Paternal Incarceration and Cognitive Development

Beyond Boys' Bad Behavior: Paternal Incarceration and Cognitive Development in Middle Childhood

Anna R. Haskins, *Cornell University*

A growing number of American school-aged children have incarcerated or formally incarcerated parents, necessitating a more comprehensive understanding of the intergenerational effects of mass imprisonment. Using the Fragile Families Study, I assess whether having an incarcerated father impacts children's cognitive skill development into middle childhood. While previous studies have primarily found effects for boys' behavior problems, matching models and sensitivity analyses demonstrate that experiencing paternal incarceration by age nine is associated with lower cognitive skills for both boys and girls, and these negative effects hold net of a pre-paternal incarceration measure of child cognitive ability. Moreover, I estimate that paternal incarceration explains between 2 and 15 percent of the Black–White achievement gap at age nine. These findings represent new outcomes of importance and suggest that paternal incarceration may play an even larger role in the production of intergenerational inequalities for American children than previously documented.

Introduction

One of the most shocking phenomena this country has witnessed in the past century has been the unprecedented rise in mass incarceration. Currently, nearly one in every one hundred adults are in prison or jail, and an additional one in fifty are under probation or on parole (Glaze and Parks 2012). Previous scholars have identified myriad deleterious consequences of mass incarceration for the

The author graciously thanks Steven Alvarado, Tom DiPrete, Irv Garfinkel, Jeffery Grigg, Paul Hanselman, Jennifer Jennings, Kristin Turney, Chris Wildeman, Elizabeth Wrigley-Field, and the Editor and anonymous reviewers of Social Forces for their valuable feedback. This research was supported by a Ford Foundation Dissertation Fellowship, the American Sociological Association's Minority Fellowship Program, and a Provost's Postdoctoral Research Fellowship from Columbia University and the Columbia Population Research Center. The author also thanks the Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD) through grants R24HD058486, R01HD36916, R01HD39135, and R01HD40421, as well as a consortium of private foundations for their support of the Fragile Families and Child Wellbeing Study. All errors are the author's own, and the contents of this paper do not necessarily reflect the official views of any funding agencies. *Address correspondence to Anna R. Haskins, Cornell University, Department of Sociology, 354 Uris Hall, Ithaca, NY 14850, USA. E-mail: arh96@cornell.edu.*

Social Forces 95(2) 861–892, December 2016
doi: 10.1093/sf/sow066
Advance Access publication on 9 September 2016

imprisoned individual and former inmate, alongside a quickly growing literature that explores the broader fallout for families and communities (Travis, Western, and Redburn 2014). What once was a rare event is now experienced by a substantial number of American school-aged children, with recent estimates indicating that around one in every fourteen minors, or 7 percent of all children nationwide, has had a parent at some point in their lives under one form of correctional supervision or another (Murphey and Cooper 2015; Sykes and Pettit 2014). The sheer number of children with incarcerated or formally incarcerated parents, alongside evidence that early cognitive skill differences shape later-life trajectories, warrants a more detailed examination of the range of collateral consequences, as mass incarceration is arguably one of America's most powerful social stratifying institutions.

While previous studies of the consequences of parental incarceration have primarily found effects for boys' behavior problems, this study—which utilizes Fragile Families data, a comprehensive set of child cognitive measures, and matching models with sensitivity analyses—moves beyond boys' behavior to demonstrate that experiencing paternal incarceration by age nine impacts the cognitive skills of both boys and girls. Negative effects hold after adjusting for child cognitive ability prior to experiencing paternal incarceration. Finally, given continued racial disparities in incarceration rates, population-level impacts of paternal incarceration on the Black–White achievement gap are calculated, producing estimates that preliminarily suggest that racial disparities in mass incarceration account for between 2 and 15 percent of present-day achievement gaps. Together, these findings suggest that paternal incarceration is an important mechanism in the production of educational inequalities among American children, creating the potential for serious and lasting intergenerational ramifications.

Mass Incarceration and the Transmission of Disadvantage from Parent to Child: Theory and Evidence

General Theoretical Implications of Parental Incarceration for Children

The impacts of punitive criminal justice policies targeted at adults extend beyond the incarcerated individual. Of those collaterally impacted, children are possibly the most vulnerable. Parental incarceration plausibly affects children through processes including, but not limited to, *trauma* experienced as a result of parent–child separation (Braman 2004; Comfort 2007); the sense of social isolation and shame brought on by the *stigma* associated with having a family member incarcerated (Goffman 1963; Murray and Farrington 2008); or the social, psychological, and economic *stress and strain* imposed upon children of the incarcerated due to family disruption, dissolution, or prolonged financial hardship (Hagan and Dinovitzer 1999; Swisher and Waller 2008).[1] Moreover, research has shown that harmful effects on child well-being can occur regardless of the resident status of the father at the time of his imprisonment, suggesting that there is

something additionally unique about incarceration that impacts children beyond mere paternal absence (Geller et al. 2012).

Paternal Incarceration and Child Outcomes: Empirical Evidence on Behavior and Beyond

Given data availability and the high cumulative risk of paternal incarceration as compared to maternal imprisonment (Wildeman 2009), the majority of work in this area has focused on fathers. While the general nature of trauma, stigma, and strain theories bears the assumption that paternal incarceration could impact both boys and girls and have consequences on child outcomes beyond that of behavior, evidence from empirical studies has been more limited. Most consistently, studies have shown that the negative effects of paternal incarceration are manifest in behavioral problems concentrated primarily among males. For example, paternal incarceration has been found to increase aggression, depression, anxiety, attention problems, and delinquency. These negative effects on male behavioral functioning and mental health are present across the life course, occurring as young as age five (e.g., Geller et al. 2012; Haskins 2014; Wildeman 2010), extending into middle childhood (e.g., Haskins 2015; Wilbur et al. 2007), and continuing to manifest in adolescence and early adulthood (e.g., Murray, Loeber, and Pardini 2012; Roettger and Swisher 2011).

These extremely consistent findings for boys and their behavioral outcomes have been pivotal in establishing the existence of harmful consequences of paternal incarceration (most notably around intergenerational transmissions of male criminality). However, they may have also narrowed our focus to the detriment of other outcomes or demographic groups (e.g., girls) where impacts are potentially more heterogeneous or sensitive to developmental period. If we looked more holistically at child well-being, further broadening the range of child outcomes explored, as suggested by Foster and Hagan (2015), could impacts of paternal incarceration extend beyond boys' bad behavior to have more considerable intergenerational implications? If so, consequences might be more expansive than previously documented. Insight can be found in studies that have explored impacts of paternal incarceration on child outcomes beyond those of behavior.

With regard to measures of child well-being, the incarceration of a father may interfere with the formal and informal financial support systems in place prior to imprisonment, which leads to a variety of unmet material needs, increased reliance on government aid, residential mobility, and housing instability for impacted children (e.g., Geller et al. 2009; Geller, Garfinkel, and Western 2011; Sugie 2012). Moreover, scholars have found that paternal incarceration increases elementary-aged children's likelihood of special education placement (Haskins 2014) and grade retention (Turney and Haskins 2014), reduces adolescent GPA and their likelihood of high school and college completion (e.g., Foster and Hagan 2007; Hagan and Foster 2012a), and increases reports of extended school absences (Nichols and Loper 2012).

However, impacts of paternal incarceration on direct measures of cognitive skills in childhood are rare. For example, scholars have found null effects of paternal incarceration for preschool children's receptive vocabulary at age three (Geller et al. 2009) and age five (Geller et al. 2012; Haskins 2014) using the Peabody Picture Vocabulary Test (PPVT), an oft-used, but far from holistic, measure of early cognitive ability. Findings like these have led scholars to conclude that the association between paternal incarceration and cognitive development is weak to null (Murray, Farrington, and Sekol 2012). And while that conclusion is consistent with the extant literature, no study has fully investigated the impact paternal incarceration has on more comprehensive and reliable measures of cognitive skills children possess and develop, especially during middle childhood. Indeed, as evidenced in Murray, Farrington, and Sekol (2012) meta-analysis, consistent, comprehensive, and standardized measures of cognitive outcomes explored with rigorous methods are virtually absent from the literature on the effects of parental incarceration. Cognitive skills evolve, and the potential for deficiencies can surface at various points as children move through the life course, emphasizing both a need for consistent and reliable measures and continual assessment of the potential impact of paternal incarceration on skills as children age.

Paternal Incarceration and Cognitive Development in Middle Childhood

Of the nearly two million minor children in the United States with currently incarcerated fathers, the majority are under the age of twelve (Glaze and Maruschak 2008). For children in the developmental stages of early to middle childhood—approximately ages two to ten—experiencing the incarceration of a parent can be especially detrimental to healthy development. Middle childhood is often marked by time in primary school and is the developmental phase where children build their academic competencies, learn to understand societal roles, begin to interact with peers, and develop intimate relationships with friends, family, and other significant adults. Moreover, it is a time where socio-emotional and academic competencies begin to "crystalize" into relatively consistent patterns of behavior and skill trajectories that persist into adolescence and early adulthood (Collins 1984; Feinstein and Bynner 2004; Kowaleski-Jones and Duncan 1999). Given that early cognitive skill differences are linked to later-life trajectories (e.g., Deming 2009), middle childhood is a critical period for healthy development of age-appropriate cognitive skills and therefore a time especially sensitive to disruption and instability (Duncan et al. 2007; Huston and Ripke 2006).

The incarceration of a parent could be seen as an event capable of producing trauma, stigma, and strain, all of which might negatively impact elementary-aged children's sense of academic competence with implications that carry on throughout the life course. Indeed, earlier impacts on behavior and attentional capacities may have lagged impacts on cognitive skill acquisition via mechanisms such as grade retention and special education placement or decreased connection to school, as evidenced in work by Dallaire and Aaron (2010) that finds that parental incarceration for school-aged children produces unique risk factors

related to the stable development of strong school ties and healthy academic environments. Thus, the social and emotional volatility produced by paternal incarceration can place school-aged children at a heightened risk for academic difficulties.

The Current Study

This study directs focus "beyond boys' bad behavior" and contributes to previous research in four key ways. First, it investigates a more comprehensive range of cognitive outcomes providing the first extensive examination of the effect of paternal incarceration on direct standardized assessments of school-aged children's reading, math, vocabulary, and memory/attentional competencies. Second, it explores the impact of paternal incarceration on these cognitive outcomes into middle childhood, an important developmental stage for the growth of academic skills, bridging previous work that has focused either on early childhood or young adulthood. Third, being cognizant of the sharp racial disparities in paternal imprisonment, it includes estimates of effects for Hispanics, alongside Blacks and Whites, as they represent a policy-relevant group often absent from the literature. Fourth, the paper addresses a number of methodological limitations that have plagued earlier work.

I first ask whether paternal incarceration diminishes the cognitive development of children in middle childhood (age nine), and then consider whether such effects vary by race and gender. To disentangle the unique impact of paternal incarceration from effects of preexisting disadvantage, I control for a wide range of covariates, all of which are measured prior to incarceration, and employ propensity score matching techniques alongside Rosenbaum bounds sensitivity analyses. I find that experiencing paternal incarceration by age nine is associated with lower cognitive skills in elementary school, and in supplementary analyses, this negative association holds even when adjusting for a measure of children's cognitive skills *prior* to their father's first incarceration. Findings indicate that negative impacts are experienced by both boys and girls and found across reading, math, and attentional dimensions of cognitive ability. Point estimates are largest for Whites; however, given that Black and Hispanic children are substantially more likely to experience paternal incarceration at the population level, mass incarceration has the potential to present serious deleterious impacts for minority children. Together, these results suggest that the negative consequences of paternal incarceration do indeed extend "beyond boys' bad behavior" to impact girls and cognitive skill development during middle childhood.

Data, Measures, and Methods

Data

I use the Fragile Families Study (FFS), a contemporary population-based longitudinal birth-cohort sample of urban children. These data were initially collected between the years of 1998–2000 from 4,898 focal children and their parents

residing across twenty large US cities. For mothers, baseline interviews took place in hospitals within forty-eight hours after the birth of the focal child, and for fathers, soon thereafter. Marital and non-marital births were randomly sampled within hospitals across cities that were stratified by labor-market conditions and policy environments; however, non-marital births were oversampled, making this a relatively economically disadvantaged sample (for a complete description of the sample and design, see Reichman et al. 2001).[2]

Since the baseline wave, four additional follow-up waves of phone interviews have occurred, taking place when the child is approximately one, three, five, and nine years old. Each wave includes separate interviews of both parents, in-home direct assessments of the child and their home environment (beginning at the year-three follow-up), and for this most recent wave—when the child is nine years old and has entered elementary school—it includes a teacher survey, a child survey, and a larger range of educational assessments. Thus, not only does the FFS follow both parents, but it does so as their child grows, offering good age specificity to track effects at various developmental stages. Interview response rates for both parents across waves can be found in appendix A of the online supplement.

Analyses for this study take advantage of information from across the five current waves of FFS data, covering the first nine years of the focal child's life. The analytic sample begins with all Black, White, and Hispanic children whose families participated in the year-nine follow-up wave ($n = 3{,}630$);[3] however, any child with missing information on the cognitive outcomes (on average, $n = 263$), or paternal incarceration experiences that occurred prior to age one ($n = 1{,}160$), is excluded, providing, *on average*, a final analytic sample of $N = 2{,}192$. Table 1 provides a descriptive snapshot of this analytical sample by paternal incarceration status as well as sample counts for each of the four child cognitive outcomes investigated. I use multiple imputation (MI) to preserve as many observations of relevant variables as possible, producing five datasets.[4] I then analyze each individual dataset and average the separate results to yield a final single set of estimates (Royston 2005; Rubin 1987).

Description of Measures

Child Cognitive Outcomes

I explore a total of four skills representing child cognitive development: (1) verbal ability, (2) reading comprehension, (3) math problem-solving skills, and (4) working memory/attentional capacities. Together, these outcomes characterize a more comprehensive and reliable assessment of child cognition than has been previously explored. Each outcome is measured at the year-nine follow-up wave for the subset of focal children whose parents agreed to participate in the "in-home" portion of survey.[5] All four outcomes are drawn from standardized norm-referenced assessments that were individually administered by the interviewer, in person, in the child's home.

The child's standard score on the Peabody Picture Vocabulary Test-III (PPVT) indicates verbal ability. Reading comprehension is measured by the child's

Table 1. Weighted Means and Standard Deviations for Dependent and Independent Variables by Paternal Incarceration Status

Variable names			Father never incarcerated (G1) Mean	SD	Father incarcerated Btw YR1 & YR9 (G2) Mean	SD	G1 vs. G2 t-test	*Ns* G1	G2	total
Outcome variables										
Cognitive (standardized)										
PPVT	A	+	0.35	(1.14)	0.01	(1.05)	***	1629	562	2191
WJ Reading	A	+	0.24	(0.99)	−0.01	(1.03)	***	1621	563	2184
WJ Math	A	+	0.3	(1.09)	0.001	(1.02)	***	1623	564	2187
Digit Span	A	+	0.23	(1.08)	0.09	(1.06)	***	1639	568	2207
Maternal demographic and household characteristics									in PSM	
Child age at YR9 (in months)			111.61	(3.55)	112.1	(3.96)	NS			
Child grade at YR9			3.13	(0.69)	3.1	(0.68)	NS			
Child race Black			0.31		0.53		***		x	
Child race White			0.4		0.1		***		x	
Child race Hispanic			0.29		0.38		**		x	
Child gender Male			0.6		0.55		NS		x	
Low birth weight			0.07		0.07		NS		x	
Child healthy			0.99		0.97		**		x	
Maternal cognitive (0–15)			7.29	(2.92)	6.81	(2.38)	+		x	
Maternal self-control (6–24)			18.17	(3.44)	17.81	(3.70)	*		x	
Maternal age at 1st birth (13–45)			24.72	(6.11)	21.2	(4.78)	***		x	
Maternal education (1–4)			2.59	(1.09)	1.91	(0.82)	***		x	
Mother cohabiting with father			0.18		0.25		**		x	

(*Continued*)

Table 1. ***continued***

Variable names	Father never incarcerated (G1) Mean	SD	Father incarcerated Btw YR1 & YR9 (G2) Mean	SD	G1 vs. G2 t-test	*Ns* G1	G2	total
Mother married to father	0.64		0.4		***		x	
Maternal parenting stress (0–12)	4.7	(2.62)	4.81	(2.91)	NS		x	
Maternal anxiety	0.03		0.03		NS		x	
Maternal depression	0.13		0.15		NS		x	
# of maternal bio kids (1–16)	2.06	(1.20)	2.26	(1.35)	NS		x	
Grandparent in HH	0.14		0.23		***		x	
# of Children in HH (0–8)	1.07	(1.31)	1.43	(1.36)	**		x	
Paternal demographic and psycho-social characteristics							x	
Paternal age (15–53)	31.13	(7.28)	27.37	(7.38)	***		x	
Father employed	0.9		0.84		***		x	
Father US citizen	0.69		0.8		***		x	
Paternal cognitive (0–15)	6.56	(2.97)	5.92	(2.68)	**		x	
Paternal education (1–4)	2.64	(1.10)	1.91	(0.86)	***		x	
Paternal self-control (6–24)	19.04	(3.60)	17.2	(3.75)	***		x	
Paternal drug and alcohol problems	0.04		0.12		***		x	
Paternal domestic violence	0.07		0.16		***		x	
Father had two bio-parent HH at 15	0.62		0.48		***		x	

Father's bio father involved	0.79		0.68		***	x
Paternal multi-partner fertility	0.24		0.36		***	x
Paternal anxiety	0.03		0.05		**	x
Paternal depression	0.07		0.13		**	x
Paternal contact with child in days (0–30)	26.77	(8.38)	24.36	(9.98)	***	x
Economic indicators						x
Poverty status (1–5)	2.25	(1.33)	3.17	(1.26)	***	x
Child living in public housing	0.07		0.09		***	x
Neighborhood unsafe	0.08		0.19		***	x
Census tract characteristics						x
% of population White	0.39	(0.35)	0.26	(0.29)	***	x
% of population Black	0.26	(0.33)	0.43	(0.39)	***	x
% of female pop. of childbearing age	0.52	(0.07)	0.52	(0.07)	NS	x
% of HHs female-headed w/ children <18	0.17	(0.13)	0.23	(0.14)	***	x
Mean # of persons per HH	2.82	(0.75)	2.76	(0.53)	NS	x
% of 25+ population with HS+ education	0.72	(0.18)	0.68	(0.14)	***	x
% of 25+ population with BA+ education	0.25	(0.22)	0.15	(0.14)	***	x
% of civilian labor force unemployed	0.1	(0.07)	0.13	(0.09)	***	x
% of housing units vacant	0.07	(0.05)	0.09	(0.08)	***	x
% of renter-occupied housing units	0.55	(0.28)	0.57	(0.25)	**	x
Median housing value in dollars in 1999	154520	(158760)	116626	(170238)	***	x
% of HH on public assistance	0.08	(0.08)	0.1	(0.12)	***	x
% of families below poverty level in 1999	0.18	(0.16)	0.23	(0.16)	***	x
% of families w/ 1999 income <$10K	0.12	(0.11)	0.16	(0.14)	***	x

(*Continued*)

Table 1. ***continued***

Variable names	Father never incarcerated (G1) Mean	SD	Father incarcerated Btw YR1 & YR9 (G2) Mean	SD	G1 vs. G2 t-test	*Ns* G1	G2	total
% of families w/ 1999 income $10–14,999	0.06	(0.05)	0.07	(0.05)	***		x	
% of families w/ 1999 income $15–24,999	0.12	(0.06)	0.14	(0.06)	***		x	
% of families w/ 1999 income $25–34,999	0.12	(0.06)	0.14	(0.05)	***		x	
% of families w/ 1999 income $35–49,999	0.15	(0.06)	0.16	(0.05)	NS		x	
% of families w/ 1999 income $50–74,999	0.17	(0.07)	0.18	(0.08)	***		x	
% of families w/ 1999 income $75–99,999	0.1	(0.06)	0.08	(0.05)	***		x	
% of families w/ 1999 income $100–149,999	0.08	(0.08)	0.05	(0.05)	***		x	
Interview city (20 indicator variables)							x	
$N = 2,207$		$n = 1,639$		$n = 568$				

Notes: A = administered assessments; descriptives of controls run on Digit Span *N*; 20 cities weights used, but *t*-tests run on unweighted data.

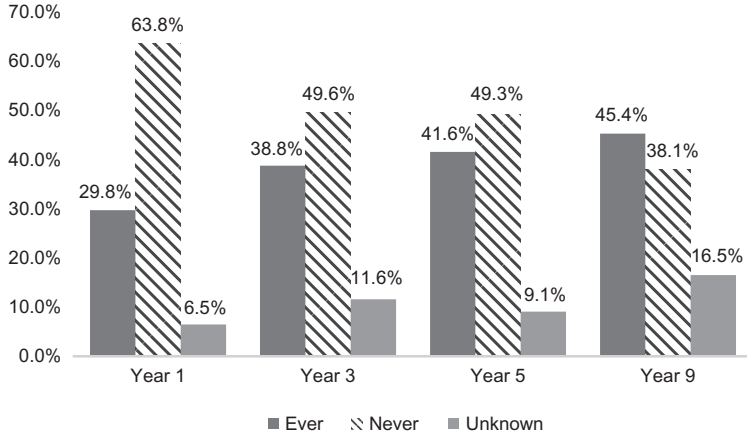
standard score on the Passage Comprehension Subtest 9 of the Woodcock–Johnson III Tests of Achievement (WJ Reading). Math problem-solving skills are assessed using the Applied Problems Subtest 10 of the Woodcock–Johnson III Tests of Achievement (WJ Math). Finally, a child's standard score on the Forward and Backward Digit Span Tests of the Wechsler Intelligence Scale for Children IV (Digit Span) indicates working memory. See appendix G of the online supplement for detailed descriptions of the specific skills each assessment measures and their associated source documentation. For ease of interpretation, the scores for each of these four cognitive outcomes are standardized with coefficients reported in standard-deviation units. Higher numbers indicate children's higher cognitive capacities in the tested area.

Paternal Incarceration

For the contemporary sample of urban school-aged children in the FFS, paternal incarceration is not a rare life event. At the first follow-up wave (year one), when the focal child is age one and paternal incarceration is first systematically measured, approximately 30 percent of the fathers in the study have experienced incarceration at some point in their lives, and this increases to nearly 46 percent by age nine—totaling just over 2,300 dads. For the full study sample, Figure 1 demonstrates the progression of paternal incarceration for focal children over waves.

Paternal incarceration is constructed based on a combination of mother and father reports of the father's current or previous incarceration status (ever or never) across study waves, beginning with the year-one follow-up wave and ending at the year-nine follow-up. At each wave mothers are asked, through a variety of interview questions, if their child's father is currently incarcerated (at the point in time of the interview) or has ever spent time in jail or prison; fathers are asked if they have ever been imprisoned. Unfortunately, the FFS does not offer

Figure 1. Prevalence of paternal incarceration in fragile families over waves in percentages



Notes: Non-imputed (unknowns included), $N = 4{,}898$.

any information on duration or frequency of incarceration, nor can it distinguish between stays in prison as opposed to jail, or levels of severity in the crime committed. If either mother or father answer yes to any question related to paternal incarceration, then the father is indicated as "ever" incarcerated for that and subsequent waves.

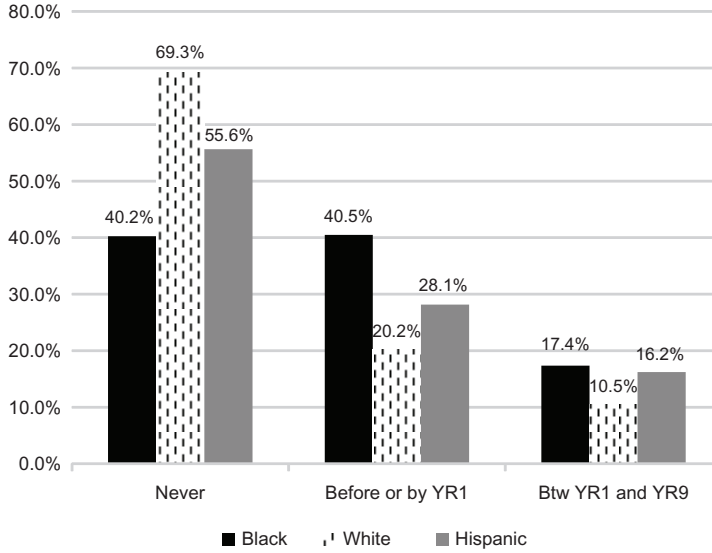
Because no direct question was asked of FFS mothers or fathers at baseline/child's birth about past or current episodes of incarceration,[6] for the purposes of this study children with reports of "ever" paternal incarceration status at age one are excluded from the analytic sample.[7] Recall from figure 1 that this is nearly 30 percent of the full sample. This sample refinement is necessary in order to attend most carefully to the temporal ordering of controls, avoid introducing "post-treatment bias," and provide unbiased estimates of the effect of paternal incarceration (Ho et al. 2007). The exclusion of this group of children is not because paternal incarceration matters less for them. Consequences for all children remain substantively important, especially when considering population-level impacts; however, refining the analytic sample in this way allows for a less biased estimate of the effect of paternal incarceration.

Thus, children's paternal incarceration experiences at age nine are indicated in one of two ways: (1) children with fathers who have no discernible incarceration histories (as reported by either mother or father consistently across all five waves) are indicated as having "never incarcerated fathers," and serve as the control group in analyses, while (2) children whose fathers experienced *first-time* imprisonment[8] sometime between the year-one and year-nine follow-up interviews (and not earlier) are placed in the treatment group. This latter group excludes any father with previously indicated incarceration experiences at year one. Fathers in this *between-years-one-and-nine* group account for a smaller number of the proportion of incarcerated fathers but are more appropriate for estimating effects since their first reported incarceration occurred after the collection of relevant baseline and year-one covariates. Figure 2 shows the breakdown of paternal incarceration status by race for the two groups of children in the analytic sample: "never" (n = 1,639) and "between year one and year nine" (n = 568), as well as the children dropped from analyses due to their father's incarceration occurring at some point prior to year one ("before or by year one").

Covariates

The wealth of information present in the restricted FFS data allows for the inclusion of a host of *pre-incarceration* characteristics of mothers, fathers, and their children likely to be associated with future paternal incarceration and children's cognitive outcomes. These include basic demographic and household characteristics, measures of health and economic well-being, an indicator for sample city, a number of contextual (census-tract) characteristics, and specific measures of parental psycho-social and deviant behaviors. Adjusting for this last set of controls diminishes concerns that parental behaviors both drive a father's incarceration and impact children's cognitive skill acquisition. Moreover, estimates of the effect of paternal incarceration are plausible only if included controls adequately address

Figure 2, Exposure to paternal incarceration in FFS by year 9 and race in percentages



Notes: Imputed; $N = 4{,}898$.

both socio-structural and deviant behavior selection. This requires not only nuanced measures of both, but also measures that precede incarceration (since both may be impacted by incarceration). In order to maintain appropriate time ordering between the dependent, explanatory, and control variables, all controls included in the analyses are measured at either the baseline or year-one follow-up interviews or are assumed fixed traits.[9] Table 1 summaries all controls—fifty-seven in total—along with descriptive statistics by paternal incarceration status.

Methods

This study utilizes propensity score matching (PSM) (Caliendo and Kopeinig 2008; Dehejia and Wahba 1999; Rosenbaum and Rubin 1983) to estimate the relationship between paternal incarceration and school-aged children's cognitive outcomes. PSM models estimate the "treatment effect" of having an incarcerated father on children's outcomes by simulating "treatment" and "control" groups from the observational FFS data. This matching technique allows for a more appropriate comparison of cognitive outcomes, via the use of a reference group of children who do not experience paternal incarceration, but are *similarly at risk*, based on the observed socioeconomic, demographic, neighborhood, health, and parental behavior covariates included in the matching model (see table 1 for this list). Propensity score matching can only account for observed differences between treatment and control groups, and is therefore no panacea for unobserved heterogeneity, but remains a valuable technique particularly when used in conjunction with a rich set of observed characteristics like those available in the FFS data.

I conduct PSM analyses only on the group of children who experience a *first-time* incarcerated father between ages one and nine and their matched "never" controls, with analyses restricted to cases within the region of common support. I use a probit regression model predicting selection into paternal incarceration to create propensity scores and a Gaussian kernel matching technique with a bandwidth of 0.08 to match similar treatment and control cases.[10] After propensity scores are estimated, I test that covariate balance was achieved and report post-matching balance statistics for each model in the final three columns of the results tables. Appendix D of the online supplement shows the distribution of common support for treatment and control groups across each outcome.

Finally, to test the robustness of the estimated treatment effects to bias stemming from an unobserved confounder, I conduct sensitivity analyses using Rosenbaum bounds (DiPrete and Gangl 2004; Rosenbaum 2002). This test assesses how strong a hypothetical unmeasured variable related to selection into paternal incarceration would need to be to undermine the results. Moreover, in supplementary analyses, I attempt to address one remaining critique of studies in this area, that is, the absence of controls for pre-incarceration measures of child outcomes (Johnson and Easterling 2012; Murray, Farrington, and Sekol 2012). To do this, I combine matching methods with change models and run analyses on a subset of the analytic sample where a "pre-treatment" (i.e., measured before *first-time* paternal incarceration) indicator of child cognitive ability is available. The control group for these supplementary analyses includes the same children as the main analytic sample; however, the treatment group is further restricted to only include the subset of children with *first-time* paternal incarceration experiences occurring between ages three and nine. This is because the second follow-up wave of the FFS, when the focal child was approximately three, is the first time any standardized measure of cognitive ability is available. The sole available measure, the PPVT, is thus used as the "pre-treatment" measure. Admittedly, this is a limited indicator of cognitive ability, as it only captures receptive vocabulary, but is often used to indicate general scholastic aptitude in young children (Tenenbaum et al. 2007). PSM models are directly analogous to those of the main analyses, but now include this additional "pre-treatment" covariate. The sample refinement leads to a reduction in size of the treatment group (from 568 to 252) and should not be considered directly comparable to the paper's main analysis. However, it is a sample that controls for children's cognitive skills prior to experiencing paternal incarceration in an effort to address the concern that children with incarcerated fathers had worse cognitive skills even before experiencing paternal incarceration.

Results

Descriptive

Figures 1 and 2 demonstrate that a large number of children in the FFS experience paternal incarceration by age nine. These data display patterns of early life-course racial disparities, with nearly 60 percent of Black children and 45 percent

of Hispanic children experiencing paternal incarceration at some point by age nine, whereas for Whites the percentage hovers at around 30. While exposure to paternal incarceration by age nine for all children in the FFS sample is high, by the time race/ethnic minority children have entered primary school, more have experienced paternal incarceration than have not. With regard to gender, boys and girls in this sample experience paternal incarceration nearly equally.

Table 1 presents descriptive statistics by paternal incarceration status for children in the main analytic sample. Across the four cognitive outcomes explored, unadjusted statistically significant mean differences surface, with children of incarcerated fathers scoring one-fifth to one-third of a standard deviation lower on every measure. Appendix B of the online supplement fleshes out these unadjusted mean comparisons by race and gender, finding generally that this pattern of inequality in cognitive outcomes by paternal incarceration status also carries over into comparisons within race and gender.

Significant differences by incarceration status also surface for forty-six of the fifty-seven pre-incarceration covariates included in the PSM models. Given that the FFS is a uniquely disadvantaged urban sample, children experiencing paternal incarceration are more likely to be Black or Hispanic, experience higher levels of poverty, live in multigenerational households, and reside in neighborhoods perceived to be unsafe and with higher percentages of female-headed households, unemployment, families in poverty, and concentrations of racial minorities. Parents of children who experience paternal incarceration have lower levels of education and cognitive ability, are less likely to be married at the time of the child's birth, and are younger, with lower levels of self-control. Fathers of these children have more problems with drugs, alcohol, and domestic violence, and report lower levels of either being raised in a two-biological-parent household or having their biological father involved in their upbringing.

Propensity Score Matching Models

I now present results for the effect of paternal incarceration on the cognitive skills of children in middle childhood. Analyses are restricted to children whose fathers were incarcerated for the *first time between year one and year nine* and their matched *never* controls (i.e., children similar on the observed pre-treatment characteristics included in the matching model, but with no paternal incarceration history by year nine). Results for the overall analytic sample (table 2) are presented first, followed by race (table 3), with separate models for Blacks, Whites, and Hispanics, and finally within gender (table 4) for boys and girls.

Overall Sample

Table 2 presents PSM results for the full analytic sample. Starting with the PPVT, the standardized point estimate of −0.024 in model 1 indicates that children experiencing paternal incarceration score lower on this measure of receptive vocabulary than similar matched peers without incarcerated fathers, but this difference is not statistically significant. However, model 2 suggests that overall, children who experience first-time paternal incarceration between years one and

Table 2. Propensity Score Matching Results for Cognitive Outcomes for Overall Group

	Paternal incarceration				Matched pairs		Mean bias before/after matching		
Cognitive outcomes	Difference	SE	*T*-statistic	*N*	Treated	Control	Before (raw)	After (matched)	% Reduction in bias
Model 1: PPVT Vocabulary	−0.024	0.055	−0.437	2191	555	1631	20.0	2.7	86.5%
Model 2: WJ Reading	−0.116*	0.058	−2.002	2184	557	1623	20.2	2.8	86.1%
Model 3: WJ Math	−0.116*	0.055	−2.109	2187	557	1625	20.1	2.8	86.1%
Model 4: Digit Span Memory	−0.122*	0.055	−2.216	2207	561	1641	20.1	2.8	86.1%

Notes: Kernel matching model estimates shown. See table 1 and the Methods section for a complete list of variables used in the models predicting the treatment. Analyses are unweighted and done on imputed data. Matched pairs indicate the average number of treated and control observations on common support. Significance levels are the following: *$p < .05$ **$p < .01$ ***$p < .001$ (two-sided).

Table 3. Propensity Score Matching Results for Cognitive Outcomes by Race

	Paternal incarceration				Matched pairs		Mean bias before/after matching		
PPVT Vocabulary	Difference	SE	*T*-statistic	*N*	Treated	Control	Before (raw)	After (matched)	% Reduction in bias
Model 1a: within Blacks	−0.015	0.065	−0.229	1096	345	737	15.2	2.4	84.2%
Model 1b: within Whites	−0.136	0.177	−0.769	482	53	352	34.7	6.5	81.3%
Model 1c: within Hispanics	0.013	0.118	0.111	613	124	467	11.4	3.3	71.1%
WJ Reading									
Model 2a: within Blacks	−0.049	0.075	−0.653	1094	347	732	15.5	2.4	84.5%
Model 2b: within Whites	−0.423**	0.188	−2.248	480	56	341	34.8	5.9	83.0%
Model 2c: within Hispanics	−0.017	0.096	−0.181	610	123	468	11.3	3.4	69.9%
WJ Math									
Model 3a: within Blacks	−0.095	0.074	−1.286	1091	347	730	15.3	2.4	84.3%
Model 3b: within Whites	−0.254	0.212	−1.197	481	57	343	34.7	6.8	80.4%
Model 3c: within Hispanics	0.023	0.101	0.231	615	124	472	11.5	3.3	71.3%
Digit Span Memory									
Model 4a: within Blacks	−0.092	0.07	−1.224	1107	350	743	15.5	2.3	85.2%
Model 4b: within Whites	−0.352	0.217	−1.623	485	58	354	33.9	6.3	81.4%
Model 4c: within Hispanics	−0.03	0.113	−0.267	615	124	472	11.5	3.5	69.6%

Notes: Kernel matching model estimates shown. See table 1 and the Methods section for a complete list of variables used in the models predicting the treatment. Analyses are unweighted and done on imputed data. Matched pairs indicate the average number of treated and control observations on common support. Significance levels are the following: *$p < .05$ **$p < .01$ ***$p < .001$ (two-sided).

Table 4. Propensity Score Matching Results for Cognitive Outcomes by Gender

	Paternal incarceration				Matched pairs		Mean bias before/after matching		
PPVT Vocabulary	Difference	SE	*T*-statistic	*N*	Treated	Control	Before (raw)	After (matched)	% Reduction in bias
Model 1a: within boys	0.017	0.082	0.206	1149	285	858	21.2	3.2	84.9%
Model 1b: within girls	−0.044	0.082	−0.544	1042	256	773	19.1	3.3	82.7%
WJ Reading									
Model 2a: within boys	−0.052	0.092	−0.563	1148	288	853	21.7	3.5	83.9%
Model 2b: within girls	−0.162*	0.08	−1.969	1036	254	770	19.1	3.2	83.2%
WJ Math									
Model 3a: within boys	0.027	0.089	0.300	1150	290	853	21.6	3.4	84.2%
Model 3b: within girls	−0.251**	0.081	−3.079	1037	253	771	19.0	3.2	83.1%
Digit Span Memory									
Model 4a: within boys	−0.177*	0.083	−2.126	1161	290	864	21.6	3.3	84.7%
Model 4b: within girls	−0.078	0.08	−0.969	1046	257	776	19.0	3.3	82.6%

Notes: Kernel matching model estimates shown. See table 1 and the Methods section for a complete list of variables used in the models predicting the treatment. Analyses are unweighted and done on imputed data. Matched pairs indicate the average number of treated and control observations on common support. Significance levels are the following: *$p < .05$ **$p < .01$ ***$p < .001$ (two-sided).

nine score just over 1/9 of a standard deviation (SD) lower than their matched controls on the WJ Reading assessment, an indicator of children's reading comprehension skills.

Model 3 indicates that paternal incarceration also has negative effects on math problem-solving skills, as measured by the WJ Math assessment. Overall, the statistically significant difference in this outcome for children is again just over 1/9 of a standard deviation (point estimate −0.116). Digit Span Memory (model 4), the last of the cognitive outcomes explored, also shows that compared to children with never incarcerated fathers, matched FFS children who experience paternal incarceration for the first time between ages one and nine have significantly lower attention, memory, and concentration skills, on the magnitude of nearly 1/8 of a standard deviation (−0.122 point estimate).

In sum, the above findings suggest that the incarceration of a father significantly limits their child's reading comprehension, math problem-solving, and memory/attentional capacities in middle childhood. In education literature, while small, effect sizes around 1/9 are meaningful[11] and the reported overall differences in cognitive skills of −0.116 to −0.122 between children with incarcerated fathers and their matched controls are equivalent to a loss within the range of one to two months of schooling.

By Race/Ethnicity

Nationally, the proportion of children with parents *currently* in prison is greatest for Blacks at nearly 7 percent and Hispanics at 2.4 percent, while less than 1 percent of White school-aged children experience current parental incarceration (Glaze and Maruschak 2008). In fact, for recent cohorts, a staggering one in four Black children will experience some period of parental incarceration by age fourteen, while the risk for Whites is under 4 percent (Wildeman 2009). Thus, sharp racial disparities in paternal imprisonment, coupled with evidence that incarceration deepens disadvantage and nearly eliminates traditional pathways of upward social mobility, make it particularly important to ask whether intergenerational impacts of mass incarceration contribute to durable patterns of racial inequality.

Models 1–4 of Table 3 present within-race PSM results for the treatment effect of paternal incarceration on the four cognitive outcomes of interest. Disaggregating the data by race results in a considerable loss of power to detect effects at the conventional .05 level; thus, not surprisingly, there are practically no statistically significant effects. However, the consistency of differences by race/ethnicity across all four outcomes is striking. While Blacks and Whites both have point estimates consistently in the expected negative direction, Hispanics have small but counterintuitive positive coefficients for two of the four outcomes. Most surprising, the point estimates of the negative effect of incarceration for Whites are dramatically higher across all outcomes—from nearly three to nine times higher than that for the Black children in the analytic sample. Tests of the difference across race/ethnic groups show no statistically significant differences; however, the width of the confidence intervals around the point estimates

indicate that there may be imprecision in the estimates due to inadequate statistical power. Although these differences are not statistically significant, it appears that Whites may drive the overall results.

By Gender

Models 1–4 of Table 4 present within-gender PSM results for the treatment effect of paternal incarceration on the four cognitive outcomes of interest. Unlike with race/ethnicity, the sample sizes are balanced by gender, presenting less concern for loss of statistical power. For girls, consistent negative effects of paternal incarceration manifest across all four cognitive outcomes, with two—reading comprehension (WJ Reading) and math problem-solving skills (WJ Math)—reaching statistical significance. Moreover, with the exception of the memory/attentional measure, point estimates for girls are two to three times the size of the boys' coefficients. And indeed, tests of gender difference between boys and girls indicate statistically significant differences for math problem-solving skills. Interestingly, impacts for boys are less consistent, with point estimates in the expected negative direction for only two of the four outcomes. Moreover, only the Digit Span assessment of memory/attentional capacities is statistically significant for boys.

In sum, the above findings suggest that the incarceration of a father does have impacts on outcomes beyond that of "boys' bad behavior." Girls with incarcerated fathers have statistically significant lower reading comprehension (point estimate −0.162; table 4, model 2b) and math problem-solving (point estimate −0.251; table 4, model 3b) skills compared to same-gender matched peers; while boys have reduced attentional capacities (point estimate −0.177; table 4, model 4a). Together, effect sizes ranging between 1/7 and 2/5 are substantial and the reported differences in cognitive skills between various groups of children with incarcerated fathers and their matched controls are equivalent to a loss within the range of one to three months of schooling.

Sensitivity Analyses and Robustness Checks

The problem of selection remains a major limitation in studies that examine effects of incarceration. For instance, without "pre-treatment" measures of child cognitive skills, it is difficult to fully attribute differences found in the child outcomes to paternal incarceration, as children may have had lower cognitive abilities prior to experiencing the incarceration of their father. Thus, I run robustness checks in the form of supplementary analyses on a subset of the main analytic sample with a "pre-treatment" cognitive skill measure (i.e., measured before first-time paternal incarceration occurred between year three and nine; see the Methods section for a review of this sample refinement).

Table 5 presents PSM results for these supplementary analyses; appendix C of the online supplement presents descriptive statistics for this subset of the analytic sample. Robustness checks were only conduced for the seven differences that were found to be significant in the main (overall, by race, and by gender) models. After adding a control for pre-incarceration cognitive skills (as measured by the

Table 5. Sensitivity Analyses—Propensity Score Matching Results for Cognitive Outcomes on Paternal Incarceration Subset between Years Three and Nine, Controlling for Prior (YR 3) Cognitive Skills

	Paternal incarceration				Matched pairs		Mean bias before/after matching		
WJ Reading	Difference	SE	*T*-statistic	*N*	Treated	Control	Before (raw)	After (matched)	% Reduction in bias
Model 1a: overall	−0.142	0.077	−1.834	1871	250	1623	19.5	5.1	73.8%
Model 1b: within Whites	−0.028	0.525	−0.054	440	23	382	32.5	15.6	52.0%
Model 1c: within girls	−0.228	0.131	−1.733	876	91	671	17.6	4.0	77.3%
WJ Math									
Model 2a: overall	−0.143*	0.073	−1.961	1873	251	1625	19.3	5.0	74.1%
Model 2b: within girls	−0.261*	0.116	−2.255	877	106	757	17.4	4.0	77.0%
Digit Span Memory									
Model 3a: overall	−0.175*	0.072	−2.426	1891	253	1641	19.3	4.9	74.6%
Model 3b: within boys	−0.229*	0.107	−2.136	1007	137	864	22.6	5.8	74.3%

Notes: Kernel matching model estimates shown. See appendix B of the online supplement for a complete list of variables used in the models predicting the treatment. Analyses are unweighted and done on imputed data. Matched pairs indicate the average number of treated and control observations on common support. Significance levels are the following: *$p < .05$ **$p < 01$ ***$p < .001$ (two-sided).

PPVT at age three), more than half of the original significant treatment effects remain. Controlling for pre-treatment PPVT scores reduces the treatment effect of paternal incarceration to non-significance for all models assessing reading comprehension. However, negative effects of paternal incarceration in the magnitude of 1/7 to 1/4 of a standard deviation remain for math problem-solving skills for the overall group as well as within girls. The measure of attentional/memory capacities also maintains statistical significance for the overall group as well as among boys in the magnitude of 1/6 to 1/5 of a standard deviation. While the treatment group in these robustness checks is not directly analogous to that of the main analytic sample, and the limited nature of the PPVT as a holistic pre-treatment measure of child cognition is far from ideal, these supplementary analyses still provide some suggestive evidence that detrimental impacts of paternal incarceration on children's cognitive outcomes remain even with the inclusion of a pre-treatment measure of cognitive ability.

Additionally, I employ Rosenbaum bounds (not shown) to check the sensitivity of the estimated treatment effects to omitted variable bias for all significant outcomes in the overall group analyses. In comparison to observed measures in the dataset, the strength of an unobserved confounding variable would need to range in magnitude between that of having a father with only a high school diploma and having a father with drug and alcohol problems to undermine the reported effects for WJ Reading, WJ Math, and the Digit Span Memory measures. This reflects a moderate sensitivity to omitted variable bias; however, given the richness of the FFS data, it is difficult to identify theoretically relevant variables not already included that fall in this range. Thus, together these analyses provide conditional support for the argument that paternal incarceration has a negative impact on child cognitive development in middle childhood.

Population Calculations

The individual-level effects of paternal incarceration estimated in this study permit a quantitative estimate of how paternal incarceration *might* contribute to racial disparities in cognitive outcomes at the population level for urban children (see appendix I of the online supplement for a detailed explanation). The total effect of paternal incarceration on children's cognitive development is a function of both its individual-level effect and the population-level prevalence of paternal incarceration. At an individual level, the treatment effect of paternal incarceration within this urban and relatively economically disadvantaged sample suggests potential for variation by race, with the highest point estimates found among White children. While the arguably underpowered tests for racial differences were non-significant, racial disparities can nonetheless be present when impacts are similar across racial groups, and can still emerge even when impacts of mass incarceration are stronger for Whites, as exposure to mass incarceration and its consequences are disproportionally experienced among racial minorities in the United States (Haskins and Lee 2016). Only a small fraction of the overall White population experiences this shock: 4 percent of White children, compared to 25 percent of Black children (Wildeman 2009). Given such stark racial

disparities in incarceration rates, the finding that paternal incarceration affects children's cognitive skills raises the question of what percentage of the Black–White cognitive skills gap may be attributable to race differences in incarceration rates.

To address this question, I calculate what the racial disparity in cognitive skills might be if Black and White children experienced paternal incarceration at equal rates. What I find is that if Black children experienced paternal incarceration at the same rate as White children, the Black–White cognitive skill gaps in reading, math, and attentional skills would be reduced by 1.7, 2.8, and 4.4 percent, respectively. However, given the large effect sizes of paternal incarceration on cognitive skills for White children within the FFS sample, the same calculation (described in appendix H of the online supplement) for Whites garners much different estimates of the reduction of the gap. If Whites were incarcerated at the same level as Blacks, the Black–White gaps in reading, math, and attentional skills would reduce respectively by 14.1, 7.5, and 14.9 percent—albeit in a leveling-down way for White children. These extrapolated population-level estimates should be considered quite preliminary given the limited nature of the analytic sample from which they are drawn. However, their similarity to estimates calculated by Wakefield and Wildeman (2014, 147), who suggest that racial disparities in mass incarceration account for a 5–10 percent increase in Black–White inequality, adds a further dimension to our developing understanding of just how consequential mass incarceration may be for racial inequality among urban children in the United States.

Discussion

Moving "beyond boys' bad behavior," this study documents negative effects of paternal incarceration on elementary-aged children's cognitive outcomes, providing evidence for an additional and potentially more alarming intergenerational pathway of disadvantage. The existence of continued population-level racial disparities in who experiences paternal incarceration presents important implications for the persistence of Black–White achievement gaps. Moreover, evidence of effects of paternal incarceration on varied dimensions of cognitive skill acquisition for both boys and girls emphasizes the pervasive nature of mass incarceration to create and perpetuate inequality across generations in ways that have serious implications for the academic development and educational trajectories of contemporary American children.

Using matching methods, attending to selection concerns, and exploring impacts across race and gender for a diverse set of cognitive schooling outcomes, I found that experiencing first-time paternal incarceration between ages one and nine negatively affects elementary-aged children's cognitive capacities. In PSM models, the magnitude of the overall effects across outcomes is educationally meaningful, ranging from 0.116 to 0.122 standard deviations, equaling a one- to two-month loss of schooling for children with incarcerated fathers compared to their matched peers with no paternal incarceration experiences. Differences in individual-level treatment effects across gender, and to some extent race, surface,

with effect sizes ranging from largest for Whites to minimal for Hispanics, with Blacks falling between. However, likely due to small disaggregated sample sizes, strong evidence in support of heterogeneous effects by race remains elusive. Both boys and girls experience impacts of paternal incarceration, with detrimental effects for girls felt across reading comprehension and math problem-solving skills, while for boys impacts surface only for memory/attentional capacities. In short, the incarceration of a father has negative impacts on children's cognitive capacities that are meaningful and detrimental to academic achievement and schooling success.

Previous work has consistently documented the negative influence of paternal incarceration on behavioral capacities of boys across the life course; however, this study's finding of detrimental associations among cognitive outcomes for boys and especially girls in middle childhood contributes new knowledge to an expanding accounting of the negative implications of paternal incarceration on American children. The surfacing of effects on cognitive skill acquisition may be for a number of reasons. First, this study employed a more rigorous design and investigated a much larger range of cognitive outcomes than previously studied. Second, with the majority of prior studies focused on either preschoolers or adolescents, middle childhood—as an important stage for the growth of academic skill competencies—has been overlooked. The novelty of these findings and their convergence with literature on education-related outcomes among young adults (e.g., Hagan and Foster 2012a), however, should not lead one to conclude that children of incarcerated parents lack intellectual capacity. Rather, as noted in a recent report by the National Research Council (Travis, Western, and Redburn 2014), paternal incarceration's role in school failure and, in this case, decreases in scores on cognitive assessments, may arise initially from social-emotional problems during early childhood that then produce lagged impacts on cognitive skill acquisition later in the life course via mechanisms such as stress, trauma, or teacher stigma, leading to decisions of grade retention, special education placement, or even expulsion.

Results also highlight that among this urban sample of children there are indeed racial disparities in exposure to paternal incarceration, and that there may be differences in the impact of paternal incarceration by race. Compared to Whites, Black and Hispanic children are both disproportionally exposed to paternal incarceration; however, compared to Blacks and Hispanics, White children in the FFS appear to experience the strongest deleterious impacts—with point estimates two to three times the size of their minority counterparts. It is possible that the estimates presented here provide suggestive evidence for fundamental racial differences in the effect of paternal incarceration among urban disadvantaged children; however, two alternative explanations are also plausible given spatial inequality in punishment, and the local concentration of incarceration in predominantly Black neighborhoods (Clear 2007; Sampson and Loeffler 2010). Estimates for Blacks (and possibly Hispanics) could be suppressed due to neighborhood spillover effects. Spillover effects of incarceration concentrated in predominantly Black neighborhoods (or even schools; see Hagan and Foster [2012b]) would produce dampened effects of paternal incarceration for Black

children (but not White) when compared to same-race "control" counterparts, as the control group would be indirectly exposed to the treatment.[12] Another interpretation could be that the White fathers in the FFS who become incarcerated are in some way selectively "worse" (e.g., committed a more severe crime or spent more time incarcerated) than the Black fathers, thus affecting their children and families more severely. Having better data on timing, duration, and crime severity would be useful for future studies, as well as focusing on the potential of mass (paternal) incarceration to be both an individual- and a community-level treatment, affecting the educational trajectories of children in high-incarceration neighborhoods with and without incarcerated fathers.

Finally, mass paternal incarceration is also likely an important, albeit partial, explanation for continuing racial inequality in cognitive skills among young urban children. The simulated population-level estimates presented, while based off a narrow analytic sample, provide suggestive upper and lower bounds of the contribution of paternal incarceration to the Black–White achievement gap among urban children at the population level. Therefore, a conservative and admittedly preliminary calculation of how the individual-level effects estimated here might scale up to the population suggests that paternal incarceration explains between 2 and 15 percent of the Black–White achievement gap at age nine, estimates that are in line with previous racial disparity calculations (e.g., Wakefield and Wildeman 2011; Wakefield and Wildeman 2014).

Limitations and Future Directions

This study aimed to establish whether effects of paternal incarceration impacted elementary-aged children's cognitive skills; however, a test of mechanisms was beyond its scope. As discussed earlier, the literature suggests three ways in which the incarceration of a parent can affect children—that of conferring stigma, inducing trauma, and causing stress and strain. Past studies have focused on strain operating through the caregiver as a likely primary explanation; however, I believe work in the areas of acute and toxic stress as well as stigma offers the most compelling avenues for understanding how paternal incarceration can impact children's cognitive skills.

Evidence from studies on acute stress and cognitive functioning (e.g., Sharkey 2010) demonstrates that young children's cognitive performance is highly sensitive to proximal traumatic or violent events, whether they are witnessed personally or occurred within the neighborhood of residence. As such, witnessing the arrest of a parent or living in a highly policed neighborhood (Dallaire and Wilson 2010; Goffman 2009; Phillips and Zhao 2010) offers additional probable scenarios for direct and indirect exposure to acute environmental trauma that could lead to impaired performance on cognitive assessments.

Relatedly, recent work in the areas of public health and epigenetics (e.g., Burke et al. 2011; Shonkoff et al. 2012) has shed light on how exposure to chronic stressors and accumulated adversity (toxic stress), such as homelessness, extended exposure to violence, poverty, and the incarceration of a family member in early childhood, is associated with increased risks for learning, behavioral,

and health problems. Experiencing acute stress and chronic disadvantage in childhood is particularly consequential for cognitive development and academic functioning, and future work focused on exploring whether paternal incarceration leads to increased risk of experiencing episodes of acute stress, chronic stressors, or accumulated adversity could provide much-needed insight into the specific mechanisms involved in the creation of this pathway of disadvantage.

Moreover, while difficult to directly test, the mechanism of stigma for children in middle childhood also has the potential to be increasingly important as children begin to value social relationships and interact more with social contexts outside the home. For example, qualitative work by Nesmith and Ruhland (2008), emphasizing the impact of parental incarceration from the child's perspective, highlights the dual ways in which children see interactions with schools and peers as both stigmatizing and supportive. And studies by Dallaire, Ciccone, and Wilson (2010) and Turney and Haskins (2014) have provided preliminary evidence of the role teachers play in explaining achievement differences among children who experience parental incarceration. School counselors, social workers, psychologists, teachers, and classmates can provide valuable social support systems for children experiencing parental incarceration. However, these same actors can also negatively impact children through stigmatization, further hampering the development of their cognitive competencies. Future research that explores these pathways will contribute significant clarity on the linkages between paternal incarceration and child development.

Finally, it is worth speculating about remaining concerns of selection bias and external validity. This study's design included a number of important elements; nevertheless, it is possible that there exist unmeasured factors associated with decreases in cognitive outcomes and increases in paternal incarceration that have the potential to impact findings. For example, estimates could be inflated due to unobserved heterogeneity and omitted variable bias. Alternatively, underreporting of paternal incarceration could bias estimates toward zero. An additional reason for why these findings may be underestimates and produce some limitation to external validity is that analyses are run only on children experiencing a "first-time" incarceration of a father between years one and nine, and not all children with "ever" incarcerated fathers. This is a large group of children in the FFS (and at the population level), and impacts of paternal incarceration for their cognitive development represent markers for later-life disadvantage. Future empirical work on the intergenerational effects of paternal incarceration is necessary, and researchers should continue to use available data, theory, and various methodological techniques to produce effective ways to best grapple with selection and employ qualitative studies to better understand the mechanisms through which these effects operate.

In sum, new findings of negative impacts on cognitive outcomes in middle childhood, coupled with previous findings of detrimental impacts on children's behavioral capacities and adolescents' educational attainment, provide converging evidence of paternal incarceration as likely an important avenue through which educational inequality is produced and reproduced among contemporary cohorts of urban American children. Early to middle childhood has recently

garnered policy attention, as it is a critical period in young children's lives for the healthy development of age-appropriate cognitive skills. Studies such as Deming (2009) and Heckman et al. (2010) have documented the presence of long-term impacts of early cognitive skill differences for later-life pathways of advantage and disadvantage, suggesting the life-cycle benefit of early skill formation and the later-life consequences of early skill deficiencies. This study contributes to this growing body of literature on the implications of mass incarceration for inequality among young American children, moving us beyond boys' bad behavior and suggesting that consequences might be more expansive than previously documented.

Notes

1. Theoretically, effects of parental incarceration on child outcomes also have the capacity to be either null or positive in nature. Children of habitually absent or uninvolved parents may not experience any effects from their parent's incarceration, and imprisoning an abusive or neglectful parent could improve child well-being (e.g., Wakefield and Wildeman 2014; Wildeman 2010). Thus, the effects of parental incarceration are likely heterogeneous; negative for most children, but potentially positive or non-existent for others.
2. At the baseline wave, nearly three-quarters of parents are unmarried (n = 3,712), while 1,186 are married.
3. This is over 77 percent of the 4,688 families eligible for interview at year nine. If the child was deceased or adopted, families were no longer considered eligible for interviewing; however, a small but non-random portion of cases were also ineligible for interviewing at the year-nine follow-up.
4. Differences in descriptive characteristics across the imputed and non-imputed datasets for the covariates included in the analytic models were negligible.
5. All families eligible for interview at year nine were contacted and invited to participate in the "in-home" survey. Among families contacted, about 72 percent completed this portion of the study (n = 3,391). Children with missing observations on the cognitive outcomes are those where a home visit could not be conducted or whose parent/caregiver only completed the parent portion of the in-home interview by telephone (Bendheim-Thoman Center for Research on Child Wellbeing 2011).
6. Technically, the incarceration status of some fathers (n = 182) was known at baseline; however, this was only if mothers (or fathers) answered that the father was in jail/prison *at the time* of the birth/baseline interview.
7. This group of children could have had fathers who experienced incarceration *at any point* before their birth up until the year-one follow-up interview. For this group, paternal incarceration potentially occurred before the measurement of important baseline and year-one covariates, making it hard to differentiate the direction of influence, rendering any estimates of the effect of paternal incarceration on outcomes for these children susceptible to bias.
8. These fathers were indicated as "never" incarcerated at year/age one but by year/age nine had an incarceration episode reported by either the child's mother or the father himself.
9. Cognitive ability is measured at the year-three follow-up wave using the Wechsler Adult Intelligence Test. It is considered a fixed trait of parents and therefore I include it as a pre-treatment control.

10. Kernel matching (as opposed to nearest neighbor and radius matching, which offer more conservative estimates because they do not use all the available cases) minimizes variance by using weighted averages of all cases in the control group to construct the outcome estimate (Caliendo and Kopeinig 2008). These weights depend on the distance a control observation is from the treated cases based on the outcome being estimated. Given my use of multiple imputed datasets, I produced average estimates of standard errors and the effect of the treatment on the treated (ATT) using Rubin's procedure for combining estimates across imputed datasets (Allison 2001).
11. See Coe (2002), Lee, Finn, and Liu (2012), and Lipsey et al. (2012) for discussions of educationally meaningful effect sizes and for guidelines from which to benchmark educational outcomes among samples of urban, low-income, and minority elementary students.
12. A violation of the Stable Unit Treatment Value Assumption (SUTVA); see Morgan and Winship (2007).

About the Author

Anna R. Haskins is an assistant professor of sociology at Cornell University and an affiliate of the Cornell Prison Education Program, the Center for the Study of Inequality, and the Cornell Population Center. Her scholarly interests are in the areas of educational inequality, social stratification, race/ethnicity, and the intergenerational social consequences of mass incarceration. Her current research assessing the effects of paternal incarceration on children's educational outcomes and engagement in schooling has been published in *Sociological Science*, *Sociology of Education*, and *Social Science Research*.

Supplementary Material

Supplementary material is available at *Social Forces* online, http://sf.oxfordjournals.org/.

References

Allison, Paul D. 2001. *Missing Data*. Thousand Oaks, CA: Sage Publications.

Bendheim-Thoman Center for Research on Child Wellbeing. 2011. "*Introduction to the Fragile Families Public-Use Data: Baseline, One-Year, Three-Year, Five-Year, and Nine-Year Telephone Data*." Princeton, NJ: Office of Population Research, Princeton University.

Braman, Donald. 2004. *Doing Time on the Outside: Incarceration and Family Life in Urban America*. Ann Arbor: University of Michigan Press.

Burke, Nadine J., Julia L. Hellman, Brandon G. Scott, Carl F. Weems, and Victor G. Carrion. 2011. "The Impact of Adverse Childhood Experiences on an Urban Pediatric Population." *Child Abuse & Neglect* 35(6):408–13.

Caliendo, Marco, and Sabine Kopeinig. 2008. "Some Practical Guidance for the Implementation of Propensity Score Matching." *Journal of Economic Surveys* 22(1):31–72.

Clear, Todd R. 2007. *Imprisoning Communities*. New York: Oxford University Press.

Coe, Robert. 2002. "It's the Effect Size, Stupid: What Effect Size Is and Why It Is Important." Paper presented at the British Educational Research Association, Exeter, UK.

Collins, W. Andrew. 1984. *Development During Middle Childhood: The Years from Six to Twelve*. Washington, DC: National Academies Press.

Comfort, Megan. 2007. "Punishment Beyond the Legal Offender." *Annual Review of Law and Social Science* 3:271–96.

Dallaire, Danielle H., and Lauren Aaron. 2010. "Middle Childhood: Family, School and Peer Contexts for Children Affected by Parental Incarceration." In *Children of Incarceted Parents: A Handbook for Researchers and Practitioners*, edited by J. M. Eddy and J. Poehlmann, pp. 101–119. Washington, DC: Urban Institute Press.

Dallaire, Danielle H., A. Ciccone, and L. C. Wilson. 2010. "Teachers' Experiences with and Expectations of Children with Incarcerated Parents." *Journal of Applied Developmental Psychology* 31(4):281–90.

Dallaire, Danielle H., and Laura C. Wilson. 2010. "The Relation of Exposure to Parental Criminal Activity, Arrest, and Sentencing to Children's Maladjustment." *Journal of Child and Family Studies* 19(4): 404–18.

Dehejia, Rajeev H., and Sadek Wahba. 1999. "Causal Effects in Nonexperimental Studies: Reevaluating the Evaluation of Training Programs." *Journal of the American Statistical Association* 94(448): 1053–62.

Deming, David. 2009. "Early Childhood Intervention and Life-Cycle Skill Development: Evidence from Head Start." *American Economic Journal*–Applied Economics 1(3):111–34.

DiPrete, Thomas A., and Markus Gangl. 2004. "Assessing Bias in the Estimation of Causal Effects: Rosenbaum Bounds on Matching Estimators and Instrumental Variables Estimation with Imperfect Instruments." *Sociological Methodology* 34:271–310.

Duncan, Greg J., Chantelle J. Dowsett, Amy Claessens, Katherine A. Magnuson, Aletha C. Huston, Pamela Klebanov, Linda S. Pagani, Leon Feinstein, Mimi Engel, and Jeanne Brooks-Gunn. 2007. "School Readiness and Later Achievement." *Developmental Psychology* 43(6):1428–46.

Dunn, Lloyd M., and Leota M. Dunn. 1997. *Peabody Picture Vocabulary Test*, 3rd ed. Circle Pines, MN: American Guidance Service.

Feinstein, Leon, and John Bynner. 2004. "The Importance of Cognitive Development in Middle Childhood for Adulthood Socioeconomic Status, Mental Health, and Problem Behavior." *Child Development* 75(5):1329–39.

Foster, Holly, and John Hagan. 2007. "Incarceration and Intergenerational Social Exclusion." *Social Problems* 54(4):399–433.

———. 2015. "Punishment Regimes and the Multilevel Effects of Parental Incarceration: Intergenerational, Intersectional, and Interinstitutional Models of Social Inequality and Systemic Exclusion." *Annual Review of Sociology* 41:135–58.

Geller, Amanda, Irwin Garfinkel, Carey E. Cooper, and Ronald B. Mincy. 2009. "Parental Incarceration and Child Well-Being: Implications for Urban Families." *Social Science Quarterly* 90(5):1186–202.

Geller, Amanda, Irwin Garfinkel, and Bruce Western. 2011. "Paternal Incarceration and Support for Children in Fragile Families." *Demography* 48(1):25–47.

Geller, Amanda, Carey E. Cooper, Irwin Garfinkel, Ofira Schwartz-Soicher, and Ronald B. Mincy. 2012. "Beyond Absenteeism: Father Incarceration and Child Development." *Demography* 49(1):49–76.

Glaze, Lauren E., and Laura M. Maruschak. 2008. *Parents in Prison and Their Minor Children*. Bureau of Justice Statistics, US Department of Justice. Washington, DC.

Glaze, Lauren E., and Lauren Parks. 2012. *Correctional Populations in the United States*. Bureau of Justice Statistics, US Department of Justice. Washington, DC.

Goffman, Alice. 2009. "On the Run: Wanted Men in a Philadelphia Ghetto." *American Sociological Review* 74(3):339–57.

Goffman, Erving. 1963. *Stigma: Notes on the Management of Spoiled Identity*. Englewood Cliffs, NJ: Prentice-Hall.

Hagan, John, and Ronit Dinovitzer. 1999. "Collateral Consequences of Imprisonment for Children, Communities, and Prisoners." In *Prisons*, edited by M. Tonry and J. Petersilia, 121–62. Chicago: University of Chicago Press.

Hagan, John, and Holly Foster. 2012a. "Intergenerational Educational Effects of Mass Imprisonment in America." *Sociology of Education* 85(3):259–86.

———. 2012b. "Children of the American Prison Generation: Student and School Spillover Effects of Incarcerating Mothers." *Law & Society Review* 46(1):37–69.

Haskins, Anna R. 2014. "Unintended Consequences: Effects of Paternal Incarceration on Child School Readiness and Later Special Education Placement." *Sociological Science* 1:141–58.

———. 2015. "Paternal Incarceration and Child-Reported Behavioral Functioning at Age 9." *Social Science Research* 52:18–33.

Haskins, Anna R., and Hedwig Lee. 2016. "Reexamining Race When Studying the Consequences of Criminal Justice Contact for Families." *ANNALS of the American Academy of Political and Social Science* 665:224–30.

Heckman, James J., Seong Hyeok Moon, Rodrigo Pinto, Peter A. Savelyev, and Adam Yavitz. 2010. "The Rate of Return to the High/Scope Perry Preschool Program." *Journal of Public Economics* 94(1–2):114–28.

Ho, Daniel E., Kosuke Imai, Gary King, and Elizabeth A. Stuart. 2007. "Matching as Nonparametric Preprocessing for Reducing Model Dependence in Parametric Causal Inference." *Political Analysis* 15 (3):199–236.

Huston, Aletha C., and Marika N. Ripke. 2006. *Developmental Contexts in Middle Childhood: Bridges to Adolescence and Adulthood*. New York: Cambridge University Press.

Johnson, Elizabeth I., and Beth Easterling. 2012. "Understanding Unique Effects of Parental Incarceration on Children: Challenges, Progress, and Recommendations." *Journal of Marriage and Family* 74(2): 342–56.

Kowaleski-Jones, Lori, and Greg J. Duncan. 1999. "The Structure of Achievement and Behavior across Middle Childhood." *Child Development* 70(4):930–43.

Lee, Jaekyung, Jeremy Finn, and Xiaoyan Liu. 2012. "Time-Indexed Effect Size for P-12 Reading and Math Program Evalution." Paper presented at the Society for Research on Educational Effectiveness, Washington, DC.

Lipsey, Mark, Kelly Puzio, Cathy Yun, Michael Herbert, Kasia Stenika-Fry, Mikel Cole, Megan Roberts, Karen Anthony, and Matthew Busick. 2012. "*Translating the Statistical Representation of the Effects of Education Interventions into More Readily Interpretable Forms*." NCSER 2013-3000. Washington, DC: National Center for Special Education Research, Institue of Education Sciences, US Department of Education.

Morgan, Stephen L., and Christopher Winship. 2007. *Counterfactual and Casual Inference*. Cambridge: Cambridge University Press.

Murphey, David, and P. Mae Cooper. 2015. "*Parents Behind Bars: What Happens to Their Children?*" Child Trends. Washington, DC.

Murray, Joseph, and David P. Farrington. 2008. "The Effects of Parental Imprisonment on Children." *Crime and Justice* 37:133–206.

Murray, Joseph, David P. Farrington, and Ivana Sekol. 2012. "Children's Antisocial Behavior, Mental Health, Drug Use, and Educational Performance after Parental Incarceration: A Systematic Review and Meta-Analysis." *Psychological Bulletin* 138:175–210.

Murray, Joseph, Rolf Loeber, and Dustin Pardini. 2012. "Parental Involvement in the Criminal Justice System and the Development of Youth Theft, Marijuana Use, Depression, and Poor Academic Performance." *Criminology* 50(1):255–302.

Nesmith, Ande, and Ebony Ruhland. 2008. "Children of Incarcerated Parents: Challenges and Resiliency, in Their Own Words." *Children and Youth Services Review* 30(10):1119–30.

Nichols, Emily B., and Ann B. Loper. 2012. "Incarceration in the Household: Academic Outcomes of Adolescents with an Incarcerated Household Member." *Journal of Youth and Adolescence* 41(11):1455–71.

Phillips, Susan D., and Jian A. Zhao. 2010. "The Relationship between Witnessing Arrests and Elevated Symptoms of Posttraumatic Stress: Findings from a National Study of Children Involved in the Child Welfare System." *Children and Youth Services Review* 32(10):1246–54.

Reichman, Nancy E., Julian O. Teitler, Irwin Garfinkel, and Sara S. McLanahan. 2001. "Fragile Families: Sample and Design." *Children and Youth Services Review* 23:303–26.

Roettger, Michael E., and Raymond R. Swisher. 2011. "Associations of Fathers' History of Incarceration with Sons' Delinquency and Arrest among Black, White, and Hispanic Males in the United States." *Criminology* 49(4):1109–47.

Rosenbaum, Paul R. 2002. *Observational Studies*. New York: Springer.

Rosenbaum, Paul R., and Donald B. Rubin. 1983. "The Central Role of the Propensity Score in Observational Studies for Causal Effects." *Biometrika* 70(1):41–55.

Royston, Paul. 2005. "Multiple Imputation of Missing Values: Update." *Stata Journal* 5(2):188–201.

Rubin, Donald B. 1987. *Multiple Imputation for Non-Response in Surveys*. New York: Wiley.

Sampson, Robert J., and Charles Loeffler. 2010. "Punishment's Place: The Local Concentration of Mass Incarceration." *Daedalus* 139(3):20–31.

Sharkey, Patrick. 2010. "The Acute Effect of Local Homicides on Children's Cognitive Performance." *Proceedings of the National Academy of Sciences of the United States of America* 107(26): 11733–38.

Shonkoff, Jack P., Andrew S. Garner, Benjamin S. Siegel, Mary I. Dobbins, Marian F. Earls, Andrew S. Garner, Laura McGuinn, John Pascoe, and David L. Wood. 2012. "The Lifelong Effects of Early Childhood Adversity and Toxic Stress." *Pediatrics* 129(1):E232–46.

Sugie, Naomi F. 2012. "Punishment and Welfare: Paternal Incarceration and Families' Receipt of Public Assistance." *Social Forces* 90(4):1403–27.

Swisher, Raymond R., and Maureen R. Waller. 2008. "Confining Fatherhood: Incarceration and Paternal Involvement among Nonresident White, African American, and Latino Fathers." *Journal of Family Issues* 29(8):1067.

Sykes, Bryan L., and Becky Pettit. 2014. "Mass Incarceration, Family Complexity, and the Reproduction of Childhood Disadvantage." *ANNALS of the American Academy of Political and Social Science* 654(1): 127–49.

Tenenbaum, Harriet R., Michelle V. Porche, Catherine E. Snow, Patton Tabors, and Stephanie Ross. 2007. "Maternal and Child Predictors of Low-Income Children's Educational Attainment." *Journal of Applied Developmental Psychology* 28(3):227–38.

Travis, Jeremy, Bruce Western, and S. Redburn, eds. 2014. *The Growth of Incarceration in the United States: Exploring Causes and Consequences*. Washington, DC: National Academies Press.

Turney, Kristin, and Anna R. Haskins. 2014. "Falling Behind? Children's Early Grade Retention after Paternal Incarceration." *Sociology of Education* 87(4):241–58.

Wakefield, Sara, and Christopher Wildeman. 2011. "Mass Imprisonment and Racial Disparities in Childhood Behavioral Problems." *Criminology & Public Policy* 10(3):793–817.

———. 2014. *Children of the Prison Boom: Mass Incarceration and the Future of American Inequality*. Oxford: Oxford University Press.

Wechsler, David. 2003. *Wechsler Intelligence Scale for Children: WISC-IV*. San Antonio, TX: Psychological Corporation.

Wilbur, M. B., J. E. Marani, D. Appugliese, R. Woods, J. A. Siegel, H. J. Cabral, and D. A. Frank. 2007. "Socioemotional Effects of Fathers' Incarceration on Low-Income, Urban, School-Aged Children." *Pediatrics* 120(3):E678–85.

Wildeman, Christopher. 2009. "Parental Imprisonment, the Prison Boom, and the Concentration of Childhood Disadvantage." *Demography* 46(2):265–80.

———. 2010. "Paternal Incarceration and Children's Physically Aggressive Behaviors Evidence from the Fragile Families and Child Wellbeing Study." *Social Forces* 89(1):285–309.

Woodcock, Richard W., K. S. McGrew, and N. Mather. 2001. *Woodcock*–Johnson Tests of Achievement. Itasca, IL: Riverside Publishing.