Final Report

Outcomes for Teenage Mothers in the First Years after Birth

Guyonne Kalb, Trinh Le and Felix Leung

Melbourne Institute of Applied Economic and Social Research

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Table of Contents

List of Tables

List of Figures

List of Appendix Tables

List of Appendix Figures

Executive summary

This report examines five research questions which we have listed below together with short summaries of the answers arising from the analyses:

1. *How do educational and labour market outcomes (e.g. school completion, highest qualification, employment rate, earnings) compare for women who are/were teenage mothers with women of the same age yet to have children or who first had children later in life?*

   Educational, labour market, health and partnership outcomes are all worse for teenage mothers than for other women. In particular, educational and labour market outcomes are substantially worse for the former group.

2. *How does this vary by broad group (e.g. metropolitan/rural, English speaking, Indigenous, low/high socio-economic status), with the age women had their first child, and the time elapsed since they had their first child?*

   Teenage mothers do not benefit to the same extent from living in metropolitan regions as other women. Higher educated teenage mothers do better than lower educated teenage mothers but have worse outcomes than other highly educated women. As their youngest child ages, teenage mother's labour market outcomes improve but to a lesser extent than for older mothers. Women with a partner have better educational and labour market outcomes, which seems to be even more strongly the case for teenage mothers.

   Outcomes are worse when giving birth for the first time at a younger age. The older mother group considered in this study is still relatively young as well when giving birth for the first time: depending on the data source they are aged 20 to 24 or 20 to 29. The analyses show that this older mother group is also disadvantaged compared to childless women but to a lesser extent than teenage mothers.

3. *How have patterns regarding incidence of teenage parenthood, factors affecting teenage motherhood and/or outcomes for teenage mothers changed over recent decades?*

   Overall, the rate of teenage motherhood appears to have decreased (after a small increase in 2007 and 2008). Educational and labour market outcomes have improved for teenage mothers from 1991 to 2006. However, the improvement for other women was larger over the same period of time. The relative risk for Indigenous women to become a teenage mother has increased from 1991 to 2006, as has the relative risk for

women living outside major capital cities. Women from a non-English speaking background are less likely than other women to become a teenage mother in 2006. The relative risk of teenage motherhood has decreased from 1991 to 2006 for women with non-Christian beliefs.

4. *How do outcomes for individual teenage mothers develop over time?*

   Disadvantage is maintained or even deepens. Labour market outcomes improve over time as the child grows older but not to the same extent as for older mothers.

5. *To what extent do any differences in these outcomes reflect a causal impact of teenage motherhood?*

   It seems plausible that employment, educational outcomes and the probability of smoking are causally affected by teenage motherhood. However, the latter may well be due to higher risk-taking behaviour amongst this group, which is unobserved in the data.

Most of these questions have been answered in extensive detail through the analyses in this report and we briefly discuss the most relevant results in this executive summary.

Data

The report draws on data from the Census (1991 and 2006) and from the Longitudinal Study of Australian Children (LSAC, waves 1 to 3) and Household, Income and Labour Dynamics in Australia (HILDA, waves 4, 6, 8) surveys to examine educational, labour market, health and partnership outcomes of young women who became a mother during their teenage years and compare them with outcomes of women who became a mother in their twenties and those who do not have children yet. Several outcomes are considered using these data, including educational outcomes (Year 12 completion, years of schooling completed, obtaining any post-school qualification, completing a university degree), labour market outcomes (labour force participation, employment status, hours worked and personal income), health outcomes (self-assessed health status and smoking status) and partnership outcomes (whether a woman with children has a partner, whether the partner is employed, and family income).

Descriptive statistics

The descriptive statistics show that, for all outcomes, teenage mothers perform worse than older mothers, who in turn perform worse than childless women. Data from Census 2006 show that compared to childless women, teenage mothers aged 15-29 are less likely to complete Year 12 (just over 40 percentage points) or to have a post-school qualification (46 percentage points at age 25-29). If teenage mothers have a post-school qualification, they are

less likely to have a university degree (41 percentage points). Teenage mothers are also less likely to be employed (38 percentage points) and if they are employed, they work fewer hours. While teenage mothers have, on average, slightly higher personal income than older mothers (possibly due to being more likely not to have a partner) and lower income than childless women, they have lower household income than both older mothers and childless women.

Although older mothers aged 20-29 tend to have better educational outcomes than teenage mothers, their labour market outcomes are very similar. This shows that childbearing and caring responsibilities have a major effect on labour market participation, regardless of education or the age of the mother. Nevertheless, older mothers have higher household income than teenage mothers, because they are more likely to have a (working) partner than teenage mothers.

In addition, the data show that in 1991, teenage mothers aged 20-24 also have far less favourable outcomes than other women of the same age. Using Census 1991 shows several similarities in the observed patterns of outcomes between the three groups of young women as compared to 2006. A number of outcomes have changed from 1991 to 2006. Some of these changes may be (partly) temporary since they are due to the economic circumstances at the time, such as the higher employment (and lower unemployment) rates for all three groups of women in 2006. However, outcomes such as education may have improved more permanently for all three groups of women, although teenage mothers are still lagging behind the other two groups in this respect. A much larger proportion of women finishes Year 12 and continues on to post-school qualifications in 2006 compared to 1991, and for childless women the proportion going to university has increased as well.

Average personal and household incomes have both increased in real terms, with the nominal income increases being much more than the overall price increases due to inflation. So, on average everyone is better off (financially at least) in 2006 than in 1991.

Another outcome that has changed substantially across all three groups from 1991 to 2006 is the legal marital status. This has decreased enormously, particularly for the two mother groups since the childless women had a low rate of marriage to begin with. The decrease in legal marriage is to some extent compensated by the increase in de facto partnerships which seem to replace the former partnerships through marriage. However, among mothers, this increase was not sufficient to completely make up for the lower rate of legal marriage, so that

teenage mothers and older mothers in 2006 are much less likely to be in a relationship than they were in 1991.

Using a simple regression with only teenage motherhood and older motherhood as explanatory variables, data from the LSAC and HILDA surveys show that compared with childless women, teenage mothers are 50 percentage points less likely to complete Year 12, 25 percentage points less likely to have a post-school qualification, 69 percentage points less likely to be employed, 8.5 percentage points less likely to have good or better health, 37 percentage points more likely to be a smoker, and have $320 ($380) less in weekly personal (family) income. These differences are consistent with what is observed in the Census data.

The same data show that compared with childless women, older mothers are 16 percentage points less likely to complete Year 12, 45 percentage points less likely to be employed, 4.4 percentage points more likely to be a smoker, and have $280 less in weekly personal income. There are no significant differences in the probability of having a post-school qualification, the probability of having good or better health, or family income, between childless women and older mothers.

Results from the multivariate analyses

When a range of factors, including own characteristics, family characteristics, parental characteristics and partner characteristics are controlled for, teenage motherhood is still significantly associated with many outcomes.

In particular, relative to similarly characterised childless women, teenage mothers are 46 percentage points less likely to complete Year 12, 12 percentage points less likely to have a post-school qualification, 43 percentage points less likely to be employed and 22 percentage points more likely to be a smoker. The effects of teenage motherhood on personal income, family income, self-assessed health status and partnership outcomes are no longer significant when a range of other factors are accounted for.

It is difficult to precisely pin down the effect of teenage motherhood on outcomes. On the one hand, the observed effect is overstated because several factors, such as unobserved personal characteristics that are important in shaping a woman's outcomes, are not controlled for. On the other hand, the observed effect of teenage motherhood on outcomes is understated because teenage motherhood is strongly associated with educational outcomes, and education has a strong effect on outcomes, especially labour market outcomes. These indirect effects of teenage motherhood are not accounted for.

Using interaction terms with teenage motherhood in multivariate analyses of the Census data, there is evidence that having a good education can considerably counteract the negative effect of teenage motherhood. Nevertheless schooling is less beneficial for teenage mothers' labour force participation than for other women's labour force participation, but if she manages to complete a university degree she experiences a larger increase in labour force participation than similar other women would. Despite this large increase, the participation rate of teenage mothers with a university degree is still lower than the participation rate of other women with a university degree.

Interestingly, teenage mothers do not appear to benefit to the same extent from the education and labour market opportunities provided in major capital cities as other young women do. Teenage mothers who have their child at age 19 are more likely to complete Year 12 (by age 19) and have a partner than younger mothers. Having completed Year 12 seems to be more strongly associated with having a partner for teenage mothers than for other women, while vice versa having a partner seems to encourage further education to at least the same extent as for other women. Having a partner is also beneficial with regard to labour market outcomes; even a non-employed partner increases the probability of employment more for teenage mothers than for other women. This suggests the effect may work through a sharing of the childcare responsibilities. The age of the youngest child is also important. That is, as the youngest child grows older, labour force participation, and employment both increase substantially but the increases are at a slightly lower rate than for older mothers.

Results from the propensity score matching (PSM) analysis

The PSM approach, which allows comparison of outcomes of women who have similar propensities to become a teenage mother, shows broadly similar results. In particular, PSM analysis suggests that relative to similarly characterised childless women, teenage mothers are 39 percentage points less likely to complete Year 12, 54 percentage points less likely to be employed and 34 percentage points more likely to be a smoker. While the multivariate regression analysis finds no significant associations between teenage motherhood and personal income and self-assessed health status, PSM analysis shows that relative to childless women, teenage mothers have $100 less in weekly personal income and are 8 percentage points less likely to have at least good health.

Examining outcomes after two and four additional years respectively, the disadvantage with regard to the outcomes listed above has remained to a large extent. The disadvantage with regard to education appears to deepen in the years after birth, while the disadvantage with

regard to employment reduces, presumably since the child ages over time (which then also seems to indicate that most teenage mothers do not have another child in quick succession). However, the difference in income (both in personal and family income) appears to become larger over time, possibly due to the different career opportunities available to teenage mothers compared to other women. The health disadvantage is maintained over time, although after 6 to 7 years it is no longer significant. This insignificance could be due to the small remaining sample of teenage mothers who answer the relevant question. The larger probability of smoking for teenage mothers compared to other women fluctuates somewhat over time, but remains very sizable. This may lead to larger health differences later in life.

Policy implications

Taken together, the regression and PSM analyses suggest that teenage motherhood has a causal impact on later outcomes, especially educational outcomes and employment status, for young women. Both types of analysis show smaller differences in outcomes between teenage mothers and older mothers than between teenage mothers and childless women. It appears that young teenage mothers are disadvantaged because they have children, which is compounded by the fact that they have children at such a young age. Child bearing and caring responsibilities associated with having children are impediments to a woman's labour market activity while having children at a young age is also an obstacle to human capital accumulation.

Accordingly, policies aimed at reducing early motherhood should help improve outcomes for young women. In addition, there should also be interventions aimed at increasing education for women who have become a mother during their teenage years, given our findings that education can considerably offset the negative impact of early motherhood. There is some evidence that the presence of a partner (and thus assistance with the caring responsibility) improves teenage mothers' labour market outcomes, and that labour market outcomes improve as children get older. This indicates that childcare assistance remains an important policy direction to focus on.

Given the finding that teenage mothers in major capital cities do not appear to benefit to the full extent from the opportunities that this environment offers (compared to other young women), this appears an area that is worth further exploration. Why do they not benefit to the same extent? Again the availability of affordable childcare comes to mind.

1. Introduction

Teenage motherhood is a critical policy issue in many countries. The major concern is that early childbearing interferes with human capital investment, causing young mothers to be disadvantaged in the labour market and in relationship outcomes, and more likely to rely on welfare. This in turn has negative consequences for themselves, their children and society. Indeed, teenage mothers are over-represented in welfare participation. For example, in Australia around one-third of single Parenting Payment recipients with a youngest child less than 6 years old had their first child before age 20 (Jeon *et al.*, 2011).

Australia's teenage fertility rate of 16 babies per 1000 teenage women in 2010 (Australian Bureau of Statistics, 2011) is low in comparison with countries, such as the US which has a teenage fertility rate (for 15-19 year old women) of 34.3 in 2010 (Hamilton and Ventura, 2012).[1] The UK also has a much higher teenage fertility rate which has been estimated to be 28 on average between 2000 and 2005 (United Nations, 2005). The teenage fertility rate is reported to be 24.2 in 2010 for England and Wales.[2] National Statistics (2012) report a teenage fertility rate of 30.2 in 2010 for Scotland.[3] It should be noted that these rates do not include pregnancies that were terminated through an abortion.[4] Teenage abortion rates are also very high in the US and the UK.

In Australia, teenage birth rates differ substantially between groups. For example, the teenage fertility rate for Aboriginal and Torres Strait Islander women was nearly five times the teenage fertility rate for all women (in 2010, 76 births per 1,000 females compared with 16 births per 1,000 females).[5] This accounted for 20 percent versus 4 percent of all births within the Indigenous and total population respectively. Overall teenage birth rates have been declining from just after 1970; from 1990 onwards the decline has been at a very slow rate (see Figure 1).

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[1] Although this rate is high compared to the Australian teenage fertility rate, Hamilton and Ventura (2012) note that this rate is the lowest ever recorded since 1940 when they started to record teenage fertility rates in the US. The 2010 rate was 44 percent below the recent peak of 61.8 in 1991, and 64 percent lower than the all-time high level of 96.3 recorded during the baby boom year of 1957.

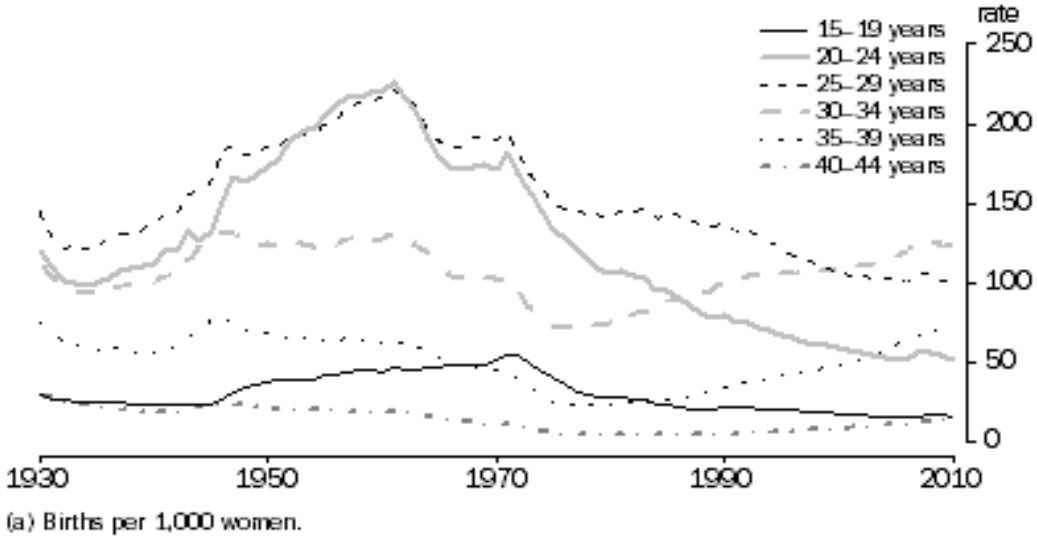
[2] As reported in Table 2b of "Birth summary tables, England and Wales, 2010" by the Office for National Statistics, see http://www.ons.gov.uk/ons/publications/re-reference-tables.html?edition=tcm%3A77-225702

[3] This statistic is based on a slightly different measure. It uses the fertility rate of women aged 15 to 19 at conception. Available on http://www.isdscotland.org/Health-Topics/Sexual-Health/Publications/2012-06-26/2012-06-26-TeenPreg-Report.pdf?64594668150

[4] The Office for National Statistics reports in its "Quarterly Conceptions to Women Aged Under 18, England and Wales, Q2 2011" that the under 18 conception rate for 2010 is the lowest since 1969 at 35.5 conceptions per thousand women aged 15–17.

[5] See Australian Bureau of Statistics (ABS) (2011).

Figure 1: Age-specific fertility rates: By selected age groups, Australia – 1930 to 2010



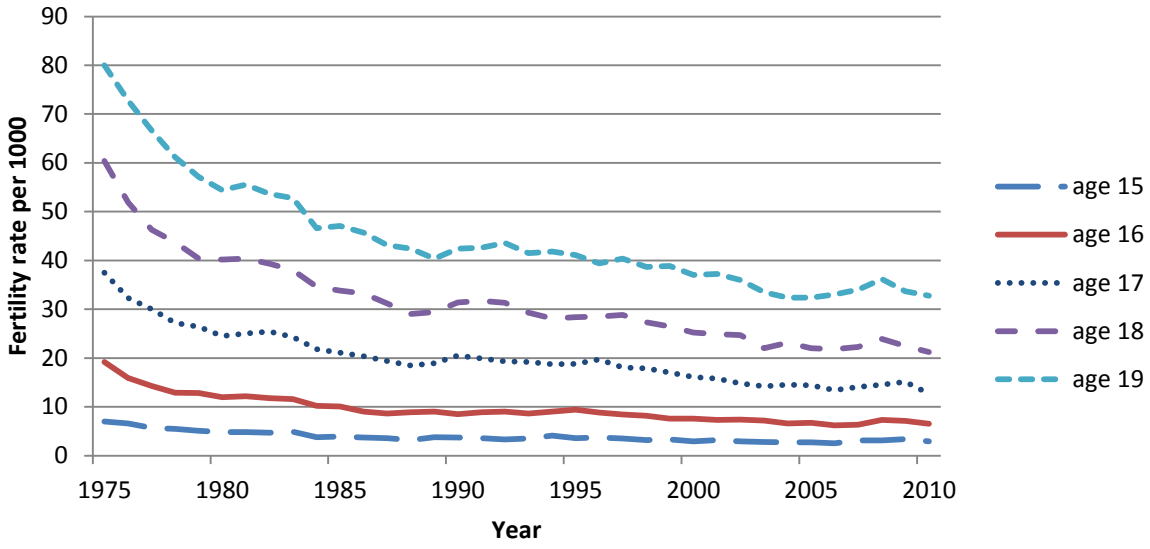
Source: ABS (2011)

Examining the fertility rates for each age in the 15- to 19-year old category in detail from 1975 onwards in Figure 2, it is clear that there has been a steady decline with the exception of a few periods, including most recently 2007 and 2008.[6] The increase started at first with only the 19-year old group experiencing a slight increase in fertility rate in 2006, which was then followed in 2007 and 2008 by slight increases in the fertility rates of the younger groups as well, before all teenage age groups returned to lower fertility rates again in 2009 and 2010. The increase in fertility rate was very minor, but similar increases appeared for the 20- to 34-year old groups as well (see Figure 1).

The outcomes of teenage mothers have been widely studied. Earlier research tends to establish a link between teenage motherhood and a wide range of outcomes without investigating whether the link is causal. In recent studies, the focus has been on determining whether the poor outcomes experienced by teenage mothers are caused by teenage motherhood or by selection bias. Selection bias arises when there are observed and/or unobserved characteristics that cause women to engage in early childbearing as well as to have poor outcomes later in life. As a result, the observed relationship between teenage motherhood and later outcomes may just reflect differences between the types of women who have children during their teenage years and those who do not, rather than a true causal impact of teenage motherhood on later outcomes. The presence of a causal relationship can only be established when selection bias is properly accounted for.

[6] Interestingly, teenage fertility rates in the US also experienced a slight increase at that time. Small increases are also observed in the early 1990s in the US and Australia. Arkes and Klerman (2009) suggest that in the US, teenage fertility behaviour may be associated with the state of the economy as measured through unemployment rates. This suggests that a pre-GFC slow-down of the economy might have affected young people's behaviour.

Figure 2: Teenage fertility rates: By age, Australia – 1975 to 2010



Source: ABS (2011)

Although teenage motherhood is less common in Australia than in many other OECD countries, socio-economic outcomes –such as health, education and employment– for those that have a first child at an early age are comparatively poor (see Jeon *et al*., 2008). Teenage mothers can therefore benefit from well-designed social policy interventions to help improve their outcomes (as well as their children's outcomes).

What is less clear is the extent to which these poor educational and labour market outcomes are caused by teenage motherhood. An alternative explanation is that there are other factors that affect the chances of becoming a teenage mother as well as lead to poor educational and labour market outcomes. Determination of which of the two explanations is more likely has implications for the design of policy aimed at improving outcomes for teenage parents.

Due to their clear disadvantage compared to other similarly-aged women, teenage mothers are a priority group for DEEWR and other policy makers. This is reflected by the announcement of compulsory participation plans and support for teenage parents in targeted locations in the 2011/12 Federal Budget. A motivation for new research is to identify any particular subgroups of teenage mothers for whom outcomes are particularly poor (or better) and for whom policy makers may need to consider additional targeted interventions (or which may provide an indication of important factors leading to relatively positive outcomes for teenage mothers).

In Australia, Webbink *et al.* examine whether or not teenage motherhood has a causal impact on smoking, drinking and body size (2008) and human capital investment (2011). The current study complements those two studies by considering the causal impact of teenage motherhood on educational, labour market, partnership and health outcomes. Thus, this study broadens the evidence base for Australia. Specifically, this study aims to address five questions relating to teenage motherhood in Australia, the first four of which are descriptive in nature:

1. How do educational and labour market outcomes (e.g. school completion, highest qualification, employment rate, earnings) compare for women who are/were teenage mothers with women of the same age yet to have children or who first had children later in life?
2. How does this vary by broad group (e.g. metropolitan/rural, English speaking, Indigenous, low/high socio-economic status), with the age women had their first child, and the time elapsed since they had their first child?
3. How have patterns regarding incidence of teenage parenthood, factors affecting teenage motherhood and/or outcomes for teenage mothers changed over recent decades?
4. How do outcomes for individual teenage mothers develop over time?
5. To what extent do any differences in these outcomes reflect a causal impact of teenage motherhood?

Establishing whether or not there is a causal link between teenage motherhood and later outcomes has important policy implications. If causality is found, then policies that prevent early childbearing can help improve later outcomes for disadvantaged women. However if poor outcomes are due to (un)observed heterogeneity (that is, there is selection on (un)observed factors into teenage motherhood), a different type of policy may be more relevant, for example, by addressing the underlying factors driving teenage motherhood and poor outcomes later in life.

The rest of the paper proceeds as follows. Section 2 summarises the literature on outcomes of teenage mothers. The data sets used in the analyses in this paper are briefly described in Section 3 while descriptive statistics of the data are presented in Section 4. Section 5 describes the methods that are used in the analyses. Section 6 reports the estimation results. Section 7 summarises and concludes.

2. Literature review

This section highlights the literature on the effect of teenage motherhood on various types of outcomes. Emphasis is placed on Australian studies and studies that address selection bias – i.e. the possibility that the observed relationship between teenage motherhood and later outcomes may just reflect differences between the type of women who have children as a teenager and those who do not, rather than the true causal impact of teenage motherhood on later outcomes (see Section 5.2 for a more technical discussion of the issue). For example, if teenage mothers were more likely to come from families of low socio-economic status (SES), then it is difficult to assess whether poor educational outcomes are brought about by early childbearing, or whether they are attributable to their low-SES background. A relationship can only be interpreted as causal when potential selection bias is appropriately accounted for. A summary table providing an overview of this literature is presented in Appendix A.

2.1 Teenage motherhood and educational outcomes

Education is a major pathway through which teenage motherhood affects a woman's later outcomes. The late teenage years is when young people prepare for high-school completion and make decisions regarding further education. Pregnancy and motherhood during this period may raise the opportunity cost of schooling to the young woman, reduce her investment in it and thus worsen her educational outcomes.

A plethora of studies have examined the relationship between teenage motherhood and educational outcomes. Many find that teenage motherhood has a significant impact on educational outcomes, even after accounting for selection bias. For example, using a matching method to match teenage mothers with similar young women in their junior high school, Levine and Painter (2003) find a substantial negative effect of teenage childbearing on education. Also using a matching method, Chevalier and Viitanen (2003) find that teenage motherhood decreases the probability of post-16 schooling by 12–24 percentage points.

By contrast, several other studies show that the impact of teenage motherhood on educational outcomes significantly weakens when selection bias is accounted for. For example, using a model of joint determination of childbearing and leaving school early, Olsen and Farkas (1989) show that the former has little impact on the latter. Using the difference-in-difference method, Brien *et al.* (2002) find that while teenage mothers have lower test scores than their counterparts without children, the effects of motherhood itself are negligible. In a more recent study using Australian twins data, Webbink *et al.* (2011) find no difference in educational

attainment between teenage mothers and their identical twin sisters, suggesting little evidence of a negative effect of teenage childbearing on educational attainment.

2.2 Teenage motherhood and labour market and welfare participation

Teenage motherhood can affect labour market outcomes in two ways. First, teenage motherhood can lower a woman's prospects in the labour market through its impact on her education (see Section 2.1) and/or work experience (as childbearing and caring are likely to keep her out of the labour market for some time) (indirect effects). Second, motherhood can reduce the energy a woman has for other activities, thus lowering her productivity (direct effect). Greater welfare reliance by teenage motherhood is expected, if teenage motherhood is associated with poorer labour market outcomes.

Many studies find that teenage motherhood leads to poorer labour market outcomes and greater welfare dependence, even after accounting for selection bias. Using an instrumental variable approach with a large number of instruments to account for selection, Klepinger *et al.*'s (1999) smallest point estimates are that teenage childbearing reduces white women's wages by 23 percent, and black women's wages by 13 percent. Fletcher and Wolfe (2008), also adopt an instrumental variable method using information on the timing of miscarriages as well as birth control choices preceding the teenage pregnancies to construct more relevant control groups for teenage mothers. They find evidence that teenage motherhood reduces annual income as a young adult by $1,000 to $3,000 and increases the probability of receiving cash assistance. Using biological fertility shocks to instrument for age at first birth, Miller (2011) finds an increase of 9 percent in earnings per year of delay in motherhood, with 3 percent being due to an increase in wages and 6 percent to an increase in work hours.

By contrast, there is other evidence that suggests that teenage motherhood has no effect on labour market outcomes. For example, Geronimus and Korenman (1992) find no significant effect of teenage childbearing on the probabilities of employment and welfare participation once unobserved family characteristics are taken into account (using sibling data). Jeon *et al.* (2008, 2011) do not investigate whether teenage childbearing *per se* has a direct effect on outcomes later in life but they focus on outcomes for this group compared to outcomes of other women with children in Australia. Using Household Income and Labour Dynamics in Australia (HILDA) Survey data, they find that this group is much worse off on a range of aspects: education, labour market outcomes, partnership outcomes, and mental and physical health. This disadvantage started already before becoming a teenage mother (e.g. they were

more likely to leave school early and to have had an unemployed parent or just one parent when growing up). This indicates that teenage childbearing is unlikely to be the sole cause but rather another symptom of this group's disadvantage.

2.3 Teenage motherhood and partnership outcomes

A woman's standard of living also depends on the presence and 'quality' of a partner. Since men are often still the main breadwinners, partnership can be an important pathway for women to escape from poverty and disadvantage. Thus, how teenage mothers compare with other women in the partnership market is of interest.

Teenage mothers are likely to be more constrained than other women in their choice of a partner. This could be because childbearing and caring responsibilities reduce the amount of time that a young mother has to search for a partner, or because children from a previous relationship discourage potential partners.

While a large number of studies have examined the impact of teenage motherhood on educational and labour market outcomes, very few studies have considered partnership outcomes. Bradbury (2006) observes that Australian teenage mothers are less likely to be legally married. Using an instrumental variable method to address selection bias, Goodman *et al.* (2004) find no effect. Using a similar approach, Ermisch and Pevalin (2005) find that while teenage motherhood does not affect a woman's probability of having a partner at age 30, it increases her chances of partnering with poorly educated and unemployment-prone men. They consider both legally married women and women living in a de facto relationship as having a partner.

2.4 Teenage motherhood and health outcomes

The effect of teenage motherhood on health outcomes is theoretically ambiguous. On the one hand, teenage motherhood could adversely affect health outcomes. This could be because childbearing and caring responsibilities at an early age, usually as a single parent[7] and with limited resources and experience, are stressful and detrimental to a woman's mental and physical health. An alternative pathway for the effect could be through reduced choices and opportunities. For example, poor educational, labour market and partnership outcomes may affect teenage mothers' mental health and induce unhealthy behaviours or lifestyles. On the other hand, teenage motherhood could also have a positive effect on health outcomes. This is

[7] In the US, 83 percent of births to teenagers are outside a marriage, and among Blacks this rate is 96 percent (Hamilton *et al.*, 2005).

because early motherhood may change the priorities of young women, steering them away from risky behaviours for the sake of their children.

So far, there is very limited evidence on the impact of teenage motherhood on health. Liao (2003) observes a lower level of mental health for teenage mothers than for other mothers or teenage women without children. Specifically, postnatal depression tends to be more severe for teenage mothers than for older women. Hobcraft and Kiernan (2001) find that teenage mothers are more likely to smoke and to have poor physical and mental health. However, neither study examines whether the association is causal.

A causal impact of teenage motherhood on health outcomes has been established by Webbink *et al.* (2008), who use Australian twins data and an instrumental variable method to account for selection. Webbink *et al.* (2008) find that teenage mothers smoke on average 2.6–4 years longer and are less likely to quit smoking than their (twin) sisters.[8] Teenage motherhood is also found to raise the probability of being overweight, especially at age 40 or older. Moreover, Webbink *et al.* (2008) show that the effect of teenage motherhood on smoking seems to be related to the lower quality of their spouses, whereas its effect on body size seems to work through lower socio-economic opportunities and the higher number of children. By contrast, using similar methods on 25-year-old Americans, Fletcher (2012) finds that teenage motherhood has little effect on smoking and obesity and may reduce drug use and binge drinking in the short term.

2.5 Life-cycle effects

Some authors argue that teenage motherhood only brings forward motherhood in time, so over the life cycle, the effect of teenage motherhood is not different from the effect of later motherhood. Using miscarriages as an instrumental variable, Hotz *et al.* (2005) show that while teenage mothers appear less likely to receive a high-school diploma, they appear to offset this by being more likely to obtain a General Educational Development (GED) certificate[9] and by working much more over their early adulthood than if they had delayed childbearing. Hotz *et al.* (2005) also find teenage mothers to have higher levels of earnings during adulthood than if they had postponed motherhood. Moreover, while teenage childbearing seems to increase public aid expenditures immediately after a teen birth, this ‘negative’ consequence is short-lived, in that teenage mothers use less public aid in their late

[8] This is measured at their current age, which is around 40 years on average.
[9] The GED, which is granted upon the successful completion of an examination that tests competency in a basic high-school curriculum, offers flexibility in study time as it does not require a fixed class schedule.

twenties as their earnings rise and their children age. On the one hand, these findings concur with Bronars and Grogger (1994) who, exploiting the natural experiment of 'twin births first', find that the short-term adverse effects of unplanned births on labour force participation, poverty and welfare recipiency dissipate over time for white unwed mothers. On the other hand, Hotz *et al.*'s (2005) findings disagree with Taniguchi (1999), who finds that women who experience early childbearing are more likely to experience a higher wage penalty.[10]

2.6 Summary

There is ample evidence that teenage mothers have worse outcomes than other women. However, part of the relationship seems to be driven by selection bias. The estimated impact of teenage motherhood on later outcomes tends to fall when selection bias is accounted for.

Most of the empirical studies on teenage motherhood focus on educational and labour market outcomes. Recently, there has been rising interest in the impact of teenage motherhood on partnership and health outcomes. Selection bias seems the strongest with respect to educational outcomes, with much evidence indicating that teenage mothers would have lower educational outcomes independent of whether or not they had a child as a teenager. This is consistent with Jeon *et al.* (2011) who, based on Australian data, find that the majority of teenage mothers had already left school before they were pregnant.

There is considerable evidence that results differ a great deal by method. Studies that use the instrumental variable method tend to find much stronger negative estimates of the effects of teenage motherhood than those that use sibling difference to control for unobserved family characteristics.[11] This could be because the sibling method relies crucially on the assumption that the only unobserved characteristics that affect teenage motherhood are related to family background. The assumption that siblings do not differ with respect to unobserved individual characteristics, such as innate abilities and motivation, is especially strong when the siblings are not identical twins.

Overall, even though the evidence is mixed, the balance of the evidence suggests that teenage motherhood has an adverse causal impact on a wide range of outcomes, including school

[10] Bronars and Grogger (1994) examine the effect of unplanned births while Taniguchi (1999) considers the timing of births on women's wages. Neither study focuses specifically on teenage women.

[11] Ribar (1999) confirms this by applying the two methods on the same data. He argues that if the unobserved individual-specific factors influencing fertility and socio-economic status are at least as strongly related as the unobserved family-specific factors influencing fertility and socio-economic status, then the sibling difference estimates represent a lower bound on the estimated effects of teenage motherhood.

completion, educational attainment, employment, earnings, welfare recipiency, partnering status, quality of partner and health.

2.7 Policy lessons

In this section, we briefly review the most recent policies[12] aimed at improving teenage mothers' outcomes in the UK and US, and discuss their impacts on a range of outcomes, as documented in the corresponding evaluation reports. Although the UK and US are similar to Australia in terms of culture, society and institutional arrangements, they have the highest teenage pregnancy rates among the OECD countries which are much higher than the rates observed for Australia as mentioned in Section 1. Nevertheless, given the similarities, the effectiveness or non-effectiveness of policies in these two countries is most likely to be easily translated to Australia.

Launched in the UK in 2001, the Sure Start Plus (SSP) pilot program was designed to provide targeted support to teenage parents and their children, and aimed to improve their social and emotional well-being, strengthen their families and communities, and improve their learning and health outcomes. While the design and delivery varied by local needs, all pilot programs were provided on the basis of one-to-one tailored support to teenage parents by SSP advisers.

Schedule 1 summarises the impacts of the SSP program on the various outcomes measured. The impacts of the pilot program were evaluated by comparing data collected through questionnaires and interviews from SSP sites to data collected from matched areas that did not have the program. Wiggins *et al.* (2005) reported their findings of the SSP National Evaluation, and suggested that the program has had "mixed success in achieving its aims and objectives" (p. 82). While the program successfully addressed the immediate needs of young pregnant women and mothers through the provision of support and advice in relation to emotional problems, pregnancy matters, housing issues and domestic violence issues, it appears to have been less successful in helping teenage parents return to education, training and employment. However, service providers considered these objectives less urgent compared to the 'crisis issues'. In addition, the program seems to have had no impact on the health outcomes of teenage mothers and their children.

[12] Earlier teenage pregnancy policies in the US and UK have also been evaluated. Trivedi *et al.* (2007), for example, provide a review of review-level studies on teenage pregnancy policies, including interventions to prevent teenage pregnancy and interventions to improve the outcomes for teenage parents. However, the policies reviewed in these review-level studies, such as Coren *et al.* (2003) and Harden *et al.* (2006), are rather dated. The more recent policies in these reviews date back to the late 1980s and early 1990s. Their findings are therefore not reported here, but the studies can be found in the listed references.

Schedule 1: Summary of two key policies

Policy	Details	Outcomes measured	Impacts
Sure Start Plus (SSP) in the UK	- Program's design and delivery varied depending on local needs - Common feature of all programs: one-to-one support to pregnant women under 18 and young parents under 20, provided personally by Sure Start Plus advisers - Work by advisers included confidence building, negotiating family relationships, advocacy with local government, and help to arrange childcare, obtain benefits, find accommodation, and access educational opportunities	- Social and emotional well-being	- Significantly more young pregnant women and mothers had received help in relation to emotional problems. - Did not find significant difference in self-esteem among young mothers in SSP and matched sites - No significant difference between young mothers in SSP and matched sites in receiving help in relation to postnatal depression
		- Families and communities	- Young mothers in SSP sites were more likely to have received help in negotiating family relationships (reporting more supportive relationships), and in relation to domestic violence. - Significantly more young mothers had received housing advice and information on parenting. - Social isolation scores among young mothers in SSP sites are not significantly different from those in matched sites.
		- Participation in education, employment and training	- No significant difference in participation rates in education, training and employment among young mothers in SSP and matched sites - Limited difference in attainment of qualifications
		- Learning of children	- No impact (Note that this was not a priority of SSP and the children's age was 9 months old on average)
		- Health	- No significant difference between SSP and matched sites in terms of the incidence of having a low birth weight baby, and the level of repeat under-18 conceptions - No significant difference in terms of the proportions who reported receiving advice on breastfeeding or smoking cessation, and in terms of the proportion of young mothers who had accessed health services before 14 weeks of pregnancy

Schedule 1: Summary of two key policies

Policy	Details	Outcomes measured	Impacts
Early Head Start in the US	- Service delivery through one of three program options: centre-based, home-based, or a combination of both - Services tailored to meet the needs of families and communities being served	- Service use	- Service use by teenage mothers was lower compared to older mothers in the program group, except for the use of childcare.
		- Child development and parenting	- No significant difference between 3-year-old children of teenage and older mothers in terms of the average level of cognitive development - The proportion of children who had Bayley MDI[a] scores above 85 was significantly higher among teenage mothers in the program group. - No significant impact was found on the language development of children of teenage mothers. - No impact was found on the mental health of teenage or older parents, at the time when children were aged three. - Favourable impacts on a wide range of parenting behaviours for older mothers; for teenage mothers, significant impacts were only found in terms of supportiveness and discipline.
		- Welfare receipt	- Welfare receipt was increased among teenage mothers at the beginning, but significantly reduced by the last two quarters of the follow-up period.
		- Education	- Participation in education programs increased among teenage mothers, but the proportion who completed a high-school degree or GED by two years after enrolment has not increased.

Source: Wiggins *et al.* (2005) for Sure Start Plus in the UK; Love *et al.* (2002) for Early Head Start in the US.

Notes: a) Bayley MDI: Bayley Scales of Infant Development Mental Development Index. A score below 85 places a child in the "at-risk range of [cognitive] developmental functioning" (Love *et al.*, 2002, p. xxv). The Bayley MDI has a mean value of 100.

Unlike Sure Start Plus, the Early Head Start program, which began in 1995 in the US, was not a program designed specifically for teenage parents, but targeted pregnant women and families with young children below age three in general. The Early Head Start programs also involved the provision of a wide range of services, including child development services, childcare, health care, family support and parenting education. Programs were delivered in one of three modes according to the needs of families and communities – home-based, centre-based, or a combination of home- and centre-based services.

Love *et al.* (2002) evaluated the impacts of the Early Head Start programs on children and their families, measured in the key areas of service use, child development, parenting, and family development. While participation in education programs increased among teenage mothers in the program group, the proportion who completed a high-school degree or equivalent had not increased two years after program enrolment. Service use among teenage mothers was lower compared to older mothers in the program group, except for the use of childcare. Welfare receipt among teenage mothers in the program group compared to those in the control group was significantly reduced by the last two quarters of the follow-up period despite an initial increase. While the Early Head Start program had favourable impacts on teenage mothers' parenting behaviour in terms of supportiveness and discipline, no significant impact was found on the mental health of teenage or older parents, when their children were aged three.

Both the US and the UK program have taken the approach of providing tailored services. Although these services are taken up by the teenage mothers and appear to benefit their emotional well-being, and are thus likely to benefit their child's emotional well-being as well, there is no strong evidence that educational or labour market outcomes have improved. However, in the US there is some evidence that welfare receipt has decreased eventually for the teenage mothers participating in the program.

3. Data

3.1 Data sources

3.1.1 Census of Population and Housing

The primary data source for the descriptive analyses in this study is the Census of Population and Housing. The Census is conducted every five years. The earliest Census which is available as a Confidentialised Unit Record File (CURF) is from 1981, while the latest Census available is from 2006, since unit record data from the latest Census, carried out in August 2011, are not available for public release until September 2013.

The key variables used in defining teenage motherhood are the age of the oldest child of the woman and the age of the woman herself. Women whose oldest child is born when they were between 15 and 19 years old are defined as teenage mothers. To minimise the number of cases where the oldest child is no longer living with the mother, we limit our sample to women aged in between 15 and 29. If available, the question regarding the number of children ever born to a woman is used to cross-check the assumption of no children living outside of the household by comparing this number with the number of children currently living with the mother. However, this question is only asked every other Census (2006, 1996, 1986 and so on) so can only be used for those years. In 1981 and 1986 the age of persons over 15 is only reported in five-yearly intervals making it impossible to determine whether the mother is a teenage mother unless she is in the age category 15 to 19 years old. Thus, this study draws on data from the 1991 Census and 2006 Census to show how outcomes of teenage mothers change over time.

While the Census data contain a relatively large number of teenage mothers, the Census contains few individual and family characteristics. By contrast, the surveys (described in the following subsections) have rich data on individual and family characteristics, but none of them contain more than 200 teenage mothers.

3.1.2 Household, Income and Labour Dynamics in Australia

The HILDA is a longitudinal survey of Australian households collecting information on all individuals for a number of randomly selected households on a yearly basis. HILDA started in 2001 and has been run annually, with each year corresponding to a wave. It covers approximately 13,000 individual respondents living in more than 7,000 households.

HILDA collects information on a large number of individual characteristics, such as education, health, labour force participation and income; household characteristics, such as the number and age of children; the number of adults in the household; and a broad range of characteristics for all adults living in the household.[13]

3.1.3 Youth in Focus

The Youth in Focus (YIF) survey asks questions about family background, living arrangements, education, work, relationships, income, health, spare time, and aspirations and attitudes of young people in Australia. Individuals born between October 1987 and March 1988 who appeared in the Centrelink administrative database were randomly selected and invited to participate in the survey.[14] One of the parents, usually the mother, of the selected individuals was also invited to answer the parent questionnaire.

Respondents were interviewed twice, once in late 2006 (wave 1, when they were around 18 years of age) and once in late 2008 (wave 2), whereas the respondents' parents were only interviewed once in wave 1.

3.1.4 Longitudinal Study of Australian Children

The Longitudinal Study of Australian Children (LSAC) is a panel data survey that follows around 10,000 children and their families over 6 years in 4 waves as they grow and learn. There are two birth cohorts of around 5,000 children each. Children in the birth (B) cohort were 3-19 months old when the study began in 2004, while children in the kindergarten (K) cohort were 4-5 years old at the start. We use the B-cohort only.

Data are collected from the children's parents, childcare providers or teachers, and the child once they are old enough. Information is collected on many early childhood issues, such as health, parenting, family relationships, education, childcare, family support, and separated families, but also on the well-being and labour market participation of the parents.[15]

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[13] Detailed information on HILDA can be found on the website http://melbourneinstitute.com/hilda/. For discussion of the design of the HILDA Survey refer to Wooden and Watson (2007).

[14] Young persons have a Centrelink record in their own right if they received any government payment, such as Youth Allowance. They may also have a Centrelink record because while they were growing up their family received a payment, such as the Child Care Benefit or Family Tax Benefit part A or B, or any social security support, such as the Disability Support Pension or NewStart Allowance. Over 98 percent of young people born between October 1987 and March 1988 in the overall Australian population appear in the Centrelink sampling frame (Breunig *et al*., 2009).

[15] More information is available from http://www.aifs.gov.au/growingup/.

3.2 Key variables

3.2.1 Teenage motherhood

Table 1 provides an overview of how teenage motherhood is defined in each data source, and what limitations were encountered. It also shows the number of teenage mothers identified in each data set. On the basis of this information, we decided to leave out further analysis of the Youth in Focus, since the number of teenage mothers is too small. Although the number of teenage mothers present in the LSAC and HILDA data are also relatively small, the numbers are more substantial than in the YIF data. In addition, we combine information from the two data sets since comparable information has been collected that can be used in the more in-depth multivariate analysis. Combining the B-cohort of the LSAC data with the HILDA data, we have just over 300 observations on teenage mothers. The LSAC data do not contain any observations on childless women, but we can use the HILDA to select women from this group that are comparable on as many aspects as is feasible.

3.2.2 Outcomes

To examine how teenage motherhood affects outcomes, the study considers a mixture of educational, labour market and relationship outcomes. Two educational outcomes are considered. The first one identifies the highest year of school completed which is an ordered variable with the following four categories ranging from the lowest to the highest: completed Year 9 or less, Year 10, Year 11 and Year 12. The second one indicates what level of post-school qualification has been obtained: no qualification, non-degree qualification, or university degree. Note that throughout this report 'Year 12' excludes non-school Year 12 equivalent qualifications while 'non-degree qualification' includes all certificate- and diploma-level qualifications.[16]

Three different labour market outcomes are considered, namely labour force status, hours worked and weekly (or annual) income. Labour force status is a categorical variable with three categories: not in the labour force, unemployed, and employed. Since the Census does not distinguish income by source, annual gross household income and weekly gross personal income from all sources are used as a proxy for labour market earnings.

[16] Thus, a woman who did not complete Year 12 but has a Year 12-equivalent certificate is considered as not having completed Year 12 and having a non-degree qualification.

Table 1: Definition of teenage motherhood and sample size by data source

Data source	Definition of teenage motherhood	Limitation in definition	Count of teenage mothers	Size of analytical sample[a]
Census 2006[b]	• Female respondent • role in the family is 'husband, wife or partner in a registered marriage', 'in de facto marriage', or 'lone parent' • number of children ever born to the woman is positive (if this variable is available) • family has at least one adoptive or natural child • 15-19 years older than the oldest adoptive/natural child in the family	• Unable to distinguish natural children from adopted children. However, this is mitigated by restricting the sample to women whose number of natural children is the same as the number of adoptive or natural children living in the household. • A teenage mother can be incorrectly identified as a non-teenage mother if her oldest child does not live with her at the time of the Census. The occurrence of this should be limited due to only selecting women aged 15 to 29 on the Census date.	3,413	82,649
Census 1991[c]	• Female respondent • role in the family is 'husband, wife or partner in a registered marriage', 'in de facto marriage', or 'lone parent' • family has at least one adoptive or natural child • 15-19 years older than the oldest adoptive/natural child in the family • Women from families other than the primary family in each household are excluded, since no relationships with potential children are recorded for these women.	• No information on the number of children ever born to a woman, so we are unable to distinguish natural children from adopted children. • Exact age in years is only available up to age 24. • A teenage mother can be incorrectly identified as a non-teenage mother if her oldest child does not live with her at the time of the Census. The occurrence of this should be limited due to only including women aged 15 to 24 on the Census date.	428	13,024
HILDA	A female respondent who is 15-19 years older than her oldest adoptive or natural child in the household	Unable to distinguish natural children from adopted children	156	3,687
Youth in Focus	A female respondent who reports having a child	Unable to distinguish natural from adopted children, although unlikely to be an issue for youth aged 18-20 years	78	2,155
LSAC	Biological mother who is 15-19 years older than her child		B cohort: 164	B cohort: 1,864

Notes: (a) Includes teenage mothers, older mothers and women without children aged 15-29; (b) based on the 5% expanded CURF; (c) based on the 1% CURF (no 5% expanded CURF is available for the 1991 Census data).

Three relationship outcomes are considered, namely whether or not a woman has a partner (married or de facto), whether the partner is employed, and family income. Finally we also

consider two health-related outcomes, namely self-assessed health and whether the woman is a regular smoker. This health information is only available for the HILDA and LSAC data.

4. Descriptive statistics

This section provides descriptive statistics by five-yearly age groups for outcomes for teenage mothers (who are aged 15-29 at the time of the Census) in comparison with outcomes for older mothers and for childless women (who are also aged 15-29 at the time of the Census, or 20-29 for older mothers). In particular, Section 4.1 reports estimates of teenage motherhood rates and mean outcomes in education, labour market and partnership by motherhood status from Census 2006, the most recent Census for which data are available. A similar analysis is repeated in Section 4.2 for Census 1991, the earliest Census for which teenage motherhood can be reasonably defined. Section 4.3 then describes trends in outcomes for teenage mothers over the 1991-2006 period. For the 2006 Census and 1991 Census, we then proceed to report on the prevalence of teenage motherhood for a range of background characteristics in Section 4.4. We finish with descriptive multivariate analyses of teenage motherhood, partnership outcomes, labour market outcomes and educational outcomes in Section 4.5.

4.1 Census 2006

4.1.1 Teenage motherhood rates

As is reported in Table 2, about 2.3 per thousand 16-year-old women became a teenage mother within the year previous to the 2006 Census. The teenage motherhood rate rises with age and is the highest for 19-year-old women, with over 18 per thousand 19-year-old women having become a mother within a year before Census 2006. Across the 15- to 19-year-old age group, the teenage motherhood rate is 7.5 per thousand women in this age group. However, there are at least two reasons why these numbers understate the true teenage fertility in Australia.[17] First, these numbers only include those teenage mothers aged 15-19 who are a household head, or partner of a household head. Teenage mothers who live with their parents as a dependent child cannot be identified since the relationship with their own child is not reported. Second, these numbers exclude births to teenage mothers that have been adopted out to overseas or to older mothers in Australia. Finally, teenage mothers who had their child before the age of 15 are also excluded from our counts.

The likely possibility that Table 2 understates true teenage fertility is illustrated in Tables 3 and 4, which suggest that teenage motherhood rates were higher among older women. For example, Table 3 indicates that 19.7 per thousand 24-year-old women became a teenage

[17] Overstatement, while theoretically possible, can be ruled out, because women aged 15-19 are unlikely to have adopted children or stepchildren.

mother at the age of 19, whereas Table 4 shows that 26.8 per thousand 29-year-old women became a teenage mother at that age.[18] There are two reasons why estimates of teenage motherhood rates are higher for older cohorts. First, older women are more likely to live independently (being a household head or partner of a household head). Second, older women are more likely to have a stepchild or adoptive child, thus more likely to be incorrectly classified as a teenage mother (to non-biological children). However, the latter group would be quite small.

Table 2: Teenage motherhood rates for ages 15-19, 2006

	Age					
	15	16	17	18	19	Total
Number of teenage mothers at age X, whose child is under the age of 1 (a)	0	14	41	65	103	223
Number of women aged X (b)	6,254	6,150	6,093	5,734	5,603	29,834
Births per 1000 [(a)/(b)*1000]	0.0	2.3	6.7	11.3	18.4	7.5
Fertility rate in 2006 (ABS, 2011)	2.5	6.2	13.4	21.8	33.0	15.3

Source: Census 2006 (5% CURF)

Table 3: Teenage motherhood rates for ages 20-24, 2006

	Age					
	20	21	22	23	24	Total
Number of teenage mothers at age X, whose child is aged 5 (a)	9	18	56	83	116	282
Number of women aged X (b)	5,702	5,888	5,904	5,887	5,882	29,263
Births per 1000 [(a)/(b)*1000]	1.6	3.1	9.5	14.1	19.7	9.6
Fertility rate in 2001 (ABS, 2011)	3.2	7.3	15.8	24.9	37.2	17.7

Source: Census 2006 (5% CURF)

Table 4: Teenage motherhood rates for ages 25-29, 2006

	Age					
	25	26	27	28	29	Total
Number of teenage mothers at age X, whose child is aged 10 (a)	12	32	58	105	161	368
Number of women aged X (b)	5,713	5,736	5,622	5,830	6,003	28,904
Births per 1000 [(a)/(b)*1000]	2.1	5.6	10.3	18.0	26.8	12.7
Fertility rate in 1996(ABS, 2011)	3.7	8.8	19.7	28.5	39.4	20.1

Source: Census 2006 (5% CURF)

Overall, the teenage motherhood rate is estimated to be 7.5 per thousand among ages 15-19 of children born in 2006, 9.6 among ages 20-24 of children born in 2001, and 12.7 among

[18] That is, the oldest child is 5 or 10 when the mother is 24 or 29 respectively.

ages 25-29 of children born in 1996. Each of these rates is constructed in such a way that it is comparable to the fertility rate per 1000 15-19 year old women as reported by the ABS. As the bottom rows in Tables 2 to 4 show, the rates derived from the Census data are lower than estimates provided by other sources (ABS, 2011), but they follow a similar trend through time. On average, the Census data lead to just under half the rate reported by the ABS (Table 2). When we use slightly older women to work out previous years' fertility rates we obtain just over half the fertility rate (Table 4). Thus, Census data tend to underestimate teenage motherhood rates, as they only count women who are living independently, and they depend on households self-reporting all information accurately. Nevertheless, while Census data cannot accurately estimate teenage fertility rates at the population level, they provide good information on many socio-economic variables. These can be used to obtain insights into outcomes and characteristics associated with teenage motherhood by comparing teenage mothers with other women. Such information is not available from other sources.

With those caveats in mind, this study proceeds to distinguish three groups of women: teenage mothers, older mothers and childless women. Teenage mothers are those who experienced birth between the age of 15 and 19. Older mothers are those who experienced birth from age 20, and childless women are those who have no children (yet). According to Census 2006, 6.5 percent of women aged 15-29 are teenage mothers, 43.5 percent are older mothers (who are by definition at least 20 years old), and 50 percent are childless women.

4.1.2 Motherhood status and educational outcomes

This section examines school completion and post-school qualifications, each presented in a set of graphs, which are discussed in turn by five-year age groups.

School completion

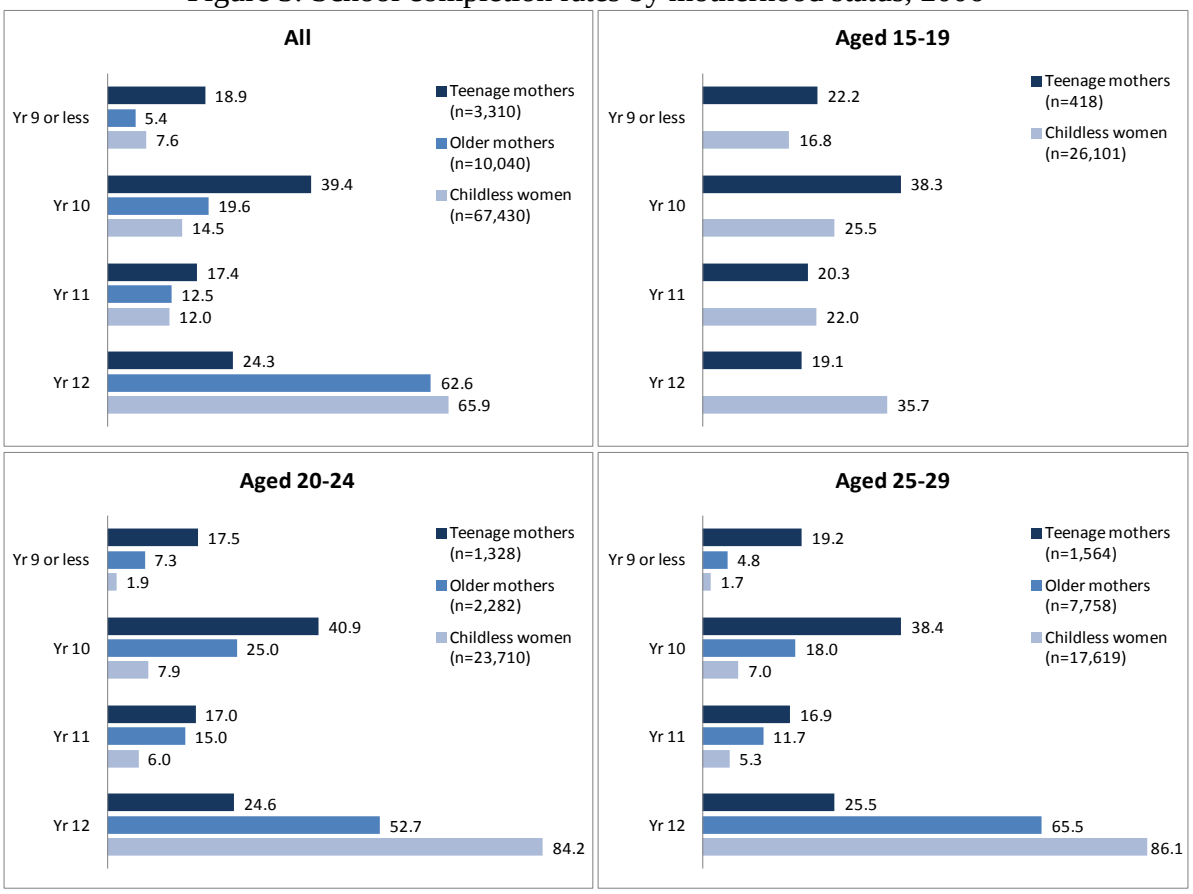
Figure 3 shows that teenage mothers aged 15-29 have much lower school completion rates than other women. While 66 percent of childless women and 63 percent of older mothers have completed Year 12, only 24 percent of teenage mother have.[19] By contrast, while 19 percent of teenage mothers have completed Year 9 or less, the corresponding rates are 5.4 percent for older mothers and 7.6 percent for childless women.

Further disaggregation by age group reveals that Year 12 is a significant hurdle for teenage mothers. Year 10 completion rates are very similar among women aged 15-19 (nearly 78

[19] This percentage does not include women who have completed Year 12 equivalent qualifications such as certificate II or university-bridging courses.

percent of teenage mothers have completed at least Year 10, compared with over 83 percent of non-mothers), mostly because with the legal school-leaving age being around 16 in most States/Territories, most teenagers would have completed Year 10 when they left school. However, while almost 36 percent of childless teenagers have completed Year 12, the corresponding rate was only half as high for teenage mothers (19 percent).

Figure 3: School completion rates by motherhood status, 2006



Source: Census 2006 (5% CURF)
Note: Entries are percentages.

Figure 3 also shows that school completion rates among women aged 20-24 are very similar to those among ages 25-29 and much higher than among ages 15-19. This pattern suggests that, regardless of motherhood status, women who did not complete Year 12 during their teenage years try to do so in their early twenties, but very little additional schooling is occurring after the age of 24.[20] The higher proportion of older mothers currently aged 25 to 29 who have completed Year 12 (compared to older mothers aged 20 to 24), reflects the higher education level of women who have their first child at age 25 or over, compared to between the ages of 20 and 24.

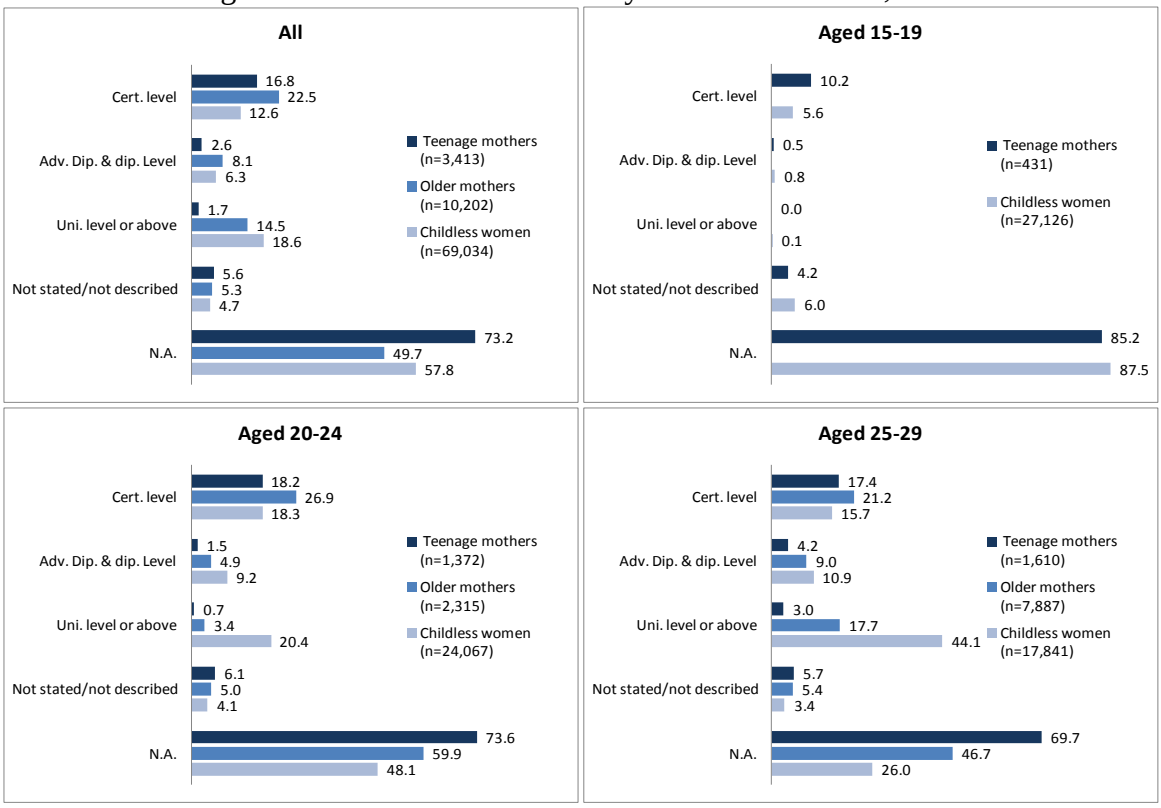
[20] Note that this is based on cross-sectional data. However, it is very common in the literature to use cross-sectional data to infer patterns over time in the absence of longitudinal data, particularly for narrow age ranges where there is no expectation of substantial behavioural changes of one birth cohort compared to the next.

Post-school education

Childless women are the most likely to have a post-school qualification while teenage mothers are the least likely. In particular, 48 percent of childless women aged 20-24 report a post-school qualification (71 percent for ages 25-29). The corresponding figures are 35 percent (48 percent) for older mothers and 20 percent (25 percent) for teenage mothers.

For those with a post-school qualification, Figure 4 shows that childless women have the highest tertiary schooling achievement, teenage mothers the lowest, and older mothers are somewhere in between. Certificate-level qualifications are the most common type of post-school qualifications for teenage mothers, while university degrees are the most common for childless women. In particular, among teenage mothers who report having a post-school qualification, almost 80 percent have a certificate-level qualification and only 8 percent have a university degree. By contrast, almost a third of older mothers and half of childless women who have a post-school qualification have a university degree.

Figure 4: Post-school education by motherhood status, 2006



Source: Census 2006 (5% CURF)
Note: Entries are percentages.

The proportion of women who have a university degree is much higher among ages 25-29 than among ages 20-24.[21] For example, while only 0.7 percent of teenage mothers aged 20-24 have a university degree, 3 percent of teenage mothers aged 25-29 have a degree. The corresponding increases are much higher among older mothers (3 percent to 18 percent) and childless women (20 percent to 44 percent). This suggests that many women who did not complete a degree during their early twenties do so in their late twenties.[22]

4.1.3 Motherhood status and labour market outcomes

Three labour market outcomes are distinguished in this section. First the labour force status is discussed, followed by hours worked and the personal income from all sources. Household income reflects potential income of a partner.

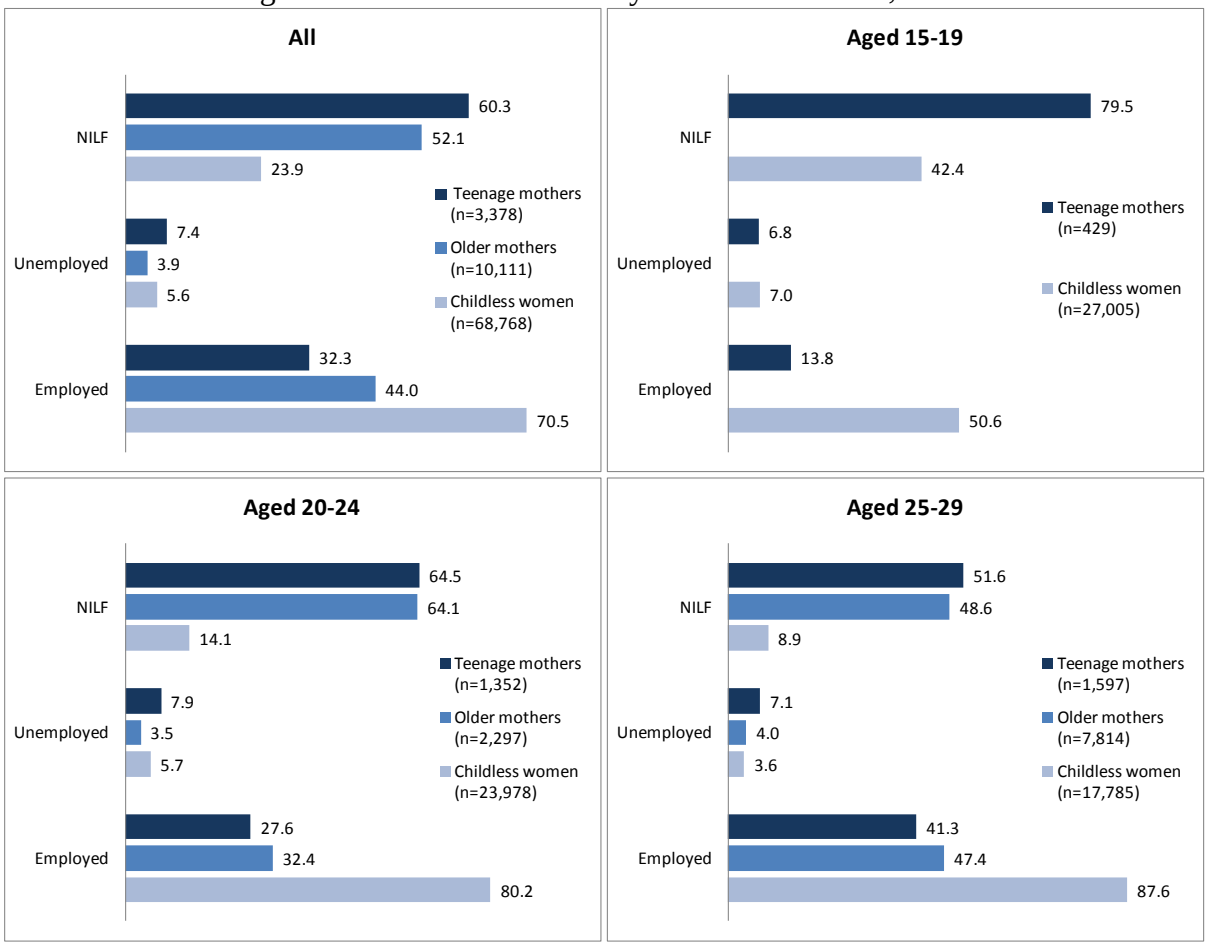
Labour force status

As reported in Figure 5, at age 15-19, non-mothers are evenly divided between employment (51 percent) and non-participation (43 percent). By contrast, almost 80 percent of teenage mothers are not in the labour force and less than 14 percent are in employment. However, Figure 6 shows that while non-participant childless teenagers tend to be at school, non-participant teenage mothers aged 15-19 tend to have left school. In particular, 79 percent of childless teenagers are studying part time or full time, compared with less than 13 percent of teenage mothers in the same age bracket.

Among older age groups (ages 20-29), teenage mothers are quite similar to older mothers in terms of labour force status, but they are very different from childless women. For example, while 64.5 percent of teenage mothers and 64.1 percent of older mothers aged 20-24 are out of the labour force, only 14 percent of childless women in this age group are. By contrast, while 80 percent of childless women are employed, the employment rates for teenage mothers and older mothers are 28 percent and 32 percent, respectively. A similar pattern is observed for ages 25-29, except that non-participation rates are lower and employment rates higher for both mother types.

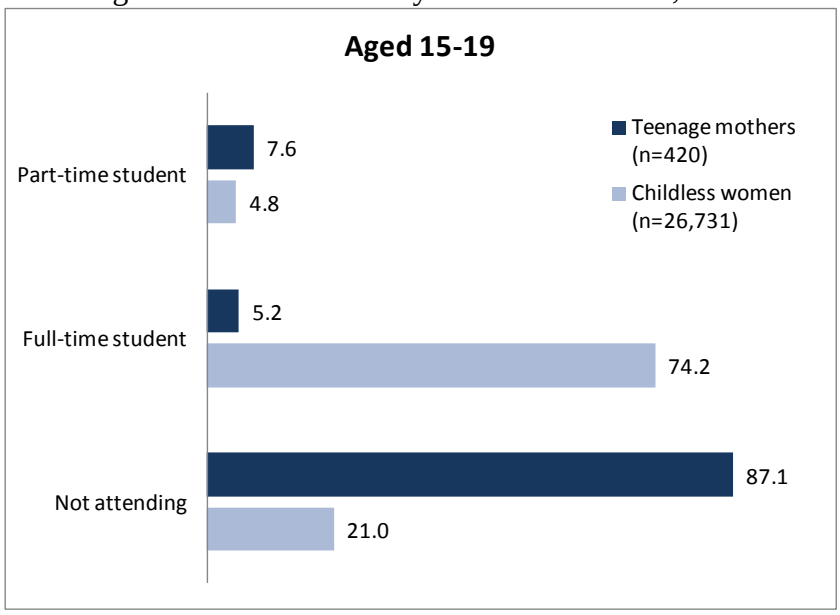
[21] We do not discuss post-school qualifications by motherhood status for ages 15-19 due to the small number of teenage mothers at this age who report on post-school qualifications.
[22] Again, this is based on cross-sectional data rather than longitudinal data.

Figure 5: Labour force status by motherhood status, 2006



Source: Census 2006 (5% CURF)
Note: Entries are percentages.

Figure 6: Student status by motherhood status, 2006

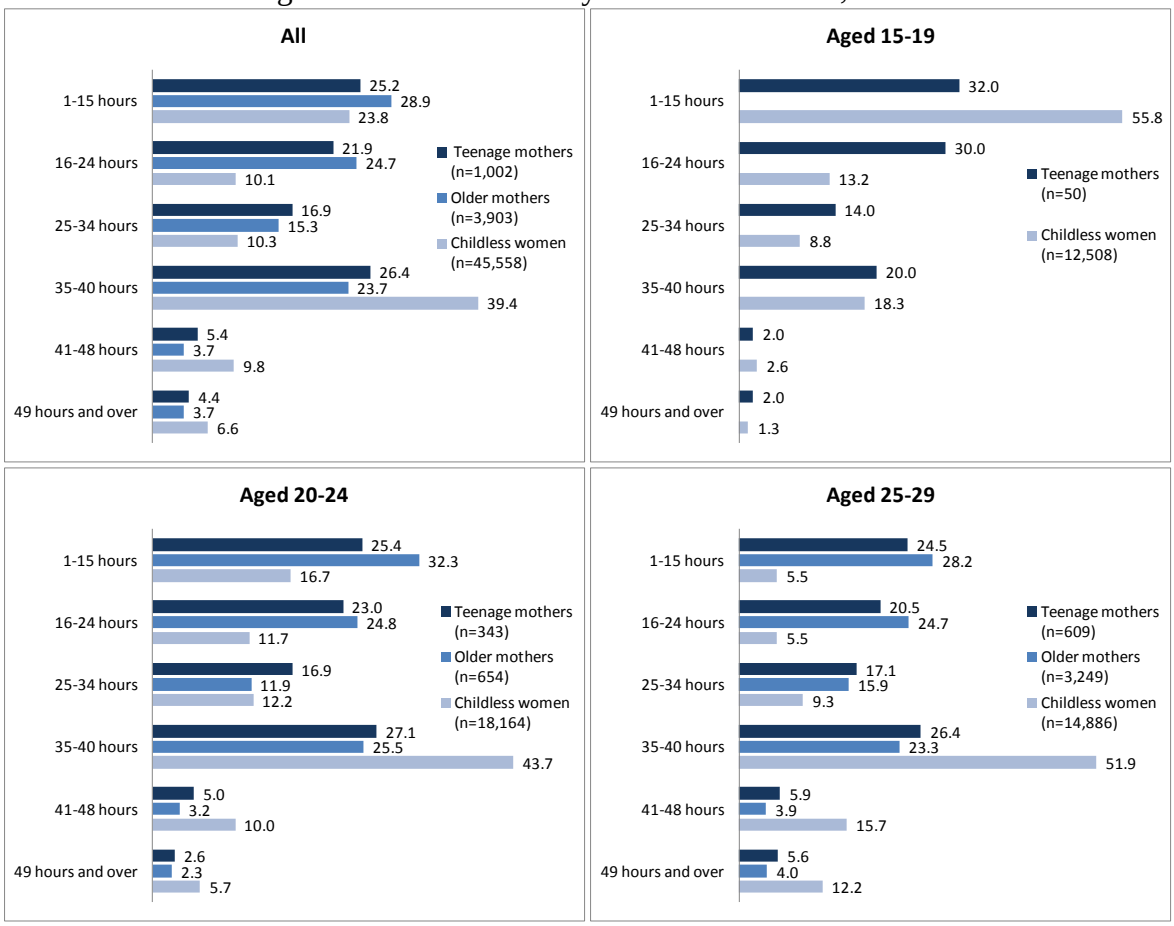


Source: Census 2006 (5% CURF)
Note: Entries are percentages.

Hours worked

Similarities between teenage mothers and older mothers are again observed in hours worked, for age groups 20-24 and 25-29 (as presented in Figure 7).[23] Overall, while 59 percent of childless women aged 20-24 work full time (i.e. at least 35 hours a week), only 35 percent of teenage mothers and 31 percent of older mothers in the same age group are in full-time employment. The proportion of women aged 25 to 29 in full-time work is higher than for the younger age group, due to fewer women being a (part-time) student.

Figure 7: Hours worked by motherhood status, 2006



Source: Census 2006 (5% CURF)
Note: Entries are percentages.

The similarities in labour force status and working hours between teenage mothers and older mothers are even more striking in light of the fact that older mothers tend to be more educated than teenage mothers (see Section 4.1.2). However, this appears to be more than offset by the fact that the child of the older mother group is younger at the time of the Census (unless of course the teenage mother has had subsequent children). The age of the youngest

[23] We do not discuss working hours by motherhood status for ages 15-19 due to the small number of teenage mothers who report on working hours.

child has been shown in the literature to be a major influence on labour supply decisions. The results here suggest that this is the case for these women as well. Childbearing and caring responsibilities have a major effect on the mother's labour market participation, across all education levels and it affects mothers of all ages, although the size of the effect may differ across these groups.

Personal income

Figure 8 (and Appendix Table 1 in Appendix B) shows that teenage mothers aged 15-19 have higher income than childless teenagers. This is because teenage mothers can receive government support (Parenting Payments), while other teenagers tend to be in education and training, and thus have little income.[24] In fact, childless teenagers are most frequently observed to have no or less than $150 of personal income per week. However, among the older age groups, teenage mothers have lower income than other women. For example, while over half of childless women aged 20-24 have a weekly income of at least $400, only 36 percent of teenage mothers and 27 percent of older mothers have income in this category.

Using the 'mid-point' method proposed by Chen *et al.* (1991) to calculate mean incomes, average weekly income is $350 for teenage mothers, $300 for older mothers and $430 for childless women.[25] For ages 25-29, the corresponding figures are respectively $390, $370 and $700. These patterns in personal income across the three groups of women appear consistent with the patterns observed in employment and working hours.

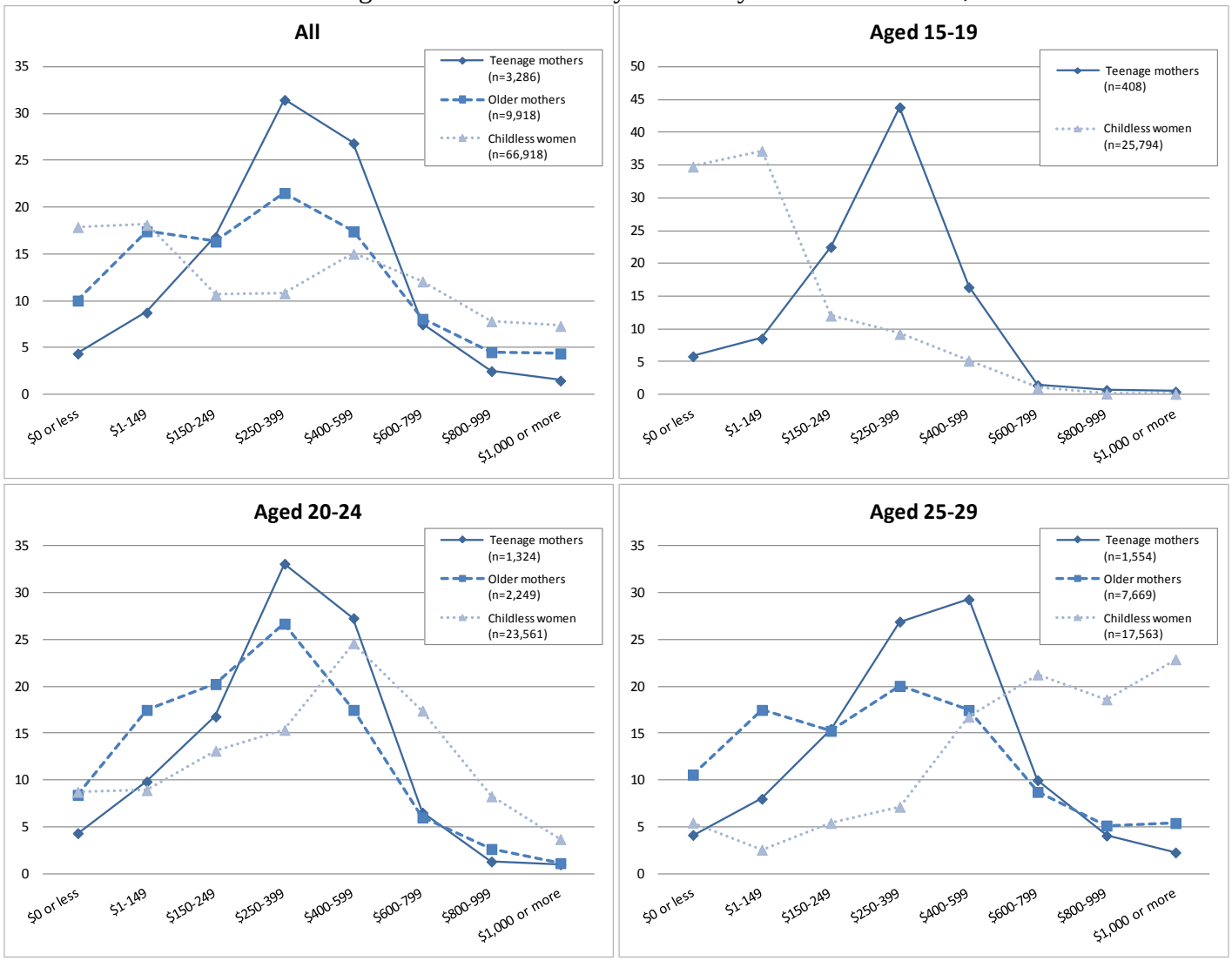
Household income

While older mothers appear to have the lowest personal income, their household income is higher than for teenage mothers, indicating that they are more likely to have an employed partner (see Figure 9 or Appendix Table 2). For example, only 36 percent of teenage mothers have weekly household income of at least $1,000, a much lower proportion than among older mothers (42 percent) and childless women (71 percent). Average weekly household income is estimated (using the 'mid-point' method) to be $930 for teenage mothers aged 20-24, $1,030 for older mothers and $1,630 for childless women. For ages 25-29, the corresponding figures are respectively $1,010, $1,230 and $1,770.

[24] In 2006, Parenting Payment Single was just below $250 per week.

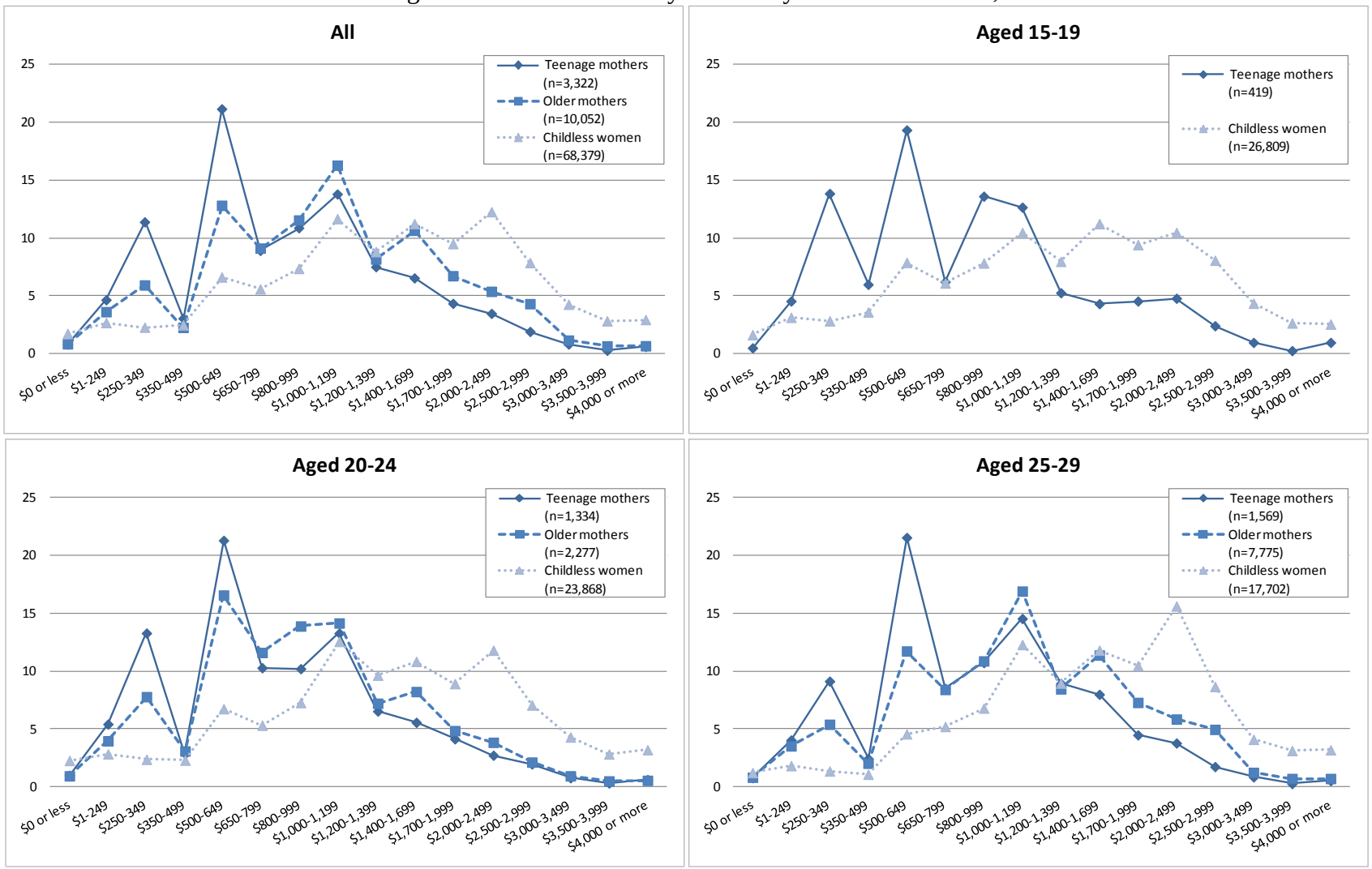
[25] Chen *et al.* (1991) recommend setting mean income at the mid-point for the closed intervals. For the open-ended interval at the top of the income distribution the mean income is set at 30 percent above the lower bound, while for the lowest income interval it is set at 80 percent of the upper bound.

Figure 8: Personal weekly income by motherhood status, 2006



Source: Census 2006 (5% CURF)
Note: Entries are percentages.

Figure 9: Household weekly income by motherhood status, 2006



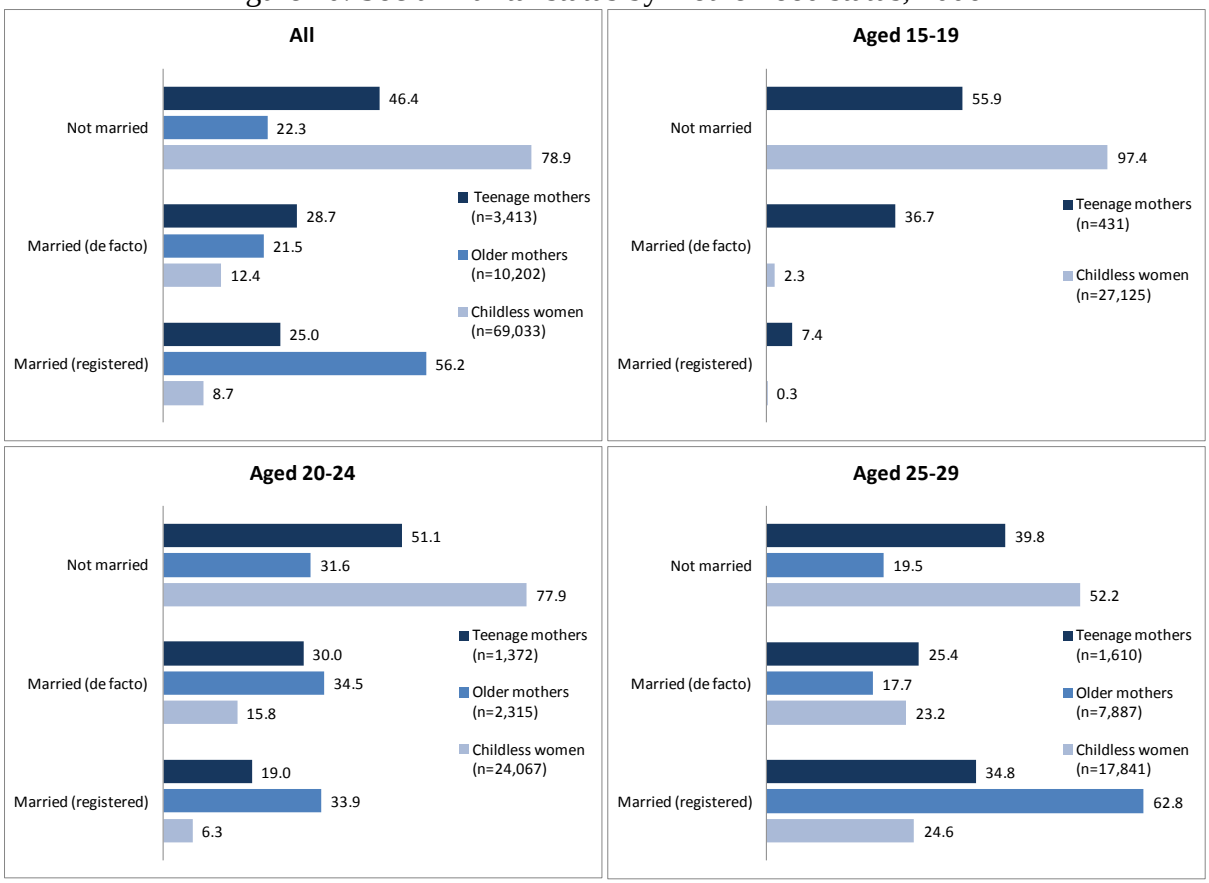
Source: Census 2006 (5% CURF)
Note: Entries are percentages.

Low household income among teenage mothers aged 20-29 is consistent with the fact that they are less likely to have a (high-income) partner than older mothers (see Section 4.1.4) and the fact that they are less likely to be in employment than childless women.

4.1.4 Motherhood status and partnership outcomes

On the one hand, Figure 10 shows that teenage mothers aged 15-19 are much more likely than childless teenagers to have a partner. We consider both women in a legal marriage and women living in a de facto relationship as having a partner. In particular, while only 2.6 percent of childless teenagers have a partner, almost half of teenage mothers are partnered. On the other hand, these numbers also suggest that a large proportion of teenage births are outside a (stable) partnership.

Figure 10: Social marital status by motherhood status, 2006



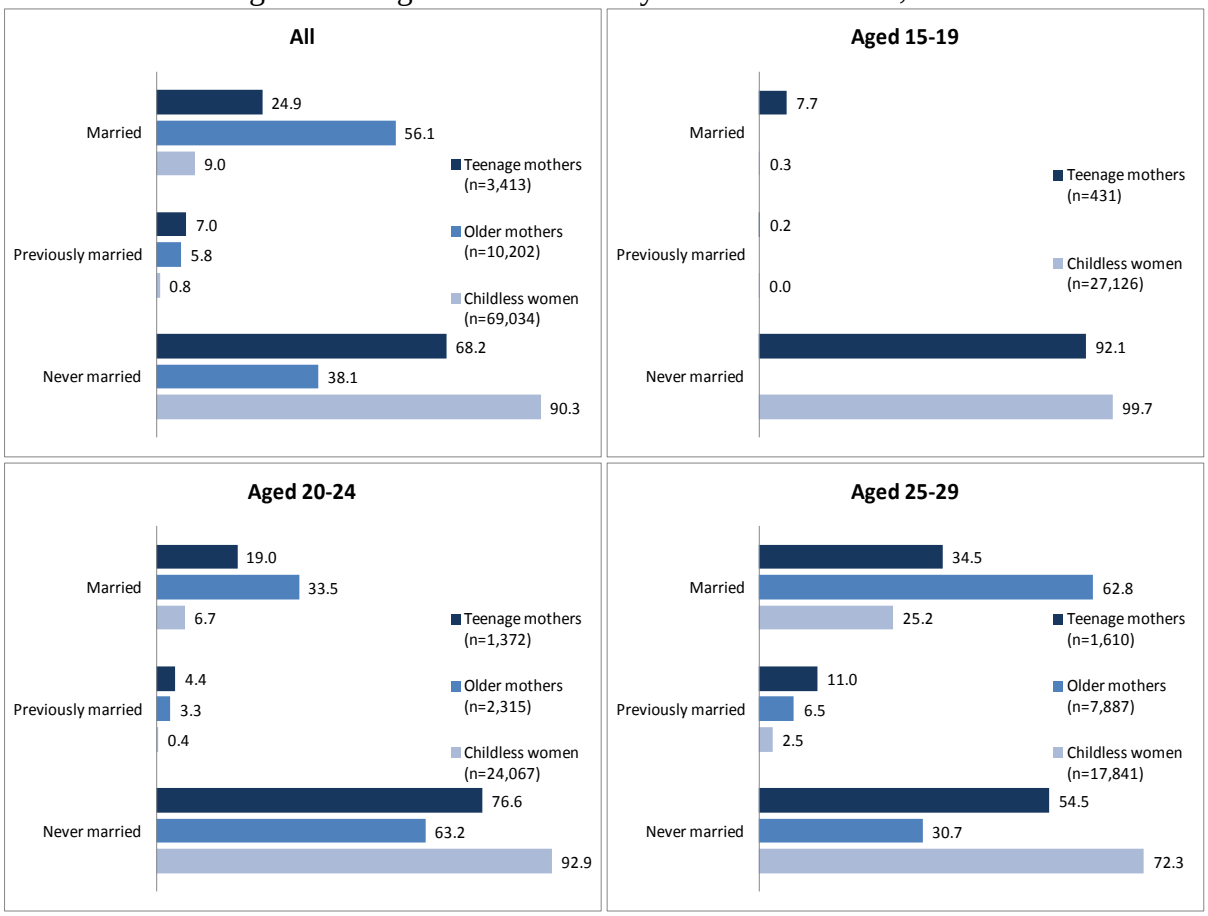
Source: Census 2006 (5% CURF) Note: Entries are percentages.

Women aged 25-29 are much more likely to have a partner than those aged 20-24 across the three groups of women. Among older age groups (20-29), older mothers are the most likely to have a partner and childless women are the least likely to have a partner. In particular, 68

percent of older mothers aged 20-24 have a partner, compared with 22 percent of childless women.

Legal marriage is also the most common among older mothers followed by teenage mothers, as shown in Figures 10 and 11. Figure 11 shows that marriage failure is more likely for teenage mothers than for other young women, with a higher percentage of teenage mothers in each age group already having experienced a divorce. This is despite having a lower legal marriage rate than older mothers.

Figure 11: Legal marital status by motherhood status, 2006



Source: Census 2006 (5% CURF)
Note: Entries are percentages.

4.1.5 Overview of outcomes

Overall, data from Census 2006 show that teenage mothers aged 15-29 have less favourable outcomes than other women. Teenage mothers are less likely to complete Year 12 or to have a post-school qualification (and if they have a post-school qualification, teenage mothers are less likely to have a university degree). Teenage mothers are also less likely to be employed (and if employed, work fewer hours). While teenage mothers have, on average, slightly higher personal income than older mothers (possibly due to the lower partnering rates of

teenage mothers) and lower income than childless women, they have lower household income than both older mothers and childless women.

Although older mothers aged 20-29 tend to have better educational outcomes than teenage mothers, their labour market outcomes are very similar. This shows that (according to expectation) childbearing and caring responsibilities have a major effect on labour market participation, regardless of education or the age of the mother. Nevertheless, older mothers have higher household income than teenage mothers, because they are more likely to have a (working) partner than teenage mothers.

4.2 Census 1991

This section presents motherhood rates and outcomes by motherhood status based on the 1991 Census. The outcomes for the 1991 Census are defined in a way that is as similar as possible to the outcomes for the 2006 Census presented in Section 4.1.

4.2.1 Teenage motherhood rates

Table 5 shows that 1.6 per thousand 16-year-old women in 1991 became a teenage mother within the previous year. The teenage motherhood rate rises with age, reaching 13.9 per thousand among 19-year-old women. Estimates are again higher for previous cohorts of teenage mothers who are currently aged 20 to 24 and who became a teenage mother 5 years ago: 16 per thousand 23-year-old women and 31.2 per thousand 24-year-old women (see Table 6). As for 2006, teenagers who gave birth to a child before the age of 15 are not included in our counts.

Table 5: Teenage motherhood rates for ages 15-19, 1991

	Age					
	15	16	17	18	19	Total
Number of teenage mothers at age X, whose child is under the age of 1 (a)	2	2	7	15	20	46
Number of women aged X (b)	1,184	1,289	1,297	1,318	1,442	6,530
Births per 1000 [(a)/(b)*1000]	1.7	1.6	5.4	11.4	13.9	7.0
Fertility rate in 1991 (ABS, 2011)	3.6	8.9	19.9	31.7	42.6	22.1

Source: Census 1991 (1% CURF)

Overall, the teenage motherhood rate is estimated to be 7.0 per thousand among ages 15-19 and 11.4 among ages 20-24 (who became a mother around 1986). While the estimated teenage motherhood rate among ages 15-19 based on Census 1991 is similar to that based on Census 2006, the corresponding rate among ages 20-24 is slightly higher based on Census 1991. As the bottom rows in Tables 5 and 6 show, the rates derived from the Census data are

lower than estimates provided by ABS (2011) sources. Using the 1991 Census leads, on average, to just under one third of the rate observed by the ABS (Table 5), which is less than in 2006. When we use slightly older women to work out previous years' fertility rates we obtain just over half the fertility rate, as we did in 2006 (Table 6).

Table 6: Teenage motherhood rates for ages 20-24, 1991

	Age					
	20	21	22	23	24	Total
Number of teenage mothers at age X, whose child is under the age of 5 (a)	0	4	11	20	39	74
Number of women aged X (b)	1,372	1,371	1,252	1,249	1,250	6,494
Births per 1000 [(a)/(b)*1000]	0.0	2.9	8.8	16.0	31.2	11.4
Fertility rate in 1986 (ABS, 2011)	3.7	9.0	20.4	33.2	45.7	21.8

Source: Census 1991 (1% CURF)

The higher estimates based on Census 1991, together with the estimates for ages 20-29 based on Census 2006 (Tables 3 and 4), suggest that teenage motherhood rates have dropped slightly over the period between 1986 and 2006. This is consistent with what is reported by the ABS (see bottom rows in Tables 2 to 6 and Figures 1 and 2).

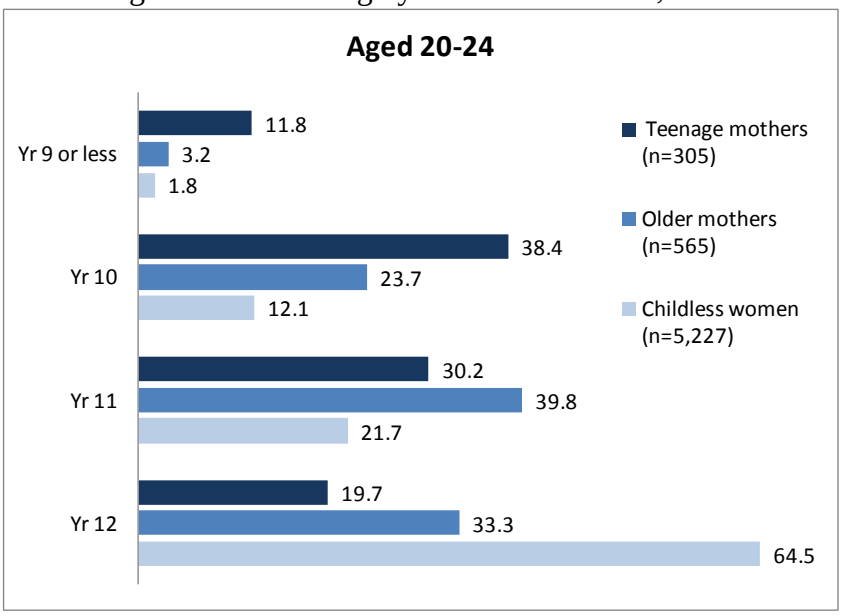
A limitation of Census 1991 is that the CURF data set is only a 1-percent sample of the population, and the age of respondents is only reported in single years for up to age 24. Hence, outcomes for women by motherhood status can only be presented for women aged 20-24, as the number of teenage mothers aged 15-19 is quite small (98), and for women aged over 25, teenage motherhood cannot be determined.

4.2.2 Motherhood status and educational outcomes

Although the 1991 Census does not ask what year of schooling each respondent has completed, it does ask at what age the respondent left school. We use this variable to approximate the schooling level for all relevant women. We assign those who left school at age 17, 18 and 19 to Year 12, those who left school at age 16 to Year 11, those who left school at age 15 to Year 10 and those who left school at age 14 or younger or who 'did not go to school' to Year 9 or less. When focussing on 20-24 year olds there are likely to be very few 'still at school' so we have added them to the 'not stated'/missing category. As in 2006, it is clear that teenage mothers are less likely than other young women to complete Year 12 and more likely to complete only Year 10 or even less. Childless women are the most likely to finish Year 12. Comparing 1991 with 2006, we see an increase in completion of Year 12

across all women, and a decrease in those completing Year 11. Mothers have increased Year 10 completion as well.

Figure 12: Schooling by motherhood status, 1991

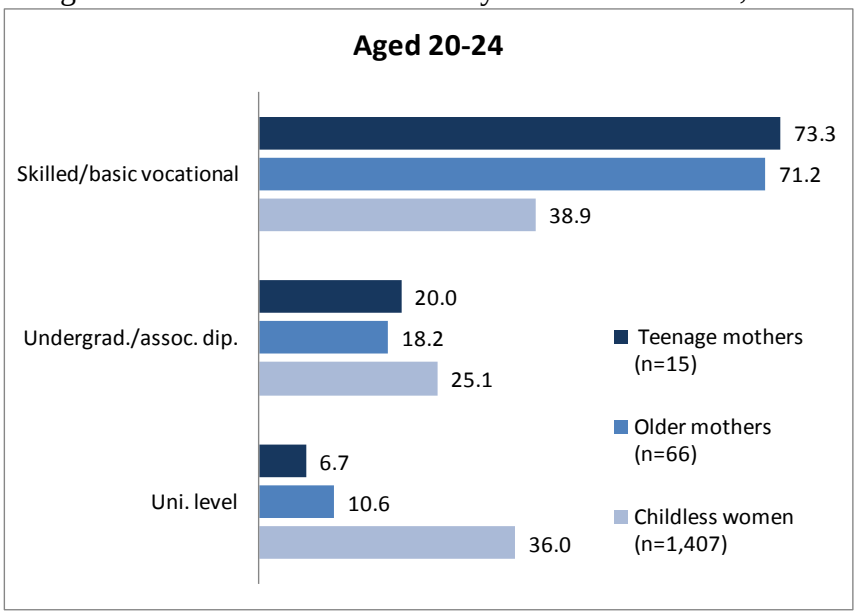


Source: Census 1991 (1% CURF)
Note: Entries are percentages.

Compared to 1991, women in 2006 would have faced compulsory schooling up to a higher age. For example, in South Australia, the age of compulsory education changed from 15 to 16 years from 1 January 2003. These changes are ongoing. In Western Australia the school-leaving age changed in 2008. It now is at the end of the year when turning 17 (it was 16). In Queensland compulsory schooling lasts until the student turns 16 or finishes Year 10. In Victoria children are required to go to school until they turn 17. Once they have finished Year 10, they have the option of employment, but if no employment can be found they have to return to education or training until they turn 17. These increases in the legal school-leaving age explain at least part of the increase in the amount of schooling that a person completes.

Childless women are the most likely to report an educational qualification while teenage mothers are the least likely to report a qualification. In particular, 25 percent of childless women aged 20-24 report a qualification, whereas the corresponding figures are 11 percent for older mothers and only 4.5 percent for teenage mothers. These percentages are all much lower than what is observed in 2006; more so for childless women and older mothers (over 20 percentage points lower) but even the proportion of teenage mothers who have a qualification is 15 percentage points lower in 1991 compared to 2006. This and the results from Figure 12 indicate that the level of education has increased for all women from 1991 to 2006.

Figure 13: Post-school education by motherhood status, 1991



Source: Census 1991 (1% CURF)
Note: Entries are percentages.

Among those who report an educational qualification, childless women are the most likely to have a university degree (although it is nearly 7 percentage points lower than in 2006), while teenage mothers and older mothers' qualifications are more likely to be vocational. Comparing 1991 with 2006, it appears that most of the growth in post-school qualifications has gone towards an increase in the proportion of women with a vocational qualification, at least for older and teenage mothers. For childless women, the growth has been highest in university level qualifications.

4.2.3 Motherhood status and labour market outcomes

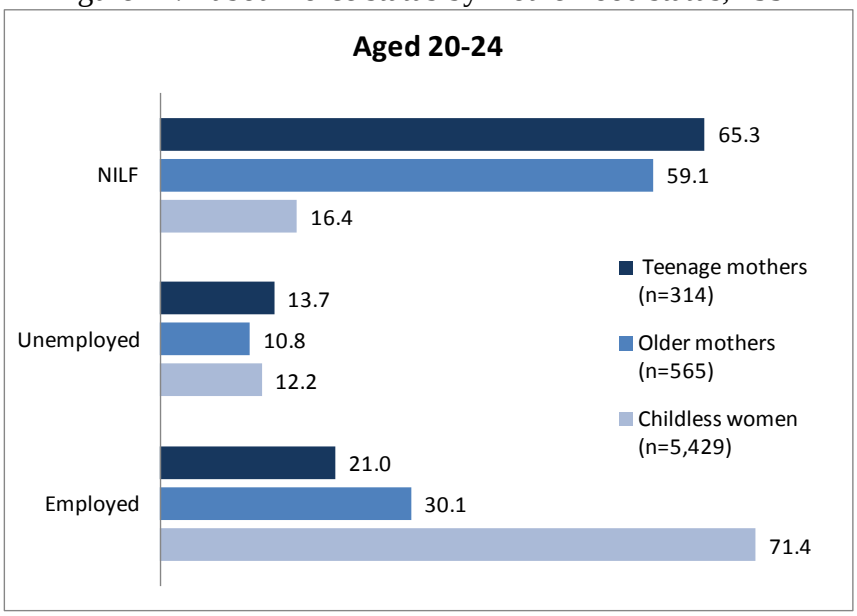
Three separate labour market outcomes are distinguished in this section. First the labour force status is discussed followed by hours worked, and the personal income from all sources. Household income reflects potential income of a partner.

Labour force status

Figure 14 shows again that teenage mothers aged 20-24 are similar to older mothers in terms of labour force status but very different from childless women. For example, only 16 percent of childless women aged 20-24 are out of the labour force, compared with 65 percent of teenage mothers aged 20-24 and 59 percent of older mothers. By contrast, while 71 percent of childless women are employed, the employment rates for teenage mothers and older mothers are 21 percent and 30 percent respectively.

These patterns are similar to what is observed in the 2006 Census. However, amongst those in the labour force, a larger proportion is employed in 2006 and a smaller proportion is unemployed, which is likely to be a reflection of better economic times in 2006 with lower overall unemployment rates.

Figure 14: Labour force status by motherhood status, 1991

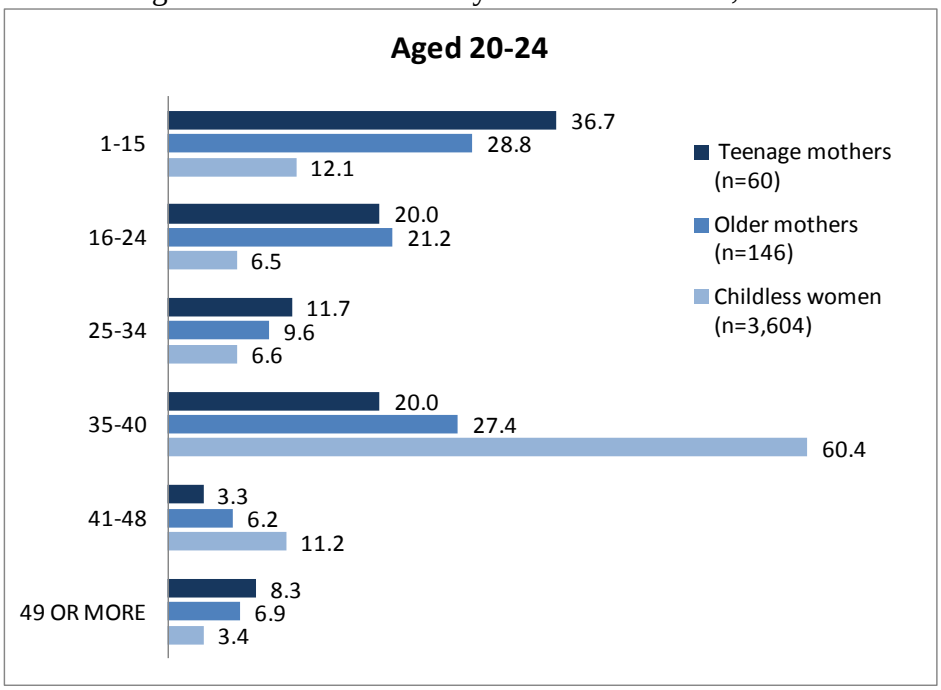


Source: Census 1991 (1% CURF)
Note: Entries are percentages.

Hours worked

Among those who are employed, childless women work longer hours than older mothers, who in turn work more than teenage mothers (see Figure 15). Specifically, 75 percent of childless women aged 20-24 work full time (i.e. at least 35 hours a week). By contrast, only 32 percent of teenage mothers aged 20-24 and 41 percent of older mothers are in full-time employment. Compared to 2006, a larger proportion of older mothers and childless women work full-time in 1991 while the proportion of teenage mothers working full-time is smaller. The latter proportion is based on a very small sample of teenage mothers so the increase from 1991 to 2006 is unlikely to be statistically significant. In 2006, more part-time employment is available than in 1991.

Figure 15: Hours worked by motherhood status, 1991



Source: Census 1991 (1% CURF)
Note: Entries are percentages.

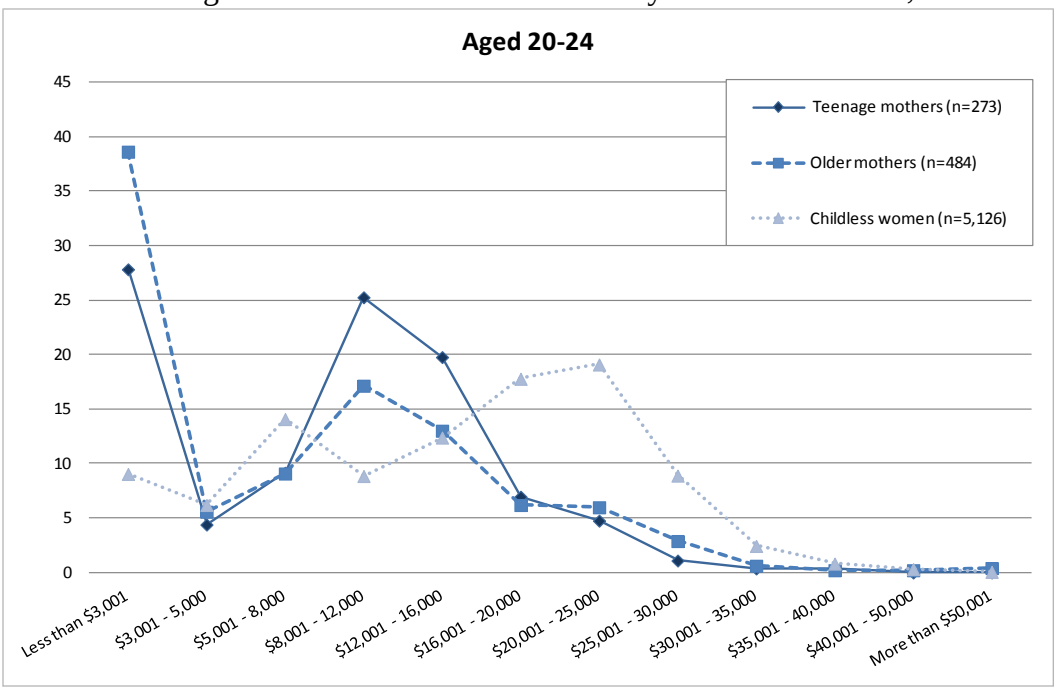
Personal income

Teenage mothers clearly have lower income than childless women (see Figure 16 and Appendix Table 3). While nearly half of all childless women have an annual income over $16,000, only 14 percent of all teenage mothers have income over this amount, which is slightly behind older mothers, 16 percent of whom have income over this amount. Older mothers are the most likely to have less than $3,000 per year in income (39 percent), followed by teenage mothers (28 percent) and childless women (9 percent). This is also reflected in the average incomes for each of the subgroups. Using the same approach by Chen *et al.* (1991) as in Section 4.1.3 for Census 2006, we find that teenage mothers have on average $9,666 in annual personal income while older mothers have slightly less ($9,165) and childless women have substantially more ($15,238).

To facilitate comparisons, note that between 1991 and 2006 (September quarters), the consumer price index increased by 46.9 percent (ABS, 2012). This means that $5,000 in 1991 is equivalent in real terms to $7,345, while $50,000 in 1991 is equivalent to $73,450. Annual levels of income for 2006 are presented in Appendix Table 1. Income levels show the same patterns as in 2006, but childless women are further ahead of the two other groups in 1991 than in 2006. It is clear that in real terms, teenage mothers and older mothers have experienced an increase in average income from 1991 to 2006, while childless women have

more or less the same income in real terms. The latter effect is likely to be due to the smaller proportion of childless women working full-time in 2006.

Figure 16: Personal annual income by motherhood status, 1991



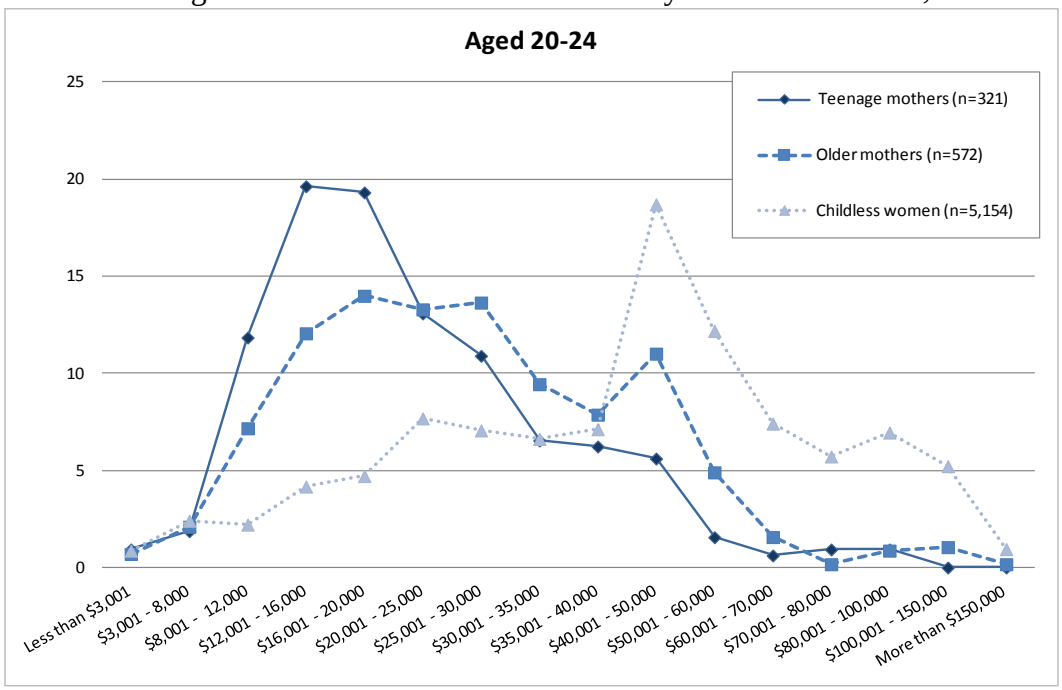
Source: Census 1991 (1% CURF)
Note: Entries are percentages.

Household income

A comparison of all household annual income by motherhood category in Figure 17 (and Appendix Table 4) clearly shows that teenage mothers have lower incomes than older mothers and childless women. On average their annual household income is $19,132 versus $26,680 for older mothers and $48,299 for childless women. Again this pattern is similar to what is observed in 2006 (Appendix Table 2), but from 1991 to 2006 real household income levels have increased considerably for all three groups of young women.

Amongst teenage mothers, the median annual income is just below $20,000; that is, slightly less than 50 percent of teenage mothers have an annual income over $20,000. This percentage is 64 percent amongst older mothers and 86 percent amongst childless women. Similar to the situation in 2006, older mothers have lower personal income but higher household income than teenage mothers, due to the higher probability of having a (working) partner.

Figure 17: Household annual income by motherhood status, 1991



Source: Census 1991 (1% CURF)
Note: Entries are percentages.

4.2.4 Motherhood status and partnership outcomes

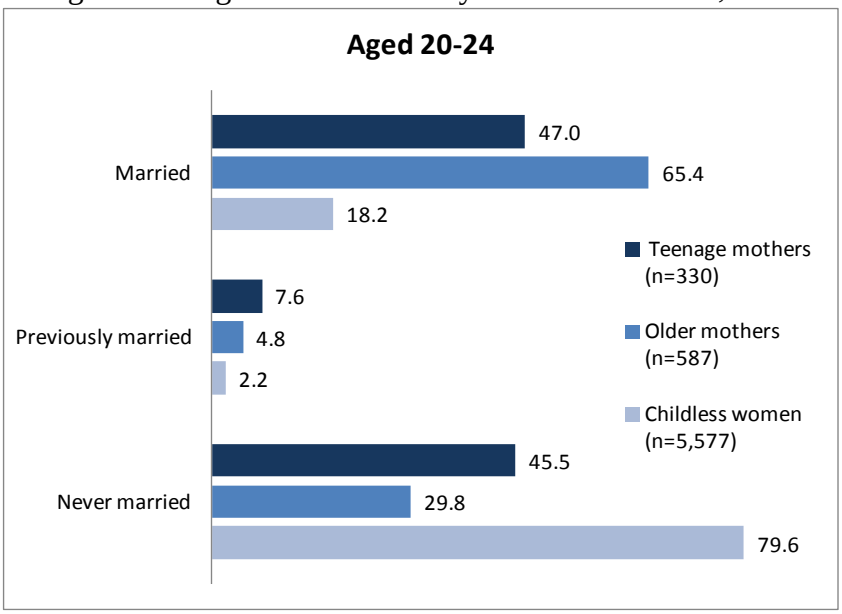
Figure 18 shows that older mothers are the most likely to be legally married, while childless women are the least likely to be legally married. Almost two thirds of older mothers aged 20-24 are married while fewer than 30 percent have never been married. Among childless women, being married is much less common than being single (18 percent versus 80 percent respectively). Teenage mothers aged 20-24 are equally likely to be married (47 percent) as to have never married (46 percent).

The proportion of women categorised as married in Figure 18 is similar to the proportion of women in 2006 categorised as being married or having a de facto relationship, but compared to those who are legally married only, the proportion who is legally married was much higher in 1991. Consistent with this observation, compared to 2006, a larger proportion in each of the three subgroups was married previously in 1991.

Although social marital status (legally married versus a de facto relationship) is not asked at the individual level in the 1991 Census, questions are asked regarding couple status at the family level. We use this variable to construct a social marital status variable at the individual level. We assign ‘not applicable’ to anyone who is not the reference person or the partner of the reference person in the family and we assign the family-level variable to the young

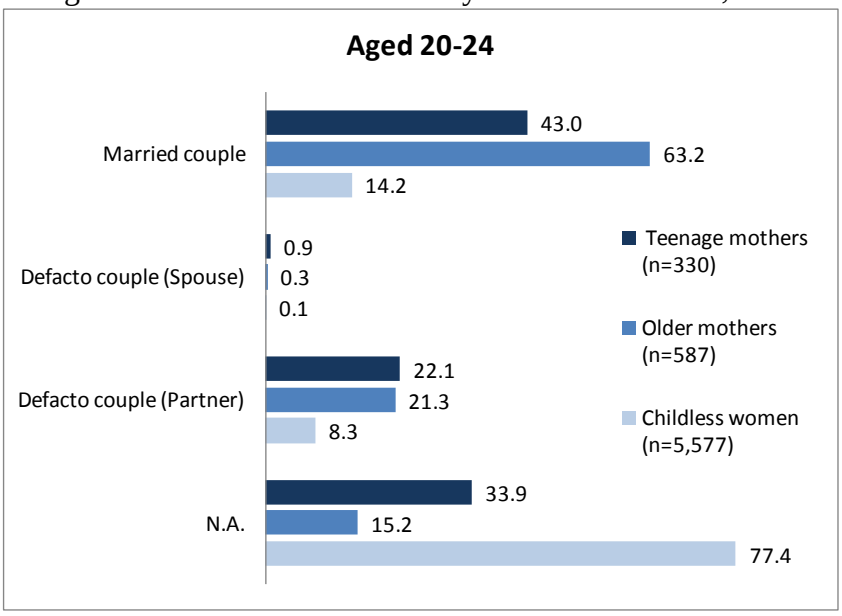
woman if she is either the reference person in the family or the partner of the reference person. The resulting variable is reported in Figure 19, where we interpret not applicable as a single person.

Figure 18: Legal marital status by motherhood status, 1991



Source: Census 1991 (1% CURF)
Note: Entries are percentages.

Figure 19: Social marital status by motherhood status, 1991



Source: Census 1991 (1% CURF)
Note: Entries are percentages.

Figure 19 shows that a substantial number of women have a de facto relationship, with this proportion being highest among teenage mothers. Compared to 2006, a larger proportion is legally married and a smaller proportion is in a de facto relationship in 1991. This is true for

teenage mothers, older mothers and childless women. In addition, teenage mothers and older mothers are both less likely to be in a relationship (either legally married or de facto) in 2006 than they were in 1991.

4.3 Trends during 1991-2006

A comparison between the two years shows several similarities in the observed patterns of outcomes between the three groups of young women. It is clear that in 1991, teenage mothers aged 20-24 also have less favourable outcomes than other women of the same age. Teenage mothers are less likely to finish Year 12 and less likely to have a post-school qualification (and if they have a post-school qualification, teenage mothers are less likely to have a university degree). Teenage mothers are also less likely to be employed (and if employed, work fewer hours). While teenage mothers on average have slightly higher personal income than older mothers and lower income than childless women, they have lower household income than both older mothers and childless women. Older mothers have higher household income than teenage mothers, because they are more likely to have a (working) partner than teenage mothers.

A number of outcomes have changed from 1991 to 2006. Some of these may be (partly) temporary since they are due to the economic circumstances at the time, such as the higher employment (and lower unemployment) rates for all three groups of women, although a small part of it may also have been caused by higher female labour force participation overall.[26] Outcomes such as education may have improved more permanently for all three groups of women, despite the teenage mothers still lagging behind the other two groups in this respect. A much larger proportion finishes Year 12 and continues on to post-school qualifications in 2006 compared to 1991, and for childless women the proportion going to university has increased as well. Average personal and household incomes have both increased in real terms, with the nominal income increases being much more than the overall price increases due to inflation. So, on average everyone is better off (financially at least) in 2006 than in 1991.

Another outcome that has changed substantially across all three groups from 1991 to 2006 is the legal marital status. This has decreased enormously, particularly for the two mother groups, since the childless women had a low rate of marriage to begin with. The decrease in legal marriage is to some extent compensated by the increase in de facto partnerships which

[26] However, this seems unlikely to be a major factor given the minor changes in the proportion out of the labour force.

seem to replace the former partnerships through marriage. However, among mothers, this increase was not sufficient to completely make up for the lower rate of legal marriage, so that teenage mothers and older mothers in 2006 are much less likely to be in a relationship than they were in 1991.

4.4 Prevalence of teenage motherhood by background characteristics

This section explores the association of a number of background characteristics observed in the Census with teenage motherhood and older motherhood. Table 7 reports on a number of individual and household characteristics which reveal clear differences in the teenage motherhood rate across groups.

There are differences by geographical area, showing that Tasmania and the Northern Territory have the highest prevalence of teenage motherhood, followed by Queensland. The rate of women becoming mother when aged 20-29 are also shown to be higher in these three regions. Consistent with the lower urbanisation of these three regions, compared to for example Victoria and New South Wales, areas outside the major capital cities have a higher prevalence of teenage motherhood (and older motherhood).

Young women's ethnic background is also shown to be important. Women who are born in Australia are the most likely to be a teenage mother (and least likely to be an older mother), followed by women born in other English-speaking countries (who are the most likely to be an older mother). Women born in non-English-speaking countries are only half as likely as women born in Australia to be a teenage mother. A similar association with the father's and mother's countries of birth is observed where both parents' backgrounds appear equally relevant. Consistently, young women who speak a language other than English at home are less likely to be a teenage mother (or an older mother). Women speaking a European language are the least likely to be a teenage mother (three times less likely than women speaking English at home), closely followed by women speaking an Asian language at home. However, those who do not speak English well or very well are much more likely to be a teenage mother (and older mother), although this is a relatively small subgroup. The starkest difference is by Indigenous status, with Indigenous young women being close to five times as likely to be a teenage mother (and older mother) as non-Indigenous women. More than 17 percent of all Indigenous women between 15 and 29 had a child as a teenager.

Table 7: Characteristics by motherhood status for ages 15-29, Census 2006

	Teenage mothers	Older mothers	Childless women	All women aged 15-29
	row %	row %	row %	row freq.
Total	4.1	12.3	83.5	82,649
States/Territories				
New South Wales	3.8	12.2	83.9	26,863
Victoria	2.7	10.4	87.0	21,107
Queensland	5.6	14.3	80.1	16,285
South Australia	4.7	12.8	82.5	6,234
Western Australia	4.7	12.9	82.5	8,056
Northern Territory	10.1	16.1	73.8	753
Tasmania	6.8	15.7	77.5	1,789
ACT	3.1	10.5	86.4	1,562
Usual residence				
Major capital cities	2.8	10.3	86.9	50,405
Other areas	6.2	15.5	78.3	32,244
Proficiency in spoken English [a]				
Very well/ well	2.1	11.0	86.9	14,143
Not well/ Not at all	5.9	23.4	70.7	969
Language spoken at home [b]				
English	4.5	12.5	83.0	67,174
European languages	1.5	10.3	88.2	4,194
Asian languages	1.9	12.1	86.0	10,026
Other Languages (incl. Australian Indigenous Languages)	11.3	17.5	71.2	794
Indigenous status [c]				
Non-Indigenous	3.8	12.2	84.0	79,801
Indigenous	17.4	18.6	64.0	2,105
Religion				
Catholic	3.3	11.0	85.7	22,521
Anglican	4.9	13.9	81.3	12,632
All other Christian beliefs together	3.4	12.1	84.5	15,090
Buddhism	1.7	9.5	88.9	2,306
Islam	5.3	23.9	70.8	2,042
All other non-Christian beliefs together	4.9	13.3	81.8	7,802
No religion	5.0	11.9	83.1	20,256
Country of birth of respondent [d]				
Australia	4.4	12.0	83.6	65,985
Eng. speaking countries	3.9	14.0	82.1	4,255
Other non-Eng. speaking countries	2.2	13.0	84.9	11,256
Country of birth of mother [e]				
Born in Australia	4.8	12.5	82.7	52,186
Born Overseas	2.7	11.9	85.4	29,136

Table 7: Characteristics by motherhood status for ages 15-29, Census 2006

	Teenage mothers	Older mothers	Childless women	All women aged 15-29
	row %	row %	row %	row freq.
Country of birth of father [f]				
Born in Australia	4.9	12.6	82.5	50,003
Born Overseas	2.7	11.8	85.5	31,300
Household income as stated [g]				
Low (below $51,999)	7.7	17.6	74.7	26,270
Medium (between $52,000 and $88,399)	3.5	13.5	83.0	26,118
High (above $88,400)	1.3	6.5	92.3	29,365

Source: Census 2006 (5% CURF)

Notes: (a) Applicable only to those whose language spoken at home is not English; 363 observations with 'Not stated'; (b) 461 observations with 'Not stated, non-verbal so described, inadequately described'; (c) 743 observations with 'Not stated'; (d) English speaking countries include United Kingdom, Ireland, United States of America, Northern America (incl. Canada, Bermuda, St Pierre and Miquelon), New Zealand, and South Africa; 1153 observations with 'Not stated'/ 'Inadequately described'; (e) 1,327 observations with 'Not stated'; (f) 1,346 observations with 'Not stated"; (g) 896 observations with 'Not stated'.

Table 7 also shows some differences by religion, with Christians, other than Anglicans, and Buddhists having the lowest teenage motherhood rates, and non-religious and non-Christian women the highest rates. Islamic women also have a much higher older mother rate, while Buddhists have the lowest older mother rates.

Household income is also shown to be important, although this is most likely a consequence of teenage motherhood. Women in households on low income are nearly six times as likely to be a teenage mother as women in households on high income.

Table 8 aims to provide, as much as is possible, similar percentages for the Census of 1991. Since we can only determine teenage motherhood for women aged 15 to 24 in 1991, we report results for women aged 15 to 24 from the 2006 Census in Appendix Table 5 to allow for a direct comparison with Table 8. Overall, young women in 1991 were slightly more likely to be an older mother than young women in 2006, while teenage motherhood rates were the same.

The regional variable is more aggregated in Census 1991 than in Census 2006. Unfortunately quite dissimilar regions were aggregated, such as Tasmania and the Australian Capital Territory (ACT). Queensland is now the region with the highest teenage motherhood rate since the Northern Territory and Tasmania have been combined with regions that had relatively low teenage motherhood rates in 2006, potentially disguising the high rates in the Northern Territory and Tasmania. Similar to 2006, young women living outside of major

capital cities are more likely to be teenage mothers (and older mothers). The teenage motherhood rate in major capital cities has decreased while in the other areas it has increased.

Table 8: Characteristics by motherhood status for ages 15-24, Census 1991

	Teenage mothers row %	Older mothers row %	Childless women row %	All women aged 15-24 row freq.
Total	3.3	4.5	92.2	13,024
States/Territories				
New South Wales	3.1	4.4	92.6	4,300
Victoria	2.6	4.2	93.2	3,313
Queensland	4.9	5.1	90.0	2,416
SA, WA and NT	4.7	12.8	82.5	6,234
Tas and ACT	3.6	4.4	92.0	609
Usual residence				
Major capital cities	2.5	3.6	93.9	6,617
Other areas	4.1	5.5	90.4	6,407
Proficiency in spoken English [a]				
Very well/ well	1.6	3.6	94.9	1,858
Not well/ Not at all	5.3	9.0	85.8	190
Language spoken at home [b]				
English	3.6	4.7	91.7	10,723
European languages	2.3	4.4	93.3	1,263
Asian languages	0.5	2.3	97.2	390
Other Languages (incl. Australian Indigenous Languages)	1.9	3.6	94.5	364
Indigenous status [c]				
Non-Indigenous	3.1	4.5	92.3	12,402
Indigenous	10.2	6.7	83.1	284
Religion [d]				
Catholic	2.9	4.6	92.6	3,883
Anglican	3.3	4.3	92.4	2,937
All other Christian beliefs together	2.8	4.0	93.2	2,818
All non-Christian beliefs together	5.8	7.3	86.9	343
No religion	5.0	5.3	89.7	1,802
Country of birth of respondent [e]				
Australia	3.4	4.4	92.2	10,800
Eng. speaking countries	3.3	6.2	90.5	842
Other non-Eng. speaking countries	3.1	5.1	91.9	1,142
Country of birth of mother [f]				
Born in Australia	3.6	4.4	92.0	8,610
Born Overseas	2.7	4.9	92.4	4,148

Table 8: Characteristics by motherhood status for ages 15-24, Census 1991

	Teenage mothers row %	Older mothers row %	Childless women row %	All women aged 15-24 row freq.
Country of birth of father [g]				
Born in Australia	3.6	4.4	92.1	8,092
Born Overseas	2.5	4.8	92.7	4,598
Household income as stated [h]				
Low (less than $30000)	7.6	8.4	84.0	4,310
Medium	1.9	4.5	93.7	3,643
High (more than $50001)	0.5	1.2	98.3	4,158

Source: Census 1991 (1% CURF)

Notes: (a) Applicable only to those whose language spoken at home is not English; 253 observations with 'Not stated language' or 'Not stated proficiency'; (b) 284 observations with 'Not stated' or 'Inadequately described'; (c) 338 observations with 'Not stated'; (d) 1,241 observations with 'Not stated'; (e) English speaking countries include United Kingdom, Ireland, United States of America, Northern America (incl. Canada, Bermuda, St Pierre and Miquelon), New Zealand, and South Africa; 240 observations with 'Not stated' or 'Inadequately described'; (f) 266 observations with 'Not stated' or 'Inadequately described'; (g) 334 observations with 'Not stated' or 'Inadequately described'; (h) 913 observations with 'Not stated'.

Similar to what is observed in 2006, there are ethnic differences. Again, young women born in Australia are the most likely to be teenage mothers and women born in non-English speaking countries are the least likely to be teenage mothers. However, the difference between the groups is much smaller in 1991 than in 2006. Teenage motherhood rates of women with parents born in Australia are higher than the rates of women with migrant parents, but again the difference is smaller than in 2006 due to higher teenage motherhood rates of women with migrant parents and lower teenage motherhood rates of women with Australian-born parents. English language proficiency has a similar association with teenage motherhood as in 2006, with no change in the prevalence of teenage motherhood for those who speak English well or very well and a slight (0.1 percentage point) decrease in the rate for women who do not speak English or do not speak it well. As before, Indigenous status has a strong association with teenage motherhood, but in 1991 the teenage motherhood rate of Indigenous women was lower. However, this observation is based on a relatively small number of young Indigenous women in 1991.

Non-Anglican Christian women have the lowest teenage motherhood rates, while non-Christian women have the highest teenage motherhood rates followed by non-religious women. Similar patterns are observed for older motherhood rates. These patterns are similar to those observed in 2006, although in 1991 fewer religious groups are distinguished due to the much smaller sample size. Buddhists who were observed to have very low teenage

motherhood rates are now part of the non-Christian religions group, which contain religious groups who had high teenage motherhood rates in 2006. From 1991 to 2006 all religious groups have seen a decrease in teenage motherhood rates, except for the Anglican women for whom an increase from 3.3 percent to 3.7 percent was observed among 15- to 24-year-old women.

Finally, comparing teenage motherhood rates across income groups, we find that high-income households are substantially less likely to contain teenage mothers than low-income households. This is similar to what is found in 2006, but in 1991 teenage motherhood rates are higher in the low-income households while they were lower in the high-income households. This could be an indication that teenage mothers are doing relatively better in 2006; that is, more of them live in households that are reasonably well off compared to the situation in 1991. This is consistent with what is observed regarding family income by motherhood status in 1991 and 2006.

4.5 Descriptive multivariate regressions

The results in the previous sections are obtained by examining the association of each characteristic separately with teenage motherhood. Several of the characteristics may be correlated with each other, so multivariate analyses are important to find out which characteristics have the strongest association with teenage motherhood and what the extent of each association is. In addition, we are interested to explain educational, labour market, and partnership outcomes. To achieve this, we run a number of simple interval and probit regressions using Census 2006 and 1991.

We estimate equations for:

- motherhood status (multinomial logit) in Section 4.5.1
- partnering status (probit) in Section 4.5.2
- labour force participation/employment (probit) in Section 4.5.3
- hours worked (interval regression) in Section 4.5.3
- income (interval regression) in Section 4.5.3
- education (ordered probit) in Section 4.5.4

As explanatory variables we include State dummies, major capital city dummy, language spoken at home (English, Asian, European, other), country of birth (Australia, other English-speaking, non-English speaking), country of birth of the mother, country of birth of the father, Indigenous status, religion, own age, age of the youngest child, number of children,

partnering status, partner's employment status, and motherhood status (in the outcome equations).

4.5.1 Motherhood status

Starting with the motherhood status, which has three possible outcomes – childless woman, teenage mother or older mother – we present relative-risk ratios in Table 9. The relative-risk ratio presents the ratio of the probability of being a teenage mother or an older mother versus being a childless woman for someone with a specific characteristic (the relative risk) to the same probability for someone without that characteristic. That is, it indicates the relative risk of being a teenage mother versus a childless woman for someone with the specified characteristic compared to someone without this characteristic. To give an example, in 2006 the relative risk of being a teenage mother was 1.94 times larger outside major capital cities compared to in major capital cities, while in 1991 the relative risk for this group was 1.49 times larger. The relative risk of being an older mother was 1.71 times larger outside major capital cities in 2006, and 1.52 times larger in 1991.

Several characteristics that were shown to be associated with motherhood status in bivariate relationships remain relevant after controlling for a range of factors. We have excluded age from the specification since young women still living at home with their parents cannot be identified as a teenage or older mother because the relationship of them with their children is not reported. As a result, the proportion of teenage mothers amongst young women is not well represented since only those living independently can be identified. Marriage and de facto relationships are strongly associated with teenage and older motherhood, although compared to 1991, the relationship has weakened considerably. However, if the partner is employed there is a negative association with teenage and older motherhood in 2006 and with teenage motherhood in 1991, indicating that women with an employed partner are less likely to be a teenage mother in both years and less likely to be an older mother in 2006.[27]

Women who completed at least Year 10 had lower relative-risk ratios than women who had Year 9 or less. However, this was not the case in 1991, when women with Year 10 had a larger relative-risk ratio than women without Year 10. Note, however, that in 1991 we had to approximate years of schooling completed by using information on the age at which the woman had left school.

[27] Note that older mothers included in the sample all had their child before the age of 30.

The more remote, less densely populated States/Territories exhibit larger relative-risk ratios, consistent with the results for living outside a major capital city. The results are less diverse in 1991, partly through the aggregation of States/Territories that are quite different, such as Tasmania and the ACT, but there also seems to be less variation by State *per se*.

Table 9: Motherhood status – relative-risk ratios (relative to childless woman)

	2006		1991	
	Teenage mothers	Older mothers	Teenage mothers	Older mothers
Relationship (single)				
Married	14.417***	29.796***	19.360***	36.470***
In a de facto relationship	4.066***	5.800***	17.000***	18.050***
Partner is employed	0.429***	0.857**	0.455***	1.177
Completed at least Year 10	0.322***	0.910*	1.203	1.827***
State of residence (NSW)				
Vic	0.732***	0.906***	1.154	1.141
QLD	1.289***	1.132***	1.651***	1.244
SA	1.345***	1.232***		
WA	1.336***	1.202***	1.098[a]	1.143[a]
NT	1.023	0.872		
Tas	1.191	1.150*		
ACT	0.542***	0.603***	0.981[b]	0.904[b]
Living outside major capital cities	1.941***	1.708***	1.491***	1.521***
Language spoken at home				
European languages	0.703**	0.925	0.602*	0.829
Asian and other languages	0.849	0.880**	0.154***	0.352***
Country of birth (Australia)				
Other English speaking countries	1.270**	1.167**	1.008	0.97
Non-English speaking countries	0.744***	0.903*	1.309	1.095
Father born overseas	0.850***	0.942	1.261	1.048
Mother born overseas	0.787***	0.885***	0.678**	1.021
Indigenous Australian	4.169***	2.617***	3.516***	2.178***
Religion (Roman Catholic)				
Anglican	1.202***	1.149***	0.996	0.958
Other Christian beliefs	0.932	0.879***	0.804	0.749**
Buddhism	1.061	1.199*		
Islam	3.178***	2.267***		
Other non-Christian beliefs	1.564***	1.226***	3.661***[c]	2.074**[c]
No religion	1.387***	1.044	1.435**	1.180
Observations		79,106		11,464
Pseudo R-squared		0.211		0.252

Source: Estimated from Census 1991 (1% CURF) and Census 2006 (5% CURF)

Notes: *significant at 10%, **significant at 5%, ***significant at 1%; reference group listed in parentheses for categorical variables. (a) Coefficient for South Australia, Western Australia and Northern Territory combined. (b) Coefficient for Tasmania and ACT combined. (c) Coefficient for all non-Christian beliefs combined.

Women who speak non-English languages at home have a low relative-risk ratio of teenage and older motherhood compared to women who speak English at home. Interestingly, migrant women from other English-speaking countries have a high relative-risk ratio compared to native-born women, but migrant women from non-English speaking countries have a low relative-risk ratio compared to native-born women. This indicates that the language spoken at home and country of birth both have separate effects, possibly through the parent's country of birth (which is likely to influence the language spoken at home to some extent). In 2006, an overseas-born parent is associated with a low relative-risk ratio of teenage and older motherhood. Women from an Indigenous background have a very high relative-risk ratio of teenage and older motherhood, which is as expected given the large observed differences in the teenage motherhood rate between Indigenous and non-Indigenous women.

The final factor we investigated is religion. There are clear differences in relative-risk ratios by religion, which are likely to reflect cultural differences. In some ethnic groups, it is relatively common to marry young and have children at a young age rather than a reflection of potential risk-taking behaviour. Associations are similar in 1991 and 2006, with non-Christian beliefs and no religion being associated with a high relative-risk ratio compared to Roman Catholics. There is not much difference between relative-risk ratios for different Christian beliefs, with Anglicans having the highest relative-risk ratio in 2006 and the Roman Catholics having the highest ratio in 1991.

4.5.2 Having a spouse or de facto partner

The presence of a partner can alleviate the task of caring for children. Therefore we investigate the factors that are associated with having a partner or spouse. Given that for women without children, the situation is quite different, we present results for all women as well as for mothers only in Table 10.

Table 10: Marginal effects on the probability of having a partner based on a probit estimation

	All women		Mothers only	
	2006	1991	2006	1991
Age	0.055***	0.076***	0.024***	0.031**
Teenage mother	0.356**	0.553***	-0.195***	-0.198*
Teenage mother * Number of children	-0.001***	-0.029	0.041***	0.031
Teenage mother * Age youngest child 2-4	-0.119**	-0.175***	-0.080***	-0.132**
Teenage mother * Age youngest child 5-9	-0.247**	-0.245***	-0.192***	-0.285**
Older mother	0.499**	0.641***		
Older mother * Number of children	-0.017***	-0.062	0.017**	-0.008
Older mother * Age youngest child 2-4	-0.209***	-0.185***	-0.182***	-0.203***
Older mother * Age youngest child 5-9	-0.337***		-0.418***	
Schooling (completed Year 9 or less)				
Completed at least Year 10	0.071**	0.110***	0.051***	0.040
Completed Year 12[d]	-0.009***	-0.098***	0.076***	0.016
Post-school qualifications (none)				
Any post-school qualification[e]	0.073***	-0.006	0.008	-0.069
University level or above	-0.014***	-0.096***	0.124***	
State of residence (NSW)				
Vic	-0.002***	0.029*	-0.007	0.066*
QLD	0.060***	0.044**	0.017	0.042
SA	0.047***		0.023	
WA	0.076***	0.024[a]	0.065***	-0.029[a]
NT	0.095**		0.061**	
Tas	-0.015**		-0.013	
ACT	-0.022**	0.018[b]	0.056*	0.019[b]
Living outside major capital cities	0.083***	0.063***	0.032***	0.060*
Language spoken at home				
European languages	-0.073**	-0.035	0.004	0.083
Asian and other languages	-0.074**	-0.118***	0.059***	
Country of birth (Australia)				
Other English-speaking countries	0.048**	0.016	-0.014	-0.018
Non-English speaking countries	0.091***	0.101***	0.060***	0.104
Father born overseas	-0.007***	-0.003	0.005	0.029
Mother born overseas	0.003***	0.025	0.022*	0.020
Indigenous Australian	-0.088**	-0.005	-0.129***	-0.162*
Religion (Roman Catholic)				
Anglican	0.022***	0.007	0.012	-0.002
Other Christian beliefs	0.023***	0.048***	0.062***	0.023
Buddhism	-0.067**		-0.140***	
Islam	0.197**		0.093***	
Other non-Christian beliefs	0.033***	0.164***[b]	0.009	-0.105[b]
No religion	0.047***	0.048**	0.004	0.044
Observations	57,909	6,995	12,666	816
Pseudo R-squared	0.199	0.201	0.146	0.128

Source: Estimated from Census 1991 (1% CURF) and Census 2006 (5% CURF)

Notes: *significant at 10%, **significant at 5%, ***significant at 1%; reference group listed in parentheses for categorical variables. (a) Coefficient for South Australia, Western Australia and Northern Territory combined; (b) Coefficient for Tasmania and ACT combined; (c) Coefficient for all non-Christian beliefs combined; (d) Excludes non-school Year 12 equivalent qualifications; (e) Includes all certificate-, diploma- and degree-level qualifications.

As expected, the probability of having a partner increases with age, particularly when childless women are included. In 1991, the effect of age was larger than in 2006. Relative to childless women, teenage mothers are more likely to be partnered (35.6 percentage points

more) but compared to older mothers they are less likely to be partnered. The latter can be most easily seen in the probit results for mothers only, which shows that teenage mothers are 19.5 percentage points less likely than older mothers to have a partner. Not surprisingly, mothers with an older youngest child are less likely to have a partner than mothers with a newborn child. This effect appears larger for older mothers than for teenage mothers, possibly due to the higher partnering rate to start with. Relative to childless women, motherhood is associated with a larger increase in the probability of having a partner in 1991 compared to 2006.

Education has mixed effects, depending on which group of women is included. Completing at least Year 10 has a positive (or zero) effect on the probability of having a partner in all groups, whereas completing Year 12 as well has a further positive effect within the group of mothers but a negative effect when childless women are also included. In 1991 the latter effect was larger, indicating a tendency of better-educated women to remain single longer than their less-educated counterparts. However, the overall effect of completing Year 12 (combined with having completed Year 10) is still positive. Similar effects are observed for post-school qualifications at university level or above versus lower-level post-school qualifications.

There are some slight differences between States/Territories, but the clear regional difference appears to be between major capital cities and outside these cities. In all groups and in both Census years are women living outside the major capital cities more likely to have a partner than women living in the major capital cities. The association is stronger when childless women are also included.

Women who are born outside Australia are more likely to live with a partner, especially if they were born in a non-English speaking country. However, amongst mothers this difference between Australian-born women and overseas-born women is smaller and/or insignificant. It seems that these women partner with men who are English-speaking or who at least do not share the same language, since a negative association is observed for women who speak a European or other non-English language at home. There are very slight differences for women whose parents were born overseas, but these are substantially smaller than the associations arising from the woman having been born overseas herself.

Women from Indigenous Australian origin are less likely to have a partner than other women, particularly amongst mothers in 2006. Combined with their high rate of motherhood, this

means that they are likely to have sole responsibility for the care of their child without support of a partner.

In addition to ethnic background as observed through language spoken and country of birth, religion also appears to play a role. Women from an Islamic background are the most likely to have a partner, followed by women without a religious background. Women with a Buddhist religion are the least likely to have a partner. Amongst mothers, the relative probabilities to have a partner remain the same: that is, they are highest for Islamic women and lowest for Buddhist women. Results for 1991 are similar, with only the probability of having a partner now being of a more substantial size for other Christian beliefs than in 2006. Amongst mothers, none of the religions are statistically significant, which could be at least partly due to the small remaining sample of 816 women.

Finally, to explore differences in partnership outcomes between teenage mothers with different characteristics, we estimate the same models as in Table 10, but add interaction terms of being a teenage mother with completing at least Year 10, completing Year 12, completing any post-school qualification, completing a university degree, living outside the major capital cities, only speaking English at home, being of Indigenous descent, being an immigrant, both parents being immigrants, and becoming a teenage mother at age 19. In 2006, the only interaction terms that are significant in the specification for all women are completing Year 12, completing any post-school qualification and only speaking English at home (see Appendix Table 6). The positive association of partnering with completing Year 10 appears slightly (but not significantly) smaller for teenage mothers than for other women and the negative association with completing a university degree is also slightly (and insignificantly) smaller. However, teenage mothers who complete Year 12 are more likely to have a partner than teenage mothers who only complete Year 10, while for other women it is the other way around.[28] In 1991, a similar pattern is found, but the positive association with completing Year 12 for other women has now turned into an insignificant association. In addition, in 2006, finishing any post-school qualification has a small negative association for teenage mothers instead of the positive association observed for other women. In 2006, although women who only speak English at home are slightly more likely to have a partner

[28] Using the marginal effects in Appendix Table 6, a childless woman or older mother with Year 10 completed is 8.0 percentage points more likely to have a partner, while she is only 6.3 (8.0 – 1.7) percentage points more likely to have a partner if she completed Year 12. For teenage mothers, this is 4.4 (8.0 – 3.6) and 13.1 (8.0 – 3.6 – 1.7 +10.4) percentage points for completing Year 10 and Year 12 respectively.

than other women, teenage mothers who only speak English at home are less likely to have a partner. In 1991, the difference in partnering rates is even larger.

Similar results are found for the subgroup of mothers in 2006. Completing Year 10 or completing Year 12 seems equally beneficial for teenage mothers as for older mothers. The gain in the probability of having a partner from finishing a university degree, compared to not having any qualifications or non-degree post-school qualifications, is considerably less for teenage mothers compared to older mothers. Living outside a major city has a larger positive effect on the partnering probability for teenage mothers than for older mothers. The sample size in 1991 is small, so none of the interaction terms are significant, except for the age at birth interaction. That is, teenage mothers who were relatively old when giving birth (that is, 19 years of age) are more likely to be partnered than younger teenage mothers and than other women of the same age. This difference is larger in 1991 than in 2006, and in 2006 the marginal effect is only just significant (at the 10%-level) in the mothers group.

4.5.3 Labour market outcomes

Four separate labour market outcomes, including labour force participation, employment, hours worked and personal income are presented in Table 11. The first two pairs of columns present the results for labour force participation and employment. This shows that, generally speaking, most associations are slightly more pronounced when considering employment than when considering labour force participation, indicating that the demand side reinforces associations that are present when only considering the supply side of labour. This means that unemployment is a more likely outcome for teenage mothers once their child is aged two or more than for childless women. Mothers with children younger than two years of age are less likely to be in the labour force and the associations with labour force participation and employment appear to be more similar. Both teenage mothers and older mothers are less likely to be in the labour force or employed than childless women.

Table 11: Labour market outcomes for women aged 20 or over

	Probit marginal effects				Interval regression coefficients			
	Labour force participation		Employment		Hours worked (if working)		Personal income	
	2006	1991	2006	1991	2006	1991	2006	1991
Age	0.003***	0.001	0.008***	0.020***	0.474	0.190*	29.582***	26.26***
Teenage mother	-0.464***	-0.598***	-0.452***	-0.597***	-5.213***	-10.910***	-81.323***	-70.64***
Teenage mother * Number of children	-0.040***	0.023	-0.052***	0.017	-2.705***	-0.436	-29.474***	-12.78
Teenage mother *Age youngest child 2-4	0.052***	0.029	0.064***	0.080	-0.206***	-0.632	-10.189	-20.16
Teenage mother *Age youngest child 5-9	0.098***	0.093***	0.122***	0.202***	0.906	6.167	-20.400	-37.27
Older mother	-0.436***	-0.374***	-0.429***	-0.414***	-13.093***	-19.310***	-265.164***	-127.1***
Older mother * Number of children	-0.042***	-0.054**	-0.058***	-0.105**	-1.579***	6.338***	-22.337***	-27.50*
Older mother *Age youngest child 2-4	0.073***	0.049**	0.093***	0.108***	4.459	3.844**	63.865***	10.96
Older mother *Age youngest child 5-9	0.104***		0.136***		5.427		81.690***	
Schooling (completed Year 9 or less)								
Completed at least Year 10	0.099***	0.066***	0.112***	0.113***	1.507	-0.699	33.839***	19.95**
Completed Year 12[d]	0.054***	0.057***	0.089***	0.096***	1.184	0.441	55.129***	26.62***
Post-school qualifications (none)								
Any post-school qualification[e]	0.061***	0.067***	0.077***	0.099***	0.765	0.338	38.587***	45.22***
University level or above	0.040***	0.026	0.053***	0.013	1.503	0.308	190.566***	53.53***
State of residence (NSW)								
Vic	-0.018***	0.017	-0.019***	-0.042**	-0.436***	-0.921**	-44.922***	-15.86***
QLD	-0.002	0.001	0.001	-0.038*	-0.053***	-0.110	-25.740***	-29.16***
SA	-0.017**		-0.011		-1.212***		-48.336***	
WA	-0.019***	0.001[a]	-0.001	-0.021[a]	-0.255***	-1.443***[a]	-31.117***	-27.43***[a]
NT	0.039***		0.074***		1.737		78.685***	
Tas	-0.007		0.002		-0.741***		-33.719***	
ACT	0.055***	0.021[b]	0.075***	0.032[b]	1.276	0.996[b]	123.448***	3.423[b]
Living outside major capital cities	-0.013***	-0.018	-0.024***	-0.048***	-1.542***	-0.298	-58.963***	-20.74***
Language spoken at home								
European languages	-0.011	0.023	-0.005	-0.008	0.039	0.751	-30.952***	-20.17**
Asian and other languages	-0.044***	-0.026	-0.062***	-0.096*	-0.268***	-0.067	-68.785***	-34.84**

Table 11: Labour market outcomes for women aged 20 or over

	Probit marginal effects				Interval regression coefficients			
	Labour force participation		Employment		Hours worked (if working)		Personal income	
	2006	1991	2006	1991	2006	1991	2006	1991
Country of birth (Australia)								
Other English-speaking countries	-0.031***	-0.043*	-0.040***	-0.026	0.422	0.237	-16.438**	-9.500
Non-English speaking countries	-0.072***	-0.045	-0.104***	-0.090**	-0.939***	0.065	-90.334***	-20.99**
Father born overseas	0.010*	0.013	0.004	-0.015	0.173	-0.921*	1.871	-13.56*
Mother born overseas	-0.010*	-0.019	-0.013**	-0.012	-0.426***	0.296	-7.799*	8.045
Indigenous Australian	-0.058***	-0.108***	-0.096***	-0.240***	-1.950***	-1.558	-23.124***	-31.57**
Religion (Roman Catholic)								
Anglican	-0.004	0.001	-0.005	-0.006	-0.061***	-0.569	-2.467	-3.54
Other Christian beliefs	-0.025***	-0.042***	-0.028***	-0.041**	-0.815***	-0.783*	-27.036***	-12.48**
Buddhism	-0.018		-0.035**		-1.534***		-40.636***	
Islam	-0.120***		-0.143***		-0.487***		-49.002***	
Other non-Christian beliefs	-0.050***	-0.024[c]	-0.073***	-0.177*** [c]	-0.666***	1.281 [c]	-44.050***	-26.01 [c]
No religion	-0.015***	-0.025	-0.025***	-0.061***	-0.617***	0.072	-18.674***	-14.94**
Relationship (no partner/spouse)								
Married	-0.053***	-0.114***	-0.076***	-0.213***	0.796	-0.355	-38.277***	-35.53***
In a de facto relationship	0.026***	-0.055**	0.058***	-0.186***	1.193	0.330	31.146***	-14.67
Partner in employment	0.061***	0.094***	0.108***	0.286***	-1.098***	0.234	7.970	40.20***
Constant					23.445	33.86***	-195.009***	-267.4***
Observations	40,664	5,003	40,664	5,003	29,390	3,246	39,957	4,721
Pseudo R-squared	0.347	0.26	0.291	0.197				

Source: Estimated from Census 1991 (1% CURF) and Census 2006 (5% CURF)

Notes: *significant at 10%, **significant at 5%, ***significant at 1%; reference group listed in parentheses for categorical variables. (a) Coefficient for South Australia, Western Australia and Northern Territory combined; (b) Coefficient for Tasmania and ACT combined; (c) Coefficient for all non-Christian beliefs combined; (d) Excludes non-school Year 12 equivalent qualifications; (e) Includes all certificate-, diploma- and degree-level qualifications.

The other characteristics reveal associations similar to those found in other studies on labour force participation and employment. Education has the expected positive effect, which increases with the level of education, but at a slowing rate for higher level education. Obtaining at least Year 10 compared to Year 9 or less results in a stronger association with labour force participation and employment than obtaining Year 12 compared to others within the group who obtained at least Year 10. Similarly, completing a post-school qualification has a stronger association with labour force participation and employment than the additional association of completing a university degree.

Except for the ACT and the Northern Territory, New South Wales offers the best employment outcomes and has the highest level of labour force participation. As expected, living in one of the major capital cities is positively associated with labour force participation and employment. Migrants are found to be less likely to participate or be employed, particularly when they are from a non-English speaking background, excluding those who speak a European language. The parents' migrant background is much less important, having much smaller negative associations with employment and participation, sometimes even turning into a small positive association. Women from an Indigenous background are much less likely to have employment or be in the labour force than non-Indigenous women. However, compared to the associations in 1991, the associations in 2006 are much smaller.

Labour force participation and employment also vary considerably by religion. Women who state that their religion is Roman Catholic or Anglican are the most likely to be in the labour force and employed. Women with other Christian beliefs or no religion, and Buddhist women are slightly less likely to be employed and participate (1.5 to 3.5 percentage points less likely). Islamic women are the least likely to participate and be employed (12.0 and 14.3 percentage points less likely), followed by other non-Christian beliefs (5.0 and 7.3 percentage points less likely).

Whether the young woman has a partner or not, and the type of relationship, are also shown to make a considerable difference. Women who are married are less likely to participate or be employed than single women, although this association has weakened from 1991 to 2006 (from 11.4 to 5.3 percentage point and 21.3 to 7.6 percentage points respectively). To a lesser extent, women living in a de facto relationship also used to be less likely to participate or be employed than single women, but the direction of this association changed from 1991 to 2006, making women in a de facto relationship now more likely to be employed and participate. These are interesting developments over time, which are consistent with

increased female labour force participation over the last few decades. Having a partner who is employed (compared to having a partner who is not employed) increases the woman's participation and employment. These associations have slightly decreased in size over time.

Appendix Table 7 presents an alternative specification, including a number of interaction terms with teenage motherhood: completing at least Year 10, completing Year 12, completing any post-school qualification, completing a university degree, having a partner (employed or non-employed), living outside the major capital cities, only speaking English at home, being of Indigenous descent, being an immigrant, both parents being immigrants, and becoming a teenage mother at age 19. The interaction terms with the education variables, having an employed partner, being an immigrant, being of Indigenous descent and becoming a teenage mother at 19 are significant in 2006. The two schooling dummy variables are both negative indicating that the positive effect on labour force participation is smaller for teenage mothers than for other women. However, if a teenage mother manages to obtain a university degree (about 49 teenage mothers in the sample of analysis managed to do this), then her probability to be in the labour force increases by much more than for other women (22.9 percentage points compared to 9.7 percentage points). Despite this strong association, teenage mothers with a university degree are still less likely to be in the labour force than childless women with a university degree, since the increase is from a low base.

Teenage mothers with an employed partner can also expect a slightly larger increase in labour force participation than similar other women with an employed partner. Very similar, but slightly larger and more significant, effects are observed for the probability of being employed. Now the interactions with having a partner (even if not employed) and having any qualifications are also significant (and positive). They alleviate some of the large negative associations of teenage motherhood with labour force participation and employment. Living outside the major capital cities has a similar negative effect on teenage mothers as on other women.

Although immigrant women in 2006 are less likely to be in the labour force or in employment, amongst teenage mothers, immigrants are not more disadvantaged than native-born. Teenage mothers who gave birth at age 19 are less likely to be in the labour force or employed than teenage mothers who had children at a younger age. This is most likely due to their children, on average, being younger at the time of the survey.

Using Census 1991, only the partner and Indigenous interaction terms are significant. The partner interactions reveal a larger positive marginal effect on labour force participation and employment than in 2006. In 1991, Indigenous women were much less likely to be in the labour force or employed than other women. However, amongst teenage mothers the gap between Indigenous and non-Indigenous women was smaller than amongst older mothers or childless women. In 2006, although overall disadvantage appears to have improved slightly, being a teenage mother reinforces the negative effect arising from being of Indigenous descent.

The final four columns in Table 11 present results related to the intensity of work as represented by the hours of work (for women in employment only) and personal income (which includes earnings). The associations observed for these outcomes are all consistent with what is observed for labour force participation and employment. Similar patterns over time are observed as well. For example, women in a de facto relationship have more personal income than their single counterparts in 2006 while having less personal income in 1991, although the latter is insignificant. Married women have less personal income in both years. In real terms (accounting for 46.9 percent of inflation) the difference in 1991 is larger than in 2006.

An exception to this consistency is that teenage mothers, if working, reduce their hours by fewer hours in 2006 than they used to do in 1991 compared to childless women. This is also the case for older mothers compared to childless women. Older mothers reduce their hours by more than teenage mothers, although they reduce labour force participation and employment to a similar extent as teenage mothers. As a result older mothers' personal incomes are also reduced to a larger extent.

Women with Year 12 or a university qualification earn substantially more than women at lower education levels. In relative terms, the increase in earnings is more than their increase in participation and employment compared to women with Year 10 or qualifications below university level.

Including the same interaction terms as in the labour force participation and employment equations, several interaction terms have significant marginal effects, but there are only few clear patterns. Results are presented in the last four columns of Appendix Table 7. Combining the different effects shows that completing Year 10 or Year 12 has similar positive effects for teenage mothers as for other women. Completing Year 12 has a positive effect for teenage

mothers which is only slightly less than for other women (2.69 hours more compared to 2.78 hours more). However, in terms of personal income, completing Year 10 or Year 12 appears to have much smaller positive effects for teenage mothers than for other women. The other two education interactions are not significant, and teenage mothers' working hours do not appear to benefit to a lesser extent from completing any qualifications or a university degree than the working hours of other women. The presence of a partner is more beneficial to a teenage mother's working hours than to the working hours of other women, which given the presence of children is to be expected. With regard to personal income, the education interaction terms have similar effects, in that completing Year 10 makes little difference income-wise for teenage mothers, while the other education interaction terms indicate positive effects on income which are only slightly smaller than for other women or the same as for other women.

None of the education interaction terms are significant in 1991 except for completing a university degree on hours worked. Completing any of the education types has more or less the same positive income return for teenage mothers as for other women.

In 2006, having a partner reduces the personal income of a teenage mother more than for other women, which is opposite to the effect on working hours and indicates that the type of employment might differ between teenage mothers with and without a partner and/or that the determinants of the selection into employment differ from the determinants of hours worked. In 1991, having a non-employed partner had a negative association with hours worked for teenage mothers but not for other women, whereas having an employed partner had a positive association with hours worked, only for teenage mothers as well. The association of having a partner with a woman's personal income is similar as in 2006, reducing teenage mothers' income more than for other women.

The negative effect on income from living outside the major capital cities in 2006 is reduced for teenage mothers compared to other women. Phrased differently, this can be interpreted as the opportunities offered by living in a capital city being of less benefit to teenage mothers than to other women. This may be due to the types of job in which they work. In 1991, no such effect is found. However, conditional on being in employment, hours worked by teenage mothers outside of the major capital cities is significantly larger than for other women, for whom no significant association is observed.

Consistent with lower employment rates in 2006 for teenage mothers who gave birth to their child at age 19, personal income is lower for this subgroup amongst teenage mothers in 2006. A similar result is observed in 2006 and 1991 for teenage mothers who only speak English at home. With regard to personal income, Indigenous teenage mothers in 1991 do relatively well amongst teenage mothers although their employment rate is still lower than that of other teenage mothers (combining the interaction marginal effects with the Indigenous marginal effects).

4.5.4 Educational outcomes

In this section we investigate educational outcomes. Table 12 presents the results for highest year of school completed for women aged 19 or over and highest post-school qualification for women aged 21 or over. In principle, women of these ages should have had the opportunity to complete the highest category of education within each outcome. We distinguish five outcomes in the highest year of school completed: less than Year 9, Year 9, Year 10, Year 11 or Year 12. Four outcomes are distinguished for the post-school qualification variable: none, certificate, advanced certificate or diploma, or a university degree.

Teenage mothers and older mothers are both less likely to complete Year 12 or obtain a university degree. Comparing 2006 and 1991, compared to childless women both groups of mothers, but teenage mothers especially, fare worse in 2006 than in 1991. This is a reflection of the increase in education of the Australian population, in which teenage mothers have not taken part to the same extent, thus lagging behind in education compared to other groups.

Women in the ACT and women living in the major capital cities are the most likely to achieve the highest education levels. Migrants appear to do quite well with regard to educational outcomes compared to native Australian women, particularly women migrating from non-English speaking countries. These positive associations are stronger in 2006 than they were in 1991. Women from an Indigenous background are less likely to achieve the highest educational outcomes compared to other women. This negative association has strengthened over time. Similar to the group of teenage mothers, they have not taken part in the increased participation in education that has improved educational outcomes for other young Australians in the past few decades.

Table 12: Educational outcomes (ordered probit – marginal effects on highest level of education within the type of education: Year 12 and university degree)

	Completed Year 12[d] (for those aged 19 or over)		Has a university degree (for those aged 21 or over)	
	2006	1991	2006	1991
Age	0.007***	0.010***	0.035***	0.024***
Teenage mother	-0.323***	-0.207***	-0.127***	-0.094***
Teenage mother * Number of children	-0.051***	-0.048	-0.106***	0.020
Teenage mother *Age youngest child 2-4	-0.026*	-0.141***	-0.026	0.080
Teenage mother *Age youngest child 5-9	-0.049***	-0.197**	-0.045**	0.166
Older mother	-0.099***	-0.096*	-0.037***	-0.019
Older mother * Number of children	-0.050***	-0.045	-0.111***	-0.062**
Older mother *Age youngest child 2-4	-0.058***	-0.080	-0.089***	-0.035*
Older mother *Age youngest child 5-9	-0.149***		-0.128***	
State of residence (NSW)				
Vic	0.037***	0.084***	0.000	-0.025***
QLD	0.047***	-0.056***	-0.012**	-0.019**
SA	-0.016**		-0.050***	
WA	-0.016***	-0.052*** [a]	-0.028***	-0.025***[a]
NT	-0.040**		-0.015	
Tas	0.000		-0.018	
ACT	0.107***	0.037 [b]	0.103***	0.041** [b]
Living outside major capital cities	-0.068***	-0.047***	-0.056***	-0.024***
Language spoken at home				
European languages	0.035***	0.040	-0.034***	-0.008
Asian and other languages	0.031***	0.084**	0.021**	-0.020
Country of birth (Australia)				
Other English-speaking countries	0.008	-0.028	0.018**	-0.011
Non-English speaking countries	0.038***	0.053*	0.080***	-0.027**
Father born overseas	0.021***	-0.025	0.007	-0.012
Mother born overseas	0.006	0.040**	0.004	0.004
Indigenous Australian	-0.169***	-0.124***	-0.116***	-0.065***
Religion (Roman Catholic)				
Anglican	-0.028***	-0.036**	-0.018***	0.002
Other Christian beliefs	-0.003	-0.012	0.014**	0.019**
Buddhism	-0.081***		-0.039***	
Islam	-0.141***		-0.100***	
Other non-Christian beliefs	-0.013**	-0.056 [c]	0.003	0.026 [c]
No religion	-0.030***	-0.053***	-0.011**	0.004
Relationship (no partner/spouse)				
Married	0.030***	-0.105***	0.058***	-0.031***
In a de facto relationship	-0.015***	-0.093***	0.014***	-0.035***
Observations	57,136	6,707	47,708	4,509
Pseudo R-squared	0.0937	0.0499	0.0633	0.0436

Source: Estimated from Census 1991 (1% CURF) and Census 2006 (5% CURF)

Notes: *significant at 10%, **significant at 5%, ***significant at 1%; reference group listed in parentheses for categorical variables. (a) Coefficient for South Australia, Western Australia and Northern Territory combined; (b) Coefficient for Tasmania and ACT combined; (c) Coefficient for all non-Christian beliefs combined; (d) Excludes non-school Year 12 equivalent qualifications.

Islamic women are the least likely to have completed Year 12 and a university degree. Consistent with their low labour force participation, it appears that they/their parents invest the least in their education.

Finally, although in 1991 women with a partner were least likely to have completed Year 12 and a university degree, in 2006 partnered women have obtained better educational outcomes than single women, except for those in a de facto relationship who are still less likely to complete Year 12, although they lag behind single women to a lesser extent than was the case in 1991.

Appendix Table 8 presents the results when two interaction terms with teenage motherhood are included. The terms considered are having a partner, living outside the major capital cities, only speaking English at home, being of Indigenous descent, being an immigrant, both parents being immigrants, and becoming a teenage mother at age 19. In 2006, having a partner has a stronger positive association with completing a higher level of schooling for teenage mothers than for other women, and in the case of a de facto relationship it turns a negative association into a positive association. In terms of obtaining a post-school qualification, there is no difference between teenage mothers and other women, all women with a partner are more likely to finish a higher level of qualification. Similar effects are observed in 1991, although then teenage mothers were not affected in their educational outcomes by having a partner, whereas other women were negatively affected.

In 2006, living outside the major capital cities had less of a negative effect on teenage mothers than on other women in regard to schooling completed. In other words, living in one of the major capital cities had less of a positive effect on educational outcomes for teenage mothers than for other women. Similar to the result for labour market outcomes, teenage mothers appear less able to benefit from the education opportunities that a major capital city has to offer than other women. This interaction term is not significant when using Census 1991 instead of Census 2006.

Teenage mothers who gave birth at age 19 are more likely than teenage mothers who gave birth at a younger age to finish a higher Year of schooling (particularly in 1991) but are no more likely to complete a university degree. Teenage mothers who only speak English at home are more likely to finish Year 12 or a university degree than other teenage mothers, whereas the reverse is true for other young women (that is, those who speak another language than English at home are more likely to finish Year 12 and more likely to complete a

university degree if an Asian or other language is spoken at home). In 2006, Indigenous teenage mothers were particularly disadvantaged with regard to education outcomes, more than other teenage mothers and more than other Indigenous women. In 1991, they are better off than other teenage mothers but still worse of than other (non-teenage mother) Indigenous women, although not to the same extent as in 2006.

5. Methods

This section provides a brief overview and explanation of the approaches used in our analysis. In principle, the remainder of this report can be read without reading this methodological section.

5.1 Basic model

To examine the effects of teenage motherhood on outcomes, we estimate a reduced-form model:

$$Y_i = \alpha_i + \beta_{T_i} T_i + \beta_X X_i + \varepsilon_i \quad (1)$$

where i indexes individuals, T is a binary variable capturing whether or not a woman had a first birth at ages 15-19, and X is a vector of control variables for own, family and parental characteristics that are related to educational and labour market outcomes; α, β_T and β_X are parameters to be estimated, with β_T capturing the total direct effects of teenage motherhood on the outcome in question, holding constant other observable factors. In principle, T can be interacted with some variables in X to examine whether the effects of teenage motherhood differ by personal or family characteristics.

Equation (1) is estimated using a probit specification for binary outcomes (e.g. Year 12 completion and employment status) and an ordinary least squares (OLS) specification for linear outcomes (e.g. personal and family income).

5.2 The issue of selection bias

A methodological issue arises because teenage motherhood is potentially endogenous. Thus, while a significant negative relationship between teenage motherhood and an outcome can show that teenage mothers are likely to have a worse outcome, it is unable to determine whether or not teenage motherhood *per se* leads to the worse outcome. This endogeneity could be due to reverse causality, where failure at school or in the labour market leads young women to engage in risky behaviour such as drug usage and/or unsafe sexual activity, which may lead to pregnancy. Endogeneity may also arise from omitted variables (or selection on unobservable factors), where both teenage motherhood and later outcomes are driven by the same unobserved factors. Such unobserved factors could be individual characteristics (such as risk taking or the ignoring of consequences) or family characteristics (such as parental supervision). This is related to the issue of selection bias, because teenage mothers are likely to be a non-random subset of the population. Ignoring the potential endogeneity of the

teenage motherhood may lead to biased and inconsistent estimates of its impact on later outcomes.

This study uses two methods to address endogeneity. Although these approaches offer no conclusive proof, both approaches explore the likelihood of an estimated association being a causal effect.

The first method compares the estimated coefficient on teenage motherhood for a specific outcome when a minimal number of control variables are included with the estimated coefficient on teenage motherhood when a broad range of other relevant variables are included. If the coefficient is much reduced and becomes insignificant, this is an indication that these other factors are the important determinants and teenage motherhood is another outcome of these factors, determined jointly with the outcome of interest.

The second method is propensity score matching (PSM). PSM estimates the treatment effect (of teenage motherhood) by comparing a treated person (teenage mother) with a control person (non-teenage mother) who is as similar to the treated person as possible. Specifically, the PSM process involves three steps. The first step obtains the propensity score, which is the predicted probability of being a teenage mother given a woman's characteristics. The second step matches a teenage mother with a non-teenage mother based on their propensity scores. Individuals that can be matched to a teenage mother form a so-called 'matched' sample (the control group). In the last step, the average treatment effect (impact of teenage motherhood on outcome) can be estimated as the mean difference in the outcome between a teenage mother and a non-teenage mother in each pair.

Several methods can be used to match a teenage mother with a non-teenage mother. This study adopts two methods. The first method (kernel matching), for each teenage mother, a 'synthetic' counterfactual is created based on the kernel-weighted average of the characteristics of the nearest non-teenage mothers. In the second method (calliper matching) matches a teenage mother with one or more non-teenage mothers if the difference in scores between the teenage mother and the non-teenage mother is less than a specified limit. For both methods, the likelihood of a match can be raised by setting a larger bandwidth, but this would be at the expense of the match quality (resulting in higher standard errors).

As such, PSM can estimate the causal effect of a treatment in the absence of a randomised experiment. However, the method relies crucially on the conditional independence assumption. That is, conditional on a subject's observed characteristics, potential outcomes

must be independent of treatment assignment. That is, among women with the same characteristics (as measured by the propensity score) used for matching, the model assumes that teenage motherhood was random. This implies that selection is solely based on observed characteristics and that all variables that influence treatment assignment and potential outcomes simultaneously are observed. Executing PSM also requires a large sample with substantial common support (that is, teenage mothers and other young women must have a wide range of characteristics in common) from which to construct a control group.

Previous studies which have used PSM to estimate the impact of motherhood include Levine and Painter (2003), Chevalier and Viitanen (2003), Goodman *et al.* (2004), and Simonsen and Skipper (2006). In particular, Levine and Painter (2003) estimate the impact of teenage motherhood on educational outcomes in the US. Both Chevalier and Viitanen (2003) and Simonsen and Skipper (2006) examine the consequences of motherhood on educational and labour market outcomes in Britain, whereas Goodman *et al.* (2004) consider the impact on wages using Danish data.

6. Estimation results

6.1 Data and sample selection

While the Census has a size advantage, it contains few individual and family characteristics that are necessary in explaining a variety of life outcomes. For the latter advantage, we next draw on LSAC and HILDA.

Both LSAC and HILDA are longitudinal surveys. In LSAC, the focal children are followed over time, and information on the mothers of the children is collected when available. All women in LSAC are thus mothers, either teenage mothers (i.e. women who have become a mother during their teenage years) or older mothers (i.e. women who have become a mother in their twenties or later). HILDA, by contrast, tracks all adults living in selected households over time. HILDA data do not only contain teenage mothers and older mothers but also childless women.

As mentioned in Section 3.1, LSAC B cohort children are aged between 3 and 19 months at wave 1 (2004). To make HILDA mothers roughly comparable to LSAC mothers while still retaining a sufficiently large number of teenage mothers, we only include HILDA mothers whose children are up to three years old at 2004. Since the number of teenage mothers in each survey is not very large (fewer than 200 in each survey) and since LSAC does not contain childless women, we pool both data sets. In particular, most of the analysis is based on LSAC B cohort wave 1 and HILDA wave 4 (both carried out in 2004). For robustness checks we also include LSAC wave 2 and 3 and HILDA waves 6 and 8 (carried out in 2006 and 2008 respectively). The analytical samples are restricted to women up to age 29 in 2004, 31 in 2006 and 33 in 2008.

We consider nine outcomes, which can be classified into four groups:

- Educational outcomes: Year 12 completion and having a post-school qualification, where a post-school qualification can be a university degree or a non-degree qualification
- Labour market outcomes: employment status and personal income
- Health outcomes: health status and smoker status
- Partnership outcomes: partnering status, partner's employment status and family income (family income is the same as personal income if the woman is single, and it equals her personal income plus her partner's income if the woman has a partner)

Furthermore, we apply a lower age limit for most of the analysis, as some ages are too young for certain outcomes to be achieved. In particular:

- Year 12 completion, having post-school qualification, employment status, personal income and family income are analysed for women aged 20 or above;
- Having a university degree is analysed for women aged 23 or above;
- Health status and smoker status are analysed for all women;
- Partnering status is analysed for women aged 20 or above with children only;
- Partner's employment status is analysed for partnered women aged 20 or above with children only.

6.2 Descriptive statistics

Table 13, which contains the means of the regression variables for our 2004 analytical sample, shows that childless women are less likely to have a partner than teenage mothers, who are in turn less likely to have a partner than older mothers. For all other eight outcomes, teenage mothers have poorer outcomes than older mothers, who in turn have poorer outcomes than childless women. For most outcomes and characteristics, the means for older mothers and childless women are statistically significantly different from the means for teenage mothers.

Table 13: Descriptive statistics of LSAC and HILDA analytical samples

	LSAC		HILDA		
	Teenage mothers	Older mothers	Teenage mothers	Older mothers	Childless women
Outcomes					
Year 12[a]	0.321	0.647***	0.250	0.604***	0.808***
Post-school qualification [a]	0.396	0.611***	0.214	0.462***	0.572**
Employed [a]	0.151	0.443***	0.250	0.413***	0.862*
Personal income [a]	235	254***	84	172	495
Having good health	0.838	0.906***	0.800	0.897**	0.910***
Being a smoker	0.618	0.286***	0.598	0.302***	0.237***
Partnered [a,b]	0.704	0.864	0.464	0.782***	.
Partner employed [a,b,c]	0.784	0.937	0.846	0.920***	.
Family income [a]	529	881***	292	697***	785***
Control variables					
Own background characteristics					
Religion (ref: No religion)	0.433	0.236**	0.346	0.240***	0.266***
Catholic	0.201	0.276***	0.109	0.176**	0.206**
Other Christian	0.250	0.389***	0.128	0.374***	0.245***
Other religion	0.104	0.093	0.013	0.057	0.038**
Religion not known	0.012	0.005***	0.404	0.154	0.245***
Indigenous Australian	0.159	0.038***	0.207	0.038***	0.031***

Table 13: Descriptive statistics of LSAC and HILDA analytical samples

	LSAC		HILDA		
	Teenage mothers	Older mothers	Teenage mothers	Older mothers	Childless women
Migrant status (ref: Australian born)	0.915	0.817***	0.929	0.866***	0.854**
Migrant from an ESB country	0.030	0.058	0.045	0.042	0.036
Migrant from an NESB country	0.055	0.125***	0.026	0.092***	0.110***
Residence (ref: Metropolitan)	0.390	0.502***	0.449	0.549***	0.690**
Regional residence	0.530	0.443***	0.506	0.422**	0.292*
Remote residence	0.079	0.054**	0.045	0.029	0.018
Parental characteristics					
Par. migrant status (ref: No migrant parent)	0.722	0.582***	0.735	0.634***	0.603**
One parent is migrant	0.136	0.148	0.129	0.164	0.181
Both parents are migrants	0.142	0.270**	0.135	0.202***	0.216*
Family characteristics					
Mixed family [d]	0.530	0.134	0.410	0.088***	0.390***
Number of children	1.195	1.709***	1.103	1.444***	
Age of youngest child (ref: 0 years)	0.884	0.859***	0.718	0.437	
1 year	0.116	0.141***	0.141	0.253	
2 years			0.096	0.165	
3+ years			0.045	0.145	
Partner's characteristics					
Partner's employment (ref: No partner)	0.393	0.136***	0.441	0.231***	0.755***
Partner employed	0.491	0.810***	0.355	0.708***	0.223***
Partner not employed	0.117	0.054***	0.204	0.061***	0.022***
Own labour market characteristics					
Age	18.878	25.965***	18.538	26.624***	20.872***
School completion (ref: Year 9 or less)	0.252	0.057***	0.214	0.051***	0.061***
Year 10-11 only	0.564	0.296***	0.604	0.346***	0.304***
Year 12[e]	0.184	0.647***	0.182	0.604***	0.635***
Post-school qual. (ref: No qual.)	0.736	0.389***	0.846	0.538***	0.645***
Non-degree qualification[f]	0.264	0.416	0.154	0.257***	0.171***
University degree	0	0.195***	0	0.204***	0.184***
Observations	164	1,700	156	455	2,654

Sources: LSAC (wave 1) and HILDA (wave 4), women aged up to 29 years only
Notes: *, ** and *** denote sample means that are significantly different from the means for teenage mothers at the 10%, 5% and 1% level respectively. (a) Outcome measured for women aged 20 or over only; (b) Outcome measured for women with children only; (c) Outcome measured for partnered women only. Partnership outcomes for all women aged 15-29 are shown under 'partner's characteristics'. Control variables are measured for all observations for which data are available. (d) A mixed family contains other people living with a couple or a nuclear family (which includes parent(s) and dependent child(ren) only), or at least two people who are not part of a couple; (e) Excludes non-school Year 12 equivalent qualifications; (f) Includes all certificate- and diploma-level qualifications. Notes (a)-(f) also apply to Tables 14, 15, 17.

6.3 Regression results

The first set of empirical results based on the HILDA and LSAC data to be reported are the regression results on the effects of teenage motherhood and other factors on various outcomes for women aged up to 29 in 2004 (the first three years after birth for women with children), based on equation (1). Models explaining binary outcomes have been estimated using a probit

regression. Probit coefficients, which give the change in the z-score (the probit index) for a one-unit change in the explanatory variable, are not immediately interpretable. Therefore, we report the average marginal effects for the probit models instead. For each observation, the marginal effect is the change in the probability of achieving the outcome when increasing the focal explanatory variable by one unit (or from 0 to 1 for dummy variables) while holding other explanatory variables constant. For each explanatory variable, the marginal effect is calculated for each observation in the estimation sample and then averaged over all observations to obtain the average marginal effect.[29]

For each outcome, two specifications are estimated: one in which motherhood status dummies are the only explanatory variables ('simple specification'), and one which further controls for own background characteristics, parental characteristics, family characteristics, partner's characteristics, and own labour market characteristics ('baseline specification'). A comparison of the two specifications shows how much of the difference between teenage mothers, older mothers and childless women is explained by observed characteristics.[30]

The regression results presented in Tables 14 and 15 show that overall, relative to childless women, older mothers have poorer outcomes and teenage mothers have considerably poorer outcomes. In the simple specification (which only controls for motherhood status), the effect of teenage motherhood is always significant, while the effect of older motherhood is only significant for educational and labour market outcomes. When other explanatory variables are added, the effects that are significant in the simple specification remain significant for most outcomes, yet the magnitude of the effects decreases noticeably. This suggests that motherhood status can be correlated quite strongly with the other explanatory variables, so not controlling for them would overstate the effect of motherhood status on outcomes.

Controlling for a comprehensive list of variables also improves the explanatory power of the models markedly. For example, the R-squared statistic for family income increases from 2% in the simple specification to 42.4% in the baseline specification. In all regressions, teenage motherhood has the strongest adverse effect on outcome (i.e. positive effect on smoking status, negative effect on all other outcomes), while education has the strongest favourable effect. The effects of most other characteristics do not display clear patterns, and are typically

[29] Age enters the regressions as a linear and a quadratic term. For probit models, the reported effect on age takes the effects of both terms into account.

[30] We also experimented with including interaction terms with teenage motherhood. However, the number of teenage mothers turns out to be too small when using the HILDA and LSAC to obtain any meaningful estimates that are significant.

small. The effects of background characteristics, such as religion, own migrant status and parental migrant status tend to be small and/or insignificant. The results for each outcome are discussed in separate subsections. First, we discuss the educational outcomes, followed by labour market, partnership and health outcomes.

6.3.1 Educational outcomes

Relative to childless women aged between 20 and 29, teenage mothers in the same age bracket are 50 percentage points less likely to have completed Year 12, while older mothers are 16 percentage points less likely to have achieved this outcome (Table 14, column 1, simple specification). When more controls are added (baseline specification), the effect of teenage motherhood only decreases slightly to 46 percentage points, while the effect of older motherhood remains the same.

Although teenage mothers are significantly less likely than childless women to obtain any post-school qualification, no significant effect is found for older mothers (Table 14, column 2). The negative effect of teenage motherhood halves (from 25 percentage points to 11 percentage points) when more controls are included. This more substantive influence from other controls is also evident from the larger increase in the R-squared statistic in the post-school qualification model compared to the completing Year 12 model. The control variables in the Year 12 completion model appear to explain this outcome to a limited extent only.

While Indigenous Australians are 19 percentage points less likely to complete Year 12 than non-Indigenous Australians, the association of Indigenous status with the probability of obtaining any post-school qualification is not significant.

Relative to Australian-born women, migrants from a non-English speaking background (NESB) are 10 percentage points more likely to complete Year 12. Interestingly, this effect switches sign for post-school qualification, with women from a NESB being 14 percentage points less likely to obtain any post-school qualification than Australian-born counterparts. Migrants from an English speaking background (ESB) are very similar to women born in Australia with regard to the educational outcomes.

Table 14: Effects of teenage motherhood and other factors on educational and labour market outcomes in the first three years after birth

	Year 12	Post-school qualification	Employed	Personal income
	(1)	(2)	(3)	(4)
Mean outcome of estimation sample	0.683	0.576	0.583	331.86
# teenage mothers	77	77	77	77
a) Simple specification				
Teenage mother	-0.499***	-0.247***	-0.693***	-321.754***
Older mother	-0.161***	-0.004	-0.448***	-277.043***
Observations	3242	3239	3165	3152
(Pseudo) R-squared	0.035	0.004	0.162	0.162
b) Baseline specification				
Motherhood status (ref: Childless woman)				
Teenage mother	-0.457***	-0.116*	-0.434***	-46.585
Older mother	-0.170***	0.022	-0.401***	-228.831***
Religion (ref: No religion)				
Catholic	0.081***	0.038	0.035*	4.410
Other Christian	0.008	0.047**	-0.007	-27.061**
Other religion	-0.009	0.053	-0.079**	-28.865
Religion not known	-0.104***	-0.066*	-0.028	-33.777*
Indigenous Australian	-0.185***	-0.061	-0.104**	51.872*
Migrant status (ref: Australian born)				
Migrant from an ESB country	0.010	0.024	-0.014	45.062
Migrant from an NESB country	0.102***	-0.142***	-0.091**	2.456
Residence (ref: Metropolitan)				
Regional residence	-0.091***	-0.055***	0.046***	-46.193***
Remote residence	-0.091**	-0.005	0.066*	2.379
Par. migrant status (ref: No migrant parent)				
One parent is migrant	-0.025	0.015	-0.019	-19.716
Both parents are migrants	-0.034	0.077***	-0.014	-19.035
Mixed family			-0.011	-33.488**
Number of children			-0.077***	42.361***
Age of youngest child (ref: 0 years)				
1 year			0.093***	
2 years			0.071	
3+ years			0.112**	
Partner's employment (ref: No partner)				
Partner employed			0.112***	-63.209***
Partner not employed			-0.099***	6.427
Age			0.015***	239.048***
Age squared				-4.555***
School completion (ref: Year 9 or less)				
Year 10-11 only		0.132***	0.143***	-9.940
Year 12		0.312***	0.229***	-19.806
Post-school qual. (ref: No qual.)				
Non-degree qualification			0.091***	15.561
University degree			0.117***	98.779***
Employed				259.390***
Observations	3242	3239	3165	3152
(Pseudo) R-squared	0.060	0.043	0.264	0.348

Source: Estimated from LSAC (wave 1) and HILDA (wave 4)
Notes: *significant at 10%, **significant at 5%, ***significant at 1%. Also see notes of Table 13.

Table 15: Effects of teenage motherhood and other factors on health and partnership outcomes in the first three years after birth

	Having good health	Being a smoker	Partnered	Partner employed	Family income
	(1)	(2)	(3)	(4)	(5)
Mean outcome of estimation sample	0.897	0.298	0.837	0.931	846.97
# teenage mothers	223	196	77	48	77
a) Simple specification					
Teenage mother	-0.085***	0.370***	-0.222***	-0.122**	-378.414***
Older mother	0.003	0.044**			2.017
Observations	3605	2782	2139	1763	3164
(Pseudo) R-squared	0.006	0.029	0.011	0.009	0.009
b) Baseline specification	0.006	0.029	0.011	0.009	
Motherhood status					
Teenage mother	-0.019	0.216***	0.023	-0.028	-91.416
Older mother	0.041**	0.019			-222.503***
Religion (ref: No religion)					
Catholic	0.011	-0.036	0.043*	-0.010	27.001
Other Christian	0.008	-0.137***	0.058***	-0.009	10.678
Other religion	-0.054*	-0.158***	0.089***	-0.072**	-84.493**
Religion not known	0.043***	-0.037	-0.010	-0.074	-26.751
Indigenous Australian	-0.032	0.122**	-0.174***	-0.182***	49.639
Migrant status (ref: Australian born)					
Migrant from an ESB country	-0.003	0.070	0.027	-0.003	126.441**
Migrant from an NESB country	0.014	-0.161***	0.024	-0.019	-53.263
Residence (ref: Metropolitan)					
Regional residence	0.010	-0.019	0.050***	-0.026**	-72.024***
Remote residence	0.042*	-0.015	0.094***	0.009	63.848
Par. migrant status (ref: No migrant parent)					
One parent is migrant	-0.020	0.024	-0.034	0.008	-21.136
Both parents are migrants	-0.011	-0.011	0.007	0.005	-10.907
Mixed family	0.002	0.038*			-47.732*
Number of children	-0.016*	0.003			31.815**
Age of youngest child (ref: 0 years)					
1 year	-0.001	-0.032			
2 years	-0.040	0.197**			
3+ years	-0.075	-0.032			
Partner's employment (ref: No partner)					
Partner employed					675.966***
Partner not employed					149.705***
Age	-0.001	0.006**	0.017***	0.005**	228.540***
Age squared					-4.108***
School completion (ref: Year 9 or less)					
Year 10-11 only	0.058**	-0.071*	0.156***	0.155***	29.746
Year 12	0.086***	-0.225***	0.218***	0.191***	42.845
Post-school qual. (ref: No qual.)					
Non-degree qualification	0.023*	-0.056***	0.013	0.011	15.416
University degree	0.063***	-0.174***	0.114***	0.039**	188.527***
Employed					244.965***
Observations	3605	2782	2139	1763	3164
(Pseudo) R-squared	0.038	0.125	0.128	0.137	0.376

Source: Estimated from LSAC (wave 1) and HILDA (wave 4)

Notes: *significant at 10%, **significant at 5%, ***significant at 1%. Also see notes of Table 13.

Compared with metropolitan residents, regional residents are 9.1 percentage points less likely to complete Year 12 and 5.5 percentage points less likely to obtain a post-school qualification. A similar achievement gap in Year 12 completion is also observed between remote residents and metropolitan residents. Living in a remote area has a small negative and insignificant effect on the probability of having a post-school qualification. The insignificance could be due to the effect being quite small and the small number of residents living in remote areas.

Not surprisingly, school completion has the strongest positive effects on the probability of obtaining a post-school qualification. Relative to women who have Year 9 or less, Year 10 or 11, and Year 12 completers are respectively 13 and 31 percentage points more likely to obtain a post-school qualification. Given the strong negative association of school completion and teenage motherhood, this may explain why including school completion in the post-school qualification model reduces the direct association of teenage motherhood with obtaining a post-school qualification. A large part of the association appears to go through school completion.

6.3.2 Labour market outcomes

Motherhood status also has a strong negative impact on labour market outcomes. However, when more explanatory variables are taken into account, the effect of teenage motherhood on both employment status and personal income decrease markedly (Table 14, columns 3 and 4). The effects of older motherhood also decrease when more explanatory variables are included, but to a much lesser extent.

Regional residence is associated with a higher probability of employment but also with lower personal income. Remote residents are also more likely to be employed than metropolitan residents, but no significant difference in income can be found between these two groups of women.

Very strong positive effects on labour market outcomes are due to education. Relative to a schooling level of Year 9 or less, Year 10 or 11, and Year 12 completion increases the probability of employment by 14 and 23 percentage points respectively. Holders of a non-degree qualification or a university degree are also significantly more likely to be in employment and have a higher income than those without any post-school qualification. However, while post-school qualifications are associated with higher personal income, no such effects are found for school qualifications.

Depending on the starting age, a one-year increase in age is associated with an increase in average weekly income for a 20-year old woman of just over $52 per week down to a decrease of almost $30 per week for a 29-year old woman.[31] This is a substantial effect given that the average income for the estimation sample is only just over $330. The decline after the age of 26 may be due to a larger proportion of women in our sample who have a partner and children at this age, and as a result move out of the labour force or into part-time employment, resulting in less personal income. The most important determinant of personal income is employment status, with employed women having on average close to $260 more in weekly income than non-employed women, other things being equal.

6.3.3 Health outcomes

In the simple specification, teenage motherhood is associated with a lower probability of having good health, but the association decreases in size dramatically and is no longer significant when other factors are controlled for (Table 15, column 1). This indicates that health is explained to a large extent by factors that are associated with teenage motherhood. Older motherhood displays no significant association in the simple specification and a small positive association after controlling for a number of characteristics. Educational qualifications of all types are associated with higher chances of having good health, while few other factors have any noticeable effects on this outcome.

One would expect that mothers smoke less than childless women, since they have incentives to protect not only themselves but also their children from the detrimental effects of smoking. Surprisingly, our models show that mothers are significantly more likely to smoke (Table 15, column 2). Relative to childless women, teenage mothers and older mothers are 37 and 4.4 percentage points more likely to smoke respectively (simple specification). The association of older motherhood with smoking loses statistical significance when other factors are accounted for, yet teenage motherhood is still strongly and significantly associated with smoking (22 percentage points).

A higher incidence of smoking is found for Indigenous women, while NESB migrant women are less likely to smoke. Religious affiliations and education are associated with lower probabilities of smoking. In particular, women with non-Christian religious beliefs are 16

[31] In our calculation, we have to take into account the coefficient on age and the coefficient on age squared. Up to age 26, income is increasing with age, after age 26 it is decreasing with age.

percentage points less likely to smoke than non-religious women, and Year 12 completers are 23 percentage points less likely to smoke than women with Year 9 or less schooling.

6.3.4 Partnership outcomes

Partnership outcomes are only considered for women with children, since for childless women, not having a partner when they are aged 20 to 29 cannot be interpreted as a good or a bad outcome. However, when children are present, having someone with whom to share the caring responsibilities is likely to make these women better off.

Compared with older mothers, teenage mothers aged 20-29 are less likely to have a partner, and among those who have a partner, teenage mothers are less likely to have an employed partner (Table 15, columns 3 and 4, simple specification).[32] When other factors are taken into account, the negative effect of teenage motherhood markedly declines and is no longer significant.

It appears that part of the effect of teenage motherhood in the simple specification is due to the effect of indigenous status. Compared with non-Indigenous mothers, Indigenous mothers are 17 percentage points less likely to have a partner, and if they have a partner, their partners are 18 percentage points less likely to be employed. Another part of the effect appears due to education. Mothers with more educational achievements are more likely to have an (employed) partner, although the effect is insignificant for non-degree qualifications (relative to no post-school qualifications). Finally, age is an important contributor with one extra year of age adding 1.7 percentage points to the probability of having a partner.

Interestingly, including extra control variables introduces a negative association of older motherhood with family income (Table 15, column 5). Background characteristics are much less important than partner's characteristics and own labour market characteristics in explaining family income. Compared with not having a partner, having an employed partner adds $680 to family weekly income, while having an unemployed partner adds $150. Own age (one extra year at age 20 is associated with just over $60 extra income per week, while at age 29 one extra year is associated with almost $14 less income per week), university education and employment status also have strong effects on family income, a pattern that has been observed for personal income as well.

[32] Recall that partnering status is only estimated for mothers aged 20 or above, and partner's employment status is only estimated for mothers aged 20 or above who have a partner.

6.3.5 Robustness checks

As a robustness check, we pool three waves together and re-estimate the models presented in Tables 14 and 15, treating different observations of the same individual as separate but not independent of each other.[33] The results, which are presented in Appendix Tables 9 and 10, are very much in line with those in Tables 14 and 15. This shows that the effects of motherhood status and other factors on the outcomes observed in Tables 14 and 15 are robust to sample size and are similar when measured over a longer period of time after the child is born.

There are a few additional results of interest to mention from this alternative specification. First, as time goes on, the probability of being a smoker declines: with 3.7 percentage points after two years and with 3.1 percentage points after four years. Second, women are less likely to be partnered after two years and this reduces further after four years. Third, the probability of reporting at least good health decreases with 0.3 percentage points for each additional year in age. Fourth, personal and family income are now positively associated with age of the woman across nearly the whole age range. For personal income, being one year older starting from age 20 increases personal income by just over $44 and at age 29 it is associated with a decrease of under $1. For family income, these amounts are just over $34 and just over $27 respectively. Thus in the latter case, income is positively associated with age across the full age range under consideration.

6.3.6 Summary

The results presented in Tables 14 and 15 show that the associations of motherhood status with most educational, labour market, health and partnership outcomes are strong and significant. However, these effects typically fall as more explanatory variables are taken into account. Only for the two educational outcomes, employment and the probability of being a smoker is the teenage motherhood coefficient still significant. This indicates that teenage motherhood status is correlated with other factors that influence the above outcomes, most dominantly these are the women's own background characteristics.

These results, however, are unable to show whether these remaining associations reflect casual relationships or are just correlations driven by other factors not controlled for in the models. For example, while teenage motherhood is found to have a significant effect on the

[33] That is, we adjust the standard errors to allow for the possible dependence of multiple observations of the same individual (i.e. the 'clustering' effect).

probability of Year 12 completion, this only indicates that other observed factors being equal, teenage mothers have a lower Year 12 completion rate than childless women. One cannot tell from these results whether the teenage motherhood experience *per se* has led to a lower probability of completing Year 12. The next section further explores whether the observed associations are likely to be causal.

6.4 Propensity score matching results

This section reports the estimation results on the impact of teenage motherhood on outcomes in the first years after birth using the PSM method described in Section 5.2. This method is more appropriate than regression models in determining if the observed effect is likely to be causal, since it aims to select observations for the control group that are as similar as possible to the observations in the treatment group (the teenage mothers in our case).

Table 16 presents the average marginal effects of a range of characteristics on the probability of being a teenage mother within the sample that we use for analysis. The probability of being a teenage mother serves as a propensity score in the PSM estimation. The distribution of the propensity score (both in terms of frequency and density) presented in Appendix Figure 1 shows that the propensity to become a teenage mother is less than 20 percent for most women in the sample (even for those women who became a teenage mother). The difference in outcomes between a teenage mother and a non-teenage mother with similar propensity scores is attributed to teenage motherhood.

Several background characteristics are associated with the likelihood of being a teenage mother. For the pooled sample combining the HILDA and LSAC samples (column 1), Year 10 completion is associated with a reduction by nearly 15 percentage points in the probability of being a teenage mother, while women with Christian beliefs are 4.8 to 5.5 percentage points less likely than non-religious women to become a mother in their teens. Own migrant status and parental migrant status are associated with lower probabilities of being a teenage mother, but none of these effects are significant.

Indigenous status is another strong predictor of teenage motherhood, with Indigenous women being 8.9 percentage points more likely to become a teenage mother than non-Indigenous women. Residents of regional areas are 3.6 percentage points more likely to be a teenage mother than metropolitan residents. The effect of remote residence is also positive but not significant.

Similar results on the probability of being a teenage mother are obtained when using the HILDA sample only (Table 16, column 2). Overall, these results are in line with the patterns observed in Section 4.

Table 16: Marginal effects on the probability of being a teenage mother

	HILDA and LSAC pooled (1)	HILDA only (2)
At least Year 10	-0.147***	-0.110***
Religion (ref: No religion)		
Catholic	-0.048***	-0.043***
Other Christian	-0.055***	-0.046***
Other religion	-0.006	-0.052
Religion not known	0.002	0.019
Indigenous Australian	0.089***	0.085***
Migrant status (ref: Australian born)		
Migrant from an ESB country	0.002	
Migrant from an NESB country	-0.015	
Parental migrant status (ref: No migrant parent)		
One parent is migrant	-0.016	-0.016
Both parents are migrants	-0.013	-0.003
Residence (ref: Metropolitan)		
Regional residence	0.036***	0.037***
Remote residence	0.031*	0.025
Observations	4190	2352
Pseudo R-squared	0.107	0.131
Number of teenage mothers	304	142

Source: Estimated from LSAC (wave 1) and HILDA (wave 4)
Notes: *significant at 10%, **significant at 5%, ***significant at 1%.

The PSM estimates for 2004 (including women with children up to the first three years after birth) are presented in Table 17. For each outcome, there are six estimates. The first two estimates are based on the kernel method (see columns 1 and 2), where for each teenage mother, a 'synthetic' counterfactual is created based on the kernel-weighted average of the characteristics of the nearest non-teenage mothers. This method has the advantage of using most non-teenage mothers in establishing the 'counterfactual' case for a teenage mother. The kernel weight depends on the propensity score of each non-teenage mother compared to the propensity score of the nearest teenage mother. The closer a non-teenage mother is to a teenage mother in terms of propensity score, the higher is the weight applied to that non-teenage mother in creating the 'counterfactual' case for a teenage mother. Two alternative bandwidths are used for the kernel method: 0.001 and 0.01.[34] When the chosen bandwidth is

[34] Chevalier and Viitanen (2003) also use these two bandwidths.

smaller, the kernel weight placed on closer neighbours is relatively larger. A bandwidth can be thought of as a 'tolerable difference'. The higher the chosen bandwidth is, the more likely it is to find a non-teenage mother that can be matched to a teenage mother, yet the less likely it is that they are a good match. The distribution of the kernel matching weights (with bandwidth 0.001) can be found in Appendix Figure 2.[35]

Table 17: Effects of teenage motherhood on outcome in the first three years after birth, based on propensity score matching method

	Kernel, bandwidth 0.001	Kernel, bandwidth 0.01	Calliper, bandwidth 0.001	Calliper, bandwidth 0.01	Same as (1) compared with older mothers only	Same as (1) compared with childless women only
	(1)	(2)	(3)	(4)	(5)	(6)
Completed Year 12						
Estimate	-0.239***	-0.245***	-0.270***	-0.273***	-0.192***	-0.389***
No. of untreated obs	2462	2462	2462	2462	2065	397
No. of matched untreated obs	2146	2437	173	178	1851	284
No. of treated obs	77	77	77	77	75	57
Post-school qualification						
Estimate	-0.144**	-0.146**	-0.200***	-0.208***	-0.149**	-0.097
No. of untreated obs	2459	2459	2459	2459	2062	397
No. of matched untreated obs	2145	2434	173	178	1845	284
No. of treated obs	77	77	77	77	75	57
Employed						
Estimate	-0.269***	-0.283***	-0.240***	-0.242***	-0.144***	-0.537***
No. of untreated obs	2461	2461	2461	2461	2064	397
No. of matched untreated obs	2145	2436	173	178	1849	284
No. of treated obs	77	77	77	77	75	57
Personal income						
Estimate	-46**	-49**	-60**	-56*	-10	-98***
No. of untreated obs	2449	2449	2449	2449	2052	397
No. of matched untreated obs	2141	2423	174	179	1663	284
No. of treated obs	77	77	77	77	75	57
Having good or better health						
Estimate	-0.073**	-0.064**	-0.092**	-0.086**	-0.068**	-0.080**
No. of untreated obs	2736	2736	2736	2736	1721	1015
No. of matched untreated obs	2656	2733	288	307	1544	988
No. of treated obs	216	222	216	222	209	197
Being a smoker						
Estimate	0.279***	0.255***	0.306***	0.284***	0.228***	0.344***
No. of untreated obs	2248	2248	2248	2248	1569	679
No. of matched untreated obs	2137	2244	230	251	1440	655
No. of treated obs	183	187	183	187	184	161

[35] Treated observations all have weight one.

Table 17: Effects of teenage motherhood on outcome in the first three years after birth, based on propensity score matching method

	Kernel, bandwidth 0.001	Kernel, bandwidth 0.01	Calliper, bandwidth 0.001	Calliper, bandwidth 0.01	Same as (1) compared with older mothers only	Same as (1) compared with childless women only
	(1)	(2)	(3)	(4)	(5)	(6)
Partnered						
Estimate	-0.136**	-0.155***	-0.192***	-0.200***	-0.136**	
No. of untreated obs	2065	2065	2065	2065	2065	
No. of matched untreated obs	1851	2033	164	171	1851	
No. of treated obs	75	76	75	76	75	
Partner employed						
Estimate	-0.058	-0.079	-0.092	-0.101	-0.058	
No. of untreated obs	1626	1626	1626	1626	1626	
No. of matched untreated obs	1233	1619	104	116	1233	
No. of treated obs	46	48	46	48	46	
Family income						
Estimate	-214***	-215***	-323***	-321***	-219***	14
No. of untreated obs	2461	2461	2461	2461	2064	397
No. of matched untreated obs	2145	2436	173	178	1850	284
No. of treated obs	77	77	77	77	75	57

Source: Estimated from LSAC (wave 1) and HILDA (wave 4)
Notes: *significant at 10%, **significant at 5%, ***significant at 1%. Sample restrictions described in Section 6.1 apply. Also see notes of Table 13.

The next two estimates are based on the calliper method (see columns 3 and 4). This method matches a teenage mother with one or more non-teenage mothers if the difference in propensity scores between the teenage mother and the non-teenage mother is less than a specified limit (the bandwidth). The calliper method gives equal weight to all matched observations and ignores all unmatched observations. As such, only a limited number of non-teenage mothers are used in calculating the counterfactual outcomes. Again, two bandwidths (0.001 and 0.01) are used for this matching method.

We also compute two other estimates, both using the kernel method with a bandwidth of 0.001. The first estimate is based on a comparison between teenage mothers and older mothers only (see column 5) and the second estimate is based on a comparison with childless women only (see column 6). For all PSM estimations, we only use treated observations whose propensity scores lie in the ‘common support’ region. A teenage mother is said to satisfy this condition if her predicted propensity score is smaller than the maximum propensity score amongst older mothers and/or childless women, and larger than the minimum propensity score amongst this group.

When comparing the treatment and control groups in terms of their mean characteristics before and after applying weights, the means in the two groups have become much more similar after applying the weights.[36] Several patterns are apparent when comparing different sets of estimates in Table 17. First, both kernel estimates and both calliper estimates are significant for all outcomes, except for partner's employment status.

Second, the kernel method (columns 1 and 2) produces larger estimates (in absolute value) for employment status, while the calliper method (columns 3 and 4) produces larger estimates for all other outcomes. For example, the kernel method with a bandwidth of 0.001 suggests that teenage motherhood reduces the probability of employment by 26.9 percentage points, whereas the calliper method with the same bandwidth suggests a smaller reduction of 24.0 percentage points. While the kernel method with a bandwidth of 0.001 attributes 7.3 percentage points of a decrease in the probability of having good or better health to teenage motherhood, the corresponding reduction predicted by the calliper method is larger in magnitude, at 9.2 percentage points.

Third, while increasing the bandwidth always increases the number of matches, its impact on the magnitude of the estimated effect can be either positive or negative. In general, estimates based on the two bandwidths are broadly similar. For example, the kernel method with a bandwidth of 0.001 (column 1) suggests that teenage motherhood reduces the probability of completing Year 12 by 23.9 percentage points, while the same method with a bandwidth of 0.01 (column 2) suggests the reduction is 24.5 percentage points. Similarly, the calliper method with a bandwidth of 0.001 (column 3) and 0.01 (column 4) suggest that teenage motherhood reduces weekly personal income by $60 and $56 respectively.

Fourth, the impact of teenage motherhood is larger when comparing teenage mothers with childless women (column 6) than when comparing with older mothers (column 5). For example, while teenage motherhood does not significantly reduce personal income compared with older mothers, it reduces average weekly personal income by $100 compared with childless women. This pattern is consistent with the patterns observed in Section 4, which suggests that the mean outcomes of older mothers lie somewhere between those for teenage mothers and those for childless women. They are also consistent with the regression results in

[36] Appendix Table 11 compares the means of the treatment and control groups before and after the matching. Most explanatory variables are statistically different between the two groups before the matching, but no significant differences between them remain after the matching.

Section 6.3, which show that compared to childless women, older motherhood is associated with poorer outcomes and teenage motherhood with considerably poorer outcomes.

As a robustness check, we also estimate the impact of teenage motherhood in later years. The results, presented in Appendix Table 12, do not show a clear pattern, with the impact of teenage motherhood increasing over time for some outcomes yet decreasing for others. This could be at least partly because of the small number of teenage mothers that remain in the survey in later years. On balance, it is apparent that the impact of teenage motherhood on educational outcomes worsens over time. For example, while teenage motherhood reduces the probability of Year 12 completion by 24 percentage points in the first three years after birth, the corresponding effect increases to 30 percentage points in the fifth year and 33 percentage points two years later. This could be because childless women accumulate more education over time than teenage mothers, which widens the gaps in educational outcomes between the two groups. No such effect is found for post-school qualifications.

By contrast, the impact of teenage motherhood on employment diminishes over time. In particular, teenage motherhood reduces the probability of working by 27 percentage points in the first three years after birth, but the effect drops to 24 and 18 percentage points respectively in the fifth and seventh years after birth. This is likely to reflect the increasing tendency for mothers to increase labour supply as their child grows up. In addition, it may be the case that teenage mothers who do better in this regard are also more likely to remain in the survey.

6.5 Comparison between regression results and PSM results

The estimates of teenage motherhood on educational outcomes based on the PSM method are smaller than those obtained by the regression method (Section 6.3). In particular, while the regression method suggests that teenage motherhood reduces the probability of completing Year 12 by 46 percentage points relative to childless women (Table 14, column 1), the PSM method indicates that it only reduces by 39 percentage points (Table 17, column 6). Similarly, the regression method finds teenage motherhood to lower the probability of obtaining any post-school qualification by 12 percentage points (Table 14, column 2), whereas the PSM method does not find a significant effect of teenage motherhood on this outcome (Table 17, column 6).

It is difficult to precisely pin down the effect of teenage motherhood on outcomes. On the one hand, the observed effect is overstated because several factors, such as unobserved personal

characteristics that are important in shaping a woman's outcomes, cannot be controlled for, and unfortunately we have a limited number of explanatory variables to use in the model to predict the probability of teenage motherhood. On the other hand, the observed effect of teenage motherhood on outcomes could be understated if we do not account for the indirect effects because teenage motherhood is strongly associated with educational outcomes and education has a strong effect on outcomes, especially labour market outcomes.

Both the regression method and the PSM method have limitations. The former fails to account for unobserved personal characteristics (such as personal preferences for children) and unobserved family characteristics (such as parental support), which are potentially important in shaping both motherhood timing and outcomes. The latter method rests crucially on the assumption that assignment to treatment (i.e., becoming a teenage mother) is purely random, given the probability of treatment (our predicted propensity score).

For some outcomes (e.g. partnering status for women with children), the small number of teenage mothers is a drawback. One consequence of the small sample is that point estimates are subject to larger margins of error. As a result, point estimates are less likely to be statistically significant. However, it is reassuring that most of the results based on small samples of teenage mothers in this study are significant.

Taken together, the regression results and PSM results suggest that while teenage motherhood is strongly associated with poorer outcomes in the first years after birth, a considerable part of the observed associations is due to selection bias. That is, teenage mothers and non-teenage mothers differ significantly in characteristics that are likely to influence their propensity to become a teenage mother. Although not all of the observed associations can be attributed to the causal impact of teenage motherhood, the indication is that causal effects are present, nontrivial and mostly significant. Thus, it seems plausible that teenage motherhood to some extent causes women to have poorer outcomes in education, the labour market, health and partnership in the first years after birth.

7. Summary and conclusion

This study has analysed data from the Census (1991 and 2006) and from the LSAC (waves 1-3) and HILDA (waves 4, 6, 8) surveys to examine educational, labour market, health and partnership outcomes of young women who became a mother during their teenage years and compared them with outcomes of women who became a mother in their twenties and those who do not have children yet. Regression models were used to quantify the strength of the relationships between teenage motherhood and the outcomes. Finally, PSM methods were used to examine to what extent the observed relationships between teenage motherhood and later outcomes are causal.

The descriptive statistics show that, for all outcomes, teenage mothers perform worse than older mothers, who in turn perform worse than childless women. Data from Census 2006 show that compared to childless women, teenage mothers aged 15-29 are less likely to complete Year 12 (just over 40 percentage points) or to have a post-school qualification (46 percentage points at age 25-29). If teenage mothers have a post-school qualification, they are less likely to have a university degree (41 percentage points). Teenage mothers are also less likely to be employed (38 percentage points) and if they are employed, they work fewer hours. While teenage mothers have, on average, slightly higher personal income than older mothers (possibly due to being more likely not to have a partner) and lower income than childless women, they have lower household income than both older mothers and childless women.

Although older mothers aged 20-29 tend to have better educational outcomes than teenage mothers, their labour market outcomes are very similar. This shows that childbearing and caring responsibilities have a major effect on labour market participation, regardless of education or the age of the mother. Nevertheless, older mothers have higher household income than teenage mothers, because they are more likely to have a (working) partner than teenage mothers.

In addition, the data show that in 1991, teenage mothers aged 20-24 also have far less favourable outcomes than other women of the same age. Using Census 1991 shows several similarities in the observed patterns of outcomes between the three groups of young women as compared to 2006. A number of outcomes have changed from 1991 to 2006. Some of these changes may be (partly) temporary since they are due to the economic circumstances at the time, such as the higher employment (and lower unemployment) rates for all three groups of

women in 2006. However, outcomes such as education may have improved more permanently for all three groups of women, although teenage mothers are still lagging behind the other two groups in this respect. A much larger proportion of women finishes Year 12 and continues on to post-school qualifications in 2006 compared to 1991, and for childless women the proportion going to university has increased as well.

Average personal and household incomes have both increased in real terms, with the nominal income increases being much more than the overall price increases due to inflation. So, on average everyone is better off (financially at least) in 2006 than in 1991.

Another outcome that has changed substantially across all three groups from 1991 to 2006 is the legal marital status. This has decreased enormously, particularly for the two mother groups since the childless women had a low rate of marriage to begin with. The decrease in legal marriage is to some extent compensated by the increase in de facto partnerships which seem to replace the former partnerships through marriage. However, among mothers, this increase was not sufficient to completely make up for the lower rate of legal marriage, so that teenage mothers and older mothers in 2006 are much less likely to be in a relationship than they were in 1991.

Using a simple regression with only teenage motherhood and older motherhood as explanatory variables, data from the LSAC and HILDA surveys show that compared with childless women, teenage mothers are 50 percentage points less likely to complete Year 12, 25 percentage points less likely to have a post-school qualification, 69 percentage points less likely to be employed, 8.5 percentage points less likely to have good or better health, 37 percentage points more likely to be a smoker, and have $320 ($380) less in weekly personal (family) income. These differences are consistent with what is observed in the Census data.

The same data show that compared with childless women, older mothers are 16 percentage points less likely to complete Year 12, 45 percentage points less likely to be employed, 4.4 percentage points more likely to be a smoker, and have $280 less in weekly personal income. There are no significant differences in the probability of having a post-school qualification, the probability of having good or better health, or family income, between childless women and older mothers.

When a range of factors, including own characteristics, parental characteristics, family characteristics, and partner characteristics are controlled for, teenage motherhood is still significantly associated with many outcomes.

In particular, relative to similarly characterised childless women, teenage mothers are 46 percentage points less likely to complete Year 12, 12 percentage points less likely to have a post-school qualification, 43 percentage points less likely to be employed and 22 percentage points more likely to be a smoker. The effects of teenage motherhood on personal income, family income, self-assessed health status and partnership outcomes are no longer significant when a range of other factors are accounted for.

It is difficult to precisely pin down the effect of teenage motherhood on outcomes. On the one hand, the observed effect is overstated because several factors, such as unobserved personal characteristics that are important in shaping a woman's outcomes, are not controlled for. On the other hand, the observed effect of teenage motherhood on outcomes is understated because teenage motherhood is strongly associated with educational outcomes, and education has a strong effect on outcomes, especially labour market outcomes. These indirect effects of teenage motherhood are not accounted for.

Using interaction terms with teenage motherhood in multivariate analyses of the Census data, there is evidence that having a good education can considerably counteract the negative effect of teenage motherhood. Nevertheless, schooling is less beneficial for teenage mothers' labour force participation than for other women's labour force participation, but if she manages to complete a university degree she experiences a larger increase in labour force participation than similar other women would. Despite this large increase, the participation rate of teenage mothers with a university degree would still be lower than the participation rate of other women with a university degree. This result of education considerably (although not completely) counteracting the negative effect of teenage motherhood does not benefit many teenage mothers, since in general, teenage mothers have significantly less education than other women. This may be because teenage women who are pre-disposed against schooling drop out of school before becoming a mother, and/or because teenage motherhood impedes the pursuit of education.

Interestingly, teenage mothers do not appear to benefit to the same extent from the education and labour market opportunities provided in major capital cities as other young women do. Teenage mothers who have their child at age 19 are more likely to complete Year 12 (by age 19) and have a partner than younger mothers.

Having a partner is beneficial with regard to labour market outcomes; even a non-employed partner increases the probability of employment more for teenage mothers than for other

women. This suggests the effect may work through a sharing of the childcare responsibilities. The age of the youngest child is also important. That is, as the youngest child grows older, labour force participation, and employment both increase substantially but the increases are at a slightly lower rate than for older mothers.

The PSM approach, which allows comparison of outcomes of women who have similar propensities to become a teenage mother, shows broadly similar results. In particular, PSM analysis suggests that relative to similarly characterised childless women, teenage mothers are 39 percentage points less likely to complete Year 12, 54 percentage points less likely to be employed and 34 percentage points more likely to be a smoker. While the regression analysis finds no significant associations between teenage motherhood, and personal income and self-assessed health status, PSM analysis shows that relative to childless women, teenage mothers have $100 less in weekly personal income and are 8 percentage points less likely to have good or better health.

Examining outcomes after two and four additional years respectively, the disadvantage with regard to the outcomes listed above has remained to a large extent. The disadvantage with regard to education appears to deepen in the years after birth, while the disadvantage with regard to employment reduces, presumably since the child ages over time. However, the difference in income (both in personal and family income) appears to become larger over time, possibly due to the different career opportunities available to teenage mothers compared to other women.

Both the regression method and the PSM method have limitations. However, the fact that they produce broadly similar results is reassuring. Both methods suggest that teenage motherhood has a causal impact on later outcomes, especially educational outcomes and employment status. Both types of analysis show smaller differences in outcomes between teenage mothers and older mothers than between teenage mothers and childless women. These results are further supported by multivariate analysis using the Census data with a more limited set of explanatory variables.

It appears that young teenage mothers are disadvantaged because they have children, which is compounded by the fact that they have children at such a young age. Child bearing and caring responsibilities associated with having children are impediments to a woman’s labour market activity while having children at a young age is also an obstacle to human capital accumulation.

Accordingly, policies aimed at reducing early motherhood should help improve outcomes for young women. In addition, there should be interventions aimed at increasing education for women who have become a mother during their teenage years, given our findings that education can considerably offset the negative impact of early motherhood. Two current programs, the Early Head Start program (US) and the Sure Plus Start program (UK), both fail to find significant improvements to educational and employment outcomes amongst the teenage mothers participating in their programs (Love *et al.*, 2002; Wiggins *et al.*, 2005).

This study provides some evidence that the presence of a partner (and thus possibly more assistance with the caring responsibility) improves teenage mothers' labour market outcomes, and that labour market outcomes improve as children get older. This indicates that childcare assistance remains an important policy direction to focus on. In the Early Head Start program in the US, a program for vulnerable families, childcare services were the only services used to a similar extent by teenage mothers as by older mothers (Love *et al.*, 2002). All other services were used to a lesser extent by teenage mothers than by older mothers.

Given the finding that teenage mothers in major capital cities do not appear to benefit to the full extent from the opportunities that this environment offers (compared to other young women), this appears an area that is worth further exploration. Why do they not benefit to the same extent? Again, the availability of affordable childcare comes to mind.

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Appendices

Appendix A: Literature summary

Source	Country/ Year(s)	Data source	Outcomes examined	Econometric method	Main findings
Jeon, Kalb and Vu 2011	Australia 2001-2005	HILDA	Welfare recipiency	Dynamic random effects probit model Decomposition analysis	Welfare participation is state dependent for all mothers, and stronger for teenage mothers than for older mothers. Conditional on welfare receipt (or not), differences in characteristics between teenage and older mothers contribute more to the higher rate of welfare participation than differences in their behaviour.
Webbink, Martin and Visscher 2011	Australia 1980/82 - 1988/89 and 1989/90 - 1996/2000	Two cohorts of twins of the Australian Twin Registry, older and younger cohort	Education: years of education	Fixed effects: using all sibling sisters; all twin sisters; and all identical twin sisters	Teenage mothers attain 0.5 years less education than their sisters; 0.3 years less than their twin sisters. Compared to their identical twins, the difference in educational attainment is close to zero and statistically insignificant.
Webbink, Martin and Visscher 2008	Australia 1980/82 - 1988/89	Two mail surveys of twin pairs enrolled in the Australian National Health and Medical Research Council Twin Registry (1980 – 1982 and 1988 – 1989), older cohort only	Health behaviour: smoking, drinking, and body size	Fixed effects: using all sibling sisters; all twin sisters; and all identical twin sisters	Teenage mothers smoke during 2.6 to 4 more years than their twin sisters, and are more likely to be overweight. The spouse of a teenage mother is more likely to be a current smoker and drinks more than the spouse of the twin sister.

Source	Country/ Year(s)	Data source	Outcomes examined	Econometric method	Main findings
Bradbury 2006	Australia 3 waves: 1996, 2000, 2003_	Australian Longitudinal Study on Women's Health	Education; employment; marriage up to age 25-30	Instrumental variable (IV) approach using miscarriage as instrument	No adverse impact of teenage childbirth is found on education, labour market, income or location; but young mothers are less likely to be legally married in their late 20s.
Simonsen and Skipper 2006	Denmark, 1997	A cross-sectional subsample of a 5% representative sample of the Danish population	Labour market: wages	Propensity score matching	Find negative impact of motherhood on wages. This is a study of mothers in general not only teenage mothers.
Ermisch and Pevalin 2005	UK, 1970-2000	British women born in 1970	Partnership outcomes at age 30	IV: miscarriage (and abortion) as instrument	Teenage motherhood increases the likelihood of a teenage mother partnering with poorly educated and unemployment-prone men.
Goodman, Kaplan and Walker 2004	UK 1970-2000	British Cohort Study	Income: family income Welfare recipiency: receipt of benefits Labour market: employment and wages Family formation: whether have a partner	IV: miscarriage as instrument and Propensity score matching	Teenage mothers are less likely to be employed at age 30, tend to work less, and have a lower hourly wage; but they are just as likely to have a partner. The impact of teenage motherhood may be small relative to the effect that pre-motherhood disadvantage has on subsequent SES.
Chevalier and Viitanen 2003	UK 1991 (wave 5)	National Child Development Study (Cohort of individuals born in 1958)	Education: post-compulsory education Labour market: work experience; wages	IV: age at menarche as instrument and Propensity score matching	Education: probability of completing post-compulsory education reduced by 12% to 24%, compared to older mothers. Labour market: work experience reduced by 3 years; and wage rate 8% lower (authors' preferred estimate).

Source	Country/ Year(s)	Data source	Outcomes examined	Econometric method	Main findings
Fletcher 2012	US 2000/01 and 1994/95	National Longitudinal Study of Adolescent Health (wave 3) Midlife Development in the United States (wave 1)	Health behaviour: incl. Tobacco, alcohol, and marijuana use, being overweight, and obese	IV: miscarriage as instrument and Fixed effects: using sister pairs	Effects of teenage motherhood on the health behaviours of young mothers are negligible and possibly protect against drug use and binge drinking (different from results in Webbink *et al.*, 2008).
Miller 2011	US 1979-2000	National Longitudinal Survey of Youth 1979 cohort (aged 14-22 at start)	Labour market: earnings; hours worked; wage rates; and wage growth	IV: miscarriage or stillbirth; accidental first pregnancy; years lagged from attempt to conceive to birth	Analysis is not on teenage mothers only. Of interest here is the effect of delaying motherhood. Delaying motherhood has the effect of increasing hours worked and wages, and hence career earnings and post-motherhood wage rates.
Wolfe *et al.* 2007	US 1970-1992	Panel Study of Income Dynamics	Relationship Labour market: income	Two stage model using IV: first estimating expectations on relationship/income for teenage mothers and non-teenage mothers, and then the effects of these expectations on teenage motherhood of the next generation.	Choice-specific measures of expected marriage/cohabitation patterns and expected income have a persistent influence on the childbearing decisions of unmarried female teenagers. That is, increasing income/marriage expectations when forgoing teenage motherhood or decreasing income/marriage expectations for teenage mothers may be effective to reduce teenage motherhood.
Hotz, McElroy and Sanders 2005	US 1979-1992	National Longitudinal Survey of Youth 1979 cohort	Education: various level of educational attainment Fertility Family formation Labour market: hours worked; wage rates	IV: miscarriage as instrument	Using miscarriage as instrument, various estimates on the effect of teenage childbearing on the outcomes are much smaller than those in previous studies, and mostly short term. A teen mother would work fewer hours and earn less at older ages if childbearing had been delayed.

Source	Country/ Year(s)	Data source	Outcomes examined	Econometric method	Main findings
			Welfare recipiency		
Hoffman 2003	US 1979-1992	National Longitudinal Survey of Youth 1979 cohort			This is a critique on a previous draft of Hotz, McElroy and Sanders (2005). Substantially smaller positive impacts on income variables; new data yields yet smaller impacts
Brien, Loya and Pepper 2002	US 1988-1994	National Education Longitudinal Study	Cognitive development: as measured by standardised test scores	Difference-in-difference model and Difference- in-difference-in-difference model	The effect of teenage childbearing on the mother's cognitive development is negligible, although teenage mothers have lower test scores than their counterparts before and after childbearing.
Klepinger, Lundberg and Plotnick 1999	US 1979-1991	National Longitudinal Survey of Young Women	Education; Labour market: work experience and earnings	IV: using state and county-level indicators of the costs of fertility and fertility control (e.g. contraception or abortion) as instruments	Years of formal education and work experience during adolescence decrease with teenage childbearing. For white women, early adult work experience also decreases. Earnings are affected through the lower educational outcomes.
Ribar 1999	US 1979-1992	National Longitudinal Survey of Youth	Income: family income-to-needs ratio (income divided by the poverty level for the woman's reported family size); family income Education: completed years of education	Fixed effects: using sister pairs (two oldest sisters in each family) IV: using sister's fertility as instrument Specification is a general model that nests IV, fixed effects and OLS. It sets bounds on reasonable estimates. IV is ruled out.	Fixed effects: 19% reduction in family income-to-needs ratio, but small and insignificant effect on family income Years of education reduced by slightly less than a year IV: teenage childbearing has a negative and severe impact on both income and educational attainment (cf. strong IV estimates in Klepinger *et al.* (1995); but weaker IV estimates in Ribar (1994); Olsen and Farkas (1989)).

Source	Country/ Year(s)	Data source	Outcomes examined	Econometric method	Main findings
Hotz, McElroy and Sanders 1997	US 1979-1992	National Longitudinal Survey of Youth	Education: obtaining high-school degree and GED Fertility: total number of children Labour market: earnings and hours worked Partnering status	IV: using miscarriage as an instrument	Early childbearing increases the total number of children the woman will have and the time spent as a single parent. It also decreases the probability of completing a standard high-school degree by 20 percentage points but this is more or less compensated by the increase in probability of obtaining a GED. Early childbearing decreases earnings and hours worked in the woman's early 20s but increases these in their late 20s and 30s.
Hotz, Mullin and Sanders 1997	US 1979-1992	National Longitudinal Survey of Youth	Education: attaining a high-school diploma at age 25 labour market: hours of work, earnings at age 27	IV: using miscarriage as an instrument. Technical paper to determine bounds on earlier estimates with the imperfect (contaminated instrument of miscarriage	Whether teenage childbearing decreases the propensity to receive a high-school diploma cannot be unambiguously determined. If present, the bounds imply that this effect is much smaller than reported elsewhere in the literature. The findings of the Hotz, McElroy and Sanders (1997) study with respect to annual hours of work or labour market earnings are confirmed. Women who have births as teens have higher labour market earnings and hours worked compared to what they would have attained if their childbearing had been delayed. Standard OLS methods are not effective in estimating the causal effects of teenage childbearing.
Ribar 1996	US 1979-1992	National Longitudinal Survey of Youth	Subsequent fertility: annual birth outcomes	Method of Simulated Moments Panel Probit model allowing for serial correlation of the error terms	Finds strong evidence of serial correlation between the unobserved determinants of teenage childbearing and later fertility. As a result, the positive effect of teenage childbearing on later fertility disappears or reverses. Reducing teenage childbearing without addressing underlying causes may only have little effect on women's subsequent socioeconomic status.

Source	Country/ Year(s)	Data source	Outcomes examined	Econometric method	Main findings
Klepinger, Lundberg and Plotnick 1995	US 1979-1991	National Longitudinal Survey of Youth, data from the Alan Guttmacher Institute, and other public sources	Education: completed years of schooling at time of interview in the year the respondent turned age 25 or, if this is missing, years of schooling at age 26	IV: using a range of potential instruments (age at menarche and variables indicative of state policies on abortion and family planning funding and services). This is a technical paper with a focus on instrument selection.	The most restrictive technique, which excludes potential instruments that fail diagnostic tests individually, yields estimated coefficients that are reasonably precise, of consistent magnitude (small negative), and at the low end of the range of point estimates. They are not significantly different from the OLS estimate, and the hypothesis that fertility is exogenous cannot be rejected in this specification.
Bronars and Grogger 1994	US 1970, 1980	Public Use Microdata Samples of the 1970 and 1980 Censuses	Labour market: Labour force participation, poverty; and welfare recipiency	IV: using an indicator for whether the first birth was a set of twins	Large short-term effects of unplanned births on labour force participation, poverty, and welfare recipiency among unmarried mothers (not necessarily teenage mothers), but not among married mothers. Most of the adverse economic effects of unplanned motherhood dissipate over time for whites, but not for black unmarried mothers. Black unmarried mothers were also less likely to marry and have lower family earnings as a result of unplanned births.
Ribar 1994	US 1979-1985	National Longitudinal Survey of Youth	Education: high-school completion	Bivariate probit: high-school completion, with teenage childbearing as an endogenous covariate Exclusion restrictions in education probit: age at menarche, availability of obstetrician/ gynaecologist, and the	Strong evidence of teenage childbearing being an endogenous determinant of high-school completion Not accounting for this endogeneity leads to overestimation of the effect of teenage childbearing on high-school completion. Teenage parenthood and failure to complete high school are separate problems. Programs which encourage education or discourage early fertility may not be automatically reinforcing.

Source	Country/ Year(s)	Data source	Outcomes examined	Econometric method	Main findings
				local abortion rate	
Hoffman, Foster and Furstenberg 1993	US 1968-1987	Panel Study of Income Dynamics	Education: incl. years of schooling Family formation: e.g. whether married at first birth Income: income-needs ratio (ratio of total family income to the official poverty standard for a family of a given size)	Fixed effects: using sister pairs A comparison with/ critique of Geronimus and Korenman (1992) is made.	Some statistically significant and quantitatively important effects of teen parenthood remain after accounting for unobserved family background. Education: Years of schooling reduced by .38 years compared to non-teen mothers Family formation: fixed-effect estimates insignificant Number of children: increased by 0.44 children compared to non-teen mothers Income: a teenage mother's income-needs ratio is reduced by over 30%
Geronimus and Korenman 1992	US 1968-1982 and 1985	National Longitudinal Survey of Young Women Panel Study of Income Dynamics	Income: income per capita; family income Education: whether a high-school graduate; post-secondary schooling Family formation: if currently married; ever married Labour market: if currently employed	Fixed effects: using sister pairs	Compared to cross-sectional estimates, fixed-effect estimates of the impact of teenage childbearing on the various outcomes are much smaller than previously estimated and/or not significant. Not accounting for pre-existing differences in socio-economic characteristics among teenage and older mothers could lead to overstated estimates of subsequent socio-economic disadvantage experienced by teenage mothers.
Olsen and Farkas 1989	US 1978-1980	Quasi-experimental data from the evaluation of the Youth Incentive Entitlement Pilot Projects	Education: early school leaving of youths from black low-income households	Hazard rate (or duration) model: bivariate specification of time until school leaving and time until first birth	Childbearing and school leaving are jointly determined (cf. Ribar, 1994) and when this is accounted for, childbearing has little effect on early school leaving.

Appendix B: Supplementary tables and figures

Appendix Table 1: Annual personal income by motherhood category in 2006

	Teenage mothers	Other women		
Personal income (annual)		Older mothers	Childless women	Total
All				
Negative or nil income	4.4	10.1	17.9	16.9
$1-7,799	8.8	17.5	18.2	18.1
$7,800-12,999	16.9	16.4	10.7	11.4
$13,000-20,799	31.5	21.6	10.9	12.2
$20,800-31,199	26.9	17.5	15.1	15.4
$31,200-41,599	7.5	8.1	12.1	11.6
$41,600-51,999	2.5	4.6	7.9	7.4
$52,000 or more	1.5	4.4	7.4	7.0
Total number of observations	3,286	9,918	66,918	76,836
Aged 15-19				
Negative or nil income	5.9		34.8	34.8
$1-7,799	8.6		37.2	37.2
$7,800-12,999	22.6		12.1	12.1
$13,000-20,799	43.9		9.3	9.3
$20,800-31,199	16.4		5.2	5.2
$31,200-41,599	1.5		1.0	1.0
$41,600-51,999	0.7		0.2	0.2
$52,000 or more	0.5		0.2	0.2
Total number of observations	408		25,794	25,794
Aged 20-24				
Negative or nil income	4.3	8.4	8.7	8.7
$1-7,799	9.8	17.5	8.9	9.7
$7,800-12,999	16.8	20.2	13.1	13.7
$13,000-20,799	33.1	26.7	15.3	16.3
$20,800-31,199	27.3	17.5	24.6	24.0
$31,200-41,599	6.5	6.0	17.4	16.4
$41,600-51,999	1.3	2.6	8.3	7.8
$52,000 or more	1.0	1.1	3.7	3.5
Total number of observations	1,324	2,249	23,561	25,810

Appendix Table 1: Annual personal income by motherhood category in 2006

	Teenage mothers	Other women		
Personal income (annual)		Older mothers	Childless women	Total
Aged 25-29				
Negative or nil income	4.1	10.6	5.4	7.0
$1-7,799	8.0	17.5	2.6	7.1
$7,800-12,999	15.4	15.2	5.4	8.4
$13,000-20,799	26.9	20.0	7.1	11.1
$20,800-31,199	29.3	17.5	16.8	17.0
$31,200-41,599	10.0	8.7	21.3	17.5
$41,600-51,999	4.1	5.1	18.6	14.5
$52,000 or more	2.3	5.4	22.9	17.6
Total number of observations	1,554	7,669	17,563	25,232

Source: Census 2006 (5% CURF)

Appendix Table 2: Annual household income by motherhood category in 2006

	Teenage mothers	Other women		
Household income (annual)		Older mothers	Childless women	Total
All				
Negative or nil income	0.8	0.8	1.7	1.6
$1-12,999	4.6	3.6	2.7	2.8
$13,000-18,199	11.4	5.9	2.3	2.7
$18,200-25,999	3.0	2.3	2.5	2.4
$26,000-33,799	21.2	12.8	6.6	7.4
$33,800-41,599	8.9	9.1	5.6	6.0
$41,600-51,999	10.9	11.5	7.4	7.9
$52,000-62,399	13.8	16.3	11.7	12.3
$62,400-72,799	7.5	8.2	8.8	8.7
$72,800-88,399	6.5	10.7	11.2	11.2
$88,400-103,999	4.3	6.7	9.5	9.2
$104,000-129,999	3.5	5.4	12.3	11.4
$130,000-155,999	1.9	4.3	7.9	7.4
$156,000-181,999	0.8	1.2	4.3	3.9
$182,000-207,999	0.3	0.7	2.8	2.5
$208,000 or more	0.6	0.7	2.9	2.6
Total number of observations	3,322	10,052	68,379	78,431
Aged 15-19				
Negative or nil income	0.5		1.6	1.6
$1-12,999	4.5		3.1	3.1
$13,000-18,199	13.8		2.8	2.8
$18,200-25,999	6.0		3.6	3.6
$26,000-33,799	19.3		7.9	7.9
$33,800-41,599	6.2		6.1	6.1
$41,600-51,999	13.6		7.8	7.8
$52,000-62,399	12.7		10.5	10.5
$62,400-72,799	5.3		8.0	8.0
$72,800-88,399	4.3		11.2	11.2
$88,400-103,999	4.5		9.4	9.4
$104,000-129,999	4.8		10.5	10.5
$130,000-155,999	2.4		8.1	8.1
$156,000-181,999	1.0		4.3	4.3
$182,000-207,999	0.2		2.6	2.6
$208,000 or more	1.0		2.5	2.5
Total number of observations	419		26,809	26,809

Appendix Table 2: Annual household income by motherhood category in 2006

	Teenage mothers	Other women		
Household income (annual)		Older mothers	Childless women	Total
Aged 20-24				
Negative or nil income	1.0	0.9	2.3	2.1
$1-12,999	5.4	4.0	2.8	2.9
$13,000-18,199	13.3	7.8	2.4	2.8
$18,200-25,999	2.9	3.1	2.3	2.4
$26,000-33,799	21.3	16.6	6.7	7.6
$33,800-41,599	10.3	11.6	5.3	5.8
$41,600-51,999	10.2	13.9	7.3	7.8
$52,000-62,399	13.3	14.1	12.6	12.7
$62,400-72,799	6.5	7.2	9.6	9.4
$72,800-88,399	5.6	8.2	10.8	10.6
$88,400-103,999	4.1	4.8	8.9	8.5
$104,000-129,999	2.7	3.8	11.8	11.1
$130,000-155,999	2.0	2.1	7.1	6.6
$156,000-181,999	0.8	0.9	4.3	4.0
$182,000-207,999	0.3	0.5	2.8	2.6
$208,000 or more	0.6	0.5	3.2	3.0
Total number of observations	1,334	2,277	23,868	26,145
Aged 25-29				
Negative or nil income	0.8	0.8	1.2	1.1
$1-12,999	4.0	3.5	1.8	2.3
$13,000-18,199	9.1	5.4	1.3	2.6
$18,200-25,999	2.4	2.0	1.1	1.4
$26,000-33,799	21.5	11.7	4.6	6.7
$33,800-41,599	8.5	8.4	5.2	6.2
$41,600-51,999	10.7	10.9	6.8	8.0
$52,000-62,399	14.5	16.9	12.3	13.7
$62,400-72,799	8.9	8.4	8.9	8.8
$72,800-88,399	8.0	11.4	11.8	11.7
$88,400-103,999	4.5	7.3	10.5	9.5
$104,000-129,999	3.8	5.8	15.6	12.6
$130,000-155,999	1.7	4.9	8.7	7.5
$156,000-181,999	0.8	1.2	4.1	3.2
$182,000-207,999	0.3	0.7	3.1	2.4
$208,000 or more	0.5	0.7	3.2	2.4
Total number of observations	1,569	7,775	17,702	25,477

Source: Census 2006 (5% CURF)

Appendix Table 3: Annual personal income by motherhood status in 1991 (ages 20-24)

	Teenage mothers (n=273)	Older mothers (n=484)	Childless women (n=5,126)
Less than $3,001	27.8	38.6	9.1
$3,001 - 5,000	4.4	5.6	6.2
$5,001 - 8,000	9.2	9.1	14.1
$8,001 - 12,000	25.3	17.2	8.9
$12,001 - 16,000	19.8	13.0	12.4
$16,001 - 20,000	7.0	6.2	17.8
$20,001 - 25,000	4.8	6.0	19.1
$25,001 - 30,000	1.1	2.9	8.9
$30,001 - 35,000	0.4	0.6	2.4
$35,001 - 40,000	0.4	0.2	0.8
$40,001 - 50,000	0.0	0.2	0.3
More than $50,001	0.0	0.4	0.1
Total number of observations	273	484	5126

Source: Census 1991 (1% CURF)

Appendix Table 4: Annual household income by motherhood status in 1991 (ages 20-24)

	Teenage mothers (n=321)	Older mothers (n=572)	Childless women (n=5,154)
Less than $3,001	0.9	0.7	0.9
$3,001 - 8,000	1.9	2.1	2.4
$8,001 - 12,000	11.8	7.2	2.2
$12,001 - 16,000	19.6	12.1	4.2
$16,001 - 20,000	19.3	14.0	4.7
$20,001 - 25,000	13.1	13.3	7.7
$25,001 - 30,000	10.9	13.6	7.1
$30,001 - 35,000	6.5	9.4	6.6
$35,001 - 40,000	6.2	7.9	7.1
$40,001 - 50,000	5.6	11.0	18.7
$50,001 - 60,000	1.6	4.9	12.2
$60,001 - 70,000	0.6	1.6	7.4
$70,001 - 80,000	0.9	0.2	5.7
$80,001 - 100,000	0.9	0.9	7.0
$100,001 - 150,000	0.0	1.1	5.2
More than $150,000	0.0	0.2	1.0
Total number of observations	321	572	5,154

Source: Census 1991 (1% CURF)

Appendix Table 5: Characteristics by motherhood status for ages 15-24, Census 2006

	Teenage mothers row %	Older mothers row %	Childless women row %	All women aged 15-24 row freq.
Total	3.3	4.2	92.6	55,311
States/Territories				
New South Wales	2.9	4.0	93.1	17,880
Victoria	2.0	3.2	94.8	14,078
Queensland	4.6	5.5	90.0	10,933
South Australia	3.6	4.5	91.8	4,269
Western Australia	3.7	4.2	92.1	5,442
Northern Territory	9.0	5.6	85.3	498
Tasmania	6.2	5.5	88.3	1,214
ACT	2.2	3.6	94.2	997
Usual residence				
Major capital cities	2.2	3.2	94.5	33,242
Other areas	4.8	5.6	89.6	22,069
Proficiency in spoken English [a]				
Very well/ well	1.6	2.7	95.7	9,108
Not well/ Not at all	5.2	9.0	85.9	544
Language spoken at home [b]				
English	3.6	4.4	92.0	45,402
European languages	1.0	2.2	96.8	2,550
Asian languages	1.5	3.2	95.3	6,487
Other Languages (incl. Australian Indigenous Languages)	8.8	6.4	84.8	546
Indigenous status [c]				
Non-Indigenous	3.0	4.0	93.0	53,224
Indigenous	13.9	10.4	75.7	1,528
Religion				
Catholic	2.6	3.3	94.2	15,373
Anglican	3.7	4.7	91.6	8,420
All other Christian beliefs together	2.4	3.9	93.7	10,290
Buddhism	1.3	2.7	95.9	1,498
Islam	4.1	9.8	86.2	1,332
All other non-Christian beliefs together	4.2	4.4	91.4	5,151
No religion	4.2	4.7	91.1	13,247
Country of birth of respondent [d]				
Australia	3.4	4.3	92.3	45,567
Eng. speaking countries	3.1	4.0	93.0	2,377
Other non-Eng. speaking countries	1.8	3.6	94.6	6,624

Appendix Table 5: Characteristics by motherhood status for ages 15-24, Census 2006

	Teenage mothers row %	Older mothers row %	Childless women row %	All women aged 15-24 row freq.
Country of birth of mother [e]				
Born in Australia	3.8	4.5	91.7	35,965
Born Overseas	2.0	3.5	94.5	18,414
Country of birth of father [f]				
Born in Australia	3.9	4.6	91.6	34,689
Born Overseas	2.1	3.5	94.5	19,698
Household income as stated [g]				
Low (below $51,999)	6.2	7.2	86.6	18,180
Medium (between $52,000 and $88,399)	2.6	4.0	93.5	16,927
High (above $88,400)	1.0	1.5	97.5	19,600

Source: Census 2006 (5% CURF)

Notes: (a) Applicable only to those whose language spoken at home is not English; 257 observations with 'Not stated' (b) 326 observations with 'Not stated, non-verbal so described, inadequately described' (c) 559 observations with 'Not stated' (d) English speaking countries include United Kingdom, Ireland, United States of America, Northern America (incl. Canada, Bermuda, St Pierre and Miquelon), New Zealand, and South Africa; 743 observations with 'Not stated'/ 'Inadequately described' (e) 932 observations with 'Not stated' (f) 924 observations with 'Not stated' (g) 512 observations with 'Not stated'

Appendix Table 6: Marginal effects on the probability of having a partner based on a probit estimation, including additional teenage mother interaction terms

	All women		Mothers only	
	2006	1991	2006	1991
Age	0.055***	0.076***	0.023***	0.022*
Teenage mother	0.480***	0.700***	-0.141**	-0.14
Teenage mother * Number of children	0.001	0.001	0.040***	0.065*
Teenage mother * Age youngest child 2-4	-0.115***	-0.149***	-0.081***	-0.097
Teenage mother * Age youngest child 5-9	-0.241***	-0.223***	-0.186***	-0.156
Teenage mother * Completed Year 10	-0.028	-0.055	-0.007	0.001
Teenage mother * Completed Year 12[d]	0.091***	0.106	-0.025	-0.047
Teenage mother * Any qualification[e]	-0.100***	-0.178***	-0.029	-0.165
Teenage mother * Completed university degree	0.005		-0.130*	
Teenage mother * Outside major capital city	-0.011	0.066	0.032*	0.072
Teenage mother * English speaking	-0.176***	-0.250***	-0.032	-0.267
Teenage mother * Indigenous	0.037	-0.078	-0.017	0.094
Teenage mother * Immigrant	-0.060	-0.084	-0.025	-0.012
Teenage mother * Both parents immigrants	0.016	0.119	-0.012	0.079
Teenage mother * Aged 19	0.019	0.148**	0.026*	0.121***
Older mother	0.498***	0.640***		
Older mother * Number of children	-0.017**	-0.061	0.018**	0.006
Older mother * Age youngest child 2-4	-0.209***	-0.185***	-0.181***	-0.183***
Older mother * Age youngest child 5-9	-0.337***		-0.416***	
Schooling (completed Year 9 or less)				
Completed at least Year 10	0.079***	0.119***	0.057***	0.055
Completed Year 12[d]	-0.016**	-0.104***	0.080***	0.021
Post-school qualifications (none)				
Any post-school qualification[e]	0.079***	-0.002	0.015	-0.036
University level or above	-0.015**	-0.098***	0.126***	
State of residence (NSW)				
Vic	-0.002	0.029*	-0.007	0.061
QLD	0.060***	0.044**	0.018*	0.038
SA	0.047***		0.024	
WA	0.076***	0.024[a]	0.066***	-0.028[a]
NT	0.086***		0.060**	
Tas	-0.015		-0.011	
ACT	-0.023	0.02[b]	0.055*	0.019[b]
Living outside major capital cities	0.084***	0.061***	0.022**	0.028
Language spoken at home				
European languages	-0.078***	-0.041*	-0.004	0.027
Asian and other languages	-0.082***	-0.114***	0.051**	
Country of birth (Australia)				
Other English-speaking countries	0.049***	0.015	-0.006	-0.047
Non-English speaking countries	0.094***	0.095***	0.066***	0.102
Father born overseas	-0.007	-0.002	0.007	0.029
Mother born overseas	0.004	0.023	0.023*	-0.001
Indigenous Australian	-0.082***	0.007	-0.141***	-0.239*

Appendix Table 6: Marginal effects on the probability of having a partner based on a probit estimation, including additional teenage mother interaction terms

	All women		Mothers only	
	2006	1991	2006	1991
Religion (Roman Catholic)				
Anglican	0.023***	0.006	0.012	-0.002
Other Christian beliefs	0.023***	0.048***	0.061***	0.023
Buddhism	-0.066***		-0.140***	
Islam	0.190***		0.092***	
Other non-Christian beliefs	0.034***	0.143***[c]	0.008	-0.138[c]
No religion	0.048***	0.050***	0.003	0.051
Observations	57,909	6,994	12,666	816
Pseudo R-squared	0.200	0.204	0.147	0.137

Source: Estimated from Census 1991 (1% CURF) and Census 2006 (5% CURF)

Notes: *significant at 10%, **significant at 5%, ***significant at 1%; reference group listed in parentheses for categorical variables. (a) Coefficient for South Australia, Western Australia and Northern Territory combined. (b) Coefficient for Tasmania and ACT combined. (c) Coefficient for all non-Christian beliefs combined. (d) Excludes non-school Year 12 equivalent qualifications; (e) Includes all certificate-, diploma- and degree-level qualifications.

Appendix Table 7: Labour market outcomes for women aged 20 or over

	Probit marginal effects				Interval regression coefficients			
	Labour force participation		Employment		Hours worked (if working)		Personal income	
	2006	1991	2006	1991	2006	1991	2006	1991
Age	0.004***	0.002	0.008***	0.021***	0.478***	0.194*	29.300***	25.989***
Teenage mother	-0.308***	-0.437**	-0.235***	-0.606***	0.086	-4.226	87.660**	147.071***
Teenage mother * Number of children	-0.046***	-0.016	-0.065***	-0.015	-3.061***	-0.605	-23.051***	-18.528
Teenage mother * Age youngest child 2-4	0.053***	0.033	0.067***	0.102*	0.044	1.073	-19.960	-39.974**
Teenage mother * Age youngest child 5-9	0.095***	0.084***	0.119***	0.214***	1.261	12.073***	-36.541**	-66.883*
Teenage mother * Completed Year 10	-0.044**	-0.076	-0.037	0.054	-1.876	-3.76	-43.640***	-35.938
Teenage mother * Completed Year 12[d]	-0.028*	-0.014	-0.052**	-0.02	1.790**	-2.658	-13.468	-20.16
Teenage mother * Any qualification[e]	0.021*	0.005	0.033**	0.07	1.241	-6.878	-1.686	27.811
Teenage mother * Completed uni degree	0.111***		0.164***		-1.384	27.690**	6.475	-11.287
Teenage mother * Has a partner	0.004	0.106***	0.028*	-0.029	2.055**	-18.411***	-132.005***	-78.478***
Teenage mother * Has employed partner	0.023*	-0.065	0.040**	0.178***	0.636	23.520***	-10.390	-52.694**
Teenage mother * Outside major capital city	0.017	-0.012	0.020	0.019	-0.430	10.937***	36.935***	17.034
Teenage mother * English speaking	-0.023	-0.074	-0.081**	-0.162	-0.673	-15.859***	-75.941***	-126.843***
Teenage mother * Indigenous	-0.037	0.110***	-0.070**	0.198***	-5.355***	0.203	-0.105	104.754***
Teenage mother * Immigrant	0.056***	0.021	0.072***	0.124	1.444	-15.260***	28.284	20.279
Teenage mother * Both parents immigrants	0.016	-0.021	0.017	0.001	1.305	13.717**	-0.398	-28.282
Teenage mother * Aged 19	-0.029**	-0.008	-0.041**	-0.018	-0.522	2.934	-31.560***	5.1
Older mother	-0.435***	-0.363***	-0.426***	-0.407***	-13.066***	-19.275***	-269.406***	-131.493***
Older mother * Number of children	-0.042***	-0.054**	-0.058***	-0.104**	-1.579***	6.420***	-21.889***	-26.458*
Older mother * Age youngest child 2-4	0.073***	0.047**	0.093***	0.107**	4.448***	3.783**	65.619***	11.696
Older mother * Age youngest child 5-9	0.103***		0.135***		5.398***		86.399***	
Schooling (completed Year 9 or less)								
Completed at least Year 10	0.114***	0.079***	0.122***	0.106***	1.675***	-0.636	48.427***	26.231**
Completed Year 12[d]	0.055***	0.057***	0.092***	0.097***	1.099***	0.502	55.463***	27.244***
Post-school qualifications (none)								
Any post-school qualification[e]	0.058***	0.068***	0.074***	0.099***	0.730***	0.365	38.230***	44.596***
University level or above	0.039***	0.019	0.052***	0.009	1.539***	0.281	189.830***	53.975***
State of residence (NSW)								
Vic	-0.019***	0.014	-0.020***	-0.044**	-0.434***	-0.894**	-45.159***	-15.340***
QLD	-0.001	0.001	0.002	-0.036*	-0.045	-0.021	-25.549***	-29.107***
SA	-0.017**		-0.012		-1.202***		-48.474***	
WA	-0.020***	-0.001[a]	-0.002	-0.023[a]	-0.271	-1.420***[a]	-30.674***	-27.695***[a]

Appendix Table 7: Labour market outcomes for women aged 20 or over

	Probit marginal effects				Interval regression coefficients			
	Labour force participation		Employment		Hours worked (if working)		Personal income	
	2006	1991	2006	1991	2006	1991	2006	1991
NT	0.037***		0.070***		1.668***		77.744***	
Tas	-0.006		0.003		-0.723*		-33.919***	
ACT	0.056***	0.024[b]	0.076***	0.034[b]	1.264***	1.045[b]	123.703***	2.085[b]
Living outside major capital cities	-0.015***	-0.017	-0.026***	-0.048***	-1.524***	-0.369	-61.301***	-20.704***
Language spoken at home								
European languages	-0.014	0.017	-0.010	-0.013	0.022	0.504	-33.002***	-23.335***
Asian and other languages	-0.046***	-0.024	-0.066***	-0.088*	-0.310	-0.219	-71.486***	-35.566**
Country of birth (Australia)								
Other English-speaking countries	-0.040***	-0.044*	-0.048***	-0.033	0.367	0.411	-18.659***	-9.464
Non-English speaking countries	-0.075***	-0.049	-0.106***	-0.108***	-0.952***	-0.147	-91.677***	-23.191**
Father born overseas	0.010*	0.014	0.004	-0.016	0.164	-0.876*	2.066	-11.515*
Mother born overseas	-0.010*	-0.019	-0.013*	-0.01	-0.432**	0.229	-7.120*	7.2
Indigenous Australian	-0.069***	-0.166***	-0.113***	-0.269***	-2.474***	-1.358	-29.347***	-54.772***
Religion (Roman Catholic)								
Anglican	-0.003	-0.001	-0.004	-0.008	-0.059	-0.598	-2.473	-3.475
Other Christian beliefs	-0.025***	-0.044***	-0.028***	-0.042**	-0.807***	-0.823**	-27.063***	-12.662**
Buddhism	-0.018		-0.034**		-1.523***		-40.447***	
Islam	-0.123***		-0.147***		-0.478		-49.898***	
Other non-Christian beliefs	-0.049***	-0.039[c]	-0.072***	-0.187***[c]	-0.659***	1.364[c]	-43.822***	-33.030**[c]
No religion	-0.014***	-0.026	-0.024***	-0.061***	-0.586***	0.101	-19.432***	-14.026**
Relationship (no partner/spouse)								
Married	-0.055***	-0.141***	-0.082***	-0.210***	0.687	-0.144	-27.542***	-31.089***
In a de facto relationship	0.025***	-0.089***	0.056***	-0.173***	1.141***	0.704	40.601***	-12.619
Partner in employment	0.061***	0.102***	0.107***	0.272***	-1.070**	-0.163	6.950	43.859***
Constant					23.293***	33.726***	-203.985***	-269.222***
Observations	40,664	5002	40,664	5,002	29,390	3,246	39,957	4,721
Pseudo R-squared	0.349	0.266	0.293	0.2				

Source: Estimated from Census 1991 (1% CURF) and Census 2006 (5% CURF)

Notes: *significant at 10%, **significant at 5%, ***significant at 1%; reference group listed in parentheses for categorical variables. (a) Coefficient for South Australia, Western Australia and Northern Territory combined. (b) Coefficient for Tasmania and ACT combined. (c) Coefficient for all non-Christian beliefs combined. (d) Excludes non-school Year 12 equivalent qualifications; (e) Includes all certificate-, diploma- and degree-level qualifications.

Appendix Table 8: Educational outcome (ordered probit – marginal effect on highest education level within type of education: Year 12 and university-level qualification)

	Completed Year 12[d] (for those aged 19 or over)		Has a university degree (for those aged 21 or over)	
	2006	1991	2006	1991
Age	0.007***	0.009***	0.035***	0.023***
Teenage mother	-0.367***	-0.402***	-0.123***	-0.096***
Teenage mother * Number of children	-0.050***	-0.059*	-0.106***	0.043
Teenage mother * Age youngest child 2-4	-0.018	-0.109**	-0.029	0.082
Teenage mother * Age youngest child 5-9	-0.036**	-0.15	-0.048**	0.227
Teenage mother * Has a partner	0.040***	0.088*	-0.004	-0.043
Teenage mother * Outside major capital city	0.029***	0.071	0.029	0.006
Teenage mother * English speaking	0.066***	0.037	0.073*	
Teenage mother * Indigenous	-0.154***	0.211***	-0.074**	
Teenage mother * Immigrant	-0.037	0.061	-0.026	-0.073***
Teenage mother * Both parents immigrants	0.017	0.005	-0.025	0.131
Teenage mother * Aged 19	0.079***	0.112**	0.010	0.051
Older mother	-0.096***	-0.092	-0.037***	-0.019
Older mother * Number of children	-0.050***	-0.044	-0.111***	-0.061**
Older mother * Age youngest child 2-4	-0.059***	-0.081	-0.089***	-0.034*
Older mother * Age youngest child 5-9	-0.150***		-0.127***	
State of residence (NSW)				
Vic	0.037***	0.082***	0.001	-0.025***
QLD	0.047***	-0.056***	-0.012**	-0.020**
SA	-0.015**		-0.050***	
WA	-0.016***	-0.053***[a]	-0.028***	-0.025***
NT	-0.034**		-0.014	
Tas	0.002		-0.017	
ACT	0.108***	0.037[b]	0.104***	0.040**
Living outside major capital cities	-0.071***	-0.051***	-0.058***	-0.025***
Language spoken at home				
European languages	0.037***	0.04	-0.033***	-0.007
Asian and other languages	0.035***	0.081**	0.022***	-0.02
Country of birth (Australia)				
Other English-speaking countries	0.011	-0.032	0.020**	-0.009
Non-English speaking countries	0.039***	0.054*	0.080***	-0.025**
Father born overseas	0.020***	-0.026	0.007	-0.012
Mother born overseas	0.006	0.038**	0.004	0.003
Indigenous Australian	-0.211***	-0.158***	-0.125***	-0.065***
Religion (Roman Catholic)				
Anglican	-0.028***	-0.036**	-0.018***	0.003
Other Christian beliefs	-0.003	-0.012	0.014**	0.019**
Buddhism	-0.082***		-0.039***	
Islam	-0.138***		-0.098***	
Other non-Christian beliefs	-0.014**	-0.056[c]	0.003	0.027
No religion	-0.030***	-0.053***	-0.012**	0.004

Appendix Table 8: Educational outcome (ordered probit – marginal effect on highest education level within type of education: Year 12 and university-level qualification)

	Completed Year 12[d] (for those aged 19 or over)		Has a university degree (for those aged 21 or over)	
	2006	1991	2006	1991
Relationship (no partner/spouse)				
Married	0.026***	-0.111***	0.058***	-0.030***
In a de facto relationship	-0.019***	-0.102***	0.015***	-0.034***
Observations	57,136	6,707	47,708	4,509
Pseudo R-squared	0.0954	0.0512	0.0635	0.0441

Source: Estimated from Census 1991 (1% CURF) and Census 2006 (5% CURF)
Notes: *significant at 10%, **significant at 5%, ***significant at 1%; reference group listed in parentheses for categorical variables. (a) Coefficient for South Australia, Western Australia and Northern Territory combined. (b) Coefficient for Tasmania and ACT combined. (c) Coefficient for all non-Christian beliefs combined. (d) Excludes non-school Year 12 equivalent qualifications.

Appendix Table 9: Effects of teenage motherhood and other factors on educational and labour market outcomes in the first seven years after birth

	Year 12[a]	Post-school qualification	Employed	Personal income
	(1)	(2)	(3)	(4)
Mean outcome of estimation sample	0.696	0.597	0.646	412.80
# teenage mothers	430	430	427	427
a) Simple specification				
Wave 2	0.015***	0.027***	0.040***	68.268***
Wave 3	0.023***	0.046***	0.085***	133.824***
Teenage mother	-0.567***	-0.238***	-0.592***	-317.934***
Older mother	-0.150***	0.023	-0.373***	-247.633***
Observations	10623	10617	10358	10345
(Pseudo) R-squared	0.053	0.009	0.145	0.120
b) Baseline specification				
Wave 2	0.018***	0.027***	-0.022**	30.026***
Wave 3	0.026***	0.045***	-0.001	69.903***
Motherhood status (ref: Childless women)				
Teenage mother	-0.532***	-0.100**	-0.396***	-42.780**
Older mother	-0.152***	0.039**	-0.387***	-203.044***
Religion (ref: No religion)				
Catholic	0.077***	0.036	0.037**	11.200
Other Christian	0.010	0.053**	0.002	-29.647***
Other religion	0.003	0.040	-0.084***	-41.081**
Religion not known	-0.054**	-0.053**	-0.010	-28.100**
Indigenous Australian	-0.171***	-0.055	-0.121***	21.418
Migrant status (ref: Australian born)				
Migrant from an ESB country	0.015	0.015	-0.025	77.151***
Migrant from an NESB country	0.096***	-0.126***	-0.109***	19.818
Residence (ref: Metropolitan)				
Regional residence	-0.083***	-0.040**	0.017	-32.964***
Remote residence	-0.097**	0.013	0.066***	35.457*
Par. migrant status (ref: No migrant parent)				
One parent is migrant	-0.012	0.008	-0.013	-13.354
Both parents are migrants	-0.027	0.093***	-0.006	-3.323
Mixed family			-0.021	-42.538***
Number of children			-0.055***	26.717***
Age of youngest child (ref: 0 years)				
1 year			0.079***	
2 years			0.121***	
3+ years			0.177***	
Partner's employment (ref: No partner)				
Partner employed			0.089***	-57.866***
Partner not employed			-0.085***	42.556**
Age			0.010***	146.800***
Age squared				-2.495***

Appendix Table 9: Effects of teenage motherhood and other factors on educational and labour market outcomes in the first seven years after birth

	Year 12[a]	Post-school qualification	Employed	Personal income
	(1)	(2)	(3)	(4)
School completion (ref: Year 9 or less)				
Year 10-11 only		0.125***	0.129***	-20.920
Year 12[a]		0.299***	0.230***	-28.096
Post-school qual. (ref: No qual.)				
Non-degree qualification[b]			0.092***	36.321***
University degree			0.125***	149.023***
Employed				353.901***
Observations	10623	10617	10358	10345
(Pseudo) R-squared	0.073	0.043	0.241	0.353

Source: Estimated from LSAC (waves 1-3) and HILDA (wave 4, 6, 8)

Notes: *significant at 10%, **significant at 5%, ***significant at 1%. Each individual may be observed for up to 3 times (one for each wave). Standard errors are adjusted to allow for the possible dependence of multiple observations of the same individual (i.e. the 'clustering' effect). Wave 2 (3) is year 5 (7) after birth for women with children. (a) Excludes non-school Year 12 equivalent qualifications; (b) Includes all certificate-, diploma- and degree-level qualifications.

Appendix Table 10: Effects of teenage motherhood and other factors on health and partnership outcomes in the first seven years after birth

	Having good health	Being a smoker	Partnered	Partner employed	Family income
	(1)	(2)	(3)	(4)	(5)
Mean outcome of estimation sample	0.906	0.262	0.820	0.932	1014.76
# teenage mothers	523	515	430	245	427
a) Simple specification					
Wave 2	0.014**	-0.037***	-0.017**	-0.001	190.998***
Wave 3	0.008	-0.031***	-0.010	0.011	338.570***
Teenage mother	-0.065***	0.331***	-0.257***	-0.129***	-351.448***
Older mother	0.007	0.021			164.651***
Observations	11783	11246	6500	5244	10357
(Pseudo) R-squared	0.004	0.020	0.025	0.018	0.050
b) Baseline specification					
Wave 2	0.014**	-0.049***	-0.048***	-0.012	137.322***
Wave 3	0.008	-0.038***	-0.063***	-0.005	213.240***
Motherhood status					
Teenage mother	-0.003	0.144***	0.003	-0.002	-71.329**
Older mother	0.031**	-0.013			-172.526***
Religion (ref: No religion)					
Catholic	0.014	-0.031*	0.040**	-0.001	39.667*
Other Christian	0.006	-0.109***	0.053***	-0.004	-4.859
Other religion	-0.033*	-0.120***	0.100***	-0.049**	-115.470***
Religion not known	0.004	0.037**	-0.011	-0.038	-15.703
Indigenous Australian	-0.043*	0.120***	-0.140***	-0.126***	25.155
Migrant status (ref: Australian born)					
Migrant from an ESB country	0.005	0.051	-0.020	-0.019	204.415***
Migrant from an NESB country	0.027	-0.152***	-0.000	-0.043*	-42.467
Residence (ref: Metropolitan)					
Regional residence	0.003	-0.013	0.050***	-0.005	-58.483***
Remote residence	0.029*	-0.005	0.065**	-0.004	110.074**
Par. migrant status (ref: No migrant parent)					
One parent is migrant	-0.014	0.013	-0.033*	0.011	-6.554
Both parents are migrants	-0.019	-0.010	0.012	0.008	-23.938
Mixed family	-0.010	0.031**			-60.792***
Number of children	-0.005	-0.005			39.107***
Age of youngest child (ref: 0 years)					
1 year	0.010	-0.001			
2 years	-0.007	0.030**			
3+ years	-0.031**	0.081***			
Partner's employment (ref: No partner)					
Partner employed					819.171***
Partner not employed					145.110***
Age	-0.003***	0.009***	0.015***	0.004**	50.709*
Age squared					-0.400

Appendix Table 10: Effects of teenage motherhood and other factors on health and partnership outcomes in the first seven years after birth

	Having good health	Being a smoker	Partnered	Partner employed	Family income
	(1)	(2)	(3)	(4)	(5)
School completion (ref: Year 9 or less)					
Year 10-11 only	0.057***	-0.100***	0.126***	0.148***	21.119
Year 12[a]	0.093***	-0.236***	0.195***	0.189***	57.493**
Post-school qual. (ref: No qual.)					
Non-degree qualification[b]	0.012	-0.042***	0.005	0.015	51.698***
University degree	0.054***	-0.163***	0.091***	0.032***	281.818***
Employed					312.780***
Observations	11783	11246	6500	5244	10357
(Pseudo) R-squared	0.032	0.110	0.107	0.115	0.443

Source: Estimated from LSAC (waves 1-3) and HILDA (wave 4, 6, 8)

Notes: *significant at 10%, **significant at 5%, ***significant at 1%. Each individual may be observed for up to 3 times (one for each wave). Standard errors are adjusted to allow for the possible dependence of multiple observations of the same individual (i.e. the 'clustering' effect). Wave 2 (3) is year 5 (7) after birth for women with children. (a) Excludes non-school Year 12 equivalent qualifications; (b) Includes all certificate-, diploma- and degree-level qualifications.

Appendix Table 11: Comparison of treatment and control groups before and after matching

		Mean of treatment group	Mean of control group	Bias between both groups	% of reduction in bias after match	Indication of statistical difference between 2 groups
At least Year 10	Unmatched	0.831	0.948	-37.8		***
	Matched	0.831	0.829	0.8	97.9	
Catholic	Unmatched	0.156	0.254	-24.5		*
	Matched	0.156	0.135	5.3	78.5	
Other Christian	Unmatched	0.208	0.372	-36.8		***
	Matched	0.208	0.201	1.6	95.7	
Other religion	Unmatched	0.130	0.073	18.8		*
	Matched	0.130	0.124	2.0	89.3	
Religion not known	Unmatched	0.156	0.052	34.5		***
	Matched	0.156	0.172	-5.2	84.8	
Indigenous Australian	Unmatched	0.117	0.037	30.2		***
	Matched	0.117	0.083	12.9	57.3	
Migrant from an ESB country	Unmatched	0.039	0.038	0.6		
	Matched	0.039	0.013	13.3	-2066.3	
Migrant from an NESB country	Unmatched	0.078	0.086	-2.8		
	Matched	0.078	0.073	1.7	39.9	
One parent is migrant	Unmatched	0.091	0.168	-23		*
	Matched	0.091	0.088	0.8	96.6	
Both parents are migrants	Unmatched	0.195	0.209	-3.5		
	Matched	0.195	0.202	-1.8	47.6	
Regional residence	Unmatched	0.584	0.438	29.5		**
	Matched	0.584	0.568	3.3	88.9	
Remote residence	Unmatched	0.026	0.044	-9.9		
	Matched	0.026	0.007	10.3	-3.9	

Source: Estimated from LSAC (waves 1-3) and HILDA (wave 4, 6, 8)

Note: *, ** and *** denote sample means that are significantly different between the treatment and control groups at the 10%, 5% and 1% level respectively.

Appendix Table 12: Effects of teenage motherhood on outcome in the first seven years after birth, based on propensity score matching method

	Years 0-3	Years 4-5	Years 6-7
	(1)	(2)	(3)
Completed Year 12[a]			
Estimate	-0.239***	-0.300***	-0.326***
No. of untreated obs	2462	2193	2109
No. of matched untreated obs	2146	1896	1888
No. of treated obs	77	70	47
Post-school qualification[b]			
Estimate	-0.144**	-0.174***	-0.094
No. of untreated obs	2459	2191	2108
No. of matched untreated obs	2145	1892	1888
No. of treated obs	77	70	47
Employed			
Estimate	-0.269***	-0.239***	-0.184**
No. of untreated obs	2461	2187	2100
No. of matched untreated obs	2145	1889	1879
No. of treated obs	77	70	47
Personal income			
Estimate	-46**	-134***	-125***
No. of untreated obs	2449	2180	2097
No. of matched untreated obs	2141	1900	1877
No. of treated obs	77	70	47
Having good or better health			
Estimate	-0.073**	-0.076**	-0.06
No. of untreated obs	2736	2299	2368
No. of matched untreated obs	2656	2203	2262
No. of treated obs	216	153	95
Being a smoker			
Estimate	0.279***	0.141***	0.217***
No. of untreated obs	2248	2142	2351
No. of matched untreated obs	2137	2026	2295
No. of treated obs	183	124	93
Partnered			
Estimate	-0.136**	-0.121**	-0.056
No. of untreated obs	2065	1802	1663
No. of matched untreated obs	1851	1477	1401
No. of treated obs	75	70	47
Partner employed			
Estimate	-0.058	0.035	0.064
No. of untreated obs	1626	1337	1247
No. of matched untreated obs	1233	1224	1153
No. of treated obs	46	39	26

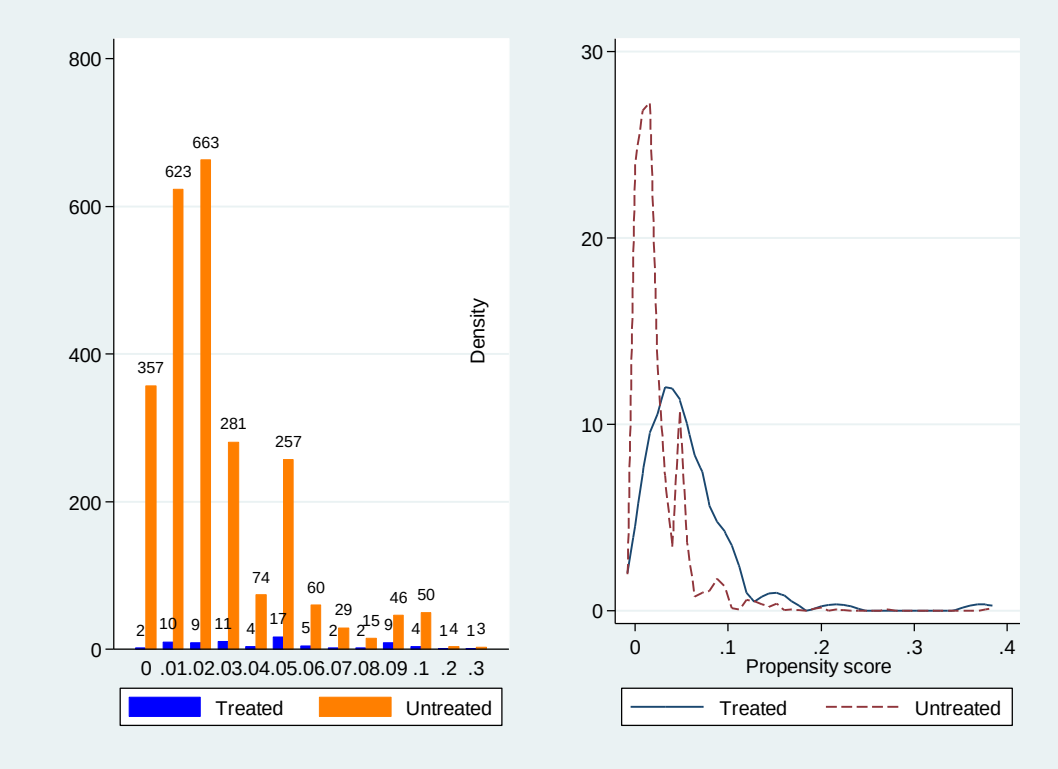
Appendix Table 12: Effects of teenage motherhood on outcome in the first seven years after birth, based on propensity score matching method

	Years 0-3	Years 4-5	Years 6-7
	(1)	(2)	(3)
Family income			
Estimate	-214***	-306***	-262***
No. of untreated obs	2461	2192	2107
No. of matched untreated obs	2145	1897	1886
No. of treated obs	77	70	47

Source: Estimated from LSAC (waves 1-3) and HILDA (wave 4, 6, 8)

Notes: Estimates are based on the kernel matching method with a bandwidth of 0.001. *significant at 10%, **significant at 5%, ***significant at 1%. Sample restrictions described in Section 6.1 apply. (a) Excludes non-school Year 12 equivalent qualifications; (b) Includes all certificate-, diploma- and degree-level qualifications.

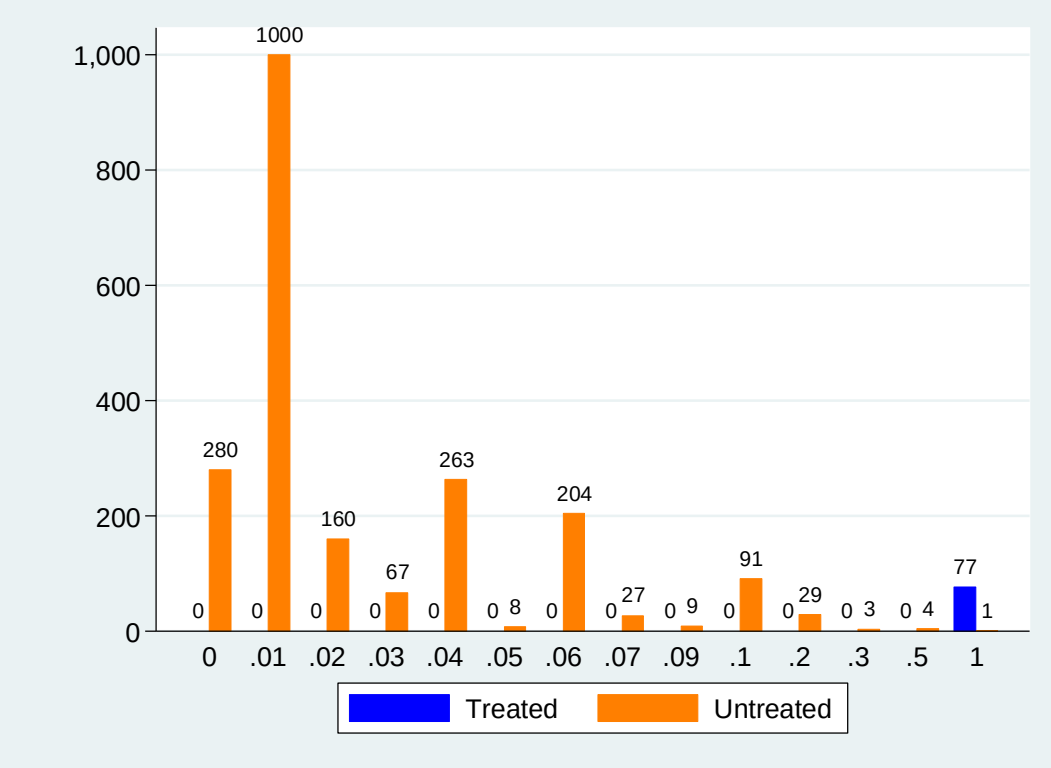
Appendix Figure 1: Distribution of propensity score



Source: Estimated from LSAC (wave 1) and HILDA (wave 4)

Notes: Treated: teenage mothers; Untreated: older mothers and childless women

Appendix Figure 2: Distribution of kernel matching weight



Source: Estimated from LSAC (wave 1) and HILDA (wave 4)
Notes: Treated: teenage mothers; Untreated: older mothers and childless women; bandwidth = 0.001