3.2)	7.80**

<sup>1</sup> The analysis of partnership outcomes is limited to the subsample of participants who reported an intimate partner relationship at age 24-25 years (abortion n = 42; pregnancy, no abortion n = 69; never pregnant n = 307).

<sup>†</sup> Significantly different from the “never pregnant by age 21” group, p < .05

<sup>‡</sup> Significantly different from the “abortion prior to age 21” group, p < .05

\* p < .05

\*\* p < .01

\*\*\* p < .001

Table 2. Associations between sociodemographic and childhood behavioural and education achievement factors, and pregnancy history prior to age 21.

Measure	Abortion prior to age 21 (n = 48)	Pregnancy but no abortion prior to 21 (n = 77)	Never pregnant by age 21 (n = 367)	$\chi^2$
<u>Sociodemographic background</u>				
% mother lacked formal educational qualifications	52.0	74.4 <sup>†‡</sup>	43.7	22.45***
% father lacked formal educational qualifications	54.3	61.6	45.5	6.85*
Mean family living standards ages 0-10 (range = 1 to 5) <sup>1</sup>	2.9	3.2 <sup>†‡</sup>	2.8	8.97**
Mean SES category at birth (range = 1 to 6) <sup>1</sup>	3.7	4.3 <sup>†‡</sup>	3.3	7.06**
<u>Childhood behaviour/educational achievement</u>				
Mean conduct problems score ages 7-9 (range = 41 to 83)	50.1 <sup>†</sup>	51.8 <sup>†</sup>	47.1	18.92***
Mean IQ score age 8-9	102.8	97.7 <sup>†‡</sup>	104.2	4.13*
Mean TOSCA score age 13 (range = 0 to 69)	36.2	31.3 <sup>†‡</sup>	38.0	4.22*
Mean GPA ages 11-13 (range = 1 to 5) <sup>1</sup>	2.4	2.6 <sup>†</sup>	2.2	8.02**
Mean number of school problems reported age 15 (range = 0 to 4)	.40 <sup>†</sup>	.42 <sup>†</sup>	.14	8.45**
Mean number of School Certificate passing grades (range = 0 to 7)	2.6 <sup>†</sup>	1.8 <sup>†‡</sup>	4.0	36.07***
% leaving school without qualifications	28.0 <sup>†</sup>	44.9 <sup>†‡</sup>	6.1	67.67***

<sup>1</sup> Lower means correspond to more positive outcomes

<sup>†</sup> Significantly different from the “never pregnant by age 21” group,  $p < .05$

<sup>‡</sup> Significantly different from the “abortion prior to age 21” group,  $p < .05$

\*  $p < .05$

\*\*  $p < .01$

\*\*\*  $p < .001$

Table 3. Associations between pregnancy history prior to age 21 and subsequent outcomes at ages 21-25 years after adjustment for covariate factors.

Measure	Abortion prior to age 21	Pregnancy but no abortion prior to 21	Never pregnant by age 21	$\chi^2$
<u>Education outcomes ages 21-25</u>				
% attending university	36.2	22.0	36.0	4.36
% gaining university degree	26.7	9.7 <sup>†‡</sup>	27.3	5.48
% enrolling in other tertiary study	57.7	64.4	55.3	2.10
% gaining other tertiary qualification	51.4	30.4 <sup>†‡</sup>	49.7	7.65*
<u>Income at age 25</u>				
Mean personal income (NZD \$000)	25.5	21.9 <sup>†</sup>	30.8	9.64**
Mean family income (NZD \$000)	44.3	38.8 <sup>†</sup>	52.8	6.05*
<u>Welfare dependence and employment ages 21-25</u>				
% welfare dependent ever ages 21-25	52.3 <sup>†</sup>	57.4 <sup>†</sup>	28.0	26.97***
% full-time employment at age 25	44.2 <sup>†</sup>	35.9 <sup>†</sup>	72.9	36.21***
<u>Partnerships age 25</u>				
Mean exposure to partner violence age 24-25	1.82	2.57	1.86	0.71
Mean dissatisfaction with partnership score age 25	13.3	13.4	12.7	1.59

<sup>†</sup> Significantly different from the “never pregnant by age 21” group,  $p < .05$

<sup>‡</sup> Significantly different from the “abortion prior to age 21” group,  $p < .05$

\*  $p < .05$

\*\*  $p < .01$

\*\*\*  $p < .001$