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Effects of Prenatal Poverty on Infant Health: State Earned Income Tax Credits and Birth Weight

Kate W. Strully,[a] David H. Rehkopf,[b] and Ziming Xuan[c]

Abstract

This study estimates the effects of prenatal poverty on birth weight using changes in state Earned Income Tax Credits (EITC) as a natural experiment. We seek to answer two questions about poverty and child wellbeing. First, are there associations between prenatal poverty and lower birth weights even after factoring out unmeasured potential confounders? Because birth weight predicts a range of outcomes across the life course, lower birth weights that result from poverty may have lasting consequences for children's life chances. Second, how have recent expansions of a work-based welfare program (i.e., the EITC) affected maternal and infant health? In recent decades, U.S. poverty relief has become increasingly tied to earnings and labor markets, but the consequences for children's wellbeing remain controversial. We find that state EITCs increase birth weights and reduce maternal smoking. However, results related to AFDC/TANF and varying EITC effects across maternal ages raise cautionary messages.

Keywords

infant health, poverty, Earned Income Tax Credit

In life course models of stratification, early-life environment is crucially important. Exposure to poverty and negative environments during critical stages of early life can negatively affect children's future developmental trajectories (e.g., cognitive and physical development), which may have lasting negative effects on educational attainment and adult earnings (Duncan and Brooks-Gunn 1997; Wagmiller et al. 2006). According to recent research, prenatal poverty and birth weight are important variables in life course processes of stratification (Conley, Strully, and Bennett 2003; Cramer 1995). As a measure of health at the start of life, birth weight is a general indicator of a baby's in-utero environment and development, and maternal poverty during the prenatal period is a robust predictor of lower birth weights (Bennett 1997). Low birth weight can in turn predict a range of negative

[a]University at Albany, SUNY
[b]University of California, San Francisco
[c]Harvard School of Public Health

Corresponding Author:
Kate W. Strully, University at Albany, SUNY, 1400 Washington Avenue, AS-308, Albany, NY 12222
E-mail: kstrully@albany.edu

outcomes across the life course, including increased infant mortality and poor childhood health, and lower educational attainment and earnings (Behrman and Rosenzweig 2004; Bennett 1997). Several scholars argue that early-childhood health (e.g., birth weight) plays an important role in life chances and, ultimately, the reproduction of inequality over generations (Case, Fertig, and Paxson 2005; Haas 2006). Policies that increase birth weights by reducing poverty among pregnant women may therefore generate long-term benefits.

Other researchers, however, challenge life course models of stratification by suggesting that early-life poverty does not have a real causal effect on children's wellbeing (Mayer 1998). Low family incomes are correlated with a range of other potentially confounding risk factors—such as mothers' early-life exposures, preferences and attitudes, and genetic variation—all of which may affect children and are difficult to properly adjust for in statistical models (Duncan 2005). If poverty does not actually affect birth weight, policies focused on increasing pregnant women's incomes may not confer expected benefits.

We use temporal variation in state Earned Income Tax Credits (EITCs) as a natural experiment to estimate the effects of prenatal poverty on infant health. The EITC is a refundable tax credit targeted at low-wage workers in the United States; it increases the incomes of disadvantaged single mothers by increasing labor market participation and wages. After adjusting for various additional factors, within-state variation in credits from one year to the next should be independent of potential confounders. We use U.S. birth certificate data from 1980 to 2002 for single mothers with a high school degree or less. Employing a difference-in-difference modeling strategy with state fixed effects, we consider how variation in state EITCs over time affects birth weight. Positive correlations between state EITCs and birth weight will imply that reducing prenatal poverty improves in-utero development and infant health, net of unmeasured risk factors. We examine possible pathways for EITC effects by testing whether changes in state EITCs affect maternal smoking during pregnancy, and we assess the extent to which mothers' smoking mediates effects of EITCs on birth weight.

Recent expansions of the EITC reflect a trend of ''liberalizing'' U.S. welfare policy and connecting cash assistance to the labor market (Danziger and Haveman 2001). The replacement of Aid to Families with Dependent Children (AFDC) (an entitlement cash assistance program) with Temporary Assistance to Needy Families (TANF) (which requires work or work-related activities) is another key example of this trend. What these policy shifts mean for maternal and child wellbeing remains controversial. Labor market entry following EITC expansions or welfare reform has increased incomes for single-mother households (Meyer and Rosenbaum 2001; Neumark and Wascher 2000). However, costs associated with employment (e.g., transportation and childcare) and barriers to regular work (e.g., low skills and weak labor markets) leave many employed mothers more financially strapped than their counterparts on welfare (Corcoran et al. 2000; Edin and Lein 1997). If time constraints and stress associated with low-wage work make it hard for mothers to create healthy home or in-utero environments, work-based welfare programs could harm child and infant wellbeing, perhaps in spite of increased incomes.

PATHWAYS BETWEEN PRENATAL POVERTY AND BIRTH WEIGHT

There are several pathways through which poverty may affect birth weight. Low incomes may limit access to health necessities, such as an adequate diet. For families experiencing food insecurity, even small, short-term variations in income can affect mothers'

nutritional intake (Tarasuk, McIntyre, and Li 2007). Poverty may also affect birth weight by increasing exposure and vulnerability to psychosocial stressors. Living below the poverty line exposes one to a disproportionate share of environmental stressors (e.g., disadvantaged communities, crime, and domestic violence [Taylor, Repetti, and Seeman 1997]). Chronic maternal distress may slow fetal growth rates and increase the risk of preterm delivery by altering the normal regulation of hormones during pregnancy (e.g., raising corticotrophin-releasing hormones and cortisol earlier than is typical) (Weinstock 2005). Furthermore, adults who experienced negative early-life exposures (e.g., in-utero distress or early childhood disease or trauma) have stronger than average hormonal and blood pressure responses to stimuli (Ladd et al. 2000). Because many poor adults were born into poverty, poor pregnant women are disproportionately likely to have experienced prenatal and early-life poverty-related stressors. This may make them particularly sensitive to stressors later in life.

Poverty may further affect birth weight by affecting mothers' health-related behaviors. In particular, poor women may find it more difficult to quit smoking when they become pregnant. Income is negatively correlated with smoking (Kanjilal et al. 2006), and stress frequently thwarts efforts to quit smoking (Kassel, Stroud, and Paronis 2003). Addictive behaviors (e.g., smoking and drinking) appear to play an important mediating role in the relationship between economic stress and lower birth weights (Sheehan 1998). We test for effects of state EITCs on the addictive behavior of smoking and assess the extent to which smoking during pregnancy mediates effects of EITCs on birth weight.

While there are many potential pathways for prenatal poverty effects, there are also several potential confounders. Unobserved genetic variation may be a source of bias. Shared environment is no doubt important, but within-family (i.e., parent/child or sibling) correlations for birth weight and poverty raise the possibility that genes are joint determinants (Wang et al. 1995). Mothers' early-life environments may also cause bias by simultaneously influencing poverty and birth weight. Early-life disadvantage can increase the risk of adult poverty, and recent research shows that mothers who experienced less healthy in-utero environments have poorer birth outcomes (Almond and Chay 2006; Lumey and Stein 1997).

Finally, unmeasured differences in mothers' attitudes and time preferences may be partially responsible for birth weight–poverty associations. Because socioeconomic attainment and health frequently require one to forego current pleasures in the interest of future returns, people who tend to consume in the present, rather than invest in the future, may end up both poorer and sicker (Fuchs 1982). If such a present orientation makes it more difficult for a woman to stay in school in the interest of future earnings and to maintain good health habits in the interest of her fetus's future health, unobserved time preferences could generate associations between prenatal poverty and birth weight. Economics literature often treats time preferences as a given, but they are not necessarily intrinsic and likely reflect earlier environmental and social exposures (Becker and Mulligan 1997).

The idea of underlying preferences sometimes motivates concerns over ''perverse'' effects of income transfers and arguments for elimination of cash transfers or their replacement with more ''paternalistic'' in-kind transfers (see, e.g., Murray 1984). If poor mothers have worse perinatal health outcomes because of present-oriented time preferences, raising their incomes could actually cause harm by increasing unhealthy habits or consumption. We test for perverse income effects by modeling associations between state EITCs and maternal smoking during pregnancy. Positive associations between state EITCs and maternal smoking

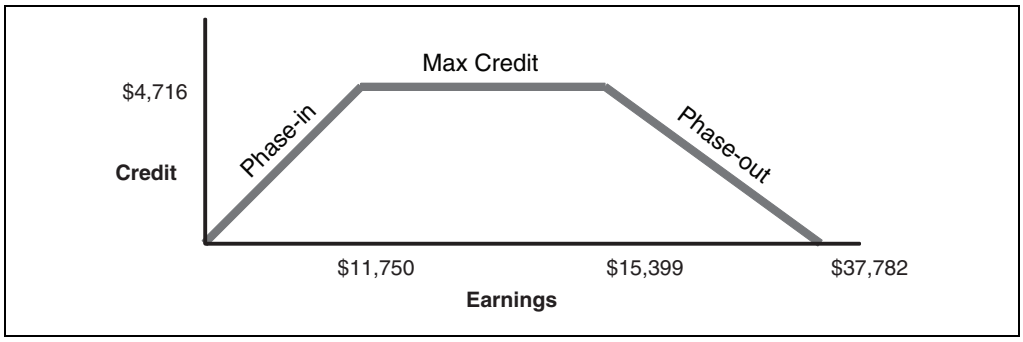

Figure 1. Federal EITC for a Family with Two Children (2007)

will suggest that income assistance has perverse health effects and increases maternal smoking. Alternatively, negative associations will suggest that income assistance reduces maternal smoking (e.g., by decreasing income-related stressors, making it easier to quit).

THE EARNED INCOME TAX CREDIT

The EITC, typically a refundable tax credit, is designed to reduce the tax burden on and supplement the incomes of low-wage workers in the United States. To qualify for the EITC, a person must have some earnings but have an adjusted gross income below a threshold that varies by year and by family size. As Figure 1 shows, the EITC has a phase-in range during which the credit increases with earnings, until reaching a plateau at the maximum credit ($4,716). Once earnings pass a certain limit ($15,399), the phase-out range begins and the credit decreases with additional earnings until reaching zero at the income threshold level ($37,782) (values are for the federal EITC for a family of two in 2007 [IRS 2007]).

The federal EITC was enacted in 1975 and is administered by the U.S. Internal Revenue Service (IRS). Since the early 1980s, 16 states have enacted their own EITCs, which are administered at the state level. Most states use the same eligibility criteria as the federal program and express their credit as a percentage of the federal credit. While the majority of state credits are refundable, Illinois, Iowa, Maine, Oregon, and Rhode Island offer nonrefundable credits. Table 1 displays trends in federal and state EITCs. For instance, New York enacted a refundable credit in 1994 equal to 7.5 percent of a filer's federal credit and then expanded it to more than three times its original size so it reached 27.5 percent by 2002. Because state credits are expressed as percentages of the federal credit, they grow when the federal credit increases.

The EITC increases poor mothers' incomes in two ways. First, as a tax credit, it reduces tax liability, which increases after-tax income. Second, the EITC's structure generates employment incentives, particularly among single mothers with low-education, which will increase earnings. Because these two components are intertwined (earnings affect the credit and the credit affects earnings), it is extremely difficult to empirically separate out their effects; the estimates from our analysis will reflect their combined impact. It is useful, however, to draw a conceptual distinction between these two exposures and consider how they each might affect birth weight.

The tax credit component of the EITC. Because federal and most state EITCs are refundable, if tax filers owe less than their calculated credit they receive the difference as a cash transfer, typically a lump sum

Table 1. Trends in Federal and State EITCs, 1983 to 2002

	Max Federal Credit	CO		DC		IL		IA		KS		ME		MD		MA		MN	
	$	%	$	%	$	%	$	%	$	%	$	%	$	%	$	%	$	%	$
1983	500																		
1984	500																		
1985	550																		
1986	550																		
1987	851																		
1988	874																		
1989	910																		
1990	953							5	48										
1991[a]	1,235							6.5	80									10	124
1992	1,384							6.5	90									10	138
1993	1,511							6.5	98									15	227
1994	2,528							6.5	164									15	379
1995	3,110							6.5	202									15	467
1996	3,556							6.5	231									15	533
1997	3,656							6.5	238							10	366	15	548
1998	3,756							6.5	244	10	376			10	376	10	376	25	939
1999	3,816	8.5	324					6.5	248	10	382			10	382	10	382	25	954
2000	3,888	10	389	10	389	5	194	6.5	253	10	389	5	194	15	583	10	389	25	972
2001	4,008	10	401	25	1,002	5	200	6.5	261	10	401	5	200	16	641	15	601	33	1,323
2002	4,140	0	0	25	1,035	5	207	6.5	269	15	621	5	207	16	662	15	621	33	1,366
Refundable?	Y	Y		Y		N		N		Y		N		Y		Y		Y	

(continued)

Table 1. (continued)

														WI					
	Max Federal Credit	NJ		NY		OK		OR		RI		VT		One Child		Two Children		Three or More Children	
	$	%	$	%	$	%	$	%	$	%	$	%	$	%	$	%	$	%	$
1983	500													30	150	30	150	30	150
1984	500													30	150	30	150	30	150
1985	550													30	165	30	165	30	165
1986	550									22.21	122								
1987	851									23.46	200								
1988	874									22.96	201	23	201						
1989	910									22.96	209	25	228	5	46	25	228	75	683
1990	953									22.96	219	28	267	5	48	25	238	75	715
1991[a]	1,235									27.5	340	28	346	5	62	25	309	75	926
1992	1,384									27.5	381	28	388	5	69	25	346	75	1,038
1993	1,511									27.5	416	28	423	5	76	25	378	75	1,133
1994	2,528			7.5	190					27.5	695	25	632	4.4	111	20.8	526	62.5	1,580
1995	3,110			10	311					27.5	855	25	778	4	124	16	498	50	1,555
1996	3,556			20	711					27.5	978	25	889	4	142	14	498	43	1,529
1997	3,656			20	731			5	183	27.5	1,005	25	914	4	146	14	512	43	1,572
1998	3,756			20	751			5	188	27	1,014	25	939	4	150	14	526	43	1,615
1999	3,816			20	763			5	191	26.5	1,011	25	954	4	153	14	534	43	1,641
2000	3,888	10	389	22.5	875			5	194	26	1,011	32	1,244	4	156	14	544	43	1,672
2001	4,008	15	601	25	1,002			5	200	25.5	1,022	32	1,283	4	160	14	561	43	1,723
2002	4,140	17.5	725	27.5	1,139	5	207	5	207	25	1,035	32	1,325	4	166	14	580	43	1,780
Refundable?	Y	Y		Y		Y		N		N		Y					Y		

Source: Leigh (2004) and Hotz and Scholz (2003).
Note: % reflects the state credit as a percentage of the federal credit; $ reflects the maximum size of the state credit (i.e., Max Fed Credit * [%/100]), dollar amounts reflect current (i.e., nominal) values, they are not adjusted for inflation.
[a]In 1991, the federal credit began varying with family size. The values depicted here are for families with more than one qualifying child. Values for families with only one child are slightly smaller.

payment after filing taxes (Hotz and Scholz 2003).[1] Evidence from a qualitative study of EITC recipients in Wisconsin suggests participants spend this refund money somewhat differently than regular paychecks, often investing in housing, cars or car repairs, paying off bills, childcare, or children's items (e.g., learning items and clothing) (Romich and Weisner 2000). While these expenditures are unlikely to have direct benefits for birth weight, there may be indirect pathways. For instance, reducing logistical barriers to employment can have substantial returns. Danziger and colleagues (2000) found that among low-income welfare recipients, the marginal effects of car ownership on future earnings were equivalent to the marginal effects of completing high school.

Earnings and EITC employment incentives. Beyond the credit itself, the EITC's incentive structure can also raise income by increasing labor market participation. The EITC is explicitly designed to encourage low-wage employment by reducing taxes on wages below a certain level. This incentive structure is particularly effective among single mothers with low education because they are more likely to fall in the EITC's phase-in range (see Figure 1). More-educated women or married couples, who are more likely to fall in the credit's plateau or phase-out ranges, are less sensitive to EITC employment incentives (Hotz and Scholz 2003). The EITC increases single mothers' labor market entry, but it has little effect on the number of hours worked for those already employed (Eissa and Hoynes 2005). For many single mothers, potential earnings are so low that costs associated with working (e.g., childcare and transportation) exceed the additional income they could get from employment. The EITC often raises effective wages above this threshold so that entering the labor market becomes a profitable option.

A considerable body of evidence shows that the EITC increases maternal employment and reduces poverty rates. Using 1984 to 1996 data from the March Current Population Surveys (CPS), Meyer and Rosenbaum (2001) find that a $1,000 reduction in income taxes associated with federal and state EITCs increased annual employment among single mothers with fewer than 12 years of education by approximately nine percentage points. Neumark and Wascher (2000), using 1985 to 1994 CPS data on poor and near-poor households, find that a 4 percent increase in the phase-in rate of a state credit is associated with a 13 percent increase in the probability of labor market entry and a 6 percent increase in the probability of rising above the poverty line. To place this in context, about 21 percent of the study's sample transitioned out of poverty during the observation period. A 6 percent increase in the probability of rising above the poverty line is, proportionately speaking, equivalent to an increase of about one-quarter to one-third of the average transition rate.

Direct effects of state EITCs on family income through reduced tax liability are not particularly large (see, e.g., the maximum credits in Table 1). Evidence shows, however, that the indirect effects of state EITCs, which operate through employment incentives and earnings, can be quite substantial. We use 1980 to 2002 March CPS data to demonstrate these indirect effects and show how state EITCs affected employment and earnings within our specific population of interest (i.e., single mothers with a high school degree or less).

POVERTY RELIEF AND INFANT HEALTH

Using natural experimental approaches, a handful of authors have tested associations between income assistance and birth weight. Currie and Cole (1993), using an instrumental variable strategy, find no effect of AFDC benefits on birth weights. Kehrer and Wolin (1979), however, find that a negative income tax (NIT) experiment in the 1970s increased

birth weight between .3 and 1.2 additional pounds for babies of African American women facing multiple risk factors. Focusing on county-level variation in the initiation of the Food Stamps program in the 1960s and 1970s, Almond, Hoynes, and Schanzenback (2008) find positive associations between food stamps and birth weight.

These studies all provide important evidence. However, they focus on programs that often have work disincentives, so they do not address how work-based welfare programs, such as EITC, might influence maternal and infant health. Research on academic achievement suggests that the structure of work incentives is important. Experimental welfare programs that encourage employment with earnings supplements promote young children's academic achievement; however, programs that mandate work but do not support it financially have few effects on children (Morris et al. 2001). Furthermore, Dahl and Lochner (2009) find that expansions of the federal EITC are associated with improvements in children's math and reading scores.

To get a general sense of how different policies with varying employment incentives affect infant and maternal health, we compare EITC estimates with several AFDC/TANF estimates, which are included in the models as controls. In contrast to the EITC, AFDC/TANF benefits, which decline with additional earnings, are generally negatively associated with employment (Moffitt 2003). If state EITCs and AFDC/TANF benefits both improve birth weights, poverty relief may be generally beneficial despite differences in work incentives. Alternatively, finding that one program is beneficial while the other is not will provide preliminary evidence that health benefits depend on work incentives or other program structures. While the AFDC/TANF estimates provide interesting points of comparison, we focus our main interpretation on state EITCs because they provide cleaner natural experiments.[2]

Examining the NIT and food stamps, Kehrer and Wolin (1979) and Almond and colleagues (2008) find larger improvements in birth weight among higher-risk groups, such as babies in lower weight ranges or African American mothers with additional risk factors (e.g., young age or no father at the birth). It seems equally likely, however, that more advantaged individuals would be better able to translate income assistance into improved infant health. Mirowsky and Ross (1998) argue that socioeconomic advantages, such as higher education, give people an enhanced sense of personal control, which allows them to turn health-producing behaviors into long-term, coherent healthy lifestyles.

In the following analysis, we test whether enactments of new state EITCs have varying effects for more or less advantaged individuals by comparing estimates across maternal age and education. Any interactions between maternal characteristics and state EITCs will reflect a combination of (1) differences in eligibility or take-up rates, which affect receipt of EITCs, and (2) differences in the health benefits of EITCs for those who receive the credit. When examining education, we compare women without high school degrees to those with only high school degrees (i.e., no education beyond high school). Mothers with high school degrees may be more likely to enter the labor market following a new EITC and then to file for the credit at tax time. Within the credit's phase-in range, higher average earnings will give more-educated women access to larger credits. Skills and cognitive abilities associated with higher education may also make it easier for mothers to translate additional income from the EITC into better health habits (e.g., improved diet). Finding larger effects among mothers with high school degrees would suggest that state EITCs are more beneficial for the relatively more advantaged; finding larger effects among mothers without a high school degree would suggest the opposite.

The relationship between birth weight and maternal age is generally curvilinear, with lower birth weights found among mothers who are 18 years or younger or older than 35. Lower birth weights among young mothers can reflect their high rates of poverty and disadvantage; among older mothers, lower birth weights are often due to age-related pregnancy complications (e.g., pre-eclampsia or gestational diabetes). Single mothers over age 35 may be more likely to have higher earnings and access to larger credits within the EITC phase-in range. On the other hand, age-related pregnancy complications may reduce the birth weight benefits of an EITC-related income boost, in which case, we could see smaller effects among older mothers, particularly in comparison to 19- to 35-year-old mothers who are in better socioeconomic positions than the youngest mothers. Mothers who are 18 years or younger are likely to have weak labor market attachment, and some may not be eligible for the EITC if they are still dependents on their parents' taxes (although they could benefit indirectly if state credits increase their parents' income). We therefore expect young mothers to get comparatively small birth weight returns from the EITC, particularly in relation to 19- to 35-year-old mothers who are at lower biological risk than mothers older than 35 years. Indeed, finding very large EITC effects among very young mothers would raise concerns about confounding from unmeasured state time trends.

RESEARCH METHODS AND DATA

We employ a difference-in-difference modeling strategy with state and year fixed effects, which can be written as the following:

$$\mathbf{Y_{ist}} = \beta_0 + \beta_1 \mathbf{EITC}_{st} + \beta_2 \mathbf{Individual}_{ist} + \beta_3 \mathbf{StateEcon/Policy}_{st} + \beta_4 \mathbf{State}_t + \beta_5 \mathbf{Year}_s + u_{ist}$$

where the subscript i reflects individuals, s reflects states, and t reflects time (i.e., year). **EITC** reflects whether a woman gave birth in a state with an EITC, **Individual** reflects a set of individual-level control variables, and **State Econ/Policy** reflects a set of controls for state economic and social policy conditions. **State** includes dummy variables for each of the U.S. states and the District of Columbia (i.e., state fixed effects), while **Year** includes dummy variables for years (i.e., year fixed effects). The state fixed effects hold constant unmeasured time-invariant differences across states (e.g., stable state differences in policy, costs of living, and population composition). The year fixed effects hold constant any time trends that affect the entire nation (e.g., changes in the national economy or federal tax and welfare policies). Including state and year fixed effects means that β_1 can be interpreted as the effect of a change in (i.e., enactment of) a state credit. Conceptually, this difference-in-difference modeling strategy involves defining a treatment and a control group and then comparing differences across these groups before and after the enactment of a state EITC. Our main treatment group is unmarried mothers with a high school degree or less, living in a state with an EITC. The main control group is unmarried mothers with a high school degree or less, but who live in a state without an EITC.

As Figure 2 shows, the natural experimental logic of the difference-in-difference approach assumes that enactment of a state EITC in year Y increases maternal income and employment but has no direct effect on birth weight in year Y+1 (independent of the effects mediated by employment/income). After adjusting for potential confounders, the fact that one state enacts a credit in a given year and another does not should be uncorrelated with individual women's unmeasured characteristics. These assumptions will be violated if there are unmeasured state-specific time trends associated with both EITCs and birth weight. That is, our estimates could be biased if enactments

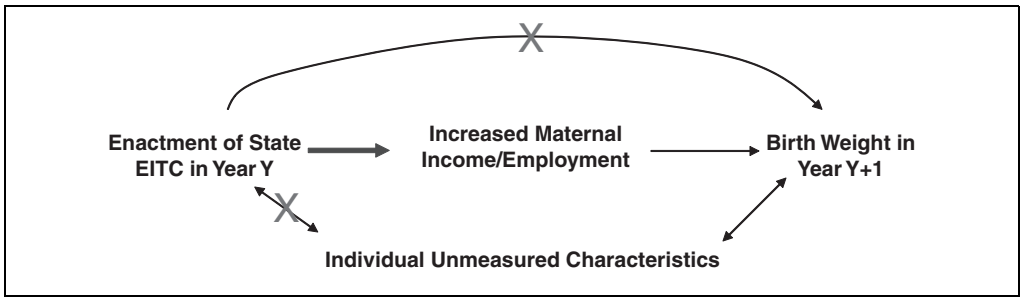

Figure 2. State EITCs as a Natural Experiment

of state EITCs coincide with other types of changes within the state that are correlated with birth weight and are not controlled for in our models. To address this, we include several control variables for states' economic circumstances and social policies. We also conduct the following two tests to check the validity of our natural experimental assumptions and bolster our causal interpretation.

Tests of the Natural Experiment Assumptions

First, we test for birth weight–EITC associations across the following three subgroups that should be relatively less sensitive to the EITC than our primary sample.

1. *Women with 16 or more years of education*. Because college-educated women are relatively high earners, they should be largely unaffected by changes in EITC policy and we expect no EITC–birth weight association for this group.
2. *Married women*. As discussed earlier, the EITC's employment incentives tend to be strongest among single mothers. While EITC policies may affect married women, depending on where their incomes fall in the credit's three-phase structure, household earnings are likely to be higher, and thus the overall effect for this group should be notably weaker than for unmarried women.
3. *Women giving birth to their first child.* Because the federal EITC is much smaller for individuals without children, and a handful of states do not offer credits to childless individuals, women who are pregnant with their first child will receive much smaller state EITCs or, in a handful of states, no credit. The overall effect on first births should therefore be substantially smaller than the effect for higher-order births.

Inappropriately strong EITC–birth weight associations for any of these subgroups will raise concerns about unmeasured state-level time trends.

Second, we compare descriptive statistics for births occurring in a given state in the years immediately before and after enactment of a new credit. Many scholars argue that taxation and income transfer policies affect marriage and fertility choices (Moffitt 2003). It is therefore conceivable that EITCs do not actually affect maternal and infant health, but rather change the composition of live births (e.g., if the EITC reduces marriage rates among mothers with a high school degree or less, the composition of the population we are analyzing is likely to change). Finding sizable changes in mothers' education, age, or marital status following a new state EITC will raise concerns about bias from composition effects.

Data

The primary data for this analysis come from the 1980 through 2002 U.S. Natality Detail File. These vital statistics contain records for virtually every birth occurring in the United States during the specified time period. Information is taken directly from birth certificates, which means that birth weight is recorded by medical professionals, rather than recalled by survey respondents. While birth certificate data do not provide all of the socioeconomic controls that are available in many national surveys, vital statistics are the only data that provide an adequate number of births in each state and year, as well as a sufficiently long time series for capturing the enactments of multiple state credits (NBER N.d.). To test the effects of state EITCs on mothers' earnings and employment, we use data from the 1980 through 2002 March demographic supplements to the Current Population Surveys (CPS). These annual data, collected by the U.S. Census Bureau, are based on a rotating national probability sample of approximately 58,000 households (IPUMS CPS N.d.).

Because the EITC is targeted at low-wage workers and tends to have the largest impact on single mothers' employment, we limit our primary samples to unmarried mothers with a high school degree or less. In the natality data, we identify mothers as women who already had at least one live birth, and we limit the sample to singleton births among U.S. residents who gave birth in their state of residence.[3] In the March CPS, mothers are identified as women of childbearing age (i.e., 15 to 44 years) who have at least one of their own children residing with them.

State-Level Variables

EITC, the main predictor of interest, is a dummy variable coded one if a woman is living in a state that has a credit in a given year and coded zero otherwise. For instance, if a state enacted a credit in 1990, women living in this state prior to 1990 will be coded zero, and women living in the state in 1990 and later will be coded one. Because all the models include state fixed effects, this variable can be interpreted as the effect of a change in (i.e., the enactment of) a state EITC. To allow state credits to have their complete effect (i.e., increase employment during a given tax year and then provide a refund when people file taxes the next year), we lag the state EITC variable by one year (e.g., a new state credit in 1990 predicts birth outcomes in 1991).[4]

In these analyses, we cannot know whether particular women filed for and received an EITC; rather, we are examining whether a change in this policy had an impact on the population most likely to be affected (i.e., unmarried mothers with a high school degree or less). This is often referred to as an ''intent-to-treat'' analysis—women who are likely to be eligible for but may not have actually received a credit are included in the treatment group (Montori and Guyatt 2001). This is a relatively conservative modeling strategy, which avoids upward bias that could occur if healthier, more advantaged women are more likely to claim the EITC. Because it necessarily involves some measurement error (i.e., some women who did not actually receive the credit are coded one on the EITC variable), it may generate downwardly biased estimates depending on how many eligible women do not actually claim the credit. We are not aware of any published estimates of what percentage of eligible individuals file for state EITCs, but estimates find that between 80 and 90 percent (depending on the data source) of eligible individuals applied for the federal EITC in the early 1990s (Scholz 1994).

To adjust for state-level time trends that may co-vary with changes in state EITCs, we include several control variables at the state level. Like the EITC variable, all of these are time varying and lagged by one

year (e.g., a state-level control measure in 1990 predicts birth outcomes in 1991).

We model *state AFDC/TANF benefit size quartile* with dichotomous variables indicating whether a respondent gave birth in a state with AFDC/TANF benefits that fell in the 1st (reference category), 2nd, 3rd, or 4th quartiles of the distribution in a given year. All benefits are based on values for a three-person family (University of Kentucky, Center for Poverty Research N.d.).

We capture differences in TANF policy with two composite variables based on De Jong and colleagues' (2005) factor analysis. *TANF work requirements* measures the types of situations that may exempt a person from work requirements (e.g., a lack of activities programs in a geographic area or spending significant time on volunteer activities). We code this variable from lenient to stringent, with higher values reflecting more limited exemption options. *TANF activities requirements* measures the types of activities that may fulfill work requirements. This variable is also coded from lenient to stringent, with lenient states accepting a range of activities (e.g., community service or childcare), and more stringent states accepting only work or school activities. In both variables, higher values reflect more work-centered TANF programs. Because TANF was not enacted until 1996, all births occurring before 1996 are coded zero for these variables. Births occurring in 1996 and later are coded as the appropriate factor analysis score for their state in that year.

State Medicaid spending is a continuous variable for a state's total Medicaid expenditures for personal health care in a given year, measured in tens of millions of dollars (U.S. Department of Health and Human Services N.d.).[5]

WIC participation is a continuous variable for the number of women in a state participating in the Special Supplemental Nutrition Program for Women, Infants, and Children in a given year, measured in thousands (Food Research and Action Center 2005).

Minimum wage is a continuous measure of the dollar value of the minimum wage in a state in a given year (University of Kentucky, Center for Poverty Research N.d.).

Number poor is a continuous variable for the number of people in a state living below the poverty line in a given year, measured in tens of thousands (University of Kentucky, Center for Poverty Research N.d.).

Gross state product is a continuous variable for the economic output of a state in a given year, measured in thousands of dollars (University of Kentucky, Center for Poverty Research N.d.).

State unemployment rate is a continuous measure of the percentage of a state's population unemployed in a given year (University of Kentucky, Center for Poverty Research N.d.).

Individual-Level Variables

Birth weight, a continuous variable measured in grams, is the primary outcome for the analysis.

Any employment is a dichotomous indicator coded one if a mother worked for at least one week in the past year. This measure serves as the first dependent variable in the CPS analysis.

Logged wages/salary is a continuous measure of a woman's total pre-tax income from wages and salary in the past year. This measure serves as the second dependent variable in the CPS analysis. This variable is logged to account for the EITC's diminishing returns for higher earners who fall in the credit's plateau and phase-out ranges.

Maternal smoking is both a dependent variable and a covariate in the analysis of natality data. It is a dichotomous variable coded one if a mother reports smoking while pregnant. Questions about smoking are available only in the natality data after 1988. Some states (i.e., California, Indiana, Louisiana, Nebraska, New York, Oklahoma, South Dakota, and Washington) report

maternal smoking in only some of the years after 1988. Results regarding maternal smoking must be interpreted with some caution because these models include a more limited subset of cases.

To adjust for individual-level characteristics that might jointly determine EITC eligibility and birth weight, we also include several control variables at the individual level.

We measure *maternal race* with dichotomous indicators for white (reference category), black, and other.[6]

We specify *birth order* with three groupings: one previous birth (reference category), two previous births, and three or more previous births. In the CPS models, we use parallel indicators for a mother's number of own children in the household (i.e., two children and three or more children; one child is the reference category).

Maternal education is a dichotomous indicator coded one if a woman has a high school degree. We test for interactions between maternal education and state EITCs by distinguishing mothers based on high school degrees and state credits. This generates four categories: mother has no high school/no state EITC (reference category), mother has no high school/state has EITC, mother has high school/no state EITC, and mother has high school/state has EITC.

We specify *maternal age* with three categories: 18 years or younger, 19 to 34 years (reference category), and 35 years or older. We test for interactions between maternal age and state EITCs by distinguishing mothers based on their age category and state credits. This generates the following six categories: mother is 18 years or younger/no state EITC (reference category), mother is 18 years or younger/state has EITC, mother is 19 to 34 years/no state EITC, mother is 19 to 34 years/state has EITC, mother is older than 35 years/no state EITC, and mother is older than 35 years/state has EITC.

Table 2 presents means and standard deviations for the 8,762,028 live births to unmarried mothers with a high school degree or less documented in the 1980 to 2002 Detailed Natality File. The table also shows descriptive statistics for a sample of 66,542 women from the 1980 to 2002 March CPS. In this relatively disadvantaged population, the mean birth weight of 3,215gm falls below the national average of approximately 3,350gm. African Americans are overrepresented, delivering about 40 percent of births in the file. About half the mothers have a high school degree, and 29 percent smoked while pregnant.

Table 3 presents a pairwise correlation matrix for all the state-level variables. EITCs are more likely in states with stronger economies. The unemployment rate and number poor in a state are negatively associated with state EITCs, while the gross state product is positively associated. This fits with the general logic that states increase social spending when they have more revenue, and with more specific evidence showing that higher gross state products predicted state EITCs in the 1980s and 1990s (Leigh 2004). State EITCs are also positively correlated with more generous AFDC/TANF benefits, minimum wages, and Medicaid programs. On the other hand, state EITCs are negatively correlated with the number of women participating in WIC. This is most likely because WIC participation partially reflects economic hardship and need for nutritional assistance, as well as program generosity. These correlations demonstrate the various relationships between economic and policy circumstances within states. One should note, however, that these correlations are means capturing time-invariant aspects of state characteristics that will be factored out in the following state fixed effects models.

Models

When predicting birth weight and logged wages/salary, we use OLS models. When predicting the dichotomous outcomes of maternal smoking and any employment, we use logistic regression and present odds ratios. Although

Table 2. Variable Means for Single Mothers with a High School Degree or Less

	1980 to 2002 Natality Data	1980 to 2002 March CPS
Birth Weight	3215.979	
	(609.331)	
Any Employment		.662
Logged Wages/Salary		6.058
		(4.592)
State has EITC	.083	.077
State AFDC/TANF Benefits for a Three-Person Family		
Benefits in Second Quartile	.245	.257
Benefits in Third Quartile	.241	.245
Benefits in Fourth Quartile	.248	.247
More Stringent State TANF Work Exemption Policy	−.075	−.050
	(.647)	(.549)
More Stringent State TANF Activities Requirement	.027	.014
	(.530)	(.473)
State WIC Participation	63.485	42.634
	(75.020)	(57.226)
State Minimum Wage	4.200	3.956
	(.795)	(.840)
State Medicaid Spending	523.851	384.839
	(607.204)	(540.669)
Number Poor Residents in State	167.982	135.167
	(149.036)	(129.033)
State Unemployment Rate	6.147	6.435
	(1.934)	(2.079)
Gross State Product	315.627	233.473
	(299.84)	(246.483)
Baby Female	.491	
Mother's Race/Ethnicity		
Black	.417	.285
Other	.035	.039
Mother's Age		
18 or Younger	.080	.028
35 or Older	.064	.380
Mother has High School Degree	.490	.636
Previous Births/Children		
Two Previous Births/Children	.274	.327
Three or More Previous Births/Children	.223	.246
Mother Smoked	.287	
EITC−Age Interactions		
Mother ≤18; State has EITC	.005	
Mother 19 to 34; No State EITC	.785	
Mother 19 to 34; State has EITC	.070	
Mother 35+; No State EITC	.057	
Mother 35+; State has EITC	.008	
EITC−Education Interactions		
No High School; State has EITC	.039	
High School Degree; No State EITC	.456	
High School Degree; State has EITC	.044	
N	8,762,028	-66,542

Note: Standard deviations for continuous variables in parentheses.

Table 3. Correlation Matrix for State-Level Variables, 1980 to 2002 Detailed Natality Files

	EITC	AFDC/ TANF (2nd quartile)	AFDC/ TANF (3rd quartile)	AFDC/ TANF (4th quartile)	TANF Work Exmpt.	TANF Activities Req.	WIC Participation	Minimum Wage	Medicaid Spending	Number Poor	Unemployment Rate
AFDC/TANF Benefits (2nd quartile)	−.171										
AFDC/TANF Benefits (3rd quartile)	.047	−.321									
AFDC/TANF Benefits (4th quartile)	.308	−.327	−.324								
TANF Work Exemption Policy	.057	.041	−.007	.015							
TANF Activities Requirements	−.160	.061	−.093	.034	−.526						
WIC Participation	−.041	−.222	−.257	.592	−.168	.179					
Minimum Wage	.243	−.089	.007	.266	.048	−.070	.387				
Medicaid Spending	.334	−.250	−.147	.642	−.074	.024	.738	.439			
Number Poor	−.046	−.225	−.242	.616	−.144	.149	.917	.182	.715		
Unemployment Rate	−.194	−.108	−.085	.040	−.004	.025	.053	−.487	−.039	.237	
Gross State Product	.058	−.234	−.178	.658	−.115	.112	.950	.421	.841	.918	.000

Note: All correlations are statistically significant at the .05 level, with the exception of the correlation between unemployment rate and gross state product.

not shown in the tables in the interest of space, all models include dichotomous indicators for year and state of residence. While it is not possible to identify sibling pairs within natality files, these data contain virtually all births occurring within the United States and, therefore, will inevitably include multiple births to the same woman. To adjust for this unmeasurable clustering, we estimated standard errors using the Huber-White procedure for robust standard errors. The March CPS data are weighted to adjust for sampling design.

RESULTS

Table 4 presents associations between state EITCs and mothers' employment and earnings, based on 1980 to 2002 March CPS. According to odds ratios from Model 1, living in a state with an EITC increases mothers' odds of working for at least one week by 19 percent. In Model 2, state EITCs increase mothers' wages/salary by 32 percent.[7] These results confirm that state EITCs should raise mothers' incomes in two ways: (1) reducing taxes by the amounts displayed in Table 1 and (2) increasing employment and wages as shown in Table 4.

AFDC/TANF, however, appears to discourage maternal employment and earnings, but only in the lower quartiles. A state increasing its AFDC/TANF benefits from the first quartile to the second reduces the chances of labor market participation by 14 percent and reduces logged wages/salary by approximately 21 percent. Being in a state with more limited TANF work exemptions is positively associated with employment and wages. Being in a state with stricter activities requirements, however, has no significant association with either outcome.

Table 5 presents associations between state EITCs, birth weight, and maternal smoking, based on 1980 to 2002 U.S. natality data. According to Model 1, state EITCs increase birth weights by, on average, 16gm. It is useful to gauge this estimate in terms of another covariate widely known to be associated with birth weight—namely, maternal education. In Model 1, having a high school degree is associated with a 47gm increase in birth weight. This implies that the average effect of state EITCs is equal to about 34 percent of the magnitude of the association between birth weight and having a high school degree.[8]

When looking at all states and years in Model 1, living in a state with AFDC/TANF benefits in the top quartile, rather than the bottom, increases birth weights by approximately 8gm. Despite different policy structures and work incentives, both EITCs and AFDC/TANF generosity appear to benefit infant health in Model 1. Living in states with higher minimum wages and Medicaid spending is positively associated with birth weight. Living in states in which more women require nutritional assistance and enroll in WIC has a small negative association with birth weight. State unemployment rates and the number of poor residents in a state are positively associated with birth weight. This may seem counterintuitive because individual-level hardship is associated with lower birth weights. Ruhm (2000 and 2004), however, finds that national recessions are associated with lower infant mortality rates and reductions in negative health behaviors such as smoking.

In Model 2 of Table 5, we test whether maternal smoking is sensitive to state EITCs. Living in a state with an EITC reduces the odds of maternal smoking by about 5 percent. However, living in a state with the most generous AFDC/TANF benefits increases the odds of maternal smoking by 9.5 percent. Mothers in states with higher unemployment rates or a larger number of poor residents appear less likely to smoke, which corresponds with the negative associations between these variables and birth weight in Model 1.

Table 4. The Effect of State EITCs on Labor Market Participation and Wages/Salary, 1980 to 2002 March Current Population Surveys

	(1) Any Employment	(2) Logged Wages/Salary
	Logistic Regression (odds ratios)	OLS Regression
State EITC	1.187***	.318***
	(.075)	(.110)
State AFDC/TANF Benefits for a Three-Person family		
Benefits in the Second Quartile	.863***	−.212**
	(.048)	(.093)
Benefits in the Third Quartile	1.037	.124
	(.083)	(.141)
Benefits in the Fourth Quartile	.969	.007
	(.099)	(.183)
More Stringent State TANF Work Exemption Policy	1.081***	.128***
	(.030)	(.048)
More Stringent State TANF Work Activities Requirements	.980	−.058
	(.032)	(.053)
State WIC Participation	1.001	.004
	(.001)	(.002)
State Minimum Wage	.978	−.062
	(.040)	(.072)
State Medicaid Spending	1.000	.000
	(.000)	(.000)
Number Poor Residents in State	.998**	−.004***
	(.001)	(.001)
State Unemployment Rate	.934***	−.122***
	(.010)	(.020)
State Gross Product	1.000	.000
	(.000)	(.001)
Black	.604***	−.876***
	(.015)	(.045)
Other	.702***	−.653***
	(.043)	(.119)
Mother's Age		
18 or Younger	.372***	−2.351***
	(.023)	(.110)
35 or Older	1.621***	1.065***
	(.035)	(.039)
Mother Has High School Degree	2.960***	2.386***
	(.063)	(.042)
Two Children in Home	.774***	−.480***
	(.019)	(.044)
Three or more Children in Home	.524***	−1.310***
	(.014)	(.050)
Constant		7.339***
		(.425)
N	66,542	66,542

Note: Robust standard errors in parentheses. All models include dummy variable controls for state and year. *$p < .05$; **$p < .01$; ***$p < .001$ (two-tailed tests).

Table 5. The Effect of State EITCs on Birth Weight and Maternal Smoking

	(1) Birth Weight	(2) Maternal Smoking	(3) Birth Weight (post-1988)	(4) Birth Weight (states with smoking data)	(5) Birth Weight (adjusts for smoking)
	OLS	Logistic (odds ratios)	OLS	OLS	OLS
State EITC	15.704***	.949***	16.138***	15.662***	12.510***
	(1.211)	(.006)	(1.365)	(1.500)	(1.471)
State AFDC/TANF Benefits for a Three-Person Family					
Benefits in the Second Quartile	.406	1.013	−7.891***	−7.196*	−5.629**
	(1.205)	(.011)	(2.812)	(2.857)	(2.815)
Benefits in the Third Quartile	3.403	1.004	−2.766	−.203	1.655
	(1.766)	(.013)	(3.176)	(2.234)	(3.188)
Benefits in the Fourth Quartile	8.415***	1.096***	−7.861*	−2.770	1.567
	(2.641)	(.016)	(3.776)	(3.879)	(3.823)
Mother Smoked					−220.216***
					(.598)
More Stringent State TANF Exemption Policies	.610	1.004	1.180**	2.683***	3.085***
	(.464)	(.002)	(.482)	(.573)	(.566)
More Stringent State TANF Activities Requirements	−.520	.994**	−.624	−1.005	−1.357**
	(.532)	(.002)	(.565)	(.612)	(.604)
State WIC Participation	−.209***	1.001***	−.123***	−.014	.093*
	(.023)	(.000)	(.027)	(.051)	(.051)
State Minimum Wage	3.106***	.928***	−.261	3.683**	.655
	(.818)	(.005)	(.978)	(1.181)	(1.171)
State Medicaid Spending	.024***	1.001***	.029***	.015***	.043***
	(.002)	(.000)	(.002)	(.004)	(.004)
Number Poor Residents in a State	.069***	.998***	−.004	−.041	−.107***
	(.015)	(.000)	(.018)	(.026)	(.026)
State Unemployment Rate	2.975***	.980***	3.476***	2.932***	2.085***
	(.276)	(.002)	(.427)	(.484)	(.477)
State Gross Product	.051***	.997***	.011	.054**	−.029*
	(.009)	(.000)	(.011)	(.017)	(.017)

(continued)

Table 5. (continued)

	(1) Birth Weight	(2) Maternal Smoking	(3) Birth Weight (post-1988)	(4) Birth Weight (states with smoking data)	(5) Birth Weight (adjusts for smoking)
	OLS	Logistic (odds ratios)	OLS	OLS	OLS
Female	−116.542***	.997	−114.992***	−115.893***	−116.022***
	(.402)	(.002)	(.452)	(.516)	(.510)
Black	−199.009***	.417***	−199.718**	−189.352***	−225.017***
	(.479)	(.001)	(.545)	(.612)	(.597)
Other	5.855***	.467***	−5.734***	18.614***	−12.163***
	(1.192)	(.003)	(1.313)	(1.525)	(1.522)
Mother's Age					
18 or Younger	−46.622***	.575***	−49.745***	−46.232***	−66.262***
	(.772)	(.003)	(.886)	(.993)	(.990)
35 or Older	−34.352***	1.222***	−45.428***	−57.878***	−49.343***
	(.942)	(.005)	(1.024)	(1.212)	(1.186)
High School Degree	47.269***	.727***	42.115***	50.179***	37.462***
	(.421)	(.002)	(.474)	(.540)	(.533)
Two Previous Births	−3.347***	1.203***	−5.005***	−7.424***	−.082
	(.480)	(.003)	(.540)	(.616)	(.609)
Three or More Previous Births	−20.619***	1.539***	−28.002***	−33.394***	−15.786***
	(.557)	(.004)	(.623)	(.720)	(.710)
Constant	3,298.063***		3304.656***	3,285.904***	3,375.813***
	(4.942)		(4.769)	(7.371)	(7.300)
Observations	8,762,028	5,260,202	6,831,732	5,254,652	5,254,652

Note: Robust standard errors in parentheses. All models include dummy variable controls for state and year.
*$p < .05$; **$p < .01$; ***$p < .001$ (two-tailed tests).

Models 3, 4, and 5 in Table 5 test whether maternal smoking is a mechanism of EITC effects on birth weight. As mentioned earlier, information on smoking was collected only after 1988 and was not collected by all states in all years. Before adjusting for maternal smoking, we test whether results are robust to the exclusion of the years and states without smoking data. Model 3 excludes all years after 1988, and Model 4 further excludes all states without smoking data. EITC estimates in these models are very similar to (i.e., within about a gram of) the Model 1 estimate based on all states and years. Model 5 includes the control variable for maternal smoking while pregnant. Compared with Model 4, this reduces the EITC–birth weight association by about 3gm.

While Model 1, which contains all years and states, reveals a positive association between AFDC/TANF benefits and birth weight, Models 3 through 5 reveal negative associations, particularly for the second quartile relative to the first. These negative associations may make some sense given that there is a positive correlation between high AFDC/TANF benefits and maternal smoking in Model 2. They also suggest, however, that associations between AFDC/TANF and birth weight are more sensitive to exclusions and less stable than the EITC estimates. This is not surprising given that the structure of AFDC/TANF, relative to EITC, is more complex and variable across time and states.

Models 3 through 5 reveal positive associations between stricter TANF work exemption policies and birth weight. After adjusting for maternal smoking in Model 5, there is a negative association between birth weight and stricter TANF activities requirement. Because stricter work exemptions and activities requirements both encourage maternal employment, the underlying reasons for these opposite signs are not clear, and we are hesitant to attribute too much meaning to these results.

In Table 6, we use a series of dichotomous variables to test whether the effect of living in a state with an EITC differs depending on mothers' ages and education levels. Model 1 reveals statistically significant differences by maternal age. The largest state EITC estimate—approximately 19gm—is found among mothers who are 19 to 34 years old, the lowest risk group. The effect of a state EITC among mothers who are 18 years or younger is substantially smaller, at around 8gm. Among older mothers who tend to face the most significant biological risk factors, the effect of a state EITC is actually negative, decreasing birth weight by an average of about 12gm. In Model 2, differences in EITC effects by maternal education are small and not statistically significant.

Tests of the Natural Experiment Assumptions

In Table 7, we present tests of the natural experimental assumptions. For efficiency of space, we show only the EITC estimates, but all models include the control variables discussed earlier and state and year dummies. Model 1 presents EITC–birth weight associations for mothers with a college degree or higher. Given their generally high earnings, these mothers should not be affected by changes in the EITC, and there is indeed no association between state EITCs and birth weights for this population. Model 2 presents results for married mothers with a high school degree or less. Relative to unmarried households, the EITC has more modest effects on the employment/earnings of married households, and we expect effects to be smaller for married women. For married mothers, a state EITC is associated with an approximately 8gm increase in birth weight, about half of the 16gm reduction among unmarried mothers in Model 1 of Table 4. Model 3 presents results for unmarried women who are having their first child. Because these women will receive smaller

Table 6. Effect of State EITCs on Birth Weight, by Maternal Age and Education

	(1) Maternal Age[a]	(2) Maternal Education[b]
Mother ≤18		
No State EITC [Reference group]	—	Change associated with EITC = 7.630gm
State has EITC	7.630**	
	(3.155)	
Mother 19 to 34 Years		
No State EITC	45.895***	Change associated with EITC = 18.968gm
	(.794)	
State has EITC	64.863***	
	(1.447)	
Mother 35+		
No State EITC	15.109***	Change associated with EITC = –12.479gm
	(1.263)	
State has EITC	2.630	
	(2.935)	
No High School		
No State EITC [Reference Group]		—
State has EITC	Change associated with EITC = 19.890gm	19.890***
		(1.442)
High School Degree		
No State EITC	Change associated with EITC = 16.399gm	47.141***
		(.439)
State has EITC		63.540***
		(1.400)
State AFDC/TANF Benefits for a Three-Person Family		
Benefits in Second Quartile	.451	.407
	(1.205)	(1.205)
Benefits in Third Quartile	3.403*	3.406*
	(1.766)	(1.766)
Benefits in Fourth Quartile	8.325***	8.406***
	(2.641)	(2.641)
More Stringent State TANF Work Exemption Policy	.589	.610
	(.464)	(.464)
More Stringent State TANF Activities Requirements	–.505	–.519
	(.532)	(.532)
State WIC Participation	–.212***	–.209***
	(.023)	(.023)

(continued)

Table 6. (continued)

	(1) Maternal Age[a]	(2) Maternal Education[b]
State Minimum Wage	3.090***	3.108***
	(.818)	(.818)
State Medicaid Spending	.024***	.024***
	(.002)	(.002)
Number Poor Residents in State	.070***	.069***
	(.015)	(.015)
State Unemployment Rate	2.965***	2.974***
	(.276)	(.276)
State Gross Product	.050***	.051***
	(.009)	(.009)
Female	−116.544***	−116.542***
	(.402)	(.402)
Black	−198.954***	−198.999***
	(.479)	(.479)
Other	5.878***	5.863***
	(1.192)	(1.192)
Mother's Age		
18 or Younger		−46.637***
		(.772)
35 or Older		−34.361***
		(.942)
High School Degree	47.288***	
	(.421)	
Two Previous Births	−3.338***	−3.349***
	(.480)	(.480)
Three or More Previous Births	−20.656***	−20.623***
	(.557)	(.557)
Constant	3,252.010***	3,298.109***
	(4.987)	(4.942)
N	8,762,028	8,762,028

Note: Robust standard errors in parentheses. All models include dummy variable controls for state and year.
[a]Interactions between state EITCs and maternal age groups are significant at the .05 level or lower.
[b]There are no statistically significant interactions between state EITCs and maternal education.
*$p < .05$; **$p < .01$; ***$p < .001$ (two-tailed tests).

Table 7. Tests of Natural Experiment Assumptions: The Effect of State EITCs on Birth Weight for Alternative Samples

	(1) High Education Sample[a]	(2) Married Sample[b]	(3) First Births Sample[c]
State has EITC	−7.867	7.727***	5.267***
	(5.939)	(.826)	(1.178)
N	283,889	17,104,823	8,592,601

Note: Robust standard errors in parentheses. Models include all the control variables listed in previous tables as well as dummy indicators for state and year. Complete models available from the authors by request.
[a]This sample includes unmarried women with 16 or more years of education who had at least one previous live birth.
[b]This sample includes married women with a high school degree or less who had at least one previous live birth.
[c]This sample includes unmarried women with a high school degree or less who had no previous live births.

state credits (and in a handful of states they receive no credit), we expect relatively modest effects for this group. Among first births, a state EITC is associated with an approximately 5gm increase in birth weight, which is less than half the magnitude of the 16gm estimate for the primary sample.

Table 8 tests for potential bias from population composition changes following implementation of a state EITC. The top panel of Table 8 contains descriptive statistics for all live births occurring in the years immediately before and after enactment of a state EITC. While there are increases in the percentage of mothers who are unmarried, who are African American, or who have less than a high school degree, these differences are quite slight, all less than one percentage point. In the bottom panel, we calculate weighted birth weight averages based on the distribution of each maternal characteristic in the years before and after enactments. The changes in these weighted averages are quite slight and generally decrease, making it seem unlikely that changes in population composition are driving positive associations between state EITCs and birth weight.

DISCUSSION AND CONCLUSIONS

This study addresses two sets of questions about poverty and child wellbeing. First, are there associations between prenatal poverty and lower birth weights after factoring out unmeasured potential confounders (e.g., mothers' early life exposures or preferences and attitudes)? Second, how have recent expansions of a large work-based welfare program—the EITC—affected maternal and infant health in the United States?

Using a natural experimental strategy, we find that state EITCs increase birth weights. Because enactment of a state EITC increases poor women's incomes, but should be uncorrelated with unmeasured characteristics, this supports a causal effect of prenatal poverty. The answer to question one appears to be yes, there are associations between prenatal poverty and low birth weights, net of unmeasured confounders. Cognitive and physical development in-utero sets the stage for later-life progress, and low birth weight is predictive of various negative outcomes across the life course (e.g., infant mortality, poor child health, and low educational attainment and earnings) (Case et al. 2005; Salsberry and Reagan 2005; Wilkinson and Marmot 2003). Lower birth weights resulting from poverty may therefore have lasting consequences, which ultimately contribute to the reproduction of inequality over generations. However, our results show that relieving poverty during the prenatal period can increase birth weights, which may reduce later negative outcomes. At the same time, mixed results for AFDC/TANF

Table 8. Test of Natural Experimental Assumptions: Maternal Characteristics and Weighted Averages of Birth Weight in the Years Immediately Before and After Enactment of a State EITC

	Percentage Year before Enactment	Percentage Year after Enactment	Percentage Point Change
Maternal Characteristics			
Unmarried	27.26	28.22	.96
Black	15.00	15.37	.37
Younger than 18 Years	2.24	2.13	−.11
Less than High School Degree	22.85	23.34	.49
N	505,440	506,017	
Average Birth Weight (gm)		Change in Average Birth Weight (gm)	
Unmarried = 3219			
Married = 3441			
Weighted average given marital status[a] distribution in year before enactment		Weighted average given marital status distribution in year after enactment	
3380.39		3380.39	−2.00
Black = 3142			
Non-Black = 3432			
Weighted average given race distribution in year before enactment		Weighted average given race distribution in year after enactment	
3388.50		3387.34	−1.16
Younger than 18 = 3171			
18 or Older = 3391			
Weighted average given age distribution in year before enactment		Weighted average given age distribution in year after enactment	
3386.07		3386.07	.24
Less than High School = 3281			
High School or Higher = 3422			
Weighted average given education distribution in year before enactment		Weighted average given education distribution in year after enactment	
3389.71		3389.15	−.56

[a]Weighted averages are based on the following formula: avg = (p) (R_1) + (1 − p) (R_2) where p = the proportions depicted in the top panel of the table and R_1 and R_2 = the average birth weights for the appropriate subgroup (e.g., unmarried and married).

generosity and across maternal ages show that the relationship between poverty relief and infant health is neither simple nor uniform.

We find that state EITCs increase maternal employment and earnings. Furthermore, state EITCs are associated with reductions in maternal smoking during pregnancy, and adjusting for maternal smoking partially accounts for state EITC–birth weight associations. While poverty relief may work through many different pathways, these results suggest that mechanisms related to employment and reductions in negative health behaviors may be important. The smoking results should be interpreted with some caution, though, because they are based on a subset of cases (smoking information was collected only after 1988 and not for all states in all years).

We also tested whether maternal education or age moderates the consequences of living in a state with an EITC. We find no evidence of varying effects for mothers with and without high school degrees. This null result does not support claims that higher education makes it easier to translate resources into improved health outcomes (e.g., Mirowsky and Ross 1998). We do, however, find differences by maternal age. Living in a state with an EITC conferred the largest benefit for mothers age 19 to 34 (the lowest risk group), notably smaller benefits for mothers who were 18 years or younger, and actually had negative effects for mothers who were 35 or older. As mentioned earlier, these interactions reflect a combination of (1) differences in receipt of the EITC (i.e., eligibility and take-up) and (2) differences in individual-level benefits for those receiving the credit. We expected smaller effects among women age 18 or younger, given that this group is likely to have weak labor market attachment and lower levels of eligibility. Finding negative effects of state EITCs for mothers who are 35 years or older is troubling, and the underlying reasons are not clear. One possible explanation is that age-related pregnancy complications among older women receiving the EITC may reduce the health benefits of additional income or heighten any health risks associated with low-wage employment.

Results across maternal age suggest that enactments of state EITCs are more beneficial for women age 19 to 35 who are at lower risk socioeconomically and biologically. This contrasts with Kehrer and Wolin's (1979) and Almond and colleagues' (2008) analyses of the NIT and food stamps, which show larger program benefits for those with more risk factors. More research is needed to understand why interaction effects differ across these studies and programs, but the pro-work incentives of the EITC, which are not part of NIT or food stamps, may be important.

The second set of questions addressed in this study has to do with the consequences of recent ''liberalization'' of U.S. welfare policy. As the EITC has expanded, and 1996 welfare reform replaced AFDC with TANF, poverty relief in the United States has become increasingly tied to labor markets and earnings. Citing lower poverty rates following EITC expansions and welfare reform, some authors argue that poor children benefit from these policy changes. Citing barriers to regular employment, costs associated with working, and the strain of low-wage work, other authors argue that these policies have been harmful. Finding positive associations between state EITCs and birth weight suggests that recent expansions of a pro-work policy have been beneficial for this indicator of infant health. When looking at all states and all years, we find that higher AFDC/TANF benefits are associated with higher birth weights. However, when focusing on cases from 1989 and later, we find negative associations. These differences across time may partially reflect varying consequences of pre- and post-1996 reform (i.e., AFDC versus TANF) policy structure.

Our analysis of smoking also reveals different effects across EITC and AFDC/TANF. While enactments of state EITCs reduce the odds of maternal smoking, larger AFDC/TANF benefits increase the odds. Arguments that underlying preferences drive associations between poverty and poor health behaviors raise concerns that income transfers could have perverse effects (e.g., leading to the purchase of more cigarettes). The AFDC/TANF results suggest that perverse effects are possible, but the EITC results suggest they are by no means inevitable. Causes of health behaviors, particularly an addictive behavior like smoking, are likely to be multifaceted and complex, so it is reasonable that different policy structures could have contrasting effects.

Looking across the results, we find consistently beneficial effects of state EITCs, but effects of state AFDC/TANF benefits are more mixed. This is not surprising because

state differences in AFDC/TANF are more complex and variable over time, relative to state differences in EITC. The overarching message, however, is that relieving poverty during the prenatal period can generate significant birth weight benefits, but the policy structure of that poverty relief matters. To understand the consequences of a more liberalized welfare state, we need a more nuanced picture of how particular policies shape behavior and health.

Our employment and earnings analysis of data from the CPS fits within a broader economics literature on the labor supply effects of the EITC. Our estimates of state EITC effects on employment probability fall roughly in between estimates offered by Meyer and Rosenbaum (2001) and Neumark and Wascher (2000). Rerunning our logistic regression from Table 4 as a probit model (to fit with Meyer and Rosenbaum) and as a linear probability model (to fit with Neumark and Wascher), associations between state EITCs and the probability of employment are slightly larger than Meyer and Rosenbaum's estimates, but considerably smaller than Neumark and Wascher's estimates (models available from the authors by request). These studies measure EITC generosity differently than we do and work with different populations, so comparisons of findings must proceed cautiously. However, our results based on enactments of state EITCs appear to fall within the general range of previously published estimates.

The internal validity of our natural experimental strategy depends on there being no unmeasured state-specific time trends associated with birth weight and state EITCs, and tests of the natural experimental strategy provide no evidence of such trends. External validity is often an important drawback to natural experimental research designs. Natural income experiments typically involve unique situations, such as winning the lottery (Lindahl 2005) or receiving income from the opening of a casino on tribal land (Costello et al. 2003). Such unique income experiences may have different effects than would acquiring the same amount of money through a more common route (e.g., regular employment or government transfers). As a natural experiment, state EITCs are likely to have relatively strong external validity because the main pathways through which they increase income—a tax credit and wages—are very common methods for acquiring income.

We conclude with some final caveats and cautions. First, we treated birth weight as a general proxy for overall infant health and wellbeing. However, birth weight per se may not be the causal factor behind certain outcomes. For instance, in-utero stressors, which are difficult to observe and associated with birth weight, could be the real cause of infant mortality. Policies that increase birth weight are likely to improve many related risk factors (e.g., in-utero stressors). If such policies do not improve related risk factors, increasing birth weights by reducing prenatal poverty may not confer broader benefits (e.g., reducing infant mortality or increasing education). Second, using dichotomous indicators for larger and smaller maximum state credits, we find no evidence of a dose-response effect on birth weight. Therefore, while enactments of state credits improve birth weight, we have no evidence that the size of credits matters. Maximum credits, however, are relatively crude measures of credit size. In the future, researchers could use data containing both earnings and birth weight information to test the effects of more nuanced measures of EITC generosity. Finally, our EITC estimates reflect the average treatment effect across many states and over many years. These estimates may not apply to particular cases (i.e., not all states enacting an EITC will see these results). We would be well-served by future research into how the effects of EITCs (or any state policy) are modified by other state characteristics.

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Notes

1. While an EITC-advance option allows filers to receive their credit incrementally throughout the year, only about 1 percent of filers make use of this option.
2. State AFDC/TANF programs vary along many different dimensions (e.g., time limits and work requirements), but most state EITCs build directly on the federal credit, making state variation easier to measure and interpret. Furthermore, because the EITC is operated through the IRS, eligibility is relatively independent of other social programs; eligibility for AFDC/TANF, on the other hand, is often coupled with various in-kind programs (e.g., food stamps, Medicaid, and job training).
3. Information on mothers' education was not available in California or Texas prior to 1989, nor in Washington prior to 1992, so births occurring in these states in earlier years are excluded from the analysis. Because all models include state fixed effects and none of these states enacted EITCs, excluding them in earlier years should have relatively little impact on the results.
4. The duration of EITC exposure during a pregnancy will depend on the timing of conception and birth. We found no evidence, however, that state EITC effects differ by season of birth, suggesting that small variations in EITC exposure do not alter the results. We also tested a contemporaneous and a two-year lagged version of the EITC variable and found only slight differences in the point estimates.
5. We code Medicaid expenditures according to the state of provider, rather than the state of residence, because data coded by state of residence are only available beginning in 1991.
6. This coding schema does not distinguish between Hispanics and non-Hispanics because Hispanic origin is not reported in the natality data in all years and states.
7. Because wages/salary is logged, these coefficients can be interpreted as semi-elasticities or percentage changes.
8. In alternative models, where state EITC is specified as the maximum state credits shown in Table 1, each $100 increase in a state's maximum credit is associated with about a 2gm increase in birth weight. This shows that positive associations between state EITCs and birth weight are replicated with more continuous measures of credit generosity. We chose not to focus on these results because the effects of credit size on birth weight may depend on where women's earnings fall in the credit's three-phase structure, and assuming a linear effect of maximum credits may be misleading. Because natality data do not provide information on earnings with which to estimate women's credits, we prefer not to make specific statements about the birth weight effects of credit sizes and structures.

References

Almond, Douglas and Kenneth Y. Chay. 2006. ''The Long-Run and Intergenerational Impact of Poor Infant Health: Evidence from Cohorts Born During the Civil Rights Era.'' Department of Economics and School of International Affairs, Columbia University, New York. Unpublished manuscript.

Almond, Douglas, Hilary Hoynes, and Diane Schanzenback. 2008. ''Inside the War on Poverty: The Impact of Food Stamps on Birth Outcomes.'' Discussion Paper 1359–08, Institute of Research on Poverty, University of Wisconsin, Madison, WI.

Becker, Gary S. and Casey B. Mulligan. 1997. ''The Endogenous Determination of Time Preferences.'' *Quarterly Journal of Economics* 112:729–58.

Behrman, Jere and Mark Rosenzweig. 2004. ''Returns to Birthweight.'' *Review of Economics and Statistics* 86:586–601.

Bennett, F. 1997. ''The LBW, Premature Infant.'' Pp. 3–16 in *Helping Low Birth Weight, Premature Babies: The Infant Health and Development Program*, edited by R. Gross, D. Spiker, and C. Haynes. Stanford, CA: Stanford University Press

Case, Ann, Angela Fertig, and Christina Paxson. 2005. ''The Lasting Impact of Childhood Health and Circumstances.'' *Journal of Health Economics* 24:365–89.

Conley, Dalton, Kate W. Strully, and Neil G. Bennett. 2003. *The Starting Gate: Birth Weight and Life Chances*. Berkeley, CA: University of California Press.

Corcoran, Mary, Sandra K. Danziger, Ariel Kalil, and Kristin S. Seefeldt. 2000. ''How Welfare Reform Is

Affecting Women's Work." *Annual Review of Sociology* 26:241–69.

Costello, E. Jane, Scott N. Compton, Gordon Keeler, and Adrian Angold. 2003. "Relationship between Poverty and Psychopathology." *Journal of the American Medical Association* 290:2023–29.

Cramer, James C. 1995. "Racial and Ethnic Differences in Birthweight: The Role of Income and Financial Assistance." *Demography* 32:231–47.

Currie, Janet and Nancy Cole. 1993. "Welfare and Child Health: The Link between AFDC Participation and Birth Weight." *American Economic Review* 83: 971–85.

Dahl, Gordon and Lance Lochner. 2009. "The Impact of Family Income on Child Achievement." Discussion Paper 1361–09, Institute for Research on Poverty, University of Wisconsin, Madison, WI.

Danziger, Sandra, Mary Corcoran, Sheldon Danziger, Colleen Heflin, Ariel Kahlil, Judith Levine, Daniel Rosen, Kristin Seefeldt, and Richard Tolman. 2000. "Barriers to Employment of Welfare Recipients." Pp. 245–78 in *Prosperity for All? The Economic Boom and African Americans*, edited by R. Cherry and W. Rodgers. New York: Russell Sage Foundation.

Danziger, Sheldon and Robert H. Haveman. 2001. "Introduction: The Evolution of Poverty and Antipoverty Policy." Pp. 1–26 in *Understanding Poverty*, edited by S. Danziger and R. H. Haveman. New York: Russell Sage Foundation.

De Jong, Gordon, Deborah Graefe, Shelly Irving, and Tanja St. Pierre. 2005. "Welfare Dimensions Summary Score (WDSS) Documentation." Population Research Institute, Pennsylvania State University, State College, PA.

Duncan, Greg. 2005. "Income and Child Wellbeing." Geary Lecture, The Economic and Social Research Institute, Dublin, Ireland.

Duncan, Greg and Jeanne Brooks-Gunn, eds. 1997. *Consequences of Growing Up Poor*. New York: Russell Sage Foundation.

Edin, Kathryn and Laura Lein. 1997. *Making Ends Meet: How Single Mothers Survive Welfare and Low-Wage Work*. New York: Russell Sage Foundation.

Eissa, Nada and Hilary Hoynes. 2005. "Behavioral Responses to Taxes: Lessons from the EITC and Labor Supply." NBER Working Paper, No. 11729.

Food Research and Action Center. 2005. *WIC in the States: Thirty-One Years of Building a Healthier America*. Retrieved January 26, 2010 (http://www.frac.org/WIC/2004_Report/Full_Report.pdf).

Fuchs, Victor, ed. 1982. *Economic Aspects of Health*. National Bureau of Economic Research Conference Report. Chicago, IL: University of Chicago Press.

Haas, Steven. 2006. "Health Selection and the Process of Social Stratification: The Effect of Childhood Health on Socioeconomic Attainment." *Journal of Health and Social Behavior* 47:339–54.

Hotz, V. Joseph and John Karl Scholz. 2003. "The Earned Income Tax Credit." Pp. 141–200 in *Means-Tested Transfer Programs in the United States*, edited by R. Moffitt. Chicago, IL: University of Chicago Press.

Internal Revenue Service (IRS). 2007. "EITC Thresholds and Tax Law Updates." Retrieved August 15, 2008 (http://www.irs.gov/individuals/article/0,,id=150513,00.html).

IPUMS CPS. N.d. *Integrated Public Use Microdata Series: March CPS*. Minnesota Population Center. Retrieved March 6, 2009 (http://cps.ipums.org/cps/index.shtml).

Kanjilal, Sanjat, Edward W. Gregg, Yilling J. Cheng, Ping Zhang, David E. Nelson, George Mensah, and Gloria A. Beckles. 2006. "Socioeconomic Status and Trends in Disparities in 4 Major Risk Factors for Cardiovascular Disease among U.S. Adults, 1971–2002." *Archives of Internal Medicine* 166:2348–55.

Kassel, Jon D., Laura R. Stroud, and Carol A. Paronis. 2003. "Smoking, Stress, Negative Affect: Correlation, Causation, and Context across Stages of Smoking." *Psychological Bulletin* 129:270–304.

Kehrer, Barbara H. and Charles M. Wolin. 1979. "Impact of Income Maintenance on Low Birth Weight: Evidence from the Gary Experiment." *Journal of Human Resources* 15:434–62.

Ladd, Charlotte O., Rebecca L. Hout, K. V. Thivikrama, Charles B. Neneroff, Michael J. Meaney, and Paul M. Plotsky. 2000. "Long-Term Behavioral and Neuroendocrine Adaptation to Adverse Early Experience." Pp. 81–102 in *Progress in Brain Research: The Biological Basis for Mind Body Interactions*, edited by E. A. Mayer and C. B. Saper. Amsterdam, The Netherlands: Elsevier Science B.V.

Leigh, Andrew. 2004. "Who Benefits from the Earned Income Tax Credit? Incidence among Recipients, Coworkers, and Firms." Australian National University, Economics Program, Research School of Social Science.

Lindahl, Mikael. 2005. "Estimating the Effect of Income on Health and Mortality Using Lottery Prizes as an Exogenous Source of Variation in Income." *Journal of Human Resources* XL:144–68.

Lumey, L. H. and A. D. Stein. 1997. "In-utero Exposure to Famine and Subsequent Fertility: The Dutch Famine Birth Cohort Study." *American Journal of Public Health* 87:1962–66.

Mayer, Susan. 1998. *What Money Can't Buy: Family Income and Children's Life Chances*. Cambridge, MA: Harvard University Press.

Meyer, Bruce D. and Dan T. Rosenbaum. 2001. "Welfare, the Earned Income Tax Credit and the

Labor Supply of Single Mothers.'' *Quarterly Journal of Economics* 116:1063–114.

Mirowsky, John and Catherine E. Ross. 1998. ''Education, Personal Control, Lifestyle and Health.'' *Research on Aging* 20:415–49.

Moffitt, Robert A. 2003. *Means-Tested Transfer Programs in the United States*. Chicago, IL: University of Chicago Press.

Montori, Victor M. and Gordon H. Guyatt. 2001. ''Intention-to-Treat Principle.'' *Canadian Medical Association Journal* 165:1339–41.

Morris, Pamela A., Aletha C. Huston, Greg J. Duncan, Danielle A. Crosby, and Johannes M. Bos. 2001. ''How Welfare and Work Policies Affect Children: A Synthesis of Research.'' New York: Manpower Research Demo Corporation.

Murray, Charles. 1984. *Losing Ground: American Social Policy, 1950–1980*. New York: Basic Books.

National Bureau of Economic Research (NBER). N.d. *NCHS Vital Statistics Natality Birth Data: 1968–2006*. Retrieved March 3, 2009 (http://www.nber.org/data/vital-statistics-natality-data.html).

Neumark, David and William Wascher. 2000. ''Using the Earned Income Tax Credit to Help Poor Families: New Evidence from a Comparison with the Minimum Wage.'' National Bureau of Economic Research Working Paper #7599.

Romich, Jennifer and Thomas Weisner. 2000. ''How Families View and Use the EITC Advance Payment versus Lump Sum Delivery.'' *National Tax Journal* 53:1245–66.

Ruhm, Christopher J. 2000. ''Are Recessions Good For Your Health?'' *Quarterly Journal of Economics* 115:617–50.

———. 2004. ''Healthy Living in Hard Times.'' *Journal of Health Economics* 24:341–63.

Salsberry, Pamela and Patricia Reagan. 2005. ''Dynamics of Early Childhood Overweight.'' *Pediatrics* 116:1329–38.

Scholz, John Karl. 1994. ''The Earned Income Tax Credit: Participation, Compliance, and Antipoverty Effectiveness.'' *National Tax Journal* 47:63–87.

Sheehan, T. Joseph. 1998. ''Stress and Low Birth Weight: A Structural Modeling Approach Using Real Life Stressors.'' *Social Science and Medicine* 47:270–304.

Tarasuk, Valerie, Lynn McIntyre, and Jinguang Li. 2007. ''Low-Income Women's Dietary Intakes are Sensitive to the Depletion of Household Resources in One Month.'' *Journal of Nutrition* 137:1980–87.

Taylor, Shelley E., Rena L. Repetti, and Teresa Seeman. 1997. ''Health Psychology: What is an Unhealthy Environment and How Does it Get Under the Skin?'' *Annual Review of Psychology* 48:411–47.

University of Kentucky, Center for Poverty Research. N.d. ''State-Level Data of Economic, Political, and Transfer-Program Information for 1980–2007.'' Retrieved November, 10, 2009 (http://www.ukcpr.org/AvailableData.aspx).

U.S. Department of Health and Human Services, Centers for Medicare and Medicaid Services. N.d. ''Health Expenditures by State of Provider: Medicaid Summary Tables, 1980–2004 (Final, February 2007).'' Retrieved June 25, 2008 (http://www.cms.hhs.gov/NationalHealthExpendData/05_NationalHealthAccounts StateHealthAccounts.asp).

Wagmiller, Robert, Mary Clare Lennon, Li Kuan, Philip M. Alberti, and J. Lawrence Aber. 2006. ''The Dynamics of Economic Disadvantage and Children's Life Chances.'' *American Sociological Review* 71:847–66.

Wang, Xiaobin, Barry Zuckerman, Gerald A. Coffman, and Michael J. Corwin. 1995. ''Familial Aggregation of Low Birth Weight among Whites and Blacks in the United States.'' *New England Journal of Medicine* 333:1744–49.

Weinstock, Marta. 2005. ''The Potential Influence of Maternal Stress Hormones on Development and Mental Health of the Offspring.'' *Brain, Behavior, and Immunity* 19:296–308.

Wilkinson, Richard and Michael Marmot. 2003. *Social Determinants of Health: The Solid Facts*. Copenhagen, Denmark: World Health Organization.

Kate W. Strully is an Assistant Professor in Sociology and Epidemiology at the University at Albany, State University of New York. Her research investigates the causal pathways responsible for socioeconomic and racial-ethnic health disparities, particularly how social positions influence—and are influenced by—physical health. Her recent projects address employment, welfare policy, and health in the United States.

David H. Rehkopf is an Assistant Professor in the Department of Epidemiology & Biostatistics in the School of Medicine at the University of California, San Francisco. His research focuses on the role of earnings, income, and work in the etiology of chronic disease, and in particular uses biomarkers to determine the biological pathways through which these exposures affect health.

Ziming Xuan, S.D., S.M., is interested in studying the influence of social-contextual determinants on health, especially among vulnerable populations. His current research focuses on mental health outcomes. He recently graduated from the Harvard School of Public Health. Currently, he is a postdoctoral fellow with the Department of Society, Human Development and Health at HSPH.