

Heterogeneous effects of parental incarceration on sexual health and fertility
using propensity score matching

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Abstract

Sexual health and risky sexual health behaviors shape long term health and wellbeing. Despite evidence that parental incarceration is associated with the health of children and young adults, few studies have explored the association between parental incarceration and sexual health and those that have did not account for selection effects. Another important consideration is how parental incarceration shapes racial and gendered disparities in health. In this study I use the National Longitudinal Study of Adolescent to Adult Health and propensity score matching to examine if parental incarceration is causally related to fertility and sexual health or simply associated with it. Then I examine if there are heterogeneous effects by race and gender. I find that parental incarceration increases fertility and risk of risky sexual health behaviors (such as earlier sexual onset and increased risk of diagnosis with an STI), and that there are heterogenous effects by race and gender for fertility, age of sexual onset, and STIs which may contribute to broader racial and gendered health inequity in the U.S. Research should identify the causal mechanisms behind these effects, and public health practitioners need to think creatively about how to offer increased access to reproductive health care and sexual health information to children of incarcerated parents.

Key words: *sexual health, fertility, parental incarceration, public health*

The United States has the highest incarceration rate in the world, with more than 6.6 million people under the supervision of the adult correctional system (Kaeble and Cowhig 2018). Public health workers and researchers have increasingly been regarding incarceration a public crisis (Dumont, Brockmann, Dickman et al. 2012). Incarcerated women have substantial reproductive health risks, including high probabilities of sexually transmitted infections and limited access to reproductive health care (Clarke, Herbert, Rosengard et al. 2006). Furthermore, the effects of mass incarceration on reproductive health expand beyond the incarcerated individual. High neighborhood incarceration rates are associated with high rates of teenage pregnancy and sexually transmitted infections, contributing to adverse health through destabilizing communities (Freudenberg 2002, Thomas and Torrone 2011).

Emerging research has explored health disparities among those who have been incarcerated, finding sexual health disparities among this historically ignored population (Braithwaite, Treadwell and Arriola 2005). A handful of studies have found that children of incarcerated parents experience sexual health disparities as well (Heard-Garris, Windelman, Choi et al. 2018, Whalen and Loper 2013). In 2007, 52% of state inmates and 63% of federal inmates reported having a child, with an estimated 1.7 million minor children have an imprisoned parents (Kaeble and Cowhig 2018). When including jail incarceration, 2.7 million children have an incarcerated parent, with two-thirds of these parents being incarcerated for non-violent offenses (Western and Pettit 2010a). This massive growth in parental incarceration has hurt the education (Haskins 2014, Haskins 2015, Haskins 2016, Haskins 2017, Turney and Haskins 2014) and financial success (Geller, Garfinkel, Cooper et al. 2009, Western and Pettit 2010b) of children. Increasing concern has been paid to how parental incarceration shapes the long-term health of

children as well. Parental incarceration is associated with lower rates of health care use and an increase of risky health behaviors (Heard-Garris et al. 2018).

More specifically, researchers have found that parental incarceration is associated with an increased number of sexual partners and probability of having sex in exchange for money (Heard-Garris et al. 2018) and family member incarceration is associated with an increased risk of teenage pregnancy (Whalen and Loper 2013). A recent study using the National Longitudinal Study of Adolescent Health to Adult Health examined health care usage and unhealthy behaviors in young adulthood (Heard-Garris et al. 2018). Using multivariable logistic regression, they found that parental incarceration was associated with forgone health care, increased prescription drug abuse, and a high number of sexual partners. Additionally, they found that maternal incarceration was associated with an increased odds of having sex in exchange for money (Heard-Garris et al. 2018). Another exception is a study using the National Longitudinal Survey of Youth, finding that having an incarcerated household member is associated with an increased risk of teenage pregnancy (Whalen and Loper 2013). They also found that girls with an incarcerated household member faced more demographic and environmental risk factors for teenage pregnancy (Whalen and Loper 2013).

While these initial studies provide support for the hypothesis that parental incarceration is associated with sexual health, several core gaps remain. Mainly, the existing studies examining the association between parental incarceration and sexual health do not account for selection. It is possible that pre-existing disadvantage is associated with both the risk of parental incarceration and sexual health and fertility. Families that experience incarceration already face a staggering array of socio-structural disadvantage independent of a parent's incarceration, and this existing disadvantage may be difficult to account for using simple controls. Selection is a

persistent issue in the study of parental incarceration, and due to the large role selection effects may play in estimating the effect of parental incarceration is it pivotal to our understanding of the true effect of parental incarceration to adjust for it. Second, there is limited research exploring how the proliferation of parental incarceration shapes racial and gendered health disparities and the implications of this intergeneration transmission of disadvantage for health inequality in the United States. Neither of the existing studies in this area examine heterogeneous effects by race and gender. Both the risk of parental incarceration (Wildeman 2009) and sexual health and fertility (Sweeney and Raley 2014) are strongly associated with race, indicating that examining heterogeneous effects may be fruitful. Additionally, research examining the effects of parental incarceration in other domains have found heterogeneous effects (Haskins 2014, Haskins 2017).

Building on this budding area of research examining the relationship between familial incarceration and sexual health, I examine the relationship between parental incarceration and sexual health and fertility. Child bearing behavior has implications for resource distribution intergenerationally and to the socio-economic health of families (Maralani 2013, McLanahan 2004). Sexual health behaviors, such as number of sexual partners and early sexual onset, have consequence for health across the life course (O'Donnell, O'Donnell and Stueve 2001, Valois, Oeltmann, Waller et al. 1999). To adjust for selection in my design, I use propensity score matching to examine a slightly more expansive set of sexual health and fertility related outcomes. Then, I replicated the aforementioned model to examine if there are heterogeneous effects by race and gender; I examine results for the full sample, Black males, Black females, White males, and White females.

Altogether, I found evidence that parental incarceration independently effects fertility, some risky sexual health behaviors, and the risk of contracting an STI. Furthermore, I found

differential effects by race and gender for some outcomes, with the highest increase in the probability of experiencing a pregnancy among white males and females, the largest increase in the number of children among Black females, largest decreases in the age of first sexual experience among Black men and women, and the largest increase in the risk of contracting and STI among Black men and women. Parental incarceration poses an independent health risk, and this risk may be particularly acute among Black females.

METHODS

To interrogate the association between parental or household incarceration on sexual health and fertility I use restricted access version of the National Longitudinal Study of Adolescent to Adult Health (Add Health). The Add Health is a national representative longitudinal survey following youth born in 1976-1982 from ages 12-18 in 1994-1995 through ages 24-32 in 2008 through 2009. Participants were recruited through schools for a large cross-sectional study (N=90,118), and a longitudinal sub-sample was selected (N=20,745). There are currently four waves of data which focus on individual traits, health and risk behaviors, families, friends, romantic partnerships, schools, neighborhood, and communities. A mandate from Congress to study adolescent health prompted the survey. There is a more than 75% retention rate through Wave IV (N=15,701).

Measures

Independent Variable: Parental Incarceration. In Wave IV, participants were retrospectively asked if their mother or father had every been incarcerated. As a result, only participants who participated in Wave IV were included (N=15,701). Using this information, I created a dichotomous indicator to represent if they had (1) or had not (0) experienced parental incarceration. Around 12% of the sample experienced parental incarceration (N=2,488), of those

that did the majority experienced paternal incarceration (N= 2,252) and a minority experienced maternal incarceration (N=533).

Dependent Variables. The first set of outcomes relate to fertility. In Wave IV participants were asked how many times they experienced a pregnancy and live birth. Using this information, I created a dichotomous indicator reflecting if the participant ever experienced a pregnancy and a continuous variable reflecting how many pregnancies they experienced. As you can see in Table 1, over half of participants experienced a pregnancy (60.38%), and the average number of pregnancies was 1.4. Additionally, I used information about the number of live births to create a continuous variable, and the average number of live births was one (0.95).

Next, I looked at sexual health. In Wave III, participants responded to questions about if they had had sex in exchange for money or sex with an IV drug user. I used this to create dichotomous indicators for both. During Wave IV, participants were asked how many sexual partners they have had, the age of their first sexual intercourse, and if they had ever been diagnosed with an STI (including HIV). Using this information, I created continuous variables for number of sexual partners and age of sexual onset and dichotomous variables reflecting if the participant had even been diagnosed with an STI and diagnosed with HIV.

Controls. I include demographic information on the participant, including gender, age at Wave I, race (non-Hispanic White, non-Hispanic Black, Hispanic, or non-Hispanic other), and household income at Wave I. I also include an indicator of parental health, representing those who reported good or excellent health. I also include parent's education (less than high school degree, high school degree, or more than high school degree), parent's marital status (single, married, widowed, divorced, or separated), parent's race (non-Hispanic White, non-Hispanic Black, Hispanic, or non-Hispanic other), and parent's age.

Analysis Strategy

The majority of my analyses rely on propensity score matching (PSM) to estimate the effect of parental incarceration on sexual health and fertility adjusting for selection effects. This method was developed by Rosenbaum and Rubin (1983) and relies on developing a propensity to experience the treatment based on observed characteristics in the data. By comparing participants with similar propensities to experience parental incarceration, I can sufficiently reduce bias enough to argue a reduced selection effect (Rosenbaum and Rubin 1983). In PSM, I compare those who have experienced parental incarceration to a reference group of those who are similarly at risk of experiencing it. While PSM does not eliminate selection effects in the study of parental incarceration, as it can only adjust for observed variation, it is a commonly used method to reduce the impact of selection when using observational data with a rich set of covariates to attempt causal inference (Abadie and Imbens 2016). PSM includes a systematic test of the balance of observables between the treatment and selected intervention groups. My analyses were limited to participants within the region of common support, and I performed balancing tests for each model (using the ‘pctest’ command in Stata). I used nearest neighbor matching to estimate the treatment effect on the treated using probit regression.

RESULTS

Parental incarceration is associated with increased fertility, some sexual health behaviors, and the risk of being diagnosed with an STI, as seen in Table 1. Parental incarceration is associated with a nearly 10% increase in the probability of experiencing pregnancy ($p < 0.001$). Parental incarceration is associated with reporting a mean number of pregnancies that is 0.5 higher ($p < 0.001$) and a mean number of children that is a quarter child higher ($p < 0.001$), on average, than those who have not experienced parental incarceration. Parental incarceration is

also associated with three more sexual partners by early adulthood ($p < 0.01$). There is only a marginal association between parental incarceration and the probability of having sex for money ($p < 0.10$), and no effect on the probability of having sex with an IV drug user. On average, those who experienced parental incarceration had an earlier sexual onset by three-fourths a year ($p < 0.001$), and increased probabilities of both reporting an STI (difference = 0.065; $p < 0.001$) and HIV (difference = 0.003; $p < 0.05$).

Next, I examined if there were racial and gendered differences in these associations. Compared to their matched counterparts, those who experienced parental incarceration were more likely to have been or gotten their partner pregnant among Black females, White males, and White females, as seen in Model 1 of Table 3. Similarly, parental incarceration has a positive significant relationship with the number of pregnancies experienced for Black females, White males, and White females. Model 3 of Table 3 shows that parental incarceration is also positively and significantly related to the number of live births experienced.

While parental incarceration is significantly and positively associated with number of sexual partners, racial and gender differences are more minimal, as seen in Table 4. Among White males, parental incarceration is associated with nearly 5 more sexual partners by early adulthood compared to matched counterparts ($p < 0.05$). Similarly, there is a marginal effect of parental incarceration on the probability of having sex in exchange for money in the general population but the sole association by race and gender is among White females who are three percentage points more likely to have sex for money than their matched counterparts ($p < 0.05$). There are no significant associations between parental incarceration and the probability of having sex with an IV drug user.

Last, there was considerable variation in the association between parental incarceration and age of first sex by race and gender, as seen in Model 4 of Table 4. The largest decrease the age of sexual onset was among Black females, who were around one year younger than their matched counterparts when they had their first sexual experience (difference=0.928, $p<0.001$). Black males who experienced parental incarceration were three-fourths a year younger ($p<0.05$), White males who did were two thirds a year younger ($p<0.01$), and White females who did were a little less than half a year younger (difference=0.416, $p<0.05$). than their matched counterparts.

Last, I looked at gender and race differences in the association between parental incarceration and the probability of getting diagnosed with an STI, as seen in Table 5. Parental incarceration was significantly and positively associated with getting diagnosed with an STI among Black males, Black females, and White males. This effect was particularly large among Black males (difference=0.152, $p<0.001$) and Black females (difference=0.128, $p<0.05$). The prevalence of HIV diagnoses among the racial and gendered groups was not high enough to run models to examine heterogeneous effects.

DISCUSSION

This study contributes to the growing body of literature on the intergenerational consequences of incarceration for health inequity. This study provides evidence to support a direct effect of parental incarceration on the fertility and sexual health and enriches our understanding of how mass incarceration contributes to persistent racial and gender health inequities in the United States.

Adjusting for selection using PSM, I find that parental incarceration increases fertility and the number of sexual partners, as well as the risk of having an STI, and lowers the age of sexual onset. There is also heterogeneity by race and gender groups. There are larger effects

among Black males and Black females for the risk of being diagnosed with an STI, with Black males having the highest increase. There are particularly large effects on fertility among White males and females and Black females, but not Black males. Furthermore, Black females have the largest decrease in the age of first sex. Among Black females, parental incarceration leads to nearly a year younger earlier onset compared to less than half a year among White females. These findings align with the existing literature which finds sexual health and fertility effects of parental incarceration (Heard-Garris et al. 2018, Whalen and Loper 2013), as well as existing research finding heterogeneous effects by child race and gender (Foster and Hagan 2007, Haskins 2014, Wildeman 2010).

This study, however, is not without its limitations. First, while propensity score matching does reduce bias in causal estimating it is by no means a perfect solution and is only as good as the covariates included. Unfortunately, because participants are recruited into the program in middle and high school, the propensity score matching is unable to account for differences that begin earlier in the life course and parent criminal activity during childhood despite the importance of these factors for these outcomes (Haskins 2014). Furthermore, recent research has questioned the efficacy of propensity score matching (Copp, Giordano, Manning et al. 2018). However, PSM is still the most commonly used analytic strategy to attempt causal estimation using observational data (Pearl 2009). Both practical and ethical concerns restrict the ability of researchers to design a traditional experiment to evaluate the causal effect of parental incarceration, leaving researchers to attempt to reduce bias while using observational data. Second, the Add Health indicator about parental incarceration is collected retrospectively and by the child instead of the parent. This introduces the possibility of misremembering parental incarceration and the possibility that children may not be aware that their parent was incarcerated

if the information was withheld from them by their parents. Last, the sensitivity of the topics of this study (sexual behaviors and incarceration) leaves measurement vulnerable to social desirability bias. This could lead to underestimation of the effect of parental incarceration.

Despite these limitations, this paper does make some important contributions to the literature. Incarceration has intergenerational consequences for sexual health and fertility, which pose unique health risks and has implications for social stratification and health inequity. Moreover, the heterogeneous effects of parental incarceration on sexual health and fertility can enlighten our understanding of persistent racial health inequality in the United States and how disadvantage is passed intergenerationally. Moving forward, researchers must seek to understand the causal mechanisms behind this disadvantage and identify where interventions could be implemented to mitigate this unique risk. In short, incarceration poses a unique sexual health risk which may both have implications for racial health inequity and contribute to social stratification and inequality.

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TABLES

Table 1. Demographic characteristics of the analytic sample.

Variable	Proportion / Mean
Parental Incarceration	0.12
Male	0.50
Age (W1)	15.66
Race	
White	0.50
Black	0.21
Hispanic	0.17
Other	0.11
Household Income	46.13
Parent's in Good Health	0.85
Parent's Education	
Less than HS	0.18
HS Degree	0.29
More than HS	0.53
Parent's Marital Status	
Single	0.06
Married	0.71
Widowed	0.04
Divorced	0.15
Separated	0.05
Parent's Race	
White	0.56
Black	0.20
Hispanic	0.15
Other	0.09
Parent's Age	41.94
Outcomes	
Pregnancy	0.60
# of Pregnancies	1.41
# of children	0.95
# of Partners	12.15
Sex for Money	0.03
Sex with IV Drug User	0.02
Age of Sexual Onset	16.29
Sexually Transmitted Infection	0.24
Human Immunodeficiency Virus	0.01

Notes. Data from Add Health. N=19,612.

Table 2. Results from propensity score matching predicting fertility, sexual health behaviors, and sexually transmitted infections.

	Pregnancy	Number of pregnancies	Number of children	Number of partners	Sex for money	Sex with IV drug user	Age of first sex	STI	HIV
Difference	0.097*** [0.018]	0.477*** [0.063]	0.241*** [0.046]	3.163** [0.979]	0.014+ [0.008]	-0.001 [0.006]	-0.740*** [0.104]	0.065*** [0.017]	0.003* [0.002]
<i>N</i>	10747	10747	10779	9586	10496	10483	11464	10573	10637
Matched Pairs									
Treated	1821	1821	1823	1625	1474	1474	1760	1784	1794
Untreated	8926	8926	8956	7961	9022	8998	9704	8789	8843

Notes. Data is from AddHealth and includes multiply imputed household income. + p<0.10, * p<0.05, ** p<0.01, *** p<0.001.

Table 3. Results from propensity score matching predicting fertility by race and gender.

	Difference	N	matched pairs	
			treated	Control
Pregnancy				
Model 1a: Parental Incarceration	0.097*** [0.018]	10747	1821	8926
Model 1b: within Black males	0.068 [0.052]	904	221	683
Model 1c: within Black females	0.101* [0.040]	1159	297	862
Model 1d: within White males	0.115** [0.038]	2964	442	2522
Model 1e: within White females	0.095** [0.033]	3140	454	2686
Number of pregnancies				
Model 2a: Parental Incarceration	0.477*** [0.063]	10747	1821	8926
Model 2b: within Black males	0.376 [0.235]	904	221	701
Model 2c: within Black females	0.582*** [0.170]	1159	297	862
Model 2d: within White males	0.536*** [0.106]	2964	442	2522
Model 2e: within White females	0.498*** [0.119]	3140	454	2686
Number of live births				
Model 3a: Parental Incarceration	0.241*** [0.046]	10779	1823	8956
Model 3b: within Black males	0.271+ [0.143]	910	221	689
Model 3c: within Black females	0.131 [0.134]	1165	297	868
Model 3d: within White males	0.289*** [0.077]	2971	443	2528
Model 3e: within White females	0.280** [0.088]	3141	454	2687

Notes. Data is from AddHealth and includes multiply imputed household income. + p<0.10, * p<0.05, ** p<0.01, *** p<0.001.

Table 4. Results from PSM predicting risky sexual health behaviors by race and gender.

	Difference	N	matched pairs	
			treated	Control
Number of partners				
Model 1a: Parental Incarceration	3.163** [0.979]	9586	1625	7961
Model 1b: within Black males	-8.659 [9.369]	718	176	542
Model 1c: within Black females	2.129 [2.024]	1019	271	776
Model 1d: within White males	4.825* [2.097]	2638	389	2249
Model 1e: within White females	1.053 [1.128]	2895	416	2479
Sex for money				
Model 2a: Parental Incarceration	0.014+ [0.008]	10496	1474	9022
Model 2b: within Black males	0.043 [0.031]	894	164	730
Model 2c: within Black females	0.013 [0.026]	1116	240	876
Model 2d: within White males	0.017 [0.014]	2796	353	2443
Model 2e: within White females	0.026* [0.011]	3049	387	2662
Age of first sex				
Model 4a: Parental Incarceration	-0.740*** [0.104]	11464	1760	9704
Model 4b: within Black males	-0.746* [0.309]	1022	209	813
Model 4c: within Black females	-0.928*** [0.258]	1221	291	930
Model 4d: within White males	-0.667** [0.220]	3145	423	2722
Model 4e: within White females	-0.416* [0.213]	3283	449	2834

Notes. Data is from AddHealth and includes multiply imputed household income. + p<0.10, * p<0.05, ** p<0.01, *** p<0.001. Sex with IV drug user not included.

Table 5. Results from PSM predicting sexually transmitted infections by race and gender.

	Difference	N	matched pairs	
			treated	Control
STI				
Model 2a: Parental Incarceration	0.065*** [0.017]	10573	1784	8789
Model 2b: within Black males	0.152** [0.051]	864	211	653
Model 2c: within Black females	0.128* [0.047]	1128	290	838
Model 2d: within White males	0.069* [0.024]	2925	434	2491
Model 2e: within White females	0.051 [0.034]	3118	451	2667

Notes. Data is from AddHealth and includes multiply imputed household income. + p<0.10, * p<0.05, ** p<0.01, *** p<0.001. HIV not included..