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## **Paternal Incarceration and Children's Food Insecurity: A Consideration of Variation and Mechanisms**

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A Consideration of Variation and Mechanisms

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## **ABSTRACT**

Despite growing attention to the unintended consequences of paternal incarceration for children's wellbeing across the life course, little is known about whether and how paternal incarceration is related to food insecurity among children, an especially acute and severe form of deprivation. In this article, I use data from the Fragile Families and Child Wellbeing Study, a cohort of children born to mostly unmarried mothers, to examine the relationship between paternal incarceration and three indicators of food insecurity among young children: current food insecurity (at age five), onset of food insecurity (between ages three and five), and exit from food insecurity (between ages three and five). Results from the most rigorous modeling strategy, propensity score matching models that further adjust for all covariates, indicate that recent paternal incarceration is associated with an increased risk of current food insecurity, an increased risk of onset into food insecurity, and a decreased risk of exit from food insecurity, but only among children living with fathers prior to his incarceration. Changes in the parental relationship, occurring after the onset of paternal incarceration, explain a moderate portion of these associations. Taken together, these findings highlight the salience of parental relationships in the association between paternal incarceration and children's food insecurity and have a number of implications for policy.

## **EXECUTIVE SUMMARY**

### Objectives

The rise in mass incarceration since the mid-1970s, especially among poorly educated minority men living in disadvantaged neighborhoods, means that a historically unprecedented number of children experience parental incarceration. In response, scholars across an array of disciplines have developed an acute interest in understanding the intergenerational consequences of incarceration. This rapidly burgeoning literature documents inequality in the academic, behavioral, and social outcomes between children with and without incarcerated fathers. Despite growing attention to the unintended consequences of paternal incarceration for children's wellbeing across the life course, little is known about whether and how paternal incarceration is related to food insecurity among children. There are good reasons to expect that paternal incarceration increases children's risk of food insecurity, defined by the Economic Research Service (ERS) of the U.S. Department of Agriculture (USDA) as having limited access to adequate food due to lacking economic or other resources, especially for children living with fathers prior to their incarceration. Therefore, this study addresses two research questions. First, what is the relationship between paternal incarceration and children's food insecurity (defined as current food insecurity, onset into food insecurity, and exit from food insecurity) among children residing with fathers prior to incarceration and children not residing with fathers prior to incarceration? Second, what are the mechanisms linking paternal incarceration to children's food insecurity?

### Methods

I use data from the Fragile Families and Child Wellbeing Study (FFCWB), a longitudinal survey of nearly 5,000 new and mostly unmarried parents who gave birth in urban areas between 1998 and 2000, to examine the relationship between paternal incarceration and children's food insecurity (Reichman et al. 2001). The analyses take place in two stages. In the first analytic stage, I use propensity score matching to estimate the average relationship between paternal incarceration and three dependent variables: children's current food insecurity (measured at the five-year survey), children's food insecurity onset, and children's food insecurity exit. In the second analytic stage, I consider the mechanisms underlying the association between paternal incarceration and children's food insecurity by using logistic regression models to estimate children's food insecurity as a function of the mechanisms, controlling for the treatment (paternal incarceration) and the propensity for the treatment.

### Results

Results from the most rigorous modeling strategy, propensity score matching models that further adjust for all covariates, indicate that paternal incarceration is associated with an increased risk of current food insecurity, an increased risk of onset into food insecurity, and a decreased risk of exit from food insecurity, but only among children living with fathers prior to his incarceration. Changes in the parental relationship, occurring after the onset of paternal incarceration, explain a moderate portion of this relationship. Post-incarceration changes in economic wellbeing, mother's parenting, and mother's health explains less of this relationship. Taken together, these

findings suggest that the consequences of paternal incarceration extend beyond the offender and spill over to children of offenders, consistent with a growing body of literature documenting the cascading consequences of incarceration for family life.

### Policy Implications

The United States has numerous social policies to address food insecurity among children. The new information garnered from this research project will produce effective strategies to eliminate childhood hunger. By documenting how the collateral consequences of incarceration extend beyond the offender, by spilling over to children of offenders, this project brings attention to the issue of the unintended consequences of paternal incarceration for children. This project also brings attention to an understudied determinant of children's food insecurity, paternal incarceration, which disproportionately affects children already at risk of food insecurity. These findings have a number of implications for policy. First, given the link between paternal incarceration and children's food insecurity, these findings suggest that families who experience paternal incarceration, especially those families that include residential fathers prior to incarceration, could benefit from being monitored for food insecurity. Relatedly, programs designed to target food insecurity among the vulnerable population of families affected by paternal incarceration may be most effective if targeted toward mothers and children living with fathers prior to incarceration. Furthermore, given that the relationship between paternal incarceration and children's food insecurity is both direct and indirect, operating especially through the parental relationship, in order to end hunger among children, policymakers should pay special attention to these additional collateral consequences of incarceration (as these additional collateral consequences have implications for children's food insecurity).

The rise in mass incarceration since the mid-1970s, especially among poorly educated minority men living in disadvantaged neighborhoods, means that a historically unprecedented number of children experience parental incarceration (Patillo, Weiman, and Western 2004; Wakefield and Uggen 2010). In response, scholars across an array of disciplines have developed an acute interest in understanding the intergenerational consequences of incarceration. This rapidly burgeoning literature documents inequality in the academic, behavioral, and health outcomes between children with and without incarcerated fathers (for reviews, see Eddy and Poehlmann 2010; Johnson and Easterling 2012; Murray, Farrington, and Sekol 2012; Travis, Western, and Redburn 2014; Wakefield and Uggen 2010; Wildeman, Wakefield, and Turney 2013; Wildeman and Western 2010). Further, because paternal incarceration is concentrated among already vulnerable children, an unintended consequence of the prison boom may be increased inequality among children (Wakefield and Wildeman 2013).

Despite growing attention to the unintended consequences of paternal incarceration for children's wellbeing across the life course, little is known about whether and how paternal incarceration is related to food insecurity among children (though see Wallace and Cox 2012). There are good reasons to expect that paternal incarceration increases children's risk of food insecurity, defined by the Economic Research Service (ERS) of the U.S. Department of Agriculture (USDA) as having limited access to adequate food due to lacking economic or other resources (Coleman-Jenson, Nord, and Singh 2013), especially for children living with fathers prior to their incarceration. Understanding how incarceration independently contributes to children's food insecurity is critical for at least two reasons. First, children's food insecurity, an often-overlooked dimension of child wellbeing, is an especially acute and severe form of deprivation that is distinct from other indicators of economic deprivation or hardship (McIntyre

et al. 2003). Second, food insecurity among children is negatively associated with a range of educational, behavioral, and health difficulties (e.g., Alaimo, Olson, and Frongillo 2001; Casey et al. 2006; Dunifon and Kowaleski-Jones 2003) and, therefore, may explain some of the negative effects of paternal incarceration on children's educational (Haskins 2014; Turney and Haskins 2014), behavioral (Geller et al. 2012; Wakefield and Wildeman 2013), and health (e.g., Foster and Hagan 2013; Roettger and Boardman 2012; Turney 2014) outcomes.

In this manuscript, I use data from the Fragile Families and Child Wellbeing Study, a longitudinal sample of children born to mostly unmarried parents in 1998 and 1999, many of whom experience paternal incarceration throughout early childhood, to answer two research questions. First, what is the relationship between paternal incarceration and children's food insecurity (defined as current food insecurity [at age five], onset into food insecurity [between ages three and five], and exit from food insecurity [between ages three and five]) among children with residential fathers (prior to incarceration) and children with non-residential fathers (prior to incarceration)? Second, to what extent do post-incarceration changes in economic wellbeing, parental relationships, maternal parenting, and maternal health explain the relationship between paternal incarceration to children's food insecurity? Overall, given the substantial number of children who experience paternal incarceration, the unequal distribution of incarceration across the population, and the importance of food insecurity for children's life course trajectories, disentangling the consequences of paternal incarceration for children's food insecurity will add a fundamental new dimension to our understanding of childhood inequality.

## **BACKGROUND**

### **Food Insecurity among Children**

Food insecurity, defined as lack of consistent access to adequate amounts of food, is a large and growing problem in the United States (Nord 2009). In 2012, nearly 18 million households in the United States were food insecure. About 3.9 households with children were food insecure. Food insecurity affects about 10% of children and 15% of households (Coleman-Jenson et al. 2013). Food insecurity among children is not evenly distributed across the population and, instead, is more likely to affect minority children, children living in households with incomes below the poverty line, and children with single parents. About three-fifths of food insecure households participate in at least one federal food and nutrition program, suggesting that these programs still leave some families vulnerable (Coleman-Jenson et al. 2013).

Additionally, food insecurity or hardship is associated with a host of academic outcomes, including reduced test scores, a greater likelihood of retention, and lower school engagement (Alaimo et al. 2001; Ashiabi 2005; Howard 2011; Jyoti, Frongillo, and Jones 2005; though see Dunifon and Kowaleski-Jones 2003); behavioral outcomes including internalizing problems, externalizing problems, poor social skills, and visits to a psychologist (Alaimo et al. 2001; Belsky et al. 2010; Dunifon and Kowaleski-Jones 2003; Huang, Oshima, and Kim 2010; Kleinman et al. 1998; Murphy et al. 1998; Slack and Yoo 2005; Slopen et al. 2010; Weinreb et al. 2002; Whitaker, Phillips, and Orzol 2006; Zaslow et al. 2009; also see Fram et al. 2011); and health outcomes including stomachaches, headaches, obesity, and poor general health (Casey et al. 2006; Chilton et al. 2009; Cook et al. 2006; Eicher-Miller et al. 2009; Gundersen and Kreider 2009; Jyoti et al. 2005; Kaiser and Townsend 2005; though see Gundersen, Garasky, and Lohman 2009; Rose and Bodor 2006). Young children are especially at risk of experiencing food

insecurity, as they are exposed to fewer alternative food resources than older children (e.g., school meal programs, meals at friends' houses), and food insecurity may be especially detrimental to the wellbeing of young children (Slack and Yoo 2005).

Therefore, given the relatively large number of children who experience food insecurity, as well as food insecurity's attendant consequences, it is especially important to understand the predictors of children's food insecurity. Additionally, because food insecurity among children is a relatively transitory state (Coleman-Jensen et al. 2012; also see Jacknowitz, Morrissey, and Brannegan 2012), it is important to understand how children transition into and out of experiencing food insecurity.

### **Paternal Incarceration and Children's Food Insecurity**

There are many reasons to expect paternal incarceration is positively associated with children's food insecurity. Although the portrait of incarcerated men is often one that is solitary and isolated from family members, the majority of incarcerated men have children (Mumola 2000). Many of these fathers are involved in their children's lives before incarceration. Prior to incarceration, many fathers are employed, contribute economically to family life, and are engaged in parenting their children (e.g., Arditti 2012; Geller, Garfinkel, and Western 2011; Turney and Wildeman 2013). Therefore, for families connected to incarcerated fathers, incarceration is a disruption that affects not only the lives of the incarcerated but also the lives of the families and children of the incarcerated. At least four possible pathways may link paternal incarceration with children's food insecurity: changes in family economic wellbeing that result from incarceration, changes in parental relationships, changes in maternal parenting, and changes in maternal health.

Economic instability resulting from paternal incarceration is perhaps the most obvious pathway through which incarceration increases children's food insecurity. Incarceration necessitates that men, most of whom were contributing earnings to families prior to incarceration, lose their jobs. This means that incarcerated men, while simultaneously accumulating legal debt (Harris, Evans, and Beckett 2010), have few opportunities to economically provide for their families (e.g., Western 2006). Incarceration facilitates human capital deficits, social network disruptions, and discrimination and, accordingly, incarcerated men have difficulty securing gainful employment after release (Hagan 1993; Pager 2003). Given the strong link between economic instability and food insecurity (e.g., Gundersen, Kreider, and Pepper 2011), it is quite likely that the economic instability resulting from paternal incarceration means that families experiencing paternal incarceration have difficulty providing nutritious and consistent access to food to their children.

The mechanisms linking paternal incarceration to children's food insecurity may not be narrowly economic. Indeed, incarceration has a number of cascading collateral consequences for family life. It is by now well known that paternal incarceration strains family relationships, leading to marital dissolution and poor relationship quality between parents (Comfort 2008; Massoglia, Remster, and King 2011; Turney forthcoming; Western 2006), increases maternal neglect and harsh parenting (Turney 2014), and increases maternal mental and physical health problems (Lee et al. 2014; Wildeman, Schnittker, and Turney 2012). Given that relationship instability (Bartfeld and Dunifon 2006; Manning and Brown 2006; though see Miller et al. 2014), parenting difficulties (Cook and Frank 2008), and health impairments (Whitaker et al. 2006) are all linked to food insecurity, it is likely that these mechanisms—in addition to resultant

changes in economic wellbeing—explain some of the positive relationship between paternal incarceration and children’s food insecurity.

Although there are good reasons to expect paternal incarceration to increase children’s risk of food insecurity, and make it more likely for children to experience an onset of food insecurity and less likely to experience an exit from food insecurity, it is equally plausible that any observed differences in food insecurity by paternal incarceration are driven by selection into incarceration rather than by incarceration itself. Children of incarcerated fathers, compared to their counterparts, experience economic and social disadvantages *prior* to the incarceration of their father and, in many cases, these disadvantages are intimately linked to incarceration and cannot be observed in observational survey data (e.g., Turney and Wildeman 2013). Indeed, unobserved heterogeneity is likely a crucial threat to causal inference when studying the intergenerational consequences of paternal incarceration (Giordano 2010; Wakefield and Uggen 2010). With respect to children’s food insecurity, specifically, it is possible that increased receipt of food stamps among families with incarcerated fathers (Chung 2012; Sugie 2012) offsets any negative consequences resulting from the incarceration (Yen et al. 2008; though see Wilde and Nord 2005).

### **Variation by Father’s Residential Status**

Another possibility is that the relationship between incarceration and children’s food insecurity varies by fathers’ residential status prior to his incarceration. Previous research suggests that there are vast differences in fathers’ economic, emotional, and instrumental contributions by his residential status prior to incarceration (Turney and Wildeman 2013). Therefore, as residential fathers, on average, contribute more to family life than non-residential fathers, it may be that the

consequences of incarceration for children's food insecurity are strongest among children with residential fathers (for a qualitative examination of heterogeneity in the consequences of paternal incarceration, see Turanovic, Rodriguez, and Pratt 2012).

### **Contributions of This Study**

Though research on the collateral consequences of paternal incarceration for child wellbeing has burgeoned in recent years (for reviews, see Eddy and Poehlmann 2010; Johnson and Easterling 2012; Murray et al. 2012; Travis et al. 2014; Wakefield and Uggen 2010; Wildeman et al. 2013; Wildeman and Western 2010), little research considers the consequences of paternal incarceration for children's food insecurity. In the one exception, Wallace and Cox (2012), who use data from the Fragile Families and Child Wellbeing Study and a series of rigorous methods that account for selection into incarceration, find no relationship between parental incarceration (measured as either paternal incarceration or maternal incarceration) and children's food insecurity (also see Schwartz-Soicher et al. 2011, who consider material hardship among families more generally). I extend this research by (1) considering if examining the average relationship between paternal incarceration and children's food insecurity masks variation by father's residential status and (2) exploring the mechanisms that explain any observed relationships.

### **DATA, MEASURES, AND ANALYTIC STRATEGY**

#### **Data Source: Fragile Families and Child Wellbeing Study**

I use data from the Fragile Families and Child Wellbeing Study (FFCWB), a longitudinal survey of nearly 5,000 new and mostly unmarried parents who gave birth in urban areas between 1998 and 2000, to examine the relationship between paternal incarceration and children's food

insecurity (Reichman et al. 2001). Mothers and fathers were first interviewed in person at the hospital or as soon as possible after the focal child's birth. Both parents were re-interviewed by telephone when the focal child was about one, three, five, and nine years old. Additionally, when children were three, five, and nine years old, a subsample of families participated in an in-home interview, which included a questionnaire for caregivers (usually children's mothers) and an activity booklet for children. The FFCWB response rates are comparable or higher to response rates of other household-based surveys such as the National Survey of Family Growth (NSFG) (Sassler and McNally 2003).<sup>1</sup>

The FFCWB are ideal for examining the relationship between paternal incarceration and children's food insecurity. First, unlike other data sources commonly used to study the prevalence and correlates of children's food insecurity (e.g., the Early Childhood Longitudinal Study-Birth Cohort [ECLS-B], the Early Childhood Longitudinal Study-Kindergarten Cohort [ECLS-K], the Study of Income and Program Participation [SIPP], none of which collect data on paternal incarceration), the FFCWB both collect data on paternal incarceration and, because the oversample of unmarried parents means that the sample is relatively disadvantaged, include a large number of fathers who experience incarceration. Additionally, these data include measures of paternal incarceration and children's food insecurity at multiple survey waves, which facilitates the consideration of transitions into and out of food insecurity and a modeling strategy that attends to the time-ordering of the dependent, explanatory, and control variables. Third, they include a wealth of information about mothers, fathers, and children, making it possible to adjust for pre-existing differences between families that have and have not experienced paternal

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<sup>1</sup> Baseline response rates were 86% for mothers and 78% for fathers. Completion rates for the one-, three-, five-, and nine-year interviews were 90%, 88%, 87%, and 76% for mothers and 74%, 72%, 70% and 59% for fathers, respectively. The completion rate for the five-year in-home survey, which is when the dependent variables are measured, is 78%.

incarceration and to consider mechanisms underlying the relationship between paternal incarceration and children's food insecurity.

*Analytic Sample.* The Core Food Security Module (CFSM), the food security module established by the U.S. Department of Agriculture (USDA), was measured at the three- and five-year in-home surveys and, accordingly, the analyses primarily draw on data through the five-year survey. The analytic sample comprises the 3,004 families who participated in the five-year in-home survey. Though there exist some observed differences between the analytic sample and the baseline sample, most differences are small and statistically insignificant. Mothers in the analytic sample, compared to mothers in the full sample, are more likely to be non-Hispanic Black (51% compared to 48%). They are also less likely to be Hispanic (25% compared to 27%), non-Hispanic other race (3% compared to 4%), and foreign-born (13% compared to 17%). Relatively few observations are missing data on the key explanatory variable and control variables, and these observations are preserved by generating 20 multiply imputed data sets in Stata.

### **Dependent Variables**

The dependent variables are measured by caregivers' responses to the Core Food Security Module (CFSM). At the three-year and five-year in-home surveys (but not other waves), caregivers are asked eight questions that measure children's food insecurity (e.g., "I relied on only a few kinds of low-cost food to feed child because I was running out of money to buy food"; see Table 1 for details about all eight measures). Children's food insecurity is measured by affirmative responses to at least two of the eight questions, consistent with methods described by others (Nord 2009; Nord and Bickel 2002).<sup>2</sup> The dependent variables are as follows: (1)

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<sup>2</sup> Caregivers that report two, three, or four conditions are classified as having low food security among children. Caregivers that report five or more conditions are classified as having very low food security among children.

*children's current food insecurity*, a dummy variable measured at the five-year survey; (2) *children's food insecurity onset* (a dummy variable indicating no food insecurity at the three-year survey and food insecurity at the five-year survey); and (3) *children's food insecurity exit* (a dummy variable indicating food insecurity at the three-year survey and no food insecurity at the five-year survey).

[Table 1 about here.]

### **Independent Variable**

The key independent variable is *recent paternal incarceration*, measured affirmatively if the father was in prison or jail after the three-year survey and up to or including the five-year survey. I consider recent paternal incarceration, instead of any paternal incarceration, because this allows for a precise estimation of the relationship between paternal incarceration and children's food insecurity (and the ability to match observations based on observed characteristics measured prior to the measure of incarceration). The measure of recent paternal incarceration utilizes both mothers' and fathers' responses about fathers' incarceration, which is advantageous because individuals are likely to under-report their own incarceration (Groves 2004) and consistent with other research using these data (see, especially, Geller et al. 2012). I consider the father to experience incarceration if either the mother or father reports incarceration.

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Because relative few children (< .8%) experience very low food security, I consider the more general condition, food insecurity among children, which includes both conditions.

## Control Variables

The analyses match children with and without recently incarcerated fathers based on an array of characteristics, all measured prior to the measure of paternal incarceration unless otherwise noted. Demographic characteristics include mother's race (non-Hispanic White, non-Hispanic Black, Hispanic, non-Hispanic other race), foreign-born status, childhood family structure (with a dummy variable indicating the mother lived with both biological parents at age 15), co-residence with a parent, and number of children in the household. Child demographic characteristics include child gender (a dummy variable indicating the child is male), child born under 2,500 grams, and child age (at the five-year survey).

The analyses also match observations based on an array of socioeconomic characteristics including mother's education (less than high school, high school diploma or GED, post-secondary education), residence in public housing, receipt of Temporary Assistance for Needy Families (TANF) in the past year, receipt of food stamps in the past year, employment in the past week, household income below the poverty line (established by the U.S. Census), and material hardship (measured by summing affirmative responses to 10 questions about hardship in the past 12 months [e.g., received free food or meals; did not pay the full amount of rent or mortgage payments]). Neighborhood disadvantage is measured by the following census tract characteristics (that are summed together and standardized): percent unemployed in the civilian labor force, percent living below the poverty line, percent receiving public assistance, and percent more than 25 years old without a high school degree ( $\alpha = .90$ ).

In addition to demographic and socioeconomic characteristics, the analyses match on a range of familial characteristics. These characteristics include mother's relationship quality with the child's father that ranges from 1 (*poor*) to 5 (*excellent*); mother's engagement, an average of

13 items (e.g., sing songs or nursery rhymes with child; hug or show physical affection to child) that ranges from 0 (*0 days per week*) to 7 (*7 days per week*) ( $\alpha = .66$ ); parenting stress, an average of four items (e.g., being a parent is harder than I thought it would be; I feel trapped by my responsibilities as a parent) that ranges from 1 (*strongly disagree*) to 4 (*strongly agree*) ( $\alpha = .60$ ); neglect, a sum of five questions about behaviors in the past year (e.g., had to leave your child home alone, even when you thought some adult should be with him/her; were so caught up in your own problems that you were not able to show or tell your child that you loved him/her). Dummy variables indicate mother's overall health (1 = *fair or poor*, 0 = *excellent, very good, or good*), mother's depression (measured with the Composite International Diagnostic Instrument-Short Form [CIDI-SF]), and mother's substance abuse (measured affirmatively if the mother reports having more than five or more drinks in one sitting or using illicit drugs in the past month).

Finally, the analyses match observations on parental characteristics that are especially associated with paternal incarceration. These characteristics include mother's and father's cognitive ability, measured by the Weschler Adult Intelligence Scale (WAIS), and mother's and father's impulsivity (at the five-year and one-year surveys, respectively), an average of six items (e.g., I will often say whatever comes into my head without thinking first; I often say and do things without considering the consequences) that ranges from 1 (*strongly disagree*) to 4 (*strongly agree*) ( $\alpha = .83$  for fathers,  $\alpha = .86$  for mothers).<sup>3</sup> Dummy variables indicate the following: the mother reports the father engaged in domestic violence, the mother or father reports the father has problems (e.g., keeping a job, getting along with family and friends)

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<sup>3</sup> Therefore, mother's impulsivity was measured after paternal incarceration. Given that impulsivity is considered a stable characteristic (Gottfredson and Hirschi 1990), this should not bias the results.

because of alcohol or drug use; and the mother or father reports the father was incarcerated at or prior to the three-year survey.

### **Mechanisms**

I consider four sets of mechanisms: economic wellbeing (poverty, material hardship, employment), relationship characteristics (co-residence with father, relationship quality), parenting (engagement, parenting stress, neglect) and health (fair/poor health, depression, substance abuse). All mechanisms are measured at the five-year survey and, therefore, at or after the measure of paternal incarceration.

### **Analytic Strategy**

*Estimating the Relationship between Paternal Incarceration and Children's Food Insecurity.* In the first analytic stage, I use propensity score matching to estimate the average relationship between paternal incarceration and three dependent variables: children's current food insecurity, children's food insecurity onset, and children's food insecurity exit. I first estimate a logistic regression model that generates a propensity score, the probability of experiencing paternal incarceration, for each observation as a function of the covariates described above (see Appendix Table A). I then restrict the analyses to regions of common support and ensure the means of the covariates are statistically indistinguishable across the treatment and control groups (see Appendix Table B). Finally, I employ a logistic regression model to estimate children's food insecurity as a function of paternal incarceration, averaging the estimates across 20 imputed data sets. I estimate these relationships first with standard kernel matching, which matches each treatment observation to all control observations by weighting control observations by their

distance from treatment observations (kernel = Epanechnikov; bandwidth = 0.06).<sup>4</sup> I then employ doubly robust matching, as subtle post-match differences may still exist between the treatment and control groups (Shafer and Kang 2008). Because of the vast differences across father's residential status, I conduct all analyses separately for residential fathers (those living with mothers and children at the three-year survey, prior to the measure of incarceration) and non-residential fathers (those not living with mothers and children at the three-year survey).

*Estimating Mechanisms.* In the second analytic stage, I consider the mechanisms underlying the association between paternal incarceration and children's food insecurity. The above analyses suggest that the relationships are concentrated among children with residential fathers and, accordingly, I restrict these analyses to those observations. Similar to Kirk and Sampson (2013), I use logistic regression models to estimate children's food insecurity as a function of the mechanisms, controlling for the treatment (paternal incarceration) and the propensity for the treatment. Model 1 presents the baseline estimate. Model 2 includes changes in economic wellbeing, Model 3 includes changes in the parental relationship, Model 4 includes changes in maternal parenting, and Model 5 includes changes in maternal health. Model 6 adjusts for all possible mechanisms. To consider how much of the treatment effect is explained by each set of mechanisms, I compare Models 2 through 6 to Model 1.<sup>5</sup>

## **Sample Description**

Table 2 presents descriptive statistics for all variables, by father's residential status at the three-year survey. Food insecurity was more common among children with non-residential fathers.

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<sup>4</sup> Results are robust to alternative matching strategies, including nearest neighbor matching (which matches each treatment observation to control observations with the closest propensity scores) and radius matching (which matches each treatment observation to control observations within a specific radius), and to different bandwidths.

<sup>5</sup> There are problems inherent in comparing across logistic regression models (Mood 2010); however, these results are similar when instead using linear probability models.

About 6.7% of children with residential fathers and 9.4% of children with non-residential fathers experienced current food insecurity (at the five-year survey). Among children with residential fathers, about 4.6% experienced an onset of food insecurity between the three- and five-year surveys and about 4.2% experienced an exit from food insecurity between the three- and five-year surveys (compared to 6.6% and 7.0% of children with non-residential fathers). Additionally, there are sharp differences in incarceration by fathers' residential status; about 8.7% of residential fathers and 26.7% of non-residential fathers were recently incarcerated.

[Table 2 about here.]

Families with residential fathers differ from families with non-residential fathers in additional ways. Among families with residential fathers, about 30% of mothers are non-Hispanic White, 36% are non-Hispanic Black, and 30% are Hispanic. Among families with non-residential fathers, the majority (66%) are non-Hispanic Black and fewer are non-Hispanic White (12.4%) or Hispanic (19.9%). Residential father families are less likely to be in poverty (29.8% compared to 59.9%), less likely to live in public housing (9.7% compared to 19.7%), and have lower levels of material hardship (1.411 compared to 2.036). Mothers are less likely to report neglect (0.117 compared to 0.184), be depressed (16.1% compared to 25.2%), or abuse substances (8.7% compared to 10.7%).

## **RESULTS**

### **Paternal Incarceration and Children's Food Insecurity**

Table 3 presents results from the propensity score matching models. Panel A presents results for families of residential fathers at the three-year survey. The unmatched models, which are essentially the unadjusted association between paternal incarceration and children's food

insecurity, show that children of incarcerated fathers are about three times as likely as their counterparts to experience food insecurity. Recent paternal incarceration is associated with a greater likelihood of children's current food insecurity ( $b = 1.055$ ,  $OR = 2.87$ ,  $p < .001$ ) and a greater likelihood of children's onset into food insecurity ( $b = 1.016$ ,  $OR = 2.76$ ,  $p < .01$ ). There is no unadjusted relationship between paternal incarceration and children's exit from food insecurity ( $b = -0.151$ ,  $OR = 0.86$ ,  $n.s.$ ), although the relationship is in the expected direction. In the matched models, paternal incarceration continues to be associated with children's current food insecurity ( $b = 0.894$ ,  $OR = 2.44$ ,  $p < .05$ ) and children's onset into food insecurity ( $b = 0.892$ ,  $OR = 2.44$ ,  $p < .05$ ). These relationships persist in the most rigorous specification, the doubly robust matching models, and, in this specification, paternal incarceration emerges as being negatively associated with children's exit from food insecurity ( $b = -.850$ ,  $OR = 0.43$ ,  $p < .05$ ). Taken together, these findings suggest that, when fathers are living with children prior to incarceration, paternal incarceration both increases the likelihood children experience an onset of food insecurity and decreases the likelihood children exit from food insecurity.

[Table 3 about here.]

Panel B presents results for families of non-residential fathers at the three-year survey. The unmatched models show that paternal incarceration is not significantly associated with children's current food insecurity ( $b = 0.090$ ,  $OR = 1.09$ ,  $n.s.$ ), children's onset into food insecurity ( $b = -0.078$ ,  $OR = 0.92$ ,  $n.s.$ ), or children's exit from food insecurity ( $b = 0.121$ ,  $OR = 1.13$ ,  $n.s.$ ). These patterns persist in the matched models and in the doubly robust matched models. Therefore, when fathers are not living with children prior to incarceration, paternal incarceration has no relationship with children's food insecurity.<sup>6</sup>

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<sup>6</sup> Existing research using these data (Wallace and Cox 2012), examining the full sample of children, finds no relationship between parental (paternal and maternal) incarceration and children's food insecurity. In supplemental

## Supplemental Analyses

The above analyses document a relationship between paternal incarceration and children's food insecurity, among families with residential fathers prior to incarceration, but suffer from two threats to causal inference: unobserved heterogeneity and reverse causality.

First, because the propensity score models only match on observed characteristics, it is possible that unobserved characteristics would render the relationship between paternal incarceration and children's food insecurity spurious. I address this concern by implementing Mantel-Haenszel bounds, a statistical procedure that quantifies the degree to which an omitted variable may render the results statistically insignificant. This is a nonparametric test that compares the observed number of observations that experienced paternal incarceration that also experienced the dependent variable with the expected number if the effect of paternal incarceration is zero. I present results from the Q- statistic, which estimates negative unobserved selection, in Appendix Table C. These results show that an omitted variable would not render the results statistically insignificant until  $\Gamma = 1.65$  (for children's current food insecurity) and  $\Gamma = 1.75$  (for children's food insecurity onset). Compare this to the predictors of paternal incarceration from Appendix Table A, which shows very few characteristics would increase the likelihood of paternal incarceration by 165% or 175%. Therefore, it is unlikely that the analyses omit a variable—that is not correlated with the other control variables included in the model—that would render the relationship between paternal incarceration and children's food insecurity statistically insignificant.

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analyses, I pooled children with residential and non-residential fathers and used propensity score matching models to estimate the relationship between paternal incarceration and children's food insecurity. These results, not presented, are consistent with Wallace and Cox (2012), further documenting the importance of considering heterogeneous relationships.

Second, I conduct falsification tests, which consider both unobserved heterogeneity and reverse causality (e.g., fathers living in households with food insecurity might engage in criminal behavior to help family get more resources and, therefore, be experience incarceration). I use propensity score modeling to estimate children’s food insecurity (measured at the three-year survey) as a function of future paternal incarceration (measured between the three- and five-year surveys, as in the main analyses) and all control variables. Here, I expect to find no relationship between future paternal incarceration and children’s food insecurity, and the presence of one might indicate spuriousness or reverse causality. These analyses (not presented but available upon request) show no relationship between future paternal incarceration and children’s food insecurity ( $b = 0.129, p = .537$ ), suggesting that unobserved characteristics are unlikely a threat to causal inference and reverse causality is unlikely operating.

### **Mechanisms Linking Paternal Incarceration to Children’s Food Insecurity**

Table 4 considers the mechanisms underlying the relationship between paternal incarceration and children’s food insecurity among families with residential fathers. I use logistic regression models to estimate two dependent variables—children’s current food insecurity and children’s onset into food insecurity—as a function of recent paternal incarceration and the propensity for experiencing recent paternal incarceration. Turning first to the estimates of children’s current food insecurity, Model 1 provides a baseline association between paternal incarceration and children’s current food insecurity, and the results are consistent with the matching results presented in Table 3. The coefficient for paternal incarceration increases by 3% when adjusting for economic wellbeing in Model 2, by 18% (and to statistical insignificance) when adjusting for parental relationship characteristics in Model 3, by 14% when adjusting for maternal parenting in

Model 4, and by 12% (and to statistical insignificance) when adjusting for maternal health in Model 5. The estimates of children's onset into food insecurity are consistent, with economic wellbeing explaining virtually none of the association (0%) and the other mechanisms explaining a moderate portion of the relationship (18% for the inclusion of parental relationship characteristics in Model 3, 12% for the inclusion of maternal parenting in Model 4, and 8% for the inclusion of maternal health in Model 5). Taken together, these results suggest that relationship characteristics most explain the relationship between paternal incarceration and children's food insecurity.

[Table 4 about here.]

## **DISCUSSION**

In this manuscript, I use data from the Fragile Families and Child Wellbeing Study, a longitudinal birth cohort of children born to mostly unmarried mothers, to estimate the relationship between paternal incarceration and food insecurity among five-year-old children. The results, estimated through a series of propensity score matching models, yield two substantive conclusions. First, recent paternal incarceration is associated with an increased risk of children's current food insecurity, an increased risk of children's onset into food insecurity, and a decreased risk of children's exit from food insecurity, but only among children living with fathers prior to experiencing paternal incarceration. Second, although post-incarceration changes in economic wellbeing explain little of these observed relationships, which is contrary to expectations, post-incarceration changes in the parental relationship explain a moderate proportion of the relationship.

The first finding, that paternal incarceration is detrimental to food insecurity among at least some children, is consistent with prior research documenting the mostly negative intergenerational consequences of paternal incarceration. Children of incarcerated fathers experience educational (e.g., Haskins 2014; Turney and Haskins 2014), behavioral (e.g., Geller et al. 2012; Wakefield and Wildeman 2011), and health impairments (e.g., Foster and Hagan 2013; Roettger and Boardman 2012; Turney 2014). These analyses show that young children are disadvantaged across another important and distinct dimension—access to nutritionally sound and adequate food. Children’s food insecurity signifies an extreme level of disadvantage and, given the relationship between children’s food insecurity and children’s educational, behavioral, and health outcomes (e.g., Alaimo et al. 2001; Ashiabi 2005; Howard 2011; Dunifon and Kowaleski-Jones 2003; Jyoti et al. 2005), it is quite possible that children’s food insecurity explains some of the relationship between paternal incarceration and children’s academic and behavioral performance in school. Although an examination of this possibility is beyond the scope of this manuscript, it is an important direction for future research.

The heterogeneous relationship between paternal incarceration and children’s food insecurity, which shows paternal incarceration has no relationship to children’s food insecurity when children are not living with their fathers prior to incarceration, is important. For one, the combination of negative associations (for children with residential fathers, where we would most expect to find negative associations) and null associations (for children with non-residential fathers, where we may or may not expect to find associations) lends face validity to the results. Additionally, the divergent findings between children with residential fathers and children with non-residential fathers provide one explanation for why prior research finds no relationship between incarceration and children’s food insecurity (Wallace and Cox 2012). More generally,

these findings highlight that paternal incarceration is not equally detrimental for all children and document the importance of considering heterogeneity in the relationship between paternal incarceration and child wellbeing.

The second finding, that post-incarceration parental relationship characteristics, measured as co-residential status and relationship quality, explains the largest share of the association between paternal incarceration and children's food insecurity (compared to economic wellbeing, maternal parenting, and maternal health), is both consistent and inconsistent with expectations. Consistent with expectations is the fact that parental relationship characteristics are important mechanisms. It is well known that incarceration destabilizes romantic relationships (e.g, Lopoo and Western 2005), and that family instability, in turn, has negative consequences for children's general wellbeing (e.g., Fomby and Cherlin 2007), and, specifically, for children's food insecurity (e.g., Bartfeld and Dunifon 2006; though see Miller et al. 2104). Mothers who recently separated from children's fathers—via incarceration—may be less equipped than their counterparts to provide adequate access to food. Inconsistent with expectations is the fact that economic wellbeing explains virtually none of the association between paternal incarceration and children's food insecurity. Perhaps mothers, who often face financial difficulties during and after the incarceration of a romantic partner (Schwartz-Soicher et al. 2011), are able to rely on government programs to ensure their children receive enough food. An alternative explanation is that mothers, acutely aware of the challenges children experience while fathers are incarcerated, sacrifice financial resources to ensure their children receive enough food. Adjudicating between these and other explanations is not necessarily possible with these data but these issues should be given attention in future research.

## **Limitations**

These analyses should be interpreted cautiously, as several limitations—many of them common to studying either paternal incarceration or children’s food insecurity—exist. First, the relatively small number of children who experience both incarceration and food insecurity—especially within the residential father subsample—precludes some additional analyses that might be instructive. For example, despite the fact that these analyses may yield useful findings, it is not possible to consider sources of heterogeneity among children with residential fathers (e.g., variation by poverty status, variation by food stamps receipt). Relatedly, too few mothers experience incarceration between the three- and five-year surveys, which makes it impossible to consider the independent effects of maternal incarceration. Very low food security among children, an even more severe marker of disadvantage, is extremely rare in the sample, making it impossible to precisely estimate the relationship between paternal incarceration and very low food security among children. Given these data limitations, researchers collecting information on children’s food insecurity should also consider collecting information on parental incarceration, and vice versa.

Another limitation involves unobserved heterogeneity. It is possible that there exists unmeasured characteristics that might render the relationship between paternal incarceration and children’s food insecurity spurious. For example, the data do not include indicators of criminal activity (though they do include measures of domestic violence and characteristics correlated with criminal activity [e.g., prior incarceration, substance abuse]), and it is possible that children of fathers engaging in criminal activity are likely to both experience paternal incarceration and food insecurity. Although I cannot rule out the possibility of a spurious relationship, several aspects of the analyses—including results from the Mantel-Haenszel bounds and the placebo

regression—suggest unobserved heterogeneity may not bias the results. Relatedly, the concentration of statistically significant relationships among children with residential fathers strengthens the case for causal inference. Future research should exploit exogenous variation—perhaps in sentencing decisions, which is not possible with these data—to more explicitly consider causal relationships.

Finally, as with all broadly representative data that ascertain information about paternal incarceration, the measure of paternal incarceration is quite crude. For example, it is not possible to distinguish between prison and jail spells, even though it is plausible to assume that prison incarceration and jail incarceration differentially influence family life. Relatedly, though the data include some information about incarceration duration and incarceration offense type, there exists a large amount of missing data in these measures that make it impossible to consider among the relatively small sample sizes of residential and non-residential fathers.

### **Policy Implications and Conclusions**

Taken together, these findings suggest that the consequences of paternal incarceration extend beyond the offender and spill over to children of offenders, consistent with a growing body of literature documenting the cascading consequences of incarceration for family life (e.g. Turney 2014; Turney and Wildeman 2013). These findings have a number of implications for policy. First, given the link between paternal incarceration and children’s food insecurity, these findings suggest that families who experience paternal incarceration, especially those families that include residential fathers prior to incarceration, could benefit from being monitored for food insecurity. Relatedly, programs designed to target food insecurity among the vulnerable population of families affected by paternal incarceration may be most effective if targeted toward mothers and

children living with fathers prior to incarceration. Furthermore, given that the relationship between paternal incarceration and children's food insecurity is both direct and indirect, operating especially through the parental relationship, in order to end hunger among children, policymakers should pay special attention to these additional collateral consequences of incarceration (as these additional collateral consequences have implications for children's food insecurity).

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**Table 1.** Description of Individual Questions Used to Measure Children's Food Insecurity

Question	Response categories	Affirmative response?
1 [I/We] relied on only a few kinds of low-cost food to feed [child/the children] because [I was/we were] running out of money to buy food	1 = often, 2 = sometimes, 3 = never	1, 2
2 [I/We] couldn't feed [child/the children] a balanced meal because [I/we] couldn't afford that	1 = often, 2 = sometimes, 3 = never	1, 2
3 [Child was/The children were] not eating enough because [I/we] just couldn't afford enough food	1 = often, 2 = sometimes, 3 = never	1, 2
4 In the last 12 months, did you ever cut the size of [child's/any of the children's] meals because there wasn't enough money for food?	1 = no, 2 = yes	2
5 In the last 12 months, did [child/any of these children] ever skip a meal because there wasn't enough money for food?	1 = no, 2 = yes	2
6 How often did [child/any of these children] skip meals because there wasn't enough money for food?	1 = almost every month, 2 = some months but not every month, 3 = only 1 or 2 months	1, 2
7 In the last 12 months, [was child/were the children] ever hungry but you just couldn't afford more food?	1 = no, 2 = yes	2
8 In the last 12 months, did [child/any of the children] ever not eat for a whole day because there wasn't enough money for food?	1 = no, 2 = yes	2

**Table 2.** Descriptive Statistics of Variables Used In Analyses, by Father's Residential Status

	Residential fathers		Non-residential fathers	
	Mean	(S.D.)	Mean	(S.D.)
Children's current food insecurity (ih5)	0.067		0.094	**
Children's onset into food insecurity (ih5)	0.046		0.066	*
Children's exit from food insecurity (ih5)	0.042		0.070	***
Paternal incarceration (y5)	0.087		0.267	***
Mother race/ethnicity (b)				
Non-Hispanic White	0.299		0.124	***
Non-Hispanic Black	0.361		0.662	***
Hispanic	0.300		0.199	***
Non-Hispanic other race	0.040		0.016	***
Mother foreign-born (b)	0.198		0.064	***
Mother age (range: 14 - 47; b)	26.406	(6.163)	23.777	(5.595) ***
Mother lived with both biological parents at age 15 (b)	0.516		0.319	***
Mother education (y3)				
Less than high school	0.246		0.331	***
High school diploma or GED	0.230		0.268	*
Post-secondary education	0.524		0.401	***
Mother lives in public housing (y3)	0.097		0.197	***
Mother receives welfare (y3)	0.121		0.344	***
Mother receives food stamps (y3)	0.264		0.576	***
Mother neighborhood disadvantage index (y3)	-0.222	(0.985)	0.219	(0.967) ***
Mother lives with parent (y3)	0.076		0.211	***
Mother number of children in household (range: 0 - 10; y3)	2.323	(1.273)	2.334	(1.421)
Mother multi-partnered fertility (y3)	0.303		0.565	***
Mother in poverty (y3)	0.298		0.599	***
Mother material hardship (range: 0 - 9; y3)	1.411	(1.508)	2.036	(1.740) ***
Mother employment (y3)	0.554		0.579	
Mother relationship quality (range: 1 - 5; y3)	3.974	(0.949)	2.189	(1.264) ***
Mother engagement with child (range: 0 - 7; y3)	4.984	(0.891)	4.979	(0.965)
Mother parenting stress (range: 1 - 4; y3)	2.213	(0.642)	2.313	(0.693) ***
Mother neglect (range: 0 - 5; ih3)	0.117	(0.430)	0.184	(0.536) ***
Mother fair or poor health (y3)	0.107		0.161	***
Mother depression (y3)	0.161		0.252	***
Mother substance abuse (y3)	0.087		0.107	***
Mother impulsivity (range: 1 - 4; y5)	1.474	(0.468)	1.592	(0.496) ***
Mother cognitive ability (range: 0 to 15; y3)	7.092	(2.716)	6.419	(2.543) ***
Father engaged in domestic violence (y3)	0.019		0.147	***
Father abused substances (b, y1, y3)	0.097		0.259	***
Father impulsivity (range: 1 - 4; y1)	1.946	(0.656)	2.091	(0.727) *
Father cognitive ability (range: 0 to 15; y3)	6.576	(2.806)	6.434	(2.649)
Father previously incarcerated (b, y1, y3)	0.266		0.570	***
Child is male (b)	0.514		0.531	
Child age, in months (range: 56 - 73; y5)	61.140	(2.524)	61.456	(2.472) ***
Child born low birth weight (b)	0.080		0.128	***
N		1,509		1,495

Notes: b = measured at the baseline survey; y1 = measured at the one-year telephone survey; y3 = measured at the three-year telephone survey; y5 = measured at the five-year telephone survey; ih3 = measured at three-year in-home survey; ih5 = measured at five-year in-home survey. City dummy variables not presented in the interest of parsimony. Asterisks indicate statistically significant differences between families with residential fathers at the three-year survey and families with non-residential fathers at the three-year survey. \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ .

**Table 3.** Propensity Score Matching Estimates of the Average Effect of Paternal Incarceration and Children's Food Insecurity, by Father's Residential Status

	Unmatched	Matched	Matched, doubly robust
<b>Panel A. Residential fathers</b>			
Children's current food insecurity	1.055 *** (0.275)	0.894 * (0.369)	0.896 * (0.458)
Children's onset into food insecurity	1.016 ** (0.325)	0.892 * (0.414)	1.048 * (0.523)
Children's exit from food insecurity	-0.151 (0.537)	-0.299 (0.596)	-0.850 * (0.394)
Treatment N	132	118	118
Control N	1,377	1,316	1,316
<b>Panel B. Non-residential fathers</b>			
Children's current food insecurity	0.090 (0.202)	-0.057 (0.240)	-0.137 (0.257)
Children's onset into food insecurity	-0.078 (0.251)	-0.224 (0.296)	-0.273 (0.304)
Children's exit from food insecurity	0.121 (0.250)	-0.005 (0.293)	0.012 (0.320)
Treatment N	381	379	379
Control N	1,096	1,033	1,033

Notes: Propensity scores are estimated with a logistic regression model estimating paternal incarceration (between the three- and five-year surveys) as a function of pre-incarceration covariates in Table 2. Matched estimates are based on kernel matching. Coefficients from logistic regression models are presented (with standard errors in parentheses). \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$  (two-tailed tests).

**Table 4.** Mechanisms of the Average Effect of Paternal Incarceration on Children's Food Insecurity, Restricted to Residential Fathers

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
	<i>Baseline</i>	+ <i>economic wellbeing</i>	+ <i>relationship characteristics</i>	+ <i>parenting</i>	+ <i>health</i>	+ <i>all mechanisms</i>
<i>Estimating children's current food insecurity</i>						
Paternal incarceration	0.892 *	0.918 *	0.729	0.769 *	0.786	0.719
	(0.383)	(0.430)	(0.449)	(0.387)	(0.407)	(0.479)
Propensity for paternal incarceration	0.844	0.619	0.827	0.988	0.530	0.621
	(0.924)	(0.979)	(0.951)	(0.928)	(0.935)	(1.057)
<i>Estimating children's onset into food insecurity</i>						
Paternal incarceration	0.890 *	0.890	0.727	0.779	0.819	0.713
	(0.422)	(0.462)	(0.519)	(0.418)	(0.465)	(0.539)
Propensity for paternal incarceration	0.591	0.537	0.570	0.651	0.253	0.450
	(0.995)	(1.037)	(1.038)	(1.021)	(1.023)	(1.136)
N	1,434	1,434	1,434	1,434	1,434	1,434

Notes: Logistic regression models estimate children's food insecurity and children's food insecurity onset as a function of the mechanisms, controlling for paternal incarceration and the propensity for paternal incarceration (from the kernel matching models presented in Table 3). Model 2 includes mother in poverty, mother material hardship, and mother employment (all measured at the five-year survey). Model 3 includes mother and father co-residential and mother relationship quality (all measured at the five-year survey). Model 4 includes mother engagement, mother parenting stress, and mother neglect (all measured at the five-year survey). Model 5 includes mother fair/poor health, mother depression, and mother substance abuse (all measured at the five-year survey). Model 6 includes all mechanisms. Coefficients from logistic regression models are presented (with standard errors in parentheses). \*  $p < .05$ , \*\*  $p < .01$ ,  $p < .001$  (two-tailed tests).

**Appendix Table A.** Logistic Regression Model Estimating Paternal Incarceration

	Residential fathers		Non-residential fathers	
Mother race/ethnicity (reference = non-Hispanic White)				
Non-Hispanic Black	0.158	(0.393)	0.405	(0.246) ^
Hispanic	-0.374	(0.453)	-0.104	(0.307)
Non-Hispanic other race	0.386	(0.723)	0.012	(0.595)
Mother foreign-born	-0.314	(0.506)	-0.638	(0.400)
Mother age	-0.081	(0.028) **	-0.046	(0.015) **
Mother lived with both biological parents at age 15	-0.700	(0.271) *	-0.033	(0.160)
Mother education (reference = less than high school)				
High school diploma or GED	-0.276	(0.320) ***	-0.043	(0.184)
Post-secondary education	-0.040	(0.321)	-0.126	(0.182)
Mother lives in public housing	-0.549	(0.387)	-0.102	(0.188)
Mother receives welfare	1.170	(0.331)	0.079	(0.180)
Mother receives food stamps	0.509	(0.315)	-0.067	(0.187)
Mother neighborhood disadvantage index	0.012	(0.152)	0.001	(0.086)
Mother lives with parent	-0.221	(0.430)	-0.090	(0.185)
Mother number of children in household	-0.077	(0.104)	-0.052	(0.054)
Mother multi-partnered fertility	0.265	(0.275)	0.039	(0.159)
Mother in poverty	-0.099	(0.287)	0.335	(0.174) ^
Mother material hardship	0.063	(0.079)	0.039	(0.043)
Mother employment	0.330	(0.264)	0.222	(0.159)
Mother relationship quality	-0.225	(0.132) ^	0.104	(0.059) ^
Mother engagement with child	-0.382	(0.133) **	-0.053	(0.074)
Mother parenting stress	0.010	(0.199)	-0.055	(0.109)
Mother neglect	0.197	(0.242)	0.138	(0.130)
Mother fair or poor health	0.280	(0.350)	-0.222	(0.199)
Mother depression	-0.094	(0.310)	0.048	(0.173)
Mother substance use	0.669	(0.364) ^	0.524	(0.214) *
Mother impulsivity	-0.602	(0.263) *	-0.035	(0.145)
Mother cognitive ability	0.077	(0.053)	-0.048	(0.030)
Father engaged in domestic violence	1.556	(0.637) *	0.247	(0.190)
Father abused substances	0.595	(0.331) ^	0.820	(0.163) ***
Father impulsivity	0.195	(0.179)	-0.073	(0.097)
Father cognitive ability	-0.135	(0.048) **	-0.060	(0.028) *
Father previously incarcerated	1.571	(0.270) ***	1.943	(0.184) ***
Child is male	0.655	(0.241) **	0.175	(0.140)
Child age, in months	0.048	(0.055)	0.114	(0.032) ***
Child born low birth weight	-0.796	(0.469) ^	-0.187	(0.211)
Log likelihood	-271		-659	
Constant	-0.904		-8.027	
N	1,509		1,495	

Notes: Results presented for first imputed data set. Standard errors are in parentheses. City dummy variables not presented in the interest of parsimony. ^  $p < .10$ , \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$  (two-tailed tests).

**Appendix Table B.** Covariate Balance, Before and After Matching

	Residential fathers						Non-residential fathers					
	Unmatched mean			Matched mean			Unmatched mean			Matched mean		
	$E(X)   d = 1$	$E(X)   d = 0$	<i>p</i>	$E(X)   d = 1$	$E(X)   d = 0$	<i>p</i>	$E(X)   d = 1$	$E(X)   d = 0$	<i>p</i>	$E(X)   d = 1$	$E(X)   d = 0$	<i>p</i>
Mother race/ethnicity												
Non-Hispanic White	0.185	0.315	0.003	0.178	0.155	0.638	0.129	0.126	0.890	0.129	0.141	0.635
Non-Hispanic Black	0.524	0.343	0.000	0.534	0.453	0.218	0.698	0.650	0.086	0.697	0.692	0.885
Hispanic	0.258	0.299	0.335	0.254	0.366	0.063	0.157	0.208	0.033	0.158	0.150	0.754
Non-Hispanic other race	0.032	0.043	0.584	0.034	0.025	0.695	0.016	0.016	0.926	0.016	0.017	0.894
Mother foreign-born	0.073	0.207	0.000	0.068	0.083	0.656	0.029	0.072	0.003	0.029	0.029	0.971
Mother age	23.169	26.836	0.000	23.025	22.897	0.840	22.459	24.266	0.000	22.480	22.528	0.900
Mother lived with both biological parents at age 15	0.282	0.540	0.000	0.271	0.280	0.883	0.281	0.332	0.067	0.282	0.280	0.935
Mother education												
Less than high school	0.355	0.229	0.002	0.373	0.390	0.785	0.381	0.300	0.004	0.380	0.371	0.806
High school diploma or GED	0.258	0.222	0.357	0.246	0.254	0.880	0.265	0.270	0.851	0.266	0.263	0.908
Post-secondary education	0.387	0.549	0.001	0.381	0.356	0.682	0.354	0.430	0.010	0.354	0.366	0.723
Mother lives in public housing	0.137	0.092	0.103	0.144	0.186	0.390	0.194	0.194	0.979	0.195	0.211	0.591
Mother receives welfare	0.403	0.090	0.000	0.390	0.380	0.872	0.412	0.321	0.001	0.409	0.406	0.934
Mother receives food stamps	0.629	0.227	0.000	0.619	0.615	0.949	0.638	0.553	0.004	0.636	0.622	0.686
Mother neighborhood disadvantage index	0.075	-0.264	0.000	0.066	-0.007	0.545	0.189	0.221	0.577	0.188	0.226	0.576
Mother lives with parent	0.097	0.071	0.302	0.102	0.098	0.920	0.192	0.221	0.236	0.193	0.194	0.952
Mother number of children in household	2.395	2.314	0.496	2.390	2.222	0.300	2.356	2.327	0.732	2.358	2.385	0.787
Mother multi-partnered fertility	0.427	0.287	0.001	0.407	0.318	0.155	0.575	0.552	0.440	0.578	0.560	0.627
Mother in poverty	0.476	0.275	0.000	0.458	0.518	0.353	0.669	0.571	0.001	0.668	0.668	0.998
Mother material hardship	2.129	1.347	0.000	2.085	2.005	0.704	2.250	1.971	0.008	2.249	2.214	0.791
Mother employment	0.548	0.554	0.905	0.542	0.488	0.409	0.551	0.587	0.231	0.551	0.535	0.642
Mother relationship quality	3.537	4.028	0.000	3.623	3.569	0.693	2.173	2.184	0.887	2.163	2.199	0.695
Mother engagement with child	4.735	5.016	0.001	4.788	4.755	0.818	4.924	4.991	0.245	4.925	4.937	0.866
Mother parenting stress	2.234	2.215	0.752	2.216	2.198	0.821	2.387	2.289	0.018	2.384	2.371	0.799
Mother neglect	0.231	0.105	0.002	0.192	0.163	0.652	0.253	0.165	0.005	0.249	0.231	0.688
Mother fair or poor health	0.169	0.098	0.013	0.161	0.228	0.194	0.152	0.162	0.667	0.153	0.148	0.854
Mother depression	0.266	0.150	0.001	0.254	0.331	0.199	0.302	0.234	0.009	0.301	0.285	0.636
Mother substance use	0.194	0.075	0.000	0.178	0.106	0.113	0.157	0.092	0.000	0.156	0.149	0.789
Mother impulsivity	1.452	1.469	0.698	1.446	1.380	0.271	1.635	1.573	0.036	1.635	1.633	0.955
Mother cognitive ability	7.210	7.105	0.681	7.119	7.237	0.703	6.221	6.494	0.070	6.253	6.314	0.735
Father engaged in domestic violence	0.113	0.011	0.000	0.068	0.068	0.997	0.213	0.129	0.000	0.211	0.204	0.823
Father abused substances	0.250	0.084	0.000	0.237	0.317	0.173	0.415	0.206	0.000	0.412	0.417	0.872
Father impulsivity	2.198	1.916	0.000	2.175	2.182	0.932	2.158	2.072	0.047	2.153	2.148	0.920
Father cognitive ability	5.724	6.706	0.000	5.778	6.044	0.439	6.203	6.496	0.067	6.214	6.203	0.953
Father previously incarcerated	0.758	0.222	0.000	0.746	0.717	0.620	0.882	0.468	0.000	0.881	0.892	0.645
Child is male	0.581	0.505	0.105	0.568	0.571	0.963	0.575	0.519	0.061	0.575	0.557	0.616
Child age, in months	61.355	61.027	0.157	61.381	61.356	0.937	61.669	61.264	0.005	61.633	61.550	0.65
Child born low birth weight	0.073	0.081	0.733	0.076	0.049	0.393	0.121	0.131	0.619	0.121	0.135	0.582
N	132	1,377		118	1,316		381	1,096		397	1,033	

Note: Results presented for first imputed data set.  $E(X) | d = 1$  indicates means for treatment group (children with incarcerated fathers).  $E(X) | d = 0$  indicates means for control group (children without incarcerated fathers). Postmatch estimates based on kernel matching. City dummy variables not presented in the interest of parsimony.

**Appendix Table C.** Results from Sensitivity Analysis for Treatment Effect on Food Insecurity among Children, Assuming Overestimation of the Treatment Effect

Gamma ( <i>I</i> )	Children's current food insecurity		Children's onset into food insecurity	
	M-H statistic	<i>p</i>	M-H statistic	<i>p</i>
1.00	3.465	0.000	3.462	0
1.05	3.276	0.001	3.291	0.001
1.10	3.097	0.001	3.128	0.001
1.15	2.927	0.002	2.974	0.001
1.20	2.765	0.003	2.829	0.002
1.25	2.611	0.004	2.69	0.004
1.30	2.464	0.007	2.557	0.005
1.35	2.324	0.010	2.431	0.008
1.40	2.189	0.014	2.31	0.01
1.45	2.060	0.020	2.194	0.014
1.50	1.936	0.026	2.082	0.019
1.55	1.816	0.035	1.974	0.024
1.60	1.700	0.045	1.871	0.031
1.65	1.589	0.056	1.771	0.038
1.70	1.481		1.675	0.047
1.75	1.376		1.581	0.057
1.80	1.274		1.491	
1.85	1.176		1.403	
1.90	1.080		1.318	
1.95	0.987		1.235	
2.00	0.897		1.154	

Note: Analyses restricted to families with residential fathers at the three-year survey. P-values exceeding .05 are omitted (unless they were the point where the relationship became statistically insignificant at the .05 level), which shows where the relationships become statistically insignificant.