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Early childbearing, human capital attainment and mortality risk

by
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Early childbearing, human capital attainment and mortality risk

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Abstract

This paper uses a rich longitudinal dataset to examine the relationship between teen fertility and both subsequent educational outcomes and mortality risk in rural South Africa. Human capital deficits among teen mothers are large and significant, with earlier births associated with greater deficits. In contrast to many other studies, we find no clear evidence of selectivity into teen childbearing in either schooling trajectories or pre-fertility household characteristics. Enrolment rates among teen mothers only begin to drop in the period immediately preceding the birth and future teen mothers are not behind in their schooling relative to other girls. Older teen mothers and those further ahead in school for their age pre-birth are more likely to continue schooling after the birth. Following women over a six year period we document a higher mortality risk before the age of 30 for teen mothers that cannot be explained by household characteristics in early adulthood.

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1. Introduction

Teenage childbearing is seen as a serious social problem and remains a source of concern in most of the world and particularly in developing countries where it is most common. In South Africa, despite considerable decline in total fertility rates since the 1970s, the percentage of women giving birth in their teens remains high and stable. The United Nations Population Division estimates that the adolescent birth rate in South Africa was 54 per 1000 women aged 15 to 19 in 2007[4]. This rate is much higher among African and Coloured teens and in rural areas (Garenne et al. 2000, Camlin et al. 2004, Marteleto et al. 2006, Moultrie et al. 2008, Moultrie and McGrath 2007)

One obvious policy question coming out of South African fertility patterns is whether high levels of teen fertility have a negative impact on women's human capital, which in turn could have a negative impact on their employment, their earnings, and the well-being of their children. Not only may early childbearing disrupt schooling and ultimate educational attainment, but there are morbidity and mortality risks associated with unprotected sex in a high HIV prevalence environment.

The consequences of teen fertility are difficult to evaluate, as the large and highly contentious literature on teen fertility in the United States has demonstrated (see Ribar 1999, Hotz et al. 2005 and Ashcraft and Lang 2006 for reviews of this literature). Although early motherhood is correlated with adverse health and social outcomes, establishing causality between teen fertility and adult socioeconomic wellbeing is far from straight forward. While there are reasons to believe that early childbearing can curtail human capital investments, it is also possible that young mothers are a select group that would have attained low levels of human capital even if their first birth had been postponed until adulthood. Researchers have applied a range of techniques in the attempt to identify the causal effect of teen childbearing. The approaches include controlling for as many observable characteristics as available (McElroy 1996, for example), sisters and twins fixed effects (Geronimous and Koreman 1993, Webbnik et al. 2009), quasi-experimental methods (Holtz et al. 1998 and 2005, Bronars and Grogger 1994, Ashcraft and Lang 2006, Fletcher and Wolfe 2008) instrumental variables procedures (Ribar 1994, Keplinger et al. 1999) and propensity score matching methods (Levine and Painter 2003). While most studies find a negative relationship between teenage childbearing and educational attainment and labor market outcomes, there is no agreement over the magnitude of the effects and some analysis find no harmful or even positive effects (Holtz et al. 2005).

Empirical evidence on the socioeconomic consequences of teen childbearing in developing countries is more scarce and South Africa is no exception. Madhavan and Thomas (2005)

[4] United Nations, Department of Economic and Social Affairs, Population Division (2010). *2010 Update for the MDG Database: Adolescent Birth Rate* (POP/DB/Fert/A/MDG2010).

find a negative relationship between early childbearing and schooling using South Africa census data, but point out that it is difficult to give the results a causal interpretation. Similarly, Grant and Hallman (2008) find a strong association between grade repetition and out of school periods with later pregnancy and pregnancy related school dropouts but causality cannot be established. Marteleto et al. (2008) use data from the Cape Area Panel Study to investigate how early life characteristics affect young-age childbearing and the factors facilitating school enrolment after childbearing. They found that young mothers who were weaker students prior to giving birth were less likely to enrol in school subsequent to giving birth. However, a significant proportion of young mothers managed to continue with their studies. This is particularly the case among African girls but it less common among coloureds and whites. Using a propensity score weighted regression approach, Ranchhod et al. (2009) find that while accounting for pre-fertility characteristics substantially reduces the negative association between teen childbearing and poor educational outcomes, estimates of the effect of a teen birth remain large and significant. To our knowledge, there are no international or South African studies documenting the extent to which early childbearing is associated with higher mortality risk in environments with high HIV prevalence.

Despite the lack of empirical evidence, there is considerable public debate and media interest in the consequences of teen pregnancy in South Africa. Much of this debate is fuelled by the perceived perverse incentives created by the child support grant[5] (Moultrie and McGrath 2007). During the 2008 election campaign, president Jacob Zuma proposed that teenage mothers be separated from their babies and "taken to colleges and forced to get an education so that they can be in a position to look after themselves" (The Times 2008). More recently the Western Cape government proposed a plan to reward schoolgirls who don't get pregnant to counteract the perceived lure of income from the child support grant (Cape Times 2010).

The goal of this analysis is to add to the small body of empirical evidence and advance our understanding of the human capital consequences of early childbearing in South Africa. We examine the relationship between teen fertility and both subsequent educational outcomes and mortality risk. We use a rich longitudinal dataset from the Africa Centre Demographic Information System (ACDIS) that allows us to control for multiple characteristics of the mothers and their households at early age before childbearing. While we may not be able to definitively establish causality, ACDIS offers much better data than has previously been available to study the links between fertility and schooling and mortality in South Africa.

We document large and significant human capital deficits among teen mothers. Women who have their first birth before the age of 20 have both worse educational outcomes and higher mortality risk than other women. Relative to their peers, teen mothers have completed around 0.8 less years of school, are 29 percentage points more likely to drop-out

[5] The child support grant is a means tested transfer to primary caregivers of children under 15. The amount was R240 per month during 2009.

of high school and 22 percentage points less likely to matriculate. Earlier births are associated with greater educational deficits. For example, women who had their first child before the age of 17 are on average 1.26 years behind their peers in contrast to older teen mothers who are about 0.6 years behind other girls. We take advantage of longitudinal data in ACDIS to assess the extent to which pre-fertility characteristics can explain the negative association between early childbearing and education. In contrast to many other studies, we find no clear evidence of selectivity into teen childbearing in either schooling trajectories or pre-fertility household characteristics. Enrolment rates among teen mothers only begin to drop in the period immediately preceding the birth and future teen mothers are not behind in their schooling relative to other girls at age 12 or 13. Pre-fertility household characteristics also do not appear to be predictive of future teen childbearing. The longitudinal data not only allows us to investigate the timing of falling behind but also to examine the factors associating with continuing school after the birth. Younger teen mothers are the most likely to drop-out of high school. Girls who were further ahead in school for their age prior to the birth are more likely to continue their education. We follow women over an eight year period and document higher mortality risk before the age of 30 for teen mothers. This differential in mortality rates cannot be explained by household characteristics in early adulthood.

The paper is organized as follows. Section 2 describes the data from ACDIS and presents rates of teen childbearing. Section 3 documents the association between early childbearing and poor educational outcomes and then turns to examine the impact of teen childbearing on human capital attainment. Section 4 examines the relationship between teen childbearing and mortality.

2. Data and rates of teen childbearing

The data for this analysis comes from ACDIS which follows approximately 86,000 individuals in 11,000 households in a demographic surveillance area (DSA) in the south of Umkhanyakude District in KwaZulu-Natal. The size of the area is around 438 km^2, it is mostly rural but includes a township and peri-urban sections. The information system was started in 2000 and it covers all individuals that are members of a household located in the site, even if they live outside the surveillance area. Baseline data on individuals includes age, sex, relationship to the head of the household, and retrospective birth histories in the case of women. Since January 1, 2000, each household in this site has been visited twice a year to update information on fertility, deaths, changes in marital status, moves within the area, and migration in and out of it. Additionally, detailed household and individual socio-economic data has been collected in seven different waves of Household Socio-Economic Survey (HSE), between 2001 and 2010. These data include information on household infrastructure and asset ownership and, among others, on school enrollment, educational attainment and employment status of household members.

Pregnancy information is collected in a number of ways in ACDIS. Upon first registration, a full retrospective birth history is gathered for every woman aged 15 to 49. At subsequent biannual household visits any new pregnancy triggers an interview with the woman about the details of the pregnancy. An additional source of pregnancy information is the annual women's health survey that includes a question asking whether the woman has ever been pregnant. All three sources of pregnancy information require that the woman herself be interviewed whereas core demographic data and HSE data is collected from a knowledgeable household informant. As such there are a number of cases where HSE data is available but we are unable to determine whether the woman has given birth or whether she gave birth before her twentieth birthday. We use all retrospective and prospective data to construct an indicator of teenage childbearing and explicitly control for missing data.

Rates of teen childbearing in the DSA are high relative to the rest of South Africa[6] with around 46% of resident women aged 20 to 50 having their first birth before the age of 20. The prevalence of teenage childbearing appears fairly consistent across age cohorts. Figure 1 presents the distribution of the mother's age at the birth of her first child for resident women aged 35 to 40 years of age at the time HSE data collection[7]. Almost half (49%) of these women had their first birth before they were 20 years of age. The majority (66%) of teenage births are in the late teens (17 to 19 years of age). There are a handful of births at very young ages, possibly due to data errors. By the age of 21, two thirds (67%) of women had given birth.

Similar to elsewhere in South Africa, birth intervals in the DSA are long (Moultrie and Timaeus 2002). In contrast to findings from the Agincourt demographic surveillance site (Garenne et al. 2000), we do not find substantial differences in the interval between first and second births between teen and older mothers. Early childbearing is associated with higher parity. Among resident women aged 35 to 40, teen mothers had on average 1.3 children more than non-teen mothers.

3. Educational outcomes and teen childbearing

Figure 2 summarizes the association between early childbearing and educational disadvantage over time. The left panel shows the mean years of completed education by age separately for women who had their first birth before age 17, between the ages of 17 and 19, between the ages of 20 and 22 and after the age of 22. At every age women who had the first birth earlier have completed significantly fewer years of education than older mothers. The gap in educational attainment between younger mothers and older mothers

[6] Using a series of national datasets, Branson (2010) estimates that around a quarter of South African women aged 15 to 49 had their first birth before the age of 20.

[7] The vast majority (97%) of resident women in the DSA have given birth at least once by the age of 35. For women who were observed multiple times between the ages of 35 and 40, we use only one observation.

widens until their late twenties. While it is possible that the educational disadvantage of teenage mothers is narrowing for younger cohorts, this widening gap is more likely to be due to the fact that many African women stay in high school well into their twenties. The gap between the youngest and oldest mothers is fairly consistently around 2.7 years between the ages of 30 and 50. The right panel of Figure 2 shows the proportion of women who have graduated from high school by age separately by age at first birth. On average teen mothers are 14 percentage points less likely to have matriculated than older mothers.

Figure 2 provides clear evidence of the ongoing negative association between teenage childbearing and education. This does not however establish whether teenage childbearing has a causal effect on women's human capital accumulation. Teen mothers may have had lower educational attainment even if they had not given birth in their teens. Early socioeconomic conditions, family characteristics and other variables may affect simultaneously the probability of being a teen mother and investments in education. It is possible that teen mothers are different from older mothers for reasons other than early childbearing. Longitudinal data – where we observe the teen mother before and after the birth – allow us to move some distance in evaluating alternative explanations for the human capital deficits apparent in Figure 2. While we may not be able to definitively establish causality, we can use the rich longitudinal data of ACDIS to control for pre-pregnancy characteristics, examine the timing of when girls fall behind and to investigate the determinants of returning to school after the birth. We can also employ sibling fixed effect models to compare outcomes of sisters who did and did not give birth in their teens. In the developing world longitudinal studies of the size and length of ACDIS are extremely rare. Indeed ACDIS offers much better data than has previously been available to look at the links between fertility and schooling and subsequent socioeconomic status in South Africa.

In order to control for pre-birth characteristics we restrict our sample to resident girls aged 12 and 13 years at the fist HSE wave (HSE1). We further restrict our sample to the 91% of these girls who were observed again (have HSE data) when they were between 14 and 20 years of age[8]. In cases where girls were observed multiple times we take the most recent observation[9]. We excluded from the sample the two girls who had already given birth at age 12. The sample is comprised of 1587 girls. Figure 3 shows the age distribution at the second observation, where just over two-thirds of the sample are aged 19 or 20.

At the second observation 543 girls (34%) are classified as teen mothers. Of those, 144 (27%) had their first child before the age of 17 (hereafter referred to as "early teen mothers"). We were unable to assign teen mother status to 163 (10%) girls. The first three columns in Table 1 present characteristics at HSE 1 and the most recent visit separately for

[8] See Appendix Table A1 for a comparison of the characteristics of those lost to follow up and those in our sample. Girls who are lost to follow up are from substantially and significantly smaller households and less likely to co-reside with either parent. Their household socioeconomic status indicators are not significantly different to girls in the sample. They have significantly less education and are significantly less likely to be enrolled although the magnitude of the differences is not substantial.

[9] The percentage of second observations taken from HSE 2 to 7 are 8%, 8%, 13%, 43%, 26% and 1% respectively.

teen mothers, non teen mothers and those we were unable to classify. At age 12 and 13 the future teen mothers have similar years of completed education, enrollment and household composition to girls who do not give birth in their teens, although they are significantly less likely to co-reside with their father. Teen mothers in the DSA do not appear to be selected from households with lower socioeconomic status. The girls that we were unable to classify do not differ greatly on observed characteristics. They have slightly but significantly fewer years of completed education than non teen mothers but this is explained by their slightly younger age. They have marginally higher household socioeconomic status and are less likely to co-reside with their mother. The final two columns of Table 1 show mean characteristics for early teen mothers and older teen mothers separately. At age 12 and 13, early teen mothers appear very similar to other teen mothers on observable characteristics.

Table 2 investigates the correlates of teen and early teen childbearing in a multivariate context. Coefficients from OLS regressions of the teen and early teen mother indicator on a range of characteristics at HSE1 and a full set of indicators for age at the second observation, year of the second observation and isigodi (traditional administrative unit) are presented. The lack of association between household socioeconomic status and the probability of teen childbearing is not surprising given the similarities between teen mothers and other girls in Table 1. Years of completed education at age 12 and 13 is not predictive of future teen childbearing. The probability of becoming a teen mother is however, negatively associated with enrollment at HSE1, although the coefficient is only significant at the 10% level. Co-residence with a father at age 12 or 13 is negatively associated with future teen childbearing. Although socioeconomic conditions at age 12 and 13 do not appear to be correlated with the probability of becoming a teen mother, we will control for those characteristics when we turn to analyze the effects of early childbearing on investments in education. We will do this using both explicit controls for pre-pregnancy characteristics and by employing a propensity score matching estimation technique.

Table 3 presents results from OLS regressions of years of education at the second observation on an indicator that the girl is a teen mother and an indicator that the girl is an early teen mother. In order to avoid possible selection issues, all girls are included and an indicator that the teen mother variable is missing is added to the regressions. The first column includes only a full set of indicators for the age at the year of the second observation. Teen mothers are on average 0.62 years behind other girls of the same age. Early teen mothers have more than twice the educational disadvantage of girls who give birth in their late teens. Having a child before the age of 17 is associated with being 1.26 years behind other girls of the same age. In the second column controls for household socio-economic status at age 12 and 13 are added. Introducing socioeconomic controls has little effect on the teen and early teen mother coefficient. The coefficient on teen mother is slightly reduced but remains significant and substantial. The controls for socio-economic status are significantly related to years of completed education but do not explain much of

the teen mother educational disadvantage. Adding years of completed education at HSE 1 does not have a significant impact on the coefficient.

If teen childbearing is simply a signal that a woman was a poor student or living in a worse environment for education, we would expect future births would predict the woman lagging behind in school prior to the pregnancy, when they were 12 or 13 years of age. In the final two columns of Table 3 we see that girls who are going to be a teen mother do not have significantly less education at age 12 or 13. Although the point estimate for early teen mothers is negative it is not significant.

Table 4 presents analogous results for the probability of dropping out of school. The outcome variable is an indicator that the woman had not completed high school and was not enrolled in school at the second observation. Similar to the results for attainment, we find that teen mothers are significantly more likely to drop out of high school and that this is not explained by the household characteristics prior to the birth when they were 12 or 13 years of age. Also in line with the results for attainment, we find that early teen mothers are significantly more likely to drop out than women who have a child in their late teen years. Controlling for age, early and late teen mothers are respectively around 0.39 and 0.27 percentage points more likely to drop out of high school than girls who do not give birth in their teens. The final two columns of Table 4 present results from regressions of enrollment at age 12 or 13 on the teen mother indicators. We find some evidence that women who are going to become early teen mothers are less likely to be enrolled at age 12 or 13 although the coefficient is small and only significant at the 10% level.

The 10% of our sample from whom we cannot assign teen mother status have completed significantly fewer grades and are more likely to drop out than other girls their age who we know have not given birth in their teens. As a robustness check, we assume that all women with missing teen mother status are not teen mothers and re-run the regressions in Tables 3 and 4. Doing this has very little effect on the coefficients for the teen and early teen mother indicators.

Numerous South African studies have documented the high returns to completing high school with respect to both the probability of employment and on earnings once employed (Branson et al. 2009). A combination of delayed initial enrolment and high rates of grade repetition result in many Africans completing school only in their twenties (Lam et al. 2010). In extending our analysis of educational attainment in Table 3 to high school completion, we therefore need to shift our focus to outcomes at age 20 or 21. In order to control for pre-fertility characteristics we restrict the sample to resident girls aged 13 at HSE 1 who were observed again at age 20 or 21. The sample consists of 620 women. The majority (80%) of the sample are 21 years of age at the second observation. Over eighty (84%) of second observations are from HSE 6 with the remainder from HSE 5. At the second observation, 38% of sample had given birth before the age of twenty. We were unable to assign teen mother status to 20% of the sample.

Attrition poses a somewhat greater problem than for the sample analyzed in Tables 3 and 4. Just less than three quarters (72%) of the resident 13 year olds at HSE 1 are seen again at age 20 or 21. There are no significant differences between those girls included in the sample and those who are lost to follow up in terms of enrollment at age 13, household assets and household access to a toilet. Girls lost to follow up are significantly less likely to co-reside with parents, more likely to come from smaller households and have also completed significantly fewer years of schooling at age 13 than girls who remain in the sample. Our concerns about attrition are somewhat allayed by a comparison of the 20 and 21 year olds at HSE 5 or HSE 6 who do and do not have baseline data from when they were 13 years old. We created an indicator for being in the sample and interacted this with indicators for teen childbearing. We regressed our high school completion indicator and a range of household characteristics on indicators for teen childbearing, being in the sample and the interaction between the two. The interaction term was insignificant in all regressions suggesting that the teen mother deficit was not different for girls with and without baseline data at age 13.

Table 5 presents coefficients from regressions of an indicator that the woman completed high school on the teen mother indicators. Compared to other 20 and 21 year olds, women who had their first child before the age of 20, are 19 percentage points less likely to complete high school. Early teen mothers are not significantly less likely than other teen mothers to complete high school although the point estimate is negative. The second column includes controls for household characteristics at age 13. As expected, there is a positive association between household socio-economic status and completion of high school. However, including controls for household characteristics only results in a slight reduction (in absolute terms) in the coefficient on the teen mother indicator. Similarly in column 3 we see a strong association between higher levels of schooling at age 13 and matriculation by age 20 or 21, but this does not explain any of the early childbearing deficit.

Tables 3 to 5 showed early childbearing to be associated with substantial educational deficits. These deficits were not apparent pre-fertility nor were they explained by pre-fertility educational outcomes or household socio-economic characteristics. We attempted to isolate the impact of teen childbearing on educational outcomes by controlling for observable pre-fertility characteristics and by documenting that future teen fertility was not a marker for poor pre-fertility educational outcomes. An increasingly popular approach to controlling for observable pre-treatment characteristics is the use of propensity score matching techniques. Table 6 presents results analogous to those in Tables 3 to 5 using a propensity score re-weighting approach. The propensity score matching results are very similar to both a naïve OLS regression and an OLS regression with pre-fertility household controls.

In addition to controlling for observed pre-fertility characteristics, the ACDIS dataset is large enough to allow us to control for omitted variables that may jointly determine teen childbearing and educational outcomes by comparing sisters who did and did not give birth

in their teens. Although there is the criticism that household characteristics could be different for different sisters at different ages the advantage is that we can control for any observed and unobserved and unobservable characteristics that are common to the sisters and time invariant. We also only need to observe each woman once which significantly increases our sample size. We restrict our sample to women seen at least once between the ages of 14 and 20. For women who are seen multiple times, the most recent observation is used. Only observations where the woman was resident in the DSA are included. Our sample includes 12194 women, 7352 of whom have at least one sister in the sample. In our sibling fixed effect model, the teen mother coefficient is identified only off those sibling groups where there is variation in the teen mother variable. There are 1253 sibling groups (made up of 3283 women in total) where at least one sister did and at least one other did not give birth in their teens. Similarly, there is variation on the early teen mother indicator in 504 sibling groups made up of 1322 women in total.

Table 7 presents results from regressions that include sibling fixed effects. Compared to their sisters, women who give birth in their teens are significantly behind in years of completed schooling for their age. On average, teen mothers have completed 0.28 years less schooling than their sisters who did not give birth in their teens. Early teen mothers are slightly more than half a year behind their sisters who have the first child after the age of 20. Teen mothers are around 21 percentage points more likely to drop out of high school than their siblings. Early teen mothers do not appear to be at an additional risk of dropping out relative to women who have their first child in their late teens.

Tables 3 and 4 presented evidence that women who were going to become teen mothers were not significantly behind in school or less likely to be enrolled at ages 12 and 13. The ACDIS longitudinal data presents the opportunity to investigate more thoroughly the timing of falling behind. We can also document the extent to which women return to school post pregnancy and whether their schooling recovers in the period after the birth or if they continue to fall behind their peers.

Following Marteleto et al. (2008) in their study in urban Cape Town, we visually summarize schooling trajectories before and after birth in Figures 4 and 5. Figure 4 presents enrolment rates by age separately for women who have their first birth at 15, 16, 17, 18 and at 23 or older. At ages 12 and 13 enrolment is almost universal and there is no evidence that future teen mothers are less likely to be enrolled than their peers. Enrolment by age follows a similar pattern across all teen mothers with a slight drop in enrolment in the year before the birth and then a substantial drop in the year of the birth. It is clear that a significant proportion of teen mothers do not drop out of school although our enrolment measure should not be confused with attendance. The proportion continuing to be enrolled after the birth decreases with age at first birth. Enrolment rates tend to be flat in the year following the birth but upward sloping in the following year providing evidence that some teen mothers who had dropped out return to school after the birth. The increase in enrolment

one year after the birth tends to be greater for younger teen mothers. By age 20 around 38% of teen mothers are enrolled in school with very little difference in enrolment rates by age at first birth. Women who delay their first birth until the age of 23 or later have higher enrolment at every age and are around 11 percentage points more likely to be enrolled than teen mothers at age 20.

Figure 5 presents years of completed schooling by age and age at first birth. At 14 years of age, educational attainment does not appear to differ by age at first birth. Teen mothers only begin to fall behind their peers in the year of the birth. As expected, given enrolment patterns in Figure 4, a portion of younger teen mothers continue to advance in school post the birth. For women who have their first birth in their late teens, however, the graph flattens out with no apparent increase in the average years of completed schooling between the ages of 18 and 20. At age 20, the educational attainment gap between teen mothers and older mothers decreases with age at first birth. Women who had their first birth at 15 have on average one year less schooling than older mothers. In contrast, women who had their first birth at 18 tend to only be half a year behind older mothers.

Table 8 presents the results of more detailed regressions to investigate the timing of falling behind and the extent to which teen mothers return to school after the birth of their child. The sample includes every HSE observation where the woman was resident in the DSA and was between the ages of 12 and 20. The sample includes 33963 observations on 12127 individuals, 41% of whom are teen mothers. Standard errors allow for clustering at the individual level and all regressions include a full set of indicators for age and year of observation. Results in the first column are from OLS regressions of years of completed education on indicators of whether the HSE observation was more than 3 years before the birth, 2 to 3 years before the birth, 1 to 2 years before the birth, 0 to 1 year before the birth, 0 to 1 year after the birth, 1 to 2 years after the birth, 2 to 3 years after the birth and more than 3 years after the birth. Women who have not given birth by the age of 20 are coded as zero on all eight of these timing indicators. For all four periods prior to the birth, teen mothers are not significantly behind in their schooling relative to other women of the same age. In the year after the birth, teen mothers are on average 0.33 years behind. The educational attainment gap between teen mothers and other teenagers increases with the time since the birth but at a decreasing rate suggesting that some of the teen mothers return to school and continue to successfully complete additional years of education. Three years after the birth, teen mothers have, on average, completed one less year of schooling than their peers.

The second column in Table 8 presents coefficients from a regression of dropping out on the pre and post birth timing indicators. More than two years before the birth, future teen mothers are not significantly less likely to be enrolled in school than other teens of the same age. There appears to be a small but significant pre-pregnancy drop in enrollment for teen mothers in the period between one and two years before the birth. In the year preceding

and the year following the birth, teen mothers are 19 and 41 percentage points less likely to be enrolled in school than their peers. A sizeable portion of teen mothers return to school in the period one to two years after the birth with the gap in dropout rates between teen mothers and other teens falling to 27 percentage points. It appears that most teen mothers who return to school do so within two years of the birth and the drop-out rate does not continue to fall with time since the birth.

In contrast to results from the Cape Area Panel Study (Marteleto et al. 2006, 2008 and Ranchhod et al. 2009), we find no clear evidence of selectivity into teen childbearing in either the schooling trajectories or pre-fertility household characteristics. We do not see any evidence of declines in enrolment more than two years before the birth nor are future teen mothers behind in their schooling relative to other girls at age 12 or 13. In addition, pre-fertility household characteristics do not appear to be predictive of future teen childbearing in the DSA. Although there is a considerable degree of selectivity in the sample of girls who give birth in their teens in the CAPS, estimates of teen mother educational deficits remain significant even accounting for pre-fertility characteristics (Ranchhod et al. 2009).

There may be a number of reasons why future teen mothers are indistinguishable on observable pre-fertility characteristics in our study but not in the CAPS. Rates of teen childbearing are around twice as high in the Africa Centre DSA than in urban Cape Town. The DSA is mostly rural, and very poor with high unemployment and a heavy morbidity and mortality burden associated with the AIDS pandemic. Nevertheless, there is considerable variation in both household socio-economic status and educational outcomes of young women.

From a policy perspective it is critical to understand the factors that enable young mothers to negotiate parenthood and schooling and those that prevent teen mothers from continuing with their education. Table 9 examines the determinants of not continuing with school. In order to investigate the pre-fertility correlates of post-birth outcomes we restrict the sample to teen mothers for whom we have schooling data both pre and post the birth. Specifically, the sample is comprised of those teen mothers who had an HSE interview within the two years preceding the birth and another HSE interview between one and two years after the birth. We focus on the period one to two years after the birth for our second observation due to enrolment patterns evident in Table 8. Dropout rates for teen mothers peak in the year following the birth, fall substantially after one year and then remain fairly constant. We exclude from the sample the small percentage of teen mothers who had already matriculated at the HSE interview prior to the birth. The outcome of interest, dropping out, is neither having completed high school nor still being enrolled in school when visited one to two years after the birth. Just under half (49%) the sample were still enrolled and 14% had completed high school at this second observation.

Given the strong relationship between age and both dropping out of school and pre birth characteristics, such as educational attainment, it is clearly important to control for age in

our regressions. This poses somewhat of a challenge as we are also interested in investigating age at first birth as one of the key determinants of who returns to school. The construction of our sample is such that age and age at first birth are necessarily collinear. Our solution is to employ age standardized versions of dropping out and pre birth educational attainment. In this way we can control for the confounding effect of age and also investigate the effect of age at first birth on subsequent outcomes. Age standardization is relative to the full sample of resident women at every HSE.

The first column of Table 9 presents results from a regression of an age standardized indicator of dropping out on age at first birth, age standardized pre birth education and an indicator that the pre birth data is from 1 to 2 rather than 0 to 1 years prior to the birth. Not surprisingly given the results in Tables 3 to 5, age at first birth of teen mothers is significantly positively associated with better schooling outcomes. The younger a teen mother at the birth of her first child, the less likely she is to complete high school or continue to be enrolled. Similar to Marteleto et al. (2006) in Cape Town, we find that teen mothers who were further ahead for their age prior to the birth, are significantly more likely to return and complete their schooling. The second column in Table 9 includes a range of pre birth household controls. The third column includes the same set of household controls but measured at the post birth observation. Including either pre or post birth household controls has no effect on the association between age at first birth and pre birth educational attainment and the probability of dropping out of school. Household assets pre and post the birth appear to be protective of schooling for teen mothers Interestingly both maternal orphanhood pre-birth and current co-residence with a mother are associated with a lower probability of dropping out, although coefficients are only significant at the 10% level.

4. Mortality and early childbearing

We have documented a clear association between early childbearing and poor educational outcomes in the DSA. We now turn to investigate another dimension of human capital, namely health. Perhaps an even greater concern related to early childbearing than schooling disruptions, is the consequences of unprotected sex in a high HIV prevalence area. Due to data limitations this is an area that has received very little attention in the literature on teen childbearing. ACDIS offers a unique opportunity to follow women over a decade and see whether indeed teen mothers are at risk for higher mortality. Documenting the extent to which teen mothers are at greater risk for morbidity and mortality is clearly important in its own right. In addition such an analysis may generate insights into attrition related biases in the association between teen childbearing and educational outcomes.

To analyze mortality we restrict our sample to the 3,004 women aged 20 to 25 resident in the DSA at HSE 1. Table 10 shows the status of these women on the 1st of January 2007 by teen mother classification. Overall, 43% gave birth to their first child before the age of 20.

We were unable to assign teen mother status to 8.3% of the sample. By January 2007, 8.6% of the sample had died and 16.6% were no longer followed by ACDIS, mostly because they were no longer resident in the DSA and were not considered a non-resident member of a household still residing in the DSA. Compared to other women, by 2007 teen mothers are more likely to be lost to follow-up (15% versus 12%) and have a higher probability of being deceased (10% versus 6%). The women whom we were unable to assign a teen mother classification were the most likely to be lost to follow up (53%) and to have died (14%). This is not surprising as early death and attrition would reduce the probability of these women ever completing a pregnancy or general health interview. Within a year of each death, nurses conduct a verbal autopsy with family and caregivers of the deceased to determine the cause of death. At least two physicians review the verbal autopsy interviews and independently assign a cause of death. The final row of Table 10 indicates the percentage of deaths where AIDS is indicated as the cause. Overall 73% of deaths were attributed to AIDS with AIDS related deaths more prevalent among teen mothers.

Table 11 investigates the correlates of death and attrition for these women in a multivariate context. Controlling for age, teen mothers are four percentage points more likely to have died by the 1st of January 2007 than women who did not give birth in their teens. The women whose teen mother status is unknown are eight percentage points more likely than non teen mothers to have died. As a robustness check of our teen mother coefficient, we re-ran the regression assuming that all unclassified women were not teen mothers. While the resultant teen mother effect was considerably reduced (coefficient = 0.026 standard error = 0.010) it was still positive and significant. The regression in the second column of Table 11 includes controls for socio-economic status at HSE1. Interestingly, the inclusion of these variables has no effect on the teen mother coefficient and none of the household SES indicators are significant predictors of death. Years of completed education at HSE 1 is significantly associated with the probability of dying. For every additional year of completed education relative to other women of the same age and socioeconomic status, the probability of dying is decreased by 0.4 percentage points. The sample in the third column is restricted to teen mothers. Among teen mothers, there does not appear to be any association between educational attainment or household SES and the probability of dying. While we are careful not to attribute causality, there is significant association between teenage childbearing and mortality before the age of 30 that is not explained by socioeconomic status in early adulthood.

Columns 4 to 6 of Table 11 present results from regressions where the dependent variable is an indicator that the individual was lost to follow up by the 1st January 2007. Controlling for age, teen mothers and those who were not classified are 4 and 42 percentage points more likely to be lost to follow up respectively. Including controls for SES reduces the teen mother coefficient slightly, although it remains positive and significant. Women living in households with access to toilets and piped water, markers of urban location, are more likely to be lost to follow up. Household size and years of completed education are negatively related to the

probability of being lost to follow up. The sample is restricted to teen mothers in the final column of Table 11. The same variables that predicted loss to follow up in the full sample are predictive of being lost to follow up for teen mothers. On these observable characteristics, teen mothers who are lost to follow up do not appear to be a select group. Among teen mothers completed education at HSE 1 is negatively associated with being lost to follow up. This suggests that earlier results examining the educational attainment of teen mothers may be biased downward (in absolute terms) due to attrition.

The final two columns of Table 11 present estimates of relative risk rates of dying from a Cox proportional hazard model. Our estimates suggest a strong association between early childbearing and mortality and are consistent with the OLS results shown in columns 1 and 2. The estimated relative hazard rates are 1.73 without pre-fertility controls and 1.63 when we include them[10]. Relative hazard rates appear robust to the choice of sample and the period over which we follow we follow the women. Restricting our focus to AIDS deaths only results in no substantial changes to our estimates of the association between early childbearing and mortality.

5. Conclusions

We examine the relationship between teen fertility and both subsequent educational outcomes and mortality risk in rural South Africa. We use a rich longitudinal dataset from the Africa Centre Demographic Information System that allows us to control for multiple characteristics of the teen mothers and their households at an early age before childbearing. We find that teenage fertility is associated with disadvantages in education levels and with higher risk of mortality at a young age. Furthermore, these effects are more pronounced for the youngest teen mothers and do not seem attributable to adverse pre-fertility characteristics.

Our findings are robust to multiple methodologies of estimation. We use OLS models, sibling fixed effects and propensity score matching and find consistent results.

[10] The equality of the survivor functions of teen mothers and other women is also rejected by the non-parametric log-rank test (Chi2(1)=14.81 p-value=0.0001)

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Figure 1: Mother's age when first child was born for resident women aged 35 to 40 at HSE 6 (2009)

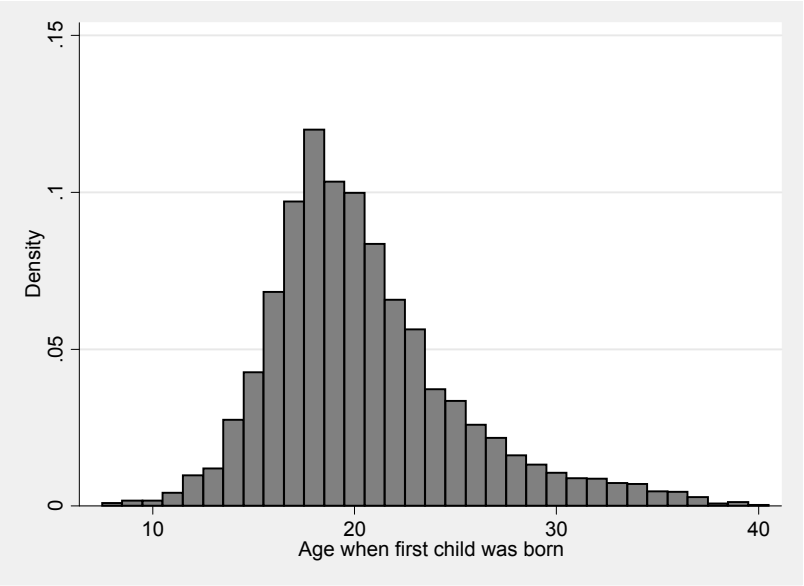

Figure2: Years of completed education and high school completion by age and age at first birth for resident women

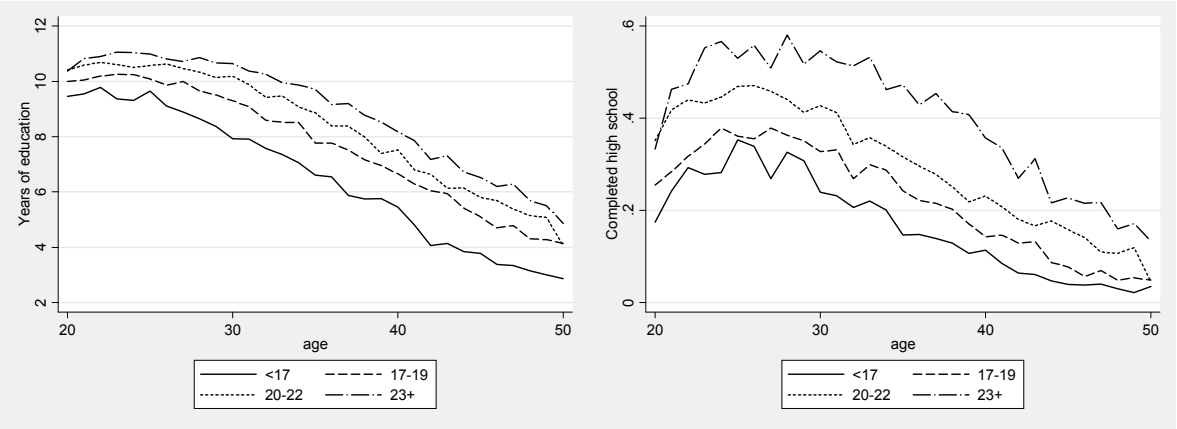

Figure 3: Age at the second observation

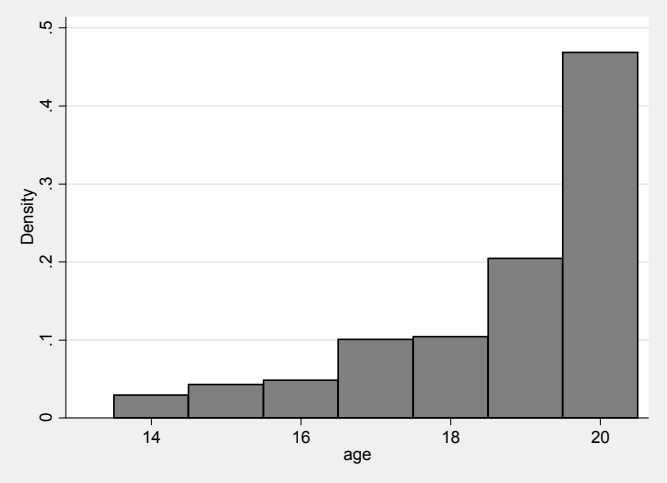

Figure 4: Enrollment by age and age at first birth

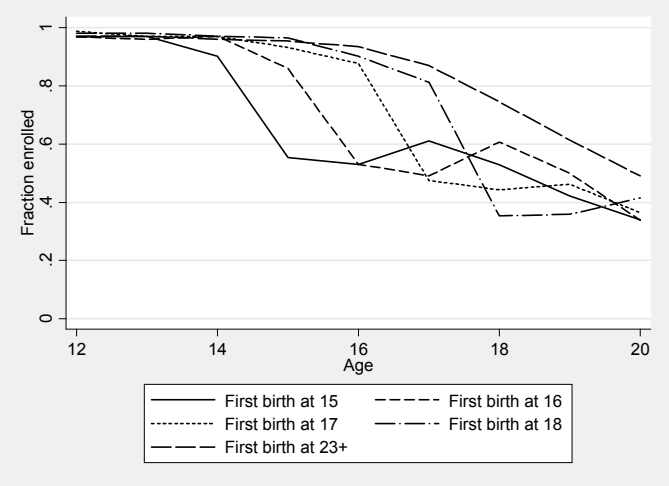

Figure 5: Years of education by age and age at first birth

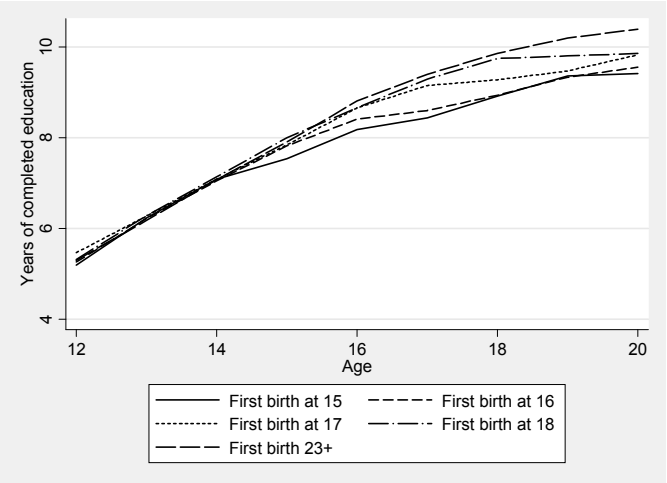

Table 1: Sample characteristics - resident women aged 12 and 13 at HSE1 and observed again between the ages of 14 and 20

	Non teen mothers	Teen mothers		Teen mother indicator missing		Early teen mothers	Other teen mothers	
Characteristics at HSE1:								
Age	12.515	12.486		12.411	**	12.500	12.481	
Years of completed education	5.796	5.770		5.258	***	5.736	5.782	
Enrollment	0.980	0.970		0.974		0.951	0.977	
Toilet	0.597	0.571		0.675	**	0.611	0.556	
Assets	4.233	4.004	*	4.767	***	4.243	3.917	
Piped water	0.392	0.354		0.460	**	0.340	0.359	
Resident members	8.276	8.223		7.626	**	8.313	8.190	
Mother co-resident	0.671	0.635		0.454	***	0.583	0.654	
Father co-resident	0.300	0.227	***	0.202	*	0.236	0.223	
Mother dead	0.074	0.061		0.104	*	0.056	0.063	
Father dead	0.125	0.120		0.147		0.111	0.123	
Mother's education	4.453	4.317		4.411		3.986	4.436	
Mother's education missing	0.176	0.149		0.325	***	0.208	0.128	
Characteristics at second visit:								
Years of completed education	10.144	10.053		9.209	***	9.493	10.256	***
Dropped out of school	0.110	0.425	***	0.196		0.514	0.393	**
Age	18.354	19.551	***	17.712	***	19.368	19.617	***
Mother co-resident	0.605	0.595		0.325	***	0.521	0.622	**
Father co-resident	0.272	0.217	**	0.153	***	0.201	0.223	
Mother dead	0.180	0.213		0.203		0.225	0.209	
Father dead	0.180	0.213		0.203		0.225	0.209	
Resident in DSA	0.804	0.783		0.344	***	0.681	0.820	***
Observations	881	543		163		144	399	

Notes to Table 1: The sample includes all 12 and 13 year old resident women at HSE1 who were observed again between the ages of 14 and 20. Where women were observed again multiple times, the most recent observation was used. The notation in column 2 denotes that differences between teen mothers and non teen mothers are significant at 10% (*), 5% (**) and 1%(***) level. Similarly the notation in columns 3 and 5 denote significant differences between those with unassigned status and non teen mothers and between early teen and older teen mothers respectively.

Table 2: Determinants of teen childbearing

	Dependent variable:			
	Teen mother		Early teen mother	
Characteristics at HSE1:				
Years of education	0.012	0.012	0.002	0.003
	(0.008)	(0.008)	(0.005)	(0.005)
Enrolled in school	-0.141*	-0.133*	-0.108**	-0.108**
	(0.074)	(0.074)	(0.049)	(0.049)
Toilet	-0.016	-0.016	0.007	0.010
	(0.028)	(0.028)	(0.018)	(0.018)
Assets	-0.003	-0.001	0.003	0.003
	(0.005)	(0.005)	(0.004)	(0.004)
Piped water	-0.018	-0.018	-0.022	-0.022
	(0.030)	(0.030)	(0.020)	(0.020)
Num resident members	-0.000	-0.001	0.000	0.000
	(0.003)	(0.003)	(0.002)	(0.002)
Mother co-resident	-0.036	-0.074**	-0.034*	-0.024
	(0.027)	(0.030)	(0.017)	(0.020)
Father co-resident	-0.057**	-0.060**	-0.003	-0.004
	(0.027)	(0.027)	(0.018)	(0.018)
Mother dead	-0.053	0.010	-0.044	-0.064*
	(0.047)	(0.053)	(0.031)	(0.035)
Father dead	-0.051	-0.059*	-0.019	-0.019
	(0.035)	(0.035)	(0.023)	(0.023)
Mother's education		-0.003		-0.002
		(0.003)		(0.002)
Mother's education missing		-0.128***		0.022
		(0.047)		(0.031)
Constant	0.160	0.203*	0.088	0.083
	(0.116)	(0.117)	(0.076)	(0.077)
Observations	1563	1563	1563	1563
R-squared	0.18	0.19	0.04	0.04

Notes to Table 2: The sample includes all 12 and 13 year old resident women at HSE1 who were observed again between the ages of 14 and 20. Where women were observed again multiple times, the most recent observation was used. All regressions include a full set of indicators for isigodi and for age at and year of most recent visit. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 3: Educational attainment and teenage childbearing - resident women aged 12 and 13 at HSE1 and observed again between the ages of 14 and 20

	Dependent Variable				
	Years of Education			Education at age 12/13	
Teen mother	-0.624***	-0.578***	-0.653***	0.017	0.085
	(0.123)	(0.119)	(0.092)	(0.098)	(0.094)
Early teen mother	-0.639***	-0.591***	-0.536***	-0.063	-0.065
	(0.184)	(0.179)	(0.138)	(0.158)	(0.151)
Teen mother indicator missing	-0.488***	-0.588***	-0.205*	-0.444***	-0.474***
	(0.164)	(0.161)	(0.124)	(0.138)	(0.134)
Toilet		0.453***	0.157*		0.377***
		(0.114)	(0.088)		(0.097)
Assets		0.134***	0.045***		0.122***
		(0.022)	(0.017)		(0.019)
Piped water		-0.166	-0.111		-0.061
		(0.125)	(0.096)		(0.105)
Num resident members		-0.019	-0.006		-0.019*
		(0.012)	(0.009)		(0.010)
Mother co-resident		0.332***	0.032		0.400***
		(0.110)	(0.085)		(0.093)
Father co-resident		-0.054	-0.054		-0.002
		(0.113)	(0.087)		(0.096)
Mother dead		-0.168	-0.046		-0.147
		(0.195)	(0.150)		(0.164)
Father dead		0.233	0.152		0.153
		(0.147)	(0.113)		(0.123)
Years of education			0.761***		
			(0.023)		
Constant	6.613***	5.706***	3.043***	5.334***	3.898***
	(0.281)	(0.369)	(0.296)	(0.069)	(0.218)
Observations	1,587	1,583	1,583	1,587	1,583
R-squared	0.229	0.301	0.587	0.080	0.188

Notes to Table 3: The sample includes all 12 and 13 year old resident women at HSE1 who were observed again between the ages of 14 and 20. Where women were observed again multiple times, the most recent observation was used. Regressions in columns 1-3 include a full set of indicators for age at and year of most recent visit. Regressions in columns 4 and 5 include an indicator that the girl is 13 at HSE1. Regressions in columns 2, 3 and 5 include a full set of indicators for isigodi. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 4: Dropping out of high school and teenage childbearing - resident women aged 12 and 13 at HSE1 and observed again between the ages of 14 and 20

	Dependent variable:				
	Dropped out of high school			Enrolled at age 12/13	
Teen mother	0.266***	0.254***	0.258***	-0.003	-0.005
	(0.025)	(0.025)	(0.025)	(0.009)	(0.009)
Early teen mother	0.127***	0.135***	0.134***	-0.026*	-0.025*
	(0.038)	(0.038)	(0.038)	(0.015)	(0.015)
Teen mother indicator missing	0.092***	0.106***	0.080**	-0.006	-0.013
	(0.034)	(0.034)	(0.034)	(0.013)	(0.014)
Toilet		-0.047*	-0.045*		0.010
		(0.024)	(0.024)		(0.010)
Assets		-0.015***	-0.014***		0.006***
		(0.005)	(0.005)		(0.002)
Piped water		0.058**	0.062**		0.001
		(0.026)	(0.026)		(0.010)
Num resident members		0.002	0.001		0.001
		(0.003)	(0.003)		(0.001)
Mother co-resident		-0.036	-0.044*		-0.004
		(0.023)	(0.023)		(0.009)
Father co-resident		-0.026	-0.023		-0.012
		(0.024)	(0.024)		(0.009)
Mother dead		-0.051	-0.062		-0.033**
		(0.041)	(0.041)		(0.016)
Father dead		0.016	0.025		-0.003
		(0.031)	(0.031)		(0.012)
Enrolled at HSE1			-0.127**		
			(0.065)		
Constant	0.075	0.093	0.149	0.980***	0.950***
	(0.058)	(0.078)	(0.100)	(0.006)	(0.022)
Observations	1,587	1,583	1,563	1,567	1,563
R-squared	0.138	0.178	0.189	0.003	0.033

Notes to Table 4: The sample includes all 12 and 13 year old resident women at HSE1 who were observed again between the ages of 14 and 20. Where women were observed again multiple times, the most recent observation was used. Regressions in columns 1-3 include a full set of indicators for age at and year of most recent visit. Regressions in columns 4 and 5 include an indicator that the girl is 13 at HSE1. Regressions in columns 2, 3 and 5 include a full set of indicators for isigodi. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 5: Matriculation from high school and teenage childbearing – resident women aged 13 at HSE1 and observed again at age 20 or 21

	Dependent variable: Matriculated by age 20 or 21		
Teen mother	-0.193***	-0.164***	-0.195***
	(0.048)	(0.048)	(0.043)
Early teen mother	-0.059	-0.059	-0.036
	(0.073)	(0.074)	(0.067)
Teen mother indicator missing	0.054	0.059	0.068
	(0.054)	(0.054)	(0.049)
Toilet at age 13		0.066	0.021
		(0.048)	(0.044)
Assets at age 13		0.025**	0.009
		(0.010)	(0.009)
Piped water at age 13		-0.033	-0.033
		(0.053)	(0.048)
Num resident members at age 13		-0.009*	-0.010**
		(0.005)	(0.005)
Mother co-resident at age 13		0.065	0.016
		(0.048)	(0.044)
Father co-resident at age 13		0.006	0.043
		(0.047)	(0.043)
Mother dead at age 13		-0.105	-0.108
		(0.085)	(0.077)
Father dead at age 13		0.014	0.031
		(0.064)	(0.058)
Years of education at age 13			0.128***
			(0.012)
Constant	0.490***	0.325***	-0.321***
	(0.053)	(0.120)	(0.123)
Observations	620	618	618
R-squared	0.058	0.142	0.292

Notes to Table 5: The sample includes all 13 year old resident women at HSE1 who were observed again between the ages of 20 and 21. Where women were observed again multiple times, the most recent observation was used. All regressions include a full set of indicators for age at and year of most recent visit. Regressions in columns 2 and 3 include a full set of indicators for isigodi. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 6: Comparison of OLS and Propensity Score Matching

	Teen mother			Early teen mother		
	Attainment	**Dropout**	**Matric**	**Attainment**	**Dropout**	**Matric**
OLS	-0.738***	0.290***	-0.220***	-1.000***	0.291***	-0.203***
	(0.110)	(0.023)	(0.040)	(0.168)	(0.036)	(0.067)
OLS with controls	-0.775***	0.286***	-0.221***	-0.936***	0.291***	-0.185***
	(0.082)	(0.022)	(0.037)	(0.127)	(0.035)	(0.062)
PSM	-0.761***	0.263***	-0.170***	-0.915***	0.317***	-0.251**
	(0.149)	(0.032)	(0.057)	(0.284)	(0.056)	(0.090)
Observations	1,587	1,583	622	1,587	1,583	622

Notes to Table 6: The sample includes all 12 and 13 year old resident women at HSE1 who were observed again between the ages of 14 and 20. Where women were observed again multiple times, the most recent observation was used. Each cell in the first three columns presents the coefficient on the teen mother indicator with standard errors in parentheses. Each cell in columns 4 to 6 presents the coefficient on the early teen mother indicator with standard errors in parentheses. Regressions in the first row include a full set of indicators for age at and year of most recent visit. Regressions in the second row also include the same set of household level controls as Tables 3 to 5. Coefficients in the third row are from a propensity score reweighted regression. The propensity score was estimated using the same set of covariates as regressions in the second row. *** p<0.01, ** p<0.05, * p<0.1

Table 7: Comparison of teenage mothers' education outcomes with their sibling(s) (mother fixed effects) – resident women observed at least once between HSE 1 and HSE 7 at ages 14 to 20

	Dependent variable:	
	Years of completed education	**Drop out**
Teen mother	-0.276***	0.208***
	(0.070)	(0.016)
Early teen mother	-0.292**	0.009
	(0.101)	(0.023)
Teen mother indicator missing	-0.458***	0.055***
	(0.076)	(0.018)
Constant	6.936***	0.107***
	(0.115)	(0.026)
Observations	12194	12194
Number of unique mothers	7849	7849
R-squared	0.30	0.11

Notes to Table 7: Sample includes all resident women observed at least once between ages 14 to 20 across the seven HSE waves. For women observed multiple times, the most recent observation was used. Regressions include a full set of indicators for age at and year of most recent visit. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 8: Timing of falling behind and dropping out – resident women between ages of 12 and 20.

	Dependent variable:	
	Years of completed education	**Dropped out**
3+ years before birth	-0.001	-0.003
	(0.046)	(0.004)
2-3 years before birth	-0.033	0.003
	(0.049)	(0.006)
1-2 year before birth	-0.027	0.026***
	(0.050)	(0.008)
0-1 years before birth	-0.035	0.192***
	(0.046)	(0.011)
0-1 years after birth	-0.328***	0.413***
	(0.048)	(0.011)
1-2 years after birth	-0.670***	0.265***
	(0.054)	(0.013)
2-3 years after birth	-0.788***	0.213***
	(0.069)	(0.015)
3+ years after birth	-1.058***	0.305***
	(0.090)	(0.019)
Observations	33,963	34,203
R-squared	0.416	0.210

Notes to Table 8: Sample includes every observation where the woman was resident and aged between 12 and 20. All regressions include a full set of indicators for age and year of observation. Robust standard errors in parentheses are clustered at the individual level. *** p<0.01, ** p<0.05, * p<0.1

Table 9: Who completes or returns to school - resident teenage mothers observed pre and post birth.

	Dependent variable: Age standardized dropping out		
		Pre-birth HH controls	Post-birth HH controls
Age at first birth	-0.138***	-0.130***	-0.137***
	(0.026)	(0.026)	(0.026)
Age standardized prior education	-0.201***	-0.189***	-0.188***
	(0.020)	(0.021)	(0.021)
Pre birth data from 1-2 years prior to birth+	0.090	0.123*	0.116*
	(0.069)	(0.069)	(0.069)
Assets		-0.059***	-0.063***
		(0.016)	(0.016)
Toilet		-0.068	-0.022
		(0.088)	(0.092)
Piped water		0.078	0.176**
		(0.082)	(0.087)
Resident members		0.010	0.015
		(0.010)	(0.009)
Mother co-resident		-0.142	-0.182*
		(0.090)	(0.097)
Father co-resident		0.079	0.061
		(0.088)	(0.093)
Mother dead		-0.201*	-0.177
		(0.116)	(0.112)
Father dead		-0.065	-0.046
		(0.085)	(0.080)
At least one resident female pensioner		0.029	-0.039
		(0.081)	(0.079)
At least one resident male pensioner		0.431***	0.169
		(0.123)	(0.119)
Constant	2.572***	2.377***	2.377***
	(0.446)	(0.618)	(0.603)
Observations	1126	1119	1117
R-squared	0.10	0.15	0.15

Notes to Table 9: Sample includes all teenage mothers who had an HSE interview within the two years preceding the birth and another HSE interview between one and two years after the birth. The sample is restricted to women who were resident at both interviews. We exclude from the sample the small percentage of teenage mothers who had already matriculated at the HSE interview prior to the birth. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

+ 0-1 years prior to birth reference category

Table 10: Sample characteristics - resident women aged 20 to 25 at HSE 1

	Teen mother status:			Total
	No	**Yes**	**Unknown**	
Observations	1450	1305	249	3004
Percentage	48.27	43.44	8.29	100
Status on 1 Jan 2007:				
Lost to follow-up	11.52	15.33	52.61	16.58
Alive	82.14	74.71	33.33	74.87
Deceased	6.34	9.96	14.06	8.6
% deaths due to AIDS	70.93	75.00	69.70	72.8

Notes to Table 10: The sample includes all resident women aged 20 to 25 at HSE1.

Table 11: Mortality and attrition by 1 January 2007 of resident women aged 20 to 25 at HSE 1

	Linear Probability Model						Cox Proportional Hazard Model	
Dependent variable:	Deceased by 1 Jan 2007			Lost to follow up by 1 Jan 2007			Deceased by 1 Jan 2007	
	All	All	Teen	All	All	Teen	All	All
Teen mother	0.038***	0.034***		0.041***	0.031**		1.727***	1.633***
	(0.011)	(0.011)		(0.014)	(0.014)		(0.236)	(0.228)
Teen mother status missing	0.083***	0.090***		0.418***	0.363***		4.540***	4.613
	(0.019)	(0.020)		(0.024)	(0.025)		(0.910)	(0.946)
Assets		-0.003	-0.006		0.001	-0.002		0.965
		(0.003)	(0.004)		(0.003)	(0.005)		(0.031)
Toilet		-0.013	-0.034*		0.035**	0.041*		0.848
		(0.013)	(0.021)		(0.016)	(0.024)		(0.132)
Electricity		0.008	0.013		-0.024	-0.037		1.075
		(0.016)	(0.025)		(0.019)	(0.029)		(0.203)
Piped water		-0.022	-0.015		0.032*	0.049*		0.804
		(0.015)	(0.024)		(0.019)	(0.029)		(0.155)
Resident members		-0.001	0.001		-0.010***	-0.013***		0.983
		(0.001)	(0.002)		(0.002)	(0.002)		(0.166)
Years of education		-0.004*	-0.002		-0.007***	-0.011***		0.955***
		(0.002)	(0.003)		(0.002)	(0.004)		(0.019)
Constant	0.028**	0.110***	0.096*	0.082***	0.153***	0.288***		
	(0.013)	(0.034)	(0.054)	(0.016)	(0.042)	(0.064)		
Observations	3004	2986	1295	3004	2986	1295	2997	2981
Chi2 / R-squared	0.01	0.03	0.03	0.09	0.14	0.07	70.21	110.75

Notes to Table 11: The sample in columns 1, 2, 4 and 5 includes all resident women aged 20 to 25 at HSE1. The sample in columns 3 and 6 is further restricted to teen mothers. All regressions include a full set of indicators for age at HSE1. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Appendix Table 1: Comparison of characteristics of those lost to follow up and those included in Table 1

	Lost to follow-up	Included in Table 1	
Characteristics at HSE1:			
Age	12.488	12.495	
Years of education	5.272	5.732	***
Enrolled	0.918	0.976	***
Toilet	0.611	0.596	
Assets	4.062	4.209	
Piped water	0.451	0.386	
Number of resident members	6.185	8.191	***
Mother co-resident	0.284	0.636	***
Father co-resident	0.136	0.265	***
Mother dead	0.086	0.072	
Father dead	0.148	0.125	
Observations	162	1587	

Notes to Appendix Table 1: The sample includes all 12 and 13 year old resident women at HSE1. The notation in column 2 denotes that differences between women lost to follow up and women included in Table 1 are significant at 10% (*), 5% (**) and 1%(***) level.

southern africa labour and development research unit

The Southern Africa Labour and Development Research Unit (SALDRU) conducts research directed at improving the well-being of South Africa's poor. It was established in 1975. Over the next two decades the unit's research played a central role in documenting the human costs of apartheid. Key projects from this period included the Farm Labour Conference (1976), the Economics of Health Care Conference (1978), and the Second Carnegie Enquiry into Poverty and Development in South Africa (1983-86). At the urging of the African National Congress, from 1992-1994 SALDRU and the World Bank coordinated the Project for Statistics on Living Standards and Development (PSLSD). This project provide baseline data for the implementation of post-apartheid socio-economic policies through South Africa's first non-racial national sample survey.

In the post-apartheid period, SALDRU has continued to gather data and conduct research directed at informing and assessing anti-poverty policy. In line with its historical contribution, SALDRU's researchers continue to conduct research detailing changing patterns of well-being in South Africa and assessing the impact of government policy on the poor. Current research work falls into the following research themes: post-apartheid poverty; employment and migration dynamics; family support structures in an era of rapid social change; public works and public infrastructure programmes, financial strategies of the poor; common property resources and the poor. Key survey projects include the Langeberg Integrated Family Survey (1999), the Khayelitsha/Mitchell's Plain Survey (2000), the ongoing Cape Area Panel Study (2001-) and the Financial Diaries Project.

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