Journal of Social Economics Research
2021 Vol. 8, No. 1 pp. 24-38.
ISSN(e): 2312-6264
ISSN(p): 2312-6329
DOI: 10.18488/journal.35.2021.81.24.38

CHILD SUPPORT ENFORCEMENT AND INFANTS' HEALTH OUTCOMES

Niraj Prasad Koirala

Texas Tech University, Department of Economics, Lubbock, TX, USA.
Email: niraj.r.koirala@gmail.com Tel: +1-806-642-7369

Article History
Received: 6 January 2021
Revised: 25 January 2021
Accepted: 8 February 2021
Published: 22 February 2021

Keywords
Child support
Health
Fetal origin hypothesis
Birth outcomes
Panel data
Prenatal care.

JEL Classification:
H75; I12; I18, D13; J13.

ABSTRACT

This paper explores the potential externality of enforcements in child support policies on infants' health outcomes. Exploiting the variations in child support policies across states and over the year and using the universe of birth records in the US (1975-2004), I document that the policies were effective in improving birth outcomes. Infants born to single mothers in states that fully adopt child support policies have on average 38 grams higher birth weight and 99 basis points lower likelihood of being born with low birth weight. These effects hold for a wide range of health outcomes. The marginal impacts are larger for mothers in states above-median changes in child support policies and for mothers who reside in poorer states. The results suggest that a higher quantity of prenatal care and better timing of prenatal care could be possible mechanisms of impact. This study contributes to the existing literature by providing the first evidence of health externality of child support policies for infants' health outcomes.

Contribution/Originality: This paper contributes to existing literature by exploring the potential externality of enforcements in child support policies on infants' health outcomes.

1. INTRODUCTION

A relatively large and growing body of literature in economics documents the positive externalities of welfare programs on individuals' health outcomes (Cole & Currie, 1993; Dooley & Prause, 2002; Kuka, 2018; Leonard & Mas, 2008). Based on the Fetal Origin Hypothesis, the prenatal period is a critical and sensitive period for infants' health and the shocks during pregnancy could have large and long-lasting effects on the health of the newborns (Almond & Currie, 2011a, 2011b; Majid, 2015). Therefore, welfare programs have the potential to influence the birth outcomes of pregnant mothers. It has been documented that some welfare benefits such as Aid to Families with Dependent Children (AFDC), Special Supplemental Nutrition Program for Women, Medicare, Medicaid, Infants, and Children (WIC), and Unemployment Insurance (UI) benefits improve infants' health (Cole & Currie, 1993; Corman et al., 2019; Haeck & Lefebvre, 2016; Leonard & Mas, 2008; Noghanibehambari & Salari, 2020).

Child support policies were introduced and enforced under the part IV-D of the 1975 Social Security Act as a method to establish paternity and collect child support payments. The main purpose of the policy was to obtain the support of the absent spouse in raising the child. It was successful in leaving single mothers out of poverty, raising their welfare, increasing their income, improving the quality of their insurance, and lowering the rates of infant mortality (Beller & Graham, 1991; Nixon, 1997; NoghaniBehambari, Noghani, & Tavassoli, 2021; Robins & Robins, 1986; Sorensen & Hill, 2004). It is arguable that mothers improve the quantity and quality of prenatal care as a response to an expected rise in their income in the future as a result of enforcements in child support policies. Such improvements have the potential to improve birth outcomes. Therefore, child support policies could act as a social program that raises single mothers' welfare and lead to enhance infants' health outcomes. This paper aims to fill this gap in the literature and explore the potential health effects of enforcement in child support policy for infants' birth outcomes.

Using the universe of birth records in the US during the years 1975-2004 and applying a difference-in-difference estimation strategy, I find that child support policies have positive and statistically significant effects on infants' birth outcomes including birth weight, low birth weight, preterm birth, fetal growth, and Apgar score. Infants born to single mothers who reside in states that implement a full set of child support policies compared to infants born to mothers who reside in states with no child support policy have on average 38 grams higher birth weight, are 99 basis points less likely to be low birth weight, and 83 basis points less likely to born prematurely. The protective effects of child support policies hold for a wide range of birth outcomes. All the estimated coefficients are economically and statistically significant. The marginal effects are consistently larger among states at the top quantiles of child support enforcement and for states at the bottom half of income per capita distribution. Moreover, I document that the main mechanism of impact is the improvements in the quantity and quality of prenatal care. Single mothers residing in states that fully implement child support compared to mothers in states with no child support policy start their prenatal care 0.3 months sooner and have 0.6 more doctor visits during prenatal development.

The contribution of this paper to the literature is twofold. It adds to the literature on the benefits of child support policy by providing new evidence of its health effects on infants. The unseen positive externality adds to the benefits of the program and help policymakers design the optimal level of enforcement of the program. Second, it adds to the literature on Fetal Origin Hypothesis by providing evidence that a social program that leads to improvements in welfare has the potential to impact birth outcomes.

Exploring the effects of the child support program and more generally a welfare-improving social program on infants' health has important policy implications. Like any social program, child support has costs and benefits. The observed costs and benefits help policymakers design the optimal structure of the program. However, such structures could be only sub-optimal if there are externalities in spillover effects. Therefore, documenting and quantifying the potential unobserved externalities is important for a policymaker to optimize the structure of the program and to find the socially optimal level of enforcement.

The rest of the paper is organized as follows. Section 2 provides a literature review. In section 3, I discuss the data source, variable construction, and the final sample. Section 4 introduces the econometric framework and discusses the main results and heterogeneity of the effects across sub-samples. Section 5 explores one potential mechanism channel. Finally, I depart some concluding remarks in section 6.

2. LITERATURE REVIEW

Child support enforcement has the potential to help single mothers out of poverty and dependency on welfare programs. For instance, Hu (1999) finds that while the policy encouraged single mothers to raise annual working hours and labor force participation it lowered their welfare participation. He concludes that large reductions in welfare costs can be attained by enforcing child support policies. Neelakantan (2009) uses data from Wisconsin and documents that child support enforcements were successful in increasing the transfers from the noncustodial parent to the custodial parent during the years 1981-1992. It raised the transfers by as much as 74 percent and declined welfare program participation by 3.9 percentage points. These results are also confirmed by studies that use structural models. For instance, Roff (2008) applies simulation results from a structural parameter model and shows that the policy increases paternal compliance with a lower effect for low paternal income. It also lowers the welfare participation of women. The results from other studies also document a substantial increase in income and reduction in welfare participation of single mothers (Aizer & McLanahan, 2006; Beller & Graham, 1991; Farré & González, 2019; Hofferth & Pinzon, 2011; Hu, 1999; Knox, 1996; NoghaniBehambari et al., 2021; Robins & Robins, 1986; Sorensen & Hill, 2004; Walker & Zhu, 2006).

Child support, as a source of rising income for single mothers, can have positive impacts on children's outcomes. For instance, NoghaniBehambari, Noghani, and Tavassoli (2020) exploit the changes in child support policies during the years 1975-1992 and show that they were associated with significant reductions in infant and toddler mortality rates. One potential mechanism of impact is that mothers choose to have better-quality private insurance when they face an increase in child support payments. The policy and the subsequent rises in payments also impact children's academic outcomes and test scores (Knox, 1996) cognitive outcomes (Argys, Peters, Brooks-Gunn, & Smith, 1998) health status (Baughman, 2017; Hofferth & Pinzon, 2011) and learning disability (Rossin-Slater, 2017). The rise in welfare and income can improve birth outcomes through several channels. The higher expected income generates incentives for pregnant mothers to increase their prenatal care and the composition of their insurance use. Hoynes, Miller, and Simon (2015) show that the increases in payments under the Earned Income Tax Credit have led to an increase in prenatal doctor visits. The affected mothers also changed the composition of their insurance to better quality private insurance. Joyce (1999) shows that participating in Prenatal Care Assistant Program, a welfare program to enhance prenatal services, increases birth weight by 35 grams, and reduces the low birth weight rate by 1.3 percentage points.

Another channel between income and birth outcomes is nutritional intakes. Nutrition is among the important determinants of newborns' health. Almond and Mazumder (2011) show that fasting during the holy month of Ramadan, as a source of nutritional deficiency, results in low birth weight and increases the share of female birth. Haeck and Lefebvre (2016) investigate the effect of the egg-milk-orange program, a nutritional program for pregnant women, on birth outcomes. They find that nutritional support could increase the birth-weight by 70 grams. Similar papers confirm the large effects of nutrition on birth outcomes (Almond, Mazumder, & Van Ewijk, 2014, 2015; Bozzoli & Quintana-Domeque, 2014; Jürges, 2015; Majid, 2015; Robinson & Raisler, 2005; Sonchak, 2016; Van Ewijk, 2011). Income can also reduce stress and anxiety through providing financial resources which in turn can positively affect birth outcomes. Olafsson (2016) shows that exposure to the 2008 financial crisis and the subsequent stress increased the probability of low birth weight. Torche (2011) shows that exposure to an earthquake as a major shock to maternal stress reduced mean birth weight and increased the low birth weight outcomes among affected mothers. A limited number of studies support the negative effects of stress on birth outcomes (Becker, Mirkasimov, & Steiner, 2017; Bozzoli & Quintana-Domeque, 2014; Carlson, 2018; Carlson, 2015; Duncan, Mansour, & Rees, 2017; Istvan, 1986). The current study can be placed among studies that explore the effects of social programs on birth outcomes. A welfare program in general increases the wellbeing of individuals and has the potential to improve the maternal environment and birth outcomes. A strand of literature in economics establishes the causal path between government welfare programs and infants' health outcomes (Baird, Friedman, & Schady, 2011; Cole & Currie, 1993; Currie & Cole, 1993; Fertig & Watson, 2009; Ga & Feng, 2012; Güneş, 2015; Haeck & Lefebvre, 2016; Hoynes, Page, & Stevens, 2011; Joyce, 1999; Kaplan, Collins, & Tylavsky, 2017; Leonard & Mas, 2008; Lindo, 2011; Myrskylä, 2010; NoghaniBehambari et al., 2021; Sonchak, 2015; Tavassoli, Noghanibehambari, Noghani, & Toranji, 2020).

3. DATA SOURCES

This paper uses several data sources. The primary data source is Natality detailed files extracted from the National Center for Health Statistics. The Natality data reports the birth outcomes of all births in the United States. It also reports limited mother characteristics including race, education, marital status, and age, and mother health behavior during pregnancy including the number of prenatal doctor visits and the month prenatal care began. More limited data on father's characteristics are also reported including age and race. I use data from 1975, the first year the child support policies started, to 2004, the last year of publicly available data.

Table-1. Summary Statistics.

Variable	Observations	Mean	Std. Dev.	Min	Max
Infant Characteristics:					
Birth Weight (grams)	89,723,098	3327.982	602.795	227	8165
Gestational Weeks	87,091,873	39.043	2.700	17	52
Sex (f=1)	89,723,098	0.488	0.497	0	1
Apgar Score	73,512,473	8.972	0.838	0	10
Term Birth Weight	67,079,131	3447.394	482.650	227	8165
Low Birth Weight	89,723,098	0.072	0.259	0	1
Extremely Low Birth Weight	89,723,098	0.013	0.113	0	1
Small for Gestational Age	87,091,873	0.102	0.302	0	1
Preterm Birth	87,091,873	0.178	0.382	0	1
Low Apgar Score	73,512,473	0.031	0.175	0	1
Fetal Growth	87,091,873	85.090	14.136	4.906	361.882
Extremely Preterm Birth	87,091,873	0.007	0.083	0	1
Mother Characteristics:					
Age	89,723,098	26.465	5.886	10	54
Race: White	89,723,098	0.796	0.402	0	1
Race: Black	89,723,098	0.160	0.367	0	1
Unmarried	89,723,098	0.283	0.450	0	1
Education (Years of Schooling)	89,723,098	12.625	2.654	0	17
Month Prenatal Care Began	87,902,804	2.596	1.517	0	9
Prenatal Visits	87,233,430	11.179	4.025	0	49
State Characteristics:					
Child Support Index	89,723,098	0.661	0.258	0	1
GSP per capita	89,723,098	43585.268	9031.635	24371.631	140143.05
Personal Income per capita	89,723,098	371.483	66.910	212.533	624.262
%Blacks	89,723,098	12.653	8.174	.222	69.376
%Whites	89,723,098	83.354	8.514	27.002	99.301
%Males	89,723,098	48.827	0.709	46.263	53.005
%Population 25-65	89,723,098	50.716	2.344	40.368	55.143
Log Current Transfer Receipt	89,723,098	18.080	0.991	14.495	19.850
Log Income Maintenance Benefits	89,723,098	15.830	1.131	11.503	17.908
Log Unemployment Insurance Benefits	89,723,098	14.594	1.119	10.697	16.796
Log Other Welfare Benefits	89,723,098	17.923	0.978	14.056	19.657
Minimum Wage	89,723,098	7.481	0.813	6.266	11.409

Notes: The data covers the years 1975-2004. All dollar values are converted into 2000 dollars to reflect real values.

I merge the Natality file with the Child Support Index (CS Index) dataset extracted from NoghaniBehambari et al. (2020) based on the state of residence of the mother and year of gestation of birth. The child support index is a score that is the average of nine indices which is explained here. Each index is a dummy that equals one if the respective law is passed in a state-year and zero otherwise. The first index is a law that allows for immediate income withholding. Second, a law that allows the custodial parent to impose a lien on the properties of the noncustodial parent. Third, a law that enforces genetic testing to recognize paternity. Fourth, a law that enforces the establishment of paternity at any age before 18. Fifth, a law that allows child support collection for parents who do not receive the AFDC payments. Sixth, a law that considers failure in child support payments delinquency. Seventh, a law that considers failure in child support payments a criminal act. Eighth, a law that imposes the payments to parents residing in other states. Ninth, a law that establishes a central registry for child support payments. The child support index is a measure that takes the average of all nine indicators and so varies between zero to one.

I also include some state-by-year controls in the regression. The data on states' welfare codes and payments are extracted from Pierson, Hand, and Thompson (2015). The demographic and population composition data are extracted from SEER (2019). The income and Gross State Product (GSP) data are extracted from the Bureau of Economic Analysis. Unemployment data are extracted from the Bureau of Labor Statistics. Data on crime and arrest rates are extracted from FBI (2018). The education and ownership data is withdrawn from Ruggles, Flood, Goeken, Grover, and Meyer (2019).

The final sample covers the years 1975-2004 and contains more than 89 million observations. Table 1 shows the summary statistics of the final sample. I focus on ten variables that capture the infants' health outcomes. The definition and unit of measurement of these variables are as follows. *Birth Weight* is in grams. *Term Birth Weight* is the birth weight for infants who were born between 37-42 weeks of gestation and is measured in grams. *Low Birth Weight* is a dummy that equals one if birth weight is less than 2500 grams. *Very Low Birth Weight* is a dummy that equals one if birth weight is less than 1500 grams. *Small for Gestational Age* is a dummy that equals one if the birth weight is at the bottom 10^{th} percentile of birth weight distribution within each gestational week. *Gestational Age* is measured in weeks of intrauterine growth. *Preterm Birth* is a dummy that equals one if gestational age is less than 37 weeks. *Apgar score* is a health index that varies between 0 to 10. *Low Apgar Score* is a dummy that equals one if Apgar Score is less than 8. *Fetal growth* is the average of weekly growth during antenatal development that is birth weight divided by gestational weeks. The average birth weight is roughly 3,327 grams and the average gestational age is 39 weeks. Figure 1 shows the geographic distribution of birth weight across US states. While northern states are at the top terciles of birth weight distributions the southern states are at the bottom terciles. Over the sample period, the mean of the constructed CS index is 0.66 with a standard deviation of 0.26. Figure 2 illustrates the state-wide distribution of changes in the *CS index* over the years 1975-2004.

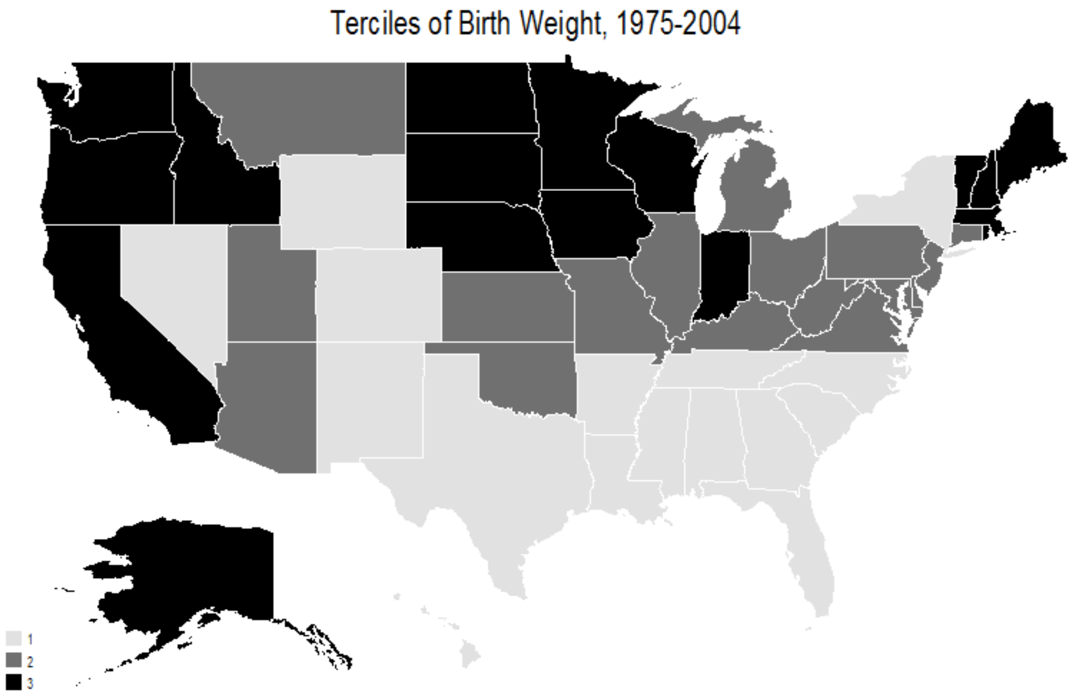

Figure-1. Distribution of birth weight across the US States over the sample period.

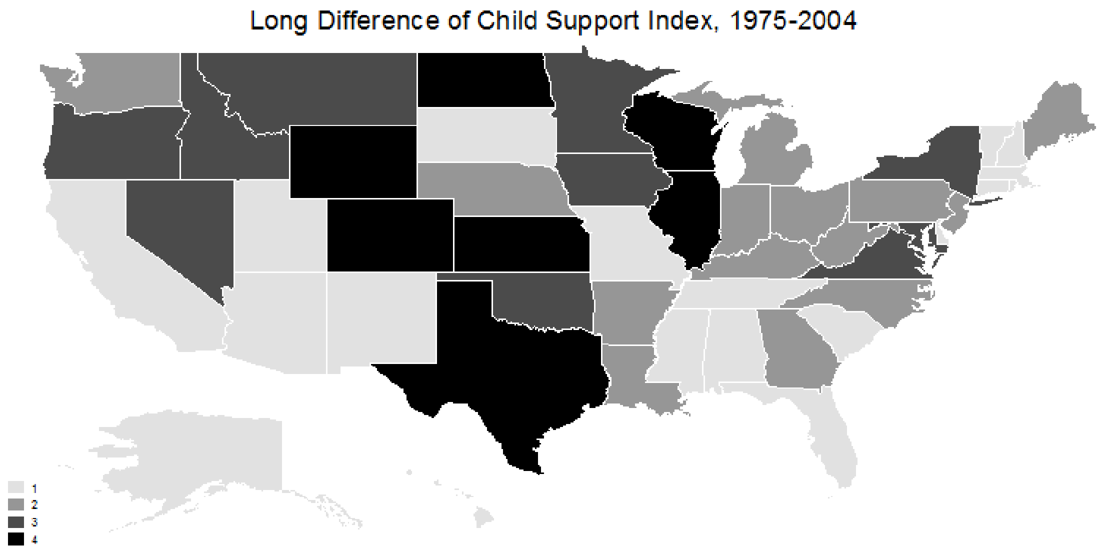

Figure-2. Distribution of Changes in Child Support Index across the US States over the Sample Period.

4. ECONOMETRIC METHOD AND THE MAIN RESULTS

The main assumption in the empirical strategy is that the birth outcomes of mothers who were exposed to enforcements in child support policies follow the same path and are determined by the same factors as those mothers who were unexposed to these policies except for the fact that they experienced a sharp rise in the policy enforcement. The basic idea is that I compare the outcomes of single mothers to married mothers (first difference) who reside in states with higher child support index to those who reside in states with lighter policies (second difference) over the years. I apply this difference-in-difference identification strategy using the following formula:

$$y_{ist} = \alpha_0 + \alpha_1 CS\ Index_{st} \times unmarried_i + \alpha_3 unmarried_i + \alpha_4 CS\ Index_{st} + X_i + Z_{st} + \xi_s + \zeta_t + Region \times t + \epsilon_{ist} \quad (1)$$

Where y is the birth outcome to mother i who reside in state s and observed at time (year-by-month) t.

The variable $CS\ Index$ is the child support index as explained in section 3. The variable $unmarried$ is a dummy that equals one for single mothers. In X is included some mothers' and fathers' characteristics.[1] The matrix Z contains some state-by-year controls.[2] The matrices ξ and ζ represents state and time (year-by-month) fixed effects. In all regressions, I also include a region by year trend. Finally, ϵ is a disturbance term. Standard errors are clustered at the state level. The parameter α_1 is the coefficient of interest. The exogeneity assumption in Equation 1 is that the changes in *CS Index* are orthogonal to other determinants of birth outcomes after I control for covariates and fixed effects. This assumption could be violated for two potential sources of Endogeneity that I address here.

First, state authorities may change the CS laws as a response to states' economic conditions or other demographic factors. Since socioeconomic conditions also influence birth outcomes, the endogenous response could bias α_1 in Equation 1. I explore this source of Endogeneity in Table 2 where I run *CS Index* on a wide range of fixed effects and states' socioeconomic covariates in a state-by-year panel dataset. None of the coefficients in column 3 are statistically significant. Even when I add a state by year trend (column 4). When I compare column 1 (without covariates) and column 3 (with full covariates), I see that the R^2 increased by only 0.037.

Table-2. Child support index and States' socioeconomic characteristics.

	Outcome: Child Support Enforcement Index			
	(1)	**(2)**	**(3)**	**(4)**
Unemployment Rate Among Single Mothers			-0.215 (0.326)	-0.175 (0.165)
Male Unemployment rate			0.365 (0.307)	0.175 (0.536)
Log GSP Per Capita			-0.156 (0.150)	-0.126 (0.152)
Log Personal Income Per Capita			-0.162 (0.168)	-0.265 (0.625)
%Blacks			0.075 (0.065)	0.046 (0.045)
%Whites			0.004 (0.005)	0.082 (0.056)
Average Weekly Wage ($1,000)			-0.095 (0.072)	-0.065 (0.051)
Black Arrest Rates			0.001	0.015

[1] Parental controls include: dummies for mother's race, dummies for mother's education, mother's age, and dummies for father's age, father's race.

[2] State-by-year controls include: real GSP per capita, real personal income per capita, percentage blacks, percentage whites, percentage males, percentage population aged 25-65, Log Current Transfer Receipt, Log Income Maintenance Benefits, Log Unemployment Insurance Benefits, Log Other Welfare Benefits, and minimum wage.

			(0.001)	(0.065)
Male Arrest Rates			-0.019 (0.026)	-0.065 (0.098)
%Less Than High School			-0.223 (0.352)	-0.156 (0.155)
%High School			0.669 (0.492)	0.196 (0.331)
%Some College			0.561 (0.467)	0.091 (0.367)
Ownership of Dwelling among Single Mothers			0.159 (0.176)	0.117 (0.150)
State Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
State-Year Trend	No	Yes	No	Yes
R^2	0.879	0.961	0.895	0.963
Observations	1,479	1,479	1,479	1,479

Notes: Robust standard errors, reported in parentheses, are clustered on the state.

The difference between columns 2 and 4 (adding state trend) is also very small, roughly 0.006. This comparison reveals that how small the changes in *CS Index* can be explained by states' economic and demographic characteristics. Therefore, one can conclude that this source of Endogeneity does not confound the estimations in Equation 1.

Second, changes in states' codes of child support policy may have been accompanied by compositional changes in other welfare benefits that in turn affect birth outcomes. Table 3 investigates this potential source of Endogeneity by running the *CS Index* on a series of welfare payments in a state-by-year panel data that includes state and year fixed effect (columns 1 and 3) or add a state trend (columns 2 and 4). The minuscule differences between R^2 of columns 3 and 1 as well as columns 4 and 2 suggest that only a marginal portion of variations in *CS Index* can be explained by those welfare payments. Also, the fact that none of the coefficients are statistically significant rules out this potential source of Endogeneity.

Table-3. Child support index and states' welfare payments.

	Outcome: Child Support Index			
	(1)	(2)	(3)	(4)
Log Current Transfer Receipts			1.190 (0.958)	-0.097 (0.082)
Log Income maintenance Benefits			0.115 (0.256)	0.072 (0.084)
Log Unemployment Insurance Benefits			-0.156 (0.845)	-0.024 (0.037)
Health Expenditure Per capita			-0.425 (0.536)	0.110 (0.098)
Policing Expenditure Per Capita			-0.789 (0.752)	-0.064 (0.091)
Unemployment Insurance Maximum Benefits			0.146 (0.186)	-0.001 (0.005)
Minimum Wage			-0.025 (0.016)	-0.041 (0.036)
State Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
State-Year Trend	No	Yes	No	Yes
R^2	0.878	0.952	0.882	0.956
Observations	800	800	800	800

Notes: Robust standard errors, reported in parentheses, are clustered on the state.

Therefore, I can argue that the estimated coefficients of Equation 1 to be unbiased estimators of true effects. Table 4 reports the main results of Equation 1. Although the results are robust in regressions without controls and region by year fixed effects, I only show the full specification estimations in this table. The main effects and the interaction term between $unmarried$ and $CS\ Index$ are reported and each column shows the results of a separate regression for one measure of health at birth. The coefficient of interest, α_1, is reported in the third row of each column. Infants born to single mothers who reside in states that fully adopt child support laws compared to infants born to other mothers have, on average, 38 grams higher birth weight (column 1), are 99 basis points less likely to be low birth weight (column 3), have 104 basis points lower probability of being small for gestational age (column 5), have 3.76 percentage points lower likelihood of being born prematurely (column 7), and have 0.3 grams per week lower intrauterine growth (column 10). These effects are equivalent to an increase of 1.1 percent from the mean of birth weight, a reduction of 13.7 percent from the mean of low birth weight, a reduction of 10.2 percent

Table-4. Child support policy and infants' birth outcomes 1975-2004.

	Birth Weight	Term Birth Weight	Low Birth Weight	Very Low Birth Weight	Small for Gestational Age	Gestational Age	Preterm Birth	Apgar Score	Low Apgar Score	Fetal Growth
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
CS Index	16.06* (5.05)	7.853 (6.685)	-0.0052** (0.0025)	0.0010 (0.0011)	-0.0001 (0.0002)	0.0965*** (0.0333)	-0.0118*** (0.0035)	0.0606 (0.0489)	-0.0011 (0.0025)	-0.1677 (0.1808)
Unmarried	-88.37*** (7.22)	-72.453*** (6.599)	0.0240*** (0.0022)	0.0029*** (0.0007)	0.0283*** (0.0032)	-0.3254*** (0.0174)	0.0444*** (0.0025)	-0.0687*** (0.0137)	0.0093*** (0.0008)	-1.2972*** (0.1787)
CS Index ×Uunmarried	37.92*** (6.14)	30.182*** (5.469)	-0.0099*** (0.0019)	-0.0016* (0.0008)	-0.0104*** (0.0027)	0.3182*** (0.0185)	-0.0376*** (0.0026)	0.0593*** (0.0164)	-0.0083*** (0.0008)	0.3040*** (0.1826)
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-by-Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State-by-Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mother Characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Father Characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State Characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.046	0.014	0.018	0.005	0.016	0.027	0.018	0.025	0.005	0.038
Observations	89,723,098	67,079,131	89,723,098	89,723,098	89,723,098	87,091,873	87,091,873	73,512,473	73,512,473	89,723,098

Notes: Robust standard errors, reported in parentheses, are clustered on the state. Parental controls include: dummies for mother's race, dummies for mother's education, mother's age, and dummies for father's age, father's race. State-by-year controls include: real GSP per capita, real personal income per capita, percentage blacks, percentage whites, percentage males, percentage population aged 25-65, Log Current Transfer Receipt, Log Income Maintenance Benefits, Log Unemployment Insurance Benefits, Log Other Welfare Benefits, and minimum wage. The definition and units of measurement of outcomes are as follows:
Birth Weight is in grams. **Term Birth Weight** is the birth weight for infants who were born between 37-42 weeks of gestation and is measured in grams. **Low Birth Weight** is a dummy that equals one if birth weight is less than 2500 grams. **Very Low Birth Weight** is a dummy that equals one if birth weight is less than 1500 grams. **Small for Gestational Age** is a dummy that equals one if the birth weight is at the bottom 10th percentile of birth weight distribution within each gestational week. **Gestational Age** is measured in weeks of intrauterine growth. Preterm **Birth** is a dummy that equals one if gestational age is less than 37 weeks. **Apgar score** is a health index that varies between 0 to 10. **Low Apgar Score** is a dummy that equals one if Apgar Score is less than 8. **Fetal growth** is the average of weekly growth during antenatal development that is birth weight divided by gestational weeks.

Table-5. Robustness of the effect of child support index on birth outcomes across sub-samples.

	Birth Weight	Term Birth Weight	Low Birth Weight	Very Low Birth Weight	Small for Gestational Age	Gestational Age	Preterm Birth	Apgar Score	Low Apgar Score	Fetal Growth
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A. Below Median CS Index										
CS Index ×Unmarried	33.066*** (7.556)	29.767*** (8.551)	-0.0086*** (0.0022)	0.0009 (0.0007)	-0.0113** (0.0042)	0.3299*** (0.0316)	-0.0375*** (0.0044)	0.0508* (0.0269)	-0.0078*** (0.0012)	0.1818 (0.1974)
R^2	0.045	0.047	0.014	0.005	0.015	0.027	0.018	0.028	0.004	0.039
Observations	61,356,478	46,018,945	61,356,478	61,356,478	59,453,495	59,453,495	59,453,495	51,697,426	51,697,426	59,453,495
Panel B. Above Median CS Index										
CS Index ×Unmarried	45.804*** (7.958)	34.813*** (4.987)	-0.0124*** (0.0029)	-0.0188** (0.0086)	-0.0116*** (0.0019)	0.3168*** (0.0241)	-0.0390*** (0.0036)	0.0719*** (0.0100)	-0.0094*** (0.0007)	0.3327* (0.1452)
R^2	00.047	0.051	0.014	0.004	0.017	0.027	0.018	0.018	0.005	0.037
Observations	28,366,620	21,060,186	28,366,620	28,366,620	27,638,378	27,638,378	27,638,378	21,815,047	21,815,047	27,638,378
Panel C. Below Median GSP per Capita										
CS Index ×Unmarried	45.678*** (8.466)	30.994*** (7.426)	-0.0145*** (0.0027)	-0.0020* (0.0010)	-0.0128*** (0.0043)	0.3484*** (0.0290)	-0.0419*** (0.0031)	0.0690*** (0.0242)	-0.0100*** (0.0005)	0.3993* (0.1433)
R^2	0.045	0.049	0.014	0.005	0.016	0.030	0.020	0.023	0.005	0.038
Observations	51,453,055	38,845,632	51,453,055	51,453,055	50,080,715	50,080,715	50,080,715	36,827,936	36,827,936	50,080,715
Panel D. Above Median GSP per Capita										
CS Index ×Unmarried	34.114*** (5.149)	30.087*** (5.182)	-0.0063*** (0.0016)	0.0011 (0.0007)	-0.0087*** (0.0021)	0.3426*** (0.0337)	-0.0382*** (0.0034)	0.0653*** (0.0138)	-0.0073*** (0.0016)	0.1102 (0.2361)
R^2	0.048	0.048	0.015	0.004	0.016	0.025	0.019	0.028	0.004	0.038
Observations	38,270,043	28,233,499	38,270,043	38,270,043	37,011,158	37,011,158	37,011,158	36,684,537	36,684,537	37,011,158

Notes: Robust standard errors, reported in parentheses, are clustered on the state. Parental controls include: dummies for mother's race, dummies for mother's education, mother's age, and dummies for father's age, father's race. State-by-year controls include: real GSP per capita, real personal income per capita, percentage blacks, percentage whites, percentage males, percentage population aged 25-65, Log Current Transfer Receipt, Log Income Maintenance Benefits, Log Unemployment Insurance Benefits, Log Other Welfare Benefits, and minimum wage. The definition and units of measurement of outcomes are as follows:
Birth Weight is in grams. Term Birth Weight is the birth weight for infants who were born between 37-42 weeks of gestation and is measured in grams. Low Birth Weight is a dummy that equals one if birth weight is less than 2500 grams. Very Low Birth Weight is a dummy that equals one if birth weight is less than 1500 grams. Small for Gestational Age is a dummy that equals one if the birth weight is at the bottom 10^{th} percentile of birth weight distribution within each gestational week. Gestational Age is measured in weeks of intrauterine growth. Preterm Birth is a dummy that equals one if gestational age is less than 37 weeks. Apgar score is a health index that varies between 0 to 10. Low Apgar Score is a dummy that equals one if Apgar Score is less than 8. Fetal growth is the average of weekly growth during antenatal development that is birth weight divided by gestational weeks.

from the mean of small for gestational age, a reduction of 21.1 percent from the mean of preterm birth, and a rise of 0.3 percent from the mean of fetal growth over the sample period. While all the marginal effects are statistically significant at conventional levels they are also economically large and point to substantial externalities of child support policies for infants' health outcomes.

4.1. Analysis across Sub-Samples

Table 5 shows the results for two sets of sub-samples: mothers residing in states below/above-median of *CS Index* changes and mothers residing in states below/above-median of real Gross State Product (GSP) per capita. The interaction effect, α_1, for each sub-sample is reported in each panel and the outcomes are in columns. Comparing the marginal effects of panels A and B, one can observe that the magnitude of the coefficients is slightly larger for states with higher changes in *CS Index*. For instance, going from states with $CS\ Index = 1$ to states with $CS\ Index = 0$, infants born to single mothers compared to married mothers have 124 and 86 basis points lower likelihood of being born with low birth weight, for states above median and below-median of *CS Index*, respectively (column 3).

Comparing panels C and D, I can see that child support policies were more effective for the health outcomes of infants in states that were relatively poorer. For instance, going from states with $CS\ Index = 1$ to states with $CS\ Index = 0$, infants born to single mothers compared to married mothers have 419 and 382 basis points lower likelihood of being born prematurely, for states above-median and below-median of GSP per capita, respectively (column 7).

These patterns hold across all health measures. Moreover, all the marginal effects are statistically significant ruling out the concern that the improvements in birth outcomes are driven by only a specific group of population.

5. MECHANISMS OF IMPACT

One of the important determinants of birth outcomes is the health utilization of pregnant mothers during prenatal development (Currie & Grogger, 2002; Hoynes et al., 2015; Mocan, Raschke, & Unel, 2015; Reichman & Florio, 1996; Sonchak, 2015). Therefore, one potential mechanism of impact between an expected rise in income as a result of enforcements in child support policy and birth outcomes is prenatal care. To explore this channel, I focus on two variables that are reported in the Natality files and capture the timing and quantity of prenatal care. I use the same empirical strategy of Equation 1 and replace the left-hand side with four intermediary outcome variables: the month that the mother initiated prenatal care, the number of prenatal doctor visits, a dummy that equals one if the month in which the prenatal care began was in the second trimester, and a dummy that equals one if the month in which the prenatal care began was in the third trimester. The results are reported in four columns of Table 6, respectively. Being a single mother residing in states with full adoption of child support laws is associated with a reduction of 0.29 months in the time that prenatal care began, 0.58 more doctor visits for prenatal care, 9.46 percentage points higher probability that prenatal care started before the second trimester, and 9.48 percentage points higher probability that the prenatal care started before the third trimester. These effects are equivalent to 11.2, 5.2, 11.6, and 9.8 percent change in the outcomes, respectively. All the coefficients are statistically significant at 1 percent level. Overall, the results of this section imply that the timing and quantity of visits could be a potential mechanism channel between child support and birth outcomes.

Table-6. Child support index and mother's prenatal health behavior.

	Month Prenatal Care Began	Prenatal Visits	Month Prenatal Care Began before Second Trimester	Month Prenatal Care Began before Third Trimester
	(1)	(2)	(3)	(4)
CS Index	-0.1138 (0.0741)	0.0890 (0.2571)	0.0318*** (0.0152)	0.0318*** (0.0135)
Unmarried	0.4302*** (0.0278)	-0.8951*** (0.1102)	-0.1257*** (0.0073)	-0.1257*** (0.0073)
CS Index ×Unmarried	-0.2932*** (0.0358)	0.5884*** (0.1498)	0.0946*** (0.0094)	0.0948*** (0.0094)
State FE	Yes	Yes	Yes	Yes
Year-by-Month FE	Yes	Yes	Yes	Yes
State-by-Region FE	Yes	Yes	Yes	Yes
Mother Characteristics	Yes	Yes	Yes	Yes
Father Characteristics	Yes	Yes	Yes	Yes
State Characteristics	Yes	Yes	Yes	Yes
R^2	0.104	0.098	0.061	0.103
Observations	87,908,889	87,424,265	87,908,889	87,908,889

Notes: Robust standard errors, reported in parentheses, are clustered on the state. Parental controls include: dummies for mother's race, dummies for mother's education, mother's age, and dummies for father's age, father's race. State-by-year controls include: real GSP per capita, real personal income per capita, percentage blacks, percentage whites, percentage males, percentage population aged 25-65, Log Current Transfer Receipt, Log Income Maintenance Benefits, Log Unemployment Insurance Benefits, Log Other Welfare Benefits, and minimum wage.

6. CONCLUSION

Understanding the health externalities of social programs is important for policymakers to design an optimal structure of these benefits. This paper aimed to show the health externality of one important social program, child support policy. Starting from 1975, the US states initiated a series of enforcement in child support policies with the main purpose of establishing paternity and collecting the payments from the noncustodial parent and transfer it to the custodial parent. Exploiting the space-time variations in the enforcement of child support policies and using the universe of birth records in the US over the years 1975-2004, I documented that the policies were effective in improving birth outcomes. Infants born to single mothers in states that fully adopt child support policies have on average 38 grams higher birth weight and 99 basis points lower likelihood of being born with low birth weight. These effects hold for a wide range of health outcomes and are statistically significant at conventional levels. The marginal impacts are larger for mothers in states above-median changes in child support policies and for mothers who reside in poorer states. The results suggest that a higher quantity of prenatal care and better timing of prenatal care could be possible mechanisms of impact.

Funding: This study received no specific financial support.
Competing Interests: The author declares that there are no conflicts of interests regarding the publication of this paper.

REFERENCES

Aizer, A., & McLanahan, S. (2006). The impact of child support enforcement on fertility, parental investments, and child well-being. *Journal of Human Resources, 41*(1), 28–45.Available at: https://doi.org/10.3368/jhr.XLI.1.28.

Almond, D., & Currie, J. (2011a). Human capital development before age five. Handbook of Labor Economics (Vol. 4, pp. 1315-1486). USA: Elsevier Press.

Almond, D., & Currie, J. (2011b). Killing me softly: The fetal origins hypothesis. *Journal of Economic Perspectives, 25*(3), 153–172.Available at: https://doi.org/10.1257/jep.25.3.153.

Almond, D., & Mazumder, B. (2011). Health capital and the prenatal environment: The effect of Ramadan observance during pregnancy. *American Economic Journal: Applied Economics, 3*(4), 56–85.Available at: https://doi.org/10.1257/app.3.4.56.

Almond, D., Mazumder, B., & Van Ewijk, R. (2014). In utero Ramadan exposure and children's academic performance. *The Economic Journal, 125*(589), 1501–1533.

Almond, D., Mazumder, B., & van Ewijk, R. (2015). In Utero Ramadan exposure and children's academic performance. *The Economic Journal*, *125*(589), 1501–1533.Available at: https://doi.org/10.1111/ecoj.12168.

Argys, L. M., Peters, H. E., Brooks-Gunn, J., & Smith, J. R. (1998). The impact of child support on cognitive outcomes of young children. *Demography*, *35*(2), 159-173.Available at: https://doi.org/10.2307/3004049.

Baird, S., Friedman, J., & Schady, N. (2011). Aggregate income shocks and infant mortality in the developing world. *Review of Economics and statistics*, *93*(3), 847-856.Available at: https://doi.org/10.1162/REST_a_00084.

Baughman, R. A. (2017). The impact of child support on child health. *Review of Economics of the Household*, *15*(1), 69–91.Available at: https://doi.org/10.1007/s11150-014-9268-3.

Becker, C. M., Mirkasimov, B., & Steiner, S. (2017). Forced marriage and birth outcomes. *Demography*, *54*(4), 1401–1423.Available at: https://doi.org/10.1007/s13524-017-0591-1.

Beller, A. H., & Graham, J. W. (1991). The effect of child support enforcement on child support payments. *Population Research and Policy Review*, *10*(2), 91–116.Available at: https://doi.org/10.1007/BF00128816.

Bozzoli, C., & Quintana-Domeque, C. (2014). The weight of the crisis: Evidence from newborns in Argentina. *Review of Economics and Statistics*, *96*(3), 550–562.Available at: https://doi.org/10.1162/REST_a_00398.

Carlson, K. (2018). Red alert: Prenatal stress and plans to close military bases. *American Journal of Health Economics*, *4*(3), 287-320.Available at: https://doi.org/10.1162/ajhe_a_00102.

Carlson, K. (2015). Fear itself: The effects of distressing economic news on birth outcomes. *Journal of Health Economics*, *41*, 117–132.Available at: https://doi.org/10.1016/j.jhealeco.2015.02.003.

Cole, N., & Currie, J. (1993). Welfare and child health: The link between AFDC participation and birth weight. *American Economic Review*, *83*(4), 971–985.Available at: https://doi.org/10.2307/2117589.

Corman, H., Dave, D., Reichman, N. E., Corman, H., Dave, D., & Reichman, N. E. (2019). *The effects of prenatal care on birth outcomes: Reconciling a messy literature. Oxford Research Encyclopedia of Economics and Finance.* United Kingdom: Oxford University Press.

Currie, J., & Cole, N. (1993). Welfare and child health: The link between AFDC participation and birth weight. *The American Economic Review*, *83*(4), 971-985.

Currie, J., & Grogger, J. (2002). Medicaid expansions and welfare contractions: Offsetting effects on prenatal care and infant health? *Journal of Health Economics*, *21*(2), 313–335.Available at: https://doi.org/10.1016/S0167-6296(01)00125-4.

Dooley, D., & Prause, J. (2002). Mental health and welfare transitions: Depression and alcohol abuse in AFDC women. *American Journal of Community Psychology*, *30*(6), 787-813.Available at: https://doi.org/10.1023/a:1020253002468.

Duncan, B., Mansour, H., & Rees, D. I. (2017). It's just a game: The super bowl and low birth weight. *Journal of Human Resources*, *52*(4), 946-978.Available at: https://doi.org/10.3368/jhr.52.4.0615-7213r.

Farré, L., & González, L. (2019). Does paternity leave reduce fertility? *Journal of Public Economics*, *172*, 52–66.Available at: https://doi.org/10.1016/j.jpubeco.2018.12.002.

FBI. (2018). *Uniform crime reporting program data: Police employee (LEOKA) data: Inter-University Consortium for Political and Social Research.* USA: Federal Bureau of Investigation.

Fertig, A. R., & Watson, T. (2009). Minimum drinking age laws and infant health outcomes. *Journal of Health Economics*, *28*(3), 737–747.Available at: https://doi.org/10.1016/j.jhealeco.2009.02.006.

Ga, Y., & Feng, L. (2012). Effects of federal nutrition program on birth outcomes. *Atlantic Economic Journal*, *40*(1), 61–83.Available at: https://doi.org/10.1007/s11293-011-9294-y.

Güneş, P. M. (2015). The role of maternal education in child health: Evidence from a compulsory schooling law. *Economics of Education Review*, *47*, 1–16.Available at: https://doi.org/10.1016/j.econedurev.2015.02.008.

Haeck, C., & Lefebvre, P. (2016). A simple recipe: The effect of a prenatal nutrition program on child health at birth. *Labour Economics*, *41*, 77–89.Available at: https://doi.org/10.1016/j.labeco.2016.05.003.

Hofferth, S. L., & Pinzon, A. M. (2011). Do nonresidential fathers' financial support and contact improve children's health? *Journal of Family and Economic Issues*, *32*(2), 280-295.Available at: https://doi.org/10.1007/s10834-010-9237-9.

Hoynes, H., Miller, D., & Simon, D. (2015). Income, the earned income tax credit, and infant health. *American Economic Journal: Economic Policy, 7*(1), 172–211.Available at: https://doi.org/10.1257/pol.20120179.

Hoynes, H., Page, M., & Stevens, A. H. (2011). Can targeted transfers improve birth outcomes? Evidence from the introduction of the WIC program. *Journal of Public Economics, 95*(7–8), 813–827.Available at: https://doi.org/10.1016/j.jpubeco.2010.12.006.

Hu, W. Y. (1999). Child support, welfare dependency, and women's labor supply. *Journal of Human Resources, 34*(1), 71–103.Available at: https://doi.org/10.2307/146303.

Istvan, J. (1986). Stress, anxiety, and birth outcomes: A critical review of the evidence. *Psychological Bulletin, 100*(3), 331-348.Available at: https://doi.org/10.1037/0033-2909.100.3.331.

Joyce, T. (1999). Impact of augmented prenatal care on birth outcomes of Medicaid recipients in New York City. *Journal of Health Economics, 18*(1), 31–67.Available at: https://doi.org/10.1016/S0167-6296(98)00027-7.

Jürges, H. (2015). Ramadan fasting, sex-ratio at birth, and birth weight: No effects on Muslim infants born in Germany. *Economics Letters, 137*, 13-16.Available at: https://doi.org/10.1016/j.econlet.2015.10.015.

Kaplan, E. K., Collins, C. A., & Tylavsky, F. A. (2017). Cyclical unemployment and infant health. *Economics and Human Biology, 27*, 281–288.Available at: https://doi.org/10.1016/j.ehb.2017.08.001.

Knox, V. W. (1996). The effects of child support payments on developmental outcomes for elementary school-age children. *Journal of Human Resources, 31*(4), 816–840.Available at: https://doi.org/10.2307/146148.

Kuka, E. (2018). Quantifying the benefits of social insurance: Unemployment insurance and health. *Review of Economics and Statistics, 102*(3), 490-505.

Leonard, J., & Mas, A. (2008). Welfare reform, time limits, and infant health. *Journal of Health Economics, 27*(6), 1551–1566.Available at: https://doi.org/10.1016/j.jhealeco.2008.05.013.

Lindo, J. M. (2011). Parental job loss and infant health. *Journal of Health Economics, 30*(5), 869–879.Available at: https://doi.org/10.1016/j.jhealeco.2011.06.008.

Majid, M. F. (2015). The persistent effects of in utero nutrition shocks over the life cycle: Evidence from Ramadan fasting. *Journal of Development Economics, 117*, 48–57.Available at: https://doi.org/10.1016/j.jdeveco.2015.06.006.

Mocan, N., Raschke, C., & Unel, B. (2015). The impact of mothers' earnings on health inputs and infant health. *Economics and Human Biology, 19*, 204–223.Available at: https://doi.org/10.1016/j.ehb.2015.08.008.

Myrskylä, M. (2010). The effects of shocks in early life mortality on later life expectancy and mortality compression: A cohort analysis. *Demographic Research, 22*, 289–320.Available at: https://doi.org/10.4054/DemRes.2010.22.12.

Neelakantan, U. (2009). The impact of changes in child support policy. *Journal of Population Economics, 22*(3), 641–663.Available at: https://doi.org/10.1007/s00148-008-0199-2.

Nixon, L. A. (1997). The effect of child support enforcement on marital dissolution. *Journal of Human Resources, 32*(1), 159–181.Available at: https://doi.org/10.2307/146244.

NoghaniBehambari, H., Noghani, F., & Tavassoli, N. (2020). Early-life income shocks and old-age cause-specific mortality. *Economic Analysis, 53*(2), 1-19.

NoghaniBehambari, H., Noghani, F., & Tavassoli, N. (2021). Child support enforcement and child mortality. *Applied Economics Letters*, 1-12.

Noghanibehambari, H., & Salari, M. (2020). Health benefits of social insurance. *Health Economics, 29*(12), 1813-1822.

Olafsson, A. (2016). Household financial distress and initial endowments: Evidence from the 2008 financial crisis. *Health Economics, 25*, 43-56.Available at: https://doi.org/10.1002/hec.3426.

Pierson, K., Hand, M. L., & Thompson, F. (2015). The government finance database: A common resource for quantitative research in public financial analysis. *PloS one, 10*(6), e0130119.Available at: https://doi.org/10.1371/journal.pone.0130119.

Reichman, N. E., & Florio, M. J. (1996). The effects of enriched prenatal care services on Medicaid birth outcomes in New Jersey. *Journal of Health Economics, 15*(4), 455–476.Available at: https://doi.org/10.1016/S0167-6296(96)00491-2.

Robins, P., & Robins, P. (1986). Child support, welfare dependency, and poverty. *American Economic Review, 76*(4), 768–788.Available at: https://doi.org/10.2307/1806073.

Robinson, T., & Raisler, J. (2005). Each one is a doctor for herself": Ramadan fasting among pregnant Muslim women in the United States. *Ethnicity & Disease, 15*(1 Suppl 1), S1-99.

Roff, J. (2008). A Stackelberg model of child support and welfare. *International Economic Review, 49*(2), 515-546.Available at: https://doi.org/10.1111/j.1468-2354.2008.00488.x.

Rossin-Slater, M. (2017). Signing up new fathers: Do paternity establishment initiatives increase marriage, parental investment, and child well- being? *American Economic Journal: Applied Economics, 9*(2), 93–130.Available at: https://doi.org/10.1257/app.20150314.

Ruggles, S., Flood, S., Goeken, R., Grover, J., & Meyer, E. (2019). *Jose Pacas, and Matthew Sobek. 2019. IPUMS USA: Version 9.0.* Minneapolis, MN: IPUMS.

SEER. (2019). Surveillance, epidemiology, and end results (SEER) program National Cancer Institute, DCCPS, Surveillance Research Program. Retrieved from www.seer.cancer.gov.

Sonchak, L. (2016). The impact of WIC on birth outcomes: New evidence from South Carolina. *Maternal and Child Health Journal, 20*(7), 1518-1525.Available at: https://doi.org/10.1007/s10995-016-1951-y.

Sonchak, L. (2015). Medicaid reimbursement, prenatal care and infant health. *Journal of Health Economics, 44*, 10–24.Available at: https://doi.org/10.1016/j.jhealeco.2015.08.008.

Sorensen, E., & Hill, A. (2004). Single mothers and their child-support receipt how well is child-support enforcement doing? *Journal of Human Resources, 39*(1), 135-154.Available at: https://doi.org/10.2307/3559008.

Tavassoli, N., Noghanibehambari, H., Noghani, F., & Toranji, M. (2020). Upswing in industrial activity and infant mortality during late 19th century US. *Journal of Environments, 6*(1), 1–13.Available at: https://doi.org/10.20448/journal.505.2020.61.1.13.

Torche, F. (2011). The effect of maternal stress on birth outcomes: Exploiting a natural experiment. *Demography, 48*(4), 1473-1491.Available at: https://doi.org/10.1007/s13524-011-0054-z.

Van Ewijk, R. (2011). Long-term health effects on the next generation of Ramadan fasting during pregnancy. *Journal of Health Economics, 30*(6), 1246–1260.Available at: https://doi.org/10.1016/j.jhealeco.2011.07.014.

Walker, I., & Zhu, Y. (2006). Child support and partnership dissolution. *The Economic Journal, 116*(510), C93–C109.Available at: https://doi.org/10.1111/j.1468-0297.2006.01078.x.