

**The Role of Child Support Debt on the Development of Mental Health Problems among
Nonresident Fathers**

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ABSTRACT

Using the first five waves of data from the Fragile Families and Child Wellbeing Study (FFCWS), this research examines whether nonresident fathers who owe child support arrears are at risk for the development of depression and alcohol abuse problems. To attenuate a potential omitted variable bias, I controlled for fathers' previous mental health status by including a lagged dependent variable as a covariate. As a robustness check, I used an instrumental variable approach to correct for endogeneity and measurement error associated with mothers' report of fathers' child support arrears. The study provides strong evidence that fathers who owe arrears are more likely to report mental health problems than those who do not owe any arrears. The study also finds that fathers who receive more support from friends and families during childbirth were less likely to develop depression caused by child support arrears than those who receive less support.

Keywords: Child support debt · Depression · Anxiety · Alcohol Abuse · Social Support · Stress Process

I. INTRODUCTION

When a child lives in a single-parent household, a nonresident parent (usually a father) is obligated to provide financial assistance to the resident parent who lives with the child. Since the enactment of the Child Support Enforcement Act of 1975, the federal government continued to strengthen its effort in collecting child support payments from noncustodial fathers (Pirog & Zioli-Guest, 2006). Nonetheless, the level of noncompliance remains high: the Office of Child Support Enforcement (OCSE) reports that as of 2011, the child support debt grew to over \$110 billion nationally. Although the OCSE collected and distributed approximately \$7 billion of these arrears in 2010, 11.3 million child support cases still had arrears remaining (OCSE, 2011). Without a doubt, the child support debt is damaging to the state economy (Bartfeld, 2003; Heinrich, Burkhardt, & Shager, 2011; Sorensen, Sousa, & Schaner, 2007).

In addition, child support debt may have unintended consequences for both nonresident fathers and their children. A growing body of research has raised concerns that child support debts are detrimental to custodial mothers and children because they fail to receive much needed-income (Bartfeld, 2005; Bartfeld & Meyer, 2003; Sorensen et al., 2007). Recent studies have also demonstrated the negative impact of child support debt on nonresident fathers' labor force participation (Miller & Mincy, 2012) and their involvement with children (Turner & Waller, 2017). However, previous studies have neglected to explore other significant consequences of the debt, particularly the impact on fathers' mental health outcomes, such as depression and anxiety.

Depression is an important cause of work absenteeism, loss of productivity, and even mortality (Henderson, Harvey, Øverland, Mykletun, & Hotopf, 2011; Mykletun et al., 2007). Approximately one in five clinically depressed and treated patients in the U.S. committed suicide

(Bostwick & Pankratz, 2000), which is expected to be higher among untreated persons. Anxiety, as is usually comorbid with depression, is responsible for a marked impairment in quality of life, reduction in social and occupational functioning (Greenberg et al., 1999; Kessler & Greenberg, 2002; Sherbourne, Wells, Meredith, Jackson, & Camp, 1996). Both depression and anxiety are typically recurrent and chronic, causing a significant financial burden associated with the use of medical resources (Fostick, Silberman, Beckman, Spivak, & Amital, 2010; Greenberg et al., 1999). The inability to repay debts would cause falling further behind in paying off child support debt, resulting in more severe depressive symptoms among impacted fathers. Indeed, the last victim of this vicious cycle would be the children who have not received any support from their nonresident fathers.

Despite some qualitative studies showing that the accumulation of large child support debt may be adversely affecting the mental health of nonresident fathers (Lin, 2000; Waller & Plotnick, 2001), there have been few quantitative studies on this relationship. Using previously unavailable data of fathers' mental health outcomes from the Fragile Families and Child Wellbeing Study (FFCWS), the current study estimates whether the nonresident fathers with child support debts are at risk for the development of mental health problems. Since the data do not provide enough information about whether the father meets anxiety disorder criteria after 3-year follow-up survey, the study uses alcohol abuse problem as an alternative outcome, given the evidence that both anxiety and alcohol problems have a shared comorbid condition with common underlying risk factors (Brady & Lydiard, 1993; Kushner, 1996; Kushner, Abrams, & Borchardt, 2000). Another goal of this paper is to investigate whether the presence of social support from friends and family can buffer or protect the fathers from the negative consequences of child support debt.

II. POLICY CONTEXT

Child support debts appear at the final stage of the child support enforcement process. When a couple is divorced or separated, a child support order must be set by state child support guidelines. Before the enactment of the Child Support Enforcement Act of 1975, family court judges had the discretion to decide the amount of child support owed. The problem with this method is that judicial discretion can sometimes be unfair, unreasonable, and even arbitrary, and therefore, the nonresident father may not be willing to comply with his obligations (Pirog & Ziol-Guest, 2006). The presence of judicial discretion was the major cause of child support debt until the enactment of the Family Security Act of 1988. This Act required judges to report a statement of reasons if the amount of child support owed deviated from the guidelines. To enforce this law, each state had to explore a variety of potential guidelines that could apply to their specific situation. There are three different types of child support guidelines including; income shares, percentage of income, and Melson Formula mode. All three guidelines take into account the incomes of either or both parents when determining the amount of the child support award.

The amount of the child support award can be modified if fathers' ability to pay child support changes (Ha, Cancian, & Meyer, 2010). However, having a child support order modified sometimes takes a longer period of time than many low-income fathers expect. A father interviewed in Mincy et al. (2014) claimed that he could not get his child support order modified because the mother of his child did not appear in court at the time of the modification hearing. Another father who had fluctuating income had difficulty modifying the orders because he could not take a day off to attend court (Mincy et al., 2014). The problem is that the child support debts continue to grow over the period of waiting for the modification. Of course, it is even more

detrimental to incarcerated fathers who usually do not have the means to pay the debts (Holzer, Offner, & Sorensen, 2005; Pearson, 2004). Further compounding the problem is that most of these low-income fathers are ignorant of the conditions under which they are eligible to apply for the modification (Hatamyar, 2000).

A nonresident father may also be less likely to allocate income to child support when his children receive less money than expected (Beller & Graham, 1996). For instance, a father with children on welfare might be reluctant to comply with child support obligations, knowing that the contributions to the child will instead be used to recoup government expenditures on welfare costs (Waller & Plotnick, 2001). To address this issue, the Child Support Amendments of 1984 required states to pass through \$50 of the child support payment to the custodial parent on welfare, and disregard this amount for determining the welfare grant. The main purpose of this policy was to give the child support obligors an incentive to use the formal child support program by cooperating with the local enforcement agencies. However, the Personal Responsibility and Work Opportunity Act of 1996 (PRWORA) modified the pass-through and disregard policies, and now states can either keep all the child support received to recover welfare expenditures, or pass all or part of the payments to custodial mothers. Another groundbreaking government effort in collecting child support includes automatic wage withholding for delinquent obligors. The Child Support Enforcement Amendments of 1984 mandated wage withholding for every noncustodial fathers with arrears, resulting in an increase in child support collections from the fathers (Garfinkel & Klawitter, 1990). The automatic wage withholding covers almost 70 percent of child support collected in 2004 (Pirog & Ziolk-Guest, 2006).

Despite remarkable success in collecting child support from nonresident fathers, the level of unpaid child support remains high, especially among low-income fathers. According to a recent study based on nine large states, fathers who make less than \$10,000 per year owed two-thirds of total child support debt, and each of these “high debtors” owed more than \$30,000 (Sorensen et al., 2007). The greater the amount of debt, the less likely the father will participate in the formal labor market, because the debt would lower the effective wage (Beller & Graham, 1996). If the father cannot work, then there are fewer chances to pay-off child support debts, and as a result, the debts are more likely to snowball. Therefore, the nonresident fathers with high arrears will continue to fall further behind regarding the repayment of their debts (Miller & Mincy, 2012; Pate, 2002).

A large body of research indicates that accumulation of arrears is, in part, the result of state-level enforcement policies (Office of Child Support Enforcement, 2014; Sorensen, 2004; Sorensen, Koball, Pomper, & Zibman, 2003; Sorensen et al., 2007). Sorensen and colleagues (2007) found that states that assessed interest on a routine basis had higher arrears growth rate than other states between the 1990s and 2000s. A report from the Institute for Research on Poverty (Bartfeld, 2003) yielded consistent results indicating that nearly 50 percent of total debts were attributable to the state-level policies. In addition, some punitive enforcement actions, such as tax refund intercepts, asset seizures, and professional license revocations, do not result in increased child support collection, but instead make it hard for low-income fathers to work in the formal labor market (Mincy & Sorensen, 1998; Sorensen et al., 2007).

To reduce the accumulation of child support debts, state and local governments had developed a number of policies under the Child Support Performance and Incentive Act of 1998

(CSPIA)¹ (U.S. Government Accountability Office, 2011). There are two approaches to reduce the debts: one is to prevent the further accumulation of debt, and the other is to reduce the existing debt (Bartfeld & Meyer, 2003; Sorensen et al., 2007). The underlying philosophy of the debt reduction programs is to help noncustodial parents pay off their current child support debts by using state resources so that they can continue to comply with child support obligations in the future. Several states, including Wisconsin, Colorado, and California, have reported that such debt reduction programs have reduced child support debt burdens for nonresident fathers and increased the receipt of child support (California Department of Child Support Service, 2008; Heinrich et al., 2011; Pearson & Davis, 2002).

III. THEORETICAL AND EMPIRICAL LITERATURE

Stress Process Model as a Theoretical Framework

The obligation to repay debts usually comes with a feeling of shame and guilt, resulting in a low self-esteem (Dwyer, McCloud, & Hodson, 2011). Likewise, child support debt may erode the father's sense of self-concept because it hampers future consumption, and increases feelings of impotence. A sociological perspective suggests that a sense of self-concept is a potential resource that can protect mental health from detrimental life events such as economic hardship and indebtedness (Kessler & Essex, 1982; Lachman & Weaver, 1998; Pudrovska, Schieman, Pearlin, & Nguyen, 2005). Thus, fathers with child support debts may become frustrated and as a result, have a high risk of depression and anxiety.

¹ According to CSPIA, the federal government is required to provide an incentive to the states that perform well based on National Child Support Goals measured by five performance indicators: arrearage collection, paternity establishment, order establishment, current collection, and cost-effectiveness (Solomon-Fears, 2013).

In recent years, research on mental health outcomes associated with personal debt has been guided by the stress process model (Drentea & Lavrakas, 2000; Drentea & Reynolds, 2015). The stress process model, proposed by Pearlin and his colleagues (Pearlin, 1999; Pearlin, Menaghan, Lieberman, & Mullan, 1981), consists of three interactive conceptual components: (1) stressors, (2) moderating resources, and (3) stress outcomes. The underlying assumption of this model is that stressors are shaped by the socioeconomic contexts associated with a father's mental health outcomes. Therefore, complex genetic mental disorders, such as schizophrenia, are usually not used as outcomes in the stress process model (Aneshensel, 1992).

The stressors include those events that occur at a personal or family level that are either acute or may have chronic consequences. One's indebtedness is a money-related stressor that could lead directly to changes in the individual's level of depression or delinquent behaviors (see Panel 1 in Figure 1). For instance, fathers with a large accumulation of arrears may have to face many uncomfortable or distressing factors. They may have to cut down their regular household expenditures, such as food or housing, to pay their overdue debts. Because of an inability to make ends meet due to a heavy arrears burden, fathers may experience serious psychological distress (Murray, 2010).

In addition, Pearlin and many stress researchers posit that life stressors can be alleviated by the presence of one's social support that are disproportionally distributed across social groups (See Panel 2 in Figure 1). The term "social support" refers to the extent to which individuals can access financial and emotional support, or both, in the form of relationships (Cohen & Wills, 1985; Johnson & Sarason, 1978; Pearlin, 1999). In the stress process model, social support is a coping device that helps fathers deal with distress caused by financial strain. For instance, when the fathers has a high arrears burden, social support can serve as a safety net to help fathers get

through difficult times. Therefore, if the father receives social support from his friends and family, his chances of developing mental health problems in response to a stressor will decrease.

Debts and Mental Health among General Population

A large body of literature suggests that financial indebtedness or an increase in debt may create a higher risk of stress-related mental health problems, such as anxiety, depression, and substance abuse (Bridges & Disney, 2010). The evidence of a causal link between individual debts and mental health is prevalent across western countries. Using data from 17 European countries between 1995 and 2012, Clayton, Liñares-Zegarra and Wilson (2015) have shown that accumulated household debts are an important factor for negative health outcomes across countries. This finding is in line with earlier work by Fitch, Hamilton, Bassett and Davey (2011) who conducted a systematic review of the relationship between personal debt and mental health in the English-language and peer reviewed literature between 1980 and 2009. Among 50 selected papers, a large number of studies found significant relationships between debt and mental health (Clayton et al., 2015). Consistent with this study, a meta-analysis recently published in clinical psychology examined data from 65 studies and found a link between debts and mental health. The study suggested that the likelihood of having a mental disorder is more than three times higher among people in debt (Richardson, Elliott, & Roberts, 2013). Meltzer and his colleagues further expanded this idea and found that the situation was more detrimental among those with addictive behaviors, such as alcohol or drug dependence (Meltzer, Bebbington, Brugha, Farrell, & Jenkins, 2013).

A growing number of studies have been addressing debt-related issues that have emerged in the U.S. According to a report from the Federal Reserve Bank of New York (2017), mortgage

debt, credit card debt, and student loans² are three major reasons Americans fall into economic hardship. Over the past two decades, media reports about the adverse mental health consequences of financial debts have increased significantly, leading many researchers to investigate the effects of indebtedness across different groups (Jacoby, 2002). Drentea and Lavrakas (2000) examined the effect of credit card debt on health problems. Using a random telephone survey in Ohio in 1997, they found that credit card debt has a stronger effect than income on stress-related health outcomes and risky behaviors, and the effects are stronger for Blacks than other racial groups. Reading and Reynolds (2001) focused on maternal depression among women who have children less than one year of age. Using self-reported data collected from families with young children, however, they found that debt concerns were not independently associated with depressive symptoms measured six months later.

There are several potential confounders to the association of indebtedness and mental health outcomes. Drentea (2000) argued that younger adults are more anxious about debts because anxiety tends to decrease with age (Schieman, 1999). Depression, on the other hand, is less likely among the young adults (Mirowsky & Ross, 1992). According to Dwyer and colleagues (2011), young adults are less stressed out from the credit card or other debts than older adults because they tend to view those debts as future investments. Another confounder of the association between indebtedness and mental health is the debt burden (Meltzer et al., 2013). Zimmerman and Katon (2005) showed that depression was highly associated with income among

² Total U.S. household debt hit a record high in the first quarter of 2017. According to the Federal Reserve Bank of New York (2017), Americans have more than \$9 trillion in mortgage debt and nearly \$4 trillion in student loan and credit card debt combined. Americans owe more than \$60,000 per person in household debt, which is the third largest amount of debt per capita among OECD countries after Japan and Ireland (OECD, 2017). Households' ability to maintain debt has been declining since the recession began, as the ratio of debt to disposable income drops from 133.7% in 2007 to 103.3% in 2017. Apparently, Americans are up to their eyeballs in debt.

low-income male. The result suggests that the greater the burden of debt, the higher the degree of depression.

Child Support and Mental Health Problems among Low-Income Fathers

Low-income nonresident fathers may have a higher risk of mental health problems than other fathers (DeKlyen, Brooks-Gunn, McLanahan, & Knab, 2006). One possible reason may be related to the strictness of child support enforcement system. Many noncustodial fathers with high levels of child support debt find it hard to comply with child support obligations. According to qualitative research conducted by Waller and Plotnick (2001), a large amount of child support debt is often described as burdensome and overwhelming for low-income noncustodial fathers. Many noncustodial father respondents to the study could not pay off child support debts, despite allocating more than half of their income to child support payments (Waller & Plotnick, 2001). To quote a father interviewed in Sherwood's qualitative study(1992) introduced by Waller and Plotnick (2001), this high level of child support debt is "what's killing us."

Kimberly Turner and Maureen Waller's study (2017) is the only empirical research that explored the link between child support arrears and fathers' mental health, although the study was originally designed to test the mediating effects of mental health on a relationship between child support arrears and father involvement. Nevertheless, they found that an accumulation of child support debt at a high level creates an increased risk for depressive symptoms among nonresident fathers whose noncustodial child was aged 9. However, the potential threat associated with endogeneity arising from simultaneity is of concern as the link between child support and mental health was cross-sectional. That is, the mental health problems of the father may lead to an inability to pay child support obligations. Therefore, the endogeneity of child

support arrears may result in biased estimates of the effect of the debts on fathers' mental health outcomes.

Based on the stress-process model and the extant literature, the present study tests the following three hypotheses:

H₁: Child support debt will be positively associated with fathers' mental health outcomes.

H₂: The effect of having child support debt on mental health outcomes will be stronger for fathers with high debt burdens than those with low debt burdens.

H₃: The existence of social support moderates the relationship between child support debt and the risk of mental health problems among nonresident fathers.

IV. DATA AND VARIABLES

Data Set

The analysis of the current study uses 3,099 repeated observations (1,606 unique observations) of fathers who were not deceased or unknown but were not living with the mother of the focal child at some point since the one-year follow-up survey. From the 4,898 unique observations at the baseline survey, 183 cases are excluded because fathers were deceased or unknown between baseline and year-nine follow-up, and 407 cases are excluded because fathers had custody, yielding 4,308 unique observations. Of these, 1,982 fathers (46%) who remain resident between 1 year and last follow-up are excluded from the sample. An additional 720 unique observations are dropped because the father was not interviewed at three- five- and nine-year follow-up; yielding the final observations of 1,606.

For the dynamic model, I pool the sample across three-, five-, and nine-year surveys when the father's mental health outcomes were measured, yielding a pooled sample of 3,099.

The pooled sample consists of 1,009 cases from the 3-year follow-up, 1,146 cases from the 5-

year follow-up, and 944 cases from the 9-year follow-up survey. Missing data on a dependent variable is included in the imputation process but is later excluded from the analytic sample, the method recommended by Von Hippel (2007), yielding 3,088 repeated observations (1,603 unique observations) for the depression outcome and 2,886 observations (1,546 unique observations) for the binge drinking outcome. The difference in demographic characteristics between the two repeated samples are minimal.

Compared to the core sample of Fragile Families and Child Wellbeing Study (FFCWS) at baseline, the study sample includes a larger proportion of fathers with lower educational attainment, more likely to born in the United States, and more African American and fewer White fathers. The study sample also includes a smaller proportion of fathers who work in full-time jobs and whose child's mother are financially independent. In short, the analytic sample is comprised of fathers who are relatively vulnerable to financial shocks. This is not surprising, given that the sample is restricted to nonresident fathers who appear to be more economically vulnerable than their resident father counterparts (Mincy et al., 2014).

Variables

Paternal depression

As shown in the literature review, paternal depression is an important dimension of mental health outcomes. Based on the World Health Organization's Composite International Diagnostic Interview-Short Form (CIDI-SF) (Kessler, Andrews, Mroczek, Ustun, & Wittchen, 1998), paternal depression is measured by fathers' direct reports at the one-, three-, five- and nine-year follow-up surveys of the FFCWS. Fathers were asked whether they had been feeling sad, blue, depressed, or were losing interest in things that were usually pleasurable in the past year that lasted more than 2 weeks. If they answered yes to any of the items, they were asked

more specific questions. These included whether they were : 1) losing interest, 2) feeling tired, 3) gain or lose in weight, 4) trouble falling asleep 5) trouble concentrating, 6) feeling down, and 7) thinking about death. Each item score used in the study are summed, leading to a depression score range of 0-7. Using this depression score, I predict a probability of being in a CIDI depression category among fathers who endorse diagnostic stem questions. As revealed by Kessler et al. (1982), individuals with a probability of more than 0.5 in the CIDI depression category or those with a depression score of 3 or higher are expected to have a major depressive disorder. The current study uses a dichotomous measure of the major depressive symptoms based on the Kessler et al.'s method described above. To control for non-random selection into arrears status, the study introduces a measure of prior paternal depression.³

Alcohol dependence

The study examines self-reported fathers' alcohol dependence in the one-, three-, five- and nine-follow-up surveys of the FFCWS based on the Alcohol and Drug Dependence scales derived from the World Health Organization's CIDI-SF (Kessler et al., 1998). Fathers will be considered as alcohol-dependent if they have at least five or more drinks in a single day in the last twelve months (dichotomous outcomes). The study includes a measure of prior alcohol dependence from the previous wave to control for earlier level of delinquent behaviors.⁴

Stress exposure: child support arrears

Following the method used by Miller and Mincy (2012), the current study constructs two measures of child support arrears at the three- five- and nine-year follow-up surveys. One is a binary measure taking the value of 1 if the fathers have ever had a child support debt, and 0

³ Note that the depression variable measured at the one-year follow-up survey is used only for the lagged dependent variable).

⁴ Note that the alcohol dependence variable measured at the one-year follow-up survey is used only for the lagged dependent variable).

otherwise. The other is a categorical measure constructed by taking the ratio of the amount of arrears to fathers' income (0= no arrears, 1=1-50%: low arrears burden, 2= 50% or above: high arrears burden). Both income and arrears are adjusted to 2006 dollars using the Consumer Price Index. Because of the high proportion of missing data for the father-reported arrears variables, the study uses the data reported by their child's mother. The mothers were asked if the father has any arrears that he is supposed to pay to the mothers or to the government. For those who did not report arrears but established child support orders, I assumed that the amount of arrears is equivalent to the difference between the amount of child support owed and the amount received. I also assumed that the amount of arrears is zero for fathers who complied with child support obligations in full.

It is evident that mothers are likely to report father's child support debts with error. For example, as Miller and Mincy (2012) pointed out, mothers may under-report the actual amount of arrears owed by fathers because they have little information about the unpaid amount of child support owed to children of different mothers. In this case, it is difficult to make an accurate estimate of arrears unless there is administrative data for child support. However, if a case, other than the missing cases, is directly related to the mother, she may over-report on the father's arrears. Much of past research on child support has suffered from the inaccurate information about payments and orders reported by both mothers and fathers. For instance, there is evidence supporting the notion that mothers tend to over-report noncustodial fathers' obligations to support their children, whereas fathers tend to under-report their obligations (Braver, Fitzpatrick, & Bay, 1991). This evidence is consistent with the results from the FFCWS data where the father's reports on the proportion of arrears that he owes to the mother or the government were significantly lower than the mother's reports. Therefore, using the mothers' reports of arrears as a

key independent variable may induce a downward bias in the estimates of the effect of arrears on mental health outcomes. The study has attempted to address this limitation using instrumental variable, as described below.

Moderator: social support

Social support refers to a range of assistance individuals could get from friends and family if needed (Cohen & Hoberman, 1983). In particular, when one becomes a parent, she or he may need extra financial help from others. I assume that a person who can help the father financially can also provide him with emotional support and make him feel less stressed about his child support debt. To measure the social support, I created a dichotomous measure to indicate whether a father had received a social support from the following question: “Since child was born, have you received any financial help or money from anyone other than mother?” The support includes fathers’ relatives and friends but does not include help from any government or private agency.

Table 1 presents the descriptive statistics for dependent and key explanatory variables. Of the fathers in the analytic sample (N=3,099), only 13.7% of them experienced depression at 1-year follow-up survey, slightly declining to 12% at 3-year and 5-year, but rising again to 14.5% by 9-year. In the 1-year follow-up survey, only 10% of fathers were engaged in binge drinking, but this proportion had increased to 35.3% of fathers by 9-year. As expected, the proportion of fathers who owe child support arrears had continued to increase over time since childbirth (from 10.2% at 1-year follow-up to 34.9% at 9-year follow-up survey). As time passes since the childbirth, a higher proportion of nonresident fathers had accumulated arrears burdens that exceeded their incomes: In the 1-year follow-up survey, only 1.6% of fathers owed child support

debts that was more than 50 percent of their income, but this proportion increased to 9.7% of fathers by 9-year.

Control variables

The study accounts for the selection into nonresident fatherhood by controlling for a large number of individual-and state-level characteristics. The study first controls for a number of time-invariant socioeconomic characteristics of fathers reported by the father at the time of the baby's birth. The study also adjusts for a set of time-varying covariates measured at each survey year.

Fathers' self-reported educational attainment at the time of birth is measured as a four-category scale: less than high school (reference), high school diploma, some college, and college graduate. Fathers' race/ethnicity is measured by a set of dummy variables for non-Hispanic White (reference), non-Hispanic Black, Hispanic, and other race. Fathers' nativity is coded as a dummy variable, with 1 indicating whether the father was born in the United States. Fathers' age and age squared are measured in years at the time of birth. To measure fathers' cognitive functioning, the study uses the Wechsler Adult Intelligence Scale-Revised (WAIS-R), a single most widely used instrument in measuring cognitive developments for young adults. The score for this variable ranges from 0 to 15, where 15 means "very intelligent." Fathers' health at the time of birth is represented by a Likert scale ranging from 1 (Great) to 5 (Poor).

The study includes three pieces of information relating to the relationship quality between mothers and fathers: (1) absence of a father's name on the birth certificate (1=No, 0=Yes); (2) fathers' number of children with other mothers at the time of baby's birth; and (3) whether fathers asked mother to have an abortion (1=Yes, 0=No). For measure of mothers' financial wellbeing, the study includes two sets of dummy variables indicating (1) whether the mothers

have unemployment insurance, disability insurance, or social security; and (2) whether the mothers receives money from friends and family. The study includes two pieces of information about the child: (1) gender (1=Male, 2=Female), and (2) low-birth weight (1=baby less than 2,500 grams, 0 baby more than or equal to 2,500 grams).

To account for the initial value problem in the dynamic Probit model, the study includes five sets of dummy variables indicating family mental health history by asking the following questions about the fathers' biological father (1) he was depressed or blue most of time; (2) he constantly nervous, edgy, or anxious; (3) he ever have a problem with drinking; (4) he ever have a problem with drugs; and (5) he ever attempt to commit suicide.

The study also includes a set of time-varying covariates measured at each survey year: mother-reported relationship transition (father becoming a non-resident parent), whether the father was in jail at the time of the interview reported by the mother, and fathers' self-reported labor force participation (1=unemployed, 2=part-time job, and 3=full-time job). Because the time-varying covariates may be affected by either or both arrears and mental health outcomes, the study will present an alternative set of estimates with lagged time-varying covariates to determine the robustness of the findings.

Table 2 provides descriptive statistics for all covariates used in the study. Approximately 20% of fathers had some college or more. 11.5% of fathers were non-Hispanic White, 64.7% were non-Hispanic Black, and 20.8% were Hispanic. On average, these fathers were in their mid-20s at the time of the baby's birth and more than 90% of them were born in the U.S. Most fathers were healthy and had their name on the birth certificate. On average, these fathers had 2.134 children with other women before the focal child was born. Only 11.6% of fathers asked the mother to have an abortion. Ten percent of mothers received public assistance, but 37% of them

received income from friends and family members. Slightly more than half of the children were boys, and only 10% of them were of low birthweight. Less than a quarter of fathers had a biological father who suffered from mental health disorders. Forty percent of fathers received social support from friends and families when the baby was born.

In regard to time-varying covariates, most fathers become nonresident when the child was five years old the results of which are consistent with the findings of Halpern and Turney (2000). Thirteen percent of fathers have been in jail at mothers' 3- and 5-year interview, declining to 8.1% at 9-year interview. Most noncustodial fathers work in full-time jobs during survey years.

Missing Data

The presence of non-random attrition can cause a serious bias in estimating causal link between treatment and outcomes. In this paper, less than 15 percent of the 3,099 cases have missing information on any study variables. Because of a large number of variables with missing data, the study uses multiple imputation using chained equation (MICE), the most advanced imputation technique in social science so far. Unlike other imputation techniques, MICE uses multiple complete data sets with multiple times to impute missingness. To use this method, three consecutive processes are needed. First, the missing values are replaced in m times, in this study's case 5 times, to generate complete data sets. Next, these multiply imputed data sets are analyzed by using a separate imputation model for each variable to generate complete data. Lastly, combine the results of the complete data set and run the previous three steps multiple times (5 times in this study).

There are three advantages in using the MICE technique. First, MICE can use model restrictions to handle complex patterns of missing data. For instance, if a father reported that he

did not establish child support orders, he skipped questions related to child support arrears. With this skip-pattern in mind, imputation models with restriction ensures that missing values on child support arrears would not be imputed for those fathers who did not establish child support orders. Next, the MICE assumes that the missing data should follow *a missing at random* mechanism, which is not a strong assumption because the study has a large number of covariates that may provide more information about the missing data. Lastly, the confidence intervals of the study results will have correct coverage properties, as MICE addresses more types of uncertainties about the missing values than any other imputation technique. For instance, the regression imputation approach assumes that the coefficients taken from the points on the regression line is considered a true value. The MICE approach, on the other hands, is skeptical of this assumption due to the uncertainty of the model's parameter. To address this type of uncertainty, MICE draws the coefficient values from an appropriate distribution, a normal distribution in case of this study, instead of assuming that the values are true.

V. ANALYTIC STRATEGY

The main objective of this study is to test whether nonresident fathers who owe child support arrears are at risk for the development of mental health and alcohol abuse problems. Our theory predicts that fathers with a history of mental health problems are likely to fall into financial difficulties, which may later have a more significant impact on severe mental illness. Therefore, failure to control for the previous mental health status may overstate the impact of child support debt on current mental health problems. To address these concerns, the study includes a lagged dependent variable (whether father had mental health/alcohol abuse problems at previous wave) as a covariate to reduce a possible omitted variable bias. Another theoretical motivation to include the lagged dependent variable is to capture the *autoregressive effects* – the

effect that accounts for the previous level of the dependent variable.⁵ This method, also known as the “dynamic Probit model” can be estimated only from the longitudinal data set.

The specification for the dynamic Probit model is as follows:

$$P\left(y_{it} = 1 | (Arr_{i,t}, y_{i,t-1}, X_{it}, \omega_i, \mu_i)\right) = \Phi(\tau Arr_{i,t} + \gamma y_{i,t-1} + X'_{i,t}\alpha + \omega'_i\beta + \mu_i) \quad (1)$$

Where $i = 1, \dots, N$ for each individual in the panel, and t refers to the time period, either wave 3 (3-year follow-up), wave 4 (5-year follow-up), or wave 5 (9-year follow-up). The dependent variable, y_{it} , is defined as a dummy variable indicating whether father i has mental or alcohol abuse problems at time t . As previously mentioned, I include the fathers’ previous history of mental or alcohol abuse problems, $y_{i,t-1}$, to account for autoregressive effect. The coefficient of the autoregressive parameter, γ , indicates the extent to which a predisposition to mental/alcohol abuse problems in previous survey year is transmitted to mental/alcohol abuse problems in current survey year. $Arr_{i,t}$ is defined in two alternative ways: either a dummy variable indicating whether father i has accumulated child support arrears at time t or the ratio of arrears to earnings. X_{it} and ω_i are vectors of time-varying and time-constant covariates, respectively. Note that the issue of reverse causality will be discussed in later section. Lastly, μ_i is time-invariant effects representing unobserved heterogeneity that is common to father i across all waves (individual-specific effects).

Although the dynamic Probit models can minimize the omitted variable bias, it cannot fully eliminate the possibility of such bias if the initial condition effects are neglected (Arellano

⁵ Or it can be defined as “the effect of a construct on itself measured at a later time” (Selig & Little, 2012)

⁶ $t-1$ refers to the lagged time period, either wave 2 (1-year follow-up), wave 3 (3-year follow-up), or wave 4 (5-year follow-up).

& Hahn, 2006; Bover & Arellano, 1997; Heckman, 1987; Wooldridge, 2005). That being said a potential relationship between time-invariant unobserved heterogeneity, μ_i , in Eq 1 and fathers' past mental health status, $y_{i,t-1}$, can lead to a significant problem of the so called "initial value problem." For example, mental health outcomes can be attributed not only to a combination of social, psychological, and economical factors, but also to unobserved personal tendencies that do not change over time (initial condition). Obviously, these unobserved personal tendencies would affect fathers' past mental health status, which would violate the basic assumption of random effects that μ_i should be independent of all other variables on the right-hand side (Angrist & Pischke, 2008). Violation of this assumption can lead to serious bias in estimates of autoregressive parameter and all other parameters, including τ .

Some studies have attempted to solve this problem by assuming that μ_i is exogenous but, as Heckman (1987) showed, this assumption can cause more serious bias. Instead, I use the approach proposed by Wooldridge (2005) who suggests that the distribution of unobserved effects can be modeled based on the initial dependent variable. However, since the fathers' mental health problems based on the CIDI-SF were not measured at the baseline of FFCWS study, its initial condition for some fathers is unknown⁷. Instead, assuming that family's past mental health history can predict one's risks for future mental disorders and alcohol use problems, and those risks are assumed to remain constant over time, I specify the unobserved heterogeneity as a linear function of the fathers' family mental health history (MHS_{i0}) as follows:

$$\mu_i = \delta_0 + \delta_1 MHS_{i0} + \varepsilon_i \quad (2)$$

⁷ Especially for those who report an establishment of child support order at Year1 follow-up.

Where

$$\mu_i | (MHS_{i0}, Arr_{it}, y_{i,t-1}, X_{it}) \approx N(0, \sigma_\varepsilon^2) \quad (3)$$

Therefore, I substitute eq2 into eq1 by adding the MHS variable as an additional covariate. This procedure yields the following equation:

$$P(y_{it} = 1 | (Arr_{it}, y_{i,t-1}, X_{it}, \omega_i, MHS_{i0}, \varepsilon_i)) = \Phi(\tau Arr_{it} + \gamma y_{i,t-1} + X'_{i,t} \alpha + \omega'_i \beta + \delta MHS_{i0} + \varepsilon_i) \quad (4)$$

The study examines three successive models by subsequently adding predictors as specified in Equation 1 and 4. The first model is a bivariate model predicting mental health outcomes based only on whether or not fathers owe child support arrears. In the subsequent model (Model 2), the study replicates the results of previous studies showing that mental health and alcohol abuse outcomes are highly correlated with individual's socio-economic characteristics. Finally, in Model 3, the study adds the lagged dependent variable and initial conditions of mental health/alcohol abuse problems to Model 2. The standard errors in each model are clustered by year to account for unobserved temporal heterogeneities. In order to make the coefficients of the Probit estimation interpretable, all results are presented as marginal effects evaluated at the sample means.

VI. RESULTS

Main Analysis

The estimation results from the dynamic Probit model are reported in Table 3 for depression and Table 4 for alcohol abuse problems. It first presents a bivariate model (Model 1) and then a model including previously identified covariates⁸ (Model 2), followed by a model

⁸ The model includes a set of time-invariant socio-demographic characteristic, as well as individual- and state-level covariates that change over time.

including both the lagged dependent variable and the initial conditions (Model 3). In each model, coefficients on the dichotomous measure of child support debt are shown at the first row. The coefficients on the ratio of arrears to earnings measure are presented in the subsequent row. Lastly, the coefficients on the covariates are from the models where the dichotomous measure was used as a key independent variable.

From the depression model, the study provides strong evidence that fathers who owe arrears are more likely to report depressive symptoms than those who do not owe any arrears. Model 1, the bivariate model, in the left panel of Table 3 shows that there is about 5.6⁹ percentage point difference in probability of having depressive symptoms between fathers who owe child support debt versus fathers who do not owe any. Having a father whose ratio of debt to income is less than 50 percent would still be at risk for the development of depressive symptoms, but the risk to the father who owes child support debt of more than 50 percent of his income is still higher (5.4 vs 8.2 percentage point). In Model 2, the results for the debt-depression relationship are robust to the inclusion of a rich set of covariates, although the effect size is reduced. For example, the magnitude of the coefficient on fathers' arrearage status is reduced by 21 percentage points ($b=0.044$, $p<0.001$), and a similar degree of change is also observed in fathers with low and high arrears burden ($b=0.049$, $p<0.05$ for low burdens; and $b= 0.048$, $p<0.01$ for high burdens, respectively). In Model 3, which adjusted for the lagged dependent variable and the initial condition, arrears coefficients are slightly reduced in magnitude ($b=0.036$) but remain significant at the 1 % level. The coefficient estimates of the lagged dependent variable can be interpreted as 1 percentage point increase in probability of developing depressive symptoms in previous survey

⁹ Note that when this result is expressed in logit form, the ratio of the probability of not having depressive symptom versus having depressive symptom (odd ratio) is 1.64. According to Chen et al.'s study (2010), the magnitude of this ratio (Odd ratio) is considered to be small as the odd ratio of 1.68 is assumed to be equivalent of Cohen's d of 0.2.

year produces a 0.11 percentage point increase in probability of developing depressive symptoms in current survey year.

Turning to the estimates of alcohol abuse problems, Model 1 in the right panel of Table 3 shows that fathers with child support arrears are 6.7 percentage points more likely to develop alcohol problems than those without the arrears. In addition, as reported in the second row, having child support arrears of less than 50 percent of fathers' income is associated with an 8.3 percentage point increase in the probability that fathers have drinking problems. However, the arrears coefficients drop by including a large set of covariates in Model 2, although the coefficient remains significant at the 1% level. The regression coefficients for arrears do not change substantially in Model 3, which adjusted for the lagged dependent variable and the initial condition. The coefficient estimates of the autoregressive effect implies that a 1 percentage point increase in probability of having drinking problems in the previous survey year produces a 0.150 percentage point increase in probability of having drinking problems in current survey year. In sum, the results indicate that, compared to those who did not owe any arrears, fathers who owe arrears are more likely to report mental health symptoms and are more likely to have alcohol abuse problems.

The findings for the control variables are generally consistent with the previous research on depression in adults. As shown in the second column of Table 3, fathers are more likely to develop mental health problems when they are unemployed, have a history of incarceration, or have children with other women. These factors put fathers at higher risk of depression. In addition, African American fathers are less likely than White fathers to develop depressive symptoms, the result of which is consistent with those obtained from a large number of previous studies (Assari & Burgard, 2015; Brown, 2003; Williams & Mohammed, 2009; Williams, Yu, Jackson, & Anderson, 1997). The marginal effects of the initial condition on depression are shown in the third

column of Table 3, indicating that family mental health history is significantly associated with fathers' current depression.

The marginal effects of the control variables on the alcohol outcomes are shown in the fifth column of Table 3, indicating that fathers are more likely to develop alcohol problems when they are attached to the labor market, have no history of incarceration, or have obtained higher education. The finding that White fathers have a higher risk of developing alcohol dependence than African American fathers is not consistent with previous research in which African American Americans have a higher risk of alcohol dependence (Herd, 1994; Mulia, Ye, Greenfield, & Zemore, 2009). Part of the reason for this discrepancy is that the sample of the study consisted of non-resident fathers who are predominately Black and Hispanic. Therefore, the results are not representative of the White Americans in general.

Heterogeneous Effects of Child Support Debt by Social Support

As hypothesized in the stress process model, the effects of child support debt on the development of depression and alcohol abuse problems may be moderated by social support. That is, fathers who experience more support from friends and family may be less likely to develop mental health and alcohol abuse problems as a result of child support debt than those who experience less support. To test this hypothesis, equation 5 adds an interaction term between child support debt and social support ($Arr_{it} \times SSup_i$) to the Eq4.

$$P\left(y_{it} = 1 | (Arr_{it}, SSup_i, y_{i,t-1}, X_{it}, \omega_i, \mu_i, MHS_{i0})\right) = \Phi\left(\tau Arr_{it} + \pi(Arr_{it} \times SSup_i) + \gamma y_{i,t-1} + X'_{it}\alpha + \omega'_i\beta + \delta MHS_{i0} + \varepsilon_i\right) \quad (5)$$

The interaction term represents the difference in the marginal effect of child support debt on outcomes between fathers with and without social support. However, unlike the linear model

with explicit interaction term, the marginal effect of child support arrears is not constant, but instead depends on the arrears variable and other covariates, including the social support variable. Therefore, as described by Ai and Norton (2003), the coefficient of the interaction term in nonlinear models, such as equation (5), is not equivalent to the marginal effect calculated by statistical software packages, e.g. Stata. Instead, as suggested by Karaca-Mandic et al. (2012), table 4 shows the marginal effect of child support arrears for fathers with social support and the marginal effect of child support arrears for fathers without social support. Testing the hypothesis requires taking the difference between these two marginal effects.

The first two columns in Table 4 provide the results required to test the hypothesis that fathers without social support will be more likely to develop depressive symptoms than those with social support if they have child support arrears. The results support this claim. That is, compared to those who received social support from friends and family during childbirth, fathers who have not received any social support have a probability of developing depressive symptoms that is 3.1 (=6.0-2.9) percentage points higher when they are behind in child support payments. The results reported in Panel 2 are more compelling in terms of dividing fathers into sub-groups who owe arrears either more or less than half of their income. Fathers with a relatively low arrears burden do not receive much benefit from social support because it could only lower the probability of having depressive symptoms by 0.8 (= 5.3-4.5) percentage points. On the other hand, if the fathers with a relatively high arrears burden do not receive social support, the incidence of depressive symptoms increases by 10.8 (= 9.4 - (-1.4)) percentage points. The results in the second column show that the hypothesis is robust to the inclusion of the lagged dependent variable and the initial condition.

The next two columns in Table 4 provide the results required to test the hypothesis that fathers without social support are more likely to engage in alcohol abuse than those with social support if they accumulate child support arrearages. The results support this hypothesis for fathers who owe arrears less than half of their income. However, the probability of having drinking problems is greater for fathers with high arrears burden who received social support from friends and family (see the results of column 3 and 4 in Panel 2). This discrepancy may be attributed to social drinking. Fathers with social support tend to have many close friends and family who involve with them and may have more chance to drink alcohol on social occasions. These friends and family may also offer a drink when a person is going through a financial crisis since alcohol is believed to relieve stress, which may cause more alcohol consumption.

Robustness Check: Instrumental Variable Estimates

As indicated above, the potential measurement errors associated with mothers' reports of fathers' child support arrears can introduce a downward bias in the estimated effect of arrears on mental health outcomes. In addition, there is also a problem of reverse causality if the mothers' reports of arrears are provided before the fathers' reports of mental health outcomes. One might argue that at least the latter problem could be solved by taking the lagged value of child support predictor as an explanatory variable. However, this approach may cause another problem associated with the timing of the survey if the interval between the time when the lagged value of arrears was measured and the time when the mental health outcomes were measured is too long. For instance, some fathers reported that they did not have arrears at the 5-year-follow-up interview, but began accumulating arrears shortly after the interview. These fathers are similar to those who are in the "arrears group," but being treated as if they are in the "non-arrears group," making the results less reliable.

To account for these two potential threats to internal validity, the study uses an instrumental variable (IV) approach that identifies an exogenous source of variation in child support arrears. The idea of this approach is to isolate the effects of arrears on mental health or alcohol abuse problems from other sources of variation, such as measurement error. To be valid, the instrument used in the analysis must satisfy two requirements: it must be associated with child support arrears and be related to mental health outcomes but only through its direct association with child support arrears. With this premise in mind, the study uses *the percentage of state arrearage collections* as an instrument for child support arrears. The arrearage collection is one of five performance measures designed to assess the effectiveness of a state's child support enforcement system under the Child Support Performance and Incentive Act of 1998 (Huang & Edwards, 2009). The degree of state arrearage collection is an exogenous variable that differs across states and years. Therefore, changes in the percentage of state arrearage collections will affect the likelihood that the father owes child support debt but that does not have a direct effect on depression or alcohol abuse problems, except when the father suffers from debt burdens. A description of this measure is provided in Appendix 1.

The study follows the three-stage procedure introduced by Adam et al. (2009), which takes into account the binary nature of the endogenous variable. This approach differs from a standard two-stage least square (2SLS) procedure, because the latter depends little on the correct specification of the first stage model, whereas the former has an opportunity to have the first stage correctly specified. Although Angrist and Kruger (2001) argue that the consistency of the second stage of 2SLS does not hinge on the correct functional form being used in the first stage, Adam et al. (2009) counter argue that misspecification in the first stage may contaminate the second stage results, yielding biased estimates of causal effects in finite samples. Despite the mixed opinions

on the misspecification of the first stage, the current study will follow the argument of Adam et al. (2009).

The first two stages of the three-stage procedure are presented in Eq6 and Eq7 respectively, while the functional form of the third stage is shown in Eq8.

$$P \left(Arr_{it} = 1 | \left(Z_{it}, X_{it}, \omega_i, \varepsilon_i^{Probit} \right) \right) = \Phi \left(Z'_{it}\pi + X'_{it}\alpha + \omega'_i\beta + \varepsilon_i^{Probit} \right) \quad (6)$$

$$Arr_{it} = X'_{it}\alpha + \omega'_i\beta + \widehat{Arr}_{it} + \varepsilon_i^{ols} \quad (7)$$

$$P \left(y_{it} = 1 | \left(\widehat{Arr}_{it}, X_{it}, \omega_i, \mu_i \right) \right) = \Phi \left(\tau \widehat{Arr}_{it} + X'_{it}\alpha + \omega'_i\beta + \mu_i \right) \quad (8)$$

The first stage (or Eq6 above) uses Probit analysis to estimate the probability that a father will have child support debt at given interview year (Arr_{it}), based on a set of valid instruments (Z_{it}) and observed predictors. The second stage (or Eq7 above) re-estimates the child support debt model using an OLS regression with the fitted value of the first stage (\widehat{Arr}_{it}) estimated in Eq6 and a set of observed predictors. The third stage (or Eq8 above) estimates the original Probit model of depression or alcohol abuse outcomes after replacing the endogenous variable (Arr_{it}) with the second stage predicted value (\widehat{Arr}_{it}). Because the predicted value derived from the first two stages produces an exogenous source of variation in child support arrears, the third stage allows one to obtain unbiased estimates of the effects of child support arrears on mental health outcomes.

The first and third columns of Table 5 present the results from the first-stage equation (Eq6) predicting child support arrears. As the z-statistics of these relations are both over 3.8, the specification do not appear to suffer from problems associated with weak instruments. The results from the second and fourth columns of the 3SLS show the estimated probability of having depression and alcohol abuse problems influenced by the predicted arrears. The magnitude of these effects are larger than the model without IV regression, suggesting that this supplemental analysis has corrected for downward bias induced by measurement error as well as by reverse causality.

VII. DISCUSSION

Debt in the U.S. reached more than \$10 trillion in 2017 (Federal Reserve Bank of New York, 2017). A growing number of recent studies have sought to understand the impact of this trend on the mental health among the general population. However, the trend of these debts does not include child support debt, the largest portion of the debt owed by noncustodial fathers. The present study contributes to the prior literature by extending the stress process theory in the context of child support enforcement policy. Using nationally representative data on nonresident fathers, this study provides the first evidence on whether nonresident fathers who owe child support debt are at risk for the development of mental health problems.

The study provides strong evidence that fathers who owe arrears are more likely to report mental health problems than those who do not owe any arrears. The study also finds that fathers who receive more support from friends and families during childbirth were less likely to develop depression caused by child support arrears than those who receive less support. To attenuate a potential omitted variable bias, the study included a lagged dependent variable to control for fathers' previous mental health status. As a robustness check, the study also used an instrumental variable approach to correct for endogeneity and measurement error associated with mothers'

report of fathers' child support arrears. The results were robust to the inclusion of a rich set of covariates and a lagged dependent variable.

Despite these findings, the study has several limitations. While the instrumental variable approach is essential for addressing concerns about measurement error in child support arrears reported by the mothers of focal children, it is not a panacea because the approach could not address the missing information about the unpaid child support owed to children of different mothers. Therefore, the results may be overestimated if the fathers owe child support to children of different mothers. The results of this study can be replicated when new data that contains complete information on the actual amount of arrears owed by fathers is available.

Nevertheless, the results from the current study have several implications for child support policy. First, debt reduction policies, such as the debt compromise programs adopted by a growing number of states, may have larger benefits than previously anticipated, because fathers' mental health problems due to arrears are smaller. To the extent that mental health problems reduce employability, fathers will be less likely to lose their jobs. These fathers are also less likely to fall further behind in paying off their debts in the future. The study also finds strong evidence that fathers with social support are less likely to develop depressive symptoms than those without social support.

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Table 1. Descriptive statistics: proportion of dependent and key independent variables

	at 1-year follow-up (lagged value at 3- year follow-up)	at 3-year follow-up N=1,099	at 5-year follow-up N=1,146	at 9-year follow-up N=944
Dependent variable				
Fathers with depression (%)	13.7%	12.0%	12.3%	14.5%
Fathers engaged in binge drinking (%)	10.0%	10.1%	24.3%	35.3%
Independent variable				
Fathers with child support arrears (%)	10.2%	27.0%	30.0%	34.9%
Ratio of arrears to fathers' income (%)				
No arrears	89.8%	72.9%	70.0%	64.9%
Between 0 and .50	8.6%	21.6%	22.3%	25.4%
50 and over	1.6%	5.5%	7.7%	9.7%

Note: The descriptive statistics were calculated based on the first set of imputed data. Results were similar for other 4 imputed samples. Total number of observations: 1,099+1,146+944=3,099

Table 2. Descriptive statistics for control, moderator, and instrumental variables (N=3,099)

	Mean/ %	(SD)
Time-invariant covariates		
Father's educational attainment at baseline (%)		
less than high school	34.7%	
High school diploma	42.5%	
Some college	19.5%	
College graduate	3.3%	
Race/ethnicity (%)		
White	11.5%	
Black	64.7%	
Hispanic	20.8%	
Other	3.0%	
Father US born (%)	91.3%	
Father's age at baseline	26.24	(6.887)
Father's intelligence (WAIS_R)	6.366	(2.573)
Father's health at baseline	2.026	(0.957)
Father-mother relationship quality		
father's name on the birth certificate (%)	91.1%	
father's # of kids with other mothers at BL	2.134	(1.411)
father asked mother to have abortion (%)	11.6%	
Mothers' financial wellbeing at baseline		
have UI, disability or SSC (%)	10.3%	
receive Income from friends and family (%)	36.9%	
Child characteristics at baseline		
Male (%)	51.9%	
Low birthweight (%)	10.3%	
Family mental health history: asked about fathers' biological father		
he was depressed or blue most of time	16.8%	
he constantly nervous, edgy, or anxious	8.0%	
he ever have a problem with drinking	21.0%	
he ever have a problem with drugs	24.7%	
he ever attempt to commit suicide	0.9%	
Moderator		
Father received social support from friends and families when the baby was born (%)	40%	

Table 2 (continued)

	Mean/ %	(SD)
Time-varying covariates		
Relationship transition (father becoming a non-resident parent) (%)		
at 1-year follow-up	4.1%	
at 3-year follow-up	8.3%	
at 5-year follow-up	69.5%	
at 9-year follow-up	18.1%	
Fathers in jail (%)		
at 3-year follow-up	12.9%	
at 5-year follow-up	12.9%	
at 9-year follow-up	8.1%	
Fathers' labor force participation (%)		
at 3-year follow-up		
Unemployed	16.8%	
Part-time job (less than 35 hours)	11.8%	
Full-time job (more than 35 hours)	71.5%	
at 5-year follow-up		
Unemployed	16.6%	
Part-time job (less than 35 hours)	14.2%	
Full-time job (more than 35 hours)	69.2%	
at 9-year follow-up		
Unemployed	0.4%	
Part-time job (less than 35 hours)	18.8%	
Full-time job (more than 35 hours)	80.8%	
A Set of potential instrumental variables		
State's unemployment rate (unit: one percent)		
at 3-year follow-up	6.110	(0.925)
at 5-year follow-up	6.011	(1.106)
at 9-year follow-up	7.703	(2.411)
CSPIA: ability to collect arrears (unit: ten percentage)		
at 3-year follow-up	5.978	(0.994)
at 5-year follow-up	0.602	(0.809)
at 9-year follow-up	6.336	(0.712)
Whether mothers on welfare (%)		
at 3-year follow-up	59.7%	
at 5-year follow-up	60.5%	
at 9-year follow-up	57.9%	

Note: The descriptive statistics were calculated based on the first set of imputed data. Results were similar for other 4 imputed samples. Standard deviations are presented in parentheses.

Table 3. Static and dynamic Probit regression of mental health and alcohol abuse outcomes

	Fathers with major depression			Fathers engaged in binge drinking		
	Model 1 dy/dx	Model 2 dy/dx	Model 3 dy/dx	Model 1 dy/dx	Model 2 dy/dx	Model 3 dy/dx
Fathers in arrears	0.056*** (0.013)	0.044*** (0.013)	0.036** (0.012)	0.067*** (0.019)	0.053** (0.019)	0.059** (0.019)
Ratio of arrears to income (ref= no arrears)						
Between 0 and .50	0.054*** (0.016)	0.049** (0.016)	0.039* (0.015)	0.083*** (0.023)	0.058** (0.022)	0.064** (0.023)
.50 and over	0.082** (0.027)	0.048* (0.024)	0.043† (0.024)	0.030 (0.040)	0.048 (0.042)	0.056 (0.041)
Lagged dependent added			0.106*** (0.017)			0.150*** (0.019)
Father's educational attainment at baseline (ref= less than high school)						
High school diploma		0.004 (0.015)	0.005 (0.015)		0.024 (0.019)	0.022 (0.019)
Some college		-0.011 (0.019)	-0.009 (0.019)		0.049* (0.025)	0.037 (0.025)
College graduate		0.037 (0.046)	0.034 (0.044)		0.042 (0.051)	0.020 (0.049)
Race/ethnicity (ref=White)						
Black		-0.100*** (0.024)	-0.077** (0.024)		-0.234*** (0.031)	-0.203*** (0.031)
Hispanic		-0.084** (0.028)	-0.063* (0.027)		-0.068+ (0.038)	-0.052 (0.038)
Others		-0.027 (0.046)	-0.035 (0.043)		-0.117* (0.057)	-0.100+ (0.058)
Father US born		0.015 (0.027)	0.007 (0.026)		0.068+ (0.037)	0.063+ (0.038)
Father's age		-0.002 (0.007)	-0.002 (0.006)		-0.008 (0.010)	-0.007 (0.010)
Father's age squared		-0.000 (0.000)	-0.000 (0.000)		0.000 (0.000)	0.000 (0.000)
Father's intelligence (WAIS_R)		0.003 (0.002)	0.002 (0.002)		0.005 (0.003)	0.004 (0.003)
Father's health		0.004 (0.008)	0.003 (0.007)		0.010 (0.009)	0.008 (0.009)
Father-mother relationship quality						
father's name on the birth certificate		-0.012 (0.021)	-0.012 (0.020)		0.029 (0.030)	0.024 (0.030)
father's # of kids with other mothers		0.012* (0.005)	0.009† (0.005)		0.003 (0.006)	0.004 (0.006)
father asked mother to have abortion		-0.014 (0.019)	-0.015 (0.019)		0.017 (0.025)	0.007 (0.025)

Table 3 (continued)

	Fathers with major depression			Fathers engaged in binge drinking		
	Model 1 dy/dx	Model 2 dy/dx	Model 3 dy/dx	Model 1 dy/dx	Model 2 dy/dx	Model 3 dy/dx
Relationship transition: father becoming a non-resident parent (ref=at 1-yr)						
3-year follow-up		0.006 (0.038)	0.016 (0.034)		0.104* (0.041)	0.107** (0.037)
5-year follow-up		0.040 (0.033)	0.046 (0.028)		0.178*** (0.031)	0.189*** (0.027)
9-year follow-up		0.076* (0.035)	0.075* (0.031)		0.125*** (0.034)	0.126*** (0.030)
Mothers' financial wellbeing at baseline						
mother has unemployment insurance, disability or SSC		-0.025 (0.021)	-0.020 (0.020)		0.027 (0.026)	0.025 (0.026)
Income from friends and family		0.015 (0.012)	0.012 (0.012)		0.011 (0.017)	0.003 (0.017)
Child characteristics at baseline						
Male		0.003 (0.012)	0.004 (0.012)		0.029+ (0.016)	0.020 (0.016)
Low birthweight		0.026 (0.018)	0.022 (0.018)		-0.039 (0.027)	-0.036 (0.027)
Time varying covariates						
Fathers in jail at previous interview		0.037† (0.020)	0.034† (0.020)		-0.087** (0.030)	-0.083** (0.031)
Father's work status at previous interview (ref=unemployed)						
Part-time job (less than 35h)		-0.011 (0.027)	-0.000 (0.026)		0.103*** (0.029)	0.102*** (0.029)
Full-time job (more than 35h)		-0.054* (0.022)	-0.039† (0.021)		0.106*** (0.023)	0.100*** (0.023)
Family mental health history: Asked About fathers' biological father						
was depressed or blue most of time			0.054* (0.023)			0.025 (0.027)
constantly nervous, edgy, or anxious			0.059* (0.027)			0.006 (0.036)
ever have a problem with drinking			-0.037 (0.032)			0.040 (0.052)
ever have a problem with drugs			0.043 (0.032)			0.007 (0.050)
ever attempt to commit suicide			0.039 (0.057)			0.037 (0.085)
Number of observations	3,088	3,088	3,088	2,886	2,886	2,886
Individual observations	1,603	1,603	1,603	1,546	1,546	1,546

Note: † $p < 0.1$, * $p < .05$. ** $p < .01$. *** $p < .001$

Table 4. Heterogeneous effects of child support arrears on noncustodial fathers' mental health and alcohol abuse outcomes by social support

	Fathers with major depression		Fathers engaged in binge drinking	
	(1) dy/dx	(2) dy/dx	(3) dy/dx	(4) dy/dx
Panel 1				
Fathers in Arrears				
No arrears VS Yes Arrears				
received social support	0.029 (0.021)	0.024 (0.020)	0.032 (0.028)	0.022 (0.027)
did not receive social support	0.060** (0.019)	0.048* (0.018)	0.010 (0.021)	0.005 (0.021)
Panel 2				
Ratio of arrears to income				
1. No arrears VS				
low arrears burden (between 0 and 50)				
received social support	0.045+ (0.025)	0.036 (0.023)	0.048 (0.035)	0.050† (0.034)
did not receive social support	0.053* (0.021)	0.043* (0.20)	0.062* (0.028)	0.068* (0.028)
2. No arrears VS				
high arrears burden (50 and more)				
received social support	-0.014 (0.031)	-0.008 (0.032)	0.116† (0.071)	0.120† (0.067)
did not receive social support	0.094** (0.035)	0.080* (0.032)	0.002 (0.049)	0.010 (0.049)
Number of observations	3,088	3,088	2,886	2,886
Individual observations	1,603	1,603	1,546	1,546
Controls	Yes	Yes	Yes	Yes
Lagged DV and initial condition added	No	Yes	No	Yes

Note: † $p < 0.1$, * $p < .05$. ** $p < .01$. *** $p < .001$

Table 5. Instrumental variable regression of noncustodial fathers' mental health and alcohol abuse outcomes on child support arrears

Dependent variable	Mental health problems		Substance abuse problems	
	First Stage dy/dx	Third Stage dy/dx	First Stage dy/dx	Third Stage dy/dx
	Fathers in arrears	Fathers with major depression	Fathers in arrears	Fathers engaged in binge drinks
A key explanatory variable				
Fathers in arrears		0.186† (0.109)		0.378*** (0.072)
A Instrumental variable				
CSPIA: percentage of state arrearage collections	-0.038*** (0.010)		-0.046*** (0.010)	
Father's educational attainment at baseline (ref= less than high school)				
High school diploma	-0.005 (0.020)	0.007 (0.015)	-0.024 (0.019)	0.030+ (0.016)
Some college	0.020 (0.026)	-0.009 (0.019)	0.011 (0.025)	0.037+ (0.021)
College graduate	-0.102† (0.056)	0.057 (0.050)	-0.118** (0.040)	0.075 (0.047)
Race/ethnicity (ref=White)				
Black	-0.076** (0.029)	-0.073** (0.026)	-0.067* (0.028)	-0.149*** (0.038)
Hispanic	-0.092** (0.034)	-0.054† (0.030)	-0.086** (0.032)	-0.011 (0.034)
Others	-0.117* (0.055)	-0.013 (0.048)	-0.064 (0.052)	-0.059 (0.051)
Father US born	-0.009 (0.031)	-0.009 (0.031)	0.098* (0.044)	0.020 (0.033)
Father's age	0.014 (0.009)	-0.004 (0.007)	0.008 (0.008)	-0.008 (0.007)
Father's age squared	-0.000* (0.000)	0.000 (0.000)	-0.000 (0.000)	0.000 (0.000)
Father's intelligence	0.007† (0.004)	0.002 (0.003)	0.003 (0.004)	0.003 (0.003)
Father's health	0.001 (0.009)	0.004 (0.008)	-0.007 (0.008)	0.011 (0.008)

Table 5. (continued)

Dependent variable	Instrumental variable regression			
	Mental health problems		Substance abuse problems	
	First Stage	Second Stage	First Stage	Second Stage
	dy/dx	dy/dx	dy/dx	dy/dx
	Fathers in arrears	Fathers with major depression	Fathers in arrears	Fathers engaged in binge drinks
Father-mother relationship quality				
father's name on the birth certificate	-0.048† (0.029)	-0.007 (0.022)	-0.030 (0.027)	0.032 (0.025)
father's # of kids with other mothers	0.006 (0.006)	0.009† (0.005)	0.001 (0.006)	0.001 (0.006)
father asked mother to have abortion	0.007 (0.028)	-0.019 (0.020)	0.008 (0.024)	0.012 (0.022)
Mothers' financial wellbeing at baseline				
mother has UI, disability or SSC	0.003 (0.029)	-0.026 (0.021)	0.013 (0.025)	0.017 (0.022)
Income from friends and family	0.028 (0.018)	0.010 (0.013)	0.038* (0.016)	-0.007 (0.015)
Child characteristics at baseline				
Male	0.051** (0.017)	-0.003 (0.014)	0.042** (0.015)	0.007 (0.015)
Low birthweight	0.039 (0.027)	0.023 (0.020)	0.046* (0.023)	-0.046* (0.022)
Time varying covariates				
Fathers in jail at previous interview	0.052† (0.031)	0.029 (0.023)	0.037 (0.036)	-0.086** (0.028)
Father's work status at previous interview (ref=unemployed)				
Part-time job (less than 35h)	0.045 (0.033)	-0.015 (0.026)	0.062* (0.029)	0.063* (0.031)
Full-time job (more than 35h)	0.007 (0.027)	-0.050* (0.021)	0.052* (0.025)	0.071** (0.027)
Family mental health history: Asked About fathers' biological father				
was depressed or blue most of time	0.003 (0.039)	0.063* (0.026)	0.030 (0.035)	0.010 (0.026)
constantly nervous, edgy, or anxious	0.040 (0.047)	0.066* (0.031)	0.009 (0.049)	0.004 (0.039)
ever have a drinking problem	-0.029 (0.058)	-0.043 (0.032)	0.000 (0.046)	0.025 (0.043)
ever have drug problems	0.034 (0.053)	0.050 (0.031)	0.012 (0.044)	0.009 (0.043)
ever attempt to commit suicide	0.027 (0.091)	0.040 (0.060)	-0.068 (0.083)	0.041 (0.074)

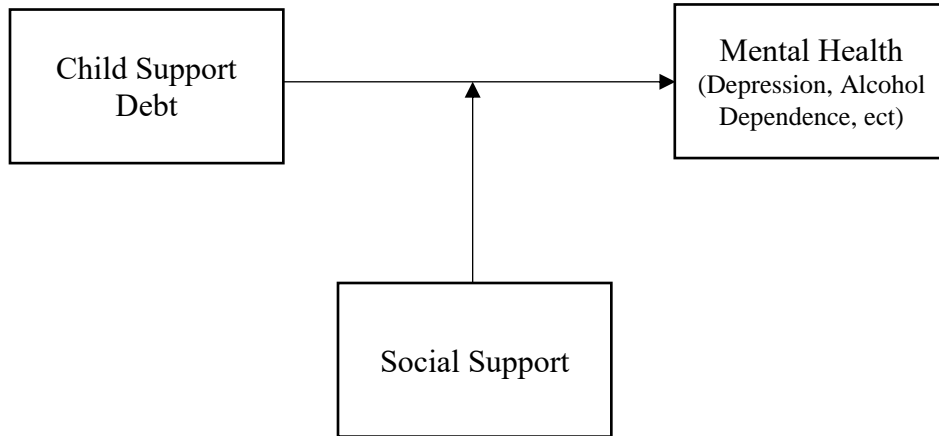
Note: † $p < 0.1$, * $p < .05$. ** $p < .01$. *** $p < .001$

Figure 1. *Stress Process Model for Noncustodial Fathers with Child Support Arrears*

1. Causal effects of child support debt on mental health among nonresident fathers



2. Moderated effect of child support debt on mental health



Appendix 1. Child Support Performance and Incentive Act for Arrearage Collection Measurement

The construction of the arrearage collection measurement assigned to each observation unfolds in two steps: First, Data on performance indicators were collected from the Office of Child Support Enforcement (OCSE) annual reports (1999-2010). Arrearage collection measurement was measured as percentages, and the method of measuring each indicator was given as follow:

$$\frac{\text{Number of cases paying towards arrears in IV – D}}{\text{Number of cases with arrears due in IV – D}}$$

Next, the performance indicator was assigned to each observation, based on the state where the custodial mother established the child support order.