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Timing of First Childbirth and Young Women's Postsecondary Education in an inner-city minority cohort

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Abstract

The present study investigated the relationships between the timing of women's first childbirth and their postsecondary education using an inner-city minority cohort. The study sample (695 females) was drawn from the Chicago Longitudinal Study (CLS), an on-going investigation of a panel of low-income minority children (94% African American) born in 1980 who grew up in high-poverty neighborhoods in Chicago. The findings indicated that, taking into account sociodemographic factors and early academic achievement, first childbirths before age 18 and between ages 19 and 21 were significantly associated with lower rates of college attendance and bachelor (BA) degree completion. First childbirths between ages 21 and 25 were not significantly associated with any outcome of postsecondary education.

Keywords

age at first childbirth; women's postsecondary education; minority; at risk group

In the past decades, the transition to adulthood has become a flourishing area of study. Based on the life course perspective, early experiences can shape later opportunities or put restrictions on pathways into adulthood. For women, motherhood is such an important experience. Research indicates that the timing of motherhood is associated with women's education, career path, earning, and health (Fergusson & Woodward, 2000; A. R. Miller, 2011; Mirowsky, 2002). Education, socioeconomic status, and income, are important indicators of adult well-being. Among those indicators, education is especially important because it is also an important mechanism that leads to lifelong benefits. For example, high educational attainment has been linked to positive adult well-being, such as earnings and health (Pascarella & Terenzini, 2005; Wolfe & Haveman, 2001). In 2008, young adults ages 25–34 with a bachelor's degree earned 28 percent more than young adults with an associate's degree, 53 percent more than young adult high school completers, and 96 percent more than young adults who did not complete high school (Aud et al., 2010). Furthermore, researchers have also become aware of the social benefits of education beyond the established economic impacts (Grossman, 2006; Wolfe & Haveman, 2001). Therefore, the present study examined the relationships between timing of first childbirth and postsecondary education participation, an important indicator of higher education.

Timing of women's first childbirth and education

Motherhood is a crucial experience for women, and depending on its timing, it could have various impacts on a woman's life trajectory. The relationships between the timing of first childbirth (or childbearing experiences) and educational attainment have been examined in studies (Ahn, 1994; Hofferth, Reid, & Mott, 2001; Klepinger, Lundberg, & Plotnick, 1995, 1999a, 1999b; Mott & Marsiglio, 1985; Pirog & Magee, 1997; Upchurch & McCarthy, 1990; Waite & Moore, 1978). Most studies have focused on the harmful effects of early childbearing on schooling and education. Although some researchers found that teenage

childbearing does not have devastating consequences for a woman's completion of high school (Hoffman, 1998), many researchers have found negative associations between teenage birth, and rates of high school completion and years of completed schooling (Grogger & Bronars, 1993; Hofferth, et al., 2001; Mott & Marsiglio, 1985). Few studies found negative associations between teenage birth and participation in postsecondary education (Hofferth, et al., 2001). Moreover, early childbearing has been found to be detrimental to women's earnings, and mental and physical health (Boden, Fergusson, & Horwood, 2008; Grogger & Bronars, 1993; Hotz, McElroy, & Sanders, 2005; Klepinger, et al., 1999a, 1999b; Mirowsky, 2002; Moore et al., 1993; Ribar, 1999). Teenage childbirth remains a vital issue for the society (Holcombe, Peterson, & Manlove, 2009).

In addition to early childbearing or teen childbearing, effects of childbearing (or motherhood) at various ages on education were discussed in a few studies. Among those studies, the most frequently used dataset is the National Longitudinal Survey of Youth (NLSY 1979), a cohort of youths first interviewed in 1979 when they were between the ages of 14 to 21, who were re-interviewed annually through 1991. Using NLSY 1979, studies showed that having a child before age 20 was significantly associated with lower rates of high school graduation and fewer years of completed schooling than not having a child before age 20 (Ahn, 1994; Klepinger, et al., 1995; Upchurch & McCarthy, 1990). Moreover, having a child before age 20 was also associated with fewer early-adult work experiences, which might have effects on future wages and poverty (Klepinger, et al., 1999a, 1999b; Moore, et al., 1993; Pirog & Magee, 1997). Studies using other datasets, such as the Panel Study of Income Dynamics (PSID) and the Christchurch Health and Development Study (CHDS), reported similar findings on the associations between early childbearing and fewer years of completed schooling (Astone & Upchurch, 1994; Fergusson & Woodward, 2000; Waite & Moore, 1978).

Several issues are raised from the existing research. First, previous studies have focused on either high school completion or years of schooling as measures of education. College attendance and degree have been examined in only a few studies (Boden, et al., 2008; Upchurch, 1993). More recently, Boden and others (2008) examined the relations between early motherhood and life outcomes, and education is one of the domain examined. They examined enrollment in postsecondary education and training, educational/vocational qualifications obtained, and college degree. Years of schooling were examined in other studies (Hofferth, et al., 2001; Klepinger, et al., 1999a; Waite & Moore, 1978). Although total year of schooling is a good indicator of education, college is an important milestone in the educational process. Given the benefits associated with college attendance and degree completion (Pascarella & Terenzini, 2005), investigation on college outcomes is warranted.

Second, the majority of previous studies have shown that early childbearing, especially before age 20, has negative effects on education. However, the different magnitudes associated with the exact timing of a woman's first childbirth have seldom been examined. Is age 20 the best cut-off point to define woman's first childbirth that might have negative effects on education? Different cut-off ages at first childbirth will provide insights to the relation between timing of motherhood and education. Third, most of the studies used birth cohorts between the 1940s and the 1960s. As many economic changes have occurred over the decades, the society has changed considerably since then. It would be valuable to examine the relations using more recent cohorts to see whether the trends have changed over time. Finally, previous studies have not focused on at-risk groups. Among racial/ethnic group, African American has the highest rate of teenage births. Furthermore, economically disadvantaged status and urban context also place teenagers at high risk of becoming pregnant early. However, such at-risk groups were not addressed previously. Examining the relations between timing of first birth and educational attainment among the at-risk groups

would provide insights on the process by which adverse outcomes were maintained through the cycles of risk factors.

Using a longitudinal study cohort born in 1980, two questions were addressed in the present study: 1) How was the timing of first childbirth related to young women's college attendance? 2) How was the timing of first childbirth related to young women's bachelor (BA) degree completion?

Conceptual Framework

Because experimental design is not feasible in this situation, it is critical to recognize the effects of confounding factors that might have on the relations between ages of childbirth and education. Sociodemographic characteristics associated with both timing of first childbirth and education are important confounding factors. Limited studies examined the factors related to the timing of first childbirth. However, numerous studies have been conducted to investigate the consequences of teenage pregnancy and factors that lead to or exacerbate teenage pregnancy (Maynard, 1997). Certain family background factors are found to be risk factors for teenage pregnancy, such as mothers' single parenting status, family history of teenage parenting, mother's age at birth, number of siblings, and family poverty status (East & Jacobson, 2001; East, Khoo, & Reyes, 2006; Ellis et al., 2003; Fergusson & Woodward, 2000; Kahn & Anderson, 1992; Kirby, Coyle, & Gould, 2001; Lancot & Smith, 2001; Levine, Pollack, & Comfort, 2001; Manlove, 1997, 1998; B. C. Miller, Benson, & Galbraith, 2001; Rindfuss & St. John, 1983; Russell, 2002; Stevens-Simon & Lowy, 1995). In addition, the relationships between child maltreatment and adolescent pregnancy have been examined in studies, although the findings are inconclusive (Blinn-Pike, Berger, Dixon, Kuschel, & Kaplan, 2002; Lancot & Smith, 2001).

Sociodemographic factors associated with educational attainment include ethnic background, socioeconomic status, and family structure (Alexander, Entwisle, & Horsey, 1997; Jordan, Lara, & McPartland, 1996; Rosenthal, 1998; Rumberger, 1987; Rumberger & Larson, 1998). Many studies have indicated that children from single-parent families and step-parent families are more likely to display signs of early disengagement from school, which affects their academic achievement (Roderick, 1993; Rumberger & Larson, 1998). In addition, family size is associated with educational attainment, as dropouts are more likely to come from large families (Steinberg, Blinde, & Chan, 1984). Low educational and occupational attainment levels of parents are also associated with dropout rates (Frank, 1990; Kronick & Hargis, 1990; Roderick, 1993). To summarize, many sociodemographic factors are associated with both early childbirth and education, such as mothers' single parenting status, mother's age at birth, family size, and family poverty status. Those sociodemographic factors were included in the present study as covariates.

The Present Study

The present study is unique in several respects. First, the present study examined college attendance and degree completion as indicators of education, which have seldom been examined in previous studies. Previous studies have focused on either high school completion or years of schooling. Although year of schooling is an important indicator of educational attainment, reaching educational milestones, such as enrollment in a 4-year college, provides an important alternative perspective. Second, the present study examined a high risk group: low-income minorities living in the inner-city, who already have an array of barriers to educational attainment. Over 94% of the study sample was African American, the racial/ethnic group that has the highest rate of teenage births. Economically disadvantaged status and living in inner-city place this group at even higher risk compared to other groups. The present study provides a close look at this group. Findings provided important

information on how age at first childbirth is associated with postsecondary education at this high risk group, which might shed light on the process by which cycles of disadvantaged status, such as poverty, may be maintained.

Third, the present study used different cut-off points for the age at first childbirth that were distinct from previous studies, which allowed an examination of potential threshold effects of timing of first childbirth on postsecondary education. In addition, age at first childbirth examined in the present study went beyond teenage years, which provides information on motherhood delays past teenage years. Fourth, the present study examined a 1980 birth cohort, which is a more recent cohort compared to birth cohorts in the 1950s that were used in previous studies (between the 1940s and the 1960s). Although a more recent cohort (National Education Longitudinal Study, NELS:88/2000) was used to examine out-of-wedlock fertility and education, the timing of first childbirth was not investigated. As society changes rapidly, it is important to examine this issue using contemporary cohorts. Finally, the present study used a longitudinal dataset spanning birth to young adulthood, which allowed control of the covariates more adequately. To sum up, the findings advance the understanding on the lasting nature of the associations documented in previous studies

Method

Sample and Data

The study sample was drawn from the Chicago Longitudinal Study (CLS), an on-going investigation of a panel of low-income minority children born in 1980 that grew up in high-poverty neighborhoods in Chicago. The original sample (N=1,539) included 989 children who entered the Chicago Child-Parent Center (CPC) program in preschool and graduated from kindergarten in 1986 (from 20 different Centers), and 550 children who participated in alternative government-funded programs in the Chicago Public Schools in 1986 without CPC preschool experience. Continuously promoted children graduated from high school in 1998. The study sample included 695 females whose status of educational attainment could be determined by August 2008 (average age = 28). Students in and outside of the Chicago Public Schools were located. Data have been collected from birth to early adulthood from various sources, such as participants, parents, teachers, school records, and other administrative records (Reynolds, 2000).

It is important to note that a significant proportion of the study sample (over 60%) participated in the Chicago Child-Parent Center (CPC) program. The CPC program is a center-based early-childhood intervention that focuses on high-poverty neighborhoods that are not served by Head Start or other early intervention programs. Eligible children may attend the program for up to 6 years (from ages 3 to 9). The main goal of the CPCs is to promote children's school competence, especially school readiness and academic achievement, by providing comprehensive educational and family-support services (e.g., free breakfasts and lunches and health screening) (Reynolds, 2000). Because positive relationships between program participation and educational attainment have been reported (Ou & Reynolds, 2006, 2008, 2010; Reynolds, Temple, Ou, Arteaga, & White, 2011; Reynolds et al., 2007; Reynolds, Temple, Robertson, & Mann, 2001), program participation was included as a covariate to ensure that any difference among groups did not result from the CPC program participation.

Measures

Postsecondary Education by Age 28—Postsecondary Education was measured by four indicators: college attendance, 4-year college attendance, 2-year college attendance, and Bachelor (BA) degree completion. Data sources included school records from colleges that

participants have attended and supplemented with self-report. All indicators were dichotomous measures.

College attendance indicated whether a youth ever attended any college (2- or 4-year college). Due to the significant difference between 2- and 4-year colleges, attendance in 2- or 4-year college was also coded separately into two variables. The two variables were not mutually exclusive. Youths could have attended both 2- and 4-year colleges given that some youths could have attended 2-year colleges first and then attended 4-year colleges later. Finally, BA degree completion indicated whether participants completed a BA degree.

Age of First Childbirth by Age 25—Age of first childbirth was obtained through self-report at age 22/24 and supplemented with public aid records from the State of Illinois and school records from the Chicago Public Schools. It was measured by age 25 because that was when the last self-report was available. In addition, by age 25, participants would have completed a BA degree if they attended 4-year colleges right after high school and completed the degree within 6 or 7 years. Therefore, parenthood status by age 25 was a reasonable point to measure the relation between childbirth and postsecondary education. Age of first childbirth was coded into six binary variables by age cuts. The reasons were briefly described below.

First, first childbirths before age 16 and age 18 have been examined extensively in early childbearing literature. In addition, eighteen is an important age because students are expected to complete high school at age 18 if they were not retained in grade. Therefore, ages 16 and 18 were used as age cuts so that the findings from the present study can be compared with findings in the literature. Second, economically disadvantaged youths in the inner city are more likely to attend community colleges than 4-year colleges. If youths attend community colleges for vocational certificates or associate degrees, it usually requires 1 to 2 years to complete the programs. Therefore, age 20 was used as another cut point for the age of first childbirth. Consistent with previous research and educational phases, six dichotomous variables were created for the age of first childbirth: age at first childbirth less than 16, between 16 and 17.99, between 18 and 18.99, between 19 and 20.99, between 21 and 24.99, and no childbirth by age 25. No childbirth by age 25 was used as the reference group.

Covariates—Covariates included individual characteristics, family characteristics, CPC program participation, and academic achievement. Table 1 presents the characteristics of the study sample and comparisons between two groups: any childbirth by age 25 and no childbirth by age 25. There were significant differences ($p < .01$) between the two groups (any childbirth by age 25 and no childbirth by age 25) in certain characteristics by participants' age 12, including maternal education, single parent status, mother employment status, TANF/AFDC participation, and number of family risk, and Iowa Test Basic Skills (ITBS) reading scores at age 11. Those characteristics were included as covariates in the present study.

Majority of the covariates were measured by age 12 of participants because it was the closest age prior to the earliest age of first childbirth in the study sample (age 12.59) when data were available. Individual characteristics included African American, any child welfare case history by participants' age 10, and participants' age in September, 1990. If participants had any record of abuse, neglect, or out of home placement by age 10, they were coded 1 in any child welfare case history.

Family characteristics included mother did not complete high school, single parent status, mother less than 18 years at child's birth, mother unemployed, four or more children in

household, and public aid receipt (TANF/AFDC). Except mother less than 18 years at participants' birth, all family characteristics were measured by age 12 of participants. CPC program participation and academic achievement included participation in CPC preschool program and CPC school-age program, and ITBS reading scores at age 11 (5th grade). Academic achievement was measured through the ITBS reading comprehension subtest (including 54 items) in 5th grade (internal consistency reliability > .90) (Hieronymus, Lindquist, & Hoover, 1982). The ITBS is group-administrated each year in the Chicago Public Schools. Fifth grade was used because it was closest but prior to the earliest age of first childbirth in the study sample. Most of the covariates were measured dichotomously except age and ITBS reading scores. Dichotomous variables were used because most of the characteristics are categorical, such as single parent status, and teen parent status.

Dichotomous variables were employed for other factors (maternal education, family size, and abuse/neglect), because it is more meaningful to examine the difference between above and below a certain threshold than to examine the difference between a continuous scale, such as if mother completed high school or not, and if they were in a large household or not. Such thresholds are meaningful because they might have different effects on education attainment (Roderick, 1993; Rumberger & Larson, 1998; Steinberg, et al., 1984). For dichotomous measures, 1 indicated the presence of a given characteristic, and 0 indicated the absence of the characteristic.

Missing index—Because missing values were imputed for some covariates, a missing index was created. Missing values ranged from 0.5% (maternal education) to 3.2% (maternal employment) except for ITBS reading scores (13.2%). Missing values were imputed through multiple imputation procedures using the EM algorithm. If one had missing value for any variable, they were coded 1 for the missing index. Otherwise, they were coded 0. The missing index was included in all models. See Appendix 1 for descriptive information of the study variables.

Data Analysis

Probit regression was used to analyze the data. STATA 11 (StataCorp LP., 2009) was used to conduct the analysis. Explanatory variables included the variables described earlier: 1) covariates, including individual characteristics, family characteristics, CPC program participation, and academic performance, and 2) variables indicating age of first childbirth. Marginal effects were calculated after probit regressions and they were used to calculate the group means on outcome measures after taking into account covariates. Marginal effects denote a change in the probability of experiencing a given outcome (such as 4-year college attendance) per 1-unit change in the explanatory variable, holding all other variables constant. Because the reference group is no childbirth by age 25, and there are multiple variables indicating various ages at first childbirth, all variables indicating age at first birth were set to zero when computing marginal effects.

Results

In the study sample, about 68% had given birth by age 25, and 31.2% had their first childbirth before age 18. The age at first childbirth ranged from 12.59 to 24.4. The average age of first childbirth in the study sample was 18.5 (S.D. = 2.27). Figure 1 shows the distribution of age at first childbirth.

Findings on any college attendance and 4-year college attendance show a similar pattern. Except first childbirths between ages 21 and 25, all ages of first childbirths were significantly associated with lower rates of college attendance and 4-year college attendance. Among the significant ages of first childbirths, first childbirths before age 18

had larger negative associations with college attendance than first childbirths at later ages. For example, for college attendance, the marginal effects of first childbirths before age 16 and between ages 16 and 18 were $-.37$ and $-.28$, respectively ($p < .01$). And the marginal effects of first childbirths at age 18 and between age 19 and 21 were $-.27$ and $-.19$, respectively ($p < .01$). On 4-year college attendance, marginal effects of first childbirths before age 16 and between ages 16 and 18 were both $-.24$ ($p < .01$), and they were $-.22$ ($p < .01$) for both first childbirths at 18 and between ages 19 and 21.

Findings on 2-year college attendance show a different pattern with findings on other outcomes. First childbirths before age 16 and between ages 16 and 18 were significantly associated with lower rates of 2-year college attendance (marginal effects = $-.24$ vs. $-.12$, respectively, $p < .01$). First childbirths at age 18 or later were not significantly associated with 2-year college attendance.

On degree completion, first childbirth before age 16 was dropped from the analyses because it perfectly predicted “not complete BA degree” after taking into account covariates. Although it was not estimated in the regression, it was significantly associated with degree completion. Similar to findings on college attendance and 4-year college attendance, all variables of age at first childbirths were significantly associated with lower rates of BA degree completion except first childbirths between ages 21 and 25. The marginal effects of various ages at first childbirth on BA degree completion were not as large as those on college attendance or 4-year college attendance. Table 2 presents marginal effects from probit regressions. Figure 2 shows adjusted group rates of selected outcomes by age at first childbirth.

Although not addressed in the present study, findings on high school completion is presented in Table 2 as well. Findings indicate that first childbirths before age 16 and between ages 16 and 18 were significantly associated with lower rates of high school completion at age 28 (marginal effect = $-.18$ vs. $-.12$, respectively, $p < .01$). The marginal effect of $-.18$ for age at first childbirth before 16 on high school completion means that the rate of high school completion of the participants who had first childbirths before age 16 was 18% lower than those who had no childbirth by age 25. First childbirths at age 18 or later were not significantly associated with high school completion.

Discussion

Using an inner-city minority cohort born in 1980, the present study provides a comparable comparison with findings from previous studies. Findings from the present study indicate that the age of first childbirth is associated with women’s participation in postsecondary education above and beyond that of sociodemographic factors and early academic achievement for this at-risk group. Findings support the relations between early childbearing (first childbirth before age 18) and low participation in postsecondary education. In addition to early childbearing, age of first childbirth at age 18 and between ages 19 and 21 are also significantly associated with low participation in postsecondary education. Findings from previous studies have indicated the associations between first childbirth before age 20 and low education, such as lower rates of high school graduation and fewer years of schooling (Ahn, 1994; Klepinger, et al., 1995; Upchurch & McCarthy, 1990). The age cut in previous studies is slightly different from the present study. First childbirths at various age are discussed more in this section.

Age of First Birth and College Attendance

For participants whose first childbirths were before age 21, the earlier their first childbirths occurred, the lower the rates of their college attendance were. Based on both literature and

the data used in the present study, participants who gave birth to their first child before age 18 had lower rates of high school completion (additional analysis available upon request). The majority of those women therefore were not qualified to attend college due to their lack of a high school diploma or equivalent credential. Thus, it is not surprising that they had lower rates of college attendance. Participants who had their first childbirth before age 18 might be less likely to return to the educational track once they made their transition to motherhood.

Unlike participants who had their first childbirth before age 18, those who had their first childbirth at age 18 or between ages 19 and 21 actually had similar rates of high school completion as those who had not given birth by age 25. Participants in this group have similar possibility as those who had not given birth by age 25 to be eligible to enroll in college. However, they still had lower rates of college attendance than those who had not given birth by age 25. They might not have the capacity to pursue higher education because the transition to motherhood and the responsibilities of childcare thereof became their first priority. Therefore, the transition to work or higher education would have become a second priority (Maynard, 1997).

Another point worth noting is the difference between the findings on 2-year college attendance and other outcomes, which might be related to the timing and duration of 2-year college attendance. There is a significant difference in 2-year college attendance between participants who had first childbirth before age 18 and those who had no childbirth by age 25. Different from 4-year college, 2-year college provides a broad range of programs, such as vocational training, customized training for business and industry, and transfer education, and offers associate degrees (AA) and certificates that address highly specific training needs (Cohen & Brawer, 2008; Phillippe & Sullivan, 2006). Students can attend 2-year college first and then transfer to 4-year college, which occur frequently for low-income and academic performance prior to college are below average students (Cabrera, Burkum, & La Nasa, 2005).

In general, 2-year college is easier to access than 4-year college in terms of admission rates and tuition costs. Therefore, 2-year college (community college) is recognized as the most affordable and accessible way to higher education. In addition, programs require one to two years to complete, much shorter than 4-year college. Participants might be more likely to “give it a shot” because it does not require at least 4 years to complete, and programs in 2-year college provide more specific needs for job market. Although more participants in the study sample have attended 2-year college than 4-year college, only a few participants have completed their programs at 2-year college.

Age of First Birth and Degree Completion

Findings on degree completion are similar to findings on 4-year college attendance. If participants completed BA degrees in 4–5 years, they would have completed the degrees around age 22–23. The potential reasons for the negative association between first childbirths prior to age 19 and BA degree completion can be referred to the discussion on age of first childbirth and college attendance. Note that the marginal effects of various ages at first childbirth on BA degree completion were not as large as those on college attendance or 4-year college attendance because BA degree completion is contingent upon 4-year college attendance. In other words, the association between ages at first childbirth and BA degree completion is attenuated because major association will be in terms of 4-year college attendance.

Finally, first childbirths between ages 19 and 21 would mean participants gave births prior to BA degree completion and possibility had not completed half of the required credits yet if

they pursued BA degrees on the regular schedule. Transition into motherhood was likely to interrupt their degree completion more than those who gave births when they were more advanced in their programs and close to complete their programs. Motherhood delay until age 21 might increase the likelihood of college attendance and BA degree completion for participants in the study sample. The positive associations between motherhood delay until age 21 and postsecondary education are consistent with findings on the relation between first birth and health (Mirowsky, 2002), which suggested a pivotal age at first birth around 21.8. Parents who had their first birth before age 21.8 are less healthy than those who did not have first birth before age 21.8.

Limitations

Findings of the present study should be interpreted in light of three limitations. First, the study investigated associations among variables rather than causal relations. A woman's first childbirth could occur either simultaneously, before, or after achievement of the final status of their educational attainment. Therefore, it is important to explain the results as correlations rather than causal links. Nevertheless, people have the option to pursue further education later in their life even if they decide not to enroll in school follow the traditional education schedule. The relations examined in the present study might also be viewed as whether timing of first childbirth would be associated with women's intention of higher education in the future. It is possible that some women are not interested in education so they decide to enter into motherhood and make the transition sooner than other women. However, it remains important to know transition into motherhood at what age might be associated with lower risk of low educational attainment for this at risk group. Especially education might be particularly beneficial not only to those women but also to their children and this understanding would help policymakers design effective preventive and intervention programs to promote higher education among this group of women (Hansen, Hawkes, & Joshi, 2009; A. R. Miller, 2011).

Second, the CLS follows a selective sample of predominantly African-American youth growing up in high-poverty neighborhoods in Chicago. As a result, the findings should not be generalized to other socioeconomic brackets. The CLS was originally designed to evaluate long-term effects of an early childhood education program. Nevertheless, the longitudinal data of this inner-city minority cohort provides a unique opportunity to examine how transition into motherhood is associated with women's education among this group that has the highest rate of teenage births. Finally, the information regarding the ages at first childbirth mainly came from self-report. Self-report relies on the honesty and accuracy of participants' responses, thus the possibility of measurement errors should be noted.

Implications

The findings from the present study have implications on potential associations between timing of first childbirth and postsecondary education for high-risk minority women, which would be helpful on promoting higher education among this population. For this high-risk inner-city cohort, the relation between first childbirths before age 21 and lower rates of participation in postsecondary education is important. First, to examine the age further closely, early childbearing before age 19 can be connected to discussion on teenage pregnancy in the literature. Teenage pregnancy remains a crucial issue for this at risk group as over 30% of the study sample had their first childbirth before age 18. The significant associations between age of first childbirths before age 18 and lower rate of high school completion implies that women who gave birth before age 18 were more likely to never complete high school whether childbirth comes before or after dropping out of high school. Public policies that succeed in reducing teenage pregnancy and childbearing are more likely to increase the educational attainment of disadvantaged young women.

In addition to preventing teenage pregnancy, intervention can also be provided to reduce the negative influence teenage pregnancy might have on women. For example, first childbirths before age 18 are associated with low rate of high school completion, and those women are likely to remain as high school non-completers even at age 28. Therefore, they are not qualified to attend college. Policies should encourage women who had their first childbirth before age 18 to obtain a high school credential through alternative approaches. This can be accomplished by providing information on programs for high school credential in child care facilities, so mothers have more opportunities to learn how to obtain a high school credential and learn about the opportunities and benefits related to further education, and how might those benefits improve their and their child's future well-being. This would not only benefit individuals but also the society in a whole, as high school completion has become a basic requirement for employment. Furthermore, high school completion opens the opportunities for postsecondary education, which lead to increasing well-being for women throughout their life courses (Perna, 2005).

Second, first childbirths before age 21 are significantly associated with lower rates of college attendance and BA degree completion in this high-risk inner-city sample. Although at present African American women are achieving higher educational levels than they were during the 1970s, childbearing remains an important challenge for their transition to adulthood and higher education. Programs that prevent teenage pregnancy or delay the age of first childbirths to at least age 21 would likely increase those women's educational attainment.

Finally, in addition to delay age of first childbirths, programs could be developed to provide assistance for young women who entered motherhood but have yet completed their education. Findings from this at risk group imply that once women entered motherhood they were less likely to pursue higher education. Or they were more likely to leave without completing the degree if they gave birth while they were in college, which put them at risk of becoming college dropouts. This specific group might benefit from programs that help them stay in college or encourage them return to school after giving births.

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Figure 1.
Numbers of Participants by Age at First birth

Figure 2.
Adjusted rates of selected outcomes by age at first childbirth

Table 1

Child Characteristics of the Study Sample

Characteristics	Study sample (N =695)	Any childbirth by age 25 (N=472)	No childbirth by age 25 (N=223)
Black, %	94.10	94.70	92.83
Mother did not complete HS by child's age 12, % ¹	44.17	49.36**	33.18
Single parent by child's age 12, % ¹	68.63	72.25**	60.99
Four or more children in household by child's age 12, % ¹	32.95	34.96	28.70
Mother was teen (<18) at child's birth, % ¹	15.11	16.10	13.00
Mother unemployed by child's age 12, % ¹	53.96	60.17**	40.81
TANF/AFDC participation by child's age 12, % ¹	55.11	62.08**	40.36
60% or more poverty in school attendance area, % ¹	78.27	76.48	82.06
Number of Family risk index (8-point scale) ^{1 2}	4.30	4.56**	3.75
Missing any family risk indicator, %	5.18	4.67	6.28
Any child welfare case histories by age 10, %	12.52	13.77	9.87
Low birth weight (< 2,500 gms), %	13.38	13.56	13.00
Participation in CPC preschool program, %	67.19	65.89	69.96
Participation in CPC follow-on program, %	56.55	55.51	58.74
Average age at September 1990 ²	10.28	10.29	10.25
ITBS reading scores in fifth grade ²	115.51	113.36**	120.07

Note

¹ Indicators included in the family risk index.² F tests were conducted for those measures. Chi-square tests were used for other measures.**
p < .01.

Table 2

Marginal effects from probit regression (N=695)

Explanatory variables	HS completion	College att.	4-year college att.	2-year college att.	BA degree ^I
<i>Individual characteristics:</i>					
Race and ethnicity (1=black)	-.04 (.329)	-.11 (.225)	-.27** (.262)	.01 (.211)	-.04 (.353)
Age at September 1990	-.08* (.205)	-.14 (.172)	-.09 (.222)	-.14* (.165)	-.15** (.325)
Any child welfare history by age 10	.01 (.187)	-.05* (.158)	-.28** (.400)	.03 (.155)	--
<i>Family characteristics:</i>					
Mother did not complete high school by child's age 12	-.05* (.137)	-.12** (.112)	-.15** (.159)	-.05 (.109)	.01 (.224)
Single parent status by child's age 12	-.01 (.151)	.02 (.116)	.04 (.149)	-.01 (.112)	-.04 (.205)
Four or more children in household by child's age 12	.02 (.139)	.01 (.113)	.01 (.156)	.01 (.110)	-.03 (.237)
Mother less than 18 years old at child's birth	-.02 (.172)	-.05 (.148)	.02 (.212)	-.03 (.146)	.07 (.277)
Mother unemployed by child's age 12	.04 (.211)	.16* (.168)	.16* (.225)	.10 (.161)	.07 (.317)
TANF or AFDC participation by child's age 12	-.09* (.213)	-.18** (.166)	-.21** (.225)	-.08 (.160)	-.08 (.324)
If missing demographic variables	-.01 (.293)	-.05 (.232)	-.01 (.282)	-.06 (.230)	--
<i>CPC program participation and academic performance</i>					
CPC preschool program participation	-.03 (.147)	-.02 (.122)	.01 (.167)	-.04 (.118)	-.00 (.249)
CPC school-age program participation	.04 (.141)	-.02 (.118)	-.08 (.162)	.02 (.114)	.04 (.249)
ITBS reading scores at age 11 (5 th grade)	.003** (.004)	.008** (.004)	.01** (.005)	.005** (.004)	.007** (.008)
<i>Timing of first birth</i>					
Age at first birth less than 16	-.18** (.218)	-.37** (.212)	-.24** (.379)	-.24** (.214)	--
Age at first birth between 16 and 17.99	-.12** (.173)	-.28** (.144)	-.24** (.240)	-.12* (.141)	-.09** (.499)
Age at first birth at 18	-.02 (.256)	-.27** (.194)	-.22** (.269)	-.11 (.192)	-.08* (.531)
Age at first birth between 19 and 20.99	.01 (.209)	-.19** (.151)	-.22** (.208)	-.03 (.146)	-.07** (.301)
Age at first birth between 21 and 24.99	.05 (.277)	.02 (.180)	-.07 (.196)	.04 (.171)	.00 (.256)
No birth by age 25 (reference group)					
Pseudo R Square	.176	.150	.323	.051	.299

Note.

^I Sample size was 527 for BA degree because some variables were dropped from the analysis due to perfect prediction of the "0" group of the outcome.

Standard errors are in parenthesis.
2
* p < .05
** p < .01

Appendix 1

Description of Key Variables

Variables	N	Mean	S.D.	Min.	Max.
Individual Characteristics:					
Race (1 = African American)	695	.941	.236	0	1
Age at September 1990	695	10.28	.307	9.58	11.70
Any child welfare history by age 10	695	.125	.331	0	1
Family Characteristics:					
Mother did not complete HS by child's age 12 ⁺	695	.442	.497	0	1
Single parent status by child's age 12 ⁺	695	.686	.464	0	1
4 or more children in household by child's age 12	695	.330	.470	0	1
Mother was less than 18 years old at child's birth ⁺	695	.151	.358	0	1
Mother unemployed by child's age 12 ⁺	695	.540	.499	0	1
TANF/AFDC participation by child's age 12 ⁺	695	.551	.498	0	1
60% or more poverty in school attendance area	695	.783	.413	0	1
Missing from any sociodemographic factor	695	.052	.222	0	1
CPC program participation and academic performance					
Preschool participation	695	.672	.470	0	1
Follow-on participation	695	.566	.496	0	1
ITBS reading scores at age 11 (5 th grade) ⁺	695	115.51	15.65	64.0	160.0
Timing of first birth by Age 25					
Age at first birth less than 16	695	.085	.279	0	1
Age at first birth between 16 and 17.99	695	.227	.419	0	1
Age at first birth at 18	695	.084	.277	0	1
Age at first birth between 19 and 20.99	695	.176	.381	0	1
Age at first birth between 21 and 24.99	695	.108	.310	0	1
No childbirth by age 25 (Reference group)	695	.321	.467	0	1
Age at first birth	472	18.50	2.27	12.59	24.40
Educational Attainment at Age 28					
High school completion	695	.837	.369	0	1
Attendance of college	695	.495	.500	0	1

Variables	N	Mean	S.D.	Min.	Max.
Attendance of 2-year college	695	.397	.490	0	1
Attendance of 4-year college	695	.186	.389	0	1
BA degree completion	695	.071	.256	0	1

Note.

+ Variables have missing values, and missing values were imputed. Missing values range from 0.4% (maternal education) to 3.2% (maternal employment), except ITBS reading scores at age 11 (13.2%).