IMPACT OF SCHOOL-BASED SUPPORT ON EDUCATIONAL OUTCOMES OF TEEN-MOTHERS: EVIDENCE FROM NEW ZEALAND'S "TEEN PARENT UNITS"

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Note on Random Rounding

All counts presented in this study have had Statistics New Zealand confidentiality rules applied. This includes the random rounding of all counts to base 3. Therefore, the sample counts presented are not exact, and in some cases aggregating sub-samples will not yield the exact population counts.

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Executive Summary

This report evaluates a unique intervention in New Zealand, where some teenage mothers have the opportunity to complete their secondary schooling at a Teen Parent Unit (TPU).

TPUs are governed by mainstream high schools ("TPU governing schools"), and are specifically designed for teenagers who are pregnant or parents. Units provide childcare (often on-site), links to health and other social services, and guidance and mentoring. To date there has been no quantitative study that establishes whether TPUs are effective in improving educational outcomes.

We find that for the cohorts studied, access to a TPU increased school enrolment rates and school qualifications for teenage mothers aged under 19 at their first birth.

The school enrolment rate after birth for the teenage mothers studied was 35 percent. Those who had access to a TPU within 20 km were 4 percentage points more likely to enrol in school after giving birth (significant at the 5 percent level). Those who had access to a TPU by virtue of being enrolled in a TPU governing school at conception were an additional 11 percentage points more likely to enrol (significant at the 1 percent level), and were estimated to be more likely to attain National Certificate in Educational Achievement (NCEA) Level 1 and 2 post-birth (significant at the 1 and 5 percent levels respectively).

We estimate that for teen mothers without qualifications who enrolled in school post-birth, enrolling in a school with a TPU increased the probability of attaining NCEA Level 1 from 37 to 59 percent (significant at the 5 percent level).

We checked whether the effects found can be interpreted as causal by testing alternative hypotheses. One such alternative hypothesis is that TPU governing schools were generally "better quality" schools and therefore the impact observed for teen mothers is due partly to the nature of the governing schools rather than a causal impact of the fact that the schools hosted a TPU. We test whether TPU governing schools generally perform better for young women. Results suggests that, overall, TPU governing schools tend to be associated with

poorer educational outcomes for young women overall, strengthening our confidence that we have estimated the impacts of the TPUs, rather than the effects of more general differences in outcomes for all students in the governing schools.

A second alternative hypothesis is that young women with access to TPU schools were more likely to continue their pregnancy to term. This might lead to selection on unobserved variables, since more motivated or ambitious young women might be more likely to continue their pregnancy because they were able to make use of the TPU to continue their study. We find no evidence of such a phenomenon.

Impact evaluation based on administrative data has a number of limitations. It does not allow all of the outcomes sought by programmes to be measured, and errors in data linkage and data limitations inevitably result in some degree of imprecision in the estimation of true impacts. In this study, for example, in the absence of data on TPU enrolment we assume a young mother was enrolled in a TPU post-birth if she enrolled in a TPU governing school. This may not always have been the case.

In addition, while the quasi-experimental methods that we use seek to control and test for unobserved selection, this may not have been adequately controlled for in our analysis. Only a randomised control trial can fully remove any doubts about selection effects. Nevertheless, quasi-experimental impact evaluations using administrative data can form a useful part of the evidence-base on programme effectiveness.

Overall, our findings indicate that specialist school-based services designed to meet the needs of teenage mothers can reduce the school enrolment gap between teen women who give birth and those who do not. Additionally, these services can substantially raise the achievement levels of teen mothers who do enrol in school.

1   Introduction

New Zealand has historically had one of the highest teenage birth rates in the OECD – second only to the United States (Families Commission, 2011). Teen births are highly concentrated amongst young women from poor families and amongst Māori and Pacifica.

The causal impacts of a teenage birth on economic outcomes such as education and wages are a point of contention amongst scholars — especially economists. Simple correlations tend to show that teen mothers have substantially worse economic and educational outcomes. However, it is likely that teenage mothers are from a selected sample of the population who would have had poorer outcomes even if they had delayed child-birth beyond their teenage years. In summarising the literature, Kearney and Levine (2012) conclude that a "substantial majority of the observed correlation between teen childbearing and inferior outcomes is the result of underlying differences between those who give birth as a teen and those who do not." (p.161.)

New Zealand, with its high teen birth rate and concentration of teenage births amongst economically deprived populations, has taken a two-track approach. While introducing some policies designed to reduce teenage pregnancies, the Government has also tried to minimise the disruption in schooling for young women enrolled in school before giving birth, and to promote second-chance learning for young women who were disengaged from schooling prior to the birth of their child. As the Families Commission overview of teenage pregnancy and parenting noted, teen mothers often struggle to maintain engagement with school. "Inflexible school policies and procedures, a lack of adequate childcare and other practical difficulties make continuing education in mainstream schools very difficult" (p.15, Families Commission, 2011).

This paper evaluates a unique intervention in New Zealand where some teenage mothers have the opportunity to receive their schooling at a Teen Parent Unit (TPU). These TPUs are specifically designed for teenagers who are pregnant or already parents.

Evaluation of this intervention helps to establish whether poor schooling outcomes for teen mothers can be off-set through schooling opportunities that are designed around the needs of

young mothers. Our study uses distance to TPUs as a proxy for access. Since TPUs are not available across all areas of the country, some young women have no access to a TPU in the surrounding area. We compare enrolment rates and educational qualifications of teen mothers in close proximity to a TPU to those further afield. We use linked administrative data, which allows us to track a near census of young women through their school-age years and observe their birth and educational outcomes.

Our findings are consistent with TPUs having two effects on the educational outcomes of teen mothers: they increase enrolment rates, and raise the probability of attaining a qualification once enrolment has taken place.

Improved educational outcomes associated with TPUs suggest that teenage birth might indeed have a causal impact on outcomes such as education. That the intervention is effective suggests that teenage birth and resulting barriers to participation and achievement play at least some role in explaining the poor schooling outcomes observed among young mothers (over and above underlying differences between those who give birth as a teen and those who do not). However, the findings from our study are not able to establish this conclusively.

This paper is organised as follows. In Section 2, we outline some details of how TPUs function. Section 3 briefly reviews the existing evidence base on similar programmes and their estimated effects. Section 4 outlines the construction of the data used in this study. Section 5 sets out some descriptive statistics on school enrolment patterns of young mothers, and Sections 6 and 7 contain the main part of the analysis. Discussion of some limitations of this study and conclusions appear in Sections 8 and 9. The Appendix contains supplementary tables and details of the location of the TPUs across the country.

2   Teen Parent Units

TPUs were set up to improve access to schooling and to promote positive educational outcomes for teenagers who are pregnant or parents. TPUs are separate units that are governed by mainstream high schools ("TPU governing schools"). The TPU is usually sited within the governing school, but in some cases is in another location. TPUs enrol pregnant and parenting teenagers[2] who are taught by registered teachers according to their individual needs. Students may also be enrolled at Te Kura — the Correspondence School, to ensure access to a wide range of curriculum areas. In these situations, courses are supervised by TPU teachers, but teaching resources and evaluations are provided remotely. In some cases, students may also access classes on-site at the governing school.

Apart from the standard high school curriculum, TPU students receive wrap-around support, pastoral care, mentoring and additional lifestyle courses (such as budgeting training). TPUs also provide early childhood education services (often on-site), and commonly have close links with other community programmes such as home-visiting services, family doctors, and Well Child/Tamariki Ora health checks for children.

Over the period covered by this study, there were no national guidelines setting out the roles and responsibilities of TPUs. Instead, these were set out in individual Memoranda of Understanding with the Ministry of Education (Education Review Office (ERO), 2014). The units could vary in what they offered students, due to deviations both in these agreements, and in the resources available in the governing school and local community. National guidelines were developed in 2014 and implemented by 2015.

The first TPU was set up in Porirua in 1994 (Baragwanath, 1997). Since then, new units have progressively been established in other parts of the country. Establishment is driven by community interest and national need. Before establishing a new TPU there needs to be interest from a potential governing school, evidence that a minimum of 15 students are ready to enrol, evidence of roll sustainability, space available to accommodate a TPU and links

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[2] While teen fathers are also able to enrol, in practice few attend these units (Families Commission, 2011).

with an early childhood education service. The Ministry of Education is the final arbiter on resourcing a new TPU (ERO, 2007; ERO, 2011; ERO, 2014).

At the time of writing, the Ministry of Education funded 23 TPUs.[3] Young parents in many parts of the country did not have access to a TPU. In 2014, the Ministry set up the "Teen Parents in Mainstream Schools" pilot programme to provide additional support to schools and students in areas where a TPU was either not available, or an existing unit did not have the capacity to take on additional students. At the time of this writing, this pilot programme was undergoing evaluation.

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[3] See Appendix Table 1 for details of the locations of these units.

3   Existing Evidence Base

Consistent with international literature, New Zealand's long-standing Christchurch and Dunedin longitudinal studies have shown strong associations between adversity in childhood and adolescence, early transition to parenthood, and educational underachievement and other poor outcomes in adulthood (Woodward and Fergusson, 1999; Fergusson and Woodward, 2000; Boden et al., 2008; Gibb et al., 2015; Jaffee et al., 2001). A study on the more recent Growing Up in New Zealand cohort highlights the clustering of young maternal age with other risk factors such as having no partner, low education level, smoking during pregnancy and receipt of an income-tested welfare benefit (Morton et al., 2015).

Other New Zealand studies have documented the very high needs of many of the students attending TPUs (Johnson and Denny, 2007), and the barriers young mothers can face in accessing information, health services and other support services (Makowharemahihi et al., 2014; Johnson and Denny, 2007; Rawiri, 2007).

While these studies provide evidence that supports the provision of specialist and intensive services for young parents and their children, to date there has been no quantitative study that establishes whether TPUs are effective in improving the educational outcomes for teenage parents (ERO, 2014). Nor has there been any investigation of their efficacy and cost effectiveness relative to other interventions such as intensive home visiting, supported housing, or enhanced services in mainstream school settings.

Those studies that are available have provided some cause for optimism that TPUs do have a positive effect. In a small in-depth longitudinal qualitative study, young mothers who had attended a TPU reported it as being helpful in changing the course of their lives for the better. They had gained access to a service that gave them the opportunity to continue their education, gave focus to their lives, led to new relationships with skilled and competent adults, and provided ready access to services for themselves and their children (Collins, 2010).

These themes are echoed in a student writing project (He Huarahi Tamariki, 2015) and a small study focused on the experiences of Māori teenage mothers, most of whom attended a

TPU (Rawiri, 2007). Results from a survey of 220 students from 19 TPUs showed that most felt safe and supported by their TPU, had plans to get more education or training after leaving the TPU, and reported that their expectations for the future had become more positive since having their baby (Johnson and Denny, 2007).

There have been multiple reports on TPUs by ERO, the Government agency responsible for evaluating and reporting on the education and care of students in schools and early childhood services. These reports are qualitative in nature, and have looked closely at performance, process and governance issues. They document a range of practices that would be expected to lead to better educational, social, health and well-being outcomes for students, and stories of students' success. At the same time, however, they highlight difficulties with student attendance and retention, and while most TPUs are assessed as performing well, some are not (ERO, 2007; ERO, 2011; ERO, 2014).

Initial development and design of TPUs was informed by specialised "schools-within-schools" operating in the United States (Baragwanath, 1997; Eisenhower Fellowships, no date). There have been few robust studies of the effectiveness of these schools, or other United States school-based interventions for adolescent parents and their children (Lachance et al., 2012; Pinzon and Jones, 2012; Seitz and Apfel, 1999).

Some of the strongest evidence that specialised school-based services can improve outcomes comes from an evaluation of the New Haven McCabe Centre, a school for pregnant teenagers. Women whose enrolment in the school was delayed due to the long summer vacation were more likely than other enrollees to have a pre-term birth. Maximum possible duration of enrolment in the school was, in effect, randomly allocated because students were only allowed to attend until the end of the school quarter in which their baby was born. After disregarding students who dropped out early, those allowed to remain in the school longer than seven weeks post-birth were less likely to have a subsequent child after a five year follow-up than those who were allowed to remain for a shorter period. In addition, for students who had been performing poorly prior to becoming pregnant, there was a positive association between the length of time they were allowed to attend and their educational outcomes (Seitz and Apfel, 1999).

Additional evidence suggestive of a positive impact on educational outcomes from a teen-parent school programme comes from an impact evaluation of on-site high-quality childcare that was made available to teen mothers in New York State conditional on their school attendance. The childcare centres were a source of advocacy and support, parent education, and connection to other community agencies. The evaluation compared mothers who enrolled in the programme with those who applied for enrolment and were placed on a waiting list but did not go on to participate. The latter group of mothers who were used as a control group showed significantly more adverse pre-programme histories compared to those who were enrolled. While the study found positive impacts after controlling for these differences, unobserved differences in risk and motivation may have remained (Crean et al., 2001).

Other programmes that are not school-based, but have some similarities to TPUs in the package of support services they provide, have been examined in a series of randomised controlled trials in the United States. A systematic review by Harden and colleagues (2006) found that programmes for teenage mothers that encouraged them to go back to school or college and provided assistance with childcare were successful in encouraging participation in education or training. High-quality programmes that focused on young mothers' education and career development without use of sanctions were more effective than those that used sanctions and incentives as part of the intervention. Across both types of programmes (those that used sanctions and incentives, and those that focused on education and career development), positive effects on participation in education and training did not necessarily translate into better rates of employment in the short-term. Young mothers in the intervention and control groups had very similar employment rates two to four years later (Harden et al., 2006).

The aim of the present study is to examine the impact of New Zealand's TPUs on educational outcomes. Our findings strengthen the international evidence-base on specialised school-based services for teen parents.

4   Data Sources

The data used for this study are from a de-identified linkage of New Zealand Government-held administrative data.[4] Included in the linkage are data from the Ministry of Education (MoE) ENROL system, which covers private, public, correspondence, denominational and special schools, that is, all registered schools.[5] Also included are New Zealand Qualifications Authority data held by the MoE on standards attained, associated credit values, and years of attainment.

The MoE ENROL data coverage expanded from 2006 to the end of 2007 by which time it covered all schools. The data include enrolment episodes, with the start and finish dates of spells at each school in which the student is enrolled. A limitation for our purposes is that these records do not allow us to establish whether a young woman who has had a teen birth is enrolled in a TPU, only whether she is enrolled in a school that is a governing school for a TPU. The data were extracted for our study in April 2014.

To be included in our study, a young woman had to be born between 1 Jan 1991 and 31 December 1994 *and* enrolled in a New Zealand school for at least one day between the start of the ENROL data in 2006 and 1 January 2008.[6] This yields 125,760 young women in the study sample.

To establish how comprehensive the data are, Table 1 shows the population size in the study and compares it to national population estimates as at 1 December 2006.[7] We have only partial cohorts for both 12 and 16 year olds. The analysis suggests that we have around 1,000 more individuals in our sample than the Statistics New Zealand December 2006 population estimates. Discrepancies could be due to young women migrating to New Zealand between December 2006 and 1 Jan 2008 who would be included in our data but not necessarily in the

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[4] This linkage is held in the Statistics New Zealand Data Lab. It is not part of the Statistics New Zealand Integrated Data Infrastructure.
[5] Children and young people in home education are not included in the data set.
[6] We drop women whose first enrolment record is after 1 January 2008 because we assume these young women were immigrants and we therefore cannot tell if they have given birth prior to entering the country.
[7] Based on Statistics New Zealand *Infoshare* downloaded on 20/01/16. Table reference DPE058AA.

population estimates. The data suggest that our method of constructing the cohort has captured a near census-level dataset of the relevant population.

Table 1: Study cohort and estimated resident female population

Age of girl as at 1 Dec 2006	Study Population	Population Estimates
12	18,369	*Not comparable*
13	30,765	30,580
14	31,143	30,730
15	32,043	31,540
16	13,440	*Not comparable*
Ages 12-16	*125,760*	*Not comparable*

Notes: Estimated resident population, females by age (Annual – December 2006). Random rounding of counts to base 3. *Source:* Infoshare, Statistics New Zealand.

The linkage used for the study also includes Ministry of Health (MoH) maternity data. Births in maternity data are identified as a result of either (i) a lead maternity carer's claim for payment; or (ii) a publicly funded hospital event. Because maternity services in New Zealand are publicly funded and provided universally and free of charge, these data capture virtually all births. We define a teen mother as a woman having a live birth between her 13th and 19th birthday, as recorded in maternity data.[8] This yields observations for 6,711 young women in the cohorts studied who had a teen (before age 19) birth.

Other administrative data in the linkage are used to establish a range of control variables. These include indicators of past involvement with the Child Youth and Family (CYF) care and protection and youth justice systems and history of being included as a dependent child in main welfare benefits. These histories were observed for young women prior to giving birth. Additional control variables include the young woman's ethnicity, and school characteristics (school decile, size of school and MoE local office to which the school was attached). Table 2 shows selected characteristics of the study sample.

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[8] Numbers with a birth before age 13 were too small to include in the analysis. We include all women who had at least one birth at age 13-18 and restrict attention to the first birth (ie. each woman appears once in the analysis and the birth of interest is the first birth). Small numbers have a second or subsequent birth before age 19.

Table 2: Characteristics of study sample

	Teen Mothers	Rest of Sample	All
European	45%	65%	64%
Māori	52%	20%	22%
Pacific	13%	10%	10%
Asian	2%	11%	10%
Other ethnic group	1%	2%	2%
1991 Birth Cohort	31%	26%	26%
1992 Birth Cohort	29%	25%	25%
1993 Birth Cohort	26%	25%	25%
1994 Birth Cohort	14%	25%	24%
Main Urban Area	67%	75%	75%
Minor Urban area	15%	12%	12%
Rural Area	3%	3%	23%
Any CYF placement prior to birth of child	13%	2%	3%
Any CYF Youth Justice referral prior to birth of child	13%	2%	2%
First observed school was Decile 1-3	36%	19%	20%
n	6,711	119,052	125,763

Notes: Study sample of young women in cohorts born between 1 Jan 1991 and 31 December 1994 and enrolled in a New Zealand school for at least one day between the start of ENROL in 2006 and 1 January 2008. Teen mothers are those who recorded a live birth between 13th and 19th birthday in the MoH maternity data. Ethnic identity variables refer to non-prioritised 'total response' measures derived from MoE Enrol data (Ethnic1, Ethnic2 and Ethnic3 variables).

Outcomes that we are concerned with in this study are enrolment in a school by the young woman after giving birth and eventual attainment of NCEA Level 1 and 2 qualifications.

ENROL data allow us to examine post-birth enrolment status of young mothers in the study. While schooling is compulsory up until the 16th birthday, 83 percent of students overall remain at school to their 17th birthday or beyond.[9]

The NCEA system is New Zealand's main national qualification standard for secondary students. Students generally begin NCEA Level 1 in year 11 (typically commencing at age 15) and continue on to NCEA Level 2 in year 12. As noted, we are able to access data that

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[9] See http://www.educationcounts.govt.nz/indicators/main/student-engagement-participation/1955.

provide detailed information about the standards and associated credits achieved by each student. Using information about how credits translate into qualifications (i.e., the requirements for the completion of NCEA Level 1 and 2 qualifications) we estimate whether the student received the qualification,[10] and also the calendar year in which it was completed. This allows us to estimate whether the young mothers in our study obtained a qualification after giving birth.

Given the different periods covered by different data sets in the data linkage, not all of our study sample participants are seen for the whole period of the study.

 provides a breakdown of the degree of censoring that applies to each birth cohort in the study.

Table 3: Censoring of study sample

Year Born	Age at start of 2006 when ENROL data starts	Age at end of 2007 when ENROL data has full coverage	Age last seen in maternity data (3 June 2012)	Age last seen in ENROL data (11 April 2014)
1991	14 - 15	16 - 17	20.5 - 21.5	22.25 – 23.25
1992	13 - 14	15 - 16	19.5 - 20.5	21.25 – 22.25
1993	12 - 13	14 - 15	18.5 - 19.5	20.25 – 21.25
1994	11 - 12	13 - 14	17.5 - 18.5	19.25 – 20.25

Data for the 1991 cohort are censored at the start in that they only first enter the ENROL data at ages 14 and 15, and are aged 16 and 17 when ENROL data gains full coverage at the end of 2007. Data for some members of the 1994 cohort are censored because we do not observe them in the maternity data right up to their 19th birthday. Controls used in our regression analysis for cohort effects account for this censoring, and also serve the purpose of taking

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[10] We estimate that NCEA Level 1 has been attained where the young person has gained at least 80 credits at Level 1 or above. We estimate that NCEA Level 2 has been attained where the young person gained at least 80 credits at Level 1 or above of which at least 60 were at Level 2 or above. Note these measures are proxies for attainment of NCEA qualifications because: (i) we do not consider literacy and numeracy credit requirements (so as to avoid the discontinuity created by the change in literacy and numeracy credit requirements in 2013); (ii) some students may have the required credits, but may not have been officially given the qualification; and (iii) some credits gained by students would be excluded when credit exclusion rules are applied to ensure that credits from similar standard assessing similar skills are excluded.

into account the steep decline in teenage births that occurred over the study period (see Appendix Figure 1), and the growth in the rates of retention in school and attainment of NCEA qualifications for recent cohorts. We test the robustness of our results to censoring through re-estimating our baseline models on restricted sub-samples for which the data were uncensored.

Data linkages within administrative domains (e.g., within health or within education systems) were generally based on anonymised administrative unique identifiers. Linkage of data across administrative domains (e.g., between the health and education systems) was probabilistic, using first name, last name, birth dates and other potentially identifying variables.[11] Data were de-identified prior to analysis, and accessed by the research team through the secure Statistics New Zealand Data Lab and a secure server at MSD. Ethics approval was granted by the Central Health and Disability Committee (Reference 14/CEN/95/AM01).

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[11] Vaithianathan et al. (2016) Appendix B provides more detail on the data linkage and clerical checks on accuracy.

5   Describing Enrolment Patterns of Young Mothers

Before turning to our main analysis, it is useful to understand the enrolment patterns of young women who give birth. For this purpose, we define a *conception date* as the (approximate) date on which the young woman conceived. We utilise maternity data, which record the gestational age of the baby at birth. By subtracting the gestational age from the baby's date of birth, we are able to establish the approximate date of conception. We define the young woman's enrolment status at conception as either: (i) enrolled in a TPU governing school; (ii) enrolled in a non-TPU school; or (iii) unenrolled.

We find that some of our sample end a spell of enrolment in December at the end of the school year, and then re-enrol in February after the summer break (although this is not the case for the majority of young women who are officially recorded as being enrolled through the summer break). In the case of these summer unenrolled sample members, if the young woman conceived during this summer period, we cannot know if she was intending to return to school. In the descriptive tables below, we consider her unenrolled if she was unenrolled at the start of the summer in which she conceived (i.e. we assume she would not have re-enrolled after the summer). We test sensitivity to excluding women who conceived in the summer break.

We define enrolment status post-birth based on a young woman's schooling engagement after the birth of her baby and before the last date where we are able to observe her in the ENROL data (April 2014). A young woman's post-birth enrolment status can be defined as either: (i) enrolled in a TPU governing school;[12] (ii) enrolled in a non-TPU school; or (iii) unenrolled. We prioritise TPU governing school enrolment so that a young woman who has at any point enrolled in a TPU governing school post-birth is classified as enrolled in a TPU governing school. If she enrols after birth but never enrolled in a TPU governing school, we classify her as enrolled in a non-TPU school. **Error! Reference source not found.** describes the enrolment status of teen mothers at conception including and excluding those who conceived in the summer periods. We also calculate this statistic for young women who conceived in

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[12] Recall that we are not able to see if a woman is enrolled in and attending the TPU, only that she is enrolled at a governing school for a TPU.

2008 or later. This is to address the concerns about data censoring – data on enrolment status at conception for those who conceived in 2006 and 2007 might be patchy due to ENROL data not being comprehensive until the end of 2007.

Table 4: Proportion of teen mothers enrolled in school at conception by age at first birth

Mother's age at first birth	All teen mothers		Excluding mothers with summer conception date		Conceived in 2008 or later and excluding mothers with summer conception date	
	% enrolled at conception	*n*	% enrolled at conception	*n*	% enrolled at conception	*n*
13	Too few for display		Too few for display		Too few for display	
14	59%	111	68%	99	Too few for display	
15	75%	465	79%	438	82%	183
16	60%	1,254	64%	1,170	65%	801
17	32%	2,355	37%	2,055	36%	1,920
18	19%	2,514	21%	2,187	21%	2,187
All	35%	6,711	40%	5,958	36%	5,112

Notes: Study sample of young women in cohorts born between 1 Jan 1991 and 31 December 1994 and enrolled in a New Zealand school for at least one day between the start of ENROL in 2006 and 1 January 2008 and who recorded a live birth between 13th and 19th birthday in the MoH maternity data. Summer conception is defined as the baby being conceived *inter alia* between December and February. Conception date is calculated as birth date minus weeks of gestation as recorded in MoH maternity data.

Overall, for the sample as a whole, between 35 and 40 percent of young women were enrolled when they conceived (depending on the definition of the sample). The lower proportion is for the sample as a whole where we consider young women unenrolled if they were unenrolled at the start of the summer in which they conceived. Ignoring those who conceived during the summer months increases the proportion who were enrolled at conception to 40 percent. Unsurprisingly, the proportion of young women enrolled at conception falls with rising age at birth.

Because they avoid the period for which data capture is incomplete, rates for those who conceived in 2008 or later provide the best estimates of non-enrolment at ages when school enrolment would be expected to be high. These rates suggest that of mothers with their first birth at age 15, 18 percent were not enrolled in school at conception. Of mothers with their first birth at age 16, 35 percent were not enrolled in school at conception (most would have

been of compulsory school age at conception). Consistent with findings for the Christchurch birth cohort (Fergusson and Woodward, 2000), these data show that even prior to giving birth, young mothers had a low rate of engagement with schooling.

Table 5 tabulates the enrolment status of the teen mothers post-birth. Only a small group have any enrolment after giving birth (35 percent). Table 6 provides the cross-tabulation between status at conception and post birth. As expected, young women who were enrolled at conception were considerably more likely to be enrolled after birth than young women who were not enrolled at conception. The proportion enrolled post-birth was 59 percent for those enrolled at conception overall, compared to 22 percent for those not enrolled at conception. More young mothers were enrolled in a non-TPU school than in a TPU governing school post-birth. This is not surprising given that there are relatively few TPUs in the country.

Table 5: Proportion of teen mothers enrolled post-birth by age at first birth

Mother's age at first birth	% enrolled at some point after birth	n
13	Too few for display	
14	97%	111
15	85%	465
16	54%	1,254
17	35%	2,355
18	14%	2,514
All	35%	6,711

Notes: Study sample of young women in cohorts born between 1 Jan 1991 and 31 December 1994 and enrolled in a New Zealand school for at least one day between the start of ENROL in 2006 and 1 January 2008 and who recorded a live birth between 13th and 19th birthday in the MoH maternity data. Enrolment after birth is defined as having at least one day's enrolment in a school after the birth of the baby and before April 2014 (when the ENROL data ends).

Table 6: Enrolment status of teen mothers at conception and post-birth

Status at conception	Status post-birth			
	Unenrolled	TPU governing school enrolled	Non-TPU school enrolled	*n*
Unenrolled	3,366 (78%)	486 (11%)	477 (11%)	4,329 (100%)
TPU governing school enrolled	87 (31%)	168 (59%)	30 (11%)	285 (100%)
Non-TPU school enrolled	882 (42%)	444 (21%)	759 (36%)	2,085 (100%)
Missing	Too few to report			15
n	4,335	1,104	1,260	6,711

Notes: Study sample of young women in cohorts born between 1 Jan 1991 and 31 December 1994 and enrolled in a New Zealand school for at least one day between the start of ENROL in 2006 and 1 January 2008 and who recorded a live birth between 13th and 19th birthday in the MoH maternity data. 15 observations have missing conception status. TPU enrollment is prioritized so that a young woman who has at some point enrolled in a TPU governing school after the birth of her child is classified as TPU governing school enrolled post-birth. Where there is a summer conception date, we consider young women unenrolled if they were unenrolled at the start of the summer in which they conceived.

An interesting exercise is to compare post-birth enrolment rates of the 285 young women who were enrolled in a TPU governing school when they conceived and the 2,085 young women who were enrolled in a non-TPU school when they conceived. The post-birth enrolment rate for the former group is 70 percent whereas for the latter it is 58 percent. Of course, there might be other differences between these schools – but if we assume that young women did not enrol in a TPU governing school in order to conceive, then this higher enrolment rate is suggestive of a positive impact of TPUs.[13]

It should be noted that young women who conceive while attending a TPU governing school can switch enrolment to a non-TPU school post-birth (and 11 percent do so). However, young women who conceive while attending a non-TPU school are nearly twice as likely to switch enrolment to a TPU governing school (21 percent make this transition). This is despite the fact that there are relatively few TPU governing schools and they are non-existent in many regions of the country. This is why we do not estimate impacts on educational

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[13] We recalculated these rates for those young women who conceived in 2008 or later, and we can confirm that the results in Table 5 are not due to the censoring problem we discussed earlier.

attendance and attainment based on enrolment in a TPU governing school post-birth. If we were to use such an estimation strategy, potential sample selection effects resulting from more motivated teen mothers migrating to these units could bias the estimated impacts of TPUs on the educational outcomes of teen mothers.

6   TPUs and Educational Outcomes for Young Mothers

We now turn to the primary purpose of this study, which is to evaluate the impact of access to a TPU on educational outcomes for young women who have given birth. That is:

$$(1) \qquad Pr(Y = 1) = \Phi(\beta_0 + \beta_1 X + \beta_2 TPU_{Access})$$

where *Y* is a dummy variable that takes on a value of one if an individual was either enrolled in school or completed an NCEA qualification post-birth; and zero otherwise. The vector *X* includes a range of individual and neighborhood control variables, and *TPU_Access* is an indicator variable of whether the young woman had access to a TPU. The probabilities of a teen mother being in school or completing an NCEA qualification are based on the cumulative density function of the standard normal $\Phi(\cdot)$. The coefficient β_2 is the parameter of interest. We hypothesise that access to a TPU will increase the probabilities of both post-birth school enrolment and the completion of NCEA Level 1 and 2 qualifications (i.e., $\beta_2 > 0$).

The most statistically robust way to estimate this would be to provide access to TPUs for a randomly selected group of teen mothers (the "treated"), and to compare their outcomes to those who did not receive any access. Such a study design was not applied in the introduction and expansion of TPUs, and given that the consensus based on existing evidence is that the units are beneficial to the young women they serve, could not be justified on ethical grounds.

However, the manner in which TPUs have evolved does provide opportunity for a "quasi-experimental" study design. TPU coverage across the country is incomplete (see Appendix Table 1) and young women's access depends largely on where they live. Some regions have no TPUs and the women in these areas provide a useful control. Moreover, prior to becoming pregnant some young women were enrolled in schools that happened to be TPU governing schools.[14] These young women have easy access to a TPU since they do not have to change

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[14] Most governing schools had begun hosting TPUs before 2006, except Flaxmere College (2014), Nelson College for Girls (2013), Tokoroa High School, James Hargest College (2011), Waiopehu College (2013) and

schools after giving birth.[15] For a third group of young women, a TPU is accessible because they live within a reasonable commuting distance of a TPU. We therefore have an opportunity to exploit whether they were enrolled in a TPU governing school prior to pregnancy and distance to a TPU as proxies for access.

6.1 Estimation Strategy

We estimate the following model:

(2) $$Pr(Y = 1) = \Phi(\beta_0 + \beta_1 X + \beta_2 TPU_{20KM} + \beta_3 TPU_{Pre-Birth})$$

where $TPU_{20KM} = 1$ if the young mother was enrolled in a school close to a TPU at or prior to conception (defined as being within 20 km of a TPU[16]), and zero otherwise; and $TPU_{Pre-Birth} = 1$ if the young mother was enrolled in a TPU governing school at conception, and zero otherwise. The dependant variable Y captures the outcomes of interest, which include; enrolment in any school after birth and achievement of NCEA Level 1 and 2 after the year of the birth and before the end of the year in which the young woman turned 19. Our evaluation approach tests whether β_2 or β_3 are individually and jointly significantly different from zero.

This approach only yields unbiased estimates if distance to a TPU is conditionally independent of outcomes for young women who give birth. Note that the requirement is a conditional independence — this includes being *conditional on a young woman giving birth*. If the presence of a TPU differentially selects young women into birth, then our strategy might yield biased estimates if there exist unobserved characteristics that influence selection and the outcome of interest. For example, if the presence of a TPU encourages more motivated young women to continue their pregnancy to term then the estimated effect of the TPU on schooling would be biased upwards. Another possible source of bias is that there

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Henderson High School (2008). These schools that became TPU governing schools after 2006 are treated as schools without a TPU.

[15] The TPU is generally located either within or close to the governing school, and has a close relationship with the governing school.

[16] 20 km was considered the upper range of a reasonable commuting distance.

may exist unobserved differences in the quality of schooling and supports for young mothers in areas that do and do not have access to TPUs. *A priori* it is unclear what the sign of these potential biases would be. In any case, we address these contamination issues later in this paper by undertaking robustness testing.

In constructing the distance dummy (TPU_{20KM}), we do not have information on the young woman's home address and therefore use distance between the school in which the young woman was enrolled at conception and the closest TPU. For those young women who were not enrolled at the time of conception, we use the distance of the last school in which they were enrolled prior to conception to the nearest TPU. We use a proximity measure defined as less than 20 km driving distance from the conception school. [17]

6.2 Schooling Outcomes for Young Mothers and Proximity to a TPU

We now turn to the results of estimating the model given in equation (2) for young women who have a teen (under 19) birth. The term X_i represents a vector of characteristics at the individual, school and neighbourhood levels. At the individual level, we include whether the young woman was enrolled at the time of conception, her birth cohort, age at first birth, ethnicity, indicators of her previous involvement with CYF care and protection and CYF Youth Justice services; and the count of days the young woman was included in a main welfare benefit before age five, a proxy for early exposure to poverty. School level controls include whether the first school the young woman was observed enrolled in was decile 1-3 (based on 2014 school deciles), and the MoE local office. Neighbourhood controls include the rural or urban classification of the young woman's census area as at the time of her child's birth (from MoH maternity data).[18]

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[17] We used a 'macro' that Google Searches the origin and destination and returns the corresponding distance between the TPU governing school and conception school locations in km. Where the physical address of the governing school was different to the physical address of the TPU, we use the physical address of the TPU.

[18] There are 954 individuals with missing data on distance between pre-conception school and the nearest TPU, which represents 14.2 percent of the sample. These observations were excluded from our regression analysis because of this key missing covariate.

Table 7 reports the key regression results where the outcome of interest is the probability that a young woman who had a teen (under 19) birth was subsequently enrolled in *any school* (not just a TPU governing school) post-birth.[19] The coefficients of interest to us are the effect of being less than 20 km from a TPU at conception; and of being enrolled in a TPU governing school at conception.

The estimated effects suggest that being at a school within 20 km of a TPU at conception increases overall post-birth enrolment by 4.0 percentage points compared to being at a school further than 20 km away (significant at a 2.1 percent level). Moreover, if the young woman was enrolled in a TPU governing school at conception, there is an additional 11.1 percentage point increase in her post-birth enrolment probability (significant at better than a 1 percent level). The combined effects mean that the average teen mother's post-birth school enrolment rate would be 15.1 percentage points higher if she was enrolled in a TPU governing school at conception compared to a teen mother who was enrolled in school at conception but had no TPU within 20km.

Table 7: Marginal effects for teen mothers on probability of post-birth enrolment

	Estimated effect on probability of enrolment post-birth. [95% confidence interval] and *p*-value
Distance of young woman's school at conception to TPU<20 km (TPU_{20KM})	0.040^{**} [0.006 0.073] $p = 0.021$
TPU governing school enrolled at conception ($TPU_{Pre-Birth}$)	0.111^{***} [0.040 0.183] $p = 0.002$
School enrolled at conception	0.265^{***} [0.235 0.296] $p = 0.000$
n	5,625

Notes; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Study sample of young women in cohorts born between 1 Jan 1991 and 31 December 1994 and enrolled in a New Zealand school for at least one day between the start of ENROL in 2006 and 1 January 2008 and who recorded a live birth between 13th and 19th birthday in the MoH maternity data. Individuals whose distance from TPU is missing (n = 954) and where MoE local office is missing (n = 123) and age of mother predicts perfectly (n = 9) were excluded from the regression. Other controls are ethnicity, cohort, rurality, age of mother at birth of first child, MoE local office, indicators of CYF placement prior to birth of child and CYF Youth Justice referral prior to birth of child, total days on benefit in first 5 years of life, school size, and school decile ranking (equaling 1 to 3 vs. 4 or greater). This table only reports some of the key findings from this analysis. A full set of regression results can be found in Appendix Table 2.

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[19] Complete sets of all regression results are available in the Appendix to this report.

reports on the key regression results for estimated completion of NCEA Level 1 and 2 qualifications by the end of the year in which the young woman turned 19. We only consider young women who had not yet attained sufficient credits to gain these qualifications by the end of the year in which they gave birth.[20]

Table 8: Marginal effects on probability of teen mothers completing NCEA Level 1 and 2 qualifications, sub-samples without the qualification before the end of the year of their first birth

	NCEA Level 1	NCEA Level 2
Distance of young woman's pre-conception school to TPU<20 km (TPU_{20KM})	-0.016 [-0.052 0.020] $p = 0.390$	-0.004 [-0.032 0.025] $p = 0.807$
TPU governing school enrolled at conception ($TPU_{Pre-Birth}$)	0.097*** [0.025 0.169] $p = 0.009$	0.055** [0.001 0.109] $p = 0.047$
School enrolled at conception	0.244*** [0.208 0.281] $p = 0.000$	0.196*** [0.167 0.224] $p = 0.000$
n Sample mean outcomes	3,849 0.27	4,914 0.21

Notes; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Study sample of young women in cohorts between 1 Jan 1991 and 31 December 1994 and enrolled in a New Zealand school for at least one day between the start of ENROL in 2006 and 1 January 2008 and who recorded a live birth between 13th and 19th birthday in the MOH maternity data. Individuals whose distance from TPU is missing (n = 954) and where MoE local office is missing (n = 123) and age of mother predicts perfectly (n = 9) were excluded from the regression. Other controls are ethnicity, cohort, rurality, age of mother at birth, MoE local office, indicators of CYF placement prior to birth of child and CYF Youth Justice referral prior to birth of child, total days on benefit in first 5 years of life, school size, and school decile ranking (=1-3 vs. not). This table only reports some of these key findings from this analysis. A full set of regression results can be found in Appendix Table 3.

There appears to be an increased likelihood of completing NCEA Level 1 if the young woman was enrolled in a TPU governing school at conception — as she is 9.7 percentage points more likely to complete NCEA Level 1 by the end of the year she turns 19. This estimated effect is statistically significant at better than a 1 percent level. Given that the rate of completion of NCEA Level 1 by this age for teen mothers in the sample overall is only 27 percent, this represents a substantial impact on this school qualification rate (an increase of

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[20] We are unable to estimate attainment prior to the *exact date* of first birth because we only have information about the calendar year in which credits were awarded.

more than one-third). There is no additional impact on the completion of NCEA Level 1 from the young woman being close to a TPU when she conceived.

A similar effect, but smaller in magnitude, is found for the probability of completing NCEA Level 2 qualifications by age 19. Being enrolled in a TPU governing school at conception increases the probability of completing NCEA Level 2 by 5.5 percentage points. This estimated effect is statistically significant at better than a 5 percent level. Again, there is no additional impact on the completion of the NCEA Level 2 from being close to a TPU governing school at conception.

An additional interesting result is the large impact on school qualification rates of being enrolled in *any school* at the time of conception. Young women who conceived while enrolled in school are 24.4 percentage points more likely to complete a NCEA Level 1 qualification, and 19.6 percentage points more likely to complete a NCEA Level 2 qualification by age 19. [21]

6.3   Selection into Birth and Access to a TPU

New Zealand has fairly permissive abortion laws. It's estimated that the proportion of teen pregnancies that end in abortion in New Zealand ranges from 65 percent among females aged 10 to 14 years old to 36 percent among females aged 15 to 19 years old (Sedgh et al., 2015). This poses a threat to the validity of our empirical strategy, because young women who live in areas without TPUs face different educational penalties from carrying their pregnancy to term to those with ready access to TPUs. In particular, those with access to TPUs have better post-birth schooling options.

Unfortunately, we do not have any information on pregnancies or terminations in the data available to us, and therefore we are unable to directly test whether access to a TPU has an impact on whether pregnancies are carried to term. However, an indirect test can be

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[21] Even when we restrict attention to those young women born between 1992 and 1993, we find similar large effect sizes on the impact of having been enrolled during conception, on NCEA qualifications.

undertaken by estimating the following model for all young women who were enrolled at age 14.

$$(3) \qquad Pr(BIRTH = 1) = \Phi\left(\gamma_0 + \gamma_1 Z + \gamma_2 TPU_{age=14}\right)$$

where BIRTH indicates whether or not a young woman became a teen mother, Z is a set of control variables and $TPU_{age=14}$ indicates whether the young woman was enrolled in a TPU governing school at age 14 (and prior to any conception). The sign of the coefficient γ_2 is of interest to us as it indicates whether easy access to a TPU increases the teenage birth rate.

Table 9 reports the key results of this regression.[22] We find that being enrolled in a TPU governing school at age 14 has no measurable effect on the probability of giving birth before age 19. The estimated coefficient is positive, but statistically insignificant at conventional test levels. This suggests that conditional on those risk factors included in the vector Z, there are no additional unobserved factors associated with enrolment in a TPU governing school at age 14 that influence the probability of having a teen birth.

Table 9: Estimated effect of TPU governing school enrolment for all young women at age of 14 on the probability of birth

	Birth before age 19
TPU governing school enrolled at 14 $\left(TPU_{age=14}\right)$	0.002 [-0.001 0.006] $p = 0.195$
n	81,129

Notes; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Study sample of young women in cohorts between 1 Jan 1991 and 31 December 1994 and enrolled in a New Zealand school for at least one day at age 14. Individuals whose MoE local office is missing ($n = 123$) were excluded from the regression. Other controls are ethnicity, cohort, MoE local office, indicators of CYF placement prior to birth of child and CYF Youth Justice referral prior to birth of child and school decile ranking (=1-3 vs. not) and each decile on its own. This table only reports some of these key findings from this analysis. A full set of regression results can be found in Appendix Table 4.

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[22] The set of controls are only a subset of the controls used in the previous regressions. The reason is that we have richer set of controls for young women who give birth compared to all who are in the enrolment data because we are able to draw on MoH maternity data for young women who give birth.

7 Impact of TPUs vs. Mainstream Schools for the Enrolled Sample

The previous section presented results that suggested that access to a TPU governing school has measurable effects on NCEA attainment. There are potentially two ways in which access to a TPU could improve qualifications. One is that access to a TPU could result in more young women enrolling after birth. The other is that once teen mothers are enrolled, TPUs might be more successful than mainstream schools at supporting them to achieve NCEA qualifications.

In this section, we consider the impact on NCEA achievement of enrolling in a TPU governing school vs. a non-TPU school. However, this is not straightforward as there are likely to be unobservable factors that have an impact on post-birth enrolment and on NCEA attainment.

For example, consider estimating the following simple regression model on those young women who enrol in a school after they give birth:

(4) $$Pr(NCEA = 1) = \Phi(\beta_1 + \beta_2 TPU)$$

where *NCEA* is the outcome of interest, and TPU is equal to 1 if the young woman enrols in a TPU governing school after birth, and zero if she enrols in a non-TPU school after birth.

The problem with interpreting β_2 as the causal effect of enrolling in a TPU vs. non-TPU school is that students who attend TPU schools may be those who face unusually low propensities to complete NCEA qualifications. To the extent that this propensity is unobserved, it is captured in the error term and the TPU variable and disturbances would be negatively correlated. This would bias downward the estimator for β_2. Therefore, we use an

Instrumental Variable (IV) method to mitigate this bias and produce the causal inference that we want.[23]

We use distance (in kms) to the nearest TPU governing school prior to conception and enrolment in a TPU governing school at the conception date as the two valid instruments for this analysis. The main exclusion restriction is the assumption we have maintained throughout this paper — which is that the presence of a TPU did not affect a young woman's decision to continue her pregnancy to term. Indeed, we did provide some earlier evidence that the young women who were enrolled in a TPU governing school prior to conception did not have a differential teen birth rate after controlling for other characteristics.

Table 10 provides the main estimates for a "Naïve" model (the simple regression model specified in equation (4)), an IV linear probability model (LPM), and the corresponding marginal effects from an IV probit model.

For NCEA Level 1, the estimated effects show that those who enrolled in a TPU post-birth had 22.2 and 23.2 percentage point increases in their likelihood of completing NCEA Level 1 in the linear and non-linear IV models. These effects are both significantly different from zero at a 5 percent level. These estimated effects are considerably larger than those from the Naïve model (16.9 percentage points), which suggests that young women who were more likely to enrol in TPUs after birth were generally *less likely* to complete NCEA Level 1 than those who enrolled in non-TPU schools after birth. In other words, the presence of TPU governing schools tends to draw teen mothers with lower overall propensities to complete NCEA level qualifications back to school.

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[23] An instrumental variable must be correlated with the regressor (TPU), but uncorrelated with the disturbance term. A valid instrument would be something that influences the propensity to be enrolled in a TPU governing school post-birth, but is statistically unrelated to the unmeasured factors that influence the propensity to complete NCEA qualifications. We argue that distance to the nearest TPU governing school prior to conception meets these criteria.

Table 10: Impact of TPU governing school enrolment post-birth on NCEA attainment (Naïve, IV LPM and IV probit estimates on young mothers who enrolled post-birth), sub-samples without the qualification before the end of the year of their first birth

	NCEA Level 1			NCEA Level 2		
	Naïve LPM	IV LPM	IV probit (marginal effects)	Naïve LPM	IV LPM	IV probit (marginal effects)
Enrolled post-birth in TPU	0.169*** [0.118 0.219] $p = 0.000$	0.222** [0.026 0.418] $p = 0.027$	0.232** [0.022 0.442] $p = 0.031$	0.145*** [0.102 0.188] $p = 0.000$	0.134* [=0.024 0.292] $p = 0.097$	0.129 [-0.035 0.292] $p = 0.123$
Adj R-squared	0.125	Stage 1 = 0.17 Stage 2 = 0.12		0.111	Stage 1 = 0.20 Stage 2 = 0.12	
Mean NCEA completion rates for those enrolled in TPU governing schools	0.53 , $n = 720$			0.40 , $n = 903$		
F-statistic from first stage regression	9.80			12.98		
Mean NCEA completion rates for those enrolled in non-TPU schools	0.37, $n = 801$			0.27, $n = 1,008$		
n	1,521			1,911		

Notes; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Study sample of young women in cohorts born between 1 Jan 1991 and 31 December 1994 and enrolled in a New Zealand school for at least one day between the start of ENROL in 2006 and 1 January 2008 and who recorded a live birth between 13th and 19th birthday in the MoH maternity data. Individuals whose distance from TPU is missing ($n = 954$) or where MoE local office is missing ($n = 123$) or who had the relevant NCEA qualification by the end of the year prior to giving birth were excluded from the regression. Other controls are ethnicity, cohort, rurality, age of mother at birth, MoE local office, indicators of CYF placement prior to birth of child and CYF Youth Justice referral prior to birth of child, total days on benefit in first 5 years of life, school size, and school decile ranking (=1-3 vs. not). Instruments are distance (in kilometres) to the nearest TPU governing school at or prior to conception and enrolment in a TPU governing school at the conception date as the two valid instruments for this analysis. This table only reports some of these key findings from this analysis. A full set of regression results can be found in Appendix Tables 5A and 5B.

In the case of NCEA Level 2 qualifications, there is less robust evidence that TPUs are more effective with some positive effects observed in the linear IV but none in the IV probit specification. The magnitude of the estimated effect from the Naïve model is similar to those found in the IV models, but the latter are imprecisely estimated with relatively large standard errors.

As noted, the fact that the estimated effects in the IV regressions are larger than those in the Naïve model suggests that those young women who self-select into TPUs are less likely to complete NCEA qualifications. To test this, we re-estimate model (4) for young women who did *not* give birth but were enrolled in school at age 14. For this estimation, *TPU* is an indicator variable which reflects whether the young woman was enrolled in a TPU governing school or a non-TPU school at age 14.

Table 11 presents the results. We are not able to control for the same extensive set of covariates but we find that overall, young women enrolled in TPU governing schools were less likely to achieve NCEA qualifications by the end of the year in which they turned 19 compared to young women enrolled in other schools. This is not an unexpected resulted because we know that TPUs are generally linked to schools and located in places where there are higher levels of social disadvantage. It does, however, suggest that our interpretation that TPUs generally attract young women with lower overall propensities to complete school qualifications is likely to be correct.

Table 11: Estimated effects of TPU governing school enrolment at age 14 on the probabilities of completing NCEA Level 1 and 2 for women who did not have a teen (under 19) birth

	NCEA Level 1	NCEA Level 2
TPU governing school enrolled at age 14 ($TPU_{age=14}$)	-0.002 [-0.009 0.005] $p = 0.635$	-0.015*** [-0.025 -0.004] $p = 0.005$

Notes; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Study sample of young women born between 1 Jan 1991 and 31 December 1994 and enrolled in a New Zealand school for at least one day at their 14th birthday, and who did <u>not</u> have a live birth between 13th and 19th birthday. This table only reports some of these key findings from this analysis. A full set of regression results can be found in Appendix Table 6.

8   Limitations

There are a number of limitations that need to be considered in interpreting the results of this study.

Data linking is probabilistic and some errors are inevitable. The data available to us capture information collected or generated in the process of administering government services, and inevitably may embody errors in measurement, reporting and recording that occur in those processes. Data limitations result in some degree of imprecision in the estimation of true impacts. Most critically, we cannot observe whether a young mother was actually enrolled in a TPU, only whether she was enrolled in TPU governing school. In addition, we do not have access to data on place of residence, and so rely on the address of the last school of attendance to estimate a young mother's proximity to a TPU. In addition, in some cases young women who gave birth may not have gone on to parent their children, and given the data available to us we are unable to restrict the analysis to just those young women who were engaged in parenting. Finally, given the constraints of the data linkage our analysis fails to capture educational outcomes for young women who left the country through outward migration.

There are also limitations in the methods that we used. There may be unobserved selection, particularly on community level characteristics, that we may not have adequately controlled for in our analysis. We estimate NCEA level attainment from credits attained and the estimation method we use results in a degree of imprecision. There is some censoring of data[24] but we did not want to drop cohorts from the analysis if possible. We test the robustness of the NCEA results by re-analysing for two sub-samples that exclude cases affected by censoring: (1) including only sample members whose conception date was after the date that they first appeared in the ENROL data; and (2) including only sample members in birth cohorts born in 1992 and 1993 (who experienced no censoring in their inclusion in

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[24] We include the 1991 cohort. However, the MoE ENROL data start at the beginning of 2006 when members of this cohort were aged 14-15. Young women in this cohort who gave birth at 13 or 14, and left school before the beginning of 2006, or before their school came on to the ENROL system (which could be in 2007), are absent from our study.

the ENROL data). Our qualitative results were not affected by these alternative specifications.

Variability in practice and performance across TPUs has been a theme in ERO reviews (ERO, 2007; ERO, 2011; ERO, 2014). Individual TPU performance is not the focus of this study. We are not able to say from our analysis whether all TPUs generated positive impacts. Nor are we able to establish which parts of the programme are the most important in helping young mothers increase their educational attainment and achievement. In this study, we examined particular birth cohorts, and examined educational outcomes within a finite follow-up period. It may not be possible to generalise our findings to other birth cohorts, to outcomes at older ages, or to outcomes in other domains.

Future studies using newly available and more extensive linked data held in the Statistics New Zealand Integrated Data Infrastructure (IDI) are recommended. IDI data would allow a more comprehensive examination of the impact of TPUs on outcomes, including mothers' post-school educational participation, earnings and welfare benefit receipt, and including children's health and early childhood education participation.

An important topic for future study is investigating whether the impact of TPUs has altered with policy changes introduced in late 2012. These changes made enrolment in education, training or work-based learning compulsory for young parents aged 16 to 18 receiving social welfare benefits once their children reach 6 or 12 months of age (6 months if a place at a TPU is available) (ERO, 2014; Work and Income, no date).

9   Conclusions

This evaluation finds that for the cohorts studied, access to a TPU increased school enrolment rates and increased school qualifications of teenage mothers. The baseline school enrolment rate after birth for the teenage mothers studied was 35 percent. Those who had access to a TPU within 20 km at conception were 4 percentage points more likely to enrol in a school after giving birth. Those who had good access to a TPU by virtue of being enrolled in a TPU governing school at conception were an additional 11.1 percentage points more likely to enrol and were estimated to be more likely to attain NCEA Level 1 and 2 qualifications post-birth.

Examining teenage mothers without qualifications who enrolled after giving birth, those enrolling in a school with a TPU were at least 22.2 percentage points more likely to attain an NCEA Level 1 qualification than those who enrolled in a non-TPU school.

The findings provided in this report indicate that TPU services designed to meet the needs of teenage mothers can reduce the school enrolment gap between teen mothers and young women who do not give birth, and improve NCEA achievement levels of enrolled teen mothers.

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Appendix – Supplementary Tables and Figures

Appendix Table 12: Teen Parent Units in operation

Teen Parent Unit Name	Governing School
He Mataariki School for Teen Parents	Mangakahia Area School, Whangarei
Connected Learning Centre	Tangaroa College, Auckland
He Wero o nga Wahine	Henderson High School, Auckland
Eden Campus	Auckland Girls' Grammar, Auckland
Taonga Education Centre	James Cook High School, Auckland
He Puawai Teen Parent Unit	Fraser High School, Hamilton
Pa Harakeke Continuing Education Centre	Tokoroa High School, Tokoroa
Rotorua School for Young Parents	Rotorua Girls' High School, Rotorua
Te Whakatipuranga School for Young Parents	Otumoetai College, Tauranga
Te Tari Ako Matua Taiohi Teen Parent Education Centre	Tarawera High School, Kawerau
Hawke's Bay School for Teenage Parents	William Colenso College, Napier
Te Whare Whai Hua Teenage Parents Centre	Lytton High School, Gisborne
Te Tipu Whenua o Pa Harakeke	Flaxmere College, Flaxmere, Hastings
Whaimana Ako Teen Parent Unit	Stratford High School, Stratford
Whakatipuria Teen Parent Unit	Freyberg High School, Palmerston North
He Whare Poipoia	Waiopehu College, Levin
Titiro Whakamua Teen Parent Programme	Heretaunga College, Upper Hutt
He Huarahi Tamariki	Wellington East Girls' College, Wellington
Wairarapa Teen Parent Unit	Makoura College, Masterton
Nelson Young Parents' School	Nelson College for Girls, Nelson
Karanga Mai Young Parents College	Kaiapoi High School, Kaiapoi
Kimihia Parents' College	Linwood College, Christchurch
Murihiku Young Parents' Learning Centre	James Hargest College, Invercargill

Source: http://teenparentschools.org.nz/our-schools/

Appendix Figure 1: Historical teen fertility rates in New Zealand
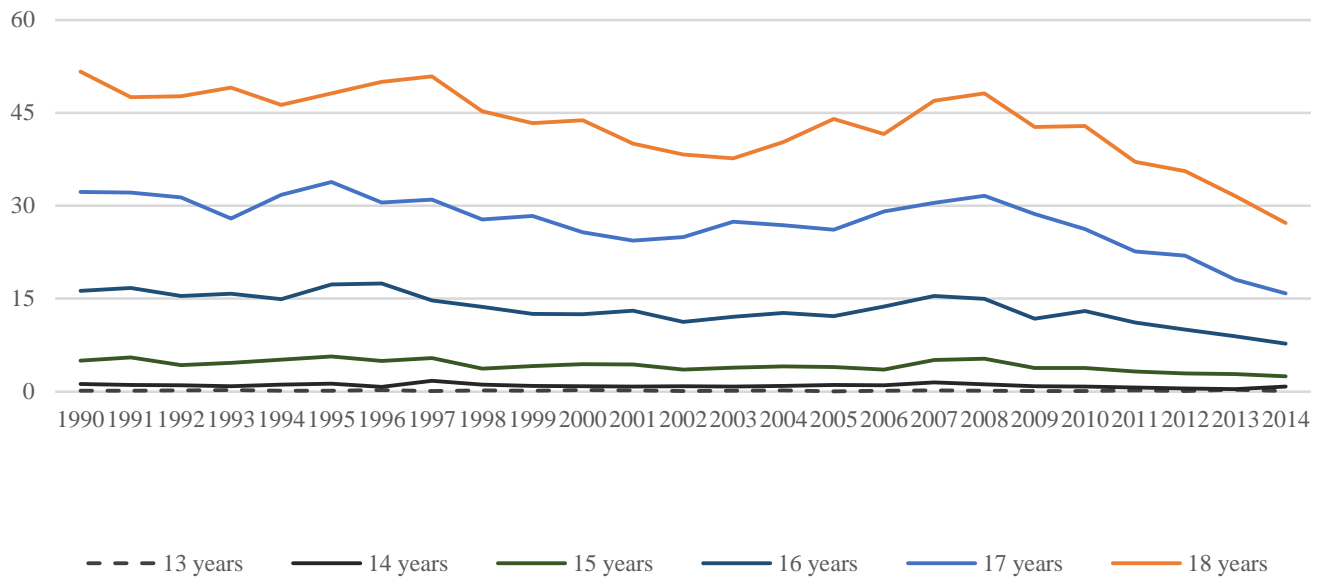
Source: Statistics New Zealand. Notes: Live births per 1,000 mean estimated female population in each age group.

Appendix Table 13: Maximum Likelihood Probit results, estimated effects for teen mothers on probability of post-birth enrolment

	Estimated Marginal Effects and Standard Errors in Parentheses
Distance of young woman's school at conception to TPU < 20 km (TPU_{20KM})	**0.040**^{**} **(0.017)**
TPU enrolled at conception ($TPU_{Pre-Birth}$)	**0.111**^{***} **(0.036)**
School enrolled at conception	0.265^{***} (0.016)
European	0.099^{***} (0.023)
Maori	0.029 (0.023)
Pacific	-0.024 (0.028)
Asian	0.114[*] (0.066)
Other ethnicity	-0.004 (0.071)
1992 birth cohort	-0.030 (0.018)
1993 birth cohort	0.017 (0.020)
1994 birth cohort	0.110^{***} (0.026)
Minor urban area	-0.019 (0.023)
Secondary urban area	0.012 (0.026)
Rural area	-0.017 (0.044)
Rural/urban not applicable/missing	0.012 (0.026)
Ever placed in CYF care	0.021 (0.023)
Ever CYF Youth Justice involvement	-0.012 (0.023)
School in bottom three deciles	-0.021 (0.017)
South Auckland MoE office	0.038 (0.032)
Christchurch MoE office	0.143^{***} (0.035)
Dunedin MoE office	0.117^{**} (0.055)
Hamilton MoE office	0.078^{***} (0.031)

Invercargill MoE office	0.159^{***} (0.052)
Napier MoE office	0.138^{***} (0.035)
Nelson MoE office	-0.019 (0.047)
Rotorua MoE office	0.166^{***} (0.033)
Wellington MoE office	0.205^{***} (0.030)
Whanganui MoE office	0.164^{***} (0.034)
Whangarei MoE office	0.151^{***} (0.039)
n	5,625
Log-Likelihood Function	-2,791.12
Pseudo R^2 Statistic	0.2416

Notes:

Full set of regression results. See the notes at the bottom of Table 7 in the main body of this report for more information on this estimation procedure. Excluded categories are birth cohort =1991, urban area = Main Urban Area and MoE Office = Auckland North.

[***] Estimated partial derivative significantly different from zero at a 1% level using a *t* test
[**] Estimated partial derivative significantly different from zero at a 5% level using a *t* test
[*] Estimated partial derivative significantly different from zero at a 10% level using a *t* test

Appendix Table 14: Maximum Likelihood Probit results, marginal effects on probability of teen mothers completing NCEA Level 1 and 2 qualifications, sub-samples without the qualification before the end of the year of their first birth

	Estimated Marginal Effects Standard Errors in Parentheses	
	NCEA Level 1	NCEA Level 2
Distance of young woman's pre-conception school to TPU < 20 km (TPU_{20KM})	**-0.016** **(0.018)**	**-0.004** **(0.015)**
TPU enrolled at conception ($TPU_{Pre-Birth}$)	**0.097***** **(0.037)**	**0.055**** **(0.028)**
School enrolled at conception	0.244*** (0.019)	0.196*** (0.015)
European	0.057** (0.024)	0.034* (0.018)
Maori	-0.001 (0.023)	-0.003 (0.018)
Pacific	0.078** (0.032)	0.045* (0.024)
Asian	-0.013 (0.064)	0.037 (0.054)
Other ethnicity	0.176** (0.085)	0.211*** (0.078)
1992 birth cohort	-0.004 (0.019)	-0.026* (0.015)
1993 birth cohort	-0.019 (0.020)	-0.005 (0.016)
1994 birth cohort	-0.007 (0.024)	-0.005 (0.019)
Minor urban area	-0.039* (0.023)	-0.055*** (0.017)
Secondary urban area	0.014 (0.027)	0.020 (0.022)
Rural area	-0.027 (0.045)	-0.027 (0.034)
Rural/urban not applicable/missing	-0.159*** (0.036)	-0.102*** (0.034)
Ever placed in CYF care	-0.040* (0.021)	-0.038** (0.018)
Ever CYF Youth Justice involvement	-0.088*** (0.019)	-0.103*** (0.015)
School in bottom three deciles	-0.026 (0.017)	-0.028** (0.013)
South Auckland MoE office	-0.029 (0.029)	-0.035 (0.021)
Christchurch MoE office	-0.081*** (0.028)	-0.099*** (0.019)
Dunedin MoE office	-0.055 (0.050)	-0.033 (0.036)
Hamilton MoE office	-0.019 (0.028)	-0.013 (0.022)

Invercargill MoE office	0.007 (0.049)	-0.041 (0.033)
Napier MoE office	0.047 (0.035)	-0.010 (0.025)
Nelson MoE office	-0.095*** (0.037)	-0.113*** (0.023)
Rotorua MoE office	0.011 (0.032)	0.014 (0.025)
Wellington MoE office	0.034 (0.030)	-0.014 (0.022)
Whanganui MoE office	-0.017 (0.031)	-0.047** (0.022)
Whangarei MoE office	-0.005 (0.038)	0.008 (0.030)
Mother at age 14	0.375** (0.163)	0.362** (0.171)
Mother at age 15	0.174*** (0.060)	0.011 (0.044)
Mother at age 16	0.096*** (0.033)	0.011 (0.024)
Mother at age 17	0.106*** (0.025)	-0.009 (0.018)
Mother at age 18	0.113*** (0.022)	0.048*** (0.016)
Days mother on benefit by age 5	-0.000** (0.000)	-0.000*** (0.000)
School size	-0.009*** (0.004)	-0.009*** (0.003)
n	3,849	4,914
Log-Likelihood Function	-1,983.98	-2,282.16
Pseudo R² Statistic	0.1247	0.1048

Notes:

Full sets of regression results. See the notes at the bottom of Table 8 in the main body of this report for more information on these estimation procedures. Excluded categories are birth cohort =1991, urban area = Main Urban Area and MoE Office = Auckland North and Mother age = 13.

*** Estimated partial derivative significantly different from zero at a 1% level using a *t* test
** Estimated partial derivative significantly different from zero at a 5% level using a *t* test
* Estimated partial derivative significantly different from zero at a 10% level using a *t* test

Appendix Table 15: Maximum Likelihood Probit results, estimated effects for all young women at age of 14 on the probability of birth

	Estimated Marginal Effects and Standard Errors in Parentheses
TPU governing school enrolled at age 14 ($TPU_{age=14}$)	**0.002** **(0.002)**
European	-0.006*** (0.002)
Maori	0.036*** (0.003)
Pacific	0.003 (0.002)
Asian	-0.022*** (0.001)
Other ethnicity	-0.013*** (0.003)
1992 birth cohort	-0.001 (0.002)
1993 birth cohort	-0.006*** (0.001)
1994 birth cohort	-0.021*** (0.001)
Minor urban area	-0.001 (0.002)
Secondary urban area	0.002 (0.002)
Rural area	-0.004 (0.003)
Rural/urban not applicable/missing	-0.009 (0.011)
Ever placed in CYF care	0.056*** (0.006)
Ever CYF Youth Justice involvement	0.085*** (0.008)
School in bottom three deciles	0.000 (0.016)
South Auckland MoE office	-0.005*** (0.002)
Christchurch MoE office	-0.006*** (0.002)
Dunedin MoE office	-0.006** (0.003)
Hamilton MoE office	0.001 (0.003)

Invercargill MoE office	0.004 (0.004)
Napier MoE office	-0.006*** (0.002)
Nelson MoE office	-0.007*** (0.003)
Rotorua MoE office	-0.006*** (0.002)
Wellington MoE office	0.002 (0.002)
Whanganui MoE office	0.001 (0.003)
Whangarei MoE office	-0.004 (0.003)
Decile 2 school at age 14	-0.005** (0.002)
Decile 3 school at age 14	-0.007*** (0.002)
Decile 4 school at age 14	-0.007 (0.013)
Decile 5 school at age 14	-0.012 (0.011)
Decile 6 school at age 14	-0.012 (0.011)
Decile 7 school at age 14	-0.016* (0.009)
Decile 8 school at age 14	-0.019** (0.008)
Decile 9 school at age 14	-0.023*** (0.007)
Decile 10 school at age 14	-0.031*** (0.005)
n	81,129
Log-Likelihood Function	-12,135.8
Pseudo R^2 Statistic	0.1209

Notes:

Full set of regression results. See the notes at the bottom of Table 9 in the main body of this report for more information on this estimation procedure. Excluded categories are birth cohort =1991, urban area = Main Urban Area and MoE Office = Auckland North, Decile school at age 14 = 1.

*** Estimated partial derivative significantly different from zero at a 1% level using a *t* test
** Estimated partial derivative significantly different from zero at a 5% level using a *t* test
* Estimated partial derivative significantly different from zero at a 10% level using a *t* test

Appendix Table 16A: Linear Probability Model and Maximum Likelihood Probit results, estimated effects on probability of completing NCEA Level 1 qualification, young teen mothers who enrolled post-birth, sub-samples without the qualification before the end of the year of their first birth

	Estimated Coefficients or Marginal Effects Standard Errors in Parentheses		
	Naïve LPM	IV LPM	IV Probit
Enrolled post-birth in TPU	**0.169***** **(0.026)**	**0.222**** **(0.100)**	**0.232**** **(0.107)**
School enrolled at conception	0.220*** (0.028)	0.222*** (0.028)	0.238*** (0.029)
European	0.102*** (0.039)	0.104*** (0.039)	0.111** (0.044)
Maori	0.002 (0.038)	0.001 (0.038)	-0.002 (0.043)
Pacific	0.059 (0.048)	0.051 (0.051)	0.052 (0.058)
Asian	-0.095 (0.104)	-0.100 (0.105)	-0.107 (0.109)
Other ethnicity	0.401*** (0.122)	0.400*** (0.123)	0.434*** (0.093)
1992 birth cohort	-0.040 (0.034)	-0.038 (0.034)	-0.046 (0.038)
1993 birth cohort	-0.062* (0.035)	-0.061* (0.034)	-0.071* (0.038)
1994 birth cohort	-0.067* (0.038)	-0.068* (0.039)	-0.077* (0.042)
Minor urban area	-0.004 (0.039)	0.009 (0.045)	0.007 (0.051)
Secondary urban area	0.039 (0.043)	0.048 (0.046)	0.053 (0.052)
Rural area	0.120 (0.082)	0.129 (0.083)	0.129 (0.092)
Rural/urban not applicable/missing	-0.152* (0.089)	-0.127 (0.100)	-0.188* (0.102)
Ever placed in CYF care	-0.076** (0.036)	-0.077** (0.036)	-0.093** (0.040)
Ever CYF Youth Justice involvement	-0.137*** (0.036)	-0.138*** (0.036)	-0.156*** (0.038)
School in bottom three deciles	-0.034 (0.029)	-0.031 (0.030)	-0.030 (0.033)
South Auckland MoE office	-0.044 (0.054)	-0.035 (0.057)	-0.036 (0.062)
Christchurch MoE office	-0.154*** (0.054)	-0.164*** (0.057)	-0.171*** (0.056)
Dunedin MoE office	-0.003 (0.104)	0.009 (0.107)	0.013 (0.118)
Hamilton MoE office	-0.071 (0.049)	-0.072 (0.049)	-0.071 (0.053)

Invercargill MoE office	-0.093 (0.081)	-0.104 (0.083)	-0.098 (0.085)
Napier MoE office	0.003 (0.053)	-0.012 (0.060)	-0.008 (0.067)
Nelson MoE office	-0.087 (0.084)	-0.073 (0.088)	-0.083 (0.094)
Rotorua MoE office	-0.006 (0.052)	-0.014 (0.053)	-0.010 (0.059)
Wellington MoE office	0.013 (0.048)	0.004 (0.051)	0.008 (0.057)
Whanganui MoE office	-0.049 (0.053)	-0.050 (0.054)	-0.051 (0.058)
Whangarei MoE office	-0.021 (0.067)	-0.026 (0.068)	-0.026 (0.075)
Mother at age 14	0.279[*] (0.163)	0.289[*] (0.164)	0.321[**] (0.145)
Mother at age 15	0.085 (0.066)	0.082 (0.067)	0.099 (0.077)
Mother at age 16	0.035 (0.050)	0.032 (0.050)	0.040 (0.058)
Mother at age 17	0.113[**] (0.047)	0.110[**] (0.047)	0.127[**] (0.055)
Mother at age 18	0.102[**] (0.047)	0.102[**] (0.047)	0.121[**] (0.055)
Days mother on benefit by age 5	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)
School size	-0.010[*] (0.006)	-0.011[*] (0.006)	-0.012[*] (0.007)
Constant	0.255[***] (0.079)	0.231[***] (0.090)	---
n	1,521	1,521	1,521
R^2 Statistic	0.1456	0.1431	---
F Statistic	7.22	6.11	---
Log-Likelihood Function	---	---	-1,861.80
Pseudo R^2 Statistic	---	---	---

Notes:

Full sets of regression results. See the notes at the bottom of Table 10 in the main body of this report for more information on these estimation procedures. The last two sets of regression results are from the second stage of these Instrumental Variable procedures. The first-stage results are available from the authors upon request. Excluded categories are birth cohort =1991, urban area = Main Urban Area and MoE Office = Auckland North, Mother age = 13.

[***] Estimated effect significantly different from zero at a 1% level using a *t* test
[**] Estimated effect significantly different from zero at a 5% level using a *t* test
[*] Estimated effect significantly different from zero at a 10% level using a *t* test

Appendix Table 17B: Linear Probability Model and Maximum Likelihood Probit results, estimated effects on probability of completing NCEA Level 2 qualification, young teen mothers who enrolled post-birth, sub-samples without the qualification before the end of the year of their first birth

	Estimated Coefficients or Marginal Effects Standard Errors in Parentheses		
	Naïve LPM	IV LPM	IV Probit
Enrolled post-birth in TPU	**0.145***** **(0.022)**	**0.134*** **(0.081)**	**0.129** **(0.083)**
School enrolled at conception	0.204*** (0.023)	0.203*** (0.023)	0.210*** (0.023)
European	0.060* (0.033)	0.060* (0.033)	0.062* (0.035)
Maori	0.013 (0.032)	0.014 (0.032)	0.014 (0.034)
Pacific	0.031 (0.041)	0.033 (0.043)	0.036 (0.046)
Asian	0.094 (0.083)	0.094 (0.083)	0.099 (0.096)
Other ethnicity	0.385*** (0.105)	0.385*** (0.105)	0.407*** (0.109)
1992 birth cohort	-0.073** (0.029)	-0.074** (0.029)	-0.078*** (0.029)
1993 birth cohort	-0.056* (0.029)	-0.056* (0.029)	-0.060** (0.029)
1994 birth cohort	-0.077** (0.032)	-0.077** (0.032)	-0.075** (0.032)
Minor urban area	-0.025 (0.032)	-0.028 (0.038)	-0.028 (0.040)
Secondary urban area	0.050 (0.037)	0.048 (0.039)	0.047 (0.043)
Rural area	0.082 (0.066)	0.080 (0.067)	0.076 (0.076)
Rural/urban not applicable/missing	-0.074 (0.081)	-0.080 (0.089)	-0.168** (0.080)
Ever placed in CYF care	-0.031 (0.032)	-0.030 (0.032)	-0.040 (0.035)
Ever CYF Youth Justice involvement	-0.172*** (0.033)	-0.172*** (0.033)	-0.202*** (0.028)
School in bottom three deciles	-0.012 (0.025)	-0.013 (0.025)	-0.011 (0.027)
South Auckland MoE office	-0.044 (0.046)	-0.046 (0.048)	-0.040 (0.049)
Christchurch MoE office	-0.123*** (0.046)	-0.122*** (0.047)	-0.121*** (0.042)
Dunedin MoE office	-0.064 (0.076)	-0.067 (0.078)	-0.064 (0.075)
Hamilton MoE office	-0.033 (0.042)	-0.033 (0.042)	-0.028 (0.044)

Invercargill MoE office	-0.096 (0.068)	-0.094 (0.069)	-0.078 (0.065)
Napier MoE office	-0.036 (0.046)	-0.032 (0.051)	-0.030 (0.052)
Nelson MoE office	-0.131* (0.074)	-0.134* (0.076)	-0.142** (0.064)
Rotorua MoE office	0.044 (0.044)	0.046 (0.045)	0.055 (0.050)
Wellington MoE office	-0.038 (0.041)	-0.036 (0.043)	-0.035 (0.044)
Whanganui MoE office	-0.032 (0.045)	-0.032 (0.045)	-0.031 (0.046)
Whangarei MoE office	0.009 (0.054)	0.011 (0.055)	0.013 (0.059)
Mother at age 14	0.295* (0.153)	0.292* (0.154)	0.344** (0.169)
Mother at age 15	-0.030 (0.058)	-0.029 (0.058)	-0.024 (0.063)
Mother at age 16	-0.028 (0.040)	-0.028 (0.040)	-0.025 (0.044)
Mother at age 17	-0.008 (0.036)	-0.008 (0.037)	-0.005 (0.041)
Mother at age 18	0.095*** (0.035)	0.095*** (0.035)	0.107*** (0.041)
Days mother on benefit by age 5	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)
School size	-0.011** (0.005)	-0.010** (0.005)	-0.011* (0.005)
Constant	0.219*** (0.064)	0.224*** (0.072)	---
n	1,911	1,911	1,911
R^2 Statistic	0.1276	0.1275	---
F Statistic	7.84	6.66	---
Log-Likelihood Function	---	---	-2,248.21
Pseudo R^2 Statistic	---	---	---

Notes:

Full sets of regression results. See the notes at the bottom of Table 10 in the main body of this report for more information on these estimation procedures. The last two sets of regression results are from the second stage of these Instrumental Variable procedures. The first-stage results are available from the authors upon request. Excluded categories are birth cohort =1991, urban area = Main Urban Area and MoE Office = Auckland North.

*** Estimated effect significantly different from zero at a 1% level using a *t* test
** Estimated effect significantly different from zero at a 5% level using a *t* test
* Estimated effect significantly different from zero at a 10% level using a *t* test

Appendix Table 18: Maximum Likelihood Probit results, marginal effects on probability of teen mothers completing NCEA Level 1 and 2 qualifications, sub-samples of women at age 14 who did not have a teen (under age 19) birth

	Estimated Marginal Effects Standard Errors in Parentheses	
	NCEA Level 1	NCEA Level 2
TPU governing school enrolled at age 14 ($TPU_{age=14}$)	**-0.002** **(0.004)**	**-0.015***** **(0.005)**
European	0.046*** (0.004)	0.058*** (0.006)
Maori	-0.052*** (0.005)	-0.097*** (0.006)
Pacific	0.012*** (0.004)	0.014** (0.006)
Asian	0.004 (0.005)	0.026*** (0.006)
Other ethnicity	0.012* (0.007)	0.027*** (0.010)
1992 birth cohort	-0.001 (0.003)	0.003 (0.004)
1993 birth cohort	0.007** (0.003)	0.020*** (0.004)
1994 birth cohort	0.011*** (0.003)	0.028*** (0.004)
Minor urban area	-0.001 (0.003)	-0.010** (0.005)
Secondary urban area	-0.004 (0.004)	-0.006 (0.006)
Rural area	0.010* (0.006)	-0.005 (0.008)
Rural/urban not applicable/missing	0.058*** (0.010)	0.102*** (0.018)
Ever placed in CYF care	-0.157*** (0.012)	-0.231*** (0.015)
Ever CYF Youth Justice involvement	-0.233*** (0.016)	-0.312*** (0.018)
School in bottom three deciles	0.121*** (0.008)	0.194*** (0.015)
South Auckland MoE office	-0.025*** (0.004)	-0.011** (0.005)
Christchurch MoE office	0.002 (0.004)	-0.007 (0.006)
Dunedin MoE office	0.022*** (0.005)	0.036*** (0.007)
Hamilton MoE office	0.009** (0.004)	0.017*** (0.006)

Invercargill MoE office	0.005 (0.007)	0.003 (0.010)
Napier MoE office	0.008 (0.005)	0.027*** (0.007)
Nelson MoE office	-0.012* (0.007)	-0.009 (0.009)
Rotorua MoE office	0.011** (0.005)	0.032*** (0.006)
Wellington MoE office	0.016*** (0.004)	0.028*** (0.005)
Whanganui MoE office	0.016*** (0.005)	0.016** (0.007)
Whangarei MoE office	0.003 (0.006)	0.015* (0.008)
Decile 2 school at age 14	-0.013** (0.006)	-0.023*** (0.009)
Decile 3 school at age 14	-0.004 (0.006)	-0.010 (0.008)
Decile 4 school at age 14	0.101*** (0.005)	0.174*** (0.011)
Decile 5 school at age 14	0.106*** (0.005)	0.182*** (0.012)
Decile 6 school at age 14	0.112*** (0.005)	0.190*** (0.012)
Decile 7 school at age 14	0.111*** (0.004)	0.194*** (0.009)
Decile 8 school at age 14	0.114*** (0.005)	0.199*** (0.010)
Decile 9 school at age 14	0.117*** (0.005)	0.207*** (0.009)
Decile 10 school at age 14	0.112*** (0.006)	0.191*** (0.013)
n	77,826	77,826
Log-Likelihood Function	-22,871.3	-34,692.4
Pseudo R^2 Statistic	0.0666	0.0562

Notes:

Full sets of regression results. See the notes at the bottom of Table 11 in the main body of this report for more information on these estimation procedures. Excluded categories are birth cohort =1991, urban area = Main Urban Area , MoE Office = Auckland North and Decile school = 1.

*** Estimated partial derivative significantly different from zero at a 1% level using a *t* test
** Estimated partial derivative significantly different from zero at a 5% level using a *t* test
* Estimated partial derivative significantly different from zero at a 10% level using a *t* test