Intergenerational Transmission of Age at First Birth in the United States: Evidence from Multiple Surveys

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Abstract

It is well established that the timing of childbearing is transmitted from parents to children in the United States. However, little is known about how the intergenerational link has changed over time and under structural and ideological transformations associated with fertility behaviors. This study first considers changes across two birth cohorts from the National Longitudinal Study of Youth (NLSY) in the extent to which parents' age at first birth is transmitted to their children. The first cohort includes individuals born during the late 1950s through the early 1960s (NLSY79) while the second includes individuals born in the early 1980s (NLSY97). Results from discrete-time event history analyses indicate that the intergenerational transmission of age at first birth between mothers and daughters as well as between mothers and sons significantly increased over the period. Father's age at first birth had trivial effects on children's timing of parenthood in both cohorts. These results were confirmed by analyses of data from three cycles of the National Survey of Family Growth (NSFG) on five birth cohorts spanning the same time period. Over this period, age at first childbirth became increasingly younger for children born to teenage mothers and increasingly older for those born to mothers who entered parenthood after age 25. These patterns have important implications for reproductive polarization and the low-fertility trap hypothesis.

Keywords: Age at first birth; Intergenerational transmission; Transition to parenthood; Discrete-time event history analysis

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INTRODUCTION

Past research has revealed that fertility behaviors are transmitted from one generation to the next. Studies of various places and time periods repeatedly have found that the fertility of parents has a significant positive effect on their children's completed parity (Danziger and Neuman 1989; Murphy and Wang 2001; Anderton et al. 1987; Pearson, Lee, and Bramley-Moore 1899; Murphy and Knudsen 2002; Duncan et al. 1965), and there is some indication that this intergenerational link has grown stronger over time (Murphy 1999). Similarly, ample evidence suggests that the timing of parenthood is transmitted across generations, although much of the existing research focuses on whether children born to teenage mothers become teenage mothers themselves (Kahn and Anderson 1992; Furstenberg, Levine, and Brooks-Gunn 1990; Manlove 1997; Horwitz et al. 1991).[1]

Steenhof and Liefbroer (2008) observed, however, that much less is known about whether and how the relationship between parental and child age at first birth has changed over time. They identify two plausible theories yielding conflicting predictions about trends in the intergenerational link over the second-half of the 20th century. On the one hand, overall increases in initial childbearing age and decreases in completed fertility over time may have reduced children's reliance on their parents' experience, therefore reducing the intergenerational transmission of age at first birth. In addition, overall inter-cohort increases in educational attainment between parents' and children's generations may reduce educational similarity between parents and children. If educational similarity functions as a mechanism for the intergenerational transmission of fertility practices, this may further reduce the effect of parents' age at first birth on their children's entry into parenthood. On the other hand, Second Demographic Transition theory (Lesthaeghe 1980; van de Kaa 1987) asserts that fertility decisions increasingly have become a matter of personal preference in most industrialized nations with the relaxing of social control over fertility behaviors. In this context, close social networks, such as those within the immediate family, may become increasingly influential on individual decision-making regarding the timing of parenthood (Kohler, Joseph L. Rodgers, and Christensen 1999), resulting in increased intergenerational similarities. Moreover, the increasing prevalence and effectiveness of contraceptive methods over time also may increase the similarities between generations.

The existing research provides limited empirical guidance for adjudicating among these conflicting theories, especially in the U.S. context. Steenhof and Liefbroer (2008) investigated these trends in the Netherlands for cohorts born from 1935 to 1984. Using municipal population register data on 5.9 million residents, they found that mother-child intergenerational transmission of age at first birth increased over this period while father-child transmission did not change. The findings for mothers provide some evidence that this intergenerational link increased over time, at least in the Netherlands, but the inconsistent results for fathers leave us wondering about implications for the theoretical explanations. Barber (2001) demonstrated that age at first birth is transmitted intergenerationally in the U.S. as well, but changes over time in the strength of this relationship have yet to be examined for this national context.

Past research has been limited in three important respects. First, the social, institutional, and economic contexts that govern the U.S. fertility regime differ from those of European countries such as the Netherlands. For example, among western countries the U.S. has a relatively low mean age at first birth (23 for women and 25 for men [Martinez, Daniels, and Chandra 2012]) whereas the Netherlands has the highest (almost 29 for birth cohorts born in the mid-1960s [Frejka and Sardon 2006]). The U.S. teen birth rate remains one of the highest among industrialized nations, although it has been declining since the 1950s and reached a historic low in 2010 (Hamilton and Ventura 2012). Furthermore, there is substantially more heterogeneity in fertility behaviors across racial/ethnic groups in the U.S. compared to European countries (Lesthaeghe and Neidert 2006). Second, the analysis of Steenhof and Liefbroer (2008) incorporated only basic demographic measures available in the population register and lacked important determinants for age at entry into parenthood. For instance, Rindfuss and John (1983) found that, in addition to demographic factors, background characteristics such as religion, region of residence, number of siblings, and living with both parents in early adolescence have significant effects on age at first birth. More importantly, Steenhof and Liefbroer were not able to test the Kohler et al. (1999) hypothesis of increasing genetic influences on the transition to parenthood. Finally, Barber's (2001) study was based on data drawn from the Detroit Area Study which sampled only white women who were married at the time of the child’s birth. Thus, her results have significant limitations for making inferences to racial/ethnic minorities as well as to the U.S. population as a whole.

In the present study, I explore the intergenerational transmission of age at entry into parenthood in a more comprehensive fashion. The study has three main aims: 1) to test whether age at first birth is transmitted intergenerationally in the U.S. population; 2) to examine whether the effect has strengthened or weakened over time; 3) to test whether there are gender differences in the strength of the intergenerational link. These aims are addressed using data from the 1979 and 1997 waves of the National Longitudinal Study of Youth (NLSY79 and NLSY97) and cycles 5, 6, and 7 of the National Survey of Family Growth (NSFG). These data not only come from nationally representative samples, but also include detailed information on family background, sexual experiences, and socioeconomic conditions not addressed in past studies.

BACKGROUND

Models of Direct Transmission of Age at First Birth

Socialization theory is the dominant model of direct intergenerational transmission of demographic behaviors, including timing of entry into parenthood. The theory asserts that the conformity of children's behavior with that of their parents is the result of direct learning and/or indirect observation, whether conscious or unconscious, that occurs as children grow up (Barber 2000; van Poppel, Monden, and Mandemakers 2008; Steenhof and Liefbroer 2008). A large body of research demonstrates that parents' childbearing behaviors affect their children's preferences which, in turn, influences children's behaviors (Axinn, Clarkberg, and Thornton 1994; Thornton 1980; Barber 2000). Through socialization processes, parents and children come to share similar attitudes, values, and preferences (Bengtson 1975; Glass, Bengtson, and Dunham 1986). Similarities between parents and children are more likely when children internalize their parents' values, attitudes, and preferences (Bavel and Kok 2009), and this internalization is more likely to occur the more accurately children perceive their parents' expectations and values (T. E. Smith 1982).

Number of siblings is one of the key indicators that a mother's behavior will exert influence on children's fertility timing. Those who grow up with many siblings tend to become parents earlier than their peers from smaller families (Rindfuss and John 1983; Michael and Tuma 1985). This may be because children from larger families model that family size and start childbearing early in order to achieve the goal. Furthermore, more siblings may translate to fewer resources per child and may hamper educational or occupational attainment that, given their negative relationship, may otherwise serve as barriers to early entry into parenthood (Steelman et al. 2002; Kuo and Hauser 1997; Murphy and Wang 2001). Similarly, a greater number of siblings is associated with less time for parents to monitor children's behaviors (Steelman et al. 2002).

Socialization theory also suggests that the degree to which family culture is transmitted to a child depends systematically on birth order in the family (Booth and Kee 2009). In particular, some past research has demonstrated that firstborn children are more likely to conform to their parents' values as compared with their later-born siblings (N. E. Johnson and Stokes 1976). Nonetheless, the empirical evidence to date is yet inconclusive. For example, Booth and Kee (2009) recently observed a negative, but insignificant, effect of birth order on number of children ever born using the British Household Panel Survey. Reher, J. Ortega, and Sanz-Gimeno (2008) observed a similar negative, and this time significant, effect of birth order on completed fertility, but only for females and not for males.

Another important moderator of socialization processes, especially with regards to fertility values, is parental religious affiliation and commitment (Pearce 2002). Although the gap in fertility between Protestants and Catholics has declined substantially in recent years (Mosher, Williams, and Johnson 1992), Catholic and Protestant women still have significantly higher fertility than non-religious women in the U.S. (Frejka and Westoff 2008). In part, this is likely related to more traditional attitudes toward sexuality and greater disapproval of abortions and birth control methods that are more prevalent among Catholics and fundamentalist Protestants. Evidence suggests that, through socialization, these values later influence children’s fertility behaviors. For example, Thornton and Camburn (1987) found that having a mother who is a fundamentalist Protestant or who attends church more frequently is associated with more conservative attitudes toward sexuality and less sexual activity among adult children.

A second model of direct intergenerational transmission emphasizes social control, which operates at both the macro level, through social norms (Lesthaeghe 1980), and the micro level, for example through parental control (Smith 1988). Social control was once understood to mean the “capacity of a social group to regulate itself,” but the more recent literature incorporates socialization theory into the concept (Janowitz 1975). With regards to fertility behaviors, parents not only serve as behavioral role models for their children but also set rules and monitor their children’s dating and sexual behavior in order to control the timing of children’s entry into parenthood. Parents employ various techniques, such as advice, commands, and love withdrawal, in an effort to control their children’s behavior (T. E. Smith 1988). Parents also utilize educational and financial resources to reinforce their preferences for their children’s behavior (Goldscheider and Goldscheider 1993; Axinn and Thornton 1992). This fact highlights how social control in the form of social norms or rules, or external social control (Liska 1997), and internal social control, or socialization, are not mutually exclusive. That is, socialization practices in a family reflect the values of the whole society in which the family lives because parents themselves developed values through socialization. In this regard, socialization can be defined as “the process by which people acquire the behaviors and beliefs of the social world in which they live” (Arnett 1995: 618), and parents can be conceived of as the link between society and children in this process (Smith 1988).

Family disruptions can play an important role in shaping children's sexual behaviors and attitudes. Prior studies consistently demonstrate that male and female children who do not live with both biological parents tend to initiate sexual intercourse earlier (Capaldi, Crosby, and Stoolmiller 1996; Hogan and Kitagawa 1985; Newcomer and Udry 1984) and become parents at younger ages, compared to children growing up in intact families. In their analysis of NLSY79 data, Hofferth and F. Goldscheiders (2010) showed that males and females who grew up in single-parent families or who experienced multiple family transitions were significantly more likely to become parents at younger ages and less likely to marry the co-parents of their children. Research also indicates that levels of parental control and emotional support tend to be lower for children who grow up in disrupted families and, as a result, they are more likely to have internalizing and externalizing behavioral problems which are strongly predictive of early transition to parenthood (Thomson, McLanahan, and Curtin 1992; Demo and Acock 1988; Newcomer and Udry 1984; Rindfuss and John 1983; Hetherington 1972).

Social control may also operate on a more macro-level, as a person's geographical region of upbringing has been linked to age at first birth. Traditionally, the southern states permitted marriage at earlier ages and experienced higher fertility rates than other U.S. regions (Rindfuss and John 1983; Hofferth and F. Goldscheider 2010). These trends may reflect distinctive patterns of social control in this region. Likewise, metropolitan status of residence may impact the timing of parenthood due to systematic geographical differences in the availability of educational or occupational opportunities and levels of community ties and social control. For example, Zelnik and Kantner (1980) observed higher levels and earlier initiation of sexual activity among blacks living in central cities compared to those in suburban areas. This suggests that differences in the ecological contexts of different areas may result in earlier transition to parenthood in urban areas.

For example, it has been suggested that early parenthood is considered a more attractive alternative when opportunities for pursuing higher education or careers are more limited (Rindfuss and John 1983). The socioeconomic structure of communities is also closely tied to the number of single-parent households, presence of gang subculture, and prevalence of drug use among peers, all of which are more common in urban areas and may indicate lower levels of social control over fertility behaviors (Demo and Acock 1988).

Models of Indirect Transmission

In contrast to direct transmission models, models of indirect transmission assert that high observed correlations between the behaviors of parents and their children are a byproduct of the transmission of social statuses or genetic inheritance. Status transmission theory argues that parents do not directly transmit specific values and beliefs to their offspring. Rather, children inherit social, cultural, and economic resources and positions from their parents, and the resultant similarity in social status may lead to a resemblance in demographic behaviors between parents and children. An implicit assumption of the theory is that people who occupy the same socioeconomic position are more likely to have similar attitudes, values, and thus demographic behaviors, than people in different structural locations within a society. Stratification research has consistently shown that parents' and children's socioeconomic statuses, measured by educational attainment, occupation, or income, are positively associated (Mare 2011). Research shows that parents and children tend to share the same social class and ethnic and religious identification, and they are likely to achieve similar levels of educational attainment (Bollen, Glanville, and Stecklov 2001). Bengtson (1975) and Glass et al. (1986) proposed that parents and children have similar value orientations because they tend to have similar social structural positions.

Still, empirical studies investigating the intergenerational transmission of demographic outcomes, such as completed fertility (e.g., Booth and Kee 2009) or divorce (e.g., Teachman 2002), generally conclude that similarities in parents' and children's social positions explain some, but not all, of the variation in these outcomes. Moreover, it is unclear whether it is the similar social positions themselves that results in similar values and behaviors. For example, more highly educated parents may have greater educational aspirations for their children compared with their less educated counterparts. Through socialization, these expectations might lead children to elect education over early parenthood. Similarly, highly educated parents may be more knowledgeable about the adverse consequences of early marriage and parenthood, and this may result in greater social control of their children's fertility behaviors through stronger discouragement of sexual activity at early ages (Thornton and Camburn 1987).

Early studies that observed similarity in fertility behavior between parents and children interpreted this as evidence of genetic inheritance (e.g., Pearson et al. 1899). More recently, Potts (1997) and Foster (2000) have argued that humans are genetically predisposed to seek sexual relations and rear children when they arrive. A series of studies using behavior genetic design found evidence for a genetic influence on human fertility and changes in its patterns over time (Kohler et al. 1999; Kohler et al. 2006; Rodgers et al. 2001; Pettay et al. 2005). One indicator of the presumed genetic influence on age at first birth is age at menarche. Shanahan (2000) speculated that earlier menarche may indicate physical maturity and may lead to earlier age at first birth, and this hypothesis is generally supported by empirical research (Presser 1978; Udry and Cliquet 1982; Kirk et al. 2001). Further, the ability to conceive children during lifetime, or fecundity, also has been found to have strong effects on the timing of parenthood (Rindfuss and John 1983), and Pettay et al. (2005) observed significant heritability of fecundity among pre-modern Finnish women.

It should be noted that direct and indirect models of transmission are not mutually exclusive. For instance, parents’ resources influences their ability to socialize and exert social control over their children (Axinn and Thornton 1992). Parents’ social class may also impact their parenting styles, which may have substantial implications for children’s behaviors and socioeconomic success over the life course (Lareau 2002; Bodovski and Farkas 2008). Belsky, Steinberg, and Draper (1991) even hypothesized that pubertal maturation, such as menarcheal age, can be altered by family environment – most notably the presence of a stepfather. Furthermore, Bengtson and Troll (1978) contend that the key premise in socialization theory, that all influences flow from parents to children, is not tenable. In contrast to conventional socialization theory that hypothesizes persistent parental influences on children throughout children’s life course, Bengtson’s developmental aging hypothesis asserts that the strength of parental influence diminishes and changes direction after children reach middle-age. Consistent with this hypothesis, Steenhof and Liefbroer (2008) found evidence among a Dutch sample that parents’ influence on their children’s transition to parenthood becomes trivial after children reach age 30.

Changes in the Strength of Intergenerational Transmission across Birth Cohorts

Social control and genetic inheritance theories predict that the intergenerational link in fertility behaviors will have increased over time, especially for cohorts born after the late 1950s and early

1960s (Kohler et al. 1999). This is because second demographic transition theory posits that substantial changes in fertility and marital behaviors since the 1960s can be attributed to ideational or value shifts toward greater individual autonomy in decision-making (Lesthaeghe 1980; van de Kaa 1987; Lesthaeghe and Surkyn 1988). Moreover, Udry (1996) argues that the amount of variation in behavior that can be explained by biological factors increases as more choices are permitted to individuals in a society. Conversely, biological differences account for less variation in human behavior under greater social constraint.

Status inheritance theory similarly predicts an increase over time in the intergenerational transmission of timing of parenthood. There is considerable evidence that the intergenerational persistence of socioeconomic status has increased markedly among recent cohorts (Beller 2009; Mare 2011), owing to increases in assortative mating (Schwartz and Mare 2005; Schwartz 2010) and inequality in parental resources (McLanahan 2004; McLanahan and Percheski 2008), the effects of which accumulate over one's life-course (DiPrete and Eirich 2006). Thus, given the close link between social status and fertility behaviors, status inheritance theory expects that the intergenerational transmission of timing of the transition to parenthood would have increased in more recent cohorts.

Socialization theory has less clear implications for trends in the intergenerational transmission of fertility. On the one hand, the substantial expansion of public education and social welfare systems may have undermined the importance of parents as socialization agents. In addition, parents increasingly have emphasized independence and autonomy over conformity and obedience when socializing their children (Alwin 1990). These structural and cultural changes may have reduced the intergenerational transmission of fertility behaviors. On the other hand, there is mounting evidence that uncertainties in the life course events, such as completion of schooling, getting a job, and transition to marriage and parenthood, has increased in most developed nations. Since the degree to which individuals learn from the experiences of those in their close social networks tends to increase with increased uncertainty (Kohler, Billari, and J. A. Ortega 2002), intergenerational transmission also may have increased.

In addition to these theoretical predictions, changes in more proximate determinants of fertility (Bongaarts 1978; Bongaarts 1982) imply a potential decline in the intergenerational transmission of age at first birth. Most notably, increased prevalence and effectiveness of contraceptive methods enabled women to engage in sexual relations without concern for interruption of their human capital investment through education or labor force participation due to unwanted births (Goldin and Katz 2002; Bailey 2006). To the extent that this enabled individuals to better control their timing of entry into parenthood, the parental influence would abate.

In summary, the various theoretical frameworks together suggest that the intergenerational link in age at first birth likely varies over time depending on a wide range of social processes occurring in the population. However, the predicted direction of the trend in the U.S. over the second half of the 20th century is unclear given the different theoretical perspectives and the lack of empirical investigation. For these reasons, the question of these trends needs to be examined with empirical data.

Gender Differences in Intergenerational Transmission

Psychological theories suggest that intimacy and understanding is greater among same-sex parent-child dyads (i.e. mother-daughter or father-son) than opposite-sex dyads (Boyd 1989;

Aldous and Hill 1965). However, in research for which both parents are included, estimates of transmission from mothers to children tend to be larger than from fathers to children, indicating that mothers may be the more influential parent. In their analysis of data from the Detroit Area Study, Thornton and Camburn (1987) found that the effect of maternal attitudes on children's behaviors and attitudes related to sexuality, such as ever having sexual intercourse, number of sexual partners, and frequency of coitus, was greater for daughters than for sons, which suggests that mothers have more influence on their daughters. Still, in their examination of similarities in the political and religious orientations and behaviors of parents and their children, Acock and Bengtson (1978) found that, on average, mothers exerted more influence in most areas on both sons and daughters than did fathers. Steenhof and Liefbroer (2008) also found that intergenerational transmission of age at first birth is stronger from mothers than from fathers, but this finding was limited to when children were young (i.e. before age 30). Smith (1982) hypothesized that these disparities in influence may result from mothers tending to interact with their children more than fathers.

METHODS

Data

This study draws data from two sources: the National Longitudinal Survey of Youth 1979 (NLSY79) and 1997 cohorts (NLSY97), and three cycles of the National Survey of Family Growth (NSFG). The two NLSY cohort studies are part of the National Longitudinal Surveys (NLS) program, conducted by the Bureau of Labor Statistics. The NLSY79 includes data on a nationally representative sample of 12,686 males and females who were 14 to 22 years old when they entered the study in 1979. Blacks, Hispanics, and economically disadvantaged youth were oversampled. The cohort was interviewed annually through 1994, after which the survey has been administered biennially. The most recent wave of data collection was completed in 2010. The NLSY97 contains data on a nationally representative sample of 8,984 males and females born between 1980 and 1984. Participants thus ranged in age from 12 to 16 by the end of 1996 when youth were recruited to participate in the study. This study also oversampled non-Hispanic Black and Hispanic youths. This cohort has been interviewed annually since 1997. The most recent round of the NLSY97 was administered in 2009. After case-wise deletion, the analytic samples include 7,189 NLSY79 participants (3,532 males and 3,647 females) and 6,278 individuals (3,239 males and 3,039 females) from the NLSY97.

The National Survey of Family Growth (NSFG) is a multi-cohort cross-sectional national study conducted by the National Center for Health Statistics (NCHS) of the Centers for Disease Control and Prevention (CDC). The NSFG was first conducted in 1973 and since has been conducted six times—in 1976, 1982, 1988, 1995, 2002, and 2006-2010. In 1973 and 1976 (cycles 1 and 2), the survey interviewed women 15–44 years of age who were currently married or had been married. In 1982 (cycle 3), the survey was expanded to include women 15–44 years of age regardless of marital status. Data on male respondents have been available only since 2002 (cycle 6).

This analysis employs data from cycles 5, 6, and 7 of the study, respectively conducted in 1995, 2002, and 2006-2010 (National Center for Health Statistics 2011). Cycles 1 through 3 are excluded from the analysis because they did not ask about women’s age at first childbirth. Although cycle 4 included information on mother’s age at first birth, it lacked data on important predictors in the current analysis, such as father’s education, respondent’s religion of up-bringing, and number of siblings, and was thus excluded. Cycle 5 is a nationally representative sample of all women aged 15-44 in 1995, while cycles 6 and 7 are nationally representative samples of all men and women in 2002 and 2006, respectively. To make comparisons between the NLSY and NSFG, the NSFG sample was restricted to participants who were born in 1957 through 1984. These participants were then grouped into five birth cohorts -- two corresponding to the NLSY samples and three five-year intervals for the interim cohorts -- representing all NSFG participants born: 1957-64 (same as the NLSY79), 1965-69, 1970-74, 1975-79, and 1980-84 (same as the NLSY97). After case-wise deletion, the analytic sample included 31,065 participants, ranging from 5,800 for the 1980-84 cohort to 6,547 for the 1975-79 cohort.

Measures

Mother's and Father's Age at First Birth. These variables were constructed from the birthdates for each respondent's mother, father, and first-born child in the family (either the respondent or the oldest sibling). In case of the NLSY79 and NLSY97, dates of birth for each family member and relationships among family members were ascertained from household rosters or respondents' reports. From these, each parent's age at first birth was computed by subtracting the parent's year of birth from the first child's year of birth. In the NLSY79, respondents' were asked the dates of birth for natural parents in 1987 and 1988. For respondents missing observations on both of these questions, parents' dates of birth were obtained from household rosters, which were collected in all rounds from 1979 to 2008. The bulk of sibling information in the NLSY79 was collected in the 1979 and 1993 survey rounds. These were used to determine year of birth for each sibling up to the 13th sibling in each family.

The NLSY97 includes a pre-generated variable for mother's age at first birth that is used in the present analysis.[2] However, father's age at first birth was not provided and thus was constructed in a similar manner as with the NLSY79 data. Dates of birth were first ascertained for (resident or nonresident) biological fathers and for each sibling in a family using the household rosters. Father's age at first birth was then calculated by subtracting the oldest sibling's year of birth from the father's year of birth. For all NLSY data, the variables for mother's and father's age at first birth were centered on the mean to ease interpretation. Each variable was centered by subtracting the analytic mean for that variable from the observation for each case to create a new variable with a mean of zero that represents each parent's distance in years from the mean age at first birth.[3] For the NSFG data, mother's age at first birth is a five-category ordinal variable where the response options are: less than 18, 18-19, 20-24, 25-29, and 30 and over. However, date of birth for fathers and siblings and father's age at first birth were not directly measured in the NSFG. For this reason, father's age at first birth was not observed nor could it be constructed from the available NSFG data.

Number of Siblings and Birth Order. For the NLSY79, the variable for number of siblings was constructed based on the number of siblings reported for each respondent in 1979. For those with missing observations for this item, the count for number of siblings in 1993 was used. The variable for birth order was determined based on the NLSY79 survey question asking how many older siblings each respondent had in 1979. For the NLSY97 sample, number of siblings and birth order were both determined using the household roster. For both NLSY samples, siblings were enumerated regardless of biological relationship (e.g., step siblings and half siblings were included). The NLSY79 did not distinguish biological relationships until the 1993 round of data collection, and although the NLSY97 did measure the biological relationship of each resident and nonresident household member, all kinds of siblings were included in the present study. This is appropriate because it is believed that interactions with siblings as part of family environment, rather than biological relationships per se, are consequential for the timing of parenthood. In the NSFG, number of siblings is determined based on the reported number of children born to each respondent's mother. Given that the vast majority of mothers retain custody of their children after separation or divorce, counting siblings from the maternal line is not unreasonable for determining the number of siblings in the household in which each respondent grew up. Birth order for NSFG respondents could not be determined as the NSFG did not directly measure birth order nor did it collect the date of birth for each sibling.

Living Arrangements during Adolescence. At the baseline interview, NLSY79 respondents were asked, "With whom were you living when you were 14 years old?" Four response categories were offered for this question: both parents, stepfather or stepmother, mother only, and all other parental living arrangements. In the NLSY97, respondents were asked about their current relationship to household parent figure at the baseline interview in 1997, when respondents were aged 12-16. The response categories for this question were re-coded to match the NLSY79. In the NSFG, living arrangements during adolescence were measured using two variables. First, respondents were asked about the parents with whom they were living at age 14 as in the NLSY79 but with only three response options (it did not include the mother-only category). Thus, living arrangements around age 14 are measured in all three samples. In addition, the NSFG includes a dichotomous variable measuring whether respondents ever lived on their own before reaching age 18. In all analyses, omitted category was those living with both parents.

Religion of Up-Bringing. For the NLSY samples, religion of up-bringing is determined by the religion in which respondents' reported they were raised. For each sample, this was reported at the baseline data collection -- in 1979 for the NLSY79 and in 1997 for the NLSY97. The NSFG similarly asked respondents the religion in which they were raised at each cycle. Although both the NLSY and NSFG surveys included measures of respondents' current religious affiliations in addition to the religion in which they were raised, the present study utilizes only the latter because it is religion conceptualized as a family environmental factor that is theoretically linked to age at first birth. In each sample, religion of up-bringing was measured with three dummy variables indicating that respondents were raised in Catholic, Protestant, or other religion, as compared to the omitted category of no religion.

Standard Metropolitan Statistical Area (SMSA) and Region. In the NLSY79 and NLSY97, SMSA was determined based on the county, state, and zip code of current residence reported at baseline. Although these measures were available for every round of the NLSY79 and NLSY97, the baseline measure is used in order to best represent the community environment in which respondents lived during adolescence or early adulthood. The categories for SMSA include not in SMSA, in SMSA but not central city, and in SMSA and in central city. Note that the category "SMSA, not in central city" was assigned to all respondents with ambiguous central city statuses, i.e., those whose SMSA central city was not known. The SMSA variables were measured as three dummy variables where the omitted category is not in SMSA. In the NSFG, SMSA reflects respondents' current residence at the time of interview and is again measured with the same three dummy variables. In all datasets, geographical region denotes the census region of the respondent's baseline residence for NLSY and current residence for NSFG.

Education. For both NLSY samples, parental educational attainment for each respondent was measured as the highest grade completed by a parent as of the latest interview date. This is a continuous variable top-coded at grade 20. In the NSFG, the question asking about parents' educational attainment included only four response categories: less than high school, high school graduate, some college, and college graduate or over. For this sample, the parental educational attainment variable is thus a four-category ordinal variable measuring the highest education attained by a parent at the time of interview. The NSFG data also include a variable for respondents' own educational attainment. Although the survey response was originally recorded as years of education, this variable was re-coded to have the same categorization as the parental education measure.

Age at Menarche. All three datasets include continuous measures of age at first menstrual period for female respondents. In both the NLSY79 and NLSY97, missing observations for those who failed to respond to this question were imputed using mean values from the sample. In addition, a dummy variable indicating a missing value in the original data for this variable was included in the model (Paul et al. 2008). However, missing observations for menarchael age in the NSFG were not imputed because of sufficient number of nonmissing values.

Race/Ethnicity. Respondent race/ethnicity was measured at baseline for the NLSY samples and at the time of interview for the NSFG sample. In all three samples, race/ethnicity had four response categories: non-Hispanic white, non-Hispanic black, Hispanic, and non-Hispanic other race. Hence, respondent race/ethnicity was measured using three dummy variables where the omitted category was non-Hispanic white.

It should be noted that variables measuring aspects of marital status, such as age at marriage, duration of marriage, or time-varying marital status, are excluded intentionally from the analyses. Such variables may represent the amount of time respondents are exposed to potential conception of a child and thus may be important determinants of age at first birth if getting married leads couples to become pregnant. However, significant theoretical and empirical evidence suggests that marital behaviors and timing of first birth are reciprocally related (Rindfuss, Morgan, and Swicegood 1984). For instance, unexpected pregnancy may cause some couples to get married. Moreover, the decisions about marriage and childbearing may result from a shared underlying third factor. For these reasons, measures of marital status are excluded from the analysis as they may introduce endogeneity into the models.

Analyses

Logistic regressions are employed to estimate discrete-time hazard models of intergenerational transmission of age at first birth. The discrete-time event history technique produces results almost identical to those of continuous-time hazard models (Singer and Willett 2003; Allison 1982). However, the discrete-time event history approach is more straightforward than continuous-time models for incorporating time-varying covariates and duration dependence into the model (Jenkins 1995). The dependent variable in the discrete-time model is a dichotomous indicator of whether the respondent experienced a live birth in the interval between two consecutive years, given that no birth occurred by the beginning of the interval. Once a birth occurs, the individual is no longer exposed to the risk of first birth and is removed from the risk set. Additionally, individuals who did not experience a birth until the most recent interview year were treated as censored at that year. For the analyses of the NLSY samples, logistic regressions of the following form were estimated:

$$\log\left(\frac{p_t}{1-p_t}\right) = \alpha + \beta_1 MAFB + \beta_2 FAFB + \beta_3 NLSY97 + \beta_4 (MAFB \times NLSY97) + \beta_5 (FAFB \times NLSY97) + \sum(\beta_k X_k),$$

where P_t is the probability of first birth at discrete time period t, conditional on a survival in period t-1, MAFB denotes mother's age at first birth, FAFB refers to father's age at first birth, NLSY97 denotes a dummy variable equal to 1 if the birth cohort is NLSY97 and 0 if the birth cohort is NLSY79, MAFB×NLSY97 and FAFB×NLSY97 refer to the product terms between birth cohort and mother's and father's age at first birth, X_k represents all other explanatory variables in the model, β_1 through β_k represent the effects associated with the explanatory variables, and α is the constant term. The effect of time is also included in the model to capture trends in the hazard rate of first birth. Because the hazard of first birth was expected to increase by respondents' mid-20s and decrease thereafter, the current model included a linear as well as a quadratic term that allowed the hazard to change over time.[4] In addition, because the NLSY sampled multiple respondents from the same household, robust standard errors that correct for clustering of observations within families were calculated.

Logistic regressions for the NSFG take the same form as the equation above with a few exceptions. First, as noted above, father's age at first birth (FAFB) is omitted from the analysis as a measure was unavailable in the data. Second, mother's age at first birth (MAFB) and birth cohorts were each included as a series of four dummy variables since both are categorical variables with five levels. This also implies that 16 interaction terms between MAFB and birth cohorts were included in the model.

RESULTS

NLSY

Table 1 presents means and standard deviations of the independent variables, delineated by cohort and gender. Reflecting the secular trends of increasing childbearing age in the United States, mother's age at first birth increased approximately one year for both male and female respondents over the period examined. Father's age at first birth also increased over the same period, but only slightly. Consistent with other national data (Davis 1981), parents of the NLSY97 cohort attained, on average, approximately one more year of education compared with parents of the NLSY79 cohort. However, there was only a slight increase in the respondent's educational attainment. Reflecting the substantial increases in divorce and remarriages that American families experienced since the second half of the 20th century (Bumpass 1990; Cherlin 2010), the proportion of respondents that lived with a step-parent or single mother more than doubled among the NLSY97 cohort as compared to the NLSY79 cohort, while the share of those who lived with both biological parents fell significantly. As Lesthaeghe and Neidert (2006) observed, the proportion of respondents raised without religion increased substantially between the two birth cohorts of both men and women. Those who grew up in Catholic families decreased somewhat, whereas those growing up in Protestant families remained approximately the same over the period. Geographical dispersion of the residence did not differ significantly, though there is a significant increase in the proportion of central city residents among the NLSY97. Reflecting the secular decline of fertility in the U.S., the number of siblings for a member of the NLSY97 cohort is, on average, approximately half of those in the NLSY79 cohort.

The decreasing number of siblings also resulted in a doubling the proportion of first born child. There is a slight decrease in age at first menstrual period (about 3 months) between the two cohorts of women.

[TABLE 1 ABOUT HERE]

Figure 1 presents kernel smoothed estimates of the hazard function of transition to parenthood for both samples (Cleves et al. 2010; Hosmer, Lemeshow, and May 2008), outlined by gender and by mother's age at first birth.[5] Consistent with Steenhof and Liefbroer (2008), it shows that the curve moves to the right as the mother's age at her first birth increases, meaning that mother's age at first birth and children's age at first birth is positively associated. However, this relationship was more pronounced between mothers and daughters than it was between mothers and sons. Furthermore, the categorical differences of a mother's age at first birth disappear after the respondent reaches approximately age 30 (see NLSY79 Female panel), which is consistent with the developmental aging hypothesis (Bengtson 1975). This also replicates the results from Steenhof and Liefbroer (2008). Comparison between NLSY79 females and NLSY97 females indicate that the gap between MAFB less than 18 and MAFB 18-19 increased while gaps among the other MAFB categories decreased. Although this may indicate a strengthening of the effect of MAFB over time, it should be noted that the hazard functions did not account for other control variables.

[FIGURE 1 ABOUT HERE]

Results of the logistic regression predicting transition to parenthood, by cohort and gender, are presented in Table 2. First, to test whether the interaction is statistically significant, goodness-of-fit for models that include product terms and exclude product terms were compared separately for males and females (results are not shown here). The differences in deviance statistics between these models are 42.09 ($p < .01$, 2 *d.f.*) for females and 27.05 ($p < .01$, 2 *d.f.*) for males, suggesting that there is a statistically significant interaction between parent's age at first birth and respondent's cohort. Note that the estimated regression coefficients for MAFB are negative and statistically significant, indicating that among the NLSY79 cohort one additional year in mother's age at her first birth was associated with a decrease in the odds of a son's and a daughter's transition to parenthood, of two percent ((1-exp[-0.018]) × 100) and one percent ((1-exp[-0.012]) × 100), respectively. Among the NLSY97 cohort, a one year increase in mother's age at her first birth is associated with a 4.5 percent ((1-exp[-0.018 - 0.028]) × 100) decrease in the odds of a son's first birth and with a 5.5 percent ((1-exp[-0.012 - 0.045]) × 100) decrease in odds of a daughter's transition to motherhood. The coefficients for the interaction term between MAFB and NLSY97 was also negative and statistically significant, suggesting that for every one year increase in MAFB, the odds of NLSY97 decreases by 3 percent for males and 4.4 percent for females. In other words, the effect of the mother's age at her first birth on the children's age at entry into parenthood has become increasingly negative between cohorts born in the late 1950s and those born in the early 1980s.

[TABLE 2 ABOUT HERE]

Figure 2 illustrates the predicted *probabilities* of giving a first birth before respondents reach age 25, which is the peak age of childbearing, by mother's age at first birth for males and females. This graph is derived from the estimated coefficients in Table 2, with all covariates set to their mean value except respondent's age and MAFB. The graph shows that as MAFB increases, the son's or daughter's probability of transitioning to parenthood decreases -- although females have a significantly higher probability as compared with males. More importantly, prior to an MAFB of 20, the probability of birth is higher for NLSY97 males and females compared to their counterparts in NLSY79. However, after the MAFB surpasses 20, the probability for the NLSY97 sample falls steeply, while the probability for NLSY79 falls more gradually. As a result, the gap in the probability of having a first birth by age 25 between the two birth cohorts grows as MAFB increases. When a respondent's probabilities of transition to parenthood by age 20, 30, or 35 were calculated, the results were essentially the same. These results demonstrate that those born to teenage mothers among the younger cohort (NLSY97) are more likely to give birth at relatively younger ages compared with the older cohort (NLSY79). By contrast, those who were born to relatively older mothers among the NLSY97 sample are less likely to give birth compared to their counterparts in the NLSY79 sample.

[FIGURE 2 ABOUT HERE]

Regarding the control variables in Table 2, the following explanations are warranted. First, consistent with past studies (e.g., Hofferth and F. Goldscheider 2010), the results indicate that growing up with a step-parent, the mother only, or other parents all significantly increased transition to motherhood. The presence of a step-parent among the non-parental situations seems to exert the strongest influence on young women's entry into motherhood. Using the NSFH (National Survey of Families and Households), Aquilino (1991) also found that if a stepfather is present, young women are much more likely to leave the mother's family at young ages. For men, however, only growing up with a step-parent has a significant and positive effect on the transition to fatherhood. Second, status inheritance theory is not supported by the result. As a proxy for parents' social status, the mother's and father's years of schooling have a significant and negative effect on a female's transition to motherhood, though only the mother's education was significant for males. When the respondent's education was included in the model, the magnitude of the coefficients for parent's education decreased, but remained significant. This implies that the effect of parents' social status on children's timing of parenthood can be only partially mediated by children's status attainment. Third, consistent with past studies (Hogan and Kitagawa 1985; Manlove 1997), the number of siblings is significantly and positively associated with a risk of fertility for males and females. Although some argued that first-born children are more likely to conform to their parent's values and attitudes and, as a result, show a greater extent of socialization compared with later-born children (Hendershot 1969; Sulloway 1996), the hypothesized effect of being first-born was found significant only among males. Fourth, there is only weak evidence supporting the genetic inheritance model. The coefficient for the quadratic term is significant and negative, while the linear term is positive and insignificant, meaning that only those who started their menstrual period at later ages are less likely to give birth. Finally, living in a metropolitan area during adolescence was not associated with a risk of fertility. However, living in the Northeast appears to decrease significantly the risk of childbearing for males and females.

NSFG

Descriptive statistics for the variables used in the analysis of NSFG are presented in Table 3. As observed in the NLSY, mother's age at birth has been increased from the late 1950s to the early 1980s. It appears that the greatest change occurred between the 20-24 group and the 25-29 group, while other categories remained approximately the same. Over the period analyzed, the proportion of respondents age 20-24 decreased by four percentage points while the proportion of respondents age 25-29 increased by eight percentage points, suggesting an increase in the mean age at first birth. Note, however, that a significant number of the early 1980 cohorts were born to mothers aged 20-24. Reflecting the secular trend in declining fertility over the period, those born in the early 1980s have, on average, one less sibling than those born in the late 1950s. Over this period, parents' educational attainment increased considerably. Furthermore, consistent with the trend of skyrocketing female labor force participation (Casper and Bianchi 2002), the fraction of mothers who worked full-time during the respondent's childhood (ages 5 to 15) increased substantially. Although NSFG also showed decreasing proportion of living with both parents, the size of the change appears to be somewhat smaller compared with NLSY. Also note that living with the mother only is included in the other parental living arrangement category, and that it increased significantly over the period.

[TABLE 3 ABOUT HERE]

Figure 3 shows the hazard function of giving birth for males and females by birth cohort and the age at which their mother had her first child. Consistent with NLSY results and previous research (Steenhof and Liefbroer 2008), the overall pattern for both males and females is that the hazard is lower as MAFB increases before sons and daughters reach age 30; after age 30 there are no discernible differences. This implies that being born to an older mother suppresses children's risk of early childbearing, but does not raise the risk of late parenthood. When looking across birth cohorts, it appears that the discrepancies of hazard by MAFB increased for both females and males alike since the late 1970s. Moreover, the growing gap seems to arise from higher risk for those born to youngest mothers (MAFB 18 or less) and lower risk for those born to older mothers (MAFB 25 and over). This observed pattern aligns with results from the analyses of NLSY samples.

[FIGURE 3 ABOUT HERE]

Same as the analyses of NLSY, discrete-time event history analysis, using logistic regression, was conducted and the results are presented in Table 4. The goodness-of-fit of models that include and exclude the interaction terms were compared separately for males and females (results are not shown here). The differences in deviance statistics between these models are 82.57 ($p < .01$, 16 *d.f.*) for females and 65.86 ($p < .01$, 16 *d.f.*) for males, suggesting that there is a statistically significant interaction between parent's age at first birth and the respondent's cohort. The first set of coefficients under mother's age at first birth represents the odds of giving a birth for those who were born from 1957-64 (the reference category). Women born to mothers who were aged 25-29 at her first birth were 19 percent ((1 - exp[-0.205]) × 100) less likely to give birth compared with those born to mothers who were less than age 18. Similarly, daughters born to mothers who gave a birth at 30 and older were 22 percent ((1 - exp[-0.248]) × 100) less likely to give birth than those who were born to mothers age 18 or younger at her first birth. Though the coefficients are not statistically significant for daughters born to mothers in their late teens or early 20s relative to those born to mothers who were aged less than 18, the coefficients showed a negative gradient. However, these patterns were not observed among males who were born from 1957-64. The coefficients for all MAFB categories were positive, and males born to mothers who were age 18-19 were significantly (23 percent) more likely to enter into parenthood than those born to mothers whose ages were 18 and under.

More importantly, the second set of coefficients under birth cohort indicates strengthened effects of the mother's childbirth during early teenage years on her children's transition into parenthood. Note that all the coefficients in the block were statistically significant and monotonically increase at subsequent birth cohorts. Specifically, daughters born from 1965-69 to mothers who gave a birth before age 18 are 14 percent (exp[0.135]) more likely to become a mother than daughters born to similar mothers from 1957-64. The odds were 24 percent, 49 percent, and 62 percent for the 1970-74, 1975-79, and 1980-84 cohorts, respectively. These same patterns were observed among males born to mothers who were aged 18 or less: the odds were 1.24, 1.62, 1.73, and 2.22, respectively. This clearly indicates that the hazard of birth increased for children who were born to teenage mothers in more recent cohorts. In addition, the intergenerational link appears to be enhanced among females born during late 1970s and males born during the early 1980s.

Interaction terms between MAFB and cohorts were organized to show the trends over birth cohorts within a MAFB category. Note that the omitted category for these coefficients is respondents born from 1957-64. Overall, the interaction terms clearly shows a negative and linear trend over the period, except for the effect of MAFB 18-19 on a female's hazard. Specifically, within a mother's age at first birth, later-born cohorts of both males and females show an increasingly negative birth hazard. Furthermore, the increasing intergenerational transmission was pronounced among MAFBs 25 and over. Therefore, these patterns confirm that the increases in intergenerational transmission at the extremes of mother's age at first birth which were observed among the NLSY samples.

[TABLE 4 ABOUT HERE]

Regarding control variables, the results are largely in accordance with those from analyses of NLSY samples, with a few exceptions. First, the coefficients for mother's employment status, which was postulated to diminish the mother's ability to control children's behaviors and the time for developing a close bond with children, were insignificant for both males and females. This implies that increased economic resources from mother's employment might outweigh the mother's reduced time with children. Using the Detroit Area Study, Thornton and Camburn (1987) also failed to find a significant effect of maternal employment on the respondent's sexual behaviors and attitudes. Second, though NSFG evidence did not support status transmission theory -- because parent's education had a significant and negative effect on children's transition to parenthood -- mother's education seems to not matter for a son's timing of fatherhood (unlike the NLSY). Third, being raised with a protestant religion, relative to growing up with no religion, is positively and significantly associated with the hazard of birth for both sexes; the effect was found only for males in the NLSY samples. Finally, age at menarche, a proxy for a physical maturity, indicates a clear and significant curvilinear relationship with the hazard of motherhood, as the genetic inheritance model suggested (Presser 1978; Shanahan 2000; E. A. Smith, Udry, and Morris 1985);the effect of age at menarche was only marginally significant among the NLSY sample. Nonetheless, it should be noted that the significant effects of menarcheal age in NSFG should be interpreted with some caution: when analyzed by birth cohorts, significant effects were found only among the cohorts born from 1957-64. Also note that measurement error in the age at menarche in the NSFG might be larger than NLSY: since the NSFG samples were comprised of women at all reproductive ages, (i.e., 15-44) and menarche typically begins around age 16-17, a substantial proportion of the women experienced it years or decades ago. By contrast, because NLSY has been administered annually or biennially, the recall bias might be smaller than for NSFG. The evidence for genetic predisposition is rather weak and, moreover, the posited strengthened influence of genetics in more recent cohorts (Kohler et al. 1999) was not supported in this study.

Besides these differences, the results from analyses of the NSFG reinforce the importance of living arrangements during adolescence on the timing of transition into parenthood. As in the NLSY, exposure to a non-intact family environment, such as step-parents or a single parent, significantly elevates the odds of becoming a parent for both males and females. Moreover, an experience of independent living before age 18 was associated with a 22 percent and a 54 percent increase in the odds of transitioning to parenthood for males and females, respectively. Waite, F. K. Goldscheider, and Witsberger (1986) suggested that young adult's independent living makes parental control over their children's behaviors, especially sexual activities, more difficult and may result in weakened intergenerational transmission of values or beliefs.

Robustness of Estimated Trends in Intergenerational Transmission of Age at First Birth

Robustness of the estimated trends in the intergenerational transmission of age at first birth was assessed with several additional analyses. First, though event-history analysis technique properly deals with the right censoring problem (see, e.g., Li and Wu 2008; Wolfinger 2011), the youngest cohorts in the NLSY and NSFG, born in 1980 through 1984, were exposed to the risk of giving birth for 25 to 30 years by the end of the observation period, which are shorter periods compared with older cohorts. To address this concern, the age of respondents in all models was restricted to 30 years, which is the maximum age that the youngest cohort could reach by the end of 2010. In both NLSY and NSFG, as expected, the results were virtually the same.[6] Secondly, educational attainment may have a reciprocal association with the timing of parenthood (Cohen, Kravdal, and Keilman 2011). That is, unplanned pregnancy and childbearing may inhibit educational attainment, especially for women. To address the potential endogeneity problem of education, the time-varying variable of “enrollment status” in each year of NLSY79 and NLSY97 was replaced by the “years of completed schooling” variable. (Note that the enrollment status variable was lagged one year.) Since the enrollment status was available only from 1979 and 1997 and there were missing data in each round, the number of person years was reduced significantly. Nonetheless, the results remained the same as those in the main analyses. In the case of NSFG, event-history data for school enrollment is not available; the sample was thus restricted to those who were older than 25 and had not given birth at the time of the interview because it was assumed that the vast majority of individuals age 25 and over would have completed schooling. Again, the results were virtually the same as those in the main analysis.

SUMMARY AND CONCLUSIONS

This article examined and compared the intergenerational transmission of age at entry into parenthood among cohorts born from the late 1950s and the early 1960s (NLSY79) to cohorts born in the early 1980s (NLSY97). Additional analyses were conducted using NSFG samples over the same time period as the NLSY samples. Empirical evidence from past research is limited, either because it was conducted in European contexts (e.g., Steenhof and Liefbroer 2008) which have significantly different social and demographic regimes than the U.S., or because data were drawn from a single city in the U.S. (Barber 2001). As a result, little is known about whether parents’ age at first birth is transmitted to their children at the national level, and if so, how the intergenerational link has been changed between 1960s and 1980s. To fill this gap in the literature, the current study explored the intergenerational transmission of childbearing timing by using three large nationally representative samples and discrete-time event history techniques.

These data sets not only give relatively consistent results, but also are in accordance with past studies.

First and foremost, the results indicate that there is a significant intergenerational transmission of age at first birth in the U.S. One additional year in a mother’s age at her first birth was associated with a two percent and one percent decrease in the transition to parenthood odds for her son and daughter, respectively, in the NLSY79 cohort (see Table 2). In the NLSY97 cohort, for every year increase in the mother’s age at her first birth, the odds of the son’s parenthood transition decrease by 4.5 percent and the odds of daughter’s parenthood transition decrease by 5.5 percent. Though the results from the NSFG cannot be compared directly with those from NLSY, since the mother’s age at her first birth was measured across five categories rather than discrete years, the odds of children’s transition to parenthood decreases as mother’s age at first birth increases -- within every birth cohort. Therefore, consistent with past studies, these results show that there is a significant effect of mother’s age at first birth on her children’s timing of transition into parenthood in the U.S.. In addition, hazard functions by parents’ age at first birth in the three samples (see Figure 1 and Figure 3) suggest that the effects were most pronounced during the children’s early adulthood years (before age 30). This implies that parents’ influences diminish as children grow older, as opposed to the perpetuating effects of parents over their children’s life course that socialization theory suggests.

Second, it appears that the intergenerational transmission of age at first birth has been strengthened significantly between the “baby boomer” cohorts and their children’s cohorts. The results from discrete-time event history analyses indicate that, in the NLSY97 cohort, an additional year of mother’s age at first birth decreases the odds of her daughter’s transition to motherhood by 4 percent,, compared with the NLSY79. Similarly, mother’s age at first birth in the NLSY97 was associated with a three percent decrease in the odds of her son's transition to fatherhood, relative to NLSY79. For example, the ratio of the birth odds for two daughters whose mothers gave her first birth 10 years apart -- one at age 20 and the other at age 30 -- decreased by approximately 37 percent ([1 - exp(-0.045 × 10)] × 100 = 37) over the period in question. Hence, a mother's age at first birth is associated with her children's timing of childbearing in an increasingly negative way in the younger birth cohort, suggesting the enhanced effect of intergenerational influence. Moreover, the results suggest that the increasing intergenerational link has occurred at the extremes of the mother's initial birth age distribution. These patterns are illustrated in Figure 2, which show predicted probabilities of giving a birth by age 25 for the two cohorts. The graph illustrates the crossover at around 20 years of mother's age at first birth. That is, for both males and females, the probability of giving birth is higher for the NLSY97 until the mother's age at first birth reaches 20, after which NLSY79 becomes higher. Similarly, estimated coefficients from the NSFG indicated that, in more recent cohort, sons and daughters born to mothers who were aged 18 and less have higher odds of birth than their counterparts in the earlier birth cohort. On the other hand, those born to mothers who were 25 or older at her first birth are increasingly less likely to give a birth in subsequent birth cohorts.

Third, the intergenerational effects of parents' age at first birth seem to run through the maternal line, as observed in the past research (Steenhof and Liefbroer 2008; Acock and Bengtson 1978). Although father's age at first birth also had a negative effect on the children's odds of transitioning to parenthood, the coefficients failed to reach significance in both samples of the NLSY. On the other hand, mother's age at first birth exerted significant and negative effects on the children's age at childbearing across all three data sets. Indeed, the effect of the mother's age at first birth was robust for different model specifications, and remained significant.

This result suggests that the same-sex model of socialization (e.g., Aldous and Hill 1965) may not be supported by empirical evidence, when applied to fertility behaviors.

Nonetheless, there are several limitations to the present study. First, past literature consistently found that the attitudes and beliefs of parents affect formation of the values and attitudes of their children, which in turn influence the children's fertility outcomes (Thornton and Camburn 1987). Despite the important roles of parents' values and attitudes regarding children's sexual behaviors (Thornton 1980; Axinn et al. 1994; Barber 2000), the current study could not address this effect due to lack of appropriate measures in the NLSY and NSFG. Second, the present study investigated the intergenerational transmission of age at first birth among the cohort born during the decades from 1957 to 1985. Therefore, longer series of data would be necessary to depict more detailed analyses of these trends. In the family decline debate, for instance, scholars often point out that comparing American families of the 1950s to subsequent generations leads to more pessimistic views, because 1950s families' behaviors were exceptional rather than standard and because empirical data collection was in its earliest stages. Likewise, analyses of intergenerational transmission data might reveal different patterns if the data for earlier cohorts were available. Finally the current study is in essence based on the two-generation model, which examines the intergenerational transmission only between parents and their children. However, Mare (2011) recently argued that two-generational models of social mobility are based on the American nuclear family, which experienced substantial changes over the latter half of the twentieth century. To account for massive structural and demographic transformations, and to shed more light on the mechanisms of intergenerational transmission of social statuses, Mare argues that we should adopt the multigenerational perspectives (i.e., more than three generations within a family).

The findings that intergenerational transmission of childbearing timing increased from the late 1950s to the early 1980s, particularly at the extremes of the distribution, have important implications for the hypotheses of low-fertility trap and reproductive polarization. Some have recently argued that the era of lowest-low fertility is not coming to an end (J. R. Goldstein, Sobotka, and Jasilioniene 2009), but also that there is the potential for a modest increase among those countries (Myrskyla, Kohler, and Billari 2009). Nonetheless, many scholars raise concerns about the possibility of persistently low fertility over the long run in the lowest-low-fertility societies (Rindfuss and Brauner-Otto 2008). Lutz and his colleagues (Lutz, Skirbekk, and Testa 2006; Lutz and Skirbekk 2005) for example, caution against the emergence of “low-fertility trap”, which refers to a feedback loop between attitudes and fertility behaviors: they hypothesize that if the number of children experienced in one’s social network while growing up drops to a certain level, the individual’s ideal family size would become lower due to social learning process. The lowered ideal family size may result in a smaller completed fertility, which may further lower ideals in their children’s generation -- a mechanism that could be reinforced by negative population momentum or a growing gap between material aspirations and expected income (Lutz et al. 2006). There is empirical evidence showing that, after experiencing low fertility for several decades, ideal family size fell below the replacement level among young generations in Europe (Testa and Grilli 2006; J. Goldstein, Lutz, and Testa 2003; Sobotka 2009) and in the US (Hagewen and Morgan 2005). In principle, the low-fertility trap hypothesis was developed to explain the future course of fertility in low-fertility European countries (Lutz et al. 2006). Results from the present study highlight the possibility that this process might be underway in the U.S., which has higher period and cohort fertility than most of the European countries. Given its substantial heterogeneity in fertility behaviors by racial and ethnic groups (Martinez et al. 2012;

Sullivan 2005), the feedback mechanism populated by this hypothesis may have implications for racial composition in the U.S. over the long run.

Moreover, Mare (2011) suggested that any research addressing intergenerational transmission is deals inherently with inequality. Similarly, McLanahan (2004) argued that women with higher educational attainment tend to give birth at a later age than their counterparts with lower education levels. She also suggested that the disparities of parenthood timing by mother's educational level are growing since the 1960s, and that gaps in children's resources have thus been rising. There is a growing amount of empirical evidence for her "reproductive polarization" hypothesis (e.g., S. P. Martin 2004; Rendall et al. 2009; Ekert-Jaffé et al. 2002; Schulze and Tyrell 2002), and the results from the current study adds support for the notion of increasing inequality through differential fertility behaviors. Note, however, that some scholars point out that individual characteristics, such as cognitive abilities (Preston and Campbell 1993), educational attainment (Mare 1997), and income (Musick and Mare 2006), are inversely correlated with fertility (e.g., the more education that one obtains, the smaller the size of one's family) and are transmitted to their children in cross-sectional data. These characteristics tend to converge on the mean at the aggregate level over several *generations*. It would therefore be too early to conclude that the intergenerational transmission of fertility behaviors will continue to increase over the long run in the U.S., but nonetheless, findings from this study indicate that intergenerational transmission has increased among those born during the latter half of the twentieth century. In addition, it appears that the increased intergenerational link took place disproportionately at the two extremes of social strata, which carries with it important implications for social inequality.

Notes

1. This restricted focus mainly is due to a driving concern over the adverse socioeconomic consequences of teenage childbearing (Hayes 1987; Hoffman, Foster, and Furstenberg 1993; Geronimus and Korenman 1992).

2. NLSY97 staffs created the age of the youth's biological mother when she gave birth to her first child based on information from the household and nonresident relative rosters.

3. Centering makes coefficients more interpretable and does not affect the substantive meaning or predictions of the model.

4. A comparison among alternative specifications for the effect of time, such as cubic, 4th-order, or 5th-order polynomials, indicated better fit to the data for the model with quadratic and linear terms. Substantial heterogeneity in fertility behaviors by sub-populations in English-speaking countries, such as the U.S., U.K., and Ireland, may produce bimodal patterns in the hazard of fertility (Sullivan 2005; Chandola, Coleman, and Hiorns 1999), in which case a curvilinear relationship may not fit the data well. Nonetheless, a quadratic relation is specified in this study for ease of interpretation and consistency with past studies.

5. Hazard functions by father's age at first birth show similar patterns for both samples, but they are not presented here due to trivial effects in the multivariate results. Also note that the NLSY97 cohort was born between 1980 and 1984 and thus the age range of participants was 25 to 29 as of 2009. Thus, the hazard functions for the NLSY97 are available up to age 29.

6. Results are not shown here but are available upon request.

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Table 1. Summary Statistics by Cohort and Sex for Variables Used in Analysis of Transition to First Birth: The National Longitudinal Survey of Youth 1979 (NLSY79) and National Longitudinal Survey of Youth 1997 (NLSY97)

	NLSY79				NLSY97			
	Male		Female		Male		Female	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Mother's Age at First Birth	22.51	4.66	22.40	4.49	23.51	4.61	23.58	4.60
Father's Age at First Birth	25.71	5.39	25.48	5.16	25.79	5.36	25.82	5.47
Mother's Education	11.92	2.67	11.78	2.63	13.08	2.70	13.10	2.66
Father's Education	12.14	3.57	11.99	3.52	13.12	3.06	13.11	2.99
Living Arrangement								
Both Parents	0.86		0.84		0.66		0.62	
Stepparent	0.05		0.05		0.12		0.12	
Mother Only	0.07		0.08		0.17		0.21	
Other Parents	0.03		0.03		0.05		0.05	
Number of Siblings	3.03	2.10	3.18	2.12	1.52	1.12	1.51	1.18
First Child	0.29		0.28		0.55		0.55	
Education	13.75	2.63	13.95	2.52	13.36	2.76	14.07	2.81
Religion Raised In								
No Religion	0.04		0.05		0.14		0.11	
Catholic	0.35		0.34		0.30		0.26	
Protestant	0.51		0.52		0.53		0.60	
Other	0.10		0.09		0.02		0.02	
SMSA								
Not in SMSA	0.30		0.30		0.20		0.20	
SMSA, Not Central City	0.56		0.55		0.56		0.56	
SMSA, Central City	0.15		0.15		0.23		0.25	
Region								
Northeast	0.21		0.21		0.20		0.18	
Midwest	0.35		0.31		0.29		0.28	
West	0.28		0.32		0.31		0.33	
South	0.16		0.16		0.21		0.20	
Race								
White	0.85		0.84		0.73		0.73	
Black	0.08		0.09		0.11		0.12	
Hispanic	0.05		0.06		0.12		0.11	
Other	0.01		0.02		0.04		0.05	
Age at Menarche			12.83	1.48			12.63	1.54
Age at Menarche Missing			0.04				0.03	
Father's Age at First Birth Missing	0.28		0.27		0.15		0.15	

Father's Education Missing	0.14	0.14	0.20	0.21
N	3,532	3,647	3,239	3,039

Note: Sample means are weighted, but *N* is unweighted.

Table 2. Coefficients from the Logistic Regression of Transition to Parenthood: National Longitudinal Survey of Youth 1979 (NLSY79) and 1997 (NLSY97)

	Male		Female	
	Coef.	S.E.	Coef.	S.E.
Mother's Age at First Birth	-0.018***	(0.005)	-0.012**	(0.005)
Father's Age at First Birth	0.001	(0.005)	-0.009*	(0.005)
Mother's Age at First Birth × NLSY97	-0.028***	(0.010)	-0.045***	(0.009)
Father's Age at First Birth × NLSY97	-0.014	(0.009)	0.004	(0.008)
NLSY97	-0.146***	(0.042)	-0.169***	(0.040)
Mother's Education	-0.014*	(0.007)	-0.014**	(0.007)
Father's Education	-0.003	(0.006)	-0.015***	(0.006)
Living Arrangement (Ref = Both Parents)				
Stepparent	0.106*	(0.059)	0.302***	(0.056)
Mother Only	-0.010	(0.048)	0.250***	(0.044)
Other Parents	0.043	(0.080)	0.132*	(0.074)
Number of Siblings	0.021**	(0.009)	0.033***	(0.010)
First Child	0.110***	(0.037)	0.046	(0.036)
Youth's Education	-0.109***	(0.007)	-0.165***	(0.008)
Religion Youth was Raised (Ref = No Religion)				
Catholic	0.049	(0.071)	0.001	(0.076)
Protestant	0.148**	(0.068)	0.118	(0.072)
Other	0.046	(0.094)	-0.041	(0.097)
SMSA (Ref = Not in SMSA)				
SMSA, Not Central City	-0.028	(0.041)	-0.031	(0.040)
SMSA, Central City	-0.067	(0.050)	-0.011	(0.049)
Region (Ref = Northeast)				
Midwest	0.143***	(0.050)	0.187***	(0.049)
West	0.091*	(0.051)	0.130***	(0.048)
South	0.068	(0.056)	0.135***	(0.052)
Race (Ref = White)				
Black	0.275***	(0.048)	0.204***	(0.047)
Hispanic	0.205***	(0.056)	0.111**	(0.053)
Other	-0.180	(0.133)	-0.142	(0.129)
Age at Menarche	-----	-----	0.126	(0.085)
Age at Menarche^2	-----	-----	-0.006*	(0.003)
Age at Menarche Missing	-----	-----	-0.175*	(0.097)
Father's Age at First Birth Missing	-0.024	(0.054)	-0.004	(0.053)
Father's Education Missing	-0.008	(0.059)	0.101*	(0.055)
Age	0.867***	(0.018)	0.917***	(0.017)
Age^2	-0.015***	(0.000)	-0.017***	(0.000)

Constant	-13.866***	(0.258)	-13.201***	(0.593)
Number of person years	243,151		231,094	
Log-likelihood	-18487		-20971	

Note: Robust standard errors in parentheses. Analyses are unweighted.
*** p<0.01, ** p<0.05, * p<0.1

Table 3. Descriptive Statistics for Variables Used in Analysis of Transition to First Birth by Birth Cohort: The National Survey of Family Growth (NSFG) Rounds 5, 6, and 7

	57-64		65-69		70-74		75-79		80-84	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Mother’s Age at First Birth										
Less than 18	0.15		0.15		0.14		0.14		0.12	
18-19	0.21		0.21		0.20		0.20		0.18	
20-24	0.44		0.44		0.43		0.42		0.40	
25-29	0.14		0.15		0.17		0.17		0.22	
30 and Over	0.06		0.04		0.05		0.06		0.08	
Mother’s Education										
Less than High School	0.28		0.27		0.24		0.21		0.16	
High School Grad	0.43		0.40		0.38		0.35		0.32	
Some College	0.15		0.18		0.20		0.23		0.26	
College Grad	0.13		0.15		0.18		0.21		0.26	
Father’s Education										
Less than High School	0.32		0.28		0.24		0.21		0.18	
High School Grad	0.33		0.35		0.32		0.33		0.30	
Some College	0.13		0.15		0.18		0.17		0.22	
College Grad	0.22		0.22		0.25		0.29		0.30	
Number of Siblings	3.97	1.56	3.61	1.59	3.31	1.53	3.18	1.44	3.05	1.39
Mother’s Work Status at Age 5-15										
No Work for Pay	0.43		0.36		0.33		0.27		0.23	
Part-time	0.19		0.19		0.18		0.19		0.17	
Full-time	0.38		0.46		0.50		0.53		0.60	
Living Arrangement at Age 14										
Both Parents	0.80		0.76		0.74		0.70		0.73	
Stepfather	0.11		0.12		0.12		0.16		0.10	
Other Parents	0.08		0.13		0.13		0.15		0.17	
Ever Lived on Own before Age 18	0.21		0.22		0.21		0.21		0.19	
Religion Raised In										
No Religion	0.05		0.08		0.08		0.09		0.10	
Catholic	0.38		0.37		0.35		0.34		0.34	
Protestant	0.51		0.49		0.49		0.48		0.47	
Other Religion	0.06		0.07		0.07		0.08		0.09	
Female	0.67		0.59		0.59		0.59		0.50	
R’s Education	13.42	2.70	13.67	2.73	13.70	2.74	13.00	2.78	12.96	2.35
Age at Interview	38.94	4.11	35.60	5.02	30.78	5.13	25.62	5.08	22.52	3.43
Race										
White	0.72		0.67		0.64		0.63		0.65	
Black	0.11		0.12		0.12		0.12		0.12	

Hispanic	0.12		0.14		0.18		0.18		0.17	
Other	0.05		0.07		0.06		0.06		0.06	
Age at Menarche	12.71	1.65	12.68	1.65	12.60	1.65	12.44	1.52	12.51	1.52
N	6,468		6,082		6,168		6,547		5,800	

Notes: Weighted proportions, unweighted N. Males are surveyed from the cycle 6 and comprise smaller proportion in the early birth cohort. Mean age at menarche applies only to females.

Table 4. Coefficients from Discrete-Time Hazard Models of Transition to First Birth by Sex: National Survey of Family Growth (NSFG) Cycles 5, 6, and 7

	Male		Female	
	Coef.	SE	Coef.	SE
Mother’s Age at First Birth (ref = < 18)				
18-19	0.298***	(0.113)	-0.009	(0.053)
20-24	0.191*	(0.104)	-0.035	(0.047)
25-29	0.029	(0.132)	-0.205***	(0.062)
30+	0.076	(0.170)	-0.248***	(0.088)
Birth Cohort (ref = 57-64)				
65-69	0.215**	(0.110)	0.135**	(0.058)
70-74	0.483***	(0.112)	0.217***	(0.059)
75-79	0.546***	(0.116)	0.400***	(0.063)
80-84	0.797***	(0.127)	0.481***	(0.072)
MAFB 18-19 × Cohort 65-69	-0.235	(0.145)	-0.156**	(0.078)
MAFB 18-19 × Cohort 70-74	-0.405***	(0.148)	-0.049	(0.081)
MAFB 18-19 × Cohort 75-79	-0.338**	(0.152)	-0.125	(0.085)
MAFB 18-19 × Cohort 80-84	-0.472***	(0.168)	-0.129	(0.099)
MAFB 20-24 × Cohort 65-69	-0.214	(0.131)	-0.201***	(0.070)
MAFB 20-24 × Cohort 70-74	-0.257*	(0.133)	-0.151**	(0.072)
MAFB 20-24 × Cohort 75-79	-0.400***	(0.137)	-0.325***	(0.077)
MAFB 20-24 × Cohort 80-84	-0.752***	(0.153)	-0.358***	(0.090)
MAFB 25-29 × Cohort 65-69	-0.153	(0.168)	-0.116	(0.093)
MAFB 25-29 × Cohort 70-74	-0.262	(0.168)	-0.159*	(0.096)
MAFB 25-29 × Cohort 75-79	-0.656***	(0.183)	-0.430***	(0.102)
MAFB 25-29 × Cohort 80-84	-1.193***	(0.206)	-0.758***	(0.121)
MAFB 30+ × Cohort 65-69	-0.442*	(0.245)	-0.218	(0.136)
MAFB 30+ × Cohort 70-74	-0.480**	(0.230)	-0.368**	(0.147)
MAFB 30+ × Cohort 75-79	-0.444*	(0.236)	-0.465***	(0.162)
MAFB 30+ × Cohort 80-84	-1.029***	(0.279)	-0.876***	(0.204)
Mother’s Education (ref = < HS)				
HS Grad	0.059	(0.044)	-0.087***	(0.026)
Some College	-0.004	(0.056)	-0.110***	(0.033)
BA+	0.004	(0.063)	-0.177***	(0.039)
Father’s Education (ref = < HS)				
HS Grad	-0.021	(0.043)	0.047*	(0.025)
Some College	-0.075	(0.054)	-0.037	(0.033)
BA+	-0.212***	(0.057)	-0.110***	(0.034)
Number of Siblings	0.052***	(0.011)	0.043***	(0.007)
Mother’s Work Status (ref = No Work for Pay)				

Part-time	-0.051	(0.046)	-0.034	(0.028)
Full-time	-0.020	(0.036)	0.009	(0.022)
Living Arrangement at Age 14 (ref = Both Bio Parents)				
Mother + Stepfather	0.207***	(0.056)	0.142***	(0.026)
Other Parents	0.138***	(0.040)	0.077***	(0.028)
Ever Lived on Own before Age 18	0.200***	(0.035)	0.431***	(0.022)
Religion Raised In (ref = No Religion)				
Catholic	0.089	(0.062)	0.025	(0.040)
Protestant	0.182***	(0.060)	0.165***	(0.038)
Other Religion	0.014	(0.081)	0.049	(0.053)
Education (ref = < HS)				
HS Grad	-0.277***	(0.042)	-0.385***	(0.027)
Some College	-0.535***	(0.046)	-0.742***	(0.029)
BA+	-0.800***	(0.051)	-1.329***	(0.033)
Race (ref = Non-Hispanic White)				
Non-Hispanic Black	0.324***	(0.043)	0.268***	(0.026)
Hispanic	0.370***	(0.046)	0.231***	(0.030)
Non-Hispanic Other	0.164**	(0.069)	0.101**	(0.048)
Age at Menarche	-----	-----	0.103**	(0.049)
Age at Menarche^2	-----	-----	-0.005***	(0.002)
Time	0.923***	(0.021)	0.948***	(0.013)
Time^2	-0.015***	(0.000)	-0.017***	(0.000)
Constant	-16.701***	(0.302)	-15.702***	(0.353)
Number of person-years	285,835		540,298	
Log-likelihood	-19355		-46830	
AIC	38805.65		93760.41	
BIC	39312.68		94320.41	

Note: Standard errors in parentheses. Analyses are unweighted.
*** p<0.01, ** p<0.05, * p<0.1

Figure 1. Hazard Rate for Transition to First Birth by Mother's Age at First Birth (MAFB) and Sex: National Longitudinal Surveys of Youth 1979 (NLSY79) and National Longitudinal Surveys of Youth 1997 (NLSY97)

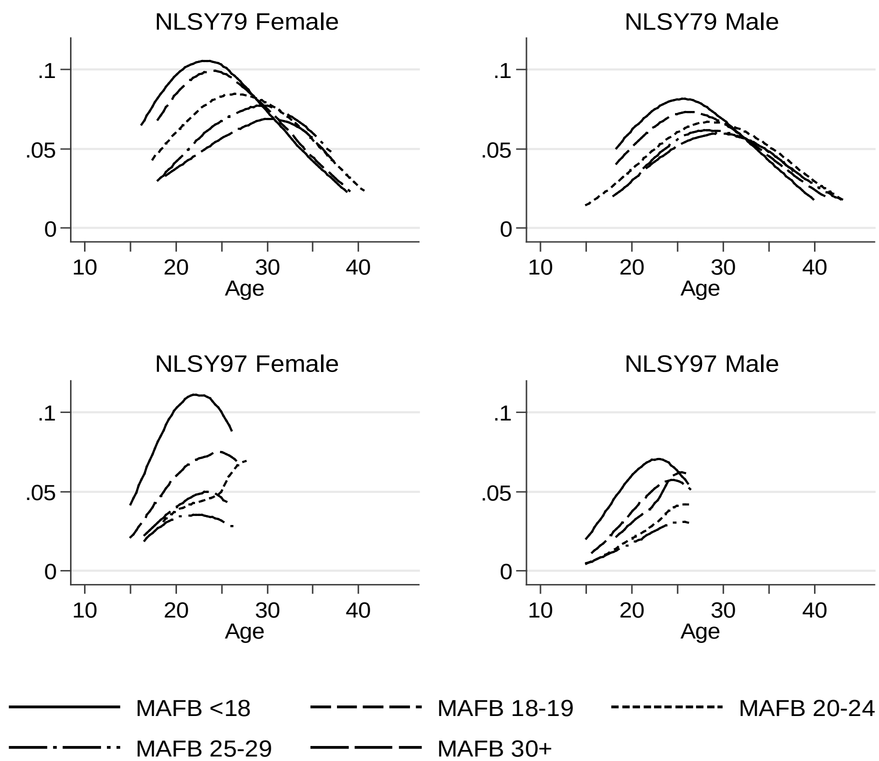

Figure 2. Predicted Annual Probabilities of Giving a First Birth by Age 25, by Mother's Age at First Birth and Sex of the Respondent: National Longitudinal Survey of Youth 1979 and National Longitudinal Survey of Youth 1997

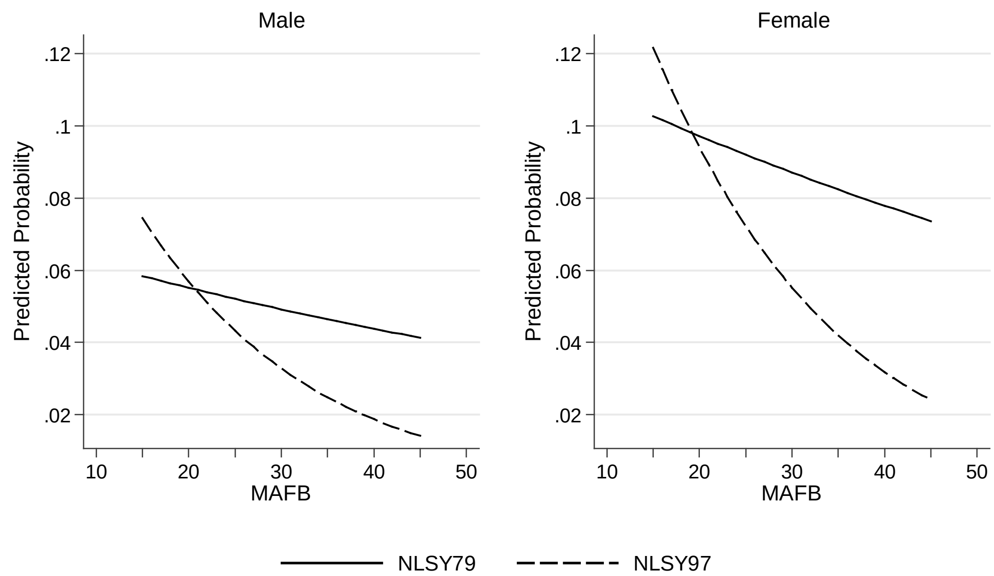

Figure 3. Hazard Rate for Transition to Parenthood by Mother's Age at First Birth (MAFB), Birth Cohort, and Sex: National Survey of Family Growth (NSFG) Cycles 5, 6, and 7