Choice or Constraint? Mass Incarceration and Fertility Outcomes Among American Men *

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Abstract

The rapid growth of the prison system over the last three decades represents a critical institutional intervention in the lives of American families, which may have far-reaching and unintended consequences for demographic processes. In this paper, we investigate how exposure to the criminal justice system affects the fertility of men. Using propensity score matching methods and data from multiple sources, we show that incarceration constrains the ferility of men and that these reductions would not have been due to individual choice in the absence of incarceration. Although incapacitation lowers the parity of men while incarcerated, we find that these parity reductions are offset by catch-up fertility when released. Spending time in prison significantly lowers the parity of male inmates by as much as one birth. Our findings are robust to different model specifications and data sources.

Introduction

The rapid growth of the prison system over the last three decades represents a critical institutional intervention in the lives of American families which may have far-reaching and unintended consequences for demographic processes. Incarceration is known to depress marriage and cohabitation among unwed parents (Wilson 1991; Edin, Nelson and Paranal 2002; Western and Lopoo 2004), thereby fundamentally altering family structure within high incarceration subgroups (Western and Wildeman 2009). Research also indicates that as many as 12% of children have had a parent in prison or jail at some point in their childhood (Foster and Hagan 2009) and that on any given day in 2000, 2.1 million American children had a father in prison or jail (Western and Wildeman 2009). Figures 1 & 2 display the number of inmates with children and the number of children with a parent in prison or jail from 1980 to 2008. The number of inmates with children and the number of children with a parent incarcerated has increased fivefold since 1980. In 2008, there were 1.243 million parents imprisioned and 2.651 million children with a parent in prison or jail. Race and class disproportionality in incarceration means that more black parents and minors are affected by penal system than any other racial group.

[INSERT FIGURES 1 & 2 HERE]

While the influence of incarceration on family formation through marriage and cohabitation is profound, little research has investigated the effects of incarceration on biological parenthood. Existing empirical evidence finds little relationship between incarceration and male fertility (Western 2006; Western and Wildeman 2009), yet theories of mate selection suggest that incarceration should affect fertility. Spending time in prison may depress male fertility through its incapacitative effects and the stigma associated with a criminal record. By fundamentally altering sex-ratios, the mass incarceration of undereducated, low skill men may constrain the reproductive opportunities of both men and women. High levels of incarceration may help explain recent trends in fertility including declines in fertility among African Americans.

In this paper we use data on the reproductive histories of men to investigate how exposure to the criminal justice system affects micro fertility outcomes and aggregate fertility patterns. We examine fertility within a counterfactual framework to assess whether and to what extent institutionalization has influenced the parity of men. A simple cross-tabulation of fertility and incarceration using household-based survey samples suggests that incarceration does not have a significant effect on men's fertility over the long term. Yet, an analysis of data from inmate surveys indicates that incarceration constrains male fertility. We find that incarceration lowers men's parity by as much a 1 birth, but that the effect is mediated by catch-up fertility when released. Timing and age-graded effects are implicated in the masking of incarceration on fertility using household-based surveys.

Individual Choice or Institutional Constraint

With the exception of the baby boom years from 1945-1964, fertility has been on the decline in the U.S. since the late 1800s. In the early 1900s, 82 percent of American women had at least one child and, on average, a woman could expect to have 3.7 children over her reproductive lifetime (Menken 1985). By the turn of the 21st century, childlessness in the U.S. had become more widespread with 19, 21, and 77 percent of married, divorced/widowed, and never married women, respectively, remaining childless in 2002 (Downs 2003). Women born in the late 20th century can expect to have approximately 2.1 children if fertility rates continue at current rates (Menken 1985).

Scholars of American fertility have generally understood 20th century trends in fertility in relation to the economic costs of childbearing (e.g., Becker 1983; Preston and Hartnett 2009; Morgan 2006) and cultural norms about childbearing and ideal family size (Cleland and Wilson 1987; Casterline 2001). Early in the 20th century children were often viewed as 'little laborers'; young children toiled in the home, fields, and factories and contributed to the household economy. The expansion of schooling and child labor laws accompanied declines in fertility through at least the first half of the 1900s. Unanticipated fertility increases after WWII have been conceptualized both as a product of economic expansion (Sweezy 1971) and intensified interest in the nuclear family following the hardships of the Depression and the war (Elder; Caldwell 1982). Accounts of fertility declines since the mid-1960s often emphasize the growing opportunity costs of children especially in light of women's growing economic empowerment (Becker 1960; Shultz 1973).

Similar economic and cultural arguments are used to explain individual-level fertility decisions (Morgan and King 2001). At the individual level, the key predictors of childbearing include age, education, and race and ethnicity. Age specific fertility rates follow an inverted-u shaped pattern. The median age at first birth has risen over the past century and the distribution of maternal age has also shifted to older ages. Education has a consistent inverse relationship with childbearing; highly educated women are less likely than less educated women to have children. A similar relationship is found for men though it is not as dramatic (Morgan 2006). Finally, Blacks and Hispanics have consistently higher rates of fertility than whites, yet over the last 30 years fertility has fallen most sharply among Blacks (Preston and Hartnett 2008).

Fertility research routinely explains reproductive outcomes in terms of female choice and constraint, where choice embodies planning and bargaining around sex and reproduction, while constraint highlights factors outside the control of women (the availability of men, infecundity, etc.). Effective contraceptives have allowed women to plan, negotiate, and time their fertility, making reproductive choice the cornerstone of fertility theory. Prior to the introduction of the pill, the promise of marriage, in the event of pregnancy, was a requisite for nonmarital sexual intercourse (Akerlof, Yellen, and Katz 1996). However, after the introduction of the pill (and legalized abortion), the cost of sexual intercourse declined and men could obtain sex without the extraction of a marriage promise. The pill was principally important in facilitating this psycho-social change because women could make greater educational and labor market investments without the loss of sexual intercourse or mate selection (Goldin and Katz 2002).

Yet, while much of our knowledge about fertility intentions and reproductive health in the U.S. is generated from reports of women, recent research and policy has focused on the reproductive lives of men. Theoretical and empirical work on household bargaining and relationships suggests that couples negotiate parity and timing of births (Thomson, McDonald, and Bumpass 1990; Thomson 1997; Greene and Biddlecom 2000). Although women's desired fertility is often the focus of study, a substantial body of work shows that male fertility desires matter for female parity progressions in both developing and developed nations (Vikat, Thomson, and Hoem 1999; Derose, Dodoo, and Patil 2002; Bankole 1995; Thomson and Hoem 1998; Thomson, McDonald, and Bumpass 1990).

Having a child may also be an pivotal event that indicates the seriousness of a relationship. For example, Griffith, Koo, and Suchindran (1985) argue that having a child serves two purposes: 1) it marks entry into adulthood and 2) it displays commitment to the relationship. In studying fertility patterns of remarried couples, they find that the number of preexisting children brought into the marriage has no effect on the likelihood of having an additional birth within the new partnership. They conclude that the new birth is important in confirming and legitimating the new marriage and step family. These findings have also been observed in other quantitative research (Vikat, Thomson, and Hoem 1999).

Qualitative research on childbearing generates similar conclusions. Work investigating the social meaning of childbearing in low-income communities identifies biological parenthood as a key feature of the transition to adulthood. The decision to have a child enables parents to make claims on each other (in terms of time, money, and/or commitment) and sometimes triggers evaluations of the long-term potential of the relationship (Edin and Kefalas 2005; Waller 2002; Anderson 1999).

Although utility and bargaining models are commonly used to explain shifts in fertility, the role of the penal institution in shaping fertility decisions and outcomes for different subpopulations has not been fully incorporated into theoretical models or comprehensively investigated empirically. The expansion of the criminal justice system may be an important determinant of fertility affecting both micro-level fertility decisions and aggregate patterns of fertility in the United States.

How might incarceration reduce or increase fertility? At the individual level incarceration is likely to affect childbearing both directly through its incapacitative effect and indirectly through economic opportunities (Pager 2003; Pager and Quillian 2005) and social stigma (see, for example, Edin and Kefalas 2005). Incarceration may redistribute or shift the relative power over negotiating intercourse and reproduction away from men and toward women if incarceration nullifies or mollifies the commitment to the partnership. If this occurs, then the non-incarcerated partner may search for a new partner and forgo childbearing with her previous partner.

Alternatively, the forced absence associated with incarceration may require a demonstration of commitment generating higher fertility among incarcerated men. If conception and live birth are important displays of commitment, couples anticipating incarceration may have children to solidify their relationship.

While research persuasively demonstrates that incarceration lowers the likelihood that a father will cohabit or marry one year after the birth of his child (Western, Loppo, and McLanahan 2004), little research has examined how incarceration may affect decision-making surrounding childbearing. Western (2006) finds similar rates of fatherhood among imprisoned and never-imprisoned men 33-40 using data from the NLSY (also reported in Western and Wildeman 2009). Pettit and Sykes (2008) find large differences in rates of fatherhood between incarcerated and non-incarcerated men. However, we know of no previous studies (including those just mentioned) that examines differences in fertility between inmates and non-inmates using case control methods.

The penal system not only is likely to have effects on the fertility of individual men, but it is an active agent in shifting the sex ratio of urban areas in such a way that the number of available women is greater than men. The fertility choices of the non-incarcerated population is then a function of the institutional constraints imposed on incarcerated men.

Theoretical Fertility Distributions

We posit that, relative to general population of men who are never incarcerated, incapacitation could have several generalized effects on the age-specific fertility rates of men. Three potential avenues to lower total fertility rates among incarcerated men focus on fertility delay, compression, and catch-up. Figure 3 displays theoretical distributions of these effects.

[INSERT FIGURE 3 HERE]

First, it is possible that incarceration shifts the overall fertility distribution of incarcerated men. This would suggest that fertility is delayed by however long an individual is removed from the general population as a function of age. Post-incarceration fertility of inmates need not differ from the fertility of never-incarcerated men. The cumulative effect of fertility declines during incapacitation would lead to lower overall parity among incarcerated men because their age-specific fertility is constrained while incarcerated. Yet, if the delay results in slightly greater fertility among the formerly incarcerated, it is possible that inmate lifetime fertility could resemble the general population of men.

A second route to lower parity is that women forgo childbearing with men who either are or have been incarcerated. In this view, inmates (or former inmates) are seen as deficient partners with whom women do not want to have a child. There is no reason to believe that the fertility of inmates and non-inmates should differ in the years preceding incarceration, but during and after incarceration the fertility of inmates should be reduced by some unknown amount. Unfortunately we cannot examine the empirical implications of this route to lower parity because we do not have data on the fertility of inmates after release from prison. However, we find it useful to outline the empirical implications. This would result in a compression of fertility.

Another possibility is that incarceration fundamentally alters the timing, but not the level, of male fertility. If men anticipate incarceration, their fertility may rise and be greater than the non-incarcerated population at younger ages. Incapacitation, however, may result in a lower mode because of the number of person-years spent involuntarily controlling their fertility. Upon release, incarcerated men may experience a fertility momentum (i.e., catch-up fertility), which would result in higher fertility rates at older ages. The overall result would imply that incarceration would not reduce male fertility but would shift male fertility from a unimodal distribution to a bimodal distribution as a function of age.

Data, Measures, and Method

Data and Measures

We pool data from the 1997 & 2004 Survey of Inmates in State and Federal Correctional Facilities (SISFCF) to examine whether incarceration has lowered the parity of men and if these reductions are due to inmate choice or institutional constraints. The data contain information on the respondent's number and ages of children, year of entry into prison, age, race, and educational attainment. We also use information on marital status and employment history prior to incapacitation to sharpen comparisons between men who were incarcerated at different ages. Respondents were randomly chosen from a two-stage sampling design, where the first stage relies on data from the Census of State and Federal Correctional Facilities, and the second stage sampled respondents from a list of inmates who used a bed the previous night. We restrict our analysis to white and black men aged 18-35 who entered state or federal prison between 1985 and 2004. Table 1 lists all other independent and dependent variables used in our analysis.

We also employ the use of three other datasets to gain leverage on fertility timing and life-time completion of childbearing for ever and never incarcerated men. Using the 1979 National Longitudinal Survey of Youth (NLSY79), we examine whether there are parity differentials for ever and never incarcerated men, age 35-44 by 2000. We follow the same counterfactual framework employed with the SISFCF data. The NLSY data will allow for a robust check on our findings for the years after inmates are released from confinement. Data from the 2002 National Survey of Family Growth (NSFG) Male Fertility Supplement and the 2007 National Survey of Drug Use and Health (NSDUH) ask various questions about imprisonment and male fertility, and these data sources provide additional insight into the age-specific fertility distributions of never and ever incarcerated men. While the NSFG questions specifically focus on biological fatherhood, the NSDUH data report information on custodial (or residential) fatherhood. Nevertheless, our measures of race, parity, education, marital status, and fatherhood are consistently coded with the SISFCF data. The NSFG and NSDUH are household based surveys that retrospectively inquire about incarceration, although they do not specifically ask about the timing and duration of incarceration spells. The SISFCF, however, surveys inmates while incarcerated and retrospectively asks about fertility, timing, and duration, thereby allowing for durational tests of incapacitation on fertility. The NLSY79 data are longitudinal and allow for an examination of fertility outcomes after release from confinement.

Method

To measure fertility choice and constraint, we estimate the ratio of time spent involuntarily controlling fertility due to incapacitation relative to the time spent controlling fertility outside of prison. Let

$$PPYL_{INVOL} = \sum (P_t - E_t) \tag{1}$$

where the $PPYL_{INVOL}$ is the number of period person-years lived (PPYL) an individual has spent incarcerated from the year of entry (E_t) to the observed survey year (P_t). Now let

$$PPYL_{VOL} = \sum (E_t - t_{15} - \sum B) \tag{2}$$

The number of period person years lived voluntarily controlling fertility is determined by the year of entry into prison (E_t); the year at which the male was of age 15 (t_{15}) to standardize or increment an initial age of fecundity for all men; and his total number of births ($\sum B$) at the time of the survey.[1] By taking the ratio of Equations 1 and 2, we obtain the relative strength of involuntary fertility control as a consequence of incarceration, as represented in Equation 3.

[1]For convenience, we assume that there is one birth per calendar year unless an inmate reports that the ages of two or more children are the same.

$$R = \frac{PPYL_{VOL}}{PPYL_{INVOL}} \tag{3}$$

R is on the range of $(0, \infty]$. When $R = 1$, there is no difference between the amount of time spent voluntarily and involuntarily controlling fertility. When $R < 1$, the respondent spent most of his fertility years, up until the time of the survey, involuntarily controlling his fertility due to incapacitation. $R > 1$ indicates that the inmate spent much of his adult life actively limiting his fertility. We recode R into a binary indicator, where $R_{INVOL} = 1$ if $R < 1$ and 0 otherwise.

We are interested in understanding whether there are systematic and significant fertility differences between incarcerated and non-incarcerated men. Because incarceration is not randomly distributed across the population, we use propensity-score matching techniques to ensure comparison between individuals who are similar on all other characteristics except their incarceration history or time spent constraining his fertility while incapacitated. Propensity-score matching simulates experimental data using observational data by using observed covariates of a treatment variable in order to estimate a respondent's propensity to be incarcerated. The propensity score is the conditional probability of being incarcerated and can be expressed as

$$P(R_{INVOL}) = Pr(T_i = 1|X_i) \tag{4}$$

where $T_i = 1$ if the i^{th} individual has involuntarily controlled his fertility and X_i is a vector of socio-demographic, social background, geographic, and labor market covariates that predict involuntary fertility control and are potential confounders in the association between fertility control and observed parity. The method balances background characteristics of treated and untreated respondents to ensure that any fertility differences between men are not due to significant differences in observed characteristics (Rosenbaum and Rubin 1983; 1984). Our treatment group includes men who have ever been incarcerated over their life-course. Our use of this method, instead of standard regression models, is necessary for several reasons.

First, by estimating the propensity score, we test for pretreatment differences in social background indicators between the two groups of men. If there are significant differences for any of the covariates then involuntary control is not random on that dimension. To rectify this, the propensity score is then balanced by constructing groups of respondents where there are no systematic differences in the pretreatment characteristics, which ensures the randomness of incarceration.

Second, by estimating the propensity score, we reduce the dimensionality of including a great number of covariates into the fertility equation (Rosenbaum and Rubin 1983, 1984). The propensity score captures and summarizes the overall effect of all covariates on the likelihood of involuntary fertility control. This leaves one effect to be estimated in the fertility models: the average effect of spending the majority of one's person-years on the observed parity of respondents with similar propensity scores. Statistically significant fertility differences indicate that spending more time incapacitated is causally linked to observed parity outcomes.

Lastly, little is known about the distribution from which incarcerated men are likely to spend a certain number of years controlling their fertility. While it is possible that this distribution is normal, there is no evidence or literature to suggest normality, particularly along certain social background characteristics. To address this issue and ensure confidence in our inferences about fertility disparities, we augment the propensity score matching method by bootstrapping (or resampling) estimates 500 times to create a likelihood distribution from which our standard errors (and confidence intervals) are more robust and representative without making any distributional assumptions.

While a number of different matching methods exist, there is no clear guideline for which method to employ in specific situations. Our data contain a disproportionate number of men who spend more time actively controlling their fertility. This may present a problem in the use of nearest neighbor or caliper matching methods because of the disparity in the number of treated and untreated cases that would have close neighbors, possibly resulting in poor matches (Bryson et al. 2002). We use a kernel matching algorithm based on the normal distribution to construct matched comparison groups. Kernel matching includes all control cases in the matching process; however, each untreated case receives a different weight based on the distance of its propensity score from the treated cases' propensity score, with the weight defined as

$$w_{ij} = \frac{G\big(\frac{P(S_j)-P(S_i)}{a_n}\big)}{\sum_j G\big(\frac{(P(S_j)-P(S_i)}{a_n}\big)} \tag{5}$$

where the kernel function G(.) and bandwidth (a_n) transform the distance of the propensity score $P(S)$ of the i-th and j-th cases for the purpose of constructing the weight w_{ij}. As a result, closer control cases receive greater weight in the matching process than cases further away (Heckman, Ichimura, Todd 1997; Heckman, Ichimura, Smith, Todd 1998; Morgan and Harding 2006). We restrict all matches to the region of common support.

Table 2 displays our matched and unmatched covariate means for the treatment and control groups. Prior to matching, there were significant preexisting differences for most of the covariates, with the exception of a high school education and occasional employment. Matching, however, reduced much of the bias associated with these differences thereby ensuring that assignment to the treatment effect is random and non-significant for all covariates in our model.[2]

Involuntary Fertility Control and Parity

We estimate four models in which involuntary fertility control is expected to impact observed parity. If incapacitation results in lower fertility, matched and unmatched estimates should show statistically significant differences. Covariate matching could increase or decrease un-

[2] Table A1 underscores this assessment, with the pseudo R-squared of the matched covariates explaining very little (0.2%) of the observed variation, ensuring that the treatment explains the difference in fertility levels.

matched estimates due to bias reductions in mean differences between the treatment and control groups.

[INSERT TABLE 3 HERE]

Table 3 presents the average difference in observed parity for inmates matched—the average treatment on the treated (ATT)—and unmatched on measures of fertility control. Model 1 excludes state fixed effects and employment prior to incarceration. In the unmatched sample, spending more time incapacitated significantly reduced fertility by .17 births (or almost one-sixth of a birth). However, after matching, six-tenths of a birth (.61) is lost due to spending the majority of one's time imprisoned. Adding state fixed effects (Model 2) to account for unobserved heterogeneity does not change estimates for the unmatched samples; however, this change more than doubles the initial parity reduction for the ATT, resulting in 1.32 fewer births on average.

Next we include employment to our models. Theoretically, labor market immersion should attenuate fertility differentials in previous models due to opportunity costs. In Model 3 we add our controls for labor force participation and find no statistically fertility differences in the unmatched sample. This finding may be consistent with work that finds no difference between incarcerated and non-incarcerated men if fertility choice and constraint are indistinguishable. Matching on observed characteristics, however, indicates that spending most of an inmates years imprisoned after age 15 reduced male parity by almost three-tenths of a birth. Including state fixed effects (Model 4) has no effect for the unmatched analysis; but our estimates of parity differences increases to a little over one child (1.08). Our analysis indicates that the amount of time spent in prison significantly reduces inmate parity, and that the parity reductions are not due to choice.

Incarceration and Fertility: A Robust Test

Estimates using the SISFCF data indicate that incarceration lowers the parity of men during their peak ages of reproduction. Consequently, reproductive outcomes after release cannot be explored with the same dataset. To check the robustness of our estimates, we examine fertility outcomes of men using the National Longitudinal Survey of Youth (NLSY79). Because respondents were between the ages of 14-22 when originally interviewed by the NLSY in 1979, by 2000, the they are between 35 and 44. If ever incarcerated men have depressed fertility outcomes while imprisoned, we speculate that their post-release fertility rates should be higher than the never incarcerated group in order to minimize observed differences in rates of fatherhood over the life-course. This would provide some evidence that former inmates experience catch-up fertility later in their life-course in order to normalize fertility outcomes between never and ever incarcerated men.

[INSERT TABLE 4 HERE]

Table 4 displays estimates from our NLSY matched model with similar, although not exact, covariates used in the estimation of the SISFCF propensity scores. In these models, the dependent variable is whether or not the respondent was ever incarcerated. Measures for employment, race, marital status, age, education, poverty status, and region are also included. Additional explanatory variables are used to capture aspects of criminal justice contact. For instance, we include measures of whether or not the respondent was ever charged and convicted of a crime. All pretreatment differences in the covariates are eliminated, and balanced covariates explain less than 1% of the variation in fertility differences between the treatment and control groups after matching.[3]

Because we do not have information on the states where former inmates were incarcerated, we run specifications for Models 1 and 3 that do not include state fixed effects. These estimates can be compared to Models 1 and 3 in Table 3, although the age ranges differ. In

[3] E-mail authors for tests of covariate balancing.

the unmatched sample, we find that ever incarcerated, single men aged 35-44 experienced higher fertility than their similarly situated never incarcerated counterparts by roughly two-thirds of a birth. Matching reduces these estimates to one-third of a birth. These effects are robust to employment status (M3a), possibly indicating that beyond a certain age, employment may no longer be a precondition for fatherhood, especially if ever incarcerated men are attempting to normalize other aspects of their life-course that are less difficult than obtaining employment.

Male Fertility Differentials in Other Surveys

Previous findings indicate no fertility differences between the never and ever incarcerated men at older ages. Yet it remains unclear whether non-differences are due to catch-up fertility or a permanent downward shift in the fertility of non-incarcerated men. If incarceration lowers the parity of men while incarcerated, and there is a simultaneous age-specific fertility shift downward for non-incarcerated men, post-release fertility estimates could appear approximately equal. We casually examine this issue using information from the 2002 National Survey of Family Growth (NSFG) Male Fertility Supplement and the 2007 National Survey of Drug Use and Health (NSDUH). Our estimates are reported in Table 5.

[INSERT TABLE 5 HERE]

The top panel of the table reports fatherhood among 40-44 year-olds in the NSFG. Within-race differences between black and white men who have ever been in prison or jail and their counterparts is minimal. Hispanics with criminal justice contact, however, are much less likely to be fathers than their counterparts. When asked about incarceration in the last year, the picture shifts drastically. The overall rates for men who have not been incarcerated in the last year remain relatively unchanged, but for men who have been incarcerated in the last year, the within-race differences are noteworthy: white inmates were 8 percentage-points less likely to be fathers; black inmates were about 5 percentage-points more likely to experience fatherhood; and Hispanics were about 9 percentage-points more likely to have at least one child. These two questions suggest that there are important within race and between group differences in fatherhood among the former and never incarcerated that highly depend on the timing of incarceration and whether the inmate has completed his fertility.

We also examine criminal justice contact using the NSDUH data for men 30-49. These data measure custodial (or residential) fatherhood among ever and never incarcerated men. Across all racial groups, roughly 50-65% of never incarcerated men report being fathers. Yet, depending on when the inmate was incarcerated, fatherhood rates vary drastically within-race and between inmate groups. For instance, rates of fatherhood among non-inmates are fairly consistent across races when asked about criminal justice contact in the last year or ever incarcerated. However, between group differences among inmates and non-inmates are significantly lower, from about 20 percentage-points for Hispanics to 25 percentage-points for whites when asked about incarceration in the last year. Life-time incarceration narrows this differential from about 4 points for blacks to 13 points for Hispanics, with whites centered at an 8 percentage-point differential when compared to their never incarcerated counterparts. Both the NSFG and NSDUH indicate that timing and fertility completion are central to determining when and how incarceration impacts male parity.

Timing and Acceleration in Male Fertility

Fertility timing, in relation to fatherhood and incarceration, are also explored using data from the NSFG. Figures 4- &5 display fatherhood density distributions by age, race, class, and incarceration status. Figure 4 shows that the fatherhood distribution for ever incarcerated, Whites is both bimodal and shifted to later ages, with an increasing density at older ages. This finding is even more pronounced among Blacks who have experienced incarceration. Initially, ever incarcerated Blacks at younger ages have higher rates of fatherhood than never incarcerated Blacks, with the first modal age around 20 years. Yet, beginning around age 30, ever incarcerated Black men begin to "make-up" their fertility differentials, with the second fatherhood mode around age 42.[4] For Hispanic men, there appears to be little difference in the fatherhood distributions by incarceration status.

[INSERT FIGURES 4 & 5 HERE]

Because incarceration disproportionately affects low skill and minority men, fertility delays and accelerations should be more apparent for men of lower education. Figure 5 shows the fatherhood distributions for high school drop outs and graduates by race, age, and incarceration status. The top panel (i.e., the first row) represents men with less than a high school diploma while the second row is for high school graduates.

Among Hispanic drop outs, the never incarcerated fertility distribution is more compressed than the distribution for former inmates, with no significant modal age differences between the two groups. For Blacks, however, the story is quite different. First, we observe the same bimodal pattern that existed in Figure 4 which ignored education. Strikingly, the modal age and density of fatherhood for low skill, never incarcerated Black men at age 30 is the same for ever incarcerated Black males at age 40, indicating a 10 age difference in fatherhood. This indicates that Black high school drop outs who have been incarcerated exhibit significant catch-up fertility due to incapacitation. There are also apparent differences in the distribution of fatherhood for White men. On average, White ever incarcerated drop outs are about 3 years younger than never incarcerated Whites. This finding may be due to early fatherhood as a response to anticipatory incarceration, or it could be that never-incarcerated White drop outs take, on average, three years longer to reproduce.

The second row of Figure 5 highlights fertility differences for high school graduates. Hispanic fathers who experience criminal justice contact exhibit a delay in fertility across the age distribution. Again, this the process of fatherhood is different for Black men. A

[4] In estimates not reported in this paper, age-specific propensity score models, using the NLSY data, also confirm this trend.

greater concentration of Black inmates enter fatherhood in their teens through early 20s, followed by a plateau throughout their 20s. After age 30, ever incarcerated Black men experience a surge in their rates of fatherhood, peaking out around age 39 and having greater fatherhood rates after age 42 than their never incarcerated Black counterparts. For Whites who have experienced incarceration, fatherhood is concentrated much later in life than compared to other White males who have never been incarcerated. Not only is there a delay in starting fatherhood among former inmates who are White, but there is also an acceleration that begins in their early-to-mid thirties. These findings confirm our NLSY causal results that ever incarcerated White and Black fathers experience catch-up fertility starting in their mid-thirties.

Conclusions

Considerable attention has been paid to how inequalities in the criminal justice system affect social, economic, and political inequality (Western and Beckett 1999; Western and Pettit 2000; Western and Pettit 2005; Pettit and Western 2004; Uggen and Manza 2002; Behrens, Uggen, and Manza 2003). However, less attention has focused on how the criminal justice system can shape and reproduce race and educational inequalities in fertility outcomes. In this paper we examined how incarceration affects fertility and in so doing draw attention to the far-reaching and unintended consequences of penal growth on demographic outcomes. Three decades of prison expansion have demonstrably affected the contours of American family life especially within social and demographic groups where it is most common (Edin and Kefalas, Waller 2002; Anderson).

These results suggest that incarceration has fundamentally influenced patterns of American fertility and may help explain recent declines in fertility among African Americans. If the timing of incarceration is correlated with reductions in fertility early in one's life-cycle, the fertility of men and women may be constrained independent of choice. The mass incarceration of low-skilled black men may mean that incapacitation suppresses the fertility of low skilled black women given observed rates of racial and educational homophily in parenthood and reproduction.

Additionally, our results are consistent with published research using household survey data. Existing empirical research suggests that incarceration has little influence on fertility (e.g., Western 2006; Western and Wildeman 2009, p. 234-235). In fact, using data from the NLSY, Western and Wildeman (2009) show that "73 percent of noninstitutional black men have had children by their late thirties compared to 70 percent of black male prisoners of the same age. Male fertility rates among prisoners and nonprisoners are also very similar for whites and Hispanics." (p.235). Research using the NSFG and NSDUH highlight similar fertility patterns between incarcerated and non-incarcerated men. Yet, the NLSY, NSFG, and NSDUH mask aspects of timing associated with the effects of imprisonment on fertility. Survey questions that separate life-time incarceration from incarceration last year allow for important tests of fertility and incarceration timing across the age distribution. If the life-time fertility of incarcerated and non-incarcerated men are similar, understanding how, when, and why incarceration has produced this finding becomes very important. In the absence of such research, differences in findings from different surveys may be an artifact of the survey's sample and questionnaire.

Furthermore, issues surrounding the timing of imprisonment and fertility should be conceptualized within an age-specific counterfactual framework that separates fertility choice from institutional constraints. Household based surveys that do not ask about the timing and duration of incarceration assume that any fertility differences are due to choice. In doing so, analyses of life-time completed fertility, aggregated over wide age intervals, may mask important fertility differences that are due to incapacitation and not individual choice.

We find that incarceration has had a very important effect on the fertility of men by removing them from a supply of women of reproductive age. Research in biology and biodemography illustrates that male removal from the population of various species has had a profound effect on mating and reproduction. For instance, Ginsberg and Milner-Gulland (1994) show that sex-specific hunting of male ungulates reduces the female fecundity of that species. Larcel, Kaminski, and Cox (1999) also find that removing the mates of mallards—specifically the males, for simulation of natural or hunting mortality—resulted in fewer female eggs laid and reduced coupling rates among yearling female mallards. The sex-ratio imbalances prevalent in these studies link mate and male removal to a host of negative population processes (lower fertility and coupling rates, higher mortality, etc.). Our work indicates that there is reason to believe male and mate removal through institutional confinement also reduces fertility in human species, but that upon release, men have the opportunity to make up their desired fertility.

Moreover, there is reason to believe our findings are consistent with other institutional interventions known to limit fertility. Past work shows that WWII had differential effects on fertility, with the birth rate rising upon the return of men (Grabill 1944; Hollingshead 1946). Similarly, recent research finds that a volunteer military has affected the marriage and fertility patterns of women. Lundquist and Smith (2005) find that military enlistment has caused non-civilian female fertility to be on par with or greater than their female civilian counterparts due to a pro-family military policy. Additionally, other institutional interventions are known to shape family formation. Educational institutions—in both access and proximity—have been implicated in limiting the fertility of men and women (Axinn and Barber 2001). The penal system is one of several institutions that alters the level and timing of fertility. Household based surveys that do not inquire about access, duration, and timing of incarceration may distort or conceal true population differences in the fertility of never and ever incarcerated men.

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Table 1: Variable Description

	Operationalization	Code
Dependent Variables		
Father	Does respondent have children?	Yes = 1 and No = 0
Number of Children	Number of Children the Respondent Has	Positive, Discrete Measure from 1-18
Involuntary Fertility Control (IFC)	Did respondent spend majority of time involuntarily controlling fertility?	Yes = 1 and No = 0
Incarcerated (only for person-year dataset)	Was the respondent incarcerated during the current year?	Yes = 1 and No = 0
Independent Variables		
White	Respondent is a Non-Hispanic White	Baseline Racial Comparison Group
Black	Respondent is a Non-Hispanic Black	Black = 1
LT High School	Respondent has less than a High School	Baseline Education Group
High School	Respondent has a High School	High School = 1
Some College	Respondent has Some College or More	Some College = 1
Never Married	Respondent is Single	Never Married = 1
Married	Respondent is Married	Baseline Marital Group
Age	Age of Respondent	Positive, Discrete Measure from 18-35
Part-Time Employment	Respondent was employed part-time before arrest	Part-Time = 1
Occasional Employment	Respondent was occasionally employed before arrest	Occasional = 1
Full-Time Employment	Respondent was employed full-time before arrest	Baseline Employment Group
State	Respondent's State of residence	FIPS code
Year	Year the respondent entered prison	1985-2004

Source: SISFCF (1997 & 2004)

Table 2: Covariate Balancing for Propensity Score Model

Variable	Sample	Mean Treated	Mean Control	%bias	%reduced $\|bias\|$	t-test t	t-test p> $\|t\|$
Black	Unmatched	0.68	0.54	29.80		14.41	0.00
	Matched	0.66	0.69	6.20	79.10	1.16	0.25
Never Married	Unmatched	0.67	0.56	22.60		12.29	0.00
	Matched	0.79	0.77	4.40	80.40	0.94	0.35
Age	Unmatched	33.25	34.60	13.50		7.27	0.00
	Matched	25.62	25.68	0.70	95.10	0.38	0.70
Age Sq.	Unmatched	1197	1305	14.10		7.51	0.00
	Matched	666	669	0.40	97.20	0.35	0.73
High School	Unmatched	0.35	0.35	0.00		0.01	0.99
	Matched	0.41	0.39	3.90	74.60	0.70	0.49
Some College	Unmatched	0.06	0.12	20.20		10.27	0.00
	Matched	0.04	0.04	1.30	93.50	0.36	0.72
Part-Time Emp.	Unmatched	0.17	0.12	12.10		5.60	0.00
	Matched	0.26	0.27	3.40	71.70	0.49	0.62
Occasional Emp.	Unmatched	0.04	0.03	3.30		1.50	0.13
	Matched	0.04	0.04	1.80	44.80	0.31	0.76

Source: SISFCF (1997 & 2004) and authors' calculations

Table 3: Estimated Differences in the Average Number of Children Between Matched & Unmatched Inmates Aged 18-35 in the Survey of Inmates Data

Models	Sample	Treated	Controls	Difference	SE	
M1: STATE FEs = NO & EMP = NO	Unmatched	1.21	1.38	-0.17	.05	**
	ATT	1.21	1.82	-0.61	.13	***
M2: STATE FEs = YES & EMP = NO	Unmatched	1.21	1.38	-0.17	.05	**
	ATT	1.21	2.53	-1.32	.18	***
M3: STATE FEs = NO & EMP = YES	Unmatched	1.43	1.35	0.08	.06	
	ATT	1.43	1.71	-0.28	.16	**
M4: STATE FEs = YES & EMP = YES	Unmatched	1.43	1.35	0.08	.06	
	ATT	1.43	2.51	-1.08	.25	***

Source: SISFCF (1997 & 2004) and authors' calculations
Whether the majority of adult person-years lived is spent incarcerated is the dependent variable.
All models control for age, race, marital status, and education.
* p<.05 ** p<.01 *** p<.001

Table 4: Estimated Differences in the Average Number of Children Between Matched & Unmatched Single Men in the NLSY & NSFG

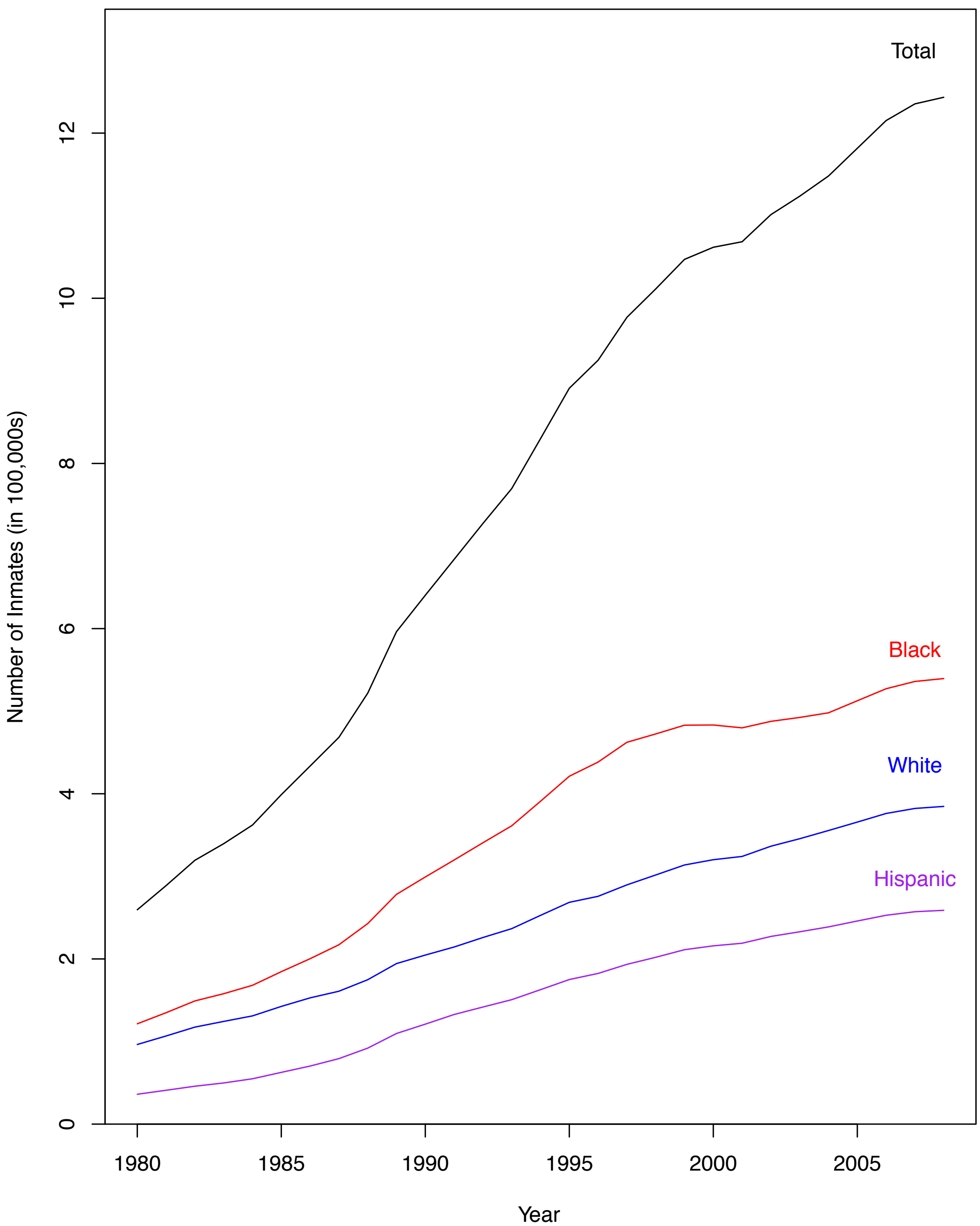
Data Source	Sample	Treated	Controls	Difference	SE	
NLSY (35-44 in 2000)	Unmatched	1.98	1.28	0.69	.11	***
	ATT	1.98	1.67	0.31	.15	*
NSFG (30-45 in 2002)	Unmatched	0.42	0.14	0.27	.03	***
	ATT	0.42	0.23	0.18	.03	***

Source: National Longitudinal Survey of Youth 1979, and authors' calculations
Ever incarcerated by 2000 & 2002 is the dependent variable in the NLSY and NSFG, respectively.
All models control for age, race, marital status, education, poverty, and employment status.
* p<.05 ** p<.01 *** p<.001

Table 5: Proportion of Fathers by Criminal Justice Contact, Survey, and Age for White, Black and Hispanic Men

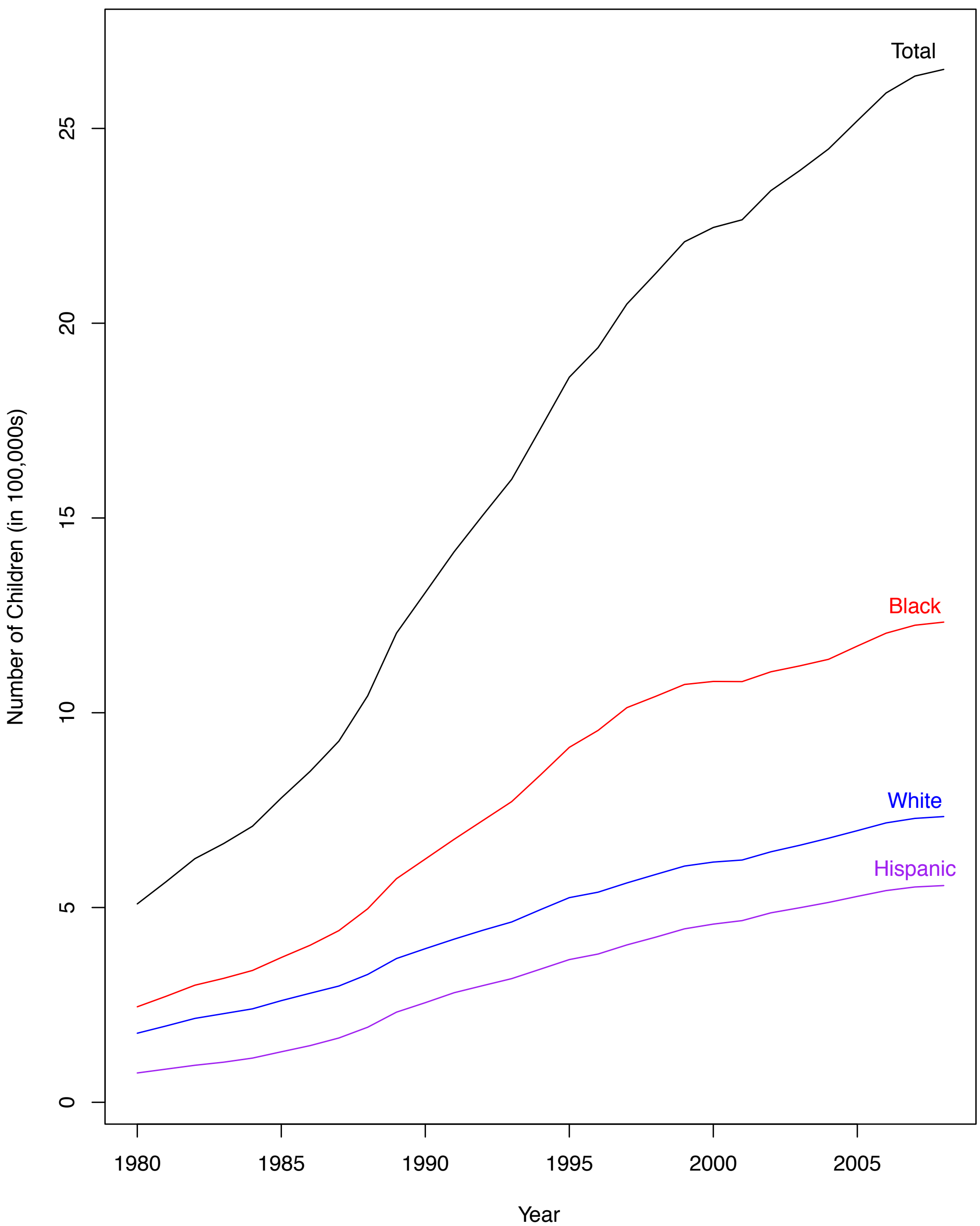
Fatherhood among 40-44 year olds in the NSFG (2002)			
	Ever in prison or jail		
	N-H White	N-H Black	Hispanic
No	0.762	0.799	0.928
Yes	0.788	0.768	0.856
	Prison or jail in last year		
	N-H White	N-H Black	Hispanic
No	0.774	0.786	0.910
Yes	0.688	0.843	1.000
Residential/Custodial Fatherhood among 30-49 year olds in the NSDUH (2007)			
	Parole		
	N-H White	N-H Black	Hispanic
No	0.587	0.515	0.618
Yes	0.124	0.198	0.405
	CJ Contact last 12 months		
	N-H White	N-H Black	Hispanic
No	0.592	0.539	0.629
Yes	0.344	0.233	0.426
	CJ Contact ever		
	N-H White	N-H Black	Hispanic
No	0.605	0.521	0.646
Yes	0.521	0.483	0.516

Figure 1: Number of Inmates with Minor Children



Authors' calculations from the Survey of Inmates and BJS data.

Figure 2: Number of Minor Children with Parents Incarcerated



Authors' calculations from the Survey of Inmates and BJS data.

Figure 3: Theoretical Fertility Distributions

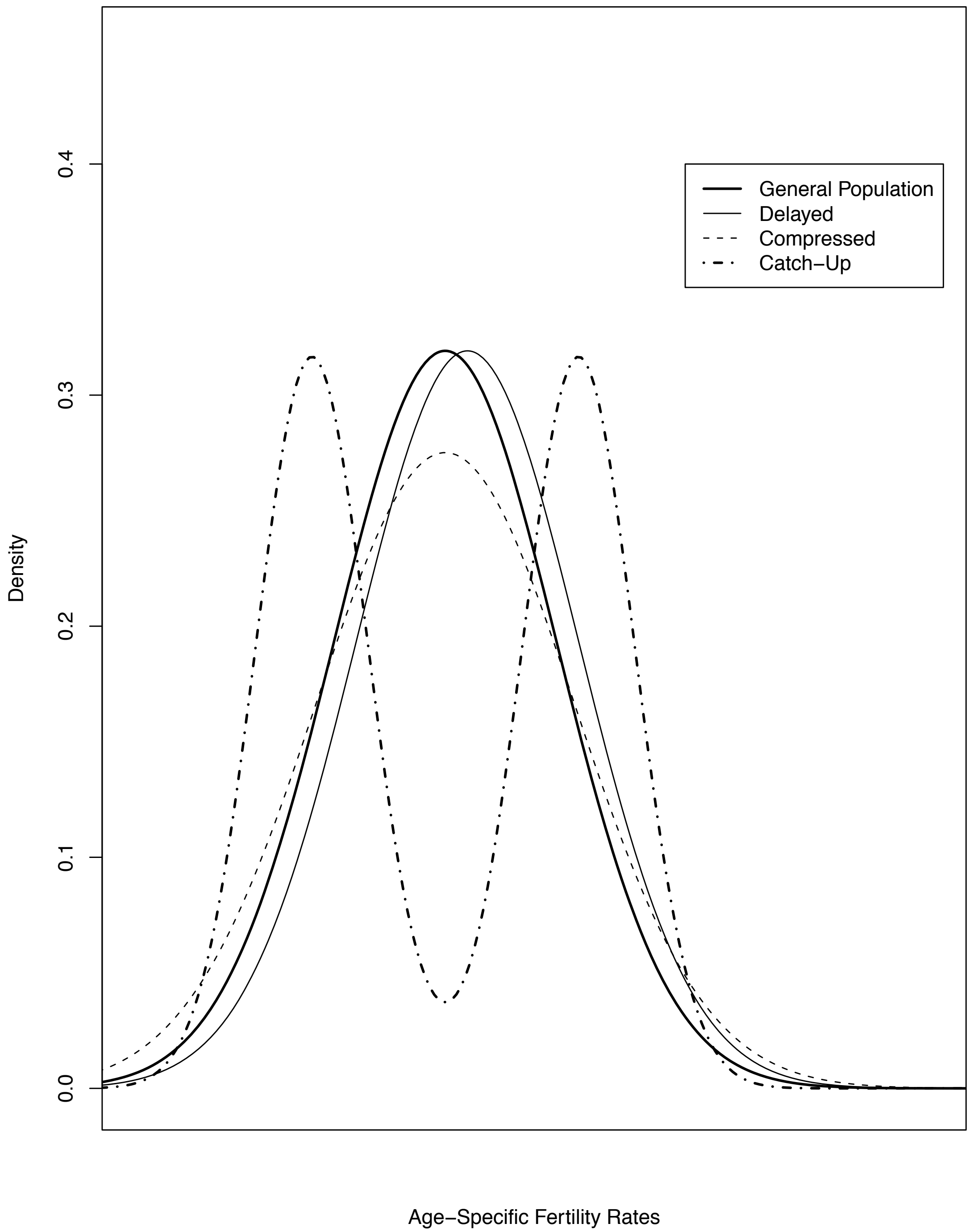


Figure 4: Distribution of Fatherhood by Race, Age, and Incarceration Status, NSFG 2002

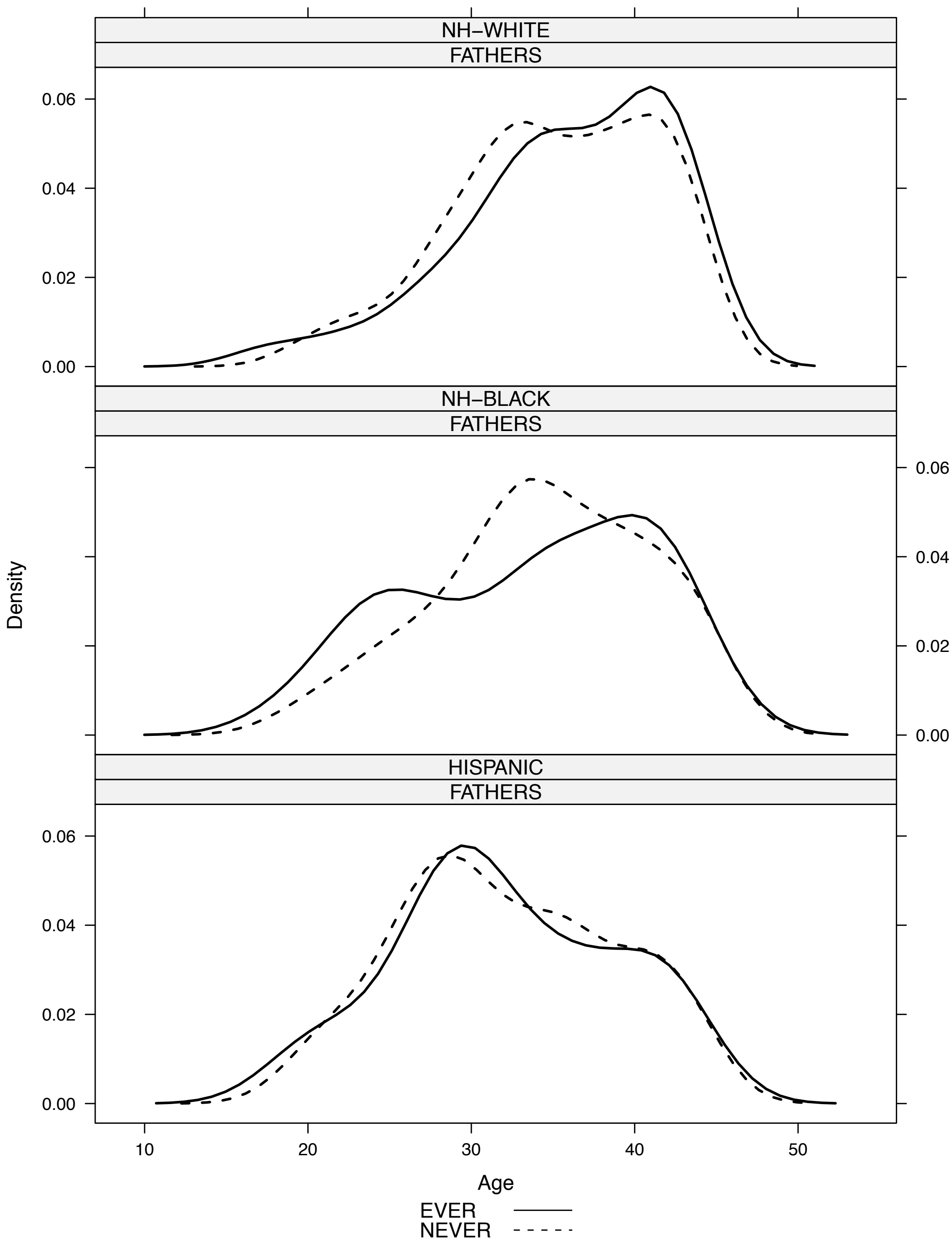


Figure 5: Distribution of Fatherhood by Race, Age, Class and Incarceration Status, NSFG 2002

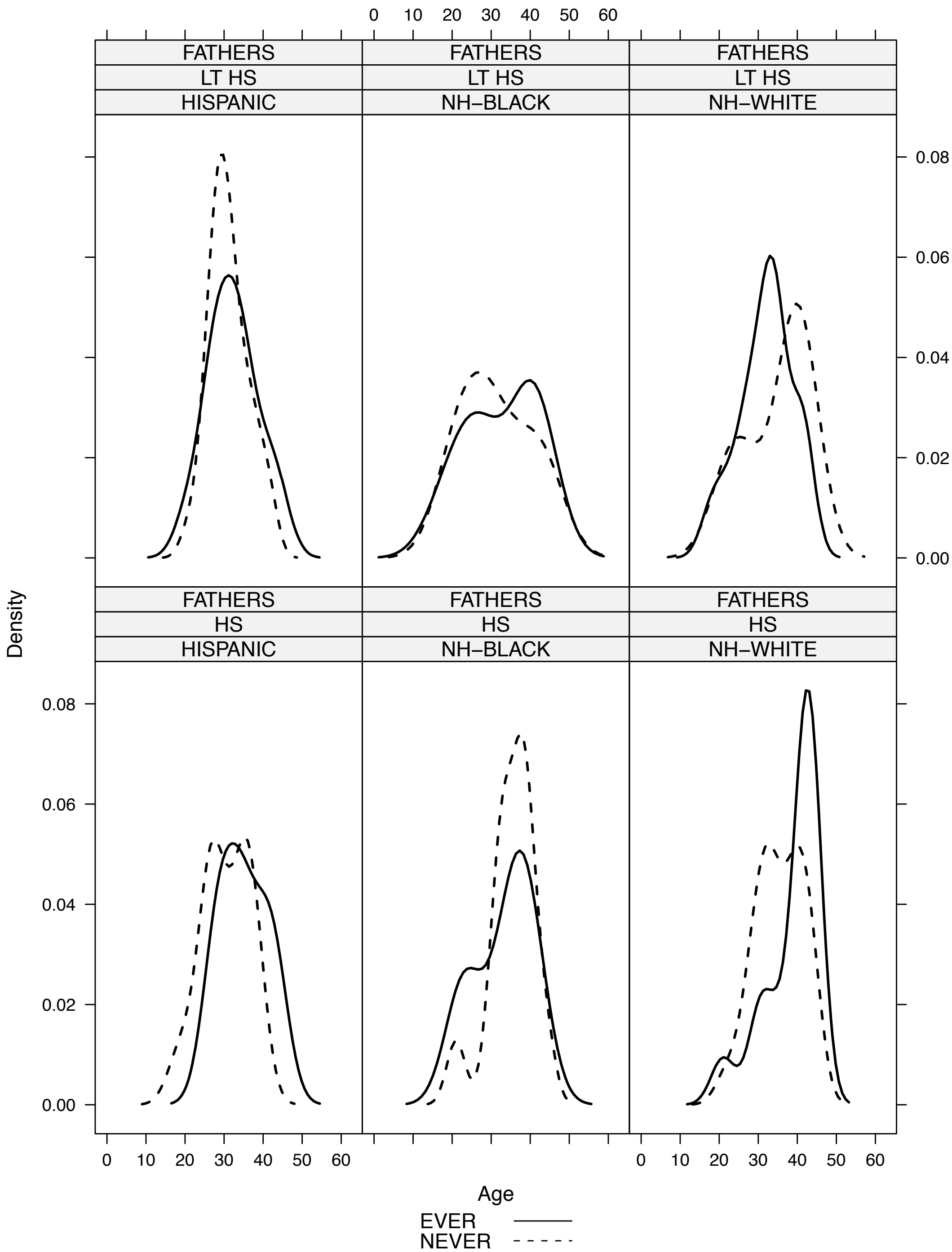


Table A1: Variation Explained by Covariates in Matched and Unmatched Samples

Data	Sample	Pseudo R-Sq	LR Chi-Sq	p > Chi-Sq
NLSY79	Unmatched	0.211	550	0.000
	Matched	0.004	3	0.975
NSFG	Unmatched	0.048	271	0.000
	Matched	0.004	8	0.508
SISFCF	Unmatched	0.020	204	0.000
	Matched	0.002	4	0.860

Source: Authors' calculations