

**EXPLAINING THE RELATIONSHIP BETWEEN PATERNAL
INCARCERATION AND FAMILY WELL-BEING:
A MEDIATING MODEL USING FOOD INSECURITY**

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The Academic Faculty

By

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To Patrick and Alice King

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SUMMARY

This dissertation explores whether families of incarcerated fathers are more likely to experience food insecurity as a result of the conviction of the father. More specifically, I test whether food insecurity explains some of the devastating consequences of paternal incarceration on mothers and children. Because children of incarcerated fathers are at higher risk of following their fathers' footsteps, this cycle of incarceration can be self-perpetuating. I try to determine how policy can be used to break this cycle.

This dissertation examines the role of food insecurity in explaining the negative impact of paternal incarceration on the well-being of mothers and children. The United States has experienced a huge prison boom over the last 40 years. A growing proportion of the incarcerated population are parents. Children growing up with one or both parents missing tend to have long-lasting disadvantages. Previous studies have attempted to suggest a few mechanisms through which paternal incarceration has negative consequences for families but has not considered the role of food insecurity.

I propose a theoretical framework to show that paternal incarceration negatively affects mothers and children through food insecurity. Using a longitudinal study of fragile families, I find that food insecurity explains some of the negative consequences of paternal incarceration on maternal depression. On the other hand, food insecurity plays no role in the effect of paternal incarceration on child behavior problems. The findings also cast doubt on whether paternal incarceration affects child well-being.

The implications for policy are two-fold. First, reducing food insecurity would mitigate the negative effects of paternal incarceration on maternal depression. More

research is needed in order to understand whether the negative effects of paternal incarceration on maternal well-being can be further mitigated. Second, prison reform would do little to reduce the behavior problems experienced by children of incarcerated fathers. Rather than incarceration, other factors contributing to social disadvantages could explain why children of incarcerated fathers have more behavior problems than other children.

CHAPTER 1

INTRODUCTION

According to the New York Times (May 24, 2014, SR10), mass incarceration has caused “widespread societal and economic damage” and the United States “has gone past the point where the numbers of people in prison can be justified by social benefits.”

These societal and economic damages not only affect the incarcerated, but their families.

This dissertation examines the impact of paternal incarceration on maternal and child well-being, focusing on whether food insecurity plays a major role. Paternal incarceration has negative effects on mothers’ and children’s well-being (Foster and Hagan, 2007; Geller and Franklin, 2014; Geller et al., 2009; Murray and Farrington, 2005; 2008; Turney et al., 2012; Turney, 2014a; Wildeman et al., 2012; Wildeman, 2009; 2010; 2012). While some of these studies examined some potential mechanisms that may explain how paternal incarceration negatively affects families, none have considered the potential role of food insecurity.

This dissertation provides a theoretical foundation that explains how and why paternal incarceration can have negative consequences on maternal and child well-being through food insecurity. I use theory from the Family Adjustment and Adaptation Response (FAAR) model to show that paternal incarceration will decrease the resources of and increase the burdens on a family (Patterson, 2002). I then use self-control theory to explain that paternal incarceration may lower self-control in children in two ways. First, paternal incarceration decreases the socialization of children through hurting the quality of parenting (Gottfredson and Hirschi, 1990). Second, which they did not articulate, may

be through the physical consequences of paternal incarceration on children, potentially resulting in lower self-control.

The neuroscience literature complements self-control theory and provides some insight on how undernutrition could negatively affect maternal and child well-being (Gilbody et al., 2007; Lewis et al., 2006; Tarullo et al., 2009; Zelazo et al., 2008). Self-control theory argues that parenting is one of the most important factors that determines whether children can learn self-control (Gottfredson and Hirschi, 1990). Undernutrition is likely to lead to lower parenting quality through lower maternal well-being. In addition, undernutrition directly has adverse consequences on the development of children (Bryan et al., 2004), which can also lead to adverse development of the specific parts of the brain where children learn self-control (Casey et al., 1997; Gogtay et al., 2004; Tarullo et al., 2009).

Paternal incarceration leads to several detrimental outcomes for mothers and children (Foster and Hagan, 2007; Geller and Franklin, 2014; Geller et al., 2009; Murray and Farrington, 2005; 2008; Turney et al., 2012; Turney, 2014b; Wildeman, 2009; 2010; 2012; Wildeman et al., 2012). This study relies on two additional streams of literature to build the argument that food insecurity plays an important role in the impact of paternal incarceration on family well-being. First, recent studies have found that paternal incarceration increases the risk of food insecurity (Cox and Wallace, 2013; Turney, 2014c). Second, food insecurity leads to many negative health and well-being outcomes in adults and children (Alaimo et al., 2001; Belsky et al., 2010; Formoso et al., 2000; Jyoti et al., 2005; McLaughlin et al., 2012; Seligman et al., 2007; 2010; Sieffert et al., 2004; Slopen et al., 2010; Stuff et al., 2004; Whitaker et al., 2006b). As a result, it is

likely that the effects of paternal incarceration on maternal and child outcomes are partially mediated by food insecurity.

In this introductory chapter, I provide a background discussion on incarceration to show the importance of the study. I then discuss its policy relevance and provide an overview of the structure of the dissertation.

1.1 The Collateral Consequences of Mass Imprisonment in the US

The United States prison population has soared since the 1970s. The number of inmates and ex-inmates increased eight-fold between the mid-1970s and 2009 (Carson, 2014). By 2004, about 6 million individuals in the United States had spent time behind bars (Uggen et al., 2006). As shown in Figure 1, the number of inmates hovered around 200,000 until the early 1970s, but between 1973 and 2008, the number rose by about 35,000 per year or at an annualized rate of 6% (Blumstein, 2011), peaking at over 1.6 million in 2009. In 2013, the number was still nearly 1.6 million.

With an incarceration rate of 716 per 100,000 people in 2011, the United States had the highest rate worldwide. In comparison, the median rate in Europe was 98 per 100,000 people and the highest rate in Western Europe was only 122 per 100,000 people in Luxembourg (Walmsley, 2013). A recent comprehensive report edited by Travis et al. (2014) for the National Research Council of the National Academies of Sciences found that a complex combination of historical, social, economic, and political forces contributed to the rise of incarceration rates starting in the 1960s, with the increases due both to a greater likelihood of incarceration given a felony conviction and to a longer average length of incarceration.

State and federal prison population

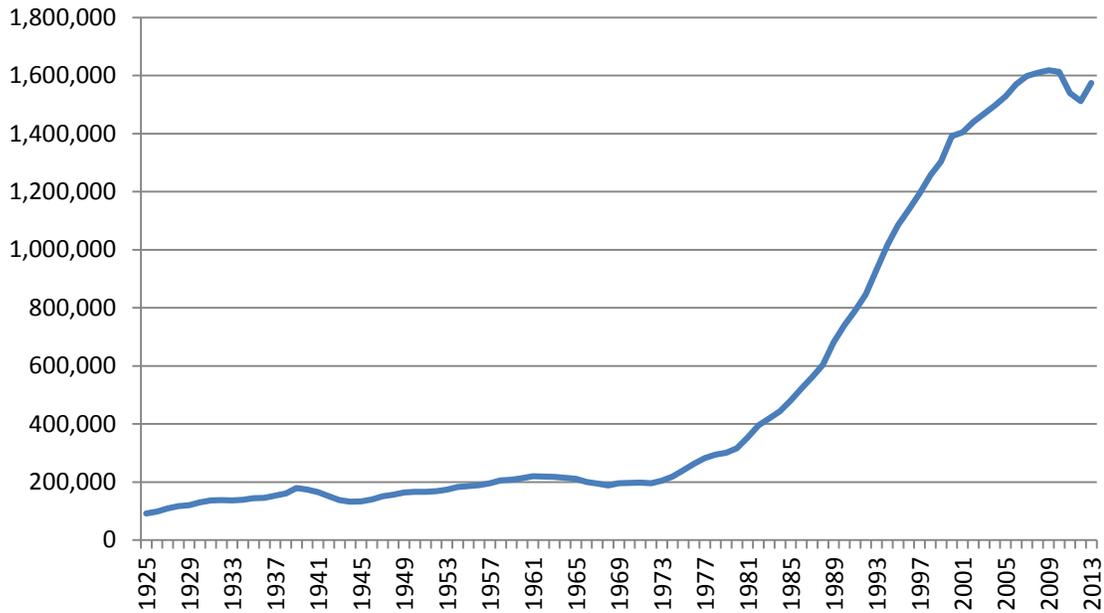


Figure 1.1. Number of prisoners with a sentence of 1 year or more in the US 1925-2013

Incarceration has negative long term consequences for prisoners. Ex-inmates have fewer economic opportunities and are less likely to find employment, in part due to the stigma of carrying a criminal record (Waldfoegel, 1994; Western and Pettit, 2000). Former prisoners have worse physical and mental health (Liebling, 1999; Liebling and Shadd, 2005; Massoglia, 2008). The increase in incarceration helps explain the increase in AIDS infection rates between 1982 and 1996 in minority communities (Johnson and Raphael, 2009). Inmates are also at higher risk of mortality. For example, Pridemore (2014) found that incarceration substantially increases the risk of premature death for men of working age. Lastly, ex-inmates can lose their voting rights in most states, which can reduce their civic engagement (Uggen and Manza, 2002).

Recent literature has started to focus on how parental incarceration affects spouses and children. Several studies find that paternal incarceration has devastating consequences for mothers and children. The removal of fathers from their homes and families creates several voids. First, the physical absence of the father increases the burden of the households to the mother. This could lead to greater parenting stress and lower mental health (Turney, 2014b; Wildeman et al., 2012). Second, the emotional absence of the father contributes to lower mental health and a higher risk of union dissolution (Lopoo and Western, 2005; Wildeman et al., 2012). A large body of literature on divorce has shown that women on average fare worse following their separation (Amato, 2000; Smock et al., 1999).

The most consequential void, which is the focus of this dissertation, is financial. Incarceration severely limits the financial contribution of fathers to their families (Geller et al., 2011). During their incarceration, fathers have very limited opportunities to earn sufficient income to financially provide for their families. Most often, they tend to rely on their families to cover their costs during their incarceration (Braman, 2004; Comfort, 2008; Harris et al., 2010). Families, stretched thin financially, are at higher risk of experiencing material hardship (Schwartz-Soicher et al., 2011), are more likely to experience food insecurity (Cox and Wallace, 2013; Turney, 2014c), and are at higher risk of experiencing housing instability (Geller and Franklin, 2014).

These negative consequences of paternal incarceration on mothers are likely to also affect children. Poor maternal well-being is associated with adverse development of children and their well-being (Crnic et al., 2005; Luoma et al., 2001). Since paternal incarceration decreases the quality of parenting and maternal parenting affects children,

part of the negative effects of paternal incarceration on child behavior problems operates through the decrease in maternal parenting quality (Wildeman, 2010).

Food insecurity may be an important factor through which paternal incarceration negatively affects mothers and children. Because paternal incarceration increases the risk of food insecurity (Cox and Wallace, 2013; Turney, 2014c), paternal incarceration is negatively affecting mothers and children through undernutrition. Food insecure individuals have multiple nutritional deficiencies (Tarasuk and Beaton, 1999; Tarasuk, 2001). Some of these deficiencies lead to depression in mothers (Seligman et al., 2007; 2010), adverse development of the brain and adverse cognitive outcomes in children (Black, 2001; Grantham-McGregor and Ani, 2001; Lozoff et al., 2000). Depression in mothers is associated with lower parenting quality (Lovejoy et al., 2000), which leads to more child behavior problems (Turney, 2012). Also, the adverse development of children due to undernutrition decreases their ability to learn self-control, which could lead to more behavior problems. For all these reasons, food insecurity could be playing an important role in the impact of paternal incarceration on maternal and child well-being.

While this dissertation focuses on the financial consequences of paternal incarceration through food insecurity on maternal and child well-being, there are other pathways through which paternal incarceration negatively affects mothers. These are mainly through the physical and emotional absence of the father, some of which will be captured in the effect of paternal incarceration. The goal of this dissertation is to tease out the effect of food insecurity, controlling for some of these alternative explanations.

I focus on the role of food insecurity because it is relatively less difficult to change through policy than the other types of paternal absences. Also, paternal physical

and emotional absence are not directly related to food insecurity, which avoids any omitted variable bias.

1.2 Importance of Study for Policy

Incarceration negatively affects family members. Several recent studies refer to the “burgeoning” literature on the collateral consequences of paternal incarceration (Turney and Wildeman, 2013; Wildeman et al., 2012). This study focuses on the financial difficulties that families are more likely to experience following incarceration. For example, mothers are more likely to experience material hardship (Schwartz-Soicher et al., 2011) and housing instability (Geller and Franklin, 2014). Paternal incarceration leads mothers to bear all the parenting responsibilities, which tends to be of lower quality (Turney and Wildeman, 2013; Wildeman et al., 2012), and contribute to a higher risk of maternal depression and lower life satisfaction (Wildeman et al., 2012)

Many children have an incarcerated father. As of 2007, over half of incarcerated individuals had children under 18 years of age (Glaze and Maruschak, 2008). Children coming from disadvantaged backgrounds and living in precarious conditions are substantially more likely than their wealthier counterparts to have an incarcerated father. Because the incarcerated are disproportionately African-American and more likely to come from low-income backgrounds, the families of the incarcerated are also disproportionately from those demographic groups (Western and Pettit, 2005). In other words, because a substantial proportion of the incarcerated population tends to be African-American, African-American children are more likely to have an incarcerated father and grow up in less stable and more disadvantaged households.

These children may be at higher risk of becoming deviants. Having an incarcerated father increases the probability of committing crimes and becoming incarcerated (Fergusson, 1952; Glueck and Glueck, 1950; Murray et al., 2012a; West and Farrington, 1973), which perpetuates the cycle of incarceration and disadvantage. The disadvantages and risks resulting from incarceration are transmitted from fathers to children. Because African-American children tend to have many disadvantages and are the group with the highest risk of delinquency, prison may be perpetuating racial inequality (Bobo and Thompson, 2006; Pager, 2009; Western, 2006).

Some of these inequalities can generate large social costs through the provision of public assistance, through the cost of incarceration, or through the perpetuation of social inequalities in families. Since paternal incarceration increases child behavior problems (Geller et al., 2009; Johnson, 2009; Wildeman, 2010), these children may have lower educational attainment and fewer economic opportunities. As a result, they may be more likely to need public assistance in the future.

Travis et al. (2014, p. 7) concluded that the change in penal policy towards more punitive policies may have brought substantial unwanted social costs, while the size of the reduction in crime and its benefits is very ambiguous. Crime control theory suggests that incarceration brings deterrence and incapacitation, which would result in a decrease in the crime rate. Instead, between 1980 and 1995, incarceration substantially increased, but the crime rate only decreased little (Blumstein, 1998).

Policy interventions to improve family well-being would potentially reduce these large social costs of low educational attainment and the lack of economic opportunities. Because this study focuses on the role of food insecurity in the relationship between

paternal incarceration and maternal and child well-being, I focus on food security related policies.

Children of incarcerated fathers tend to have long-lasting disadvantages (Wakefield and Uggen, 2010; Wildeman, 2009). Because paternal incarceration increases the risk of union dissolution, children of incarcerated fathers tend to be raised by a single mother (Geller et al., 2011; Western, 2006). Children of single mothers tend to have lower educational attainment (Downey, 1994; Krein and Beller, 1988), which reduces their future economic prospects and opportunities. Also, the cycle of intergenerational transmission of crime and incarceration from father to child may perpetuate itself.

Yet, the factors that specifically contribute to these disadvantages are not well understood. Identifying them and determining which ones can be more easily changed through policy could potentially reduce these disadvantages. For example, if paternal incarceration does affect family well-being through food insecurity, public assistance programs – whether or not specifically aimed to reduce food insecurity – would benefit families of incarcerated fathers. Food assistance programs such as the School Breakfast Program (SBP), or the National School Lunch Program (NSLP) are effective in reducing food insecurity by increasing nutrients intake (Bartfeld and Ahn, 2011; Burghardt and Devaney, 1995).

Because paternal incarceration increases the risk of food insecurity (Cox and Wallace, 2013; Turney, 2014c), these programs would reduce the effect of paternal incarceration on food insecurity. Food secure mothers are less likely to experience depression (Whitaker et al., 2006). Higher maternal well-being is associated with better parenting (Turney, 2012), which would reduce the risk of child behavior problems by

improving child self-control. In addition, food secure children are less likely to experience adverse development of the brain (Grantham-McGregor et al., 1999), which would also help them improve their self-control and reduce behavior problems.

1.3 Research Question and Organization of Dissertation

This dissertation addresses the following general research question: Does food insecurity play a role in the negative effect of paternal incarceration on various maternal and childhood outcomes? The dissertation is divided into four additional chapters. Chapter 2 provides a theoretical framework that explains how paternal incarceration can affect the well-being of mothers and children through food insecurity. I then review the relevant literature to show evidence supporting my hypothesis. Chapter 3 discusses the data from the Fragile Families and Child Wellbeing Study (FFCWS), which is a longitudinal survey of families with children born to unmarried mothers in 20 large cities in the United States. For maternal well-being, I examine depression, life satisfaction, and poor health. For child well-being, I examine antisocial and aggressive attitudes towards others (which psychologists categorize as externalizing behaviors) and emotional feelings the child experiences, such as anxiety and low self-esteem (which psychologists classify as internalizing behaviors). Both empirical essays have the challenge of counteracting bias due to selection into incarceration. I use several different methods including matching to attempt to minimize this bias. Chapter 4 presents the findings of the analysis. Chapter 5 discusses the results and its implications for policy and some direction for future research.

CHAPTER 2

LITERATURE REVIEW

Paternal incarceration negatively affects families through three distinct pathways. First, the physical absence of the father can contribute to lower family well-being by increasing parenting burden. Second, the emotional absence of the father can also lead to lower family well-being by increasing parenting stress. Lastly, his financial absence, which is the focus of this dissertation, can contribute to food insecurity and undernutrition, leading to lower maternal and child well-being

I focus on this last mechanism, because it is the most tangible one, which means that it is easier to change through policy than the others. Also, the analysis focuses on fragile families that are at higher risk of experiencing many disadvantages, such as family instability and living in poverty. The theoretical framework in this chapter specifically focuses on the potential role of food insecurity.

2.1 Theoretical Framework

Three theoretical frameworks help explain the impact of paternal incarceration on family well-being. The incarceration of fathers disrupts the functioning of a family. First, family stress theories provide an overview of how families are affected by the incarceration of fathers and how they cope with it.

Patterson's (1988; 2002) Family Adjustment and Adaptation Response (FAAR) model shows that family resources and demands affect how well a family will cope with the strain of paternal incarceration. The model shows that fragile families tend to be poorly equipped to deal with paternal incarceration. The imbalance between their low

initial amount of resources and high demands are further disrupted when the father is imprisoned. As a result, they are likely to experience long-term negative consequences and be even worse off than their initial precarious situation.

Two additional sets of theories identify food insecurity as an important factor that can explain the devastating consequences of paternal incarceration on mothers and children. The theoretical linkages partly build upon each other. One identifies the potential source of child behavior problems and the other explains how food insecurity may lead to lower maternal well-being and child behavior problems.

Second, Gottfredson and Hirschi (1990) argued that the propensity to commit crimes originates from the lack of self-control. Self-control theory could help identify both physical (or direct) and social (or indirect) aspects through which paternal incarceration affects children. Children typically learn self-control from their parents, and the imprisonment of the father leaves mothers the difficult task of teaching self-control to their children by themselves. The quality of the parenting provided determines whether children learn self-control.

Third, the neuroscience literature complements self-control theory by showing that nutritional deficiencies could adversely affect both mothers and children. Food insecurity decreases maternal well-being and parenting quality (Huang et al., 2010; Siefert et al., 2001; Slack and Yoo, 2005; Whitaker et al., 2006b). Since the parenting quality of mothers decreases, children may be less likely to learn self-control and more likely to have behavior problems. In addition, child food insecurity is associated with multiple nutritional deficiencies (Kirkpatrick and Tarasuk, 2008; Skalicky et al., 2006). Some of these deficiencies lead to underdevelopment of specific parts of the brain where

children learn self-control (Benton, 2008; Georgieff, 2007; Lozoff et al., 2000). As a result, children could also be more likely to have behavior problems as a result of undernutrition.

In this chapter, I provide a more detailed discussion of those theories to better understand the relationship between paternal incarceration and family well-being. I then review the evidence from the literature to show that several studies have found evidence to support these theories.

2.1.1 Family Stress and Family Resiliency Theories

Family stress and family resiliency theories are useful in understanding the consequences of paternal incarceration on maternal well-being. Hill (1949) proposed a family stress model based on the temporary absence of fathers due to war. In the model, several factors affect the way families cope with the crisis: these are the family's stressors, perceptions, and resources. Families that become overwhelmed by the crisis have an imbalance and fare poorly, with more stressors than resources available.

Family resiliency models build upon family stress theories to take into account how the accumulation of stress affects families and other factors that may affect the adaptation of families. Patterson (2002) described resilience as "doing well in the face of adversity." The Family Adjustment and Adaptation Response (FAAR), depicted in Figure 2, attempts to underline the links between family stress theory and family resiliency theory (Patterson, 1988, 2002).

The model emphasizes four interacting concepts: (1) demands, (2) capabilities, (3) meanings, and (4) adjustment/adaptation (Patterson, 1988; 2002). Families engage in active processes to balance demands and capabilities. Family demands include "(a)

normative and non-normative stressors, (b) ongoing family strains, and (c) daily hassles” (Patterson, 2002, p. 350). Examples of family demands that generate stress or disruptions in the family are enrollment of a child in school or the relocation of a family for various reasons.

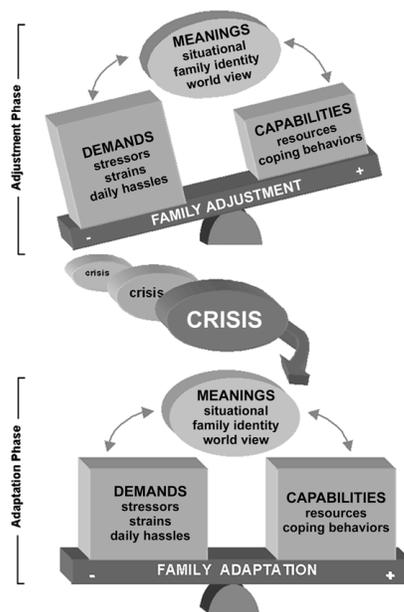


Figure 2.1. Family Adjustment and Adaptation Response Model (Patterson, 1988)

Family capabilities are “(a) tangible and psychosocial resources and (b) coping behaviors.” Social support, both formal (e.g. financial) and informal (e.g. emotional), is an example of resources and coping mechanisms that may be available to families. The model identifies three different levels of family meanings: “(a) families’ definitions of their demands and capabilities; (b) their identity as a family; and (c) their world view.” The concept of family meanings can be an abstract one. For example, when faced with a diagnosis of a child’s chronic health condition, a family needs to change its prior beliefs

and values to understand the challenge it will face with the illness and how it will adapt to the health condition (such as potential stigma) (Patterson, 2002, p. 350).

In this model, families attempt to balance demands with their available resources (capabilities). If a lack of capabilities renders them unable to meet those demands, a crisis occurs until a family performs a major change in its functioning. For example, if a family is unable to maintain a stable environment in the home, family members suffer from it, leading to a crisis, such as the loss of a job. The crisis disrupts the trajectory of the functioning of the family, which leads to poorer functioning (Patterson, 2002). Families unable to restore a balance between demands and capabilities become more vulnerable (McCubbin and Patterson, 1983).

Paternal incarceration is a crisis that adds strain on a family. The severity of the negative consequences of the imprisonment of the father depends on how much the father was contributing to the family prior to his incarceration. Fathers who lived with their families prior to imprisonment tend to contribute more to their families than non-resident fathers, through both his presence and his financial contribution. As a result, the incarceration of a father who lived with his family will substantially reduce the resources of the family. Even though non-resident fathers may not live with their families, the support they provide to their families through financial means (e.g child support) and the time spent with the child during visits improves the well-being of children (Amato and Gilbreth, 1999; Nepomnyaschy et al., 2014).¹ Assuming that fathers were not completely

¹ The only exception may be if the father did not contribute in any way to the family. Mothers may decide to raise the child on their own without any assistance from fathers. Several studies have shown a variation in child support enforcement. In a review of the literature on child support enforcement, Huang and Han (2012) explained that although the federal government has increased legislation to augment the collection of child

estranged to their families, their incarceration reduces resources of the family as fathers are no longer able to assist in the functioning of the family. At the same time, the family's demands increase as mothers are likely to have to shoulder most of the responsibilities of the households. Non-resident fathers who do not contribute to their families are a potential exception. Not only their incarceration may not affect the financial situation of the family, but it would also not affect the responsibilities of the mother if she has been estranged with the father to begin with. I account for these fathers in different ways in this study. For example, one way is to exclude them from the analysis.

Several studies on the effect of paternal incarceration found evidence to support the prediction of the FAAR model that the resources of families decrease following incarceration. Schwartz-Soicher et al. (2011) found evidence that paternal incarceration leads to an increase in material hardship. Two studies found that paternal incarceration leads to an increase in the risk of food insecurity (Cox and Wallace, 2013; Turney, 2014c). The literature on the effect of paternal incarceration on families also found evidence that the demands on families, especially mothers, increase following incarceration. The household becomes a single-parent household, which increases parenting stress and parental strain (Arditti et al., 2003). Using data from the Fragile Families and Child Wellbeing Study (FFCWS), Cooper et al. (2009) found that mothers

support payments, which lead to more payments, this effort still fall short of a desirable level of compliance. For example, they cited a report prepared for the US Census Bureau showing that in 2008, about a third of mothers did not even have a child support order and half of them did not receive a single payment from the father (Grall, 2011).

separating with a resident father or re-partnering with a non-biological father, tend to have higher parenting stress.

The FAAR model predicts that families that are unable to recover from the crisis – in this case, paternal incarceration – will become more vulnerable and have poorer functioning. Many studies on the collateral consequences of incarceration support this idea. First, because incarceration reduces economic opportunities, formerly incarcerated fathers tend to have fewer economic opportunities and lower paying jobs when they are not unemployed (Western et al., 2001; Western, 2002). Second, the literature on the collateral consequences of paternal incarceration has mostly found negative effects on mothers and children (Foster and Hagan, 2007; 2009; Geller et al., 2009; 2012; Johnson, 2009; Murray and Farrington, 2005; 2008; Murray et al., 2009; 2012; Wildeman, 2009; Wildeman, 2010; Wildeman et al., 2012). These negative outcomes will be discussed in greater detail later in this section.

As a result, fragile families tend to be poorly equipped to deal with a crisis such as paternal incarceration. These negative consequences tend to be long lasting and these families will have poorer functioning according to predictions from the FAAR model. The model helps understanding that paternal incarceration is most likely going to decrease the resources and increase the demands of families. While the framework helps establishing this link, additional theories are needed to understand how it operates. In other words how the financial resources (i.e. food insecurity) affects maternal and child well-being.

2.1.2 A General Theory of Crime or Self-Control Theory

Gottfredson and Hirschi's *A General Theory of Crime* (1990) is one of the most popular and widely cited theories of crime. They argue that the lack of self-control causes individuals to commit crimes. Individuals commit crimes or other deviant behaviors to receive instant gratification. For example, drug users (who, in most cases are committing a felony through possession) consume drugs to reward the part of the brain that releases pleasurable feelings.

The pathways through which paternal incarceration may lead to low self-control in children can be broken down into two different explanations. One can be thought as the social explanations that Gottfredson and Hirschi provide. The other has to do with the potential effect of paternal incarceration on the physical development of children. For the later one, I will use literature in neuroscience, which relates to the last set of theories I use in this dissertation.

Gottfredson and Hirschi argued that parents are the main force shaping the self-control of children. In other words, poor parenting and “ineffective child-rearing” tend to lead to low levels of self-control (Gottfredson and Hirschi, 1990, p. 97). They posited several requirements to adequately raise a child: “(1) monitor the child’s behavior; (2) recognize deviant behavior when it occurs; and (3) punish such behavior. All those require affection or investing time with the child” (Gottfredson and Hirschi, 1990, p. 97). In addition, they believed that the level of self-control plateaus at adolescence. If children do not learn self-control early enough, they will probably have low self-control for most of their lives, as it will be progressively more difficult to learn self-restraint. In addition, children with absent or negligent parents are unable to learn self-control. Even

if the school can reinforce restraint in children, the lack of supervision and parenting at home makes it difficult for children to learn restraint in the first place. An incarcerated father cannot meet any of those requirements to raise his child due to his absence. The mother, under greater stress due to the need of fulfilling both parents' obligations, would not be able to completely fulfill all those duties. As a result, children who are unable to learn self-control can become deviant themselves. Gottfredson and Hirschi (1990) also posited that for children in low-income households, the employment of the mother can increase the risk of delinquency due to the low likelihood that the child is supervised by an adult. Furthermore, children living in broken or reconstituted homes have higher rates of crime than children in families with two parents (Gottfredson and Hirschi, 1990, p. 103). The lack of supervision combined with the lack of family stability is detrimental for children's development.

Self-control plays an important role in the development of children. In a meta-analysis, Pratt and Cullen (2000) found that, in general, self-control is an important predictor of crime and deviant behaviors. Reviewing the evidence from experimental studies on self-control, Mischel et al. (1989) concluded that children who were able to exercise restraint and delay gratification had higher educational attainment, better social skills, and stronger abilities to handle difficult situations involving stress.

Paternal incarceration decreases the parenting quality of mothers and a higher risk of deviance for children, though only for parents who were living together (Turney, 2014b), and increases the risk of deviance in children. Erratic and dysfunctional parenting leads to antisocial and delinquent behavior in children (Jaffee et al., 2006; Serbin and Karp, 2003; 2004; Thronberry et al., 2003). Children living in single-parent households

are more likely to commit crimes or become incarcerated, which is partly due to the absence of the father (Antecol and Bedard, 2007; Harper and McLanahan, 2004). Also, following paternal incarceration, the amount of instrumental support the mother receives tends to be lower (Turney et al., 2012). This is a result of the inability of the father to provide in-kind or financial support, but also because of the stigma of having an incarcerated partner. The social network of mothers tends to decrease, lowering the number of individuals willing or able to provide support, further lowering the amount and quality of maternal parenting.

2.1.3 Undernutrition and its Effect on Adults and Children

While Gottfredson and Hirschi (1990) articulated social explanations for low-levels of self-control, undernutrition could also lower self-control. I turn to the nutritional and neuroscience literature to examine how paternal incarceration can lead to low self-control through food insecurity (or undernutrition).

The FAAR model predicts that paternal incarceration (or the crisis) will decrease the financial resources of a family. Paternal incarceration increases material hardship (Schwartz-Soicher et al., 2011). Paternal incarceration increases household and child food insecurity (Cox and Wallace, 2013; Turney, 2014c). Food insecurity can affect both mothers and children, which can undermine the parenting quality of mothers and have direct adverse consequences on the development of children through undernutrition and their ability to learn self-control.

Food insecurity may increase the risk of maternal depression in two ways. Food insecurity can increase maternal stress, which can have several negative consequences. Brown and Moran (1997) showed that one of the factors affecting depression in women is

humiliation or entrapping events. For mothers, experiencing financial strain and food insecurity can be a stressful event that may recur periodically. In addition to the negative effects of stress on health, stress has other negative consequences. For example, stressful life experiences reduce feelings of self-worth and personal control (Krause and Van Tran, 1989). Single mothers may experience even greater stress as they have bear all the responsibilities of their households.

Recurrent or accumulated stressful life events have a positive association with depression, and that single-mothers with low self-esteem and low support are the most vulnerable (Brown and Harris, 1978; Brown and Moran, 1997; Costello, 1982; Heflin et al., 2005). The experience of food insecurity may erode the self-confidence of mothers and the accumulation of stress as a consequence of paternal incarceration may increase the risk of maternal depression.

Food insecurity could also lead to maternal depression through undernutrition. Food insecure adults tend to have multiple nutritional deficiencies, including deficiencies in iron, calcium, folate, and vitamin B₁₂ (Kirkpatrick and Tarasuk, 2008; Tarasuk, 2001). These multiple nutritional deficiencies have adverse effects on the physical and mental health of adults. Iron deficiency increases the risk of early mortality for women and calcium deficiency increases the risk of bone fracture (Recker et al., 1996; Zimmermann and Hurrell, 2007). Folate and vitamin B₁₂ are associated with depression.

Based on a review of several decades of research on nutritional deficiencies and neuropsychiatric disorders, Alpert and Fava (1997) credited Herbert (1962) as the first to show an association between folate deficiency and symptoms of depression in men. The consequences of folate deficiency also applies to women. Bottiglieri (1996) tested the

theory emerging from Reynolds and Stramentinoli (1983) and Scott et al. (1981) that folate and vitamin B₁₂ play a crucial role in the functioning of the central nervous system and their role in producing the chemical S-adenosylmethionine (SAM) that is found to have antidepressant properties. He found that deficiencies of both folate and vitamin B₁₂ lead to neurological disturbances such as depression.

Using a randomized double blind trial design with about 1,000 healthy men, Hesecker et al. (1992) found that reducing vitamin intake for 2 months leads to lower mental capacities and functioning. For example, respondents felt more irritable, experienced lower well-being, and had feelings of depression, higher reaction time, and lower memory capability. Most of those symptoms disappeared once the participants were fed an adequate amount of vitamins.

Using a sample of elderly adults in Netherlands, Tiemeier et al. (2002) found an association between the lack of vitamin B₁₂ and folate with symptoms of depression. The study provides further evidence of the crucial role those nutrients play in the central-nervous-system. Two papers reviewed the evidence from the literature on nutrition deficiency and risk of depression and concluded that folate deficiency appears to have an association with depression (Alpert et al., 2000; Reynolds, 2002). Furthermore, several studies have been able to determine the specific gene (MTHFR C677T TT) that metabolizes folate (Gilbody et al., 2007a; Lewis et al., 2006). Without folate, this genotype influences the way the folate metabolic pathway functions (Gilbody et al., 2007b).

The increasing number of studies showing an association between folate deficiency and risk of depression may imply a causal link. Gilbody et al. (2007b)

conducted a meta-analysis using case-control and observational studies and concluded that it is likely that folate deficiency is causally related to depression. Their conclusion is reinforced by the gene-association studies finding that the gene MTHFR C677T is associated with depression in several studies. Two studies have found evidence that food insecurity increases the risk of depression in adults (Bronte-Tinkew et al., 2007; Whitaker et al., 2006), which is most likely as a result of deficiencies in folate and vitamin B₁₂ (Seligman et al., 2007; Seligman, 2010).

Building from self-control theory by Gottfredson and Hirschi (1990), who argued that poor parenting leads to low self-control in children, food insecurity could be an important factor contributing to the decrease in parenting quality, which also could lead to low self-control in children. The neuroscience literature helps understanding how food insecurity can lead to a decrease in parental and child well-being. For parents, food insecurity may lead to lower parental mental health and lower parenting quality and ability either through the accumulation of stress through the effects of undernutrition and nutrient deficiencies such as folate and vitamin B₁₂, which increases the risk of depression.

Similar to adults, children experiencing food insecurity have multiple nutritional deficiencies, including deficiencies in zinc and iron (Kirkpatrick and Tarasuk, 2008; Skalicky et al., 2006). In a review of the literature of the effect of different nutrients, Bryan et al. (2004) concluded that iodine, iron, and folate are important nutrients that affect brain development and cognitive function. In addition, they explained that other nutrients such as vitamin B₁₂ and omega 3 polyunsaturated fatty acids also contribute to development in young children. According to studies in the neuroscience literature, self-

control in children is related to two specific parts of the brain. The first is the prefrontal cortex, which progressively develops from infancy through adolescence (Casey et al., 1997; Gogtay et al., 2004; Tarullo et al., 2009). The second is the orbitofrontal cortex, which involves decision making (Tarullo et al., 2009; Zelazo et al., 2008).

Malnutrition and undernutrition, more specifically deficiencies in zinc and iron, lead to adverse effects of the development of these parts of the brain (Benton, 2008; Georgieff, 2007). Skalicky et al. (2006) found a positive association between food insecurity and deficits in iron. Other studies found that iron deficiencies resulting from food insecurity lead to adverse cognitive development in children (Black, 2001; Grantham-McGregor and Ani, 2001; Lozoff et al., 2000). This suggests that malnutrition and undernutrition from food insecurity could lead to low self-control. Children with lower levels of self-control tend to have more behavior problems (NICHD, 1998).

2.2 Summary

This section discussed three different set of theories that help understand how paternal incarceration affect maternal and child well-being. First, the Family Adjustment and Adaptation Response model (FAAR) predicts that paternal incarceration leads to a change in resources and demands of a family, which could result in food insecurity among many other problems. Second, self-control theory argues that low self-control, which comes for the most part from poor parenting, leads to a child becoming delinquent. Third, the neuroscience literature points to two different pathways through which food insecurity leads to child behavior problems. Food insecurity indirectly leads to lower child behavior problems by reducing maternal parenting quality and well-being. Food

insecurity may directly lead to low self-control through undernutrition, which leads to more behavior problems.

2.3 Review of the Evidence

2.3.1 Paternal Incarceration and Family Well-Being

Many recent studies have found that paternal incarceration negatively affects mothers and children. A growing number of inmates leave mothers and children behind when incarcerated. As of 2007, about half of prisoners lived with their children prior to imprisonment and half of parents in prison were the main financial providers of their children (Glaze and Maruschak, 2008). In addition, about one-third of children who have an incarcerated parent will reach age 18 while the parent remains in jail.

Paternal incarceration has been found to increase the risk of maternal depression by 30 percent and reduce maternal life satisfaction (Wildeman et al., 2012), and increase maternal housing instability (Geller and Franklin, 2014). Several factors can explain how paternal incarceration negatively affects mothers and children. First, incarceration increases family instability (Craigie et al., 2012). Using the National Longitudinal Survey of Youth 1979 (NLSY79), Lopoo and Western (2005) found that incarceration reduces the stability of marriages. One of the consequences of union dissolution and divorce for women is often financial hardship (Amato, 2000; Smock et al., 1999). Although some mothers may be able to better adjust to separation, others (especially those from fragile families), tend to be worse off after separating (Amato, 2000).

Paternal incarceration negatively affects maternal well-being partly through parenting. Paternal incarceration negatively affects parenting quality by increasing maternal neglect and physical aggression towards the child (Turney, 2014b). A meta-

analysis showed that poor parenting and parenting stress are associated with maternal depression, and these effects are strongest for disadvantaged women (Lovejoy et al., 2000).

Paternal incarceration also leads to many negative outcomes for children. Many studies report that paternal incarceration contributes to child externalizing (or aggressive) behavior problems (Geller et al., 2012; Johnson, 2009; Wakefield and Wildeman, 2011a; Wildeman, 2010). The odds of several (11) behavior problems such as antisocial personality or delinquency were twice as high for children of incarcerated fathers than other children (Murray, 2005; Murray et al., 2009). Children of incarcerated fathers are twice as likely to engage in theft as other children (Murray et al., 2012), their odds of social exclusion are twice as high as other children (Foster and Hagan, 2007). Also, paternal incarceration increases the odds of many health problems such as migraines and poor health in adolescents (Lee et al., 2013). Children of incarcerated fathers have twice the mortality risk of other children (Wildeman, 2012), are twice as likely to experience homelessness (Wildeman, 2014), more likely to exhibit delinquent behaviors (Murray and Farrington, 2005; Roettger and Swisher, 2011), twice as likely to use drug (Roettger et al., 2011), and even future conviction and criminal activity (Farrington and Welsh, 2007).

The evidence on the effect of paternal incarceration on child internalizing behaviors is more mixed. Children with internalizing behavior problems are less likely to complete high school (McLeod and Kaiser, 2004). Several studies found no statistically significant effect of paternal incarceration on child internalizing behaviors (Craigie, 2011; Geller et al., 2012; Johnson, 2009). One study found that it contributes to

neuroticism, anxiety and depression, and antisocial personality (Murray and Farrington, 2008), and another study found that paternal incarceration increases internalizing behavior problems by about five percent (Wakefield and Wildeman, 2011b). One possible reason provided by Travis and Western (2014) is the possibility that behaviors such as depression do not manifest themselves until adolescence.

2.3.2 Potential Mechanisms

Some of the negative consequences of paternal incarceration is due to the decreases in economic well-being. Paternal incarceration strains the finances of a family in several ways. First, family income drops (Geller et al., 2011). During incarceration, fathers earn minimal amounts and after incarceration, their economic opportunities are limited. In addition, they tend to live apart from their families post-release, which reduces the amount of in-kind support he can provide. Second, maintaining contact with the incarcerated father can consume a sizable proportion of their financial resources. For example, visiting the father in prison requires commuting and taking time off work (Geller et al. 2011; Grinstead et al., 2001), and families may need to pay for phone cards and mail. These costs can add up for the family as they can spend up to \$300 (or \$435 in today's dollars) per month to visit and maintain contact with the father (Grinstead et al., 2001; Hairston, 1998).

Even though the family does not spend its financial resources to maintain contact with the father during his incarceration, the family is still worse off because the estranged father merely contributes financially what he is legally obligated to, or more often than not, fathers do not keep up with child support payments even if they can financially afford to pay them (Sorensen, 1997). All these financial difficulties through the decrease

in the contribution of fathers and the increase in family strain contribute to the risk that families experience material hardship (Schwartz-Soicher et al., 2011). Furthermore, the stigma of having an incarcerated partner can lead mothers to withdraw from their social support and other activities, which decreases the size of their network and the amount of support potentially available. Following the incarceration of the father, their support such as financial, child care, or temporary housing, substantially decreases (Turney et al., 2012).

Considering the mechanisms that may explain the relationship between paternal incarceration and child behavior problems, Wildeman (2010) found that paternal absence does not play an important mediating role. The effect of paternal incarceration on maternal and child well-being remains statistically significant after controlling for known potential mechanisms in the literature. This means that there are additional mechanisms that have not been studied that can help explain how paternal incarceration negatively affects mothers and children. Food insecurity could be an important one. Before I examine the role of food insecurity as a mechanism, I briefly review the literature on food insecurity and well-being.

2.3.3 Food Insecurity and Well-Being

Food insecurity has received an increasing amount of attention as it is affecting a substantial number of households and individuals in the U.S. The latest estimates show that 14.3% of U.S. households (about 50 million individuals) were food insecure in 2013.

Food insecurity is known to lead to lower health outcomes (both physical and mental) for adults and children. For mothers, food insecurity increases the risk of maternal depression by up to 30 percent (Heflin et al., 2005; Whitaker et al., 2006a;

Zaslow et al., 2009), have more than twice the odds of having a longstanding health condition or an activity-limiting health condition (Stuff et al., 2004, Tarasuk, 2001), increases the risk of diabetes and other chronic diseases (Seligman, 2007; 2010), and has a negative effect on parenting by increasing parenting stress (Huang et al., 2010; Slack and Yoo, 2005).

For children, food insecurity increases child behavior problems partly through parenting (Huang et al., 2010; Slack and Yoo, 2005; Whitaker et al., 2006b), and decreases their academic performance. For example, food insecure children have lower reading and mathematics scores, and are 1.44 times more likely to repeat a grade and 1.89 times more likely to have seen a psychologist (Alaimo et al., 2001; Jyoti et al., 2005). In food insecure young infants and children, the odds of developmental risks are 1.77 higher than food secure children (Rose-Jacobs et al., 2008). Food insecure children have lower IQ scores and more emotional problems (Belsky et al., 2010; McLaughlin et al., 2012). These lower outcomes remain statistically significant even after accounting for potential confounders (Weinreb et al., 2002).

As discussed in the theoretical section. Food insecurity is likely to have negative consequences on maternal and child well-being through undernutrition. Evidence from the literature shows that food insecurity adults have nutritional deficiencies in folate and vitamin B₁₂ among others (Kirkpatrick and Tarasuk, 2008; Tarasuk, 2001). These deficiencies affect the functioning of a specific gene that metabolizes folate, which increases the risk of neurological disruption and depression (Gilbody et al., 2007a; Lewis et al., 2006).

Food insecure children also have several nutritional deficiencies, including deficiencies in zinc and iron (Kirkpatrick and Tarasuk, 2008; Skalicky et al., 2006). These deficiencies lead to underdevelopment of the brain of children and adverse cognitive outcomes (Benton, 2008; Georgieff, 2007; Lozoff et al., 2000). This would lead to the inability of children to learn self-control (Zelazo et al., 2008), and increases their risk of behavior problems. In addition, because food insecurity increases the risk of maternal depression, parenting quality is likely to decrease as a result of food insecurity, resulting in more behavior problems in children.

2.3.4 Food Insecurity as Mechanism

Paternal incarceration can lead to food insecurity in several ways. Most directly, paternal incarceration increases economic instability. During their incarceration, fathers have very few opportunities to earn a significant income to financially contribute to their families (Western, 2006), and also accumulate legal debt (Harris et al., 2010). After their release, ex-inmates face grim employment prospects and receive low-wages when they can find employment (Western, 2006). In addition, paternal incarceration leads to a decrease in the amount of support received by the mother (Turney et al., 2012). This decrease in support comes from both the reduction in in-kind and financial support from the incarcerated father, but also from the lower support received from the shrinking social networks of mothers.

Paternal incarceration increases family instability (Tasca et al., 2011), and leads to more parental stress (Turney, 2014b). Because family instability, parenting stress, and lower health are all related to food insecurity (Bartfeld and Dunifon, 2006; Cook and

Frank, 2008; Whitaker et al., 2006a), it is likely that food insecurity plays an important role in the relationship between paternal incarceration and maternal well-being.

Two studies have found that paternal incarceration increases the risk of food insecurity. Both studies use data from the Fragile Families study. Cox and Wallace (2013) found that paternal incarceration increases the risk of food insecurity by between 4 to 11 percent. Turney (2014) found that the recent incarceration of the father increases the risk of current food insecurity, increases the risk of onset into food insecurity, and reduces the likelihood of being food secure. There is also evidence that paternal incarceration leads to lower well-being in mothers (Wildeman et al., 2012), and more behavior problems in children (Geller et al., 2012; Wildeman, 2010). The effect of paternal incarceration on maternal well-being could be operating through food insecurity.

2.4 Knowledge Gaps from Previous Literature

Aside from the unknown role of food insecurity in the collateral consequences of paternal incarceration on maternal and child well-being, there may be limitations from the literature. While most of previous studies attempt to check the robustness of their results, their approach is not always comprehensive. The goal of this section is not to single out any study particularly but to provide some examples. For example, several studies choose to use city fixed-effects in their analysis rather than individual fixed-effects (e.g. Turney et al., 2013; Wildeman et al., 2012). Their explanation is that the interview took place in 20 cities. In this context, a city fixed-effects specification assumes that there are unobserved factors that are correlated with both paternal incarceration and the outcomes of interest. It is more likely that there can be factors at the individual level that can affect both the risk of paternal incarceration and maternal well-being. Also, some

of these analyses use a lagged-dependent variable model. When using a two-wave analysis, fixed-effects models tend to be more reliable than lagged-dependent variable models (Johnson, 2005).

In this study, I use individual fixed-effects to account for potential unobserved heterogeneity at the individual level. One of the advantages of using longitudinal data is the ability to use fixed and random-effects models to produce better estimates.

Another potential issue relates to the use of propensity score matching in the studies that do use it. Ho et al. (2007) argue that studies that use propensity score matching to estimate an average treatment effect are likely to yield biased estimates because even after matching there may be differences in observed characteristics remaining between the control and treatment groups. They argue that matching assumes that “any remaining imbalance in the matched sample is strictly unrelated to the treatment, which we know is false” (Ho et al., 2007, p. 213). Instead, they recommend using matching to pre-process the data. The data is reweighted so that “good” matches receive a higher weight and “bad” matches receive a lower weight or are discarded. Once the data is reweighted, estimating a regression model with these weights should yield better results. In a design replication study, Ferraro and Miranda (2014) provide an empirical example of estimating a fixed-effects model after pre-processing yield estimates that are identical to the experimental estimates.

2.5 Hypothesis

Previous literature found that: (1) paternal incarceration lowers maternal and child well-being, (2) food insecurity lowers maternal and child well-being, (3) paternal incarceration increases household food insecurity. I then hypothesize that part of the negative effects of paternal incarceration on maternal and child well-being are through food insecurity.

2.6 Conclusion

This chapter provided a theoretical framework to understand how paternal incarceration negatively affects mothers and children through food insecurity. I also reviewed the empirical literature to show why I would expect food insecurity to be an important mechanism in the effect of paternal incarceration on maternal and child well-being. I discussed some potential empirical issues with studies from the literature using the Fragile Families data. The next chapter discusses the Fragile Families data and methodology I use to try to minimize selection bias.

CHAPTER 3

DATA AND METHODOLOGY

In this dissertation, I argue that because: (1) paternal incarceration leads to lower maternal and child well-being, (2) paternal incarceration leads to a higher risk of food insecurity, and (3) food insecurity leads to lower maternal and child well-being, food insecurity is an important overlooked mechanism that can explain some of the negative effects of paternal incarceration on maternal well-being. Since both analyses use the same dataset and empirical strategy, I discuss them together. The dependent and some of the control variables utilized differ between the analyses.

3.1 Data

The Fragile Families and Child Wellbeing Study (FFCWS) is a longitudinal study following about 5,000 families with children born between 1998 and 2000 in 20 large cities with populations greater than 200,000. The study focuses on “fragile” families who are at higher risk of separation and poverty. Due to the growing proportion of children born to unmarried parents, the principal investigators felt the need to focus and oversample children born of unmarried parents (Reichman et al., 2001). According to the National Vital Statistics System, about 41 percent of children born in 2012 had unmarried parents. Of particular interest to the investigators are unmarried fathers who are more likely to earn lower-income and have a higher propensity for (domestic) violence. Prior to this study, there was no longitudinal dataset available that provided comprehensive information on these fathers and families. As a result, little was known about this

growing population. About three quarters of parents in the sample are unmarried. When weighted, the sample is representative of unmarried mothers in these 20 large US cities.

When designing the sampling frame, the investigators went through several steps. First, the principal investigators categorized the list of 77 potential cities with population larger than 200,000 according to welfare generosity, strength of child support system, and the strength of the local labor market (Richman et al., 2001). Sixteen cities were selected at random in order to have a wide range of policy environments and labor market conditions. The remaining 4 cities were chosen specifically due to the interest of specific foundations.

Second, they sampled hospitals within each city and ended up with 75 hospitals that agreed to provide them access to patients for the study. Third, within each hospital site, births were randomly sampled until a pre-set quota for married and unmarried couples was reached. For every 100 births, the principal investigators sampled 75 non-marital and 25 marital births. This number is arbitrarily chosen because the main motivation of the principal investigators is to collect a large sample size of unmarried parents. Also, there was a paucity of available data on unmarried parents prior to this study. These quotas correspond to the percentage of non-marital births in each hospital in 1996 or 1997. The principal investigators wanted to ensure that the sample of non-marital births was representative of the non-marital births of each city. On the other hand, the sample of marital births was not necessarily representative of the marital births because the sample was drawn based on the hospitals with the most non-marital births (Reichman et al., 2001).

The study excluded the following parents: those who placed the child for adoption, those with a deceased father, those who could not speak English or Spanish to complete the interview, mothers not healthy enough to participate in the study and provide information on the father, and those whose baby died before the interview. Also, most hospitals prohibited the investigators from interviewing parents who were younger than 18 years old. If one parent was younger than 18 in these hospitals, the family did not participate in the interview.

Mothers and fathers were interviewed at the following regular intervals: baseline, 1 year, 3 year, 5 year, and 9 year. At years 3 and 5, mothers answered an in-home survey which includes detailed questions about food insecurity and child behavior problems. Starting at year 3, the survey is progressively expanded to include surveys of child care providers, kindergarten teachers, in-home assessments, and a survey of the child herself (starting year 9). Data collection for year 15 started in early 2014.

Because this study focuses on fragile families, fathers in these families are disproportionately more likely to have experienced incarceration. By year 5, about 40 percent of the father in the sample have experienced incarceration. As a result, studies on incarceration often use this dataset. In other nationally representative longitudinal studies such as the National Longitudinal Survey of Youth 1979 (NLSY) or the Panel Study of Income Dynamics (PSID), incarcerated fathers tend to represent 1-3 percent of the sample.

After each wave, some households are lost due to attrition. The baseline survey has 4,898 mothers and children, and by the 5th year, 4,055 remain. The nature of the

sample also makes it difficult to keep track of the fathers and as a result, there are fewer fathers remaining in the sample at each wave. At baseline, 3,742 fathers participated in the study and 3,087 remained in the sample by the 5th year.

I dropped mothers with missing responses on the depression and life satisfaction questions (n=98) and dropped mothers (n=179) who have experienced past incarceration to isolate the effect of paternal incarceration from maternal incarceration. After keeping mothers who answered both core and in-home surveys at the 3rd and 5th year, the sample has 2,300 mothers for the analysis of maternal well-being. For the child behavior problems analysis, I dropped missing responses on the behavior problems questions and the sample has 1,902 children.

Table 1 compares the characteristics of the mothers who completed all surveys to those who dropped out of the sample. Most of the differences are not substantial except for their educational levels and relationship with the father. Mothers who drop out the sample are more likely to be high school dropouts (37.4 vs 31.6 percent) and likely to have already been separated with the father at baseline (32.7 vs 19.5 percent).

Table 1. Comparison of samples after attrition

Variable name	Participated in surveys	Dropped from sample	Difference
Mother race (%)			
White	21.8	20.4	1.4
Black	50.6	44.7	5.9**
Hispanic	24.4	29.8	-5.4**
Other	3.2	5.1	-1.9**
Mother education at baseline (%)			
Less than high school	31.6	37.4	-5.8**
High school	30.2	30.2	0
Some college	26.5	22.3	4.2**
College graduate or beyond	11.6	9.8	1.8*
Mother age at baseline	25.2	25.3	-0.1
Household Income at baseline	25,496	24,094	1,402*
Number of children	1.25	1.24	0.01
Mother relationship with father (%)			
Married	25.9	20.6	5.3**
Cohabitate	36.4	32.2	4.2**
Non resident	18.8	14.5	4.3**
Separated	19.5	32.7	-13.2**
Number of observations	2,300	2,598	

Significance levels: * $p < 0.05$, ** $p < 0.01$.

3.2 Measures

Dependent variables – Maternal Well-Being

Maternal depression. I use a binary variable to indicate whether the mother is at risk of depression. To construct this variable, I use the Composite International Diagnostic Interview Short Form (CIDI-SF), which is a standard survey instrument used to assess

mental disorders (Kessler et al., 1998). The Fragile Families dataset has a series of questions assessing the risk of a Major Depressive Episode (MDE). Two sets of questions diagnose the potential risk of MDE by asking mothers whether they felt depressed for two weeks during the past year or whether they lost interest in pleasurable activities. If they answered affirmatively to one of the two questions, they are asked seven more questions (listed in Table 2) such as whether they had trouble sleeping or felt worthless. Mothers who answered affirmatively to at least three of these questions are considered at risk of MDE. Previous studies use a binary measure of MDE to measure depression (Cairney et al., 2003; Wildeman et al., 2012; Whitaker et al., 2006a). Some studies have pointed out some limitations of the CIDI-SF (Horwitz and Wakefield, 2007; Link, 2000). The most reliable instrument is the Schedules for Clinical Assessment in Neuropsychiatry (SCAN) interview, which is substantially more time consuming (Aalto-Setälä et al., 2002). Although some of these concerns are legitimate, the CIDI-SF instrument is reliable and useful to diagnose risks of depression in large scale surveys when only a limited number of questions can be asked. About 16 percent of mothers experienced depression at the 5th year.

Life satisfaction. The 5th year survey asked mothers how satisfied they are with their lives overall. The four potential responses range from very dissatisfied to very satisfied. Similar to Wildeman et al. (2012), I use a binary variable to indicate whether the mother is satisfied or very satisfied with her life. About 88 percent were satisfied with their lives at the 5th year.

Table 2. Maternal depression questions

First screen: In past year, have you felt sad/depressed for 2 or more weeks in a row? In past year, was there 2 week period when you lost interest in most things?
Second screen: During those 2 weeks, did you feel more tired/low on energy than usual? Did you gain/lose weight without trying, or stay the same? Did you have trouble falling asleep during those 2 weeks? Did you have a lot more trouble concentrating than usual? During this period did you feel down on yourself? Did you think a lot about death during those 2 weeks? In past year, did you feel worried/tense/anxious for a month or more?

Poor health. At the 5th year, mothers are asked to self-report their health on a scale of five choices (poor, fair, good, very good, excellent). I use a binary variable to indicate whether the mother reports to be in poor or fair health. About 14 percent of mothers reported to be in poor or fair health. All the dependent variables in this study are binary because previous studies use these measures in a binary form (Reichman et al., 2014; Wildeman et al., 2012). In addition, binary measures facilitate the use of fixed-effects and lagged-dependent variable models, which cannot be estimated or are difficult to estimate using non-linear models with multiple categories such as ordered or multinomial logit.

Dependent variables – Child Well-Being

Child behavior problems. I use the Child Behavior Checklist/1¹/₂-5 (CBCL) to construct externalizing and internalizing behavior problems (Achenbach, 1991). The CBCL is typically completed by the caregiver or parent and asks whether the caregiver thinks that each statement relating to the behavior of the child is: (0) not true, (1) somewhat or

sometimes true, and (2) very true or often true. For externalizing behaviors, I use 15 questions at year 3 ($\alpha=0.85$) and 25 questions at year 5 ($\alpha=0.84$). For internalizing behaviors, I use 19 questions at year 3 ($\alpha=0.79$) and 16 questions at year 5 ($\alpha=0.70$), which are listed in Table 3. I sum the responses and standardize them with a mean of 0 and standard deviation of 1 to obtain a single measure for each dependent variable.

The Fragile Families survey asks about 70 of the 100 questions of the CBCL. From previous studies, there is a large variation in the number and choice of which questions to include to construct the child behavior problems measures (Geller et al., 2009; 2012; Turney, 2012 Wildeman, 2010). Some of these studies use as many as 30 questions for each child behavior problem measure. The results tend to be not sensitive to the way the measures are constructed (Wildeman, 2010). I used factor analysis to include as many questions as possible and have a Cronbach's alpha large enough to have reliable measures. An alpha of 0.7 or higher gives a "good" measure of internal consistency.

Key theoretical variables of interest

Paternal incarceration. Several studies on paternal incarceration distinguish between past and recent incarceration (Geller et al., 2012; Geller and Franklin, 2014; Wildeman, 2010; 2014; Wildeman et al., 2012). Using a measure of recent paternal incarceration is useful as it provides more leverage to estimate a causal effect (Wildeman, 2012). The longitudinal nature of the dataset provides the advantage that the measures of recent paternal incarceration between the 3rd and 5th year occurred right before the outcomes of interest at the 5th year.

Table 3. Child behavior problems measures

Internalizing behaviors

Responses in both 3rd and 5th year surveys:

Cries a lot
Nervous, high strung, or tense
Self-conscious or easily embarrassed
Shy or timid
Sulks a lot
Too fearful or anxious
Underactive, slow moving, lacks energy
Unhappy, sad, or depressed

Additional responses in 3rd year survey:

Acts too young
Avoids looking others in eye
Clings to adults
Disturbed by change in routine
Feelings easily hurt
Refuses to play games
Separation anxiety
Shows little affection
Shows little interest in things
Unresponsive to affection
Withdrawn

Additional responses in 5th year survey:

Complains or loneliness
Complains that no one loves him/her
Feels s/he has to be perfect
Fears s/he might think or do something bad
Feels that others are out to get him/her
Feels too guilty
Feels worthless or inferior
Rather be alone than with others
Refuses to talk
Secretive, keeps things to self
Stares blankly
Suspicious
Worries

Externalizing behaviors

Responses in both 3rd and 5th year surveys:

Destroys others' things
Disobedient at home
Fights

Additional responses in 3rd year survey

Defiant
Demanding
Does not show guilt
Easily frustrated
Hits others
Hurts unintentionally
Impatient
Punishment ineffective
Selfish
Stubborn
Uncooperative
Wants attention

Additional responses in 5th year survey:

Argues
Attacks others
Braggs
Cruel
Destroys own things
Disobedient at school
Has delinquent friends
Impulsive
Jealous
Lies
Runs away from home
Screams
Sets fires
Shows off
Steals at home
Steals outside of home
Sulks
Swears
Teases
Threatens
Vandalizes
Unusually loud

Also, because the event is recent, it reduces the possibility that the effect of paternal incarceration can be explained by unmeasured factors. I define recent paternal incarceration as the imprisonment of the father between the 3rd and 5th year or whether the father was incarcerated at the 5th year based on both maternal and paternal reports to avoid under-reporting (Geller et al., 2011; Wildeman et al., 2012).

Controlling for past incarceration can be informative to show the potential additive effect of recent paternal incarceration. Incarceration tends to have long-lasting negative effects on inmates even after their release (Pettit and Western, 2004; Western and Pettit, 2000). The past incarceration variable is binary indicating whether the father had ever been in jail between the birth of the child and 3rd year. Because the Fragile Families study focuses on the most disadvantaged families, paternal incarceration tends to be a common occurrence among these families. Forty percent of fathers were incarcerated at some point between the birth of the child and year 5, and 20 percent have been incarcerated within the previous two years.

Food insecurity. The main hypothesis in this study is whether food insecurity play a mediating role on child behavior problems. The FFCWS survey uses 18 questions to measure food insecurity. These 18 questions were created from the United States Department of Agriculture (USDA) and implemented in the Current Population Survey Core Food Security Module (CPS-CFSM) introduced in 1995 shown in Table 4. The CFSM is the standard instrument used to measure food insecurity in the U.S.

The questions are ordered from the least severe form to the most severe form of food insecurity to capture its different aspects (malnutrition and undernutrition). For

example, the first questions assesses whether households felt at risk of experiencing a shortage of food or whether they could not eat balanced meals (malnutrition). The remaining questions build up from them and attempt to determine whether households experienced deprivation and/or severe undernutrition because they could not afford to purchase food. The survey is designed to screen out households that answered negatively to the first few questions. If they did feel that they may run out of food or that they experienced malnutrition, it is very unlikely that they experienced severe undernutrition and deprivation. The questions relating to children are designed in a similar way.

With an affirmative response to at least three of these questions, a household is considered food insecure. Households that answered affirmatively to six or more of these questions are further classified as *very low food secure* by the USDA. Few households in this sample fall into this category (Cox and Wallace, 2013). As a result, I use a binary measure of food insecurity. Using a continuous measure of food insecurity with the sum of the affirmative responses yielded similar results. However, the analysis becomes complicated when using matching. When the treatment is binary, matching is straightforward. If the treatment is non-binary, one needs parametric methods to match. To keep the analysis simple, I use the binary measure of food insecurity. About 17 percent of the sample experienced food insecurity at year 5 or when the child is around 5 years old.

Table 4 – Food insecurity questionnaire

<p>Adults</p> <p>Q1. I worried whether our food would run out before we got money to buy more (often, sometimes, or never true in the last 12 months).</p> <p>Q2. The food that we bought just didn't last, and we didn't have money to get more (often, sometimes, or never true in the last 12 months).</p> <p>Q3. We couldn't afford to eat balanced meals (often, sometimes or never true in the last 12 months).</p> <p>Q4. In the last 12 months, did you or other adults in your household ever cut the size of your meals or skip meals because there wasn't enough money for food?</p> <p>Q5. How often did this happen – almost every month, some months but not every month, or in only one or two months?</p> <p>Q6. In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money to buy food?</p> <p>Q7. In the last 12 months, were you ever hungry but didn't eat because you couldn't afford enough food?</p> <p>Q8. Sometimes people lose weight because they don't have enough to eat. In the last 12 months, did you lose weight because there wasn't enough food?</p> <p>Q9. In the last 12 months, did you or other adults in your household ever not eat for a whole day because there wasn't enough money for food?</p> <p>Q10. How often did this happen – almost every month, some months but not every month, or in only one or two months?</p> <p>Children</p> <p>Q11. We relied on only a few kinds of low-cost food to feed the children because we were running out of money to buy food (often, sometimes or never true in the last 12 months)</p> <p>Q12. We couldn't feed the children a balanced meal because we couldn't afford that (often, sometimes, or never true in the last 12 months).</p> <p>Q13. The children were not eating enough because we just couldn't afford enough food (often, sometimes, or never true in the last 12 months).</p> <p>Q14. In the last 12 months, did you ever cut the size of any of the children's meals because there wasn't enough money for food?</p> <p>Q15. In the last 12 months, did any of the children ever skip meals because there wasn't enough money for food?</p> <p>Q16. How often did this happen – almost every month, some months but not every month, or in only one or two months?</p> <p>Q17. In the last 12 months, were the children ever hungry but you just couldn't afford more food?</p> <p>Q18. In the last 12 months, did any of the children ever not eat for a whole day because there wasn't enough money for food?</p>

Control variables

To attempt to minimize issues related to selection, I use a cross-sectional and a longitudinal analysis. In the cross-sectional one, I use control variables from the baseline and the 3rd year to ensure appropriate time-order of maternal depression and life satisfaction at year 5, recent paternal incarceration between year 3 and 5, and control variables at baseline or year 3 (Wildeman et al., 2012).

I control for socioeconomic and demographic information at baseline as they affect maternal well-being and the risk of paternal incarceration. I control for race/ethnicity (Black, Hispanic, White, and other race) using mutually exclusive binary measures. I include a binary measure of immigrant status, a set of mutually exclusive binary measures of education (high school dropout, high school, some college, and college graduate). I also control for the age of the mother when the child was born and the age of the child at the 3rd year. I include a continuous measure of income-to-poverty ratio, which may be correlated with food insecurity and maternal well-being. I also include a binary measure of the mother's parents history of depression, which can predict maternal well-being. I control for the number of children, whether the household participates in the SNAP program, and whether the mother is employed.

Control variables for relationship quality and status between parents and whether the mother has a new romantic partner are included, as these factors can affect parenting and maternal well-being (Carlson and McLanahan, 2008; Carlson and Magnuson, 2011). Mothers report their relationship quality with the father (1 = poor to 5 = excellent).

Relationship status indicates whether the parents are married, cohabitating, in a relationship but not cohabitating, or separated.

Because paternal incarceration and food insecurity can affect mothers through parenting (Lovejoy et al., 2000; Turney, 2014b), I also construct the following variables relating to parenting: parenting stress, co-parenting, share parenting responsibilities, and paternal engagement with child. These variables are listed in Table 5. Mothers answer four questions relating to parenting stress such as “being a parent is harder than I thought it would be.” The responses range from 1 (strongly disagree) to 4 (strongly agree). I average the responses from these 4 questions. To construct a co-parenting measure, I use six questions answered by the mother about whether the father provides parenting to the child. For example, how often from 0 to 7 days a week the father read stories to the child. I average the responses to these six questions. Absentee fathers who have not spent any time with the child during the past month have a value of 0 (Carlson et al., 2008).

For parenting responsibilities, a categorical variable indicates how often the father spent one or more hours a day with the child (1 = not at all, 5 = nearly every day). The paternal engagement variable is the average days per week the father spent with the child doing the following four activities: singing songs, reading stories, telling stories, and playing with toys.

Table 5. Parenting measures

Variable Name	Components
Parenting Stress	Being a parent is harder than I thought it would be I feel trapped by my responsibilities as a parent Taking care of my child(ren) is more work than pleasure I often feel tired/worn out from raising a family
Co-parenting	Father acts like the father you want? Can trust father to take care of child? Father respects schedules/rules you make? Father supports way you want to raise child? Talk about problems raising child? Count on father to look after child for few hours?
Sharing parenting responsibilities	Sings songs or nursery rhymes to child? Hug or show physical affection to child? Read stories to child?

To delineate between food insecurity and material hardship, I construct two variables relating to financial hardship: material hardship and social support. Paternal incarceration reduces the social support of mothers, which may affect their well-being (Turney et al., 2012). I use the following six questions at the 3rd year pertaining to material hardship in the last 12 months: “(1) whether the gas, oil, or electricity bill was unpaid, (2) borrowed money from friends or family, (3) whether any household member did not see the doctor or go to the hospital due to the cost, (4) cut back on buying clothes for herself, (5) worked overtime or took second job, and (6) whether the telephone service was disconnected.” For social support, mothers answer the following four questions on whether they could count on someone: “(1) to lend them \$200, (2) \$1000,

(3) to help with emergency child care, or (4) to provide with a place to live in the following year.”

The analysis for child well-being has mostly similar control variables. In addition, I control for additional variables that may be related to paternal incarceration and child behavior problems. At year 3, I indicate whether the mother was in poor or fair health. To measure maternal cognitive ability and impulsiveness, I use the Wechsler Adult Intelligence Scale-Revised (Wechsler 1981) and the Dickman (1990) dysfunctional impulsivity scale. Because self-control theory suggests that low self-control in children leads to behavior problems and delinquency (Gottfredson and Hirschi, 1990), I also control for parental self-control (mother and father) using an average of the following four questions: “(1) I often say what comes into my head without thinking, (2) Often, I don’t think enough before I act, (3) I often say/do things without considering consequences, and (4) I often get in trouble because I don’t think before I act.” I also control for maternal depression as it relates to parenting and child behavior problems (Turney, 2012). Because domestic violence and drug or alcohol abuse can predict paternal incarceration and affect child behavior problems (Wildeman, 2010; Yoo, 2014), I control for these factors. Lastly, I control for whether the child had low birthweight.

The longitudinal analysis uses the same control variables at both the 3rd and 5th year and drops the characteristics that remain fixed such as race and education. Also, I do not include self-control because it is only measured at year 3. I use two different methods to deal with unobserved factors that may affect food insecurity, paternal incarceration, and maternal and child well-being. I use fixed-effects models if these factors are time-invariant and lagged-dependent variable models if these factors are time-variant.

3.3 Empirical Strategy

Many of the remaining mothers and fathers have missing data. Previous studies, especially the ones using the Fragile Families data, use imputation techniques to avoid having to drop these observations (Bzostek and Beck, 2011; Cox and Wallace, 2013; Geller and Franklin, 2014; Goldberg and Carlson, 2014; Gruenewald and Pridemore, 2012; Turney, 2014c; Wildeman, 2014). Several use multivariate imputation by chained equations (mice) (Royston, 2004; 2005). This method assumes that the missing values are random and are predicted from the other remaining variables. The method generates m number of datasets, which may generate different imputed values in each dataset. The effect of each covariate is an average across the number of datasets generated. The number of datasets should be as large as possible (Graham et al., 2007). Previous studies use an m of at most 20, which is what I use.

The main issue in the literature on the impact of incarceration relates to selection into incarceration. It is likely that individuals who experience incarceration tend to be different than those who do not engage in criminal activities in observable and unobservable ways. In general, incarcerated individuals tend to have the “least human capital, financial capital, and social capital” (Wakefield and Uggen, 2010). Examining the effect of incarceration requires a comparison group with similar levels of human, financial, and social capital. Since some of these characteristics are measurable, it is possible to reduce selection bias by controlling for these measures. However, other characteristics that increase the likelihood in committing crimes such as low self-control (Gottfredson and Hirschi, 1990), are not available in this dataset. Most studies use

different methods to attempt to account for selection. However, it is difficult to determine what the best approach is and whether the methodology selected is the optimal one.

Because the dependent variable of interests are binary (maternal depression, life satisfaction, and poor maternal health), one might opt to use binary response models designed to specifically deal with such dependent variables. Some caveats with probit and logit models are that the interpretation of the effects of the estimates is not straightforward and requires some calculations. In addition, it becomes more complicated if one includes, for example, interaction terms. Angrist and Pischke (2009, p. 103) argue that Linear Probability Models (LPM) perform as well as nonlinear models for estimating marginal effects. The use of fixed-effects models brings another methodological issue to consider when using a binary dependent variable. A linear regression model (such as Ordinary Least Squares) and a nonlinear model (such as logit) produce estimates for different samples. For example, in the case of logit, if the dependent variable remains a failure (0) or a success (1) from one year to another, these observations will be dropped. This means that OLS will calculate marginal effects that includes these groups with no success or failure while fixed-effects will omit them. In other words, fixed-effects logit will estimate the effect of paternal incarceration on a sub-set of the sample, which may lead to LPM/OLS being preferable except for some cases outlined by Beck (2011). For these reasons, I will use LPM in this study.

A Linear Probability Model predicting maternal well-being would look like the following:

$$\text{MatDep}_5 = \beta_0 + \beta_1 \text{RecentPInc}_5 + \beta_2 \text{PastPInc}_3 + \beta_3 X_3 + \varepsilon \quad (1)$$

where the dependent variable is maternal depression at year 5. I control for the recent incarceration of the father between year 3 and 5, the past incarceration of the father, and include control variables at baseline or year 3. The same model is estimated with maternal life satisfaction and poor maternal health as the dependent variables.

The same models are re-estimated to include food insecurity at year 5 to determine how the effect of recent paternal incarceration changes:

$$\text{MatDep}_5 = \beta_0 + \beta_1 \text{RecentPInc}_5 + \beta_2 \text{PastPInc}_3 + \beta_3 \text{FoodInsec}_5 + \beta_4 X_3 + \varepsilon \quad (2)$$

For the analysis on child well-being, the Linear Probability Models would look like:

$$\text{ChildBehavior}_5 = \beta_0 + \beta_1 \text{RecentPInc}_5 + \beta_2 \text{PastPInc}_3 + \beta_3 X_3 + \varepsilon \quad (1')$$

$$\text{ChildBehavior}_5 = \beta_0 + \beta_1 \text{RecentPInc}_5 + \beta_2 \text{PastPInc}_3 + \beta_3 \text{FoodInsec}_5 + \beta_4 X_3 + \varepsilon \quad (2')$$

Two separate models are estimated for child externalizing and internalizing behavior problems.

There are several – non-mutually exclusive – methods to deal with selection. One option takes advantage of the longitudinal aspect of the data to use fixed and/or random effects models. Fixed-effects models are necessary if there are time-invariant omitted variables that are correlated with paternal incarceration, food insecurity, and the dependent variables of interest. This assumes that these omitted variables (or unobserved characteristics) are constant over time. The main limitation of fixed-effects models is that they will yield potentially biased estimates if the omitted variables are not constant over time and cannot be controlled for. A fixed-effects estimation model would look like the following:

$$\Delta\text{MatDep}_{it} = \beta_1 \Delta\text{PInc}_{it} + \beta_2 \Delta\text{X}_{it} + \alpha_i + u_{it} \quad (3)$$

where the dependent variable is the change in maternal depression for mother i at year t , Pinc indicates the change in paternal incarceration from year 3 to 5, X_{it} is a vector of time-varying control variables, α_i are individual fixed effects. A second model controls for food insecurity to examine how the effect of paternal incarceration changes:

$$\Delta\text{MatDep}_{it} = \beta_1 \Delta\text{PInc}_{it} + \beta_2 \Delta\text{X}_{it} + \beta_3 \Delta\text{FoodInsec}_{it} + \alpha_i + u_{it} \quad (4)$$

I also estimate the same models with the change in maternal life satisfaction and the change in poor maternal health as the dependent variables.

For the analysis on child well-being, the fixed-effects model would look like:

$$\Delta\text{ChildBehavior}_{it} = \beta_1 \Delta\text{PInc}_{it} + \beta_2 \Delta\text{X}_{it} + \alpha_i + u_{it} \quad (3')$$

$$\Delta\text{ChildBehavior}_{it} = \beta_1 \Delta\text{PInc}_{it} + \beta_2 \Delta\text{X}_{it} + \beta_3 \Delta\text{FoodInsec}_{it} + \alpha_i + u_{it} \quad (4')$$

The random effects model has the assumption that any unobserved variables are uncorrelated with the other independent variables and the dependent variable. If that is the case, a random effect is more efficient than fixed-effects.

$$\Delta\text{MatDep}_{it} = \beta_1 \Delta\text{PInc}_{it} + \beta_2 \Delta\text{X}_{it} + \beta_3 \Delta\text{FoodInsec}_{it} + c_i + v_{it} \quad (5)$$

$$\Delta\text{ChildBehavior}_{it} = \beta_1 \Delta\text{PInc}_{it} + \beta_2 \Delta\text{X}_{it} + \beta_3 \Delta\text{FoodInsec}_{it} + c_i + v_{it} \quad (5')$$

A standard Hausman test helps determine whether the random effects model is appropriate. In the fixed-effects model, any unobserved omitted variable that remains constant from year 3 to year 5 would be differenced out. In this study, because there are only two time periods, a fixed-effects model produces the same estimates as a difference-in-difference model. In these models, the standard errors should be clustered (Bertrand et al., 2004), which in this case would be at the city level. Failure to cluster the standard errors would lead to over-rejection of the null hypothesis. Bertrand et al. (2004) found

that many studies that did not account for the serial correlation across clusters, the standard error can be severely biased which can lead to statistically significant estimates when they should not be. Using 20 years of data from the Current Population Survey (CPS), they found that not clustering the standard errors leads to find an effect “significant at the 5% level of up to 45% of the placebo laws” (Bertrand et al., 2004). In this study, the standard errors would be clustered at the city-level.

A potential unaccounted confounder in a fixed-effects model is past maternal depression (or other past maternal and child well-being measures). Past maternal well-being may be a time-varying confounder that may predict future maternal well-being. A lagged-dependent variable model would look like the following:

$$\text{MatDep}_5 = \beta_1 \text{RecentPInc}_5 + \beta_2 \text{PastPInc}_3 + \beta_3 \text{FoodInsec}_5 + \beta_4 X_3 + \beta_5 \text{MatDep}_3 + \varepsilon \quad (6)$$

$$\begin{aligned} \text{ChildBehavior}_5 = & \beta_1 \text{RecentPInc}_5 + \beta_2 \text{PastPInc}_3 + \beta_3 \text{FoodInsec}_5 + \beta_4 X_3 \\ & + \beta_5 \text{ChildBehavior}_3 + \varepsilon \quad (6') \end{aligned}$$

Angrist and Pischke (2009) explain that including both individual effects and lagged-dependent variables in a model creates additional methodological issues. A lagged-dependent variable with fixed-effects is not possible to estimate in this case because there are only two waves available. Their recommendation is to estimate both a fixed-effects and a lagged-dependent variable model separately. They explain that, if the lagged-dependent variable model was the correct one to use, a fixed-effects model will over-estimate the effect of interest. Similarly, if the fixed-effect model was correct, a lagged-dependent variable model will under-estimate the effect of interest. These could help determining the lower and upper bounds of the causal effect of paternal incarceration.

Comparing lagged dependent variable and fixed-effects (or first-differencing) models in two-wave panels, Johnson (2005) shows that the lagged dependent variable does not perform as well as fixed-effects. Unless both models show consistent results, the fixed-effects model appear to provide more reliable estimates.

One way to deal with selection is to restrict the sample to fathers who have experienced incarceration. If incarcerated fathers are a self-selected sub-sample of the population, a comparison among them by examining the effect of recent paternal incarceration would appear to be reasonable. The estimates from this sample may be conservative given how specific the sample is (i.e. only previously incarcerated fathers), which may also yield statistically insignificant results. It may be difficult to determine whether this would be due to the loss of observations, leading to less statistical power and precision, or whether there is really no incremental effect of another episode of paternal incarceration among these fathers. Several studies are able to still produce statistically significant results using this methodology, which may reduce this concern (Turney and Wildeman, 2013; Turney et al., 2012; Wildeman, 2014; Wileman et al., 2012). However, the sample size in these studies is likely to be larger than in this dissertation due to its focus on food insecurity. These studies relied on the core surveys only while this dissertation further restricts the sample to households that completed the in-home surveys. These previous findings are useful for policy as they show that even among very fragile families with previously incarcerated fathers, an additional episode of incarceration still has negative consequences on mothers.

Another possibility to deal with selection is to exclude all fathers who are incarcerated at year 3 in order to use a difference-in-difference design, where the change

is from not incarcerated at year 3 to being incarcerated at year 5. Different estimation models can be utilized for sensitivity tests and to check whether the results differ depending on the sample used. For example, when excluding incarcerated fathers at year 3, the sample still includes fathers incarcerated prior to year 3, which may change the results.

A commonly used method to attempt to account for selection into incarceration is matching. In their detailed guide, Caliendo and Kopeinig (2008) provide an in-depth discussion on implementing propensity score matching and its assumptions. Matching attempts to find, for each treated observation, an untreated observation as similar as possible on all the observable characteristics (or covariates) in a pre-set area of common support (or overlap level). This is typically done using a logit regression to calculate the probability of receiving the treatment (in this case, incarceration).

Different matching techniques could yield different results. Checking the balance of the covariates (measured characteristics) between control (not incarcerated) and treatment (incarcerated) groups provides information on the optimality of the matching technique used. As a general rule of thumb, Morgan and Winship (2007, p. 109) recommend using nearest-neighbor caliper matching with replacement or kernel matching. Nearest-neighbor matching discards untreated that were not matched to treated observations. A matching done with replacement means that an untreated observation can be used to match more than one treated observation. When using matching, one can use a caliper to set a maximum limit allowed of the differences between the control and treatment groups. Any observation from the control group that has too large of a

difference is discarded Kernel matching takes a weighted average of several observations in the control group for each treated observation (Heckman et al., 1997; 1998).

If there are unobserved variables that affect both the outcome (maternal or child well-being) and receiving the treatment (incarceration), some hidden bias may arise, which would not provide robust estimates. Sensitivity tests, such as one provided by Rosenbaum (2002), helps determine whether there is likely to be hidden bias.

Several scholars argue that combining these different methods of causal inference might be a more optimal strategy (Ho et al., 2007; Imbens and Wooldridge, 2009). Ho et al. (2007) argue that many studies use matching assuming as an estimation method. This is unlikely to be the case since matching merely computes the difference of means between the control and treatment group after matching. This would be an unbiased estimate only in the case of exact matching when each treated group is matched to an exactly identical control group.

They explain that in most cases, matching is not done exactly and reporting the difference of means as the average treatment on the treated assumes that “any remaining imbalance in the matched sample is strictly unrelated to the treatment, which we know is false, or has no effect on the outcome, which we have no evidence about before consulting the outcome variable” (Ho et al., 2007, p. 213). In other words, unless matching provides identical groups of incarcerated and not incarcerated fathers, merely using propensity score matching would still yield biased estimates because any remaining differences is likely due to the incarceration status of the father.

As a result, in most observational studies, one should preprocess the data using matching and then estimate models by reweighting each observation accordingly. In this

study, mothers (or children) from the untreated group that are similar matches with mothers (or children) with incarcerated fathers would receive a higher weight while those that are dissimilar would either be discarded from the analysis or receive a lower weight. In addition to reducing bias, preprocessing may also reduce the variance of the estimates.

Ferraro and Miranda (2014) argue that preprocessing strengthens estimates from fixed-effects models. They list four strong assumptions embedded in fixed-effects models that are almost never discussed. One of them for example, assumes that the units of observation exhibit a common response to shocks. In this case, a(n) (exogenous) shock would be an event that affects the well-being of mothers and children the same way regardless of whether the father is incarcerated. If the event has a stronger or weaker effect on the well-being of families of incarcerated fathers, fixed-effects models could have a large bias (Ferraro and Miranda, 2014; Gibbons et al., 2014).

They add that although it is possible to relax some or all of these assumptions, new complications or issues may appear, which makes it necessary to preprocess the data beforehand. Using a design-replication study where the comparison (or control) group did not come from the experiment, they show that preprocessing the data and then using fixed-effects models provides estimates that are identical to the experimental design where the comparison group was randomly assigned (Ferraro and Miranda, 2014). They conclude that panel data are not a “panacea for addressing bias” and that estimates from fixed-effects models without preprocessing the data using matching can lead to misleading conclusions. As a result, this study will preprocess the data and estimate models by reweighting the data using weights from the preprocessing.

Last but not least, there is also a potential issue of reverse causality. Is paternal incarceration having a causal effect on maternal well-being or is lack of maternal well-being leading to paternal incarceration? The former seems to be more likely than the later but this assertion may not be simple to prove. To ensure the appropriate time-ordering of the events, several studies construct a variable indicating the recent incarceration of the father and use a lagged-dependent variable model. At the 5th year, mothers are asked whether the father has been incarcerated over the “last 2 years” and another question asks whether the father is currently incarcerated (Geller et al., 2012; Wildeman, 2010; 2014; Wildeman et al., 2012). This attempts to ensure that the incarceration of the father occurred before the mother reports on her well-being. If mother or children had lower well-being prior to paternal incarceration, a lagged-dependent variable should account for prior well-being that occurred before the recent incarceration of the father.

One of the strengths of this dissertation is the use of matching to pre-process the data before estimating lagged-dependent variable and fixed-effects models to examine the association between paternal incarceration and family well-being.

CHAPTER 4

RESULTS

4.1 Sample Characteristics – Maternal Well-Being

Table 6 shows descriptive statistics by recent paternal incarceration status. These summary statistics are based on the 20 datasets with the imputed observations. Most differences of means between the two samples are statistically different. Mothers with recently incarcerated fathers have lower well-being and are at greater disadvantage than other mothers. At the 5th year, these mothers are more likely to be depressed (22.5 vs 14.6 percent), less likely to be satisfied with their lives (81.5 vs 91.1 percent), and in poorer health (18.3 vs 13.4 percent) when the father has been recently incarcerated. They are almost twice as likely to experience food insecurity (30.2 vs 16.5 percent). Over two-thirds of these mothers are African-American (67.8 vs 46.7 percent), and over three-quarters of them have no college level education (77.7 vs 58.1 percent).

The mothers of children with an incarcerated partner have an income around the poverty level while the income of other mothers is about twice as much. Prior to the incarceration of the father, about two-thirds of mothers have already been separated and over a quarter of them have a new partner. Prior to paternal incarceration, a large proportion of mothers received SNAP benefits (63.8 vs 36.1 percent). Also, fathers who are recently incarcerated tend to be less involved with their children prior to incarceration.

Table 6. Maternal characteristics of sample by paternal incarceration status

		Not incarcerated in past 2 years	Incarcerated in past 2 years	Difference
Dependent variables	Depressed (year 3)	18.6	30.1	-11.5**
	Depressed (year 5)	14.6	22.5	-7.9**
	Satisfied (year 3)	88.7	81.7	7.0**
	Satisfied (year 5)	91.1	81.5	4.4**
	Poor health (year 3)	12.4	15.0	-2.6**
	Poor health (year 5)	13.4	18.3	-4.9**
Key independent variables	Food insecure (year 3)	20.3	32.1	-11.8**
	Food insecure (year 5)	16.5	30.2	-13.7**
	Father incarcerated between baseline and year 3	27.8	79.8	52.0**
Control Variables	Employed (year 3)	56.9	55.2	1.7
	Mother race			
	White	23.7	13.3	10.4**
	Black	46.7	67.8	-21.1**
	Hispanic	24.4	16.7	7.7**
	Other	3.3	2.1	1.2
	Foreign born	15.0	4.7	10.3**
	Age	25.8	22.6	3.2**
	Mother education			
	Less than HS	29.2	41.8	-12.6**
	High school	28.9	35.9	-7.0**
	Some college	27.8	21.1	6.7**
	College graduate	14.0	1.1	12.9**
	Material hardship year 3	1.5	2.1	-0.6*
	Income/poverty ratio year 3	1.9	1.1	0.8*
	Relationship with father			
	Married (year 3)	36.4	9.4	27.0**
	Cohabiting	21.2	15.5	5.7*
	Separated	37.9	66.2	-28.3**
	Non-resident	4.4	8.9	-4.5*
	Relationship quality	3.3	2.6	0.7*
	New partner (year 3)	15.4	29.4	-14.0**
	Number of children	2.3	2.4	-0.1
	Parenting stress (year 3)	2.2	2.3	-0.1
	Co-parenting (year 3)	3.4	3.0	0.4*
	Share parenting responsibilities	3.5	2.0	1.5**
	Engages with child	4.2	3.4	0.8*
Social support (year 3)	3.1	2.8	0.3*	
Food stamps (year 3)	36.1	63.8	-27.7**	
Observations	1,874	426		

Significance levels: *p<0.05, **p<0.01.

4.2 Sample Characteristics – Child Well-Being

Table 7 presents summary statistics for the child sample by paternal incarceration status. Children of recently incarcerated fathers tend to have more behavior problems at both the 3rd and 5th year. For externalizing behaviors, the difference is larger following incarceration (2.9 vs 0.6). The other characteristics tend to be similar to the sample of mothers. In addition, families with a recently incarcerated father have a greater risk of having domestic violence and drug or alcohol abuse prior to incarceration.

4.3 Association between Paternal Incarceration and Family Well-Being

I estimated models using three different methods to deal with the missing values. The first uses listwise deletion (keeping only non-missing observations). The second recodes the missing values as zero and includes binary variables for these missing values. The third uses imputation using multiple chained equations. The results were overall similar and only the results using imputation will be reported. All models control for city. All the models include the control variables but will these not be reported in the table for clarity. The full tables with results are in the appendix.

Table 8 uses Linear Probability Models to show the association between recent paternal incarceration and maternal depression at the 5th year, controlling for several characteristics with robust standard errors. Model 1 shows the association for the full sample. Mothers in this sample have a base probability of being depressed of 13 percent. The recent incarceration of the father increases the risk of depression by 4 percentage points (or 30 percent).

Table 7. Child characteristics by paternal incarceration status

		Not incarcerated in past 2 years	Incarcerated in past 2 years	Difference
Dependent Variables	Externalizing behaviors (year 3)	7.7	8.3	-0.6**
	Externalizing behaviors (year 5)	8.9	11.8	-2.9**
	Internalizing behaviors (year 3)	5.8	6.6	-0.8**
	Internalizing behaviors (year 5)	4.2	4.9	-0.7**
Key independent variables	Food insecure (year 3)	19.8	31.6	-11.8**
	Food insecure (year 5)	16.1	30.2	-13.7**
	Father incarcerated between baseline and year 3	28.0	79.5	-51.5**
Control variables	Employed (year 3)	57.4	55.1	2.3
	Mother race			
	White	24.8	12.2	12.6**
	Black	48.3	70.4	-21.1**
	Hispanic	23.3	15.5	8.2**
	Other	3.5	2.0	1.5
	Foreign born	12.8	3.6	9.2**
	Age of mother (birth)	25.8	22.5	3.3**
	Mother education			
	Less than HS	27.6	39.6	-12.0**
	High school	30.1	37.4	-7.3**
	Some college	27.7	21.9	5.8**
	College graduate	14.4	1.1	13.3**
	Material hardship (y3)	1.4	1.8	-0.4*
	Income/poverty ratio (y3)	2.2	1.1	1.1*
	Relationship with father			
	Married (y3)	36.1	9.4	26.7**
	Cohabiting	20.7	15.5	5.2**
	Separated	38.4	66.0	-27.6**
	Non-resident	4.8	9.1	-4.3*
	Relationship quality	3.3	2.6	0.7*
	New partner (y3)	15.1	28.6	-13.5**
	Number of children (y3)	2.3	2.4	-0.1
	Parenting stress (y3)	2.2	2.3	-0.1
	Co-parenting (y3)	3.4	3.0	0.4*
	Share parenting responsibilities	3.4	2.9	0.5*
	Engages with child (y3)	4.2	3.4	0.8*
	Social support (y3)	3.2	2.8	0.4
	Food stamps (y3)	36.4	64.3	-27.9**
	Domestic Violence (y3)	5.8	15.8	-10.0**
	Drug/Alcohol abuse	6.3	24.1	-17.8**
	Low birthweight	9.3	11.1	-1.8*
	Mother depression (y5)	18.4	30.8	-12.4**
Smoked while pregnant	0.4	0	0.4	
Mother self-control (y3)	1.5	1.6	-0.1	
Father self-control (y3)	1.6	2.0	-0.4	
Observations	1,541	361		

Significance levels: *p<0.05, **p<0.01.

Model 2 adds food insecurity at the 5th year and shows that food insecurity reduces the effect of recent paternal incarceration by about 18 percent (from 3.9 to 3.2 percentage points). Model 3 restricts the sample to previously incarcerated fathers and shows that recent paternal incarceration increases maternal depression by about 6 percentage points. In Model 4, controlling for food insecurity reduces the effect of recent paternal incarceration by 21 percent. As expected, there are other factors that contribute to maternal depression such as material hardship, poor relationship quality with the father, parenting stress, and low levels of social support (not shown).

Table 8. Linear probability regressions predicting maternal depression

	Full Sample		Previously incarcerated fathers only	
	Model 1	Model 2	Model 3	Model 4
Recent paternal incarceration	0.04* (2.05)	0.032 (1.68)	0.06** (2.95)	0.05* (2.52)
Father ever incarcerated year 3	-0.001 (-0.05)	-0.003 (-0.17)		
Food insecure year 5		0.09** (3.96)		0.09* (2.56)
Constant	0.13 (1.69)	0.12 (1.61)	0.12 (0.99)	0.12 (0.94)
Observations	2,300	2,300	861	861

t-statistics with robust standard errors in parentheses

** p<0.01, * p<0.05

Table 9 shows the same models using maternal life satisfaction as the dependent variable. Recent paternal incarceration decreases the probability that the mother will report being satisfied with her life by about 5 percentage points. In Model 2, including food insecurity at year 5 reduces the effect of paternal incarceration by about 10 percent. Restricting the sample to only previously incarcerated fathers, neither food insecurity nor paternal incarceration have a statistically significant effect. Paternal incarceration does not have a relationship with whether the mother reports her health as poor or fair (Table 10).

Table 9. Linear probability regressions predicting maternal life satisfaction

	Full Sample		Previously incarcerated fathers only	
	Model 1	Model 2	Model 3	Model 4
Recent paternal incarceration	-0.05* (-2.14)	-0.04 (-1.93)	-0.04 (-1.73)	-0.04 (-1.55)
Father ever incarcerated year 3	-0.01 (-0.81)	-0.01 (-0.71)		
Food insecure year 5		-0.07** (-3.13)		-0.05 (-1.54)
Observations	2,300	2,300	861	861

t-statistics with robust standard errors in parentheses

** p<0.01, * p<0.05

Table 10. Linear probability regressions predicting poor maternal health

	Full Sample		Previously incarcerated fathers only	
	Model 1	Model 2	Model 3	Model 4
Recent paternal incarceration	0.02 (1.07)	0.02 (0.85)	0.01 (0.41)	0.01 (1.45)
Father ever incarcerated year 3	-0.01 (-0.55)	-0.01 (-0.64)		
Food insecure year 5		0.07** (3.05)		0.051 (1.53)
Observations	2,300	2,300	861	861

t-statistics with robust standard errors in parentheses

** p<0.01, * p<0.05

Table 11 presents estimates for child externalizing behaviors. In Model 1 with the full sample, the recent incarceration of the father increases child behavior problems by 0.28 standard deviations. In Model 2, controlling for food insecurity does little to reduce the effect of paternal incarceration. Models 3 and 4 restrict the sample to only ever incarcerated fathers. The recent incarceration of the father has a larger effect and increases child externalizing behaviors by about one-third of a standard deviation. In Model 4, controlling for food insecurity only reduces the effect of incarceration by about 10 percent.

Table 11. Linear probability regressions predicting child externalizing behavior problems

	Full Sample		Previously incarcerated fathers only	
	Model 1	Model 2	Model 3	Model 4
Recent paternal incarceration	0.28** (4.24)	0.26** (3.55)	0.34** (3.70)	0.31** (3.37)
Father ever incarcerated year 3	0.16** (2.94)	0.16** (2.78)		
Food insecure year 5		0.26** (3.79)		0.35** (3.29)
Observations	1,902	1,902	719	719

t-statistics with robust standard errors in parentheses
 ** p<0.01, * p<0.05

In Table 12, paternal incarceration does not have an association with child internalizing behaviors for the full sample in Models 1 and 2. Restricting the sample to only fathers who have been previously incarcerated (Models 3 and 4), the recent incarceration of the father increases child internalizing behaviors by about 0.23 standard deviations. Controlling for food insecurity decreases the effect of recent paternal incarceration by about 13 percent.

I used fixed-effects models to account for the constant unobserved characteristics that may be correlated with paternal incarceration and maternal and child well-being. The Hausman test rejected the null hypothesis that the random effects model was adequate so I report only the results from fixed-effects in Tables 13-15 for mothers and Tables 16 and 17. The standard errors are clustered at the city level.

Table 12. Linear probability regressions predicting child internalizing behavior problems

	Full Sample		Previously incarcerated fathers only	
	Model 1	Model 2	Model 3	Model 4
Recent paternal incarceration	0.10 (1.53)	0.08 (1.13)	0.23** (2.72)	0.20* (2.38)
Father ever incarcerated year 3	0.06 (1.08)	0.06 (1.05)		
Food insecure year 5		0.39** (5.68)		0.34** (3.36)
Observations	1,902	1,902	719	719

t-statistics with robust standard errors in parentheses

** p<0.01, * p<0.05

Models 1 and 2 in Table 13 estimate the effect of paternal incarceration for the full sample. In Model 1, the change in paternal incarceration increases the risk of maternal depression by about 8 percentage points. In all the models, food insecurity does not seem to play a mediating role in the effect of paternal incarceration and does not have a statistically significant effect. Models 3 and 4 restricts the sample to only fathers who were not incarcerated at year 3. The change in incarceration increases the probability of maternal depression by about 10 percentage points. Models 5 and 6 restrict the sample to only fathers who have ever been incarcerated. In these models, paternal incarceration does not have a statistically significant effect on maternal depression.

Table 13. Fixed-effects regressions predicting the change in maternal depression

	Full sample		Not incarcerated at year 3		Ever incarcerated at year 3	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Paternal incarceration	0.08** (2.95)	0.08** (2.93)	0.10** (3.35)	0.10** (3.33)	0.04 (1.21)	0.04 (1.20)
Food insecure		-0.02 (-1.15)		-0.01 (-4.26)		-0.02 (-0.51)
Observations	2,300	2,300	1,095	1,095	861	861

t-statistics with clustered standard errors in parentheses
 ** p<0.01, * p<0.05

I also estimated a model restricting the sample to never incarcerated fathers at year 3 (not shown) in which the recent incarceration of the father increases the risk of maternal depression by about 16 percentage points. Food insecurity did not have a statistically significant association with maternal depression. Paternal incarceration did not have a statistically significant association with the change in maternal life satisfaction and maternal health (Tables 14 and 15).

Table 14. Fixed-effects regressions predicting the change in maternal life satisfaction

	Full sample		Not incarcerated at year 3		Ever incarcerated at year 3	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Paternal incarceration	-0.02 (-0.92)	-0.02 (-0.97)	-0.01 (-0.48)	-0.01 (-0.56)	-0.02 (0.71)	-0.02 (0.73)
Food insecure		-0.05** (-2.83)		-0.04** (-2.40)		-0.06* (-1.96)
Observations	2,300	2,300	1,095	1,095	861	861

t-statistics with clustered standard errors in parentheses
 ** p<0.01, * p<0.05

Table 15. Fixed-effects regressions predicting the change in poor maternal health

	Full sample		Not incarcerated at year 3		Ever incarcerated at year 3	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Paternal incarceration	0.03 (1.27)	0.03 (1.26)	0.03 (1.07)	0.03 (1.07)	0.03 (1.16)	0.03 (1.15)
Food insecure		-0.008 (-0.44)		-0.003 (-0.17)		-0.03 (-1.05)
Observations	2,300	2,300	1,095	1,095	861	861

t-statistics with clustered standard errors in parentheses
 ** p<0.01, * p<0.05

For child externalizing behaviors in Table 16, the effect of the change in paternal incarceration is statistically significant for the full sample (Models 1 and 2) and the restricted sample that includes only fathers who did not experience incarceration at year 3. Among fathers who have already experienced incarceration, an additional trip to jail does not have a statistically significant effect on child externalizing behaviors. Also, the change in food insecurity status does not have a statistically significant association with child externalizing behaviors.

Table 16. Fixed-effects regressions predicting the change in child externalizing behaviors

	Full sample		Not incarcerated at year 3		Ever incarcerated at year 3	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Paternal incarceration	0.22** (3.37)	0.22** (3.38)	0.29** (3.99)	0.29** (3.99)	0.14 (1.65)	0.13 (1.63)
Food insecure		0.09 (1.71)		0.07 (1.22)		0.12 (1.48)
Observations	1,900	1,900	1,728	1,728	718	718

t-statistics with clustered standard errors in parentheses

** p<0.01, * p<0.05

Table 17 presents the estimates for child internalizing behaviors. In all the models, the change in paternal incarceration does not have a statistically significant association with child internalizing behaviors. On the other hand, food insecurity does contribute to child internalizing behaviors in all the models.

Table 17. Fixed-effects regressions predicting the change in child internalizing behaviors

	Full sample		Not incarcerated at year 3		Ever incarcerated at year 3	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Paternal incarceration	0.09 (1.26)	0.09 (1.29)	0.04 (0.57)	0.04 (0.58)	0.06 (0.68)	0.06 (0.64)
Food insecure		0.26** (4.75)		0.30** (5.31)		0.21* (2.44)
Observations	1,900	1,900	1,728	1,728	718	718

t-statistics with clustered standard errors in parentheses

** p<0.01, * p<0.05

4.4 Matching on Covariates – Preprocessing

I use different matching methods and compare them in Table 18 for the sample of mothers. In the table, I report the standardized mean differences between the treated and untreated groups. For example, the first number in the first column reads as that the proportion of mothers with a high school degree is 14.9 percent higher in the treated group for the full (unmatched) sample. A standardized difference of 20 percent or greater is considered to be substantial (Lee, 2013; Rosenbaum and Rubin, 1985). The table also shows the average of the standardized differences and the number of observations on and off support. The observations that are off-support are the ones that are discarded for having poor or no matches. The second column shows the covariate balance for nearest neighbor with replacement and the third column uses calipers. The fourth column shows Mahalanobis matching with calipers, which is a distance-type matching between two observations. The last column shows Kernel matching.

The first thing to notice is that any of the matching method substantially improves the balance of the covariates. In other words, any of the matching techniques makes the treated and untreated groups more comparable. Matching has a tradeoff between bias and variance. As more observations are discarded to minimize bias, the variance increases. Mahalanobis matching makes the two groups very similar but also has the most observations that are off support. Also, the generalizability of the estimates could be a concern when too many observations are discarded. On the other end, all the observations are on support when using nearest neighbor matching. However, the difference with the unmatched sample is that the sample is being reweighted by the quality of the match. I chose Kernel matching as it is a “middle ground” solution where the groups are comparable and not too many observations are being dropped.

Table 19 provides the balance test on covariates after matching for the child sample. Similar to the sample of mothers, matching improves the balance of covariates. I also use Kernel matching to pre-process the data to have a large enough sample and a smaller bias. From the unmatched sample to Kernel matching, the average standardized difference with all the covariates decreased from 32.5 to 3.2 and 96 observations were discarded from having poor matches.

Table 18. Balance test on covariates after propensity score matching – Maternal sample

	Full sample Unmatched	Nearest neighbor	Nearest neighbor with calipers	Mahalanobis with calipers	Kernel
Mother HS degree	14.9	-7.0	-12.5	0	4.3
Mother some college	-15.5	8.3	10.3	0	-3.3
Mother has college degree	-49.9	-1.4	-1.6	0	-0.4
Father HS degree	7.2	-5.7	-5.0	0	2.2
Father some college	-27.9	-11.9	-12.8	0	-1.6
Father has college degree	-55.9	0	0	0	0.1
Food stamps receipt	57.7	-0.2	-2.8	6.4	10.9
Mother is black	43.7	-8.3	-6.7	0	1.7
Mother is Hispanic	-23.3	-2.1	-3.9	0	-0.9
Mother other race	-7.5	0.8	0.8	0	-5.7
Father is black	42.5	-16.3	-15.3	0	0.1
Father is Hispanic	-18.3	4.9	4.8	0	-1.4
Father other race	-0.2	11.7	8.3	0	1.8
Age	-58.4	-13.7	-15.4	-1.7	1.6
Drug or alcohol abuse	61.9	-16.3	-17.7	0	1.3
Income to poverty ratio	-49.0	0.7	1.6	-1.2	1.1
Employed	-3.6	10.6	11.4	0	0.3
Average difference	32.9	7.4	7.9	0.6	2.3
Observations on support	2,300	2,300	1,553	1,220	1,645
off support			747 (36)	1,079 (76)	655 (15)

The numbers in the table are standardized difference of means.

The numbers in parentheses for off support indicates the number of treated observations that were discarded

Table 19. Balance test on covariates after propensity score matching – Child sample

	Full sample Unmatched	Nearest neighbor	Nearest neighbor with calipers	Mahalanobis with calipers	Kernel
Mother HS degree	15.4	15.3	12.8	0	3.8
Mother some college	-13.5	-8.0	-7.5	0	0.5
Mother has college degree	-51.6	0.9	1.0	0	1.3
Father HS degree	5.3	6.0	3.9	0	1.8
Father some college	-27.8	-2.5	-1.3	0	2.1
Father has college degree	-56.5	0.2	0.2	0	0.2
Food stamps receipt	58.1	-5.0	-8.2	0	-6.3
Mother is black	46.0	6.1	2.2	0	-2.7
Mother is Hispanic	-19.7	2.9	5.1	0	0.1
Mother other race	-9.6	-15.0	-7.6	0	-1.7
Father is black	43.7	0.1	0.9	0	-4.1
Father is Hispanic	-15.6	2.5	4.3	0	1.2
Father other race	1.9	0.5	-5.1	0	3.4
Age	-59.3	-10.7	-17.0	-2.1	4.6
Drug or alcohol abuse	51.2	4.2	2.1	0	8.2
Income to poverty ratio	-49.3	2.4	4.2	-0.2	2.4
Employed	-4.6	12.0	11.6	0	5.7
Social Support	-32.0	28.7	31.1	-0.9	1.4
Domestic violence	32.7	0.3	6.8	0	9.0
Average difference	32.5	6.7	7.5	0.2	3.2
Observations on support	1,902	1,902	1,261	530	1,806
off support			641 (30)	1,372 (100)	96 (4)

The numbers in the table are standardized difference of means.

The numbers in parentheses for off support indicates the number of treated observations that were discarded

4.5 Association between Paternal Incarceration and Family Well-Being after Preprocessing

I re-estimated the models in Tables 8 through 17 using preprocessing. Tables 20-22 present linear probability models after preprocessing for each maternal well-being dependent variable. Food insecurity has a statistically significant effect on maternal depression and poor health. However, it is difficult to determine whether it plays any mediating role because the effect of paternal incarceration is not statistically significant in any of the models.

Table 20. Linear probability models after preprocessing predicting maternal depression

	Full Sample		Previously incarcerated fathers only	
	Model 1	Model 2	Model 3	Model 4
Recent paternal incarceration	-0.012 (-0.20)	0.001 (0.02)	-0.02 (0.32)	-0.01 (0.13)
Father ever incarcerated year 3	0.01 (0.21)	0.01 (1.06)		
Food insecure year 5		0.14* (2.62)		0.18* (2.62)
Observations	1,576	1,576	721	721

t-statistics with robust standard errors in parentheses

** p<0.01, * p<0.05

Table 21. Linear probability models after preprocessing predicting maternal life satisfaction

	Full Sample		Previously incarcerated fathers only	
	Model 1	Model 2	Model 3	Model 4
Recent paternal incarceration	-0.06 (-1.58)	-0.06 (-1.67)	-0.05 (0.79)	-0.05 (0.84)
Father ever incarcerated year 3	-0.004 (-0.61)	-0.003 (-0.05)		
Food insecure year 5		-0.02 (0.36)		-0.02 (0.30)
Observations	1,576	1,576	721	721

t-statistics with robust standard errors in parentheses

** p<0.01, * p<0.05

Table 22. Linear probability models after preprocessing predicting poor maternal health

	Full Sample		Previously incarcerated fathers only	
	Model 1	Model 2	Model 3	Model 4
Recent paternal incarceration	0.06 (1.34)	0.07 (1.55)	0.02 (0.36)	0.03 (0.50)
Father ever incarcerated year 3	-0.02 (-0.35)	-0.02 (0.43)		
Food insecure year 5		0.10* (2.23)		0.13* (2.19)
Observations	1,576	1,576	721	721

t-statistics with robust standard errors in parentheses

** p<0.01, * p<0.05

In Table 23 and 24, I re-estimated linear probability models after pre-processing for child behavior problems. For child externalizing behaviors, recent paternal incarceration has a statistically significant effect in all the models. Controlling for food insecurity reduces the effect of incarceration by about 6 percent in Model 2 and 11 percent in Model 4. Table 24 shows that there is no association between recent paternal incarceration and child internalizing behaviors in the full sample. In the sample restricted to previously incarcerated fathers, food insecurity reduces the effect of paternal incarceration by about 13 percent.

Table 23. Linear probability models after preprocessing predicting child externalizing behaviors

	Full Sample		Previously incarcerated fathers only	
	Model 1	Model 2	Model 3	Model 4
Recent paternal incarceration	0.24* (2.37)	0.23* (2.26)	0.34* (3.04)	0.30* (2.63)
Father ever incarcerated year 3	0.19 (1.11)	0.17 (1.04)		
Food insecure year 5		0.40* (2.41)		0.46* (2.34)
Observations	1,803	1,803	700	700

t-statistics with robust standard errors in parentheses

** p<0.01, * p<0.05

Table 24. Linear probability models after preprocessing predicting child internalizing behaviors

	Full Sample		Previously incarcerated fathers only	
	Model 1	Model 2	Model 3	Model 4
Recent paternal incarceration	0.02 (0.30)	0.01 (1.23)	0.24* (2.24)	0.21 (1.93)
Father ever incarcerated year 3	0.23 (1.88)	0.22 (1.86)		
Food insecure year 5		0.37* (3.08)		0.36* (2.23)
Observations	1,803	1,803	700	700

t-statistics with robust standard errors in parentheses

** p<0.01, * p<0.05

Table 25 presents fixed-effects estimates after preprocessing for maternal depression. Model 1 and 2 include the matched sample after discarding poor matches (n = 1,645). Model 3 and 4 restrict the sample to only fathers who were not incarcerated at year 3 (n = 1,464). Model 5 and 6 restrict the sample to only fathers who have previously been incarcerated (n = 749). In all models, the change in incarceration has a statistically significant association (between 13 to 17 percentage points) with maternal depression. In addition, controlling for food insecurity reduces the effect of paternal incarceration by about 10 percent.

Table 25. Fixed-effects models after preprocessing predicting the change in maternal depression

	Full sample		Not incarcerated at year 3		Ever incarcerated at year 3	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Paternal incarceration	0.148** (2.91)	0.132** (2.61)	0.167** (3.40)	0.155** (3.14)	0.149* (2.43)	0.135* (2.18)
Food insecure		-0.14* (-2.33)		-0.10 (-1.59)		-0.13 (-1.72)
Observations	1,645	1,645	1,464	1,464	749	749

t-statistics with clustered standard errors in parentheses

** p<0.01, * p<0.05

The fixed-effects estimates after preprocessing for maternal life satisfaction and poor maternal health (not shown) show no role of food insecurity in the association between life satisfaction and poor health. I also estimated a lagged-dependent variable model (not shown) to bound the effect of paternal incarceration. The effect of paternal incarceration is not statistically significant in all these models.

The estimates from fixed-effects models after preprocessing are shown in Tables 26 and 27. The change in paternal incarceration does not have an association with child behavior problems. In addition, the change in food insecurity increases only child internalizing behavior problems.

Table 26. Fixed-effects regressions after preprocessing predicting the change in child externalizing behaviors

	Full sample		Not incarcerated at year 3		Ever incarcerated at year 3	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Paternal incarceration	0.11 (0.86)	0.11 (0.86)	0.19 (1.47)	0.18 (1.38)	-0.01 (-0.10)	-0.01 (-0.09)
Food insecure		-0.02 (-0.12)		0.08 (0.49)		-0.04 (-0.22)
Observations	1,813	1,813	1,642	1,642	705	705

t-statistics with clustered standard errors in parentheses
 ** p<0.01, * p<0.05

Table 27. Fixed-effects regressions after preprocessing predicting the change in child internalizing behaviors

	Full sample		Not incarcerated at year 3		Ever incarcerated at year 3	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Paternal incarceration	0.06 (0.47)	0.04 (0.29)	0.08 (0.61)	0.02 (0.14)	0.01 (0.05)	-0.01 (-0.08)
Food insecure		0.41* (2.55)		0.54** (3.29)		0.45* (2.51)
Observations	1,813	1,813	1,642	1,642	705	705

t-statistics with clustered standard errors in parentheses
 ** p<0.01, * p<0.05

The results for the association between paternal incarceration and maternal depression are summarized in Table 28. The results for life satisfaction and poor health are not shown as they have no association with paternal incarceration. Comparing the fixed-effects results to the lagged dependent variable estimates after preprocessing, we can see that the models provide contradicting findings on whether paternal incarceration has an association with maternal depression. The lagged-dependent variable model, which can be viewed as lower bound estimate, shows a statistically insignificant effect while the fixed-effects model, which can be viewed as an upper bound estimate, shows a statistically significant one. On the other hand, controlling for food insecurity in the fixed-effects model at best reduces the effect of paternal incarceration by 10 percent. Comparing lagged-dependent variable and fixed-effects models in a two-wave panel analysis, Johnson (2005) found that if the model is “properly specified, no measurement error was present in the variables, and controls for all sources of spuriousness were included in the model,” then both lagged-dependent variable and fixed-effects model would give the same results but we know that this is never the case. As a result, fixed-effects model perform better and should be more reliable. In this case, paternal incarceration does have an association with maternal depression and food insecurity plays a small mediating role if we are to rely on the findings from fixed-effects models.

Table 28. Summary of results of the association between paternal incarceration and maternal depression

		Full sample	No prison (year 3)	Ever incarcerated
NO	Linear Probability Model	0.03		0.05*
PREPROCESSING	Fixed-effects	0.08*	0.10**	0.04
AFTER	Lagged-Dependent Variable model	0.04		0.06
PREPROCESSING	Linear Probability Model	0.001		-0.01
	Fixed-effects	0.13**	0.16**	0.14*

Significance level: ** p<0.01, * p<0.05

Tables 29 and 30 provide a summary of the results for child behavior problems. Overall, the results for child internalizing behavior problems show no association with paternal incarceration. These results directly contradict previous studies showing that paternal incarceration has an association with at least child externalizing or aggressive behaviors. I re-estimated separate models for residential and non-residential fathers and got similar results.

Table 29. Summary of results for child externalizing behavior problems

		Full sample	No prison (year 3)	Ever incarcerated
NO	Linear Probability Model	0.26**		0.31**
PREPROCESSING	Fixed-effects	0.22**	0.29**	0.13
AFTER	Lagged-Dependent Variable model	0.25**		0.20
PREPROCESSING	Linear Probability Model	0.23*		0.30*
	Fixed-effects	0.11	0.18	-0.01
Significance level: ** p<0.01, * p<0.05				

Table 30. Summary of results for child internalizing behavior problems

		Full sample	No prison (year 3)	Ever incarcerated
NO	Linear Probability Model	0.08		0.20*
PREPROCESSING	Fixed-effects	0.09	0.04	0.06
AFTER	Lagged-Dependent Variable model	0.07		0.19
PREPROCESSING	Linear Probability Model	0.01		0.21
	Fixed-effects	0.04	0.02	-0.01
Significance level: ** p<0.01, * p<0.05				

4.6 Discussion

This chapter considered the role of food insecurity in the association between paternal incarceration and maternal well-being. Lagged-dependent variable and fixed-effects model show that paternal incarceration increases maternal depression by 5 to 10 percent. Also, paternal incarceration increases child externalizing behavior problems by between 0.22 to .31 standard deviations. There is no association between paternal incarceration and child internalizing behavior problems.

The results also show that pre-processing can substantially change the size and direction of the coefficients of interest. Paternal incarceration has a positive association with only maternal depression. Controlling for food insecurity decreases this effect by about 10 percent, but it is still statistically significant. These findings differ from Wildeman et al. (2012) who found a statistically significant effect of paternal incarceration on maternal depression and life satisfaction using lagged-dependent variable models.

For child behavior problems, after pre-processing, there is no longer an effect of paternal incarceration on child externalizing behavior. Previous studies examining the relationship between paternal incarceration and child behavior problems using the Fragile Families dataset found an effect of paternal incarceration on child externalizing behaviors but no effect on child internalizing behaviors (Craigie, 2011; Geller et al., 2012; Wakefield and Wildeman, 2011; Wildeman, 2010). The findings from this study are inconsistent with the literature and suggest that the effects of paternal incarceration are driven by selection. For example, Geller et al. (2012) use different methods to minimize

selection and found robust evidence that paternal incarceration contributes to child aggressive behavior problems.

For child internalizing behaviors, consistent with previous studies, there is no association with paternal incarceration. These findings do not change when examining residential and non-residential fathers. In some of these models, the lagged-dependent variable model gives somewhat different results than fixed-effects. But in two-wave panels, fixed-effects models tend to yield more reliable estimates.

CHAPTER 5

DISCUSSION

5.1 Summary of findings

From Chapter 4, fixed-effects and lagged-dependent variable models show that paternal incarceration contributes to lower maternal well-being and higher child externalizing behavior problems. Food insecurity plays a mediating role only in the association between paternal incarceration and maternal depression.

I used propensity score matching using Kernel matching to pre-process the data to have more similar control and treated groups. The fixed-effects results after preprocessing using matching suggest that paternal incarceration has an association with maternal depression and that controlling for food insecurity reduces this effect by 10 percent. There is no association between paternal incarceration and maternal life satisfaction and poor maternal health.

For children, there is no association between paternal incarceration and child behavior problems. The findings for both mothers and children did not change when considering the residential status of the father prior to his incarceration.

Considering the role of food insecurity. Food insecurity plays a marginal role only in explaining maternal depression. This implies that either the theoretical framework that I proposed needs at least to be refined, or that the dataset and/or methods used for the analysis may not be optimal.

5.2 Limitations of Study

This dissertation has limitations, which may reduce the reliability of the results. First, the focus in this study on food insecurity leads to a substantial loss of observations from the sample. Out of the full sample of nearly 5,000, this study uses about 2,000 observations while other studies use about 3,000 to 4,000 observations. The smaller sample may lead to smaller statistical power, which may explain the mostly statistically insignificant findings. However, some preliminary findings with the large sample shows similar estimates of paternal incarceration than the ones presented in this dissertation.

Along the same lines, the study relies on only two waves of data that measure food insecurity, which may be a weakness. The ability to use more waves of data is generally an advantage. Since chronic food insecurity has long-term consequences, having a measure of food insecurity that spans several waves of data would be more informative for policy. Second, it is not possible to determine the length of incarceration for many fathers in this sample. There is some information on length and spell of incarceration(s), but this information is mostly incomplete for a lot of fathers. A binary indicator of incarceration includes a wide range of incarcerated fathers who may have been incarcerated from a few days to several years. One would suspect that the effect of a short incarceration would be different than a longer one. Cho (2010) found that the length of maternal incarceration has different effects for boys and girls. Similarly, if length of paternal incarceration matters and/or incarceration has long-term effects, these may be potentially missed in the study as the analysis spans two years, which may not be long enough.

Third, this study estimated an average effect. It is possible that paternal incarceration has different effects among mothers and children. Turney and Wildeman (2015) found that the effect of maternal incarceration is heterogeneous. In other words, the average effect of maternal incarceration on child well-being does not provide a full picture of the effect. They found that maternal incarceration has negative consequences for children who are least likely to have an incarcerated mother. Similarly, it could be possible that the effect of paternal incarceration is also heterogeneous and affects children differently.

5.3 Policy Implications of Study and Future Research

The findings of this study raise more questions than provide answers. There are two follow-up questions from this dissertation. First, will the overall lack of findings be similar when examining a broader set of maternal and child well-being outcomes. Second, since the theoretical framework I proposed was not empirically verified, which part does not or which parts do not hold? Does food insecurity really have adverse consequences on mothers and children? Does paternal incarceration lead to food insecurity (and financial hardship)? More importantly, does paternal incarceration really lead to lower maternal (other than depression) and child well-being? These questions have been explored in the literature but the methodologies used could potentially be improved upon.

Could it be that these families are at such great disadvantages that they are more likely to experience paternal incarceration and have lower well-being? This would imply that paternal incarceration is not really the cause of these issues but these antecedent

factors might be. Given some of the limitations of this dissertation that I outlined, more research is needed to have a better understanding of incarceration. With better empirical methods and better data, these previous studies from the literature could be improved upon.

The implications of this study for policy vary. Is there a need for prison reform? This dissertation focuses on the collateral consequences of paternal incarceration for families examining maternal depression, life satisfaction, and child behavior problems. For these specific outcomes, the findings suggest that except for maternal depression, prison reform would not eliminate these negative outcomes for families. It is unknown whether paternal incarceration has an effect on a broader set of maternal and child well-being outcomes. Unfortunately, some of these broader sets of outcomes are not available in the Fragile Families data. For example, using cross-sectional data from the National Survey of Children's Health (NSCH) and examining a richer set of outcomes, Turney (2014d) found that paternal incarceration increases learning disabilities, attention deficit disorder related conditions, behavioral problems, developmental delays, and speech problems in children. The cross-sectional nature of the data does not enable one to make any definitive causal claims.

Since food insecurity plays a marginal role in the relationship between paternal incarceration and maternal depression, the SNAP program (or Food Stamps) would provide some assistance in reducing food insecurity and mediate some of the negative effects of paternal incarceration on maternal depression.

Another area that needs more research is the financial consequences of paternal incarceration for families. For fathers who return to their families, some of these impacts can be examined post-incarceration for both short and long term outcomes depending on the felony conviction. One of the provisions of the 1996 Welfare Reform (PRWORA) was to ban individuals with drug felonies from receiving welfare, such as food stamps (SNAP) and TANF for the rest of their lives. States had the discretion on whether or not they would enforce this provision or opt-out of this ban. According to a report on welfare bans by the Sentencing Project, a non-profit advocacy group, as of 2013 about half of the states administer a modified ban, with the rest of the states more or less evenly split on a full ban or no ban at all (The Sentencing Project, 2013).

These welfare bans that some states have in place are problematic because ex-offenders who were convicted for a drug offense have almost no path to redemption. After their release, they are already facing higher odds of rehabilitating themselves and their ineligibility for public assistance makes it even more difficult. In addition, the consequences of welfare bans would be more disastrous for formerly incarcerated mothers, who more often is the main caregiver of children. Because they are not eligible for Food Stamps or TANF, they might have to resort to criminal activities to provide for their child(ren). This creates a cycle where ex-drug offenders are less likely to exit the criminal justice system. Comparing individuals convicted for a drug felony to other convicted individuals who have access to public assistance in states with a ban is one possibility of examining this issue. Another possibility could be to compare individuals convicted for a drug felony in states with a ban to similar individuals convicted for a drug felony in states without a ban and compare the outcomes such as

food insecurity to see any differences. Any differences would be informative for policy and would suggest that these bans prevent individuals with drug felonies from receiving public assistance, which increases their risk of food insecurity and financial difficulties.

During the Summer of 2014, lawmakers in the state of California decided to repeal their welfare ban for drug conviction, perhaps with the belief that it is a misguided policy. Future research evaluating the effect of this policy change on the outcomes of ex-drug offenders and their families would be informative for policy.

Many studies have shown that there is a risk of intergenerational transmission of crime. If effective policies can be designed to reduce the disadvantages and social inequalities experienced by children of incarcerated fathers, these policies could possibly help reduce the risk that these children engage in criminal activities in the future themselves. Because the probability of engaging in criminal activities decreases with age, it may help reduce incarcerations in the future.

The consequences of paternal incarceration on maternal well-being could also be so complex that rather than one factor explaining most of this relationship, the effect of incarceration operates through several mechanisms. If so, it shows how difficult and complicated it is to deal with this issue. Future research should attempt to quantify the effect of each mechanism and determine which one(s) contribute to these negative outcomes the most in order to formulate potential adequate policy responses to reduce these undesirable outcomes.

APPENDIX

Table 8. Linear probability regressions predicting maternal depression

	Full Sample		Previously incarcerated fathers only	
	Model 1	Model 2	Model 3	Model 4
Recent paternal incarceration	0.0387* (0.0190)	0.0324 (0.0189)	0.0561* (0.0189)	0.0480* (0.0190)
Father ever incarcerated (y3)	-0.00114 (0.0184)	-0.00324 (0.0184)		
Food insecure (y5)		0.0912** (0.0234)		0.0872* (0.0340)
Mother race				
Black	-0.0390 (0.0224)	-0.0390 (0.0225)	-0.0135 (0.0426)	-0.0103 (0.0432)
Hispanic	-0.0820** (0.0252)	-0.0841** (0.0252)	-0.0580 (0.0479)	-0.0587 (0.0479)
Other	-0.0267 (0.0471)	-0.0294 (0.0478)	0.0436 (0.105)	0.0399 (0.105)
Foreign born	0.0237 (0.0248)	0.0246 (0.0245)	0.0951 (0.0592)	0.0954 (0.0578)
Age (baseline)	-0.000147 (0.00153)	-0.000408 (0.00153)	-0.00119 (0.00308)	-0.00159 (0.00309)
Mother education				
High school	0.00929 (0.0201)	0.00960 (0.0200)	0.0196 (0.0315)	0.0224 (0.0313)
Some college	0.0269 (0.0221)	0.0285 (0.0222)	0.0541 (0.0391)	0.0554 (0.0392)
College graduate	-0.0621* (0.0310)	-0.0589* (0.0308)	-0.117* (0.0518)	-0.116* (0.0532)
Mother's parent depression history	0.121** (0.0182)	0.122** (0.0181)	0.142** (0.0311)	0.144** (0.0309)
Material hardship (y3)	0.0228** (0.00592)	0.0182** (0.00593)	0.0123 (0.00931)	0.00860 (0.00932)
Income/poverty ratio (y3)	0.00314 (0.00412)	0.00353 (0.00400)	-0.0134 (0.0138)	-0.0117 (0.0137)
Mother relationship with father (y3)				
Married	0.0361 (0.0297)	0.0371 (0.0295)	0.0879 (0.0548)	0.0905 (0.0542)
Cohabiting	-0.00374	-0.00410	0.0141	0.00851

Table 8 (Continued)

	Full Sample		Previously incarcerated fathers only	
	Model 1	Model 2	Model 3	Model 4
	(0.0285)	(0.0284)	(0.0456)	(0.0456)
Non-resident	0.0703	0.0688	0.00494	0.00662
	(0.0421)	(0.0417)	(0.0615)	(0.0608)
Mother has new romantic partner	0.0204	0.0175	0.0380	0.0333
	(0.0253)	(0.0252)	(0.0353)	(0.0353)
Relationship quality with father	-0.0300**	-0.0288**	-0.0198	-0.0177
	(0.00935)	(0.00925)	(0.0156)	(0.0156)
Number of children (y3)	-0.00545	-0.00763	-0.00802	-0.0118
	(0.00643)	(0.00645)	(0.0105)	(0.0108)
Parenting stress (y3)	0.0369**	0.0341**	0.0456*	0.0424*
	(0.0116)	(0.0116)	(0.0199)	(0.0198)
Coparenting (y3)	-0.00221	-0.00146	-0.0225	-0.0220
	(0.0172)	(0.0171)	(0.0266)	(0.0266)
Share parenting responsibilities (y3)	0.00800	0.00638	0.00204	-0.000303
	(0.00567)	(0.00564)	(0.00961)	(0.00963)
Father engagement with child (y3)	0.00755	0.00809	0.0233	0.0245
	(0.0119)	(0.0121)	(0.0172)	(0.0174)
Maternal social support (y3)	-0.0219**	-0.0177*	-0.0284*	-0.0238
	(0.00785)	(0.00784)	(0.0122)	(0.0122)
Receives food stamps (y3)	0.0274	0.0247	0.0265	0.0242
	(0.0186)	(0.0185)	(0.0299)	(0.0297)
Constant	0.125	0.119	0.124	0.117
	(0.0741)	(0.0740)	(0.125)	(0.125)
Observations	2,300	2,300	861	861

Robust standard errors in parentheses

** p<0.01, * p<0.05

Table 9. Linear probability regressions predicting maternal life satisfaction

	Full Sample		Previously incarcerated fathers only	
	Model 1	Model 2	Model 3	Model 4
Recent paternal incarceration	-0.0473* (0.0221)	-0.0426 (0.0221)	-0.0477 (0.0276)	-0.0431 (0.0278)
Father ever incarcerated (y3)	-0.0132 (0.0163)	-0.0116 (0.0163)		
Food insecure (y5)		-0.0666** (0.0213)		-0.0501 (0.0326)
Mother race				
Black	-0.0263 (0.0174)	-0.0264 (0.0174)	-0.0651 (0.0362)	-0.0670 (0.0364)
Hispanic	0.0301 (0.0196)	0.0316 (0.0197)	0.00666 (0.0400)	0.00709 (0.0400)
Other	-0.00946 (0.0403)	-0.00753 (0.0398)	0.0891 (0.0712)	0.0911 (0.0699)
Foreign born	0.00646 (0.0201)	0.00585 (0.0200)	-0.0445 (0.0556)	-0.0447 (0.0550)
Age (baseline)	-0.00278* (0.00137)	-0.00259 (0.00138)	-0.00683* (0.00296)	-0.00660* (0.00300)
Mother education				
High school	0.0175 (0.0174)	0.0173 (0.0173)	0.0360 (0.0292)	0.0344 (0.0293)
Some college	0.00144 (0.0195)	0.000271 (0.0195)	0.0112 (0.0370)	0.0104 (0.0371)
College graduate	0.0352 (0.0251)	0.0329 (0.0250)	0.0895 (0.0721)	0.0888 (0.0705)
Mother's parent depression history	-0.0339* (0.0150)	-0.0342* (0.0149)	-0.0265 (0.0278)	-0.0271 (0.0277)
Material hardship (y3)	-0.0151** (0.00493)	-0.0118* (0.00508)	-0.0198* (0.00850)	-0.0177* (0.00866)
Income/poverty ratio (y3)	0.00117 (0.00144)	0.000888 (0.00141)	0.0117 (0.0109)	0.0108 (0.0109)
Mother relationship with father (y3)				
Married	-0.00187 (0.0264)	-0.00262 (0.0264)	0.0138 (0.0493)	0.0123 (0.0492)
Cohabiting	-0.00247 (0.0263)	-0.00221 (0.0263)	0.00841 (0.0439)	0.0116 (0.0437)

Table 9 (Continued)

	Full Sample		Previously incarcerated fathers only	
	Model 1	Model 2	Model 3	Model 4
Non-resident	-0.0162 (0.0351)	-0.0151 (0.0350)	-0.0557 (0.0618)	-0.0566 (0.0621)
Mother has new romantic partner Relationship quality with father	0.00117 (0.0231)	0.00326 (0.0231)	-0.00121 (0.0335)	0.00145 (0.0333)
Number of children (y3)	0.0316** (0.00816)	0.0307** (0.00809)	0.0398** (0.0144)	0.0386** (0.0143)
Parenting stress (y3)	0.00489 (0.00558)	0.00648 (0.00557)	0.00921 (0.00933)	0.0114 (0.00948)
Coparenting (y3)	-0.0388** (0.0102)	-0.0367** (0.0102)	-0.0453* (0.0188)	-0.0434* (0.0187)
Share parenting responsibilities (y3)	0.00182 (0.0161)	0.00128 (0.0160)	0.00639 (0.0246)	0.00613 (0.0246)
Father engagement with child (y3)	-0.00755 (0.00508)	-0.00637 (0.00507)	-0.00444 (0.00931)	-0.00308 (0.00936)
Maternal social support (y3)	0.00333 (0.0109)	0.00294 (0.0110)	-0.0141 (0.0174)	-0.0148 (0.0175)
Receives food stamps (y3)	0.0132 (0.00704)	0.0101 (0.00708)	0.00425 (0.0116)	0.00164 (0.0118)
Constant	-0.0173 (0.0160)	-0.0153 (0.0160)	-0.0132 (0.0277)	-0.0119 (0.0277)
	0.955** (0.0682)	0.959** (0.0679)	1.095** (0.118)	1.100** (0.119)
Observations	2,300	2,300	861	861

Robust standard errors in parentheses

** p<0.01, * p<0.05

Table 10. Linear probability regressions predicting poor maternal health

	Full Sample		Previously incarcerated fathers only	
	Model 1	Model 2	Model 3	Model 4
Recent paternal incarceration	0.0243 (0.0227)	0.0194 (0.0227)	0.0115 (0.0278)	0.00679 (0.0277)
Father ever incarcerated (y3)	-0.0101 (0.0184)	-0.0117 (0.0184)		
Food insecure (y5)		0.0695** (0.0228)		0.0505 (0.0329)
Mother race				
Black	-0.0252 (0.0202)	-0.0252 (0.0202)	0.000342 (0.0386)	0.00222 (0.0386)
Hispanic	0.00336 (0.0236)	0.00178 (0.0237)	0.0222 (0.0450)	0.0218 (0.0450)
Other	0.00446 (0.0455)	0.00245 (0.0450)	0.0629 (0.104)	0.0608 (0.104)
Foreign born	0.0172 (0.0255)	0.0178 (0.0254)	0.0243 (0.0598)	0.0245 (0.0594)
Age (baseline)	0.00857** (0.00153)	0.00837** (0.00153)	0.0123** (0.00284)	0.0121** (0.00285)
Mother education				
High school	-0.0214 (0.0202)	-0.0212 (0.0201)	-0.0290 (0.0302)	-0.0275 (0.0302)
Some college	-0.0399* (0.0219)	-0.0387* (0.0220)	-0.00589 (0.0366)	-0.00515 (0.0367)
College graduate	-0.130** (0.0274)	-0.128** (0.0274)	-0.219** (0.0462)	-0.218** (0.0471)
Mother's parent depression history	0.0318 (0.0162)	0.0322 (0.0162)	0.0349 (0.0281)	0.0356 (0.0280)
Material hardship (y3)	0.0163** (0.00556)	0.0128* (0.00557)	0.0126 (0.00854)	0.0105 (0.00848)
Income/poverty ratio (y3)	-0.00296 (0.00190)	-0.00267 (0.00185)	-0.0121 (0.0132)	-0.0111 (0.0132)
Mother relationship with father (y3)				
Married	0.0473 (0.0302)	0.0481 (0.0301)	0.0655 (0.0558)	0.0670 (0.0558)
Cohabiting	0.0400 (0.0280)	0.0398 (0.0280)	0.00922 (0.0435)	0.00601 (0.0436)

Table 10 (Continued)

	Full Sample		Previously incarcerated fathers only	
	Model 1	Model 2	Model 3	Model 4
Non-resident	0.0577 (0.0386)	0.0565 (0.0384)	0.0547 (0.0583)	0.0557 (0.0580)
Mother has new romantic partner Relationship quality with father	0.00738 (0.0235)	0.00520 (0.0235)	0.0189 (0.0321)	0.0162 (0.0322)
Number of children (y3)	-0.0378** (0.00936)	-0.0369** (0.00938)	-0.0396** (0.0150)	-0.0384* (0.0151)
Parenting stress (y3)	0.00284 (0.00617)	0.00117 (0.00623)	-5.11e-05 (0.0100)	-0.00222 (0.0101)
Coparenting (y3)	0.0174 (0.0117)	0.0153 (0.0117)	0.0400* (0.0192)	0.0382* (0.0192)
Share parenting responsibilities (y3)	0.0103 (0.0179)	0.0109 (0.0179)	0.0122 (0.0263)	0.0125 (0.0264)
Father engagement with child (y3)	-0.00144 (0.00546)	-0.00268 (0.00545)	-0.000570 (0.00946)	-0.00194 (0.00948)
Maternal social support (y3)	0.00855 (0.0112)	0.00896 (0.0113)	0.0144 (0.0176)	0.0151 (0.0177)
Receives food stamps (y3)	-0.0253** (0.00792)	-0.0221** (0.00804)	-0.0108 (0.0120)	-0.00819 (0.0122)
Constant	0.0532** (0.0178)	0.0511** (0.0178)	0.0771** (0.0292)	0.0757* (0.0292)
	-0.0251 (0.0727)	-0.0298 (0.0726)	-0.248* (0.111)	-0.253* (0.110)
Observations	2,300	2,300	861	861

Robust standard errors in parentheses

** p<0.01, * p<0.05

Table 11. Linear probability regressions predicting child externalizing behavior problems

	Full Sample		Previously incarcerated fathers only	
	Model 1	Model 2	Model 3	Model 4
Recent paternal incarceration	0.277** (0.0654)	0.262** (0.0737)	0.337** (0.0912)	0.307** (0.0910)
Father ever incarcerated (y3)	0.161** (0.0548)	0.161** (0.0579)		
Food insecure (y5)		0.258** (0.0680)		0.345** (0.105)
Mother race				
Black	-0.0951 (0.0655)	-0.0964 (0.0640)	-0.0976 (0.121)	-0.0898 (0.119)
Hispanic	-0.0298 (0.0770)	-0.0375 (0.0742)	0.0834 (0.140)	0.0671 (0.137)
Other	0.165 (0.139)	0.156 (0.138)	0.141 (0.327)	0.119 (0.314)
Foreign born	-0.0951 (0.0655)	-0.0964 (0.0640)	-0.0976 (0.121)	-0.0898 (0.119)
Age (baseline)	-0.0203* (0.0102)	-0.0200 (0.0104)	-0.0158 (0.0187)	-0.0183 (0.0188)
Mother education				
High school	-0.00416 (0.00442)	-0.00446 (0.00435)	0.00323 (0.00923)	0.00157 (0.00943)
Some college	-0.00313 (0.0591)	-0.00647 (0.0626)	-0.0883 (0.0973)	-0.0855 (0.0960)
College graduate	-0.115 (0.0667)	-0.115 (0.0661)	-0.180 (0.115)	-0.177 (0.114)
Mother's parent depression history	-0.175 (0.103)	-0.175 (0.0888)	-0.554* (0.214)	-0.576** (0.204)
Material hardship (y3)	0.0594** (0.0199)	0.0482* (0.0208)	0.0777* (0.0342)	0.0602 (0.0349)
Income/poverty ratio (y3)	-0.00690 (0.00978)	-0.00595 (0.00510)	-0.0607* (0.0361)	-0.0577 (0.0358)
Mother relationship with father (y3)				
Married	-0.0787 (0.0892)	-0.0735 (0.0906)	-0.372* (0.174)	-0.371* (0.171)
Cohabiting	-0.0390 (0.0869)	-0.0427 (0.0921)	-0.255 (0.158)	-0.293* (0.155)

Table 11 (Continued)

	Full Sample		Previously incarcerated fathers only	
	Model 1	Model 2	Model 3	Model 4
Non-resident	0.0732 (0.109)	0.0732 (0.110)	-0.129 (0.183)	-0.129 (0.181)
Mother has new romantic partner	0.0791 (0.0709)	0.0722 (0.0761)	0.0829 (0.106)	0.0574 (0.105)
Relationship quality with father	0.0303 (0.0274)	0.0319 (0.0281)	0.0515 (0.0496)	0.0560 (0.0491)
Number of children (y3)	0.0205 (0.0183)	0.0147 (0.0179)	0.0326 (0.0305)	0.0182 (0.0313)
Parenting stress (y3)	0.162** (0.0353)	0.161** (0.0363)	0.121 (0.0629)	0.121 (0.0623)
Coparenting (y3)	-0.145** (0.0532)	-0.145** (0.0534)	-0.185* (0.0799)	-0.193* (0.0791)
Share parenting responsibilities (y3)	0.0245 (0.0169)	0.0202 (0.0175)	0.0432 (0.0322)	0.0376 (0.0317)
Father engagement with child (y3)	0.0152 (0.0376)	0.0178 (0.0375)	0.0624 (0.0551)	0.0688 (0.0525)
Maternal social support (y3)	0.00924 (0.0217)	0.0188 (0.0234)	-0.0109 (0.0397)	0.00439 (0.0398)
Receives food stamps (y3)	0.0274 (0.0539)	0.0274 (0.0573)	0.0265 (0.0952)	0.0242 (0.0947)
Employed (3y)	-0.00821 (0.0486)	0.00328 (0.0486)	-0.214 (0.111)	-0.234* (0.109)
Domestic violence (y3)	-0.0216 (0.0917)	-0.0319 (0.0984)	-0.190 (0.120)	-0.214* (0.120)
Drug/alcohol abuse (y3)	-0.0548 (0.0899)	-0.0766 (0.103)	0.0868 (0.127)	0.0844 (0.128)
Low birthweight	0.0519 (0.0754)	0.0456 (0.0817)	0.185 (0.107)	0.172 (0.104)
Mother depression (y3)	0.149* (0.0589)	0.131* (0.0628)	1.261 (0.839)	1.400 (0.856)
Smoked while Pregnant	0.792* (0.398)	0.790 (0.680)	1.261 (0.839)	0.0814 (0.0824)
Mother self-control	0.0798 (0.0502)	0.0703 (0.0505)	0.0867 (0.0828)	0.0814 (0.0824)
Father self-control	0.0143 (0.0491)	0.00615 (0.0505)	0.0270 (0.0919)	0.0202 (0.0915)
Observations	1,902	1,902	719	719

Robust standard errors in parentheses

** p<0.01, * p<0.05

Table 12. Linear probability regressions predicting child internalizing behavior problems

	Full Sample		Previously incarcerated fathers only	
	Model 1	Model 2	Model 3	Model 4
Recent paternal incarceration	0.0996 (0.0649)	0.0778 (0.0686)	0.234** (0.0861)	0.204* (0.0858)
Father ever incarcerated (y3)	0.0592 (0.0544)	0.0584 (0.0556)		
Food insecure (y5)		0.390** (0.0687)		0.339** (0.101)
Mother race				
Black	-0.0918 (0.0651)	-0.0938 (0.0619)	-0.162 (0.119)	-0.154 (0.119)
Hispanic	0.249** (0.0766)	0.238** (0.0770)	0.355* (0.147)	0.339* (0.147)
Other	0.178 (0.139)	0.164 (0.136)	0.0413 (0.301)	0.0205 (0.293)
Foreign born	0.0338 (0.0842)	0.0462 (0.0859)	0.333* (0.199)	0.364* (0.196)
Age (baseline)	-0.0150 (0.0101)	-0.0145 (0.0104)	0.00756 (0.0187)	0.00504 (0.0186)
Mother education				
High school	-0.00268 (0.00439)	-0.00313 (0.00426)	-0.000199 (0.00876)	-0.00183 (0.00886)
Some college	0.0725 (0.0589)	0.0675 (0.0612)	-0.0232 (0.0970)	-0.0205 (0.0957)
College graduate	-0.141* (0.0665)	-0.140* (0.0636)	-0.210 (0.110)	-0.208 (0.110)
Mother's parent depression history	-0.0179 (0.102)	-0.0183 (0.0898)	-0.165 (0.296)	-0.186 (0.290)
Material hardship (y3)	0.0826** (0.0197)	0.0656** (0.0209)	0.0634 (0.0331)	0.0462 (0.0332)
Income/poverty ratio (y3)	-0.0108 (0.00971)	-0.00934 (0.00721)	-0.0175 (0.0392)	-0.0146 (0.0393)
Mother relationship with father (y3)				
Married	-0.0467 (0.0878)	-0.0389 (0.0870)	-0.135 (0.166)	-0.134 (0.163)
Cohabiting	0.0692 (0.0851)	0.0636 (0.0825)	0.0833 (0.149)	0.0464 (0.147)

Table 12 (Continued)

	Full Sample		Previously incarcerated fathers only	
	Model 1	Model 2	Model 3	Model 4
Non-resident	-0.0735 (0.108)	-0.0735 (0.0998)	-0.168 (0.163)	-0.168 (0.167)
Mother has new romantic partner	0.0141 (0.0700)	0.00381 (0.0730)	-0.0211 (0.103)	-0.0462 (0.101)
Relationship quality with father	-0.00210 (0.0273)	0.000416 (0.0264)	-0.0332 (0.0438)	-0.0288 (0.0437)
Number of children (y3)	-0.0311 (0.0181)	-0.0399* (0.0180)	0.0162 (0.0299)	0.00205 (0.0304)
Parenting stress (y3)	0.0926** (0.0350)	0.0912* (0.0357)	0.0823 (0.0623)	0.0828 (0.0615)
Coparenting (y3)	-0.0351 (0.0511)	-0.0356 (0.0517)	-0.0712 (0.0759)	-0.0788 (0.0747)
Share parenting responsibilities (y3)	0.0261 (0.0165)	0.0197 (0.0164)	0.0449 (0.0309)	0.0394 (0.0302)
Father engagement with child (y3)	-0.0266 (0.0326)	-0.0227 (0.0322)	0.0189 (0.0465)	0.0250 (0.0451)
Maternal social support (y3)	-0.0290 (0.0217)	-0.0145 (0.0234)	-0.0803* (0.0386)	-0.0653 (0.0380)
Receives food stamps (y3)	-0.00163 (0.0535)	-0.00534 (0.0545)	-0.0293 (0.0903)	-0.0338 (0.0898)
Employed (3y)	-0.0799 (0.0483)	-0.0626 (0.0487)	-0.0820 (0.0878)	-0.0581 (0.0865)
Domestic violence (y3)	0.00904 (0.0910)	-0.00657 (0.0889)	-0.0544 (0.110)	-0.0738 (0.109)
Drug/alcohol abuse (y3)	-0.150 (0.0900)	-0.183 (0.0942)	-0.255* (0.114)	-0.278* (0.113)
Low birthweight	-0.0384 (0.0749)	-0.0480 (0.0690)	-0.0483 (0.112)	-0.0508 (0.112)
Mother depression (y3)	0.162** (0.0585)	0.135* (0.0629)	0.112 (0.104)	0.0999 (0.102)
Smoked while Pregnant	0.370 (0.397)	0.366 (0.481)	0.774 (0.656)	0.912 (0.676)
Mother self-control	0.0938 (0.0498)	0.0795 (0.0510)	0.103 (0.0862)	0.0982 (0.0850)
Father self-control	0.0841 (0.0489)	0.0719 (0.0483)	0.00804 (0.0848)	-0.00598 (0.0834)
Observations	1,902	1,902	719	719

Robust standard errors in parentheses

** p<0.01, * p<0.05

Table 13. Fixed-effects regressions predicting the change in maternal depression

	Full sample		Not incarcerated at year 3		Ever incarcerated at year 3	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Paternal incarceration	0.0771** (0.0261)	0.0766** (0.0261)	0.0951** (0.0284)	0.0948** (0.0284)	0.0388 (0.0321)	0.0386 (0.0321)
Food insecure		-0.0232 (0.0202)		-0.00912 (0.0214)		-0.0158 (0.0309)
Mother/father relationship						
Married	0.0265 (0.0511)	0.0241 (0.0511)	-0.00249 (0.0543)	-0.00354 (0.0544)	0.0947 (0.0954)	0.0931 (0.0955)
Cohabiting	0.00952 (0.0452)	0.00893 (0.0452)	-0.0236 (0.0491)	-0.0238 (0.0492)	0.130 (0.0719)	0.128 (0.0720)
Non-resident	-0.0493 (0.0429)	-0.0504 (0.0429)	-0.0731 (0.0470)	-0.0736 (0.0471)	0.0117 (0.0677)	0.0107 (0.0678)
New partner	0.0379 (0.0216)	0.0376 (0.0216)	0.0290 (0.0235)	0.0287 (0.0235)	0.0425 (0.0311)	0.0428 (0.0311)
Number of children	0.00290 (0.00917)	0.00253 (0.00918)	0.00608 (0.00991)	0.00589 (0.00992)	-0.00598 (0.0137)	-0.00646 (0.0138)
Relationship quality	0.0100 (0.00916)	0.0102 (0.00918)	0.00938 (0.00957)	0.00937 (0.00958)	0.0165 (0.0150)	0.0172 (0.0150)
Parenting stress	-0.0692** (0.0152)	-0.0677** (0.0153)	-0.0622** (0.0159)	-0.0616** (0.0160)	-0.0481 (0.0253)	-0.0468 (0.0255)
Share parenting responsibilities	-0.00658 (0.00525)	-0.00663 (0.00524)	-0.00462 (0.00557)	-0.00465 (0.00557)	-0.0192* (0.00952)	-0.0194* (0.00953)
Coparenting	0.0340 (0.0191)	0.0330 (0.0191)	0.0406* (0.0206)	0.0402 (0.0207)	0.0193 (0.0293)	0.0188 (0.0294)
Engagement with child	0.00126 (0.0105)	0.000810 (0.0105)	0.00371 (0.0109)	0.00352 (0.0109)	0.00206 (0.0164)	0.00199 (0.0164)
Social support	-0.000651 (0.00905)	-0.00104 (0.00905)	0.000525 (0.00966)	0.000392 (0.00966)	0.000760 (0.0148)	0.000681 (0.0148)
Employment	0.0279 (0.0168)	0.0284 (0.0168)	0.0372* (0.0175)	0.0373* (0.0175)	0.0295 (0.0271)	0.0302 (0.0271)
Food stamp receipt	-0.00259 (0.0208)	-0.00199 (0.0208)	-0.00432 (0.0218)	-0.00402 (0.0218)	-0.0397 (0.0321)	-0.0392 (0.0322)
Constant	0.179* (0.0900)	0.188* (0.0907)	0.137 (0.0977)	0.141 (0.0984)	0.208 (0.134)	0.212 (0.134)
Observations	2,300	2,300	1,095	1,095	861	861

Clustered standard errors in parentheses

** p<0.01, * p<0.05

Table 14. Fixed-effects regressions predicting the change in maternal life satisfaction

	Full sample		Not incarcerated at year 3		Ever incarcerated at year 3	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Paternal incarceration	-0.0209 (0.0228)	-0.0220 (0.0227)	-0.0116 (0.0243)	-0.0136 (0.0243)	-0.0225 (0.0319)	-0.0233 (0.0319)
Food insecure		-0.0508** (0.0178)		-0.0444* (0.0185)		-0.0600* (0.0306)
Mother/father relationship						
Married	0.0704 (0.0445)	0.0650 (0.0444)	0.0848* (0.0465)	0.0812* (0.0464)	0.0861 (0.0944)	0.0804 (0.0942)
Cohabiting	0.0547 (0.0394)	0.0534 (0.0394)	0.0672 (0.0421)	0.0669 (0.0420)	0.0627 (0.0711)	0.0576 (0.0710)
Non-resident	0.0691* (0.0374)	0.0666* (0.0373)	0.0861** (0.0402)	0.0808** (0.0402)	0.0755 (0.0668)	0.0715 (0.0667)
New partner	0.0303 (0.0188)	0.0298 (0.0188)	0.0249 (0.0201)	0.0247 (0.0201)	0.0311 (0.0307)	0.0323 (0.0307)
Number of children	0.00384 (0.00799)	0.00302 (0.00799)	-0.00793 (0.00848)	-0.00963 (0.00849)	0.0104 (0.0135)	0.00863 (0.0135)
Relationship quality	0.0127 (0.00807)	0.0131 (0.00802)	0.00882 (0.00820)	0.00907 (0.00815)	0.0132 (0.0155)	0.0157 (0.0155)
Parenting stress	-0.0273** (0.0133)	-0.0241* (0.0133)	-0.0260* (0.0136)	-0.0223 (0.0136)	-0.0392 (0.0251)	-0.0342 (0.0252)
Share parenting responsibilities	-0.00563 (0.00465)	-0.00574 (0.00464)	-0.00660 (0.00464)	-0.00690 (0.00464)	-0.00626 (0.00991)	-0.00712 (0.00990)
Coparenting	0.0148 (0.0191)	0.0127 (0.0192)	0.0277 (0.0198)	0.0258 (0.0198)	0.0120 (0.0318)	0.0100 (0.0320)
Engagement with child	-0.00310 (0.00920)	-0.00406 (0.00914)	-0.00393 (0.0104)	-0.00519 (0.0103)	0.00532 (0.0146)	0.00508 (0.0145)
Social support	0.0261** (0.00837)	0.0253** (0.00838)	0.0249** (0.00857)	0.0242** (0.00857)	0.0507** (0.0156)	0.0504** (0.0156)
Employment	0.0264* (0.0146)	0.0275* (0.0146)	0.0270* (0.0150)	0.0278* (0.0150)	0.0188 (0.0267)	0.0213 (0.0267)
Food stamp receipt	-0.0158 (0.0181)	-0.0144 (0.0181)	-0.0117 (0.0186)	-0.00681 (0.0187)	-0.0438 (0.0318)	-0.0421 (0.0317)
Constant	0.713** (0.0823)	0.734** (0.0827)	0.721** (0.0865)	0.724** (0.0876)	0.618** (0.135)	0.632** (0.135)
Observations	2,300	2,300	1,095	1,095	861	861

Clustered standard errors in parentheses

** p<0.01, * p<0.05

Table 15. Fixed-effects regressions predicting the change in poor maternal health

	Full sample		Not incarcerated at year 3		Ever incarcerated at year 3	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Paternal incarceration	0.0298 (0.0234)	0.0296 (0.0234)	0.0277 (0.0258)	0.0276 (0.0258)	0.0341 (0.0293)	0.0337 (0.0292)
Food insecure		-0.00766 (0.0181)		-0.00323 (0.0193)		-0.0295 (0.0282)
Mother/father relationship						
Married	0.00515 (0.0459)	0.00434 (0.0459)	0.0243 (0.0492)	0.0239 (0.0493)	0.00844 (0.0868)	0.00561 (0.0869)
Cohabiting	-0.0236 (0.0407)	-0.0238 (0.0407)	-0.00858 (0.0445)	-0.00865 (0.0445)	-0.0949 (0.0654)	-0.0974 (0.0655)
Non-resident	-0.0478 (0.0385)	-0.0481 (0.0386)	-0.0391 (0.0426)	-0.0393 (0.0426)	-0.118* (0.0616)	-0.120* (0.0617)
New partner	-0.00857 (0.0194)	-0.00866 (0.0194)	-0.00945 (0.0213)	-0.00956 (0.0213)	-0.00693 (0.0283)	-0.00634 (0.0283)
Number of children	0.00716 (0.00826)	0.00704 (0.00827)	0.00614 (0.00900)	0.00607 (0.00900)	0.0165 (0.0125)	0.0156 (0.0125)
Relationship quality	-0.00847 (0.00867)	-0.00841 (0.00868)	-0.00541 (0.00936)	-0.00541 (0.00937)	-0.0152 (0.0143)	-0.0140 (0.0144)
Parenting stress	0.0370** (0.0136)	0.0375** (0.0137)	0.0432** (0.0144)	0.0434** (0.0145)	0.0155 (0.0231)	0.0179 (0.0232)
Share parenting responsibilities	-0.00612 (0.00478)	-0.00614 (0.00478)	-0.00569 (0.00495)	-0.00570 (0.00495)	-0.00682 (0.00905)	-0.00724 (0.00909)
Coparenting	0.00160 (0.0202)	0.00127 (0.0203)	0.000365 (0.0223)	0.000226 (0.0224)	0.0101 (0.0282)	0.00917 (0.0282)
Engagement with child	-0.00657 (0.0104)	-0.00672 (0.0104)	-0.0152 (0.0116)	-0.0152 (0.0116)	0.00632 (0.0157)	0.00619 (0.0157)
Social support	0.00490 (0.00860)	0.00478 (0.00860)	0.0117 (0.00924)	0.0116 (0.00924)	-0.00466 (0.0142)	-0.00480 (0.0142)
Employment	-0.0210 (0.0151)	-0.0209 (0.0151)	-0.0198 (0.0159)	-0.0198 (0.0159)	-0.0655** (0.0246)	-0.0643** (0.0246)
Food stamp receipt	-0.0113 (0.0187)	-0.0111 (0.0187)	-0.0119 (0.0198)	-0.0118 (0.0198)	-0.00387 (0.0292)	-0.00303 (0.0293)
Constant	0.124 (0.0822)	0.127 (0.0827)	0.106 (0.0904)	0.108 (0.0910)	0.223* (0.121)	0.230* (0.121)
Observations	2,300	2,300	1,095	1,095	861	861

Clustered standard errors in parentheses

** p<0.01, * p<0.05

Table 16. Fixed-effects regressions predicting the change in child externalizing behaviors

	Full sample		Not incarcerated at year 3		Ever incarcerated at year 3	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Paternal incarceration	0.223** (0.0661)	0.223** (0.0660)	0.293** (0.0735)	0.293** (0.0735)	0.135 (0.0819)	0.133 (0.0818)
Food insecure		0.0903 (0.0527)		0.0678 (0.0557)		0.119 (0.0804)
Married	0.0325 (0.132)	0.0406 (0.132)	0.0404 (0.139)	0.0474 (0.139)	0.0431 (0.245)	0.0535 (0.245)
Cohabiting	-0.0508 (0.113)	-0.0493 (0.113)	-0.0643 (0.123)	-0.0632 (0.123)	-0.0819 (0.182)	-0.0741 (0.182)
Non-resident	-0.0646 (0.109)	-0.0626 (0.109)	-0.0654 (0.118)	-0.0635 (0.118)	-0.173 (0.174)	-0.172 (0.174)
New partner	0.0679 (0.0559)	0.0664 (0.0559)	0.0409 (0.0602)	0.0416 (0.0602)	0.100 (0.0804)	0.0940 (0.0804)
Number of children	0.0422 (0.0237)	0.0428 (0.0237)	0.0368 (0.0255)	0.0378 (0.0255)	0.0739* (0.0351)	0.0755* (0.0351)
Relationship quality	-0.0325 (0.0241)	-0.0334 (0.0241)	-0.0365 (0.0250)	-0.0367 (0.0250)	-0.0235 (0.0397)	-0.0290 (0.0400)
Parenting stress	0.141** (0.0396)	0.135** (0.0398)	0.149** (0.0412)	0.144** (0.0414)	0.0408 (0.0650)	0.0295 (0.0653)
Share parenting responsibilities	0.0287 (0.0164)	0.0299 (0.0164)	0.0274 (0.0177)	0.0284 (0.0178)	-0.0116 (0.0264)	-0.00913 (0.0264)
Coparenting	-0.0180 (0.0572)	-0.0176 (0.0572)	-0.0207 (0.0584)	-0.0203 (0.0584)	0.0267 (0.0880)	0.0277 (0.0879)
Engagement with child	-0.0223 (0.0259)	-0.0204 (0.0259)	-0.0223 (0.0256)	-0.0208 (0.0257)	-0.00281 (0.0416)	-0.00136 (0.0415)
Social support	-0.0270 (0.0241)	-0.0249 (0.0241)	-0.00647 (0.0258)	-0.00492 (0.0258)	-0.0751 (0.0379)	-0.0728 (0.0379)
Employment	0.0127 (0.0438)	0.0102 (0.0438)	0.00215 (0.0454)	0.00135 (0.0454)	0.00743 (0.0701)	0.00252 (0.0701)
Food stamp receipt	0.137* (0.0532)	0.134* (0.0532)	0.0936 (0.0561)	0.0909 (0.0561)	0.0633 (0.0804)	0.0616 (0.0804)
Material hardship	0.0102 (0.0183)	0.00799 (0.0183)	0.00331 (0.0192)	0.00133 (0.0192)	0.00413 (0.0292)	-0.0001 (0.0293)
Maternal depression	-0.0572 (0.0548)	-0.0569 (0.0548)	-0.0973 (0.0574)	-0.0984 (0.0574)	-0.00492 (0.0909)	-0.0044 (0.0908)
Child age (months)	0.000317 (0.00125)	0.000473 (0.00125)	-0.000677 (0.00138)	-0.000566 (0.00139)	0.00294 (0.00192)	0.00324 (0.00193)
Observations	1,900	1,900	1,728	1,728	718	718

Clustered standard errors in parentheses. ** p<0.01, * p<0.05

Table 17. Fixed-effects regressions predicting the change in child internalizing behaviors

	Full sample		Not incarcerated at year 3		Ever incarcerated at year 3	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Paternal incarceration	0.0886 (0.0688)	0.0881 (0.0684)	0.0435 (0.0757)	0.0435 (0.0751)	0.0593 (0.0873)	0.0559 (0.0869)
Food insecure		0.261** (0.0550)		0.304** (0.0572)		0.207* (0.0847)
Married	-0.419** (0.137)	-0.395** (0.136)	-0.410** (0.143)	-0.378** (0.142)	-0.387 (0.260)	-0.369 (0.259)
Cohabiting	-0.302* (0.118)	-0.298* (0.117)	-0.306* (0.126)	-0.302* (0.125)	-0.0102 (0.194)	0.00323 (0.193)
Non-resident	-0.404** (0.113)	-0.399** (0.113)	-0.373** (0.122)	-0.364** (0.121)	-0.220 (0.186)	-0.218 (0.185)
New partner	-0.0489 (0.0584)	-0.0534 (0.0580)	-0.0929 (0.0619)	-0.0897 (0.0613)	0.0351 (0.0857)	0.0240 (0.0855)
Number of children	0.0551* (0.0246)	0.0569* (0.0245)	0.0482 (0.0262)	0.0528* (0.0260)	0.0881* (0.0374)	0.0910* (0.0373)
Relationship quality	-0.0169 (0.0240)	-0.0194 (0.0240)	-0.0177 (0.0248)	-0.0184 (0.0246)	0.0305 (0.0400)	0.0211 (0.0400)
Parenting stress	0.0691 (0.0415)	0.0512 (0.0414)	0.0581 (0.0423)	0.0372 (0.0422)	0.114 (0.0694)	0.0941 (0.0696)
Share parenting responsibilities	-0.0180 (0.0165)	-0.0146 (0.0163)	-0.0116 (0.0169)	-0.00713 (0.0167)	-0.0590 (0.0306)	-0.0547 (0.0302)
Coparenting	-0.0675 (0.0570)	-0.0662 (0.0562)	-0.0663 (0.0573)	-0.0644 (0.0567)	-0.0233 (0.0875)	-0.0215 (0.0862)
Engagement with child	0.00219 (0.0289)	0.00764 (0.0291)	-0.00352 (0.0311)	0.00289 (0.0312)	-0.0157 (0.0434)	-0.0132 (0.0436)
Social support	0.00850 (0.0260)	0.0144 (0.0259)	0.0248 (0.0271)	0.0317 (0.0269)	0.00607 (0.0422)	0.0102 (0.0422)
Employment	0.0160 (0.0456)	0.00859 (0.0454)	0.0599 (0.0467)	0.0563 (0.0463)	-0.0257 (0.0745)	-0.0342 (0.0743)
Food stamp receipt	0.0853 (0.0554)	0.0774 (0.0551)	0.0753 (0.0576)	0.0631 (0.0572)	0.0617 (0.0804)	0.0587 (0.0804)
Material hardship	0.0172 (0.0190)	0.0108 (0.0189)	-8.28e-05 (0.0197)	-0.009 (0.0196)	0.0362 (0.0310)	0.0289 (0.0311)
Maternal depression	-0.0096 (0.0548)	-0.0088 (0.0567)	-0.0345 (0.0590)	-0.0398 (0.0585)	0.0215 (0.0967)	0.0224 (0.0963)
Child age (months)	-0.00027 (0.00129)	0.00018 (0.00129)	0.00041 (0.00139)	0.00091 (0.00138)	-0.00397 (0.00206)	-0.00346 (0.00206)
Observations	1,900	1,900	1,728	1,728	718	718

Clustered standard errors in parentheses. ** p<0.01, * p<0.05

Table 20. Linear probability models after preprocessing predicting maternal depression

	Full Sample		Previously incarcerated fathers only	
	Model 1	Model 2	Model 3	Model 4
Recent paternal incarceration	-0.0122 (0.0599)	0.000935 (0.0569)	-0.0208 (0.0651)	-0.00826 (0.0656)
Father ever incarcerated (y3)	0.0112 (0.0532)	0.00557 (0.0526)		
Food insecure (y5)		0.139* (0.0529)		0.177* (0.0675)
Mother race				
Black	-0.0315 (0.0652)	-0.0141 (0.0668)	0.0225 (0.0895)	0.0536 (0.0928)
Hispanic	0.0298 (0.0679)	0.0429 (0.0673)	0.0582 (0.106)	0.0778 (0.106)
Other	0.0755 (0.134)	0.0803 (0.132)	0.125 (0.164)	0.138 (0.160)
Foreign born	0.0930 (0.101)	0.0916 (0.100)	0.222 (0.106)	0.216 (0.106)
Age (baseline)	-0.00466 (0.00454)	-0.00526 (0.00433)	-0.00492 (0.00635)	-0.00490 (0.00612)
Mother education				
High school	-0.00256 (0.0349)	-0.00456 (0.0327)	0.0259 (0.0512)	0.0309 (0.0472)
Some college	0.151* (0.0496)	0.146* (0.0475)	0.193** (0.0618)	0.196** (0.0594)
College graduate	0.00569 (0.104)	0.0178 (0.0999)	-0.00793 (0.146)	0.0202 (0.152)
Mother's parent depression history	0.102 (0.0485)	0.103* (0.0467)	0.128* (0.0528)	0.131* (0.0498)
Material hardship (y3)	0.0238 (0.0148)	0.0185 (0.0138)	0.00785 (0.0204)	-0.000237 (0.0199)
Income/poverty ratio (y3)	-0.0534** (0.0149)	-0.0513** (0.0149)	-0.0664** (0.0210)	-0.0640** (0.0203)
Mother relationship with father (y3)				
Married	0.0466 (0.0702)	0.0515 (0.0653)	0.0563 (0.0874)	0.0627 (0.0810)
Cohabiting	-0.0289 (0.0626)	-0.0322 (0.0625)	-0.0410 (0.0725)	-0.0572 (0.0722)

Table 20 (Continued)

	Full Sample		Previously incarcerated fathers only	
	Model 1	Model 2	Model 3	Model 4
Non-resident	-0.00158 (0.0775)	-0.00692 (0.0752)	-0.0778 (0.0841)	-0.0829 (0.0758)
Mother has new romantic partner	0.0343 (0.0499)	0.0302 (0.0501)	0.0442 (0.0604)	0.0409 (0.0597)
Relationship quality with father	-0.0126 (0.0249)	-0.00823 (0.0243)	-0.0138 (0.0337)	-0.00618 (0.0343)
Number of children (y3)	-0.0135 (0.0165)	-0.0174 (0.0156)	-0.0119 (0.0214)	-0.0189 (0.0203)
Parenting stress (y3)	0.0885 (0.0528)	0.0819 (0.0528)	0.0778 (0.0438)	0.0691 (0.0412)
Coparenting (y3)	0.000948 (0.0381)	-0.00436 (0.0379)	-0.00974 (0.0526)	-0.0202 (0.0527)
Share parenting responsibilities (y3)	-0.00177 (0.0148)	-0.00416 (0.0151)	-0.00163 (0.0175)	-0.00386 (0.0180)
Father engagement with child (y3)	0.0109 (0.0220)	0.0144 (0.0224)	0.0243 (0.0285)	0.0319 (0.0294)
Maternal social support (y3)	-0.0234 (0.0190)	-0.0158 (0.0183)	-0.0401 (0.0271)	-0.0309 (0.0269)
Receives food stamps (y3)	-0.0913* (0.0403)	-0.0933* (0.0390)	-0.0731 (0.0533)	-0.0755 (0.0504)
Constant	0.198 (0.202)	0.177 (0.199)	0.245 (0.262)	0.189 (0.258)
Observations	1,576	1,576	721	721

Robust standard errors in parentheses

** p<0.01, * p<0.05

Table 21. Linear probability models after preprocessing predicting maternal life satisfaction

	Full Sample		Previously incarcerated fathers only	
	Model 1	Model 2	Model 3	Model 4
Recent paternal incarceration	-0.0621 (0.0392)	-0.0635 (0.0381)	-0.0458 (0.0577)	-0.0469 (0.0561)
Father ever incarcerated (y3)	-0.00373 (0.0612)	-0.00313 (0.0610)		
Food insecure (y5)		-0.0150 (0.0413)		-0.0160 (0.0530)
Mother race				
Black	0.0328 (0.0730)	0.0310 (0.0737)	0.0106 (0.120)	0.00786 (0.121)
Hispanic	0.0403 (0.0845)	0.0390 (0.0843)	0.0435 (0.123)	0.0417 (0.124)
Other	0.103 (0.105)	0.103 (0.104)	0.100 (0.176)	0.0992 (0.177)
Foreign born	0.0598 (0.0907)	0.0599 (0.0902)	-0.0840 (0.113)	-0.0837 (0.112)
Age (baseline)	-0.00344 (0.00355)	-0.00337 (0.00356)	-0.00764 (0.00539)	-0.00764 (0.00539)
Mother education				
High school	0.0461 (0.0391)	0.0463 (0.0388)	0.0464 (0.0514)	0.0459 (0.0521)
Some college	0.000138 (0.0533)	0.000617 (0.0527)	0.0176 (0.0730)	0.0174 (0.0732)
College graduate	0.123 (0.0678)	0.122 (0.0686)	0.108 (0.121)	0.106 (0.123)
Mother's parent depression history	0.0433 (0.0412)	0.0433 (0.0413)	0.0460 (0.0437)	0.0457 (0.0437)
Material hardship (y3)	-0.0283* (0.0125)	-0.0278 (0.0126)	-0.0148 (0.0187)	-0.0140 (0.0187)
Income/poverty ratio (y3)	0.0368** (0.0115)	0.0365** (0.0115)	0.0450* (0.0169)	0.0448* (0.0170)
Mother relationship with father (y3)				
Married	-0.177 (0.0803)	-0.177 (0.0808)	-0.138 (0.119)	-0.138 (0.120)
Cohabiting	-0.0305 (0.0669)	-0.0300 (0.0668)	0.000803 (0.0789)	0.00241 (0.0790)

Table 21 (Continued)

	Full Sample		Previously incarcerated fathers only	
	Model 1	Model 2	Model 3	Model 4
Non-resident	0.0254 (0.0416)	0.0260 (0.0413)	0.0156 (0.0764)	0.0161 (0.0762)
Mother has new romantic partner	-0.0224 (0.0548)	-0.0218 (0.0547)	-0.0493 (0.0653)	-0.0488 (0.0655)
Relationship quality with father	0.0269 (0.0198)	0.0264 (0.0196)	0.0250 (0.0264)	0.0244 (0.0267)
Number of children (y3)	0.0183 (0.0138)	0.0188 (0.0137)	0.0208 (0.0188)	0.0215 (0.0191)
Parenting stress (y3)	-0.0822 (0.0378)	-0.0816 (0.0380)	-0.0575 (0.0321)	-0.0568 (0.0314)
Coparenting (y3)	-0.0116 (0.0381)	-0.0111 (0.0376)	-0.000348 (0.0480)	0.000492 (0.0475)
Share parenting responsibilities (y3)	0.00331 (0.0145)	0.00359 (0.0146)	-0.00174 (0.0186)	-0.00151 (0.0188)
Father engagement with child (y3)	-0.0104 (0.0234)	-0.0108 (0.0234)	-0.0170 (0.0291)	-0.0177 (0.0292)
Maternal social support (y3)	0.00532 (0.0205)	0.00449 (0.0205)	0.00953 (0.0299)	0.00866 (0.0293)
Receives food stamps (y3)	0.0114 (0.0501)	0.0116 (0.0499)	-0.0403 (0.0587)	-0.0401 (0.0586)
Constant	1.064** (0.162)	1.066** (0.164)	1.084** (0.230)	1.089** (0.231)
Observations	1,576	1,576	721	721

Robust standard errors in parentheses

** p<0.01, * p<0.05

Table 22. Linear probability models after preprocessing predicting poor maternal health

	Full Sample		Previously incarcerated fathers only	
	Model 1	Model 2	Model 3	Model 4
Recent paternal incarceration	0.0576 (0.0430)	0.0669 (0.0431)	0.0234 (0.0652)	0.0325 (0.0650)
Father ever incarcerated (y3)	-0.0179 (0.0511)	-0.0218 (0.0506)		
Food insecure (y5)		0.0993* (0.0445)		0.128* (0.0585)
Mother race				
Black	0.0324 (0.0387)	0.0448 (0.0386)	0.000873 (0.0612)	0.0232 (0.0620)
Hispanic	0.101 (0.0808)	0.111 (0.0784)	0.0700 (0.106)	0.0843 (0.103)
Other	-0.150* (0.0585)	-0.147* (0.0581)	-0.195 (0.110)	-0.185 (0.105)
Foreign born	0.127 (0.0800)	0.126 (0.0761)	0.115 (0.151)	0.111 (0.143)
Age (baseline)	0.0144** (0.00356)	0.0140** (0.00346)	0.0192** (0.00394)	0.0192** (0.00397)
Mother education				
High school	-0.0768 (0.0429)	-0.0781* (0.0424)	-0.0877 (0.0518)	-0.0838 (0.0514)
Some college	-0.0145 (0.0640)	-0.0179 (0.0649)	-0.0267 (0.0891)	-0.0250 (0.0895)
College graduate	-0.313** (0.0779)	-0.304** (0.0745)	-0.358* (0.112)	-0.338* (0.112)
Mother's parent depression history	-0.0628 (0.0519)	-0.0620 (0.0506)	-0.0858 (0.0588)	-0.0834 (0.0562)
Material hardship (y3)	0.0288 (0.0194)	0.0250 (0.0192)	0.0222 (0.0229)	0.0164 (0.0226)
Income/poverty ratio (y3)	0.0332 (0.0281)	0.0347 (0.0283)	0.0569 (0.0314)	0.0586 (0.0309)
Mother relationship with father (y3)				
Married	0.0941 (0.0656)	0.0974 (0.0670)	0.106 (0.106)	0.111 (0.110)
Cohabiting	-0.0456 (0.0752)	-0.0483 (0.0746)	-0.104 (0.0937)	-0.116 (0.0917)

Table 22 (Continued)

	Full Sample		Previously incarcerated fathers only	
	Model 1	Model 2	Model 3	Model 4
Non-resident	-0.00847 (0.0610)	-0.0124 (0.0618)	-0.000397 (0.0756)	-0.00420 (0.0772)
Mother has new romantic partner	0.0130 (0.0500)	0.0100 (0.0501)	0.0110 (0.0653)	0.00832 (0.0656)
Relationship quality with father	-0.0557 (0.0329)	-0.0526 (0.0328)	-0.0580 (0.0384)	-0.0525 (0.0378)
Number of children (y3)	0.00515 (0.0211)	0.00234 (0.0206)	0.00286 (0.0254)	-0.00227 (0.0249)
Parenting stress (y3)	0.0974* (0.0423)	0.0927 (0.0422)	0.0522 (0.0484)	0.0459 (0.0460)
Coparenting (y3)	0.000735 (0.0566)	-0.00296 (0.0568)	0.00771 (0.0621)	0.000284 (0.0622)
Share parenting responsibilities (y3)	0.00922 (0.0155)	0.00752 (0.0156)	0.000555 (0.0194)	-0.00105 (0.0191)
Father engagement with child (y3)	0.0306 (0.0368)	0.0332 (0.0369)	0.0491 (0.0427)	0.0546 (0.0426)
Maternal social support (y3)	-0.0158 (0.0187)	-0.0104 (0.0190)	-0.0289 (0.0227)	-0.0223 (0.0232)
Receives food stamps (y3)	0.0729 (0.0625)	0.0715 (0.0602)	0.117 (0.0738)	0.116 (0.0703)
Constant	-0.472* (0.164)	-0.488* (0.158)	-0.479* (0.189)	-0.520* (0.182)
Observations	1,576	1,576	721	721

Robust standard errors in parentheses

** p<0.01, * p<0.05

Table 23. Linear probability models after preprocessing predicting child externalizing behaviors

	Full Sample		Previously incarcerated fathers only	
	Model 1	Model 2	Model 3	Model 4
Recent paternal incarceration	0.237* (0.100)	0.225* (0.0994)	0.341* (0.112)	0.303* (0.115)
Father ever incarcerated (y3)	0.185 (0.166)	0.168 (0.162)		
Food insecure (y5)		0.400* (0.166)		0.461* (0.197)
Mother race				
Black	-0.0178 (0.155)	-0.00463 (0.139)	-0.120 (0.165)	-0.111 (0.140)
Hispanic	0.432 (0.196)	0.426 (0.189)	0.314 (0.223)	0.277 (0.213)
Other	0.137 (0.451)	0.113 (0.452)	0.313 (0.494)	0.274 (0.508)
Foreign born	-0.240 (0.223)	-0.170 (0.217)	-0.189 (0.294)	-0.0785 (0.288)
Age (baseline)	0.0141 (0.0314)	0.0178 (0.0314)	0.0333 (0.0427)	0.0374 (0.0424)
Mother education				
High school	0.00404 (0.0177)	0.00423 (0.0174)	0.00987 (0.0207)	0.0101 (0.0207)
Some college	-0.0197 (0.163)	-0.0574 (0.153)	-0.0914 (0.223)	-0.126 (0.201)
College graduate	-0.265 (0.205)	-0.286 (0.185)	-0.222 (0.251)	-0.238 (0.217)
Mother's parent depression history	-0.589 (0.328)	-0.588 (0.299)	-0.489 (0.376)	-0.462 (0.360)
Material hardship (y3)	0.0647 (0.0490)	0.0542 (0.0493)	0.0848 (0.0697)	0.0699 (0.0704)
Income/poverty ratio (y3)	-0.0132 (0.0540)	-0.0125 (0.0541)	-0.119 (0.0633)	-0.119 (0.0622)
Mother relationship with father (y3)				
Married	-0.334 (0.215)	-0.326 (0.202)	-0.524 (0.335)	-0.531 (0.315)
Cohabiting	-0.0485 (0.167)	-0.0703 (0.172)	-0.102 (0.233)	-0.134 (0.238)

Table 23 (Continued)

	Full Sample		Previously incarcerated fathers only	
	Model 1	Model 2	Model 3	Model 4
Non-resident	0.0161 (0.233)	0.0202 (0.224)	0.0567 (0.306)	0.0566 (0.272)
Mother has new romantic partner	-0.00828 (0.196)	-0.0281 (0.203)	-0.0419 (0.226)	-0.0531 (0.236)
Relationship quality with father	0.0669 (0.0608)	0.0923 (0.0603)	0.00215 (0.0792)	0.0446 (0.0796)
Number of children (y3)	-0.00408 (0.0302)	-0.0210 (0.0336)	-0.0358 (0.0479)	-0.0585 (0.0503)
Parenting stress (y3)	0.145 (0.0934)	0.150 (0.0868)	0.157 (0.0959)	0.157 (0.0907)
Coparenting (y3)	-0.250* (0.0965)	-0.285* (0.0973)	-0.209 (0.124)	-0.275 (0.129)
Share parenting responsibilities (y3)	0.0307 (0.0396)	0.0292 (0.0386)	0.0269 (0.0547)	0.0272 (0.0547)
Father engagement with child (y3)	0.0734 (0.0737)	0.0769 (0.0708)	0.107 (0.0848)	0.118 (0.0833)
Maternal social support (y3)	0.0156 (0.0397)	0.0471 (0.0395)	0.0346 (0.0564)	0.0735 (0.0594)
Receives food stamps (y3)	0.0837 (0.0979)	0.0700 (0.0960)	0.0159 (0.139)	-8.54e-05 (0.133)
Employed (3y)	0.0198 (0.134)	0.0296 (0.130)	0.0105 (0.165)	0.0327 (0.158)
Domestic violence (y3)	-0.130 (0.169)	-0.136 (0.155)	-0.201 (0.171)	-0.215 (0.156)
Drug/alcohol abuse (y3)	-0.151 (0.155)	-0.162 (0.152)	-0.251 (0.180)	-0.259 (0.176)
Low birthweight	0.164 (0.160)	0.163 (0.165)	0.322 (0.254)	0.328 (0.263)
Mother depression (y3)	0.296 (0.137)	0.243 (0.140)	0.268 (0.176)	0.229 (0.181)
Smoked while pregnant	0.602 (0.514)	0.474 (0.511)	0.511 (1.028)	0.624 (1.028)
Mother self-control	0.183 (0.119)	0.163 (0.113)	0.332 (0.153)	0.312 (0.140)
Father self-control	-0.157 (0.139)	-0.163 (0.136)	-0.203 (0.193)	-0.202 (0.189)
Observations	1,803	1,803	700	700

Robust standard errors in parentheses.

** p<0.01, * p<0.05

Table 24. Linear probability models after preprocessing predicting child internalizing behaviors

	Full Sample		Previously incarcerated fathers only	
	Model 1	Model 2	Model 3	Model 4
Recent paternal incarceration	0.0205 (0.0674)	0.00900 (0.0700)	0.237* (0.106)	0.207 (0.107)
Father ever incarcerated (y3)	0.233 (0.124)	0.218 (0.117)		
Food insecure (y5)		0.367* (0.119)		0.356 (0.160)
Mother race				
Black	0.0909 (0.145)	0.103 (0.139)	-0.0314 (0.206)	-0.0246 (0.191)
Hispanic	0.664** (0.155)	0.658** (0.153)	0.627* (0.226)	0.598* (0.225)
Other	0.225 (0.378)	0.203 (0.374)	0.312 (0.591)	0.283 (0.589)
Foreign born	-0.151 (0.278)	-0.0868 (0.275)	-0.169 (0.412)	-0.0840 (0.408)
Age (baseline)	0.0135 (0.0214)	0.0169 (0.0220)	0.0154 (0.0297)	0.0185 (0.0300)
Mother education				
High school	-0.00535 (0.0137)	-0.00516 (0.0136)	-0.00140 (0.0169)	-0.00119 (0.0169)
Some college	-0.00642 (0.147)	-0.0412 (0.147)	-0.137 (0.166)	-0.164 (0.160)
College graduate	-0.183 (0.147)	-0.203 (0.139)	-0.261 (0.210)	-0.273 (0.202)
Mother's parent depression history	0.347 (0.326)	0.347 (0.315)	-0.217 (0.345)	-0.197 (0.335)
Material hardship (y3)	0.0521 (0.0360)	0.0425 (0.0371)	0.0655 (0.0527)	0.0538 (0.0513)
Income/poverty ratio (y3)	-0.0159 (0.0495)	-0.0153 (0.0488)	0.0378 (0.0901)	0.0379 (0.0893)
Mother relationship with father (y3)				
Married	0.0322 (0.206)	0.0395 (0.193)	-0.135 (0.373)	-0.140 (0.351)
Cohabiting	0.295 (0.187)	0.275 (0.185)	0.396 (0.270)	0.371 (0.267)

Table 24 (Continued)

	Full Sample		Previously incarcerated fathers only	
	Model 1	Model 2	Model 3	Model 4
Non-resident	-0.0977 (0.157)	-0.0939 (0.159)	-0.155 (0.173)	-0.155 (0.177)
Mother has new romantic partner	-0.0106 (0.146)	-0.0288 (0.150)	-0.0437 (0.170)	-0.0521 (0.177)
Relationship quality with father	-0.0479 (0.0595)	-0.0245 (0.0593)	-0.126 (0.0805)	-0.0934 (0.0794)
Number of children (y3)	0.0525 (0.0371)	0.0370 (0.0329)	0.105* (0.0425)	0.0874 (0.0392)
Parenting stress (y3)	0.0385 (0.0824)	0.0430 (0.0777)	0.0277 (0.0884)	0.0274 (0.0847)
Coparenting (y3)	-0.0282 (0.125)	-0.0607 (0.128)	-0.00860 (0.157)	-0.0599 (0.156)
Share parenting responsibilities (y3)	0.0193 (0.0417)	0.0179 (0.0417)	0.0569 (0.0468)	0.0571 (0.0480)
Father engagement with child (y3)	0.00919 (0.0702)	0.0122 (0.0702)	0.0167 (0.0807)	0.0247 (0.0810)
Maternal social support (y3)	-0.00727 (0.0434)	0.0216 (0.0462)	-0.0322 (0.0570)	-0.00218 (0.0606)
Receives food stamps (y3)	-0.0127 (0.115)	-0.0251 (0.113)	0.0215 (0.148)	0.00944 (0.143)
Employed (3y)	-0.194 (0.106)	-0.185 (0.114)	-0.201 (0.135)	-0.184 (0.140)
Domestic violence (y3)	-0.0427 (0.176)	-0.0481 (0.177)	-0.0990 (0.230)	-0.109 (0.231)
Drug/alcohol abuse (y3)	-0.174 (0.211)	-0.184 (0.216)	-0.256 (0.247)	-0.261 (0.253)
Low birthweight	-0.0799 (0.171)	-0.0808 (0.173)	-0.0515 (0.242)	-0.0466 (0.243)
Mother depression (y3)	0.288 (0.149)	0.240 (0.147)	0.267 (0.201)	0.237 (0.199)
Smoked while pregnant	0.0226 (0.306)	-0.0934 (0.318)	0.213 (0.413)	0.300 (0.423)
Mother self-control	0.249 (0.161)	0.231 (0.156)	0.422 (0.232)	0.407 (0.226)
Father self-control	0.0552 (0.112)	0.050 (0.112)	0.0318 (0.139)	0.0322 (0.138)
Observations	1,803	1,803	700	700

Robust standard errors in parentheses.

** p<0.01, * p<0.05

Table 25. Fixed-effects models after preprocessing predicting the change in maternal depression

	Full sample		Not incarcerated at year 3		Ever incarcerated at year 3	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Paternal incarceration	0.148** (0.0508)	0.132** (0.0505)	0.167** (0.0491)	0.155** (0.0494)	0.149* (0.0612)	0.135* (0.0620)
Food insecure		-0.139* (0.0595)		-0.0948 (0.0598)		-0.126 (0.0734)
Mother/father relationship						
Married	0.364** (0.131)	0.355** (0.125)	0.295* (0.135)	0.285* (0.129)	0.490** (0.169)	0.464** (0.161)
Cohabiting	0.421** (0.133)	0.388** (0.117)	0.350** (0.127)	0.323** (0.115)	0.574** (0.129)	0.534** (0.118)
Non-resident	0.0305 (0.0827)	0.0284 (0.0773)	0.00502 (0.102)	-0.00245 (0.0957)	0.119 (0.113)	0.113 (0.109)
New partner	0.141 (0.0835)	0.138 (0.0818)	0.0752 (0.0514)	0.0693 (0.0494)	0.164 (0.104)	0.167 (0.103)
Number of children	-0.0218 (0.0184)	-0.0227 (0.0182)	-0.0236 (0.0250)	-0.0249 (0.0248)	-0.00938 (0.0224)	-0.00877 (0.0221)
Relationship quality	-0.0136 (0.0301)	-0.00382 (0.0280)	-0.0471 (0.0283)	-0.0398 (0.0265)	0.00578 (0.0310)	0.0156 (0.0315)
Parenting stress	-0.0736 (0.0430)	-0.0612 (0.0437)	-0.0884 (0.0449)	-0.0754 (0.0452)	-0.0108 (0.0573)	-0.00577 (0.0580)
Share parenting responsibilities	-0.0200 (0.0174)	-0.0199 (0.0168)	-0.00954 (0.0200)	-0.0108 (0.0203)	-0.0249 (0.0218)	-0.0229 (0.0213)
Coparenting	-0.0404 (0.0791)	-0.0431 (0.0778)	0.0750 (0.0642)	0.0731 (0.0633)	-0.115 (0.0903)	-0.116 (0.0890)
Engagement with child	0.00950 (0.0419)	0.00803 (0.0414)	-0.00219 (0.0318)	-0.00370 (0.0315)	0.0104 (0.0485)	0.0105 (0.0479)
Social support	0.00243 (0.0312)	-0.00371 (0.0311)	-0.0297 (0.0273)	-0.0332 (0.0275)	-0.00659 (0.0401)	-0.0124 (0.0396)
Employment	-0.0298 (0.0431)	-0.0242 (0.0416)	-0.0116 (0.0427)	-0.00515 (0.0414)	-0.0183 (0.0626)	-0.0120 (0.0618)
Food stamp receipt	-0.0158 (0.0966)	0.000777 (0.0963)	-0.131* (0.0651)	-0.117 (0.0649)	-0.0322 (0.115)	-0.0114 (0.115)
Constant	0.390 (0.211)	0.401 (0.217)	0.411 (0.246)	0.415 (0.250)	0.306 (0.268)	0.318 (0.270)
Observations	1,645	1,645	1,464	1,464	749	749

Clustered standard errors in parentheses. ** p<0.01, * p<0.05

Table 26. Fixed-effects regressions after preprocessing predicting the change in child externalizing behaviors

	Full sample		Not incarcerated at year 3		Ever incarcerated at year 3	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Paternal incarceration	0.110 (0.128)	0.111 (0.130)	0.189 (0.129)	0.179 (0.130)	-0.0142 (0.145)	-0.0127 (0.147)
Food insecure		-0.0176 (0.147)		0.0835 (0.171)		-0.0368 (0.168)
Married	-0.438 (0.315)	-0.430 (0.298)	-0.228 (0.318)	-0.273 (0.289)	-0.344 (0.363)	-0.328 (0.358)
Cohabiting	-0.812** (0.185)	-0.802** (0.180)	-0.779** (0.189)	-0.831** (0.182)	-0.770** (0.243)	-0.749** (0.234)
Non-resident	-0.712** (0.211)	-0.703** (0.200)	-0.621** (0.217)	-0.661** (0.210)	-0.680* (0.303)	-0.658* (0.291)
New partner	0.171 (0.130)	0.172 (0.130)	0.100 (0.129)	0.0973 (0.129)	0.110 (0.163)	0.114 (0.163)
Number of children	0.0362 (0.0529)	0.0354 (0.0533)	-0.00497 (0.0615)	0.00214 (0.0624)	0.0689 (0.0593)	0.0680 (0.0596)
Relationship quality	-0.0435 (0.0574)	-0.0423 (0.0569)	-0.0668 (0.0630)	-0.0716 (0.0621)	-0.00353 (0.0683)	0.000169 (0.0672)
Parenting stress	-0.249* (0.121)	-0.246 (0.126)	-0.360** (0.132)	-0.375** (0.134)	-0.169 (0.139)	-0.165 (0.146)
Share parenting responsibilities	-0.0512 (0.0421)	-0.0511 (0.0424)	-0.0158 (0.0483)	-0.0116 (0.0443)	-0.0753 (0.0505)	-0.0745 (0.0514)
Coparenting	0.0584 (0.123)	0.0577 (0.123)	0.0238 (0.129)	0.0260 (0.129)	0.101 (0.137)	0.0980 (0.137)
Engagement with child	0.0181 (0.0754)	0.0180 (0.0757)	0.0228 (0.0790)	0.0223 (0.0782)	0.0189 (0.0872)	0.0186 (0.0875)
Social support	-0.0807 (0.0644)	-0.0820 (0.0651)	-0.0196 (0.0650)	-0.0182 (0.0608)	-0.0823 (0.0918)	-0.0850 (0.0937)
Employment	0.213 (0.131)	0.214 (0.127)	0.227 (0.141)	0.224 (0.134)	0.125 (0.155)	0.128 (0.151)
Food stamp receipt	0.171 (0.129)	0.170 (0.129)	0.109 (0.146)	0.113 (0.147)	0.0391 (0.144)	0.0362 (0.145)
Material hardship	-0.0299 (0.0444)	-0.0286 (0.0463)	-0.0739 (0.0466)	-0.0791 (0.0498)	-0.00865 (0.0554)	-0.00468 (0.0562)
Maternal depression	0.0805 (0.110)	0.0809 (0.109)	-0.0089 (0.130)	-0.00688 (0.129)	0.0382 (0.126)	0.0385 (0.125)
Child age (months)	-0.00491 (0.00382)	-0.00494 (0.00378)	-0.00449 (0.00361)	-0.00405 (0.00336)	-0.0046 (0.00458)	-0.00463 (0.00455)
Observations	1,813	1,813	1,642	1,642	705	705

Clustered standard errors in parentheses. ** p<0.01, * p<0.05

Table 27. Fixed-effects regressions after preprocessing predicting the change in child internalizing behaviors

	Full sample		Not incarcerated at year 3		Ever incarcerated at year 3	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Paternal incarceration	0.0604 (0.128)	0.0347 (0.120)	0.0818 (0.135)	0.0168 (0.123)	0.00709 (0.156)	-0.0116 (0.144)
Food insecure		0.405* (0.159)		0.540** (0.164)		0.452* (0.180)
Married	-0.532 (0.324)	-0.716* (0.299)	-0.0135 (0.340)	-0.305 (0.302)	-0.359 (0.507)	-0.548 (0.471)
Cohabiting	0.0620 (0.219)	-0.153 (0.173)	0.425 (0.226)	0.0902 (0.161)	0.0325 (0.281)	-0.225 (0.230)
Non-resident	-0.00554 (0.236)	-0.206 (0.196)	0.296 (0.236)	0.0409 (0.184)	0.114 (0.336)	-0.156 (0.284)
New partner	0.0628 (0.134)	0.0423 (0.135)	0.0621 (0.118)	0.0431 (0.117)	0.0290 (0.180)	-0.0269 (0.177)
Number of children	-0.0198 (0.0473)	-0.00351 (0.0480)	0.0189 (0.0581)	0.0649 (0.0584)	-0.0350 (0.0633)	-0.0250 (0.0640)
Relationship quality	0.0453 (0.0516)	0.0195 (0.0474)	0.0237 (0.0527)	-0.00751 (0.0477)	0.0847 (0.0708)	0.0394 (0.0651)
Parenting stress	0.229 (0.124)	0.145 (0.132)	0.133 (0.135)	0.0370 (0.130)	0.258 (0.160)	0.204 (0.156)
Share parenting responsibilities	-0.0216 (0.0481)	-0.0240 (0.0443)	-0.0474 (0.0539)	-0.0198 (0.0442)	-0.0278 (0.0596)	-0.0383 (0.0567)
Coparenting	-0.204 (0.118)	-0.189 (0.117)	-0.186 (0.101)	-0.171 (0.0969)	-0.228 (0.152)	-0.191 (0.150)
Engagement with child	0.0228 (0.0652)	0.0260 (0.0625)	0.0300 (0.0692)	0.0281 (0.0641)	0.0111 (0.0849)	0.0141 (0.0822)
Social support	-0.0255 (0.0909)	-0.00780 (0.0783)	0.0519 (0.0987)	0.0629 (0.0782)	-0.0317 (0.121)	-0.00877 (0.105)
Employment	0.196 (0.144)	0.164 (0.118)	0.325* (0.153)	0.303* (0.116)	0.199 (0.189)	0.154 (0.155)
Food stamp receipt	0.263* (0.106)	0.293** (0.107)	0.264* (0.122)	0.290* (0.123)	0.240 (0.139)	0.274* (0.136)
Material hardship	0.110** (0.0408)	0.0778 (0.0416)	0.0228 (0.0417)	-0.0107 (0.0435)	0.146** (0.0543)	0.0972 (0.0557)
Maternal depression	0.253* (0.119)	0.241* (0.119)	0.154 (0.170)	0.168 (0.175)	0.347* (0.153)	0.344* (0.151)
Child age (months)	-0.00602 (0.00346)	-0.00536 (0.00321)	-0.00807* (0.00310)	-0.00528* (0.00259)	-0.00727 (0.00444)	-0.0068 (0.00423)
Observations	1,813	1,813	1,642	1,642	705	705

Clustered standard errors in parentheses. ** p<0.01, * p<0.05

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