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ESSAYS ON CHILD WELL-BEING AND THE SOCIAL SAFETY NET

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ESSAYS ON CHILD WELL–BEING AND THE SOCIAL SAFETY NET

DISSERTATION

A dissertation submitted in partial
fulfillment of the requirements for
the degree of Doctor of Philosophy
in the College of Business and
Economics at the University of
Kentucky

By
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Lexington, Kentucky

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Lexington, Kentucky 2019

ABSTRACT OF DISSERTATION

ESSAYS ON CHILD WELL–BEING AND THE SOCIAL SAFETY NET

This dissertation consists of three essays examining the role of two particular social safety net programs, the Temporary Assistance for Needy Families (TANF) program and the Supplemental Nutrition Assistance Program (SNAP), on the well-being of children from disadvantaged households. While the impact of these programs on the adults and parents of the household have been studied extensively, less is known about their effect on children. This is true for both their immediate impact on child well-being and any long-run impacts on children who grow up under these programs. Given the demonstrated importance of child well-being on later life adult outcomes, understanding the lasting effects of the programs is of great policy importance.

In Essay 1, I examine the effect of welfare reform on long-run educational attainment and family structure outcomes on children who grew up under the reformed welfare system. In the early 1990's, the United States reformed its welfare system through state waivers and the TANF program. These changes altered family resources and potential investments for childhood human capital, which in turn could affect later adult outcomes. Using data from the Panel Study of Income Dynamics (PSID) Child Development Supplement (CDS) and the Transition to Adulthood Supplement (TAS), I examine the short-run effects of welfare reform on cognitive and noncognitive outcomes and the long-run impact of welfare reform on adult education and family structure through age 28. I find that as children, these individuals have higher reading test scores by an average of 6 percent of a standard deviation. As adults, I find robust evidence that these treated individuals are on average 9 percent more likely to graduate college. I also find some evidence that they are more likely to be married and less likely to have a child out of wedlock. The impacts of welfare reform are larger for women than men for childhood test scores and college completion, marriage rates, and out of wedlock births as adults.

In Essay 2, I continue to study the effects of welfare reform on child well-being, here focusing on the effect of welfare reform on the health insurance coverage, healthcare utilization, and the health status of children. In addition to changing the overall resources available to the family to invest in child health, welfare reform also has specific implications for health insurance coverage. As mothers were moved to work they could gain private coverage and welfare reform eliminated automatic eligibility for Medicaid. In this essay, I use data from the PSID CDS. I find a 3-5 percent decrease in the likelihood that a child has had their annual checkup but no change to the insurance coverage of children. For health status, I find lower rates of asthma by 17 percent among African American children and an increase of 3-5 healthy days a year for all children. I present suggestive evidence that the improvements in child health are driving the reduction in healthcare utilization. Given the evidence in the

literature on the importance of childhood health, these improvements have potentially large ramifications for future adult health.

Finally, in Essay 3 I explore the effect of the real purchasing power of SNAP benefits for households with children on dietary quality of food acquisitions and food insecurity. SNAP, formerly food stamps, is one of the most important components of the social safety net. However, there is concern that benefits are inadequate given high food insecurity rates among participating households. Currently SNAP does not account for variation in local food prices and does not sufficiently consider the dietary needs of adolescent children. Using data from the Food Acquisition and Purchase Survey (FoodAPS), I exploit variation in county level food prices and family composition to estimate the purchasing power of food expenditures for SNAP and SNAP–eligible households to test for the effect of additional benefits on dietary quality and food security. I find that a ten percent increase in purchasing power is associated with increased per person weekly acquisition of grains, proteins, dairy, and vegetables by 1.5-2.5 percent. However the quantity of added sugars also increases by approximately two percent, suggesting an ambiguous impact on health. In line with these modest changes in quantity, I do not find a statistically significant impact of purchasing power on food insecurity rates.

KEYWORDS: TANF; SNAP; Safety Net; Program Evaluation; Poverty; Welfare

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Date: July 26, 2019

ESSAYS ON CHILD WELL–BEING AND THE SOCIAL SAFETY NET

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Date: July 26, 2019

For my wife, Mackenzie

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Chapter 1: Introduction

The social safety net in the United States is a collection of multiple welfare programs designed to catch Americans if they fall on hard times. The safety net is comprised of many programs run by different government agencies that provide assistance depending on the particular needs of the individual or family. For adults who have used the programs, the impact of the safety net both in the short and long-run has been extensively studied, though research in the area is always ongoing as programs and rules change. One understudied aspect of the social safety net is the impact of the programs on child well-being. Many of our safety net programs target children either directly or indirectly and yet compared to what we know about their impact on adults, we know comparatively little how they affect children.

The importance of childhood well-being is being shown more and more frequently across the economics literature. Child well-being covers many facets of a child's life but can broadly refer to their physical and mental health, nutrition, education, and social skills. Early childhood education and home environment can shape their learning and social behavior affecting their cognitive and noncognitive skills. The child's in-utero environment can have lasting impacts on their health which can spillover to their education and social life as well. These measures matter not only because they improve the lives of children but also because these childhood traits have significant effects on adult outcomes as well. "Children are the future" is an oft repeated phase, but for our country's disadvantaged children what are we doing to help them not only now but in the future? Is the social safety net working to alleviate poverty five or ten years from now? Indeed the most cost effective way to improve future adult well-being might be to improve the well-being of children today. This dissertation

aims to explore for our most vulnerable children, what does the U.S. social safety net do to improve their well-being? What are we doing today to break the cycle of inequality tomorrow?

This dissertation consists of three essays examining the role of two particular social safety net programs. The first is the Temporary Assistance to Needy Families (TANF) program created by the Personal Responsibility and Work Opportunity Reconciliation Act (PRWORA), more commonly known as welfare reform, which provides cash assistance to families. The second is the Supplemental Nutrition Assistance Program (SNAP), formerly known as food stamps, which provides benefits redeemable towards the purchase of food. Combined these two programs reach more than 20 million households annually and provide assistance to some of our country's most vulnerable children. While the impact of these programs on the adults and parents of the household have been studied extensively, less is known about their effect on children. This is true for both their immediate impact on child well-being and any long-run impacts on children who grow up under these programs. Given the demonstrated importance of child well-being on later life adult outcomes, understanding the lasting effects of the programs is of great policy importance.

In Essay 1, I examine the effect of welfare reform on long-run educational attainment and family structure outcomes on children who grew up under the reformed welfare system. In the early 1990's, the United States reformed its welfare system through state waivers and the TANF program. These changes altered family resources and potential investments for childhood human capital, which in turn could affect later adult outcomes. Using data from the Panel Study of Income Dynamics (PSID) Child Development Supplement (CDS) and Transition to Adulthood Supplement (TAS) I estimate a model of the technology of human capital, or skills production, similar to the one described by Cunha and Heckman (2007). In this model, skills in the current

period are a function of investment in the previous periods. Here, skills as a young adult are a function of fixed family characteristics, endowment of skills at birth, and investments made in childhood.

Applying this model to welfare reform, if the change in welfare policies changed the investment decisions of affected mothers, then those affected children should have different levels of skills as adults. To motivate the adult outcomes, I first examine if welfare reform had an effect on childhood cognitive and noncognitive skills. The model is estimated empirically using a triple difference framework that can accommodate family fixed effects by exploiting variation in welfare reform timing and likelihood of TANF participation. I find that at-risk children who were exposed to welfare reform score higher on reading achievement tests by on average 5-7% of a standard deviation. Turning to long-run outcomes in the adult sample, I find that these same children are on average 9 percent more likely to complete college as well as some evidence of higher rates of marriage and fewer having children out of wedlock, an explicit goal of the TANF program. Overall, these effects tend to be larger in magnitude for women than men. For the whole sample, the effect of welfare treatment on higher reading score and college completion result is robust to the addition of family fixed effects, the sample of non-movers, and the inclusion of state-time fixed effects. Using an event study model I find that the first exposure to welfare reform has the largest impact when the individual is in-utero through the age of one.

In Essay 2, I continue to study the effects of welfare reform on child well-being, here focusing on the effect of welfare reform on the health insurance coverage, healthcare utilization, and the health status of children. In addition to changing the overall resources available to the family to invest in child health, welfare reform also has specific implications for health insurance coverage. As mothers were moved to work they could gain private coverage and welfare reform eliminated automatic eligibility for Medicaid. In this essay, I use data from the PSID CDS. I exploit the variation

in the timing of welfare reform by state and the likelihood of TANF participation to estimate a triple difference model. I find consistent evidence that welfare reform reduced the likelihood that a child had an annual checkup by 3-5 percent, but find no change to the insurance coverage of children. For health status, I find lower rates of asthma by 17 percent among African American children and an increase of 3-5 healthy days a year for all children. I present suggestive evidence that the improvements in child health are driving the reduction in healthcare utilization. Given the evidence in the literature on the importance of childhood health, these improvements have potentially large ramifications for future adult health.

Finally, in Essay 3 I explore the effect of the real purchasing power of SNAP benefits for households with children on dietary quality of food acquisitions and food insecurity. SNAP, formerly food stamps, is one of the most important components of the social safety net. However, there is concern that benefits are inadequate given the high food insecurity rates among participating households. Currently, SNAP does not account for variation in local food prices and does not sufficiently consider the dietary needs of adolescent children. Using data from the Food Acquisition and Purchase Survey (FoodAPS), a rich dataset on household food acquisitions and local prices from April 2012 to January 2013, I exploit variation in county level food prices and family composition to estimate the purchasing power of food expenditures for SNAP and SNAP–eligible households to test for the effect of additional benefits on dietary quality and food security. I find that a ten percent increase in purchasing power is associated with increased per person weekly acquisition of grains, proteins, dairy, and vegetables by 1.5-2.5 percent. However the quantity of added sugars also increases by approximately two percent, suggesting an ambiguous impact on health. In line with these modest changes in quantity, I do not find a statistically significant impact of purchasing power on food insecurity rates. Households with adolescents and single mother households exhibit similar purchasing patterns. The results are

robust to an alternative measurement of the local food prices. The findings here have implications for the public health benefits of SNAP and the purchasing habits of disadvantaged households with children.

Chapter 2: Long-Run Impact of Welfare Reform on Educational Attainment and Family Structure

2.1 Introduction

In the economics literature, there is extensive evidence on the importance of childhood well-being on later life outcomes. Events and circumstances in childhood have lasting effects into adulthood. This relationship has been shown for not only intuitively important measures such as childhood health and family income (Case et al., 2005; Duncan et al., 1998), but also interrelated individual, family, and community level factors. These factors include early education, neighborhood quality, and the presence of welfare programs (Heckman et al., 2013; Chetty et al., 2016; Hoynes et al., 2016). The magnitude and extent of these factors should be an important consideration to policy makers when they are designing and implementing programs that are targeted for children, particularly if the goal is improving intergenerational mobility.

In this paper I examine one such program that is centered on the wellbeing of children that has yet to have its long-term impact extensively studied, the Temporary Assistance for Needy Families (TANF) program. Implemented in 1996, TANF, commonly referred to as welfare reform, replaced the Aid to Families with Dependent Children (AFDC) welfare program. Like its predecessor, TANF provides in-kind and financial assistance to low income families with children, typically a single mother household. However, under TANF, individuals now face work requirements, time limits on assistance, stringent sanctions for noncompliance, and family caps for benefits among other conditions. Policy makers sought to decrease welfare dependency by moving recipients towards employment by changing the incentives AFDC recipients faced.

With the new requirements and stipulations, welfare reform potentially affected multiple facets of the home environment of children from low-income households. As mothers are moved to work, this changed their time endowment and possibly their income available to invest in their children. As shown in the literature, this change in childhood investment could have a significant impact on later life adult outcomes. As TANF recently passed the twenty year mark, we can just now begin to study the long run impacts of welfare reform on the children raised under TANF. This paper aims to contribute to the emerging literature on the long run effects of the TANF program and explore potential mechanisms for the effects.

Using data from the Panel Study of Income Dynamics (PSID) Child Development Supplement (CDS) and Transition to Adulthood Supplement (TAS) I estimate a model of the technology of human capital, or skills production, similar to the one described by Cunha and Heckman (2007). In this model, skills in the current period are a function of investment in the previous periods. Here, skills as a young adult are a function of fixed family characteristics, endowment of skills at birth, and investments made in childhood. Applying this model to welfare reform, if the change in welfare policies changed the investment decisions of affected mothers, then those affected children should have different levels of skills as adults. To motivate the adult outcomes, I first examine if welfare reform had an effect on childhood cognitive and noncognitive skills. The model is estimated empirically using a triple difference framework that can accommodate family fixed effects by exploiting variation in welfare reform timing and likelihood of TANF participation.

I contribute to the existing literature on the short-run effects of welfare reform by showing that at-risk children who were exposed to welfare reform score higher on reading achievement tests by on average 5-7% of a standard deviation. This paper is also one of the first to test for the long-run effect of welfare reform on educational attainment and family structure. I find that these same children are on average 9

percent more likely to complete college as well as some evidence of higher rates of marriage and fewer having children out of wedlock, an explicit goal of the TANF program. I find that increased usage of formal child care is a likely mechanism for improvements to childhood cognitive function. Overall, these effects tend to be larger in magnitude for women than men. For the whole sample, the effect of welfare treatment on higher reading score and college completion result is robust to the addition of family fixed effects, the sample of non-movers, and the inclusion of state-time fixed effects. Using an event study model I find that the first exposure to welfare reform has the largest impact when the individual is in-utero through the age of one.

2.2 Literature Review

2.2.1 Early Childhood

Early childhood, and even in-utero events, have been shown to have important effects on an array of later life outcomes, such as health, income, education, and other aspects of well-being. These childhood events include their health, family income and socio-economic status, and early education, among others. This section briefly reviews the literature on the relationship between childhood circumstance and later life outcomes, and highlights evidence from particular early childhood programs as well as health and income characteristics more generally.

One of the better known segments of the childhood circumstance literature concerns early childhood education programs such as the Head Start Program, the Perry Preschool Project, and the Carolina Abecedarian Project, which all sought to provide high quality child care and education to disadvantaged children. Reanalyzing the data from the literature, Elango et al. (2015) find, across these programs, lasting gains for children that did not have access to another high quality alternative program. Children in the programs experience higher cognitive function, higher educational attainment, lower arrest rates, and less welfare usage as adults.

The long-term effects of education go beyond early childhood education and child care. The quality of a child's elementary classes also has persistent effects into adulthood. In the late 1980's, the state of Tennessee randomly assigned one of cohort children and their teachers into different sized classrooms in grades K-3 within their school. By linking the experiment data to tax return data, Chetty et al. (2011) are able to do a thorough longer-term analysis. Individuals assigned to small classroom sizes were more likely to have attended college. The authors attribute most of the gain to improvements in the child's noncognitive ability.

Work has also been done on more general conditions such as the long term effects of child health and family income/SES. The literature has shown that throughout all stages of childhood, health plays an important role not only for adult health but other outcomes as well. This relationship holds even after controlling for a variety of confounding factors such as income and education as shown by Case et al. (2005). Looking at a cohort of British adults born in 1958, Case et al. find that having chronic health conditions as a child leads to worse health as an adult. A similar result is shown by Currie et al. (2010). Currie et al study 50,000 children born in Manitoba, Canada between 1979 and 1987, and like Case et al., find that physical health is an important indicator of young adult health. However, Currie et al. also find that early mental health problems lead to higher rates of being on social assistance and lower literacy scores. This relationship between early health and adult outcomes even extends to in-utero conditions as summarized by Almond and Currie (2011). They show that the effects of fetal conditions are persistent and that the health effects can remain latent for many years. For example, fetal conditions such as low birthweight, mother's alcohol or smoking usage are linked to heart disease in middle age.

Lastly, and perhaps most apparently is that the family's income or socioeconomic status in childhood has lasting implications throughout adulthood. However, given the endogeneity issues, the causal evidence for this relationship is more limited. Early

evidence from sibling models, as described in Duncan et al. (1998), shows that children who grew up with higher levels of income are more likely to complete more years of schooling. Other work shows the short-term impact of income by studying natural experiments that raised family income. Dahl and Lochner (2012) find that an increase in income, as instrumented by the Earned Income Tax Credit expansion, improved child achievement test scores. The effect was largest for children from disadvantaged households, though the authors don't explore what could be the potential mechanisms. Examining the EITC further, Bastian and Michelmore (2018) find that the long-run impact of exposure to the EITC as a teenager leads to higher educational attainment and earnings as an adult. They find the primary channel for the improvement is increases to pre-tax family income.

Given the evidence above, welfare programs then can have potentially large impacts on a child's later well-being given that they can affect their health, income, or other facet of their life. There have been recent studies on the long-run effects of social safety net programs. Brown et al. (2017) study expansions to Medicaid and the State Children's Health Insurance Program in the 1980's and 90's and find that children affected by the expansions paid more in taxes, collected less in EITC by the age of 28. This suggests that increased medical coverage improved child health and raised their productivity as adults. Hoynes et al. (2016) examine the county-by-county rollout of the food stamp program in the 1960's to test if having access to food stamps as a young child improves adult outcomes. The authors find that when these children are adults they have better reported health and an increase in the economic self-sufficiency of women.

2.2.2 TANF

Another program whose long term-effects we can now begin to analyze is the TANF program. TANF was implemented in 1996, and replaced the AFDC welfare program. AFDC was a federal entitlement program that provided financial assistance to low income families with children, typically a low-educated single mother household. In the years prior to PRWORA, welfare caseloads had swelled under AFDC and starting in 1992 states started seeking and receiving waivers to experiment with their state welfare program to deal with the rising caseloads.[1] PRWORA codified many of these changes into federal law. PRWORA sought to decrease welfare dependency by moving recipients towards employment by changing the incentives AFDC recipients faced. Under TANF, individuals now face work requirements, time limits on assistance, and family caps for benefits among other conditions.

The year that a state first implemented some type of welfare reform, either a welfare waiver or TANF, is shown in Figure 2.1, with implementation dates taken from Crouse (1999). Thirty states implemented a major welfare waiver before TANF. Nineteen of those thirty implemented a waiver in the years before TANF was passed, 1992-1995, with the remaining states implementing either a waiver or TANF in either 1996 or 1997. Though not shown on the map, Hawaii and Alaska implemented welfare reform in 1997 as well. The last state to implement any kind of reform was New York in November, 1997. Figure 2.1 also shows the geographic variation in implementation dates with no region of states all implementing reform at the same time.

As over twenty years have now passed since TANF became law, we can now begin to study its long-term impacts on the children affected. While much has been written on the impact of welfare reform on caseloads, employment, and income, relatively

[1] Politically, rising caseloads appeared to be the motivator for welfare reform, with Bill Clinton campaigning in 1992 to "end welfare as we know it." However, Ziliak et al. (2000) show that states with high caseloads were not more likely to request federal waivers.

little is known about the long-term effect of welfare reform.[2] Early work on this topic comes from Hartley et al. (2017) who model intergenerational transmission of welfare use from mother to their daughters before and after welfare reform. They find that welfare reform attenuated the transmission of dependence by at least one-third.

There are two main channels that PRWORA could affect the cognitive and noncognitive skills of children, which in turn could affect their livelihood as adults. First, PRWORA could change the income of families. Evidence on this point is somewhat mixed. Early work by Schoeni and Blank (2000) and Grogger (2003) find modest, positive effects of welfare reform on earnings, income, and poverty rates. However, the proceeding work tried to account for the heterogeneity in welfare reform and found varying effects. Work by Bitler et al. (2006b) and Bollinger et al. (2009) shows that PRWORA lowered the income of less skilled mothers in the bottom half of the income distribution and raised income among more skilled mothers. As outlined above, and by work such as Duncan et al. (2014), income can affect family stress at home. The stress itself is cognitively draining and any stress from the parents may spill over into harsher parenting practices, which could alter the child's personality traits. Less income also means less resources to invest into the children such as high quality child care, education, and other learning experiences.

The second avenue for PRWORA to affect childhood mental traits is the time endowment of the mother. In many states' TANF programs, adults must be engaged in an acceptable work activity, commonly defined as participation in the paid workforce and usually 20-30 hours per week. In addition, states have the option to levy a sanction equal to all or part of the welfare benefit on those who fail to comply with the work requirements. As PRWORA moved mothers to work, they have less time to spend with their children and may choose low-quality child care as a substitute.

[2]See Blank (2002) & Ziliak (2016b) for excellent reviews on this literature.

However, it is possible that attachment to work could increase the subjective well-being of mothers as found by Herbst (2013). This increase in subjective well-being could spillover to the child. Therefore, the effect of welfare reform on child cognitive development is unclear.

The evidence on welfare reform and child mental attributes is slightly mixed. Morris et al. (2009) examine the relationship between welfare reform and the achievement scores of children using 7 different welfare experiments carried out across the United States in the 1990's. For young children, those aged five or less, the programs that were the most effective were the ones that not only boosted employment of the mother but also raised income through an earnings supplement. Young children in these programs saw an increase in their achievement tests by 7 percent of a standard deviation. There was no statistically significant impact for children between 6-9 and a slight negative effect for children older than 10.

Heflin and Acevedo (2011) use panel data from the Fragile Families and Child Well-being Study to examine the non-income effects of TANF participation on child cognitive development as measured by the Peabody Picture Vocabulary Test. They control for child and mother characteristics, welfare connections, family dynamics, and home environment factors. Their results indicate that welfare receipt is associated with an 11% of a standard deviation decrease in child cognitive score. They find that 7% of the effect of TANF is through maternal stress while income accounts for 18%.

Herbst (2014) also examines child cognitive ability but studies the impact of a specific TANF policy, the age-of-youngest-child exemptions. Following PRWORA there was substantial variation across states in regards to when a mother had to return to work following the birth of a child, ranging from 0 months to as many as 24 months. Herbst uses this variation and panel data from the Early Childhood Longitudinal Study Birth Cohort to estimate the impact of maternal employment on

early life cognitive ability as measured by the Bayley Short Form-Research test. His result indicates that each month of maternal work corresponds to a 0.08 standard deviation reduction in cognitive score.

With my sample of young adults, I am able to test the impact of welfare reform on a variety of outcomes relating to educational attainment and family structure. The education outcomes are a natural extension of the test scores examined in childhood and the work so far in the welfare reform literature, suggesting potential improvements to childhood human capital. Educational attainment represents one of the consistently bright spots for children after welfare reform. Offner (2005) uses March CPS data and find that high school drop-out rates among teenagers declined 24 percent after welfare reform. While Miller and Zhang (2012) use both the October schooling supplement of the CPS and administrative Common Core data and find a 20 percent reduction in high school dropout rates. Dave et al. (2012) examines difference by gender and use the October CPS to employ a triple difference model comparing high risk of welfare teenage girls to low risk teenage boys. They find that welfare reform reduced the odds of a teen girl dropping out by 15 percent. In light of these results, I expect higher college attendance and completion rates as adults, with welfare reform potentially having stronger effects for women.

The family structure outcomes are motivated by two of the explicit goals of TANF, "prevent and reduce the incidence of out of wedlock pregnancies and establish annual numerical goals for preventing and reducing the incidence of these pregnancies" and "encourage the formation and maintenance of two parent families." Early evidence of the effect of welfare reform on family structure is mixed with studies finding no robust effects (Fitzgerald and Ribar, 2004; Graefe and Lichter, 2008; Dunifon et al., 2009; Knab et al., 2009), lower rates of marriage (Bitler et al., 2004), more children living in married families (Bitler et al., 2006a), and more children in blended families

(Cherlin and Fomby, 2005). This paper seeks to provide clarity to this literature by estimating the long-run impacts of welfare reform on family structure for the children of welfare reform.

2.3 Model

Key to this project is modeling the technology of human capital or skills production. My model is similar to the one described by Cunha and Heckman (2007), whereby skills in the current period are a function of skills and investments made previously as well as fixed family characteristics. Specifically, for any period, t $\forall t \geq 0$, the production function is written as

$$\theta_{t+1} = f(h, \theta_t, I_t), \tag{2.1}$$

where θ represents a vector of skills or attributes, h denotes time-invariant parental characteristics, and I_t is investment in human capital in the previous period.

Equation 2.1 can be rewritten in recursive form by substituting for θ_t, θ_{t-1}, ... repeatedly:

$$\theta_{t+1} = g(h, \theta_0, I_1, ..., I_t), \tag{2.2}$$

where θ_0 is the individual's endowment of skills at birth.

For simplicity, suppose that birth/prenatal is period 0, childhood is period 1, and young adulthood is period 2. In this case, I can rewrite equation (2.2) as:

$$\theta_2 = g(h, \theta_0, I_1) \tag{2.3}$$

In words, skills as a young adult are a function of fixed family characteristics, ones endowment of skills at birth, and investments made when in childhood. Applying this framework to welfare reform, the change in welfare policies potentially changes the

investment decisions of affected mothers. If the child is young enough, these policy changes could also affect the decision-making of the pregnant mother, thus changing the child's birth endowment as well. Adulthood outcomes are then a function of these changes to childhood endowments and investments.

With some assumptions, equation (2.3) can be estimated with the use of proxies for each of the production inputs. First, I assume that the production function g is linear in inputs and is constant across time and individuals. Young adulthood human capital, θ_2, can be proxied by educational attainment and family structure. Let birth weight and being breastfed be proxies for initial skill endowment, θ_0. Early childhood exposure to welfare reform, explained in detail below, is a proxy for the family investment decisions in childhood human capital, I_1. A model with siblings and family fixed effects is also estimated to control for time-invariant parental characteristics, h.

With these assumptions, the task is to compare children affected by welfare reform to similar children who were not. Here I exploit the differential rollout of state welfare waivers and TANF implementation between the years of 1992 to 1997 to estimate a triple difference model. I compare the outcomes of adults who were exposed to welfare reform to those who were not, taking likelihood of welfare participation into account. The model takes the form:

$$Y_{istb} = \gamma W_{isb} + \delta T_i + \beta(W_{isb} * T_i) + \Gamma X_{istb} + \eta_t + \eta_s + \eta_b + u_{istb}, \tag{2.4}$$

where i denotes the individual, t the interview year, s the state of residence, and b the birth year. Y_{istb} is the outcome of interest, W_{isb} indicates exposure to welfare reform, T_i takes a value of one if the child is from a low-educated single mother household, X_{istb} is a vector of demographic and state level controls and includes measures of birth weight and being breastfed, η_t, η_s, and η_b are interview year, state, and birth year fixed effects, respectively. Lastly, u_{istb} is the error term that is assumed to be uncorrelated

with the covariates. All reported standard errors are clustered at the state level. As is common in the literature, low-educated refers to having twelve years of education or less. Here, mother means biological, step, adoptive mother, or grandmother. The comparison group for these at-risk children is the children of higher-educated single mothers and children from two parent families where at least one parent has less than a college degree. Children from households with two college-educated parents are omitted from the analysis.

For the main independent variable, W_{isb}, I follow the approach of Hoynes et al. (2016) and measure how much of the individual's life before the age of five they were exposed to welfare reform. The variable is the share of months between conception and the age of five that either welfare waivers or TANF were in place in their state. Given the evidence from Kaestner and Lee (2005) that welfare reform affects a mother's prenatal decision it is important to account for welfare reform exposure that occurs in-utero. The variable takes a value of 0 if the child turned five before any welfare reform was implemented in their state and a value of 1 if they were conceived after welfare reform.[3] Any in-between value will be some fraction expressed as $x/69$ where x is the number of months they were exposed. Major welfare waiver and TANF implementation dates are taken from Crouse (1999).

This method is different from natural experiments that are episodic, in that they "turn on" and then later "turn off." Here, once a state reforms its AFDC program either through welfare waivers or by implementing TANF, it keeps the reform and does not revert or "turn off." This restricts the comparisons that can be made because there will never an adult that was exposed in early childhood, but not later childhood. As such, comparisons are about additional welfare reform exposure earlier in childhood, conditional on having it later in childhood as well.

[3]I assume a 9 month gestation period between birth and conception

Interpreting the coefficients from equation (2.4), γ is the own effect of full welfare reform exposure and δ is the own effect of growing up in a disadvantaged low-educated, single mother household that is at risk of being affected by welfare reform. The parameter of interest is then β and represents the impact of full welfare reform exposure, being exposed from conception to age 5, for someone who's likely to be affected by welfare reform. This means that β is an intent-to-treat estimate. Because going from zero months of exposure to sixty-nine months of exposure can be seen as a drastic change, I also present treatment estimates at the mean level of exposure. Looking at the mean level of exposure gives me an average intent-to-treat effect (AITT). This assumes that all children of single low-educated mothers were affected by welfare reform. The model also assumes that the effect of one additional month of welfare reform exposure is constant regardless of age, an assumption I relax in section 2.5.3. Note that γ then represents the impact of welfare reform exposure on someone who is not at-risk to take up AFDC/TANF. As such I expect the coefficient to be zero. Identification of β is given by variation in states' passage of welfare waivers and TANF, the birth year of the adults, and their family status when they were children. The model assumes there is no difference in cognitive and noncognitive trends between children of low-educated single mothers and high educated single mothers or children from low-educated two parent families before the implementation of welfare reform.

In the model, the outcomes for both childhood and adulthood are the individual's skills. Ideally, measured skills would be the same between the two periods but in practice this is unfortunately not the case in the data. In childhood, the vector of human capital skills consists of test scores and behavior scales for cognitive and noncognitive skills, respectively. For cognitive skills, I use the Woodcock-Johnson Revised Tests of Achievement (WJ-R) originally developed by Woodcock et al. (1989). My measure of childhood noncognitive function comes from the Behavioral Problem Index (BPI). Because measures of cognitive and noncognitive skills are not available in

adulthood, I examine outcomes that are at least partly determined by their cognitive and noncognitive skills. This includes educational attainment and changes to family structure. Education is used because it is a natural extension of the childhood test scores and family structure because it is an explicit goal of the TANF program.

To try to control for unobserved family characteristics, h in equation (2.2), I also run a model with family fixed effects, meaning u_{istb} is correlated with the $X's$. Here the sample only includes individuals that have a sibling in the data as well. That empirical model can be written as

$$\tilde{Y}_{istb} = \gamma \tilde{W}_{isb} + \beta(\widetilde{W_{isb} * T_i}) + \Gamma \tilde{X}_{istb} + \eta_t + \eta_s + \eta_b + u_{istb}, \tag{2.5}$$

where $\tilde{}$ indicates the family-time-demeaned variable. This model compares individuals who were exposed to welfare reform to their siblings that were not exposed while sweeping out time-invariant family characteristics. In this model, identification comes from pairs of siblings with different amounts of welfare exposure due to being born at different times.

2.4 Data

Data for this project comes from two supplements of the Panel Study of Income Dynamics (PSID), the Child Development Supplement (CDS) and the Transition to Adulthood Supplement (TAS). The PSID is longest running longitudinal survey, starting with 4,802 households in 1968 and still follows all members and descendants to this day. In 1997, the PSID supplemented its main data collection with additional information on 3,563 0-12 year-old children and their parents for the CDS. The children were drawn at random from participating core families with the condition that there cannot be more than 2 children from any household. The children were followed

up twice after the 1997 survey, once in 2002 and again in 2007. Information about the children was collected from their Primary Care Giver (PCG), most typically their mother. Once children reached the age of 18 they left the CDS and entered the TAS.

The TAS was first fielded in 2005 with the aim of collecting information on young adults who had not yet formed their own household, a growing group of individuals that many surveys miss. The TAS has been fielded every two years since 2005, with the most recent wave being in 2015, and collects information on schooling, labor force outcomes, and health. Individuals enter the TAS when they turn 18 and stay until they are 28 years old, even if they have formed their own household during that time. The analysis sample includes one observation for each interview year that the individual satisfies these age restrictions. Adults in the TAS were children when welfare reform was enacted.

Because of the longitudinal structure of the PSID, I am able to follow these young adults back to their childhood and measure their welfare reform exposure and investment in their human capital production. This information comes from the core family files and the CDS. I assign family status and state of residency to the child using information from the 1997 wave for computing their welfare exposure and treatment. The TAS sample consists only of children who were interviewed for the CDS. This means I have data on their childhood human capital levels as well as measures of human capital investment. All relevant information on measures of cognitive and noncognitive skill and tables come from the PSID CDS 1997 User Guide by Hofferth et al. (1997). In section 2.5, I show results from the "first stage" of the model by examining if welfare had an impact on childhood outcomes, to motivate the effects I see on adult outcomes.

For cognitive skills, I use the Woodcock-Johnson Revised Tests of Achievement (WJ-R) originally developed by Woodcock et al. (1989). The WJ-R test contains nine subtests measuring different aspects of academic achievement and was used in

the NLSY-Child Study and the Carolina Abecedarian Project as well. The WJ-R test has been used throughout the psychology literature to measure child achievement (Nelson et al., 2004; Davis-Kean, 2005; Hughes and Kwok, 2007). For the CDS, the PSID administered 3 subtests in each of the three waves that cover the reading and math portions of the test. The three subtests are Letter-Word Identification, Passage Comprehension, and Applied Problems. The letter-word and applied problems tests were administered to children over the age of one, and the passage comprehension test was administered to children ages five and older. A description of each individual subtest is found in Appendix Table A.1.

My measure of childhood noncognitive function comes from the Behavioral Problem Index (BPI). The BPI is a 30-item questionnaire administered to the child's PCG developed by Peterson and Zill (1986). Each question describes a different problematic behavior and asks the PCG whether the child exhibits the problem behavior often, sometimes, or never. Behaviors include having sudden changes in mood or feeling, is fearful or anxious, bullies or is cruel or mean, demands a lot of attention. Behaviors are also divided into two subscales, a measure of externalizing or aggressive behavior and a measure of internalizing, withdrawn or sad behavior. The index is then the total number of affirmative responses among the 30 questions. The BPI has been used to study children across a variety of disciplines in the US and the UK (McCormick et al., 1990; McCulloch et al., 2000; Christakis et al., 2004; Bernal and Keane, 2011). In the CDS, the questions are asked for every child 3 and older. Appendix Table A.2 lists each of the 30 questions and lists if they are external or internal behaviors as well as their reliability taken from Hofferth et al. (1997).

Survey weighted descriptive statistics for the CDS sample can be found in Table 2.1. Given the age restrictions on the tests, the sample sizes here fluctuate. For the WJ-R subtests the standardized score, which is standardized by age, is the outcome of interest. For BPI, I examine the raw score. The BPI has a maximum score of

thirty and a minimum score of zero. A higher BPI score means the child exhibits more problematic behaviors. The average amount of welfare reform exposure is 0.30 which translates to about twenty months. In the sample there are 2,464 observations of children with no welfare reform exposure, and there are 2,992 observations of children with a nonzero amount of exposure. For these children with exposure the average amount is 0.54 which is about three years. Roughly twenty percent of children are from an at-risk household. Information on state controls comes from University of Kentucky Center for Poverty Research Welfare Data. The child's birth weight and if they were breastfed are included in the models to control for in-utero/birth characteristics, θ_0 from equation (2.2). State controls are used to try to account for the local macroeconomy. State minimum wage and maximum TANF benefits are measured in 2007 dollars. State EITC is calculated as a percentage of the federal rate.

Survey weighted descriptive statistics for the TAS sample are found in Table 2.2. The descriptive statistics of the TAS sample show a population that is still finishing school, with almost three-quarters reporting that they have at least attended college but only 27 percent over the age of twenty with a two or four year college degree.[4] For family structure 11 percent of the sample is married and 14 percent have a child out of wedlock. Eighteen percent of them are from an at-risk household. For these adults the average amount of exposure is 0.17 which is approximately one year of childhood was spent in a state that had enacted some kind of welfare reform. There are 4,003 observations of adults with no welfare reform exposure, and there are 2,353 observations of adults with exposure. For those with exposure the average amount is 0.46 or about thirty-two months.

[4]Because of the time it takes to complete any college degree is at least two years, all analysis examining college completion is restricted to the sample of individuals twenty years or older.

This low rate of exposure is largely an artifact of the way the data is constructed. Those with the least amount of exposure would be those who were the oldest in the CDS, the children who had already turned five before welfare reform was enacted. These children would turn 18 first and thus would be in the TAS before the youngest children that have the most exposure to welfare reform. These older children are then in the TAS for up to five waves while the younger children with the most exposure may only be in the TAS for one or two waves.

2.5 Results

2.5.1 Main Results

To help motivate the adult results, I first present results for the childhood sample. If welfare reform affects the livelihood of the adults, I should expect to find some effect of welfare reform on their cognitive or noncognitive skills when they are children. Though as described previously, sometimes these effects can be latent and not manifest themselves until later years. The results are shown in Tables 2.3 & 2.4. Table 2.3 shows least squares results from equation (2.4) while Table 2.4 shows results from the family fixed effects model, equation (2.5).

In these tables the coefficient for welfare treatment corresponds to β, the coefficient for welfare exposure corresponds to γ, and being from an at-risk household corresponds to δ from equations (2.4) & (2.5). For welfare treatment, the interpretation of the coefficient is the effect of an at-risk child going from no welfare reform exposure before the age of five to full welfare reform exposure before the age of 5. These results should be interpreted as the total effect of welfare reform treatment. The two tables show that at-risk children exposed to welfare reform experienced better outcomes compared to the comparison group. The magnitudes are generally larger in the fixed effect specification, but both specifications show that fully treated children improved their reading test scores by a statistically significant and fairly large

amount, between 23-39 percent of a standard deviation. At the mean level of exposure of twenty months, this translates to a 6-7 percent of a standard deviation increase in reading test scores.

The effect of treatment also has a positive but statistically insignificant effect on the applied problems mathematics test score. Though the coefficient is negative in both specifications, suggesting an improvement in behavior, I do not see a statistically significant effect of welfare treatment on my noncognitive measure, the BPI. As expected, the coefficients for welfare exposure for those at low risk of being affected by welfare reform are statistically not different from zero as apart from one instance, the fixed effect model for letter word score, suggesting there is potentially some kind of cohort effect beyond what is captured by the birth-year fixed effects. The coefficients for being from an at-risk household matches what one would expect. Children from disadvantaged families have lower test scores and exhibit more problematic behaviors. The results show that the short-run effect of welfare reform treatment suggests improvement to reading test scores with potential gains to mathematics and behavior as well. With gains potentially this large for fully exposed children, I should expect to see improvements in adulthood as well, particularly with regard to educational attainment.

It is helpful to put the magnitude of these effects in the context of the larger literature. For the childhood results, my findings of an average effect of a 5-7 percent of a standard deviation increase in reading scores are in line with the earlier work of Morris et al. (2009) who found that young children whose family participated in a state welfare experiment that raised earnings and employment saw an increase in their achievement tests by 7 percent of a standard deviation. However, these magnitudes are smaller than what researchers have found examining the Project STAR results.

As outlined by Schanzenbach (2006), researchers have consistently found that smaller class sizes increase test scores by 15 percent of a standard deviation, with minority students getting an even larger boost.

I now turn to the TAS sample to test for the long-run impacts of welfare reform. Tables 2.5 & 2.6 present the main results for the young adult sample. The results are in line with the childhood results of higher test scores and fewer problematic behaviors. Adults who were treated by welfare reform as children show strong improvements in the likelihood of graduating college, the likelihood they are married, and are less likely to have a child out of wedlock. For educational attainment, the coefficients for the family fixed effect model are larger in magnitude than the OLS specification but have the same pattern of statistical significance. Interestingly, neither specification finds an effect of welfare reform treatment on the likelihood of attending college, though both are positive, but both find that full welfare reform treatment increases the likelihood of graduating college by about 15 to 20 percentage points. At the mean level of exposure of twelve months, this is an average intent-to-treat effect of 9 to 12 percent increase from the baseline means.

The OLS model also shows that the fully treated adults are 8.1 percentage points more likely to be married, with the average welfare treatment effect being 12 percent more likely, but this coefficient is not statistically different from zero when controlling for fixed family characteristics. Similarly, the fully treated adults are 15 percentage points less likely to have a child out of wedlock. Those with the mean level of treatment are 2.6 percentage points or 18 percent less likely to have a child out of wedlock, though this effect is also not statistically different from zero when controlling for fixed family characteristics. As expected, the coefficients for welfare exposure among low-risk children are zero with one exception, for the OLS model of marriage. However, it does not persist once fixed family characteristics are accounted for. The coefficients

for growing up in a disadvantaged household suggest that young adults have lower rates of educational attainment, less likely to be married, and more likely to have a child out of wedlock.

These results show strong improvements for children who grew up affected by welfare reform. It appears the gains to reading test scores as a child translate to higher educational attainment later in life. Perhaps because they are more educated, they also find themselves in more stable family environments. Treated adults show some evidence of higher rates of marriage and fewer children born out of wedlock, suggesting that TANF is meeting its goal of more two parent, stable families. However, it should be noted that these are all relatively young adults whose ultimate family structure may yet to be determined, but these early results are consistent with program goals.

Here again, it is helpful to put these effect sizes into context. Bastian and Michelmore (2018) find that teenage exposure to EITC increases the likelihood of completing college by 4.2 percent while Cohodes et al. (2016) find that Medicaid expansion between the 1980 and 1990 birth cohorts increased college completion by 6 percent. While these are both smaller effects than what I find, it should be noted that these papers both focus on completion of a four year college degree, while I examine both two year completion and four year completion. For family structure, Bitler et al. (2004) find that TANF implementation is associated with a 13-21 percent reduction in marriage rates. My estimate for the second generation of welfare reform suggests an almost equal but opposite increase in marriage. For fertility, Garfinkel et al. (2003) and Horvath-Rose et al. (2008) examine specific attributes of welfare reform, state welfare benefits and family caps respectively, and find reductions in non-marital births of 4-6 percent. This suggests that my drops in non-marital births may be driven more by gains to education and increases to marriage.

The improvements to childhood test scores coincides with improvements to adult educational attainment. The next question is what could be inducing improvements to childhood cognitive function? One of the significant changes of welfare reform is that TANF moved away from cash benefits to more in-kind benefits. Child care subsidies make up a significant portion of states' in-kind benefits (Ziliak, 2016b). Combined with the work requirements, these policies may induce mothers to opt for formal child care. High quality formal child care has been shown to improve childhood cognitive and noncognitive function (Morris et al., 2009; Heckman et al., 2013; Elango et al., 2015). The effect of welfare reform on child care use is shown in Table 2.7.

Here I test if welfare reform led to more child care use overall child care use and specifically if the care was informal care or formal care. Here informal care is defined as being watched by a relative or other individual and formal care encompasses daycare, pre-K, before and after school programs, and extra curricular programs. Parents may report multiple forms of formal and informal care. Table 2.7 shows that total child care use increased but only usage of formal child care increased by a statistically significant amount. At-risk children with the mean level of welfare reform exposure are 26 percent more likely to be enrolled in formal child care, while only being 4 percent more likely to use informal child care. This shift to formal care helps explain the increase in childhood reading test scores.

2.5.2 Results By Gender

Given that TANF and its predecessor AFDC primarily benefit single mothers, and the work of Hartley et al. (2017) on the transmission of welfare use from mothers to daughters, I also test if the children of welfare reform have different results by gender. Tables 2.8 & 2.10 show results for boys and girls, respectively. Tables 2.9 & 2.11 show results for adult men and women, respectively. Here I present the results from the model without family fixed effects. The sample size is too small otherwise to reliably

draw any inference, as a family fixed effects model by gender would only compare brothers to brothers and sisters to sisters. From childhood to adulthood, the effects of welfare treatment are much stronger for females than males.

Tables 2.8 & 2.9 show the results for males. Here the results are much weaker compared to full sample results show in Tables 2.3 & 2.5. For the childhood sample, welfare reform treatment does not have an impact on the reading scores or behavior of young boys. The coefficients for the reading test scores are still positive, but not at a statistically significant level. Boys also do not appear to be as affected by growing up in a disadvantaged household. Given the lack of a measurable effect of welfare reform on young boys, it is perhaps not surprising that I also find a lack of an impact of welfare reform treatment when these boys are young men. These results are seen in Table 2.9.

I find that treated men are not more likely to complete college at a statistically significant level. However, the men are still more likely to be married at a rate roughly equal to that for the whole sample, 7.3 percentage points for the fully treated and 1.2 percentage points for those with mean level of exposure. There are no statistically significant effects of welfare treatment on college attendance, starting their own family unit, or having a child out of wedlock. Here again, men appear to be less affected by growing up in a disadvantaged household, though they are statistically significantly more likely to have a child out of wedlock if they are from a disadvantaged household.

For females however, I find strong effects of welfare reform on childhood test scores and adult outcomes. These results are shown in Tables 2.10 & 2.11. Girls seem to be entirely driving the main results from Table 2.3. Girls who were fully treated by welfare reform score 35-47 percent of a standard deviation higher on their reading tests. At the mean level of treatment, this is a 10-14 percent of a standard deviation

improvement. Girls appear to be deeply affected by growing up in a disadvantage household. Girls from these families score much worse on their reading and math tests and they exhibit more problematic behaviors.

These gains seen for the girls in childhood carries over into young adulthood. Young women who were fully treated by welfare reform are 23 percentage points more likely to graduate college. For the mean level of exposure this is a 13.5 percent increase from baseline. Women with full treatment are 9.2 percentage points more likely to be currently married. At the mean level of treatment, this is a 12 percent increase and a 22 percent reduction, respectively. The disadvantages of growing up in a family at-risk of being affected by welfare reform continues into adulthood. Those women from low-educated single mother households are less likely to attend college, more likely to be a single parent, and are less likely to be married.

It appears that the gains from welfare treatment shown in the OLS model in Table 2.5 are primarily driven by women. While men do see gains to college completion and are less likely to have a child out of wedlock, the results are much stronger for women. Interestingly, the effects of welfare reform on child care usage is the same between boys and girls as seen in Appendix Tables A.3 & A.4. As in the whole sample, both boys and girls are significantly more likely to use formal child care use. While somewhat surprising, these results do match some of the larger literature. The results for female educational attainment are in line with the literature that finds that welfare reform reduced the rates of female high school dropouts (Offner, 2005; Dave et al., 2012; Miller and Zhang, 2012; Hartley et al., 2017). Other programs such as the Moving to Opportunity experiment, which moved young children to nicer neighborhoods, also found that teenage girls were the largest beneficiary of the improved environment (Chetty et al., 2016).

2.5.3 Robustness Checks

I now turn my attention to the possibility of endogenous migration. To this point there have been no restrictions on the individuals staying in the same state all throughout childhood. If parents and their children migrated in response to welfare generosity, then the movement would be endogenous and bias the results of the model. To address this, I re-estimate equation (2.4), for childhood and adult outcomes, on individuals who never moved states during childhood. These results are shown in Tables 2.12 and 2.13.

For the childhood results, Table 2.12, the results are generally similar to the main results shown in Table 2.3 both in terms of magnitude and percent change. The exception being that the estimates for the effect of full welfare treatment are stronger for the reading tests for the sample of non-movers. The effect of welfare treatment is now positive for the behavior problem index, but still not statistically different from zero. Given the point estimates, this is likely due to the smaller sample size and resulting larger standard errors for the estimates. The own effect of welfare reform exposure persists between specifications as does the effect of being from a disadvantaged household. This trend holds for the young adult results as well, seen in Table 2.13. The effect of welfare reform treatment on college completion and family structure is robust to the sample of non-movers only and nearly identical in magnitude and percent change. For the family structure outcomes, the results are still statistically insignificant though they are larger in magnitude. The results of the fixed effect specification also hold for the sample of nonmovers. These results are seen in Appendix Tables A.5 & A.6.

One might also be concerned about the effect of changing state policies over these time periods such as Medicaid expansion or SNAP liberalization that won't be captured by state and survey year fixed effects. To control for any state specific time trends I re-estimate equation (2.4) and include state-year fixed effects. This is done for

both childhood and adult outcomes and the results are seen in Tables 2.14 and 2.15. Here again the results are quite similar to the main specifications. This suggests that my results are not driven by other changing state specific policies. I also re-estimate the fixed effect specifications including state-year fixed effects. These results are seen in Appendix Tables A.7 & A.8.

In Appendix Tables A.9 & A.10 I test the sensitivity of my results to the inclusion of particular control variables. Here I focus on childhood letter word reading test scores and adult college completion, the two results that are the most robust to alternative specifications. For identification purposes, each of the triple difference terms and the fixed effects are included in each specification. Both Appendix Tables A.9 & A.10 show that the effect of welfare reform is statistically significant in all variations. The individual demographic controls shown in column (2) have the largest effect on the welfare treatment coefficient, as it increases from the no controls specification in column (1). Adding in controls for the mother's characteristics also dramatically attenuates the coefficient for being from an at-risk household.

Lastly, I explore an alternative specification for childhood exposure to welfare reform and adult outcomes to examine the effect of the timing of exposure. Though the literature agrees that early childhood is a crucial time, it is possible that welfare reform exposure at all ages matters for later life outcomes. In this alternative specification, I use an event study model that allows me to explore the timing of welfare reform exposure more thoroughly.

In the event study framework, I allow the effect of welfare reform to vary by the individual's age at welfare reform implementation in their state for the sample of individuals that were raised by a low-educated single mother. For example, If a person was eight years old when welfare reform was implemented in their state, they would have an event time of 8. If welfare reform was implemented two years before they were born, they would have an event time of -2. I then replace the exposure

measure in the difference in difference model of equation (**??**) with a series of dummy variables based on the individuals age at welfare reform from two years prior to birth through age 9 with age 10 being the omitted category. The model is written as

$$Y_{istb} = \sum_{a=-2}^{9} \gamma_a D_{isb} + \Gamma X_{istb} + \eta_t + \eta_s + \eta_b + u_{istb}, \tag{2.6}$$

where $D_{isb} = 1$ if their age at welfare reform implementation is equal to a. I present the results for college completion for the sample of individuals that were raised by low-educated single mothers in Figure 2.2 and as a placebo test for the advantaged sample of adults who were not raised by a low-educated single mother household in Figure 2.3.

Here I focus on the college completion outcome as it is the long-run outcome that is consistently significant across specifications. It is important to note that this graph is the opposite of the typical event study graph. Here, exposure decreases as one moves to the right of the graph. A person with an event time of -1 is exposed from in-utero through all of childhood, while a person with event time of 8 is only exposed from age 8 onwards. The results for the at-risk sample match the literature which suggests that in-utero and very early childhood exposure will have the largest impact on adult outcomes. The figure shows those exposed pre-birth to the age of one have the largest gains when it comes to college completion as an adult. The effect of welfare reform exposure steadily decreases as the child's age at first exposure increases, though the effects of exposure are still positive through age nine. The effect is less precisely measured at young ages though, reflecting the relatively low amount of welfare exposure in the adult sample as outlined before. The relative flatness of the line in negative time to birth also helps rule out the possibility of any pre-trends

that could be influencing my results. The results in Figure 2.3 are also encouraging for my estimation approach, as welfare reform exposure for those not at-risk of being affected by welfare reform has no effect on college completion across all ages.

2.6 Conclusion

Childhood circumstance can have wide reaching implications for adulthood. In the economics literature everything from childhood health and income to neighborhood to school has been shown to have effects later in life. This paper is part of a growing section of literature to seeks to answer what are the long-run effects of childhood exposure to the social safety net. As welfare reform passed its twenty year anniversary, this is one of the first tests for the long-run effects of the TANF program. These results are crucial to our understanding of the total impact of the TANF program, and its implications for policy changes to other programs in the future.

Using data from the PSID, I model the human capital production technology as a function of childhood investment. I estimate the model empirically using a triple difference framework that can accommodate family fixed effects. I first contribute to the existing literature on the short-run effects of welfare reform by showing that at-risk children who were exposed to welfare reform score higher on reading achievement tests. Turning to the adult sample, I find that these same children are more likely to complete college, more likely to be married, and are less likely to have a child out of wedlock. The latter two results suggesting that PRWORA was successful in its goal of promoting two-parent families. Increased formal child care use is a likely mechanism for these improvements.

Women seem to benefit more from this treatment than men. As girls they score much higher on their cognitive reading tests. For women affected by welfare reform, they are much more likely to complete college, be married, and not be a single mother. For the whole sample, the effect of welfare treatment on higher reading scores and

college completion is robust to the addition of family fixed effects, the sample of non-movers, and the inclusion of state-time fixed effects. Using an event study model I find that first exposure has the largest impact when the individual is in-utero through the age of one.

Finally, putting these results into the context of the larger literature on welfare reform, it is helpful to recall the words of Blank (2009). In her survey chapter, she concludes by saying, "It is perhaps surprising that these very large changes in welfare use, work, and earnings have had at best small effects on other domains of family life among single-mother families . . . It is possible that these other domains will show effects only over time, with longer-term cumulative effects on health, child outcomes, or fertility that are simply not yet visible in the data." The results presented here reflect her belief that the wider effects from welfare reform are not found in the single-mothers themselves but in the lives of their grown children.

The changes to household environment brought on by welfare reform were perhaps felt the strongest by the children of the household during their formative years than by the parents themselves. My work presented here, along with Hartley et al. (2017), suggests this to be the case. Both papers find noticeable effects of welfare reform on adult outcomes for those who were children at the time of welfare waivers and PRWORA. These results are among the first in an emerging literature on the long-run effect of welfare reform. However, there is still more work to be done. As the sample ages we will be able to examine long-run effects of welfare reform on outcomes such as health, earnings, and family structure.

Tables and Figures

Figure 2.1: Welfare Reform Implementation Year, By State

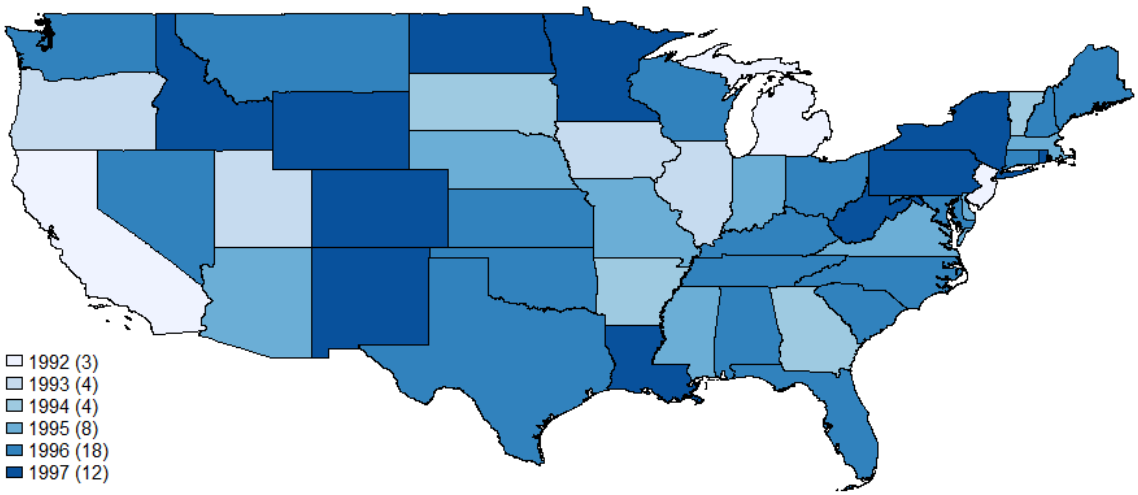

Figure 2.2: Event Study Estimates of the Impact of Welfare Reform on College Completion - At-Risk Sample

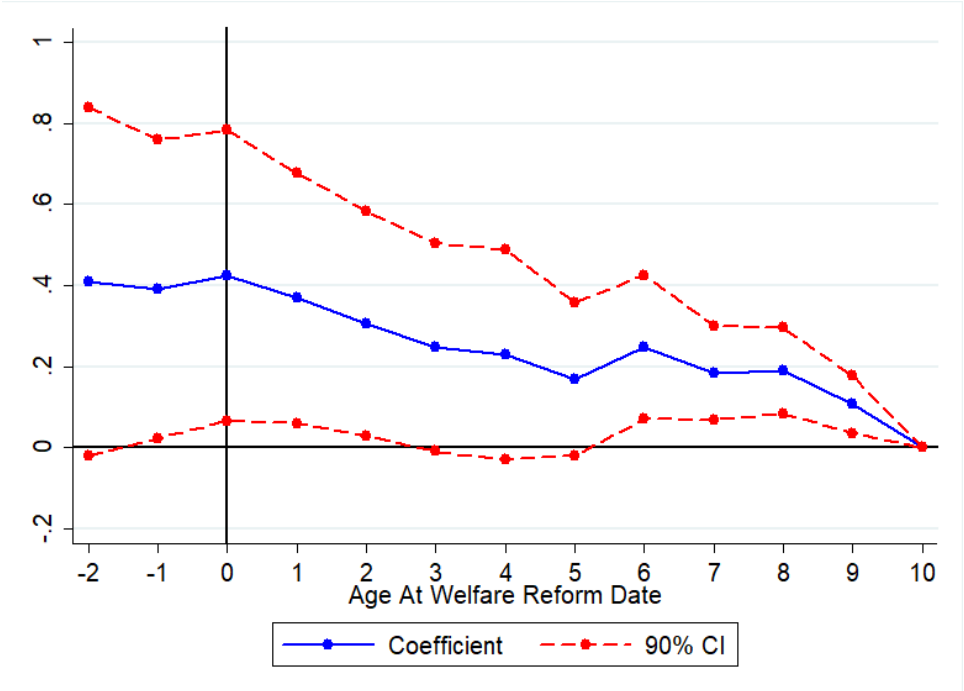

Figure 2.3: Event Study Estimates of the Impact of Welfare Reform on College Completion - Advantaged Sample Placebo Test

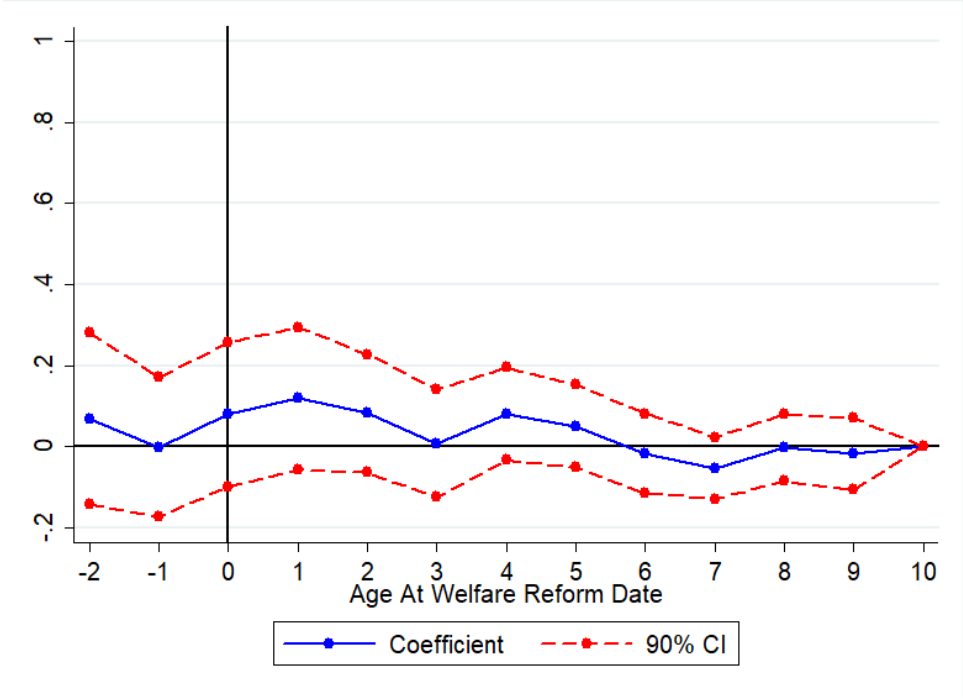

Table 2.1: Descriptive Statistics - Child Development Supplement

	Mean	SD	Observations
Welfare Exposure	0.30	0.36	5456
Raised by Low-Edu Single Mom	0.17	0.38	5456
Cognitive Outcomes			
Letter Word Score	103.75	18.19	4760
Applied Problems Score	104.05	16.51	4741
Passage Comprehension Score	102.25	16.33	4173
Noncognitive Outcome			
Behavior Problem Index	8.49	6.31	5341
Demographics			
Child Age	11.49	4.04	5456
Male	0.51	0.50	5456
White	0.61	0.49	5456
Black	0.18	0.38	5456
Number of Siblings	1.46	1.14	5456
Birthweight (ounces)	119.01	21.74	5456
Was Breastfed	0.54	0.50	5456
Mother Age	38.90	7.82	5456
Mother Less Than HS Edu.	0.22	0.41	5456
Mother HS Degree	0.36	0.48	5456
Mother Some College Edu.	0.33	0.47	5456
Mother College Degree	0.07	0.26	5456
Mother Postgraduate	0.03	0.17	5456
Raised By Grandparents	0.03	0.16	5456
Urban Residency	0.63	0.48	5456
State Controls			
State Unemployment Rate	5.29	1.05	5456
State Minimum Wage	6.33	0.82	5456
State EITC Rate	0.04	0.08	5456
Maximum TANF Benefit 2-Person	378.97	145.09	5456
Maximum TANF Benefit 3-Person	471.29	181.08	5456
Maximum TANF Benefit 4-Person	552.18	206.44	5456

Table 2.2: Descriptive Statistics - Transition to Adulthood Supplement

	Mean	SD	Observations
Welfare Exposure	0.17	0.29	6356
Raised By Low-Edu Single Mom	0.18	0.38	6356
Outcomes			
Some College	0.71	0.45	6278
College Degree	0.27	0.44	4397
Currently Married	0.11	0.31	6356
Single Parent	0.14	0.35	6354
Demographics			
White	0.70	0.46	6356
Black	0.20	0.40	6356
Male	0.50	0.50	6356
Age	21.6	2.73	6356
Number of Siblings	1.61	1.12	6356
Childhood Characteristics			
Birth Weight (ounces)	119.3	22.20	6356
Was Breastfed	0.54	0.50	6356
Mother Less Than HS Edu.	0.23	0.42	6356
Mother HS Degree	0.35	0.48	6356
Mother Some College Edu.	0.32	0.47	6356
Mother College Degree	0.06	0.25	6356
Mother Postgraduate	0.03	0.17	6356
Raised By Grandparents	0.03	0.17	6356
State Controls			
State Minimum Wage	7.88	0.78	6356
State Unemployment Rate	7.12	2.24	6356

Table 2.3: Childhood Human Capital

	Letter Word	Passage Comp.	Applied Problems	BPI
Welfare Treatment (β)	4.305***	3.040**	0.574	-0.068
	(1.122)	(1.390)	(1.250)	(0.673)
Welfare Exposure (γ)	-1.368	-2.233	-2.155	0.396
	(1.991)	(2.086)	(1.839)	(0.644)
At-Risk (δ)	-3.732***	-2.965***	-0.124	1.249***
	(0.695)	(0.863)	(0.818)	(0.305)
Outcome SD	18.14	16.48	16.47	6.31
Percent Change	23.74	18.44	3.49	-1.07
Treatment at Mean W_{isb}	1.280	0.904	0.171	-0.020
Perc. Change at Mean	7.06	5.48	1.04	-0.32
Obs.	4,884	4,267	4,865	5,503

Note: standard errors clustered at the state level, * p <0.10, ** p <0.05, *** p <0.01. Controls include child gender, child race, number of siblings, child age, mother's age, mother education, birth weight, if breastfed, if raised by grandparent, urban residency, state unemployment rate, state minimum wage, state EITC, maximum TANF benefit for 2,3,4 person families. State, interview year, and birth-year fixed effects included.

Table 2.4: Childhood Human Capital Family Fixed Effects

	Letter Word	Passage Comp.	Applied Problems	BPI
Welfare Treatment (β)	7.135*	3.281	1.952	-1.443
	(3.661)	(2.804)	(2.262)	(1.073)
Welfare Exposure (γ)	-6.188**	-1.160	-4.348	0.503
	(2.479)	(4.280)	(3.917)	(0.996)
Outcome SD	18.11	16.78	16.12	6.37
Percent Change	39.40	19.56	12.11	-22.64
Treatment at Mean W_{isb}	2.082	0.957	0.570	-0.421
Perc. Change at Mean	11.50	5.71	3.53	-6.60
Obs.	3,063	2,705	3,050	3,414
Sibling Pairs	786	777	786	813

Note: standard errors clustered at the state level, * p <0.10, ** p <0.05, *** p <0.01. Controls include child gender, child race, number of siblings, child age, mother's age, birth weight, if breastfed, urban residency, state unemployment rate, state minimum wage, state EITC, maximum TANF benefit for 2,3,4 person families. State, interview year, and birth-year fixed effects included.

Table 2.5: Adulthood Human Capital

	Attend College	College Degree	Married	Single Parent
Welfare Treatment (β)	0.022	0.146***	0.081***	-0.156**
	(0.074)	(0.036)	(0.021)	(0.062)
Welfare Exposure (γ)	-0.005	0.040	-0.071**	-0.039
	(0.064)	(0.042)	(0.035)	(0.039)
At-Risk (δ)	-0.082**	-0.039*	-0.051***	0.102***
	(0.036)	(0.023)	(0.016)	(0.025)
Sample Mean	0.71	0.27	0.11	0.14
Percent Change	3.07	54.76	73.39	-100.00
Treatment at Mean W_{isb}	0.004	0.024	0.014	-0.026
Perc. Change at Mean	0.51	9.12	12.22	-18.38
Obs.	6,278	4,397	6,356	6,354

Note: standard errors clustered at the state level, * p <0.10, ** p <0.05, *** p <0.01. Controls include gender, race, number of siblings, age, birth weight, if breastfed, mother's education, if raised by grandparent, state unemployment rate, state minimum wage. State, interview year, and birth-year fixed effects included.

Table 2.6: Adulthood Human Capital Family Fixed Effects

	Attend College	College Degree	Married	Single Parent
Welfare Treatment (β)	0.078	0.199**	0.044	-0.052
	(0.126)	(0.088)	(0.050)	(0.092)
Welfare Exposure (γ)	-0.085	-0.202**	-0.081	-0.051
	(0.095)	(0.083)	(0.056)	(0.109)
Sample Mean	0.73	0.28	0.10	0.14
Percent Change	10.72	70.36	43.04	-36.83
Treatment at Mean W_{isb}	0.014	0.035	0.008	-0.009
Perc. Change at Mean	1.87	12.25	7.49	-6.41
Obs.	3,878	2,689	3,921	3,919
Sibling Pairs	733	680	734	734

Note: standard errors clustered at the state level, * p <0.10, ** p <0.05, *** p <0.01. Controls include gender, race, age, birth weight, if breastfed, state unemployment rate, state minimum wage. State, interview year, and birth-year fixed effects included.

Table 2.7: Child Care Use

	Childcare Use	Informal Care	Formal Care
Welfare Treatment (β)	0.092	0.021	0.063**
	(0.061)	(0.053)	(0.025)
Welfare Exposure (γ)	-0.014	-0.021	0.006
	(0.026)	(0.028)	(0.018)
At-Risk (δ)	0.011	0.034**	-0.019*
	(0.016)	(0.013)	(0.011)
Outcome Mean	0.21	0.15	0.07
Percent Change	44.21	13.60	88.76
Treatment at Mean W_{isb}	0.027	0.006	0.019
Perc. Change at Mean	13.15	4.04	26.39
Obs.	6,209	6,209	6,209

Note: standard errors clustered at the state level, * p <0.10, ** p <0.05, *** p <0.01. Controls include child gender, child race, number of siblings, child age, mother's age, mother education, birth weight, if breastfed, if raised by grandparent, urban residency, state unemployment rate, state minimum wage, state EITC, maximum TANF benefit for 2,3,4 person families. State, interview year, and birth-year fixed effects included.

Table 2.8: Childhood Human Capital - Boys

	Letter Word	Passage Comp.	Applied Problems	BPI
Welfare Treatment (β)	0.920	1.007	-1.265	1.079
	(1.989)	(2.207)	(2.072)	(1.014)
Welfare Exposure (γ)	0.775	-0.439	-3.725*	-0.459
	(2.200)	(2.930)	(2.040)	(0.892)
At-Risk (δ)	-1.516	-1.551	0.921	1.086**
	(1.208)	(1.236)	(1.148)	(0.500)
Outcome SD	18.76	17.01	17.40	6.41
Percent Change	4.90	5.92	-7.27	16.83
Treatment at Mean W_{isb}	0.271	0.296	-0.372	0.317
Perc. Change at Mean	1.44	1.74	-2.14	4.95
Obs.	2,459	2,126	2,453	2,788

Note: standard errors clustered at the state level, * p <0.10, ** p <0.05, *** p <0.01. Controls include child race, number of siblings, child age, mother's age, mother education, birth weight, if breastfed, if raised by grandparent, urban residency, state unemployment rate, state minimum wage, state EITC, maximum TANF benefit for 2,3,4 person families. State, interview year, and birth-year fixed effects included.

Table 2.9: Adulthood Human Capital - Men

	Attend College	College Degree	Married	Single Parent
Welfare Treatment (β)	-0.089	0.051	0.073**	-0.066
	(0.104)	(0.064)	(0.029)	(0.065)
Welfare Exposure (γ)	0.025	0.046	-0.042	-0.021
	(0.098)	(0.063)	(0.037)	(0.057)
At-Risk (δ)	-0.042	-0.005	-0.025	0.067**
	(0.048)	(0.032)	(0.016)	(0.029)
Sample Mean	0.67	0.23	0.09	0.10
Percent Change	-13.41	22.13	84.47	-69.24
Treatment at Mean W_{isb}	-0.015	0.008	0.012	-0.011
Perc. Change at Mean	-2.19	3.62	13.80	-11.31
Obs.	2,961	2,055	2,998	2,996

Note: standard errors clustered at the state level, * p <0.10, ** p <0.05, *** p <0.01. Controls include race, number of siblings, age, birth weight, if breastfed, mother's education, if raised by grandparent, state unemployment rate, state minimum wage. State, interview year, and birth-year fixed effects included.

Table 2.10: Childhood Human Capital - Girls

	Letter Word	Passage Comp.	Applied Problems	BPI
Welfare Treatment (β)	8.280***	5.546***	2.523	-1.383
	(1.733)	(1.971)	(1.988)	(0.981)
Welfare Exposure (γ)	-2.159	-2.854	0.123	2.123**
	(2.958)	(2.775)	(2.580)	(0.884)
At-Risk (δ)	-6.404***	-4.892***	-1.569*	1.526***
	(1.070)	(1.021)	(0.914)	(0.474)
Outcome SD	17.38	15.90	15.39	6.19
Percent Change	47.64	34.89	16.39	-22.35
Treatment at Mean W_{isb}	2.489	1.667	0.759	-0.416
Perc. Change at Mean	14.32	10.49	4.93	-6.72
Obs.	2,425	2,141	2,412	2,715

Note: standard errors clustered at the state level, * p <0.10, ** p <0.05, *** p <0.01. Controls include child race, number of siblings, child age, mother's age, mother education, birth weight, if breastfed, if raised by grandparent, urban residency, state unemployment rate, state minimum wage, state EITC, maximum TANF benefit for 2,3,4 person families. State, interview year, and birth-year fixed effects included.

Table 2.11: Adulthood Human Capital - Women

	Attend College	College Degree	Married	Single Parent
Welfare Treatment (β)	0.126	0.230***	0.092**	-0.230***
	(0.099)	(0.056)	(0.034)	(0.085)
Welfare Exposure (γ)	-0.052	0.034	-0.099*	-0.072
	(0.083)	(0.076)	(0.051)	(0.054)
At-Risk (δ)	-0.110**	-0.067**	-0.067**	0.124***
	(0.048)	(0.029)	(0.026)	(0.040)
Sample Mean	0.75	0.30	0.14	0.19
Percent Change	16.77	76.13	67.61	-100.00
Treatment at Mean W_{isb}	0.022	0.041	0.016	-0.041
Perc. Change at Mean	2.97	13.48	11.97	-21.88
Obs.	3,317	2,342	3,358	3,358

Note: standard errors clustered at the state level, * p <0.10, ** p <0.05, *** p <0.01. Controls include race, number of siblings, age, birth weight, if breastfed, mother's education, if raised by grandparent, state unemployment rate, state minimum wage. State, interview year, and birth-year fixed effects included.

Table 2.12: Childhood Human Capital - Nonmovers

	Letter Word	Passage Comp.	Applied Problems	BPI
Welfare Treatment (β)	4.651***	3.349**	0.327	0.027
	(1.507)	(1.610)	(1.277)	(0.753)
Welfare Exposure (γ)	0.388	-0.017	-2.556	0.134
	(2.083)	(2.080)	(2.099)	(0.792)
At-Risk (δ)	-3.512***	-2.938***	0.100	1.436***
	(0.918)	(0.928)	(1.025)	(0.338)
Outcome SD	18.31	16.73	16.48	6.30
Percent Change	25.40	20.02	1.98	0.43
Treatment at Mean W_{isb}	1.409	1.014	0.099	0.008
Perc. Change at Mean	7.69	6.06	0.60	0.13
Obs.	4,125	3,652	4,110	4,539

Note: standard errors clustered at the state level, * p <0.10, ** p <0.05, *** p <0.01. Controls include child gender, child race, number of siblings, child age, mother's age, mother education, birth weight, if breastfed, if raised by grandparent, urban residency, state unemployment rate, state minimum wage, state EITC, maximum TANF benefit for 2,3,4 person families. State, interview year, and birth-year fixed effects included.

Table 2.13: Adulthood Human Capital - Nonmovers

	Attend College	College Degree	Married	Single Parent
Welfare Treatment (β)	-0.005	0.138***	0.073***	-0.152**
	(0.081)	(0.042)	(0.020)	(0.074)
Welfare Exposure (γ)	0.009	0.087	-0.068*	-0.054
	(0.075)	(0.053)	(0.038)	(0.042)
At-Risk (δ)	-0.081*	-0.032	-0.053***	0.106***
	(0.041)	(0.023)	(0.017)	(0.032)
Sample Mean	0.72	0.27	0.11	0.14
Percent Change	-0.76	50.44	66.57	-100.00
Treatment at Mean W_{isb}	-0.001	0.024	0.013	-0.026
Perc. Change at Mean	-0.13	8.78	11.59	-18.58
Obs.	5,278	3,682	5,344	5,342

Note: standard errors clustered at the state level, * p <0.10, ** p <0.05, *** p <0.01. Controls include gender, race, number of siblings, age, birth weight, if breastfed, mother's education, if raised by grandparent, state unemployment rate, state minimum wage. State, interview year, and birth-year fixed effects included.

Table 2.14: Childhood Human Capital - Time Trends

	Letter Word	Passage Comp.	Applied Problems	BPI
Welfare Treatment (β)	4.493***	3.152**	0.768	-0.016
	(1.170)	(1.418)	(1.285)	(0.676)
Welfare Exposure (γ)	-1.857	-2.158	-2.263	0.311
	(2.106)	(2.401)	(1.897)	(0.706)
At-Risk (δ)	-3.754***	-2.931***	-0.140	1.204***
	(0.694)	(0.869)	(0.833)	(0.304)
Outcome SD	18.14	16.48	16.47	6.31
Percent Change	24.77	19.12	4.66	-0.26
Treatment at Mean W_{isb}	1.336	0.937	0.228	-0.005
Perc. Change at Mean	7.37	5.68	1.39	-0.08
Obs.	4,884	4,267	4,865	5,503

Note: standard errors clustered at the state level, * p <0.10, ** p <0.05, *** p <0.01. Controls include child gender, child race, number of siblings, child age, mother's age, mother education, birth weight, if breastfed, if raised by grandparent, urban residency, state unemployment rate, state minimum wage, state EITC, maximum TANF benefit for 2,3,4 person families. State, interview year, and birth-year fixed effects included.

Table 2.15: Adulthood Human Capital - Time Trends

	Attend College	College Degree	Married	Single Parent
Welfare Treatment (β)	0.015	0.141***	0.084***	-0.157**
	(0.076)	(0.042)	(0.020)	(0.063)
Welfare Exposure (γ)	-0.008	0.016	-0.083**	-0.033
	(0.060)	(0.056)	(0.039)	(0.040)
At-Risk (δ)	-0.084**	-0.038	-0.050***	0.101***
	(0.036)	(0.024)	(0.016)	(0.025)
Sample Mean	0.71	0.27	0.11	0.14
Percent Change	2.08	53.15	76.05	-100.00
Treatment at Mean W_{isb}	0.003	0.024	0.015	-0.027
Perc. Change at Mean	0.36	9.16	13.10	-19.18
Obs.	6,278	4,397	6,356	6,354

Note: standard errors clustered at the state level, * p <0.10, ** p <0.05, *** p <0.01. Controls include gender, race, number of siblings, age, birth weight, if breastfed, mother's education, if raised by grandparent, state unemployment rate, state minimum wage. State, interview year, and birth-year fixed effects included.

Chapter 3: Welfare Reform and Children's Health

3.1 Introduction

Childhood well-being is a multifaceted measure of interrelated individual, family, and community level factors. These factors are important not only for the immediate happiness and livelihood of a child, but also because of the long-reaching impacts childhood circumstance can have on outcomes throughout the course of the child's life. Childhood test scores, family socioeconomic standing, and even neighborhood quality have been found to predict later life outcomes. Of particular importance among these early factors is childhood health. Health at all stages of a child's life, from in-utero to infant to adolescent, has been shown to have a meaningful impact later on; not just for future health but also education and labor market outcomes as well.

As such, government programs that target the health of children either explicitly such as Medicaid, the Children's Health Insurance Program (CHIP), and the Supplemental Nutrition Assistance Program (SNAP) or more implicitly such as the Earned Income Tax Credit (EITC) are of particular importance due to their long reaching influence on well-being. One program that explicitly targets children and has been understudied with respect to childhood health is the Temporary Assistance to Needy Families (TANF) program that replaced the Aid to Families with Dependent Children (AFDC) program in the mid 1990's, a period commonly referred to as welfare reform.

Like its predecessor, TANF provides in-kind and financial assistance to low income families with children, typically a single mother household. However, under TANF, individuals now face work requirements, time limits on assistance, stringent sanctions for noncompliance, and family caps for benefits among other conditions. Policy makers sought to decrease welfare dependency by moving recipients towards

employment by changing the incentives AFDC recipients faced. This process was started in the early 1990's as states were given waivers to change their AFDC programs and culminated with the passage of the Personal Responsibility and Work Opportunity Reconciliation Act (PRWORA) in 1996. PRWORA codified many of the state changes into the federal law that created the TANF program.

Welfare reform can affect the health of children primarily through the new work requirements that the mothers faced. As the mothers are moved to work, there may be a decline in Medicaid coverage for the family, even if the children remain eligible. However, this loss of public coverage could be offset by gains in private coverage through their employer (Ham et al., 2009). Additionally, the family's economic resources could change as a result of employment. While earnings would increase after the program changes, this could be offset by a loss of transfer income. Much of the literature finds the total impact of welfare reform on income to be heterogeneous (Bitler et al., 2006b; Bollinger et al., 2009).

The relationship between welfare reform and the health of children is a relatively understudied area, due in part to the lack of datasets that ask child focused health questions. The literature so far has found adverse effects of welfare reform during in-utero or infant stages with lower rates of prenatal care (Kaestner and Lee, 2005) and lower rates of breastfeeding (Haider et al., 2003). Beyond these early stages of childhood there is some evidence of lower rates of health insurance coverage among children (Cawley et al., 2006) and lower rated health for the children of non-citizens (Kalil and Ziol-Guest, 2009). The health of mothers is a more explored area and has generally found a net decrease in health insurance coverage but no change to health status (Kaestner and Kaushal, 2003; Bitler et al., 2005; Cawley et al., 2006; Kaestner and Tarlov, 2006).

To provide further insight into this relationship, I use the Panel Study of Income Dynamics (PSID) Child Development Supplement (CDS) to estimate the impact of welfare reform on the insurance coverage, healthcare utilization, and health status of affected children. The CDS is a special supplement of the PSID that was started in 1997 and interviewed children aged between 0-12 and their primary care giver. Children are interviewed every five years or until they turn eighteen. The CDS collects extensive information on the well-being of children that can be combined with the core family and individual files to create a comprehensive view of the health of the child.

This paper is the first the study the relationship between welfare reform and healthcare utilization of children. It also makes important contributions to the literature on welfare reform and health insurance coverage of children by providing estimates on overall and composition of coverage. This paper is also the first to examine the effect of welfare reform on objective and subjective health conditions for a representative sample of children. I exploit the variation in the timing of welfare reform by state and the likelihood of TANF participation to estimate a triple difference model. Given the literature on health discrepancies among minorities, I also provide results by children's race. I find consistent evidence that welfare reform reduced the likelihood that a child had an annual checkup by 3-5%. This decline in utilization does not seem to be driven by changes in the insurance coverage of the child. However, the rate of diagnosed cases of asthma also falls by 17% and treated children have 3 more healthy, full function days a year. The results for the whole sample mask important differences by race, with white children reporting drops in their healthcare utilization and black children reporting drops in diagnosed cases of asthma.

3.2 Background

3.2.1 The Importance of Childhood Health

Childhood is a particularly important aspect of childhood well-being because of its immediate importance and its lasting impact on a variety of outcomes beyond future health status. The lasting impacts of health start at the earliest stages of childhood. In their review of the literature, Almond and Currie (2011) highlight that in-utero and infant health, such as born with a low birth weight (born weighing less than 2500 grams), are strong predictors of future well-being. Individuals born with low birth weight were more likely to have less schooling, lower earnings, and in some cases more chronic conditions in their adult life. Infant health investments such as breastfeeding also impact a child's well-being by reducing the likelihood of respiratory tract infections, asthma, obesity, and diabetes as a child and an adult (American Academy of Pediatrics, 2012).

While much has been written on the causes and consequences of in-utero and infant health, health status during childhood has received relatively less attention in the literature. However, the existing research shows that these conditions still have meaningful impact on future life outcomes. This relationship holds even after controlling for a variety of confounding factors such as income and education as shown by Case et al. (2005). Looking at a cohort of British adults born in 1958, Case et al. analyze the impact of having chronic health conditions as a child on outcomes from ages 16-42.[1] The authors find that having poor health as a young child leads to less educational attainment at 16; worse self-reported health at ages 23, 33, & 42; and that men are less likely to be employed at ages 33 and 42.

[1]For their study, Case et al. include physical impairments, mental and emotional conditions, and other 'systems' conditions as chronic conditions.

A similar result is shown by Currie et al. (2010). Currie et al. study 50,000 children born in Manitoba, Canada between 1979 and 1987, and compare the children to their siblings. Focusing on the health status of the children from age 3 and under, the authors find that having major health conditions is an important indicator of young adult physical health, similar to Case et al. However, Currie et al. also find that early mental health problems such as diagnosed ADHD or conduct behaviors lead to higher rates of being on social assistance and lower literacy scores as a young adult. Looking at data from the United States, Smith (2009) uses a sample of siblings from the PSID to study the effect of self reported health at 16 on adult socioeconomic outcomes. He finds that being in excellent or very good health at age 16 is associated with higher household income and wealth, though he does not find a robust effect of health on education.

Given the illustrated importance of childhood health, government programs that either explicitly or implicitly target childhood health are of particular policy interest. There have been a number of recent studies that have looked at the short and long-run impact of programs such as Medicaid, SNAP, and the EITC. Hoynes et al. (2015) use the variation from federal reforms to the EITC to examine the effect of after-tax income on incidences of low birth weight. Using the Vital Statics Natality Data and the Current Population Survey, the authors find that a $1,000 increase in EITC receipt leads to a 3 percent decline in a newborn child having a low birth weight. They attribute the gain to more prenatal care and fewer negative health behaviors such as smoking among mothers. A similar result is found by Strully et al. (2010) who examine changes in state EITC programs.

Brown et al. (2017) study expansions to Medicaid and the State Children's Health Insurance Program in the 1980's and 90's and find that children affected by the expansions paid more in taxes and collected less in EITC by the age of 28. This suggests that the increased medical coverage among vulnerable children from Medicaid im-

proved child health and raised their productivity as adults. Hoynes et al. (2016) examine the county-by-county rollout of the food stamp program in the 1960's to test if having access to food stamps as a young child improves adult outcomes. The authors find that when these children are adults they have better reported health and an increase in the economic self-sufficiency of women. One mechanism for the improvements in adult outcomes is better nutrition in early childhood and in-utero.

3.2.2 Welfare Reform and Its Implications for Health

Another program that targets the well-being of children is the TANF program. TANF was implemented in 1996 with the passage of PRWORA, and replaced the AFDC welfare program. AFDC was a federal entitlement program that provided financial assistance to low income families with children, typically a low-educated single mother household. In the years prior to PRWORA, welfare caseloads had swelled under AFDC and starting in 1992 states started seeking and receiving waivers to experiment with their state welfare program to deal with the rising caseloads.[2] PRWORA codified many of these changes into federal law. PRWORA sought to decrease welfare dependency by moving recipients towards employment by changing the incentives AFDC recipients faced. Under TANF, there was a transition to more in-kind versus cash benefits. Additionally, individuals now face work requirements, time limits on assistance, and family caps for benefits among other conditions.

The year that a state first implemented some type of welfare reform, either a welfare waiver or TANF, is shown in Figure 3.1. Implementation dates are taken from Crouse (1999). Thirty states implemented a major welfare waiver before TANF. Nineteen of those thirty implemented a waiver in the years before TANF was passed,

[2]Politically, rising caseloads appeared to be the motivator for welfare reform, with Bill Clinton campaigning in 1992 to "end welfare as we know it." However, Ziliak et al. (2000) show that states with high caseloads were not more likely to request federal waivers.

1992-1995, with the remaining states implementing either a waiver or TANF in either 1996 or 1997. Though not shown on the map, Hawaii and Alaska implemented welfare reform in 1997 as well. The last state to implement any kind of reform was New York in November, 1997. Figure 3.1 also shows the geographic variation in implementation dates with no region of states all implementing reform at the same time.

While much has been written on welfare reform over the twenty years that have passed since TANF became law, we still know little about the effects of welfare reform on child health.[3] There are two main channels for welfare reform to affect childhood health and both stem from the work requirements mothers faced under TANF. First, as mothers were moved to work their insurance coverage may change as they lose public coverage but possibly gain private. Second, as mothers enter the labor force, income may change as earnings rise but government benefits fall.

As welfare reform moved mothers to work, they could lose their insurance coverage. Health insurance is an important component of the health production function. Prior to welfare reform, families receiving AFDC were automatically eligible for health insurance through Medicaid. PRWORA eliminated this automatic eligibility, though families who met the 1996 AFDC eligibility standard remained eligible in an effort to end "welfare-lock." This severing raised administrative barriers for those who remained eligible even after gaining employment. As mothers are moved to work, they may gain private insurance coverage to the extent that former or current welfare recipients are able to find jobs offering health insurance benefits. The literature shows a net decrease in health insurance coverage for mothers, suggesting that the administrative barriers were too great or mothers were unable to find employment that offered health benefits.

[3]See Blank (2002) & Ziliak (2016b) for excellent reviews on the broader welfare reform literature.

This result is shown across multiple data sources. Bitler et al. (2005) use the Behaviorial Risk Factor Surveillance System (BRFSS) from 1990-2000, Kaestner and Kaushal (2003) use the Current Population Survey (CPS) from 1993-2000, and Cawley et al. (2006) use the Survey of Income and Program Participation (SIPP) from 1992-1999. All three papers employ a difference-in-difference approach and find that the gains in private insurance do not offset the loss of public coverage. DeLeire et al. (2006) also use the CPS from 1989-2001 and find that welfare reform is associated with an increase in private insurance coverage, though they find no substantial decline in public coverage rates. Following these studies is work by Ham et al. (2009) who also use the SIPP but from 1990-2001 to test the validity of the difference-in-difference approaches used by the previous authors. Their work rejects the parallel trend assumption, meaning married mothers and single women without children are not valid comparison groups for single women with children. Despite this, after they run individual regressions for each group they find a very similar result that Medicaid coverage fell more than the gain in private insurance and that this effect is concentrated among minority women.

Despite this consistent finding of lower net coverage for mothers, it is possible that children were sheltered from the change. In 1997, Congress created the Children's Health Insurance Program (CHIP) which provided incentives and funding to states to expand healthcare coverage and usage among low-income children. However, the same administrative barriers apply here as well. As Currie (2004) notes, take up is enhanced by automatic or default enrollment. Evidence so far suggests that children also saw a net decrease in insurance coverage. In the same study, Cawley et al. (2006) find that post-welfare reform eligible children were 3% less likely to have insurance though this is a smaller decline than the 8% the authors find for mothers. The economics literature on insurance and health care utilization from random experiments shows that health care utilization rises with insurance and health outcomes

potentially improve (Manning et al., 1987; Finkelstein et al., 2012; Aron-Dine et al., 2013). Recent work shows that childhood health insurance coverage also mediates the intergenerational transmission of health status (Halliday et al., 2019).

Second, welfare reform could positively or negatively affect the economic resources available to the family. The economics literature has demonstrated a positive relationship between income and health (Smith, 1999; Case et al., 2002, 2008). After welfare reform, the hope was that the rule changes made work "pay" in that the gains in earnings would more than offset the losses in transfer income. evidence on this point is somewhat mixed. Early work by Schoeni and Blank (2000) and Grogger (2003) find modest, positive effects of welfare reform on earnings, income, and poverty rates. However, the proceeding work tried to account for the heterogeneity in welfare reform and found varying effects. Work by Bitler et al. (2006b) and Bollinger et al. (2009) shows that PRWORA lowered the income of less skilled mothers in the bottom half of the income distribution and raised income among more skilled mothers.

Though welfare reform has clear mechanisms to affect health status, the literature to date has largely found no effect of welfare reform on health outcomes. Using the BRFSS, both Bitler et al. (2005) and Kaestner and Tarlov (2006) find no change in the self reported health status of mothers under TANF. This is despite the net decrease in insurance coverage both papers find, though Bitler and coauthors do find a decrease in some measures of healthcare utilization for mothers. Focusing on children's health, other work on welfare reform and has also looked at changes in health inputs such as healthcare utilization. Kaestner and Lee (2005) use the National Natality Files from 1992-2000 and show that post welfare reform mothers utilized less prenatal care. The effect is stronger for mothers who participate in WIC. Using a propriety survey, Haider et al. (2003) found that under TANF, there are fewer mothers who report breastfeeding their new children. Our only evidence for changes in children's health

outcomes comes from Kalil and Ziol-Guest (2009) who use the 1993, 1996, and 2001 panels of the SIPP and find that children of low income non-citizens had lower parent rated health than children of low income citizens after PRWORA.

This paper seeks to provide clarity and new insight to the existing literature. Work so far in this area has been limited to either in-utero or infant health production inputs or subjective health measures for particular demographic groups. This study comprehensively examines multiple facets of childhood health from their insurance coverage, to their utilization of health services, and objective and subjective measures of health status.

3.3 Methodology

3.3.1 Empirical Model

The empirical task of this study is to compare children affected by welfare reform to similar children who were not. Here I exploit the differential rollout of state welfare waivers and TANF implementation between the years of 1992 to 1997 to estimate a triple difference model. I compare the outcomes of children who were exposed to welfare reform to those who were not, taking likelihood of welfare participation into account. The model takes the form:

$$Y_{istb} = \gamma W_{isb} + \delta T_i + \beta(W_{isb} * T_i) + \Gamma X_{istb} + \eta_t + \eta_s + \eta_b + u_{istb}, \tag{3.1}$$

where i denotes the individual, t the interview year, s the state of residence, and b the birth year. Y_{istb} is the outcome of interest, W_{isb} indicates exposure to welfare reform, T_i takes a value of one if the child is from a low-educated single mother household, X_{istb} is a vector of demographic and state level controls, η_t, η_s, and η_b are interview year, state, and birth year fixed effects, respectively. Lastly, u_{istb} is the error term that is assumed to be uncorrelated with the covariates. All reported standard errors

are clustered at the state level. As is common in the literature, low-educated refers to having twelve years of education or less. Here, mother means biological, step, adoptive mother, or grandmother. Children in the comparison group come from single mother households where the mother has some college education and two parent households where neither parent has a college degree. Any children from households with a college-educated parent are omitted from the analysis.

For the main independent variable, W_{isb}, I follow the approach of Hoynes et al. (2016) and measure how much of the individual's life before the age of five they were exposed to welfare reform. The variable is the share of months between conception and the age of five that either welfare waivers or TANF were in place in their state. Given the evidence from Kaestner and Lee (2005) that welfare reform affects a mother's prenatal decision it is important to account for welfare reform exposure that occurs in-utero. The variable takes a value of 0 if the child turned five before any welfare reform was implemented in their state and a value of 1 if they were conceived after welfare reform.[4] Any in-between value will be some fraction expressed as $x/69$ where x is the number of months they were exposed. Major welfare waiver and TANF implementation dates are taken from Crouse (1999).

This method is different from natural experiments that are episodic, in that they "turn on" and then later "turn off." Here, once a state reforms its AFDC program either through welfare waivers or by implementing TANF, it keeps the reform and does not revert or "turn off." This restricts the comparisons that can be made because there will never a child that was exposed in early childhood, but not later childhood. As such, comparisons are about additional welfare reform exposure earlier in childhood, conditional on having it later in childhood as well.

[4]I assume a 9 month gestation period between birth and conception

Interpreting the coefficients from equation (3.1), γ is the own effect of full welfare reform exposure and δ is the own effect of growing up in a disadvantaged low-educated, single mother household that is at risk of being affected by welfare reform. The parameter of interest is then β and represents the impact of full welfare reform exposure, being exposed from conception to age 5, for someone who's likely to be affected by welfare reform. This means that β is an intent-to-treat estimate. Because going from zero months of exposure to sixty-nine months of exposure can be seen as a drastic change, I also present treatment estimates at the mean level of exposure. Looking at the mean level of exposure gives me an average intent-to-treat effect (AITT). This assumes that all children of single low-educated mothers were affected by welfare reform. Note that γ then represents the impact of welfare reform exposure on someone who is not at-risk to take up AFDC/TANF. As such I expect the coefficient to be zero. Identification of β is given by variation in states' passage of welfare waivers and TANF, the birth year of the children, and their family status. The model assumes there is no difference in health trends between children of low-educated single mothers and the comparison group before the implementation of welfare reform.

In the model, the outcomes include a wide variety of health measures. I examine the child's insurance coverage as well as the composition of coverage to see if children affected by welfare reform switch from types of coverage. Healthcare utilization is also examined as a measure of a health investment. I examine varying degrees of utilization from annual checkups for the children to more severe cases of visits for injury. Lastly, given their importance for later life outcomes, I test if the children have any change in the incidence of chronic health conditions as well as subjective measures of health status.

To try to control for unobserved family characteristics such as genetics that may affect a child's health status, in section 3.4.3 I present results from a model with family fixed effects, meaning u_{istb} is correlated with the $X's$. Here the sample only

includes individuals that have a sibling in the data as well. That empirical model can be written as

$$\tilde{Y}_{istb} = \gamma \tilde{W}_{isb} + \beta(\widetilde{W_{isb} * T_i}) + \Gamma \tilde{X}_{istb} + \eta_t + \eta_s + \eta_b + u_{istb}, \tag{3.2}$$

where $\tilde{}$ indicates the family-time-demeaned variable. This model compares individuals who were exposed to welfare reform to their siblings that were not exposed while sweeping out time-invariant family characteristics. In this model, identification comes from pairs of siblings with different amounts of welfare exposure due to being born at different times.

3.3.2 Data

Data for this project comes from the Panel Study of Income Dynamics (PSID) and its supplement the Child Development Supplement (CDS). The PSID is longest running longitudinal survey, starting with 4,802 households in 1968 and still follows all members and descendants to this day. In 1997, the PSID supplemented its main data collection with additional information on 3,563 0-12 year-old children and their parents for the CDS. The children were drawn at random from participating core families with the condition that there cannot be more than 2 children from any household. The children were followed up twice after the 1997 survey, once in 2002 and again in 2007. Children stayed in the CDS until they turned eighteen. Information about the children was collected from their Primary Care Giver (PCG), typically the child's mother. I assign family status and state of residency to the child using information from the 1997 wave for computing their welfare exposure and treatment.

The CDS was started to help facilitate research on "the consequences of family events and circumstances such as family structure and income during the years children are living with their parents for children's educational and economic successes as

young adults" (Hofferth et al., 1997). Previous data collection on children in the PSID had been limited to simple demographic information such as age, sex, and education. The CDS added extensive assessments of the cognitive, emotional, and health status of the surveyed children. The supplement thoroughly explores child health following birth with questions covering healthcare utilization, doctor diagnosed chronic conditions, and subjective measures of health. Information on health insurance coverage can be found in the CDS in addition to the core PSID individual file.

Given the extensive data collection, I have a wide-array of health outcomes to examine. For healthcare utilization, I use a number of measures that capture varying degrees of severity to allow me to test how responsive the family is to the changes from welfare reform. These outcomes range from if the child had their recommended annual to checkup to if they've visited the doctor for illness or injury. I also narrow down the measures of health status to two measures of chronic conditions and two subjective measures of health. Given the importance of physical chronic conditions and mental chronic conditions in the literature, (Case et al., 2005; Currie et al., 2010), I examine the impact of welfare reform on doctor diagnosed cases of asthma and hyperactivity/ADHD.

Subjective measures of health can also measure child wellbeing and are often used in the literature. My first measure of subjective health is if the PCG reports that the child has any limits on usual childhood activities such as participating in games or sports, attending school regularly, or doing regular school work. The second is a composite measure developed by Erickson et al. (1995) and used by Johnson and Schoeni (2011) and Halliday et al. (2019) that incorporates the PCG rated health of the child and the severity of any limitations the child may have on activities.

The composite measure converts rated health and activity limitations to a continuous measure of health that is akin to healthy life years. Each PCG can rate their child as being in "excellent, very good, good, fair, or poor" health. Additionally, each

child can have either no limit on activities, limited in a minor activity, or limited in their major activity. For children under 5, their major activity is play and for children 5 and older their major activity is attending school. These 15 discrete health states are then assigned a numerical value that are shown in Table 3.1. For example, a child that is in very good health with a limit on a minor activity has a health quality measure of 0.79 suggesting they are at 79 percent of full function for the year.

Survey weighted descriptive statistics for the child health outcomes and relevant controls can be found in Table 4.1. The average level of welfare reform exposure for the sample is 0.33 which translates to an average length of welfare reform exposure of approximately twenty-three months or almost two years. In the sample, there are 2,418 observations of children with no welfare reform exposure and 3,076 with a nonzero amount of exposure. For these children with welfare reform exposure, the average amount is 0.55 which is thirty-eight months of exposure. Twenty-one percent of the sample is from an at-risk household which is a household headed by a low-educated single mother.

For the insurance outcomes, nearly 90 percent of the children have some form on insurance, with 60 percent having some kind of private insurance and 33 percent having some form of public insurance. The health insurance questions are a two year retrospective which leads to some PCG reporting that their child has multiple forms of insurance over the time period. This results in the totals exceeding the amount that have at least one kind of insurance. The 89 percent coverage rate is roughly in line with the U.S. Census reported rates for all children under 18 during the time period (Bennefield, 1998; Mills and Bhandari, 2003; DeNavas-Walt et al., 2008).

I examine a variety of healthcare utilization measures to test for the impact of welfare reform on this particular health input. These measures range in severity/necessity and include having an annual checkup and visiting the doctor in the past year for illness or injury. The sample means reflect the severity of these visits. Annual check-

ups and visits for illness are the most common at 77 and 62 percent, respectively. Visits for injury are more rare with 19 percent of the observations recording a visit for injury in the past year. For health status, having a chronic condition as a child is uncommon with 13 percent reporting having a diagnosed case of asthma and 7 percent a case of hyperactivity/ADHD. PCGs are also unlikely to report their child to have a limiting condition and the average child has full function 93 percent of the year, which is in line with Erickson et al. (1995) estimates who used the National Health Interview Survey.

I control for child and household demographics by including family composition and information about the child's mother. To try to control for genetics and common environment outside of the family fixed effect model, I also control for the mother's self rated health. Specifically this includes an indicator if the mother reports being in excellent health and an indicator if the mother reports being in poor health, the best and worst levels of self reported health. Ideally, I would control for the mother's past health and health behaviors as well, particularly during the prenatal period for each child, but that data is not consistently available. State controls are used to try to account for the local macroeconomy and the generosity of the state's welfare system. State EITC rates are reported as a percentage of the federal credit. Information on state controls comes from the University of Kentucky Center for Poverty Research (2016) Welfare Data with the exception of Medicaid expenditure per enrollee which comes from Centers for Medicare & Medicaid Services. The minimum wage, Medicaid expenditures, and maximum TANF benefit are measured in 2007 dollars.

3.4 Results

3.4.1 Baseline Results

I first present results for overall insurance status and healthcare utilization. If welfare reform is affecting the inputs of the health production function, I may then expect to see changes in the health status of at-risk children with welfare reform exposure. These results are shown in Table 3.3. In this table and the following tables, the coefficient for welfare treatment corresponds to β, the coefficient for welfare exposure corresponds to γ, and being from an at-risk household corresponds to δ from equations (3.1) & (3.2). For welfare treatment, the interpretation of the coefficient is the effect of an at-risk child going from no welfare reform exposure before the age of five to full welfare reform exposure before the age of 5.

Table 3.3 shows the effect of welfare reform on varying measures of healthcare utilization and total insurance coverage. At-risk children who were exposed to welfare reform in their early life are less likely to have used any of the measures of utilization in the past year. A fully treated child at-risk of being affected by welfare reform is 11 percent less likely to have had their annual checkup. While this effect may seem large, it is important to remember that full welfare reform exposure is a two standard deviation increase from the mean level of exposure. As such, it is more reasonable to interpret these effects at the mean level of treatment. At the mean level of treatment, these children are 3.6 percent less likely to have had their annual checkup. There is no statistically significant change to the likelihood of visiting the doctor for illness or injury though both of the coefficients are negative. Given that these types of visits are more necessary and potentially cover severe ailments, it is perhaps not surprising the see a lack of a significant result. The own effect of welfare reform on a child not

likely to be affected is not statistically different from zero, as expected. Interestingly, children from disadvantaged households are not any more or less likely to utilize healthcare or be insured compared to their more advantaged counterparts.

These decreases in utilization are intriguing despite the positive, though statistically insignificant, effect of welfare reform on insurance coverage. While there is no precisely measured change in net insurance coverage, it could be the case that the composition of coverage changed. It is perhaps the case that following welfare reform more children are covered by less generous private plans and then decrease their utilization. The results for the composition of insurance coverage in shown in Table 3.4.

Table 3.4 shows on net no change to the health insurance coverage of children affected by welfare reform. The first column shows the effects of welfare reform on total coverage as seen in Table 3.3, with the remaining columns showing private coverage and public coverage, respectively. The likelihood of having private insurance does increase, which is consistent with the results for mothers. The positive coefficient for public coverage, however, is also positive which is consistent with the Medicaid expansions. Though none of these effects are statistically significant at traditional levels. The results also show that children from disadvantaged, low-educated single mother households are much less likely to have private coverage and are much more likely to have public coverage. The own effect of welfare on a child not likely to be affected is not statistically different from zero, as expected.

In terms of health production inputs, the evidence so far suggests a slight decrease in utilization in the form of fewer checkups and no significant change to insurance coverage. I now turn to various measures of health output to examine the impact of welfare reform. These results are shown in Table 3.5. The results are suggestive of improvements to child health. Children treated by welfare reform are much less likely to be diagnosed with asthma and have a higher health quality measure. Fully

treated children are 54 percent less likely to have a doctor diagnosed case of asthma, while at the mean level of exposure, these children are nearly 18 percent less likely to have asthma. Similarly, treated children also have higher levels of health quality. The coefficient suggests a fully treated child would increase their healthy, full function days by 10.2 days year. A child with the mean level of exposure will have 3.3 more healthy, full function days a year.[5] The effect of welfare reform on hyperactivity/ADHD and having any limit on activities is negative, but it is not statistically significant at any traditional level.

Table 3.5 also shows the health discrepancies between children from at-risk families and children from more advantaged households. Children from disadvantaged families are much more likely to have a diagnosed case of hyperactivity/ADHD, have a limit on their activities, and have a lower measure of health quality. Troubling here are the significant coefficient for the own effect of welfare reform. However, as seen in section 3.4.3, the effects either attenuate or are eliminated altogether in the model with state-time fixed effects, suggesting there may be state-specific time trends driving the results.

Initially, the results presented here may seem unintuitive. Welfare reform is associated with a decrease in healthcare utilization but a general improvement in health status. The relationship between healthcare utilization and status may run in both directions. Increased doctor visits may improve health, but also parents of healthy children may not feel the need to regularly utilize healthcare services, particularly more preventative care such as an annual checkup. In the latter case, welfare reform induced improvements in health would then also be associated with a decline in utilization. To analyze the direction of this relationship, I use an ad hoc approach and regress contemporaneous health quality and annual checkup and vice-versa along

[5] $0.028 \times 365 = 10.2$ days. $0.009 \times 365 = 3.3$ days.

with models with a lagged independent variable. Where the lagged model can assess if healthcare today is associated with better future health or if health status today is associated with less future care. These results are shown in Table 3.6.

Columns (1) and (2) of Table 3.6 show the relationship between the child's health quality and having an annual checkup. Column (1) shows their contemporaneous relationship while column (2) uses the lag of health quality as the explanatory variable. Columns (3) and (4) reverse the relationship with column (4) showing the effect of lagged annual checkup on health quality. Columns (1) and (3) show a contemporaneous correlation between the two measures. Higher levels of health quality are negatively correlated with having an annual checkup. Columns (2) and (4) are suggestive of healthy children opting for less future healthcare rather than healthcare utilization influencing future health. Higher levels of health quality last period are associated with a significant reduction in the likelihood of future annual checkups while having an annual checkup is not associated with better future health. If welfare reform is inducing improved health status, then we should then expect utilization to fall as well.

The results here present an interesting parallel to the welfare reform research on the health status of mothers following PRWORA (Bitler et al., 2005; Kaestner and Tarlov, 2006). There is a similar decrease in utilization as measured by having annual checkups and some evidence of a shift to private coverage. However, the results suggest improvements to childhood health given the significant results for asthma and health quality and the negative coefficients for the other measures. As shown in the research of Case et al. (2005) and Currie et al. (2010), this reduction in a chronic health condition as a child could have important consequences for later life adult health. The results for the whole sample may also be masking important differences in the health status of children by race.

3.4.2 Results by Race

Given that the existing literature finds important differences in the effect of welfare reform by race, I also test if the children of welfare reform have different health outcomes by race. I re-estimate equation (3.1) for the subsamples of white non-Hispanic children and black non-Hispanic children. The results are shown in Tables 3.7, 3.8, and 3.9 where panel (a) shows the results for white children and panel (b) shows the results for black children. Table 3.7 shows the results for total insurance coverage and healthcare utilization. Interestingly, the welfare reform induced changes in health care utilization seem to be driven entirely by white children. White children treated by welfare reform are 6.5 percent less likely to have had their annual checkup at the mean level of welfare reform exposure.[6] The healthcare utilization of black children is unchanged after welfare reform with the coefficients being an order of magnitude smaller than for white children. Though the coefficients here are negative as well. Disadvantaged children from either group also do not have different levels of healthcare utilization compared to children from more advantaged households.

Again, I explore if differences in insurance composition could be driving the changes in healthcare utilization. These results are shown in Table 3.8. Similar to the whole sample, neither group is statistically more likely to have insurance coverage. Though when split into the two subsamples, the results show an almost equal and opposite effects on the likelihood of having private or public insurance for both groups. White children are 5.7 perrcentage points more likely to have private insurance and 6.4 percentage points less likely to have public insurance. Black children are 6.1 percentage points more likely to have private insurance coverage and 5.3 percentage points less likely to have public coverage. This decline in public insurance with

[6]It should be noted that black children have, on average, slightly less welfare reform exposure that white children. White children average twenty-three months of exposure while black children average eighteen months of exposure.

the gain in private coverage mirrors the research on the coverage of mothers, though the effects here are not statistically significant. As with the whole sample results, children from disadvantaged families are much less likely to have private insurance coverage and are more likely to have public insurance.

Table 3.9 shows the effect of welfare reform on health status. Although white children saw the largest changes to their healthcare utilization, they show improvements in health status in the form of higher rated health quality. The coefficient here suggesting an improvement of 15 days of full function for those with full exposure and 5 days for a mean level of exposure. Black children also see gains to their health quality and have a reduction in diagnosed cases of asthma and having a reported limit on activities. At the mean level of exposure, treated children have a 19 percent reduction in asthma and a 14 percent reduction in having a limit on their activities. Despite these sizable changes in chronic health and activity limits, the improvements to health quality are more modest than those found for white children. For black children, full welfare reform exposure there is an improvement of 7 days of full function and 2 days more for those with a mean level of exposure.

One possible concern from the results in Tables 3.3 & 3.5, is that there is a decrease in doctor diagnosed cases of asthma simply because children are visiting the doctor less often. However, as seen in panel (b) of Tables 3.7 & 3.9 the reduction in asthma is being driven almost entirely from black children who are also not any more or less likely to have visited the doctor for their annual checkup. Given that African Americans are much more likely to suffer from asthma (Barnes et al., 2007), this suggest there is a meaningful improvement in health instead of cases going underreported. One possible explanation for this drop in asthma rates may stem from the work requirements. As mothers were moved to work, they have less time to spend caring for their children and may opt for formal or informal care as a substitute. As Fuller et al. (2002) note, initially mothers tend to opt for informal child care but as

they move into more stable jobs they opt for formal child care centers. If either of these options provides a cleaner or more hygienic environment for the child that is perhaps smoke or mold free, asthma rates may fall.

3.4.3 Robustness Checks

To test for the sensitivity of my results to the inclusion of particular control variables, I re-estimate equation (3.1) adding in the control variables sequentially. Here I focus on the health quality outcome as it was significant across both the white and black samples of children. These results are seen in Table 3.10. Column (1) shows the results with no controls added, (2) with child/household demographic information included, (3) with mother information, and (4) with state controls. For identification, the state, year, and birth-cohort fixed effects are included in each specification. Table 3.10 shows that the effect of welfare treatment is very robust to the inclusion of varying controls. The effect of being from an at-risk household does attenuate as more controls are added, specifically information about the child's mother.

Next, to try to better control for the role genetics and other fixed family characteristics have on health, I re-estimate the outcomes from Tables 3.3 & 3.5 using a model that incorporates family fixed effects as shown in equation (3.2). Here the sample only includes individuals that have a sibling in the CDS as well. These results are presented in Tables 3.11 & 3.12. The results for healthcare utilization are largely unchanged. Welfare reform is associated with a decline in multiple measures of doctor visits, but is only statistically significant in the case of having an annual checkup. Here children with the mean level of exposure are 5 percent less likely to have had a checkup in the past year. For health status, the coefficients are generally larger in magnitude but of the same sign as in Table 3.5. Children with a mean level of exposure are 43 percent less likely to have asthma and are 61 percent less likely to have a limiting condition. The effect of welfare reform on health quality is also similar

to the whole sample results, though slightly larger. One possible explanation for the larger magnitudes comes from Currie and Almond (2011). If parents are reinforcing shocks induced by welfare reform as opposed to compensating for them, then the fixed effect estimate is a combination of reaction to the shock as well as the shock itself, causing the estimates to overstate the true effect of the shock.

I now turn my attention to the possibility of endogenous migration. To this point there have been no restrictions on the individuals staying in the same state all throughout childhood. If parents and their children migrated in response to welfare generosity, then the movement would be endogenous and bias the results of the model. To address this, I re-estimate equation (3.1), for utilization and health status outcomes, on individuals who never moved states during childhood. These results are shown in Tables 3.13 and 3.14. For healthcare utilization, the results are unchanged in sign and relative magnitude compared to the baseline estimates. Treated children with an average amount of welfare reform exposure are 3.3 percent less likely to have an annual checkup.

For health status, shown in Table 3.14, the results are also similar in magnitude to the baseline results in Table 3.5. In this specification, welfare reform does not have a statistically significant impact on asthma but the coefficients are near identical in magnitude, the effect is less precisely estimated with the smaller sample size. The effect of welfare reform on health quality is also unchanged, with children receiving full exposure having almost 11 more full function days and those with the mean level of exposure having 3 more healthy days.

Lastly, one might also be concerned about the effect of changing state policies over the same time period as the analysis, such as Medicaid expansion or SNAP liberalization, that won't be captured by state and survey year fixed effects. To control for any state specific time trends I re-estimate equation (3.1) and include state-year fixed effects. These results are shown in Tables 3.15 & 3.16. Here the

results are also unchanged from the baseline estimates, suggesting that the results are not driven by other changing state specific policies. Compared to the baseline results in Table 3.5, the added fixed effects attenuate the results for the own effect of welfare reform on children not likely to be affected by the rule changes. Here the coefficients for asthma and hyperactivity are not statistically different from zero, as expected.

3.5 Conclusion

Childhood well-being is a multifaceted measure of interrelated individual, family, and community level factors. These factors are important not only for the immediate happiness and livelihood of a child, but also because of the long-reaching impacts childhood circumstance can have on outcomes throughout the course of their life. Among the most important of these factors is childhood health. This paper presents new evidence on the effect of welfare reform on not only childhood health inputs but also objective and subjective measures of health status on a representative sample of children. Using data from a special supplement of the PSID, I find that at-risk children who were exposed to welfare reform are 3-5 percent less likely to have had their annual checkup, are 17 percent less likely to be diagnosed with asthma, have 3 more healthy, full function days a year. The results are robust to the inclusion of family fixed effects, the sample of nonmovers, and the inclusion of state specific time trends. However, the results for the whole sample mask important differences in health outcomes by race. The decline in healthcare utilization is concentrated among white children, while black children are much less likely to be diagnosed with asthma. Both groups, however, report higher quality health.

As noted in the literature, the full ramifications of shocks to childhood health may be latent and not realized until much later in life. As Case et al. (2005) note, the relationship between early childhood health and later life health grows stronger over

time. The results here suggest a potentially mixed impact of welfare reform on later life health. Checkups are an important clinical instrument for preventing future illness in children (Chung et al., 2006). If children from disadvantaged families are using less preventative care, then they could face greater health discrepancies as adults. However, given the impact of childhood chronic health conditions (Case et al., 2005; Currie et al., 2010), welfare reform could be associated with a reduction in health and socioeconomic discrepancies among African Americans. This uncertainty highlights the importance of future study. As the children of welfare reform age, this presents a promising and important avenue of research to contribute to the emerging literature on the long-run impacts of welfare reform as seen in Hartley et al. (2017) and Vaughn (2018).

Tables and Figures

Figure 3.1: Welfare Reform Implementation Year, By State

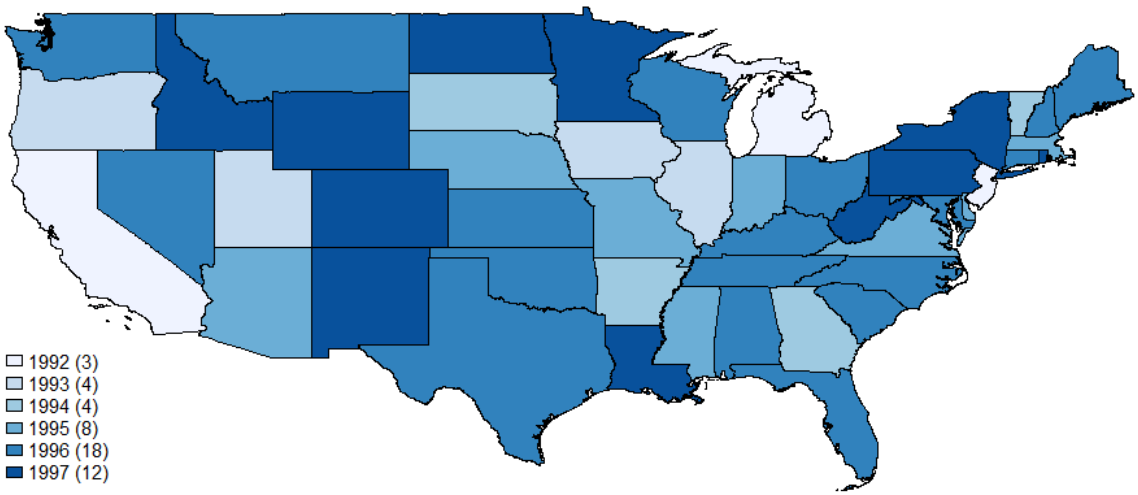

Table 3.1: Health Quality Measure

	PCG Rated Health				
Activity Limitation	Excellent	Very Good	Good	Fair	Poor
Not Limited	1	0.92	0.84	0.63	0.47
Limited - Minor	0.87	0.79	0.72	0.52	0.38
Limited - Major	0.81	0.74	0.67	0.48	0.34

Source: Erickson et al. (1995). For formulation see authors' Technical Notes section. For children under 5 major activity is play and for chidlren 5 and older the major activity is attending school. For children under 5 minor activity is attending school or doing school work and for children 5 and older the minor activity is play or doing school work.

Table 3.2: Descriptive Statistics - Child Development Supplement

	Mean	SD	Observations
Welfare Exposure	0.33	0.36	5224
Raised by Low Edu. Single Mother	0.21	0.41	5224
Health Insurance			
Insured	0.90	0.31	5224
Private Insurance	0.60	0.49	5224
Public Insurance	0.33	0.47	5224
Healthcare Utilization			
Had Annual Checkup	0.77	0.42	5224
Visited for Illness	0.62	0.48	5224
Visited for Injury	0.19	0.39	5224
Health Outcomes			
Asthma	0.13	0.34	5224
Hyperactive	0.07	0.26	5224
Limit on Activities	0.08	0.27	5224
Health Quality	0.93	0.10	5224
Demographics			
Child Age	10.6	4.7	5224
Male	0.50	0.50	5224
White	0.55	0.50	5224
Black	0.19	0.40	5224
Number of Siblings	1.45	1.17	5224
Mother Age	37.4	8.2	5224
Mother Less than HS Edu.	0.32	0.47	5224
Mother HS Degree	0.39	0.49	5224
Mother Some College Edu.	0.30	0.46	5224
Mother Excel. Self Health	0.20	0.40	5224
Mother Poor Self Health	0.03	0.16	5224
Raised By Grandparents	0.03	0.16	5224
Urban	0.61	0.49	5224
State Controls			
Unemployment rate	5.27	1.06	5224
State Minimum Wage	6.31	0.83	5224
State EITC Rate	0.03	0.08	5224
Medicaid Exp. per Enrollee	6428	2170	5224
Maximum TANF Benefit 2-Person	381	146	5224
Maximum TANF Benefit 3-Person	474	183	5224
Maximum TANF Benefit 4-Person	556	209	5224

Table 3.3: Childhood Health Insurance & Utilization

	Insured	Annual Checkup	Illness Visit	Injury Visit
Welfare Treatment (β)	0.044	-0.085**	-0.027	-0.037
	(0.030)	(0.033)	(0.052)	(0.031)
Welfare Exposure (γ)	-0.011	0.043	0.028	-0.000
	(0.024)	(0.032)	(0.053)	(0.041)
At-Risk (δ)	0.010	0.024	-0.027	0.027
	(0.019)	(0.023)	(0.029)	(0.023)
Outcome Mean	0.90	0.77	0.62	0.19
Percent Change	4.90	-10.96	-4.33	-19.72
Treatment at Mean W_{isb}	0.014	-0.028	-0.009	-0.012
Perc. Change at Mean	1.61	-3.59	-1.42	-6.47
Obs.	5,224	5,224	5,224	5,224

Note: standard errors clustered at the state level, * p <0.10, ** p <0.05, *** p <0.01. Controls include child gender, child race, number of siblings, child age, mother age, mother health, mother education, urban residency, state unemployment rate, state minimum wage, state EITC, state Medicaid expenditures per enrollee, maximum TANF benefit for 2,3,4 person families. State, interview year, and birth-year fixed effects included.

Table 3.4: Childhood Health Insurance Composition

	Insured	Private Insurance	Public Insurance
Welfare Treatment (β)	0.044	0.037	0.008
	(0.030)	(0.055)	(0.064)
Welfare Exposure (γ)	-0.011	0.015	-0.030
	(0.024)	(0.054)	(0.063)
At-Risk (δ)	0.010	-0.218***	0.237***
	(0.019)	(0.034)	(0.033)
Outcome Mean	0.90	0.60	0.33
Percent Change	4.90	6.21	2.35
Treatment at Mean W_{isb}	0.014	0.012	0.003
Perc. Change at Mean	1.61	2.04	0.77
Obs.	5,224	5,224	5,224

Note: standard errors clustered at the state level, * p <0.10, ** p <0.05, *** p <0.01. Controls include child gender, child race, number of siblings, child age, mother age, mother health, mother education, if raised by grandparent, urban residency, state unemployment rate, state minimum wage, state EITC, state Medicaid expenditures per enrollee, maximum TANF benefit for 2,3,4 person families. State, interview year, and birth-year fixed effects included.

Table 3.5: Childhood Health Status

	Asthma	Hyperactive	Activity Limit	Health Quality
Welfare Treatment (β)	-0.076*	-0.002	-0.040	0.028***
	(0.041)	(0.028)	(0.025)	(0.008)
Welfare Exposure (γ)	0.080*	-0.050*	-0.003	-0.022**
	(0.042)	(0.029)	(0.027)	(0.010)
At-Risk (δ)	0.001	0.024**	0.037***	-0.015***
	(0.021)	(0.010)	(0.013)	(0.005)
Outcome Mean	0.13	0.07	0.08	0.93
Percent Change	-56.63	-3.14	-50.39	3.07
Treatment at Mean W_{isb}	-0.025	-0.001	-0.013	0.009
Perc. Change at Mean	-18.57	-1.03	-16.53	1.01
Obs.	5,224	5,224	5,224	5,224

Note: standard errors clustered at the state level, * p <0.10, ** p <0.05, *** p <0.01. Controls include child gender, child race, number of siblings, child age, mother age, mother health, mother education, if raised by grandparent, urban residency, state unemployment rate, state minimum wage, state EITC, state Medicaid expenditures per enrollee, maximum TANF benefit for 2,3,4 person families. State, interview year, and birth-year fixed effects included.

Table 3.6: The Timing of Health Status and Utilization

	(1) Checkup	(2) Checkup	(3) Health Quality	(4) Health Quality
Health Quality	-0.221***	—	—	—
	(0.042)			
Health Quality Lag	—	-0.186***	—	—
		(0.057)		
Checkup	—	—	-0.014***	—
			(0.003)	
Checkup Lag	—	—	—	-0.005
				(0.006)
Obs.	5,224	2,803	5,224	2,779

Note: standard errors clustered at the state level, * p <0.10, ** p <0.05, *** p <0.01. Controls include child gender, child race, number of siblings, child age, mother age, mother health, mother education, urban residency, state unemployment rate, state minimum wage, state EITC, state Medicaid expenditures per enrollee, maximum TANF benefit for 2,3,4 person families. State, interview year, and birth-year fixed effects included.

Table 3.7: Childhood Health Insurance & Utilization - By Race

(a) White Children

	Insured	Annual Checkup	Illness Visit	Injury Visit
Welfare Treatment (β)	0.027	-0.159**	-0.166	-0.103
	(0.065)	(0.074)	(0.102)	(0.065)
Welfare Exposure (γ)	-0.038	0.059	0.030	-0.047
	(0.030)	(0.067)	(0.072)	(0.078)
At-Risk (δ)	-0.048	-0.008	0.054	0.040
	(0.040)	(0.046)	(0.052)	(0.045)
Outcome Mean	0.93	0.74	0.69	0.21
Percent Change	2.94	-21.41	-24.02	-48.51
Treatment at Mean W_{isb}	0.009	-0.052	-0.054	-0.034
Perc. Change at Mean	0.96	-7.00	-7.85	-15.85
Obs.	2,006	2,006	2,006	2,006

(b) Black Children

	Insured	Annual Checkup	Illness Visit	Injury Visit
Welfare Treatment (β)	0.000	-0.010	-0.021	-0.017
	(0.042)	(0.050)	(0.082)	(0.038)
Welfare Exposure (γ)	0.027	0.006	0.069	0.004
	(0.039)	(0.039)	(0.073)	(0.051)
At-Risk (δ)	0.018	0.001	-0.042	-0.002
	(0.024)	(0.030)	(0.031)	(0.020)
Outcome Mean	0.92	0.87	0.54	0.17
Percent Change	0.02	-1.16	-3.85	-9.52
Treatment at Mean W_{isb}	0.000	-0.003	-0.005	-0.004
Perc. Change at Mean	0.00	-0.30	-1.00	-2.48
Obs.	2,508	2,508	2,508	2,508

Note: standard errors clustered at the state level, * p <0.10, ** p <0.05, *** p <0.01. Controls include child gender, number of siblings, child age, mother age, mother health, mother education, urban residency, state unemployment rate, state minimum wage, state EITC, state Medicaid expenditures per enrollee, maximum TANF benefit for 2,3,4 person families. State, interview year, and birth-year fixed effects included.

Table 3.8: Childhood Health Insurance Composition - By Race

(a) White Children

	Insured	Private Insurance	Public Insurance
Welfare Treatment (β)	0.027	0.057	-0.064
	(0.065)	(0.120)	(0.079)
Welfare Exposure (γ)	-0.038	0.020	-0.061
	(0.030)	(0.071)	(0.061)
At-Risk (δ)	-0.048	-0.202***	0.194***
	(0.040)	(0.055)	(0.055)
Outcome Mean	0.93	0.77	0.19
Percent Change	2.94	7.46	-33.78
Treatment at Mean W_{isb}	0.009	0.019	-0.021
Perc. Change at Mean	0.96	2.44	-11.04
Obs.	2,006	2,006	2,006

(b) Black Children

	Insured	Private Insurance	Public Insurance
Welfare Treatment (β)	0.000	0.061	-0.053
	(0.042)	(0.073)	(0.093)
Welfare Exposure (γ)	0.027	0.136	-0.080
	(0.039)	(0.118)	(0.146)
At-Risk (δ)	0.018	-0.295***	0.314***
	(0.024)	(0.044)	(0.041)
Outcome Mean	0.92	0.44	0.52
Percent Change	0.02	13.64	-10.26
Treatment at Mean W_{isb}	0.000	0.016	-0.014
Perc. Change at Mean	0.00	3.55	-2.67
Obs.	2,508	2,508	2,508

Note: standard errors clustered at the state level, * p <0.10, ** p <0.05, *** p <0.01. Controls include child gender, number of siblings, child age, mother age, mother health, mother education, if raised by grandparent, urban residency, state unemployment rate, state minimum wage, state EITC, state Medicaid expenditures per enrollee, maximum TANF benefit for 2,3,4 person families. State, interview year, and birth-year fixed effects included.

Table 3.9: Childhood Health Status - By Race

(a) White Children

	Asthma	Hyperactive	Activity Limit	Health Quality
Welfare Treatment (β)	-0.051	-0.015	-0.011	0.043***
	(0.081)	(0.073)	(0.054)	(0.015)
Welfare Exposure (γ)	0.127*	-0.054	0.015	-0.009
	(0.070)	(0.045)	(0.043)	(0.016)
At-Risk (δ)	-0.023	0.030	-0.001	-0.011
	(0.037)	(0.030)	(0.027)	(0.009)
Outcome Mean	0.13	0.08	0.08	0.94
Percent Change	-38.10	-19.25	-13.40	4.58
Treatment at Mean W_{isb}	-0.017	-0.005	-0.003	0.014
Perc. Change at Mean	-12.45	-6.29	-4.38	1.50
Obs.	2,006	2,006	2,006	2,006

(b) Black Children

	Asthma	Hyperactive	Activity Limit	Health Quality
Welfare Treatment (β)	-0.117***	0.012	-0.042*	0.021**
	(0.038)	(0.033)	(0.023)	(0.010)
Welfare Exposure (γ)	0.074	-0.061*	-0.032	-0.021
	(0.064)	(0.036)	(0.049)	(0.020)
At-Risk (δ)	0.022	0.010	0.044**	-0.016**
	(0.037)	(0.020)	(0.019)	(0.007)
Outcome Mean	0.16	0.09	0.08	0.91
Percent Change	-74.56	13.27	-54.59	2.35
Treatment at Mean W_{isb}	-0.030	0.003	-0.011	0.006
Perc. Change at Mean	-19.39	3.45	-14.20	0.61
Obs.	2,508	2,508	2,508	2,508

Note: standard errors clustered at the state level, * p <0.10, ** p <0.05, *** p <0.01. Controls include child gender, number of siblings, child age, mother age, mother health, mother education, if raised by grandparent, urban residency, state unemployment rate, state minimum wage, state EITC, state Medicaid expenditures per enrollee, maximum TANF benefit for 2,3,4 person families. State, interview year, and birth-year fixed effects included.

Table 3.10: Childhood Health Quality

	(1)	(2)	(3)	(4)
Welfare Treatment (β)	0.027***	0.026***	0.028***	0.028***
	(0.009)	(0.009)	(0.008)	(0.008)
Welfare Exposure (γ)	-0.022**	-0.023**	-0.022**	-0.022**
	(0.011)	(0.011)	(0.010)	(0.010)
At-Risk (δ)	-0.024***	-0.021***	-0.015***	-0.015***
	(0.005)	(0.005)	(0.005)	(0.005)
Demographics	NO	YES	YES	YES
Mother Controls	NO	NO	YES	YES
State Controls	NO	NO	NO	YES
Obs.	5,224	5,224	5,224	5,224

Note: standard errors clustered at the state level, * p <0.10, ** p <0.05, *** p <0.01. Child/HH Controls: child age, child gender, child race, number of siblings, if raised by grandparent, and urban residency. Mother Controls: mother age, mother health, and mother education. State Controls: state unemployment rate, state minimum wage, state EITC, state Medicaid expenditures per enrollee, and maximum TANF benefit for 2,3,4 person families. State, interview year, and birth-year fixed effects included in each specification.

Table 3.11: Childhood Health Insurance & Utilization - Family Fixed Effects

	Insured	Annual Checkup	Illness Visit	Injury Visit
Welfare Treatment (β)	0.008	-0.121*	-0.082	-0.103
	(0.038)	(0.061)	(0.064)	(0.068)
Welfare Exposure (γ)	-0.051	0.039	0.006	-0.001
	(0.033)	(0.037)	(0.082)	(0.053)
Outcome Mean	0.90	0.76	0.61	0.19
Percent Change	0.92	-16.01	-13.43	-55.03
Treatment at Mean W_{isb}	0.003	-0.038	-0.026	-0.033
Perc. Change at Mean	0.29	-5.04	-4.22	-17.31
Obs.	3,149	3,149	3,149	3,149
Sibling Pairs	696	696	696	696

Note: standard errors clustered at the state level, * p <0.10, ** p <0.05, *** p <0.01. Controls include child gender, child race, number of siblings, child age, mother's age, urban residency, state unemployment rate, state minimum wage, state EITC, state Medicaid expenditures per enrollee, maximum TANF benefit for 2,3,4 person families. State, interview year, and birth-year fixed effects included.

Table 3.12: Childhood Health Status - Family Fixed Effects

	Asthma	Hyperactive	Activity Limit	Health Quality
Welfare Treatment (β)	-0.170*	0.052	-0.144***	0.046**
	(0.098)	(0.050)	(0.043)	(0.022)
Welfare Exposure (γ)	0.042	-0.035	0.076**	-0.027**
	(0.073)	(0.032)	(0.035)	(0.013)
Outcome Mean	0.12	0.07	0.07	0.93
Percent Change	-100.00	70.69	-100.00	4.95
Treatment at Mean W_{isb}	-0.053	0.016	-0.045	0.014
Perc. Change at Mean	-43.69	22.24	-61.25	1.56
Obs.	3,149	3,149	3,149	3,149
Sibling Pairs	696	696	696	696

Note: standard errors clustered at the state level, * p <0.10, ** p <0.05, *** p <0.01. Controls include child gender, child race, number of siblings, child age, mother's age, urban residency, state unemployment rate, state minimum wage, state EITC, state Medicaid expenditures per enrollee, maximum TANF benefit for 2,3,4 person families. State, interview year, and birth-year fixed effects included.

Table 3.13: Childhood Health Insurance & Utilization - Nonmovers

	Insured	Annual Checkup	Illness Visit	Injury Visit
Welfare Treatment (β)	0.039	-0.078**	-0.029	0.000
	(0.034)	(0.035)	(0.062)	(0.030)
Welfare Exposure (γ)	-0.033	0.045	0.038	-0.025
	(0.026)	(0.044)	(0.068)	(0.041)
At-Risk (δ)	0.014	0.008	-0.039	0.012
	(0.021)	(0.024)	(0.038)	(0.025)
Outcome Mean	0.89	0.77	0.63	0.19
Percent Change	4.35	-10.13	-4.58	0.01
Treatment at Mean W_{isb}	0.013	-0.026	-0.010	0.000
Perc. Change at Mean	1.45	-3.37	-1.53	0.00
Obs.	4,265	4,265	4,265	4,265

Note: standard errors clustered at the state level, * p <0.10, ** p <0.05, *** p <0.01. Controls include child gender, child race, number of siblings, child age, mother age, mother health, mother education, if raised by grandparent, urban residency, state unemployment rate, state minimum wage, state EITC, state Medicaid expenditures per enrollee, maximum TANF benefit for 2,3,4 person families. State, interview year, and birth-year fixed effects included.

Table 3.14: Childhood Health Status - Nonmovers

	Asthma	Hyperactive	Activity Limit	Health Quality
Welfare Treatment (β)	-0.072	-0.001	-0.023	0.030***
	(0.055)	(0.036)	(0.029)	(0.009)
Welfare Exposure (γ)	0.097**	-0.062*	-0.005	-0.021*
	(0.044)	(0.032)	(0.035)	(0.011)
At-Risk (δ)	-0.002	0.013	0.031**	-0.012**
	(0.025)	(0.012)	(0.013)	(0.006)
Outcome Mean	0.13	0.07	0.08	0.93
Percent Change	-54.35	-1.36	-28.65	3.28
Treatment at Mean W_{isb}	-0.024	-0.000	-0.008	0.010
Perc. Change at Mean	-18.12	-0.45	-9.55	1.09
Obs.	4,265	4,265	4,265	4,265

Note: standard errors clustered at the state level, * p <0.10, ** p <0.05, *** p <0.01. Controls include child gender, child race, number of siblings, child age, mother age, mother health, mother education, if raised by grandparent, urban residency, state unemployment rate, state minimum wage, state EITC, state Medicaid expenditures per enrollee, maximum TANF benefit for 2,3,4 person families. State, interview year, and birth-year fixed effects included.

Table 3.15: Childhood Health Insurance & Utilization - Time Trends

	Insured	Annual Checkup	Illness Visit	Injury Visit
Welfare Treatment (β)	0.048	-0.082**	-0.024	-0.039
	(0.032)	(0.034)	(0.052)	(0.031)
Welfare Exposure (γ)	-0.017	0.033	0.021	0.000
	(0.028)	(0.031)	(0.054)	(0.037)
At-Risk (δ)	0.008	0.023	-0.029	0.027
	(0.019)	(0.023)	(0.029)	(0.023)
Outcome Mean	0.90	0.77	0.62	0.19
Percent Change	5.34	-10.66	-3.80	-20.81
Treatment at Mean W_{isb}	0.016	-0.027	-0.008	-0.013
Perc. Change at Mean	1.75	-3.50	-1.25	-6.83
Obs.	5,224	5,224	5,224	5,224

Note: standard errors clustered at the state level, * p <0.10, ** p <0.05, *** p <0.01. Controls include child gender, child race, number of siblings, child age, mother age, mother health, mother education, if raised by grandparent, urban residency, state unemployment rate, state minimum wage, state Medicaid expenditures per enrollee, maximum TANF benefit for 2,3,4 person families. State, interview year, and birth-year fixed effects included.

Table 3.16: Childhood Health Status - Time Trends

	Asthma	Hyperactive	Activity Limit	Health Quality
Welfare Treatment (β)	-0.075*	-0.002	-0.036	0.028***
	(0.042)	(0.029)	(0.026)	(0.008)
Welfare Exposure (γ)	0.071	-0.043	-0.008	-0.021**
	(0.045)	(0.030)	(0.030)	(0.010)
At-Risk (δ)	0.001	0.024**	0.035***	-0.015***
	(0.022)	(0.010)	(0.013)	(0.005)
Outcome Mean	0.13	0.07	0.08	0.93
Percent Change	-56.12	-3.24	-45.78	3.03
Treatment at Mean W_{isb}	-0.025	-0.001	-0.012	0.009
Perc. Change at Mean	-18.41	-1.06	-15.02	1.00
Obs.	5,224	5,224	5,224	5,224

Note: standard errors clustered at the state level, * p <0.10, ** p <0.05, *** p <0.01. Controls include child gender, child race, number of siblings, child age, mother age, mother health, mother education, if raised by grandparent, urban residency, state unemployment rate, state minimum wage, state Medicaid expenditures per enrollee, maximum TANF benefit for 2,3,4 person families. State, interview year, and birth-year fixed effects included.

Chapter 4: SNAP Purchasing Power and Nutrition Among Households with Children

4.1 Introduction

The Supplemental Nutrition Assistance Program (SNAP), formerly "food stamps", is a federal program that provides nutrition benefits to low-income individuals and families that are used at stores to purchase food. The program is administered by the United States Department of Agriculture (USDA) Food and Nutrition Service (FNS) through its nationwide network of FNS field offices. Research to date has found that SNAP has been highly effective at alleviating poverty (Tiehen et al., 2015) and improving food insecurity rates among participants (Nord and Prell, 2011; Gregory et al., 2015; Schmidt et al., 2016). SNAP participation has also been shown to have positive effects on health, particularly among children (Bitler, 2015; Bronchetti et al., 2018).

However, there has been additional data to reflect that SNAP benefits may not be adequate to address the nutritional needs of those participating in the program (Ziliak, 2016a). SNAP benefits are nationally legislated, and with the exception of Alaska and Hawaii, are not adjusted to reflect local food costs. The time spent acquiring ingredients and preparing meals is also not accounted for in the estimation of the typical families food expenditures. Additionally, depending on the family dynamic, these supplemental funds may not provide enough to meet nutritional outcomes for all those in the households. Among those with an adolescent in the household, depending on gender, activity level, and other key factors the SNAP benefit may not provide an adequate amount to meet their increased nutritional needs due to the maximum

benefit design. In addition, those caretakers with an adolescent in the household may choose to skip meals or experience hunger in order to provide enough food for the other members in the household.

Another specific family dynamic experiencing hunger is families with a lone mother; with 34% of these caregivers reporting they skip meals or ate less when food was scarce (McIntyre et al., 2003). Although families participating in SNAP are supposed to receive a benefit level to meet basic needs, the family dynamic of a lone mother may influence dietary purchases relative to households that have two caregivers in the home. The lone mother may need to "manage the process" (Radimer et al., 1990), meaning that families strategize and work to avoid hunger (McIntyre et al., 2003). The management of food falls more heavily on women given traditional roles about family life and there are greater expectations on women for feeding and nurturing their children (DeVault, 1994). This dynamic of care giver, especially among single mothers, had led to recent studies indicating that this subpopulation reports worse dietary intake, food insecurity, and higher BMI (Martin and Lippert, 2012). A current study by Balisteri (2018) using data from multiple years of the Current Population Survey Food Security Supplement found that children growing up in complex family households are more vulnerable to food insecurity, on average, than children growing up in two biological married-parent households. Their results also show higher odds of child food insecurity among single mother households than among married biological or married stepfamilies suggesting a protective effect of marriage beyond economic resources.

Together, these individual and cultural factors place households with children, particularly single mother households or households with adolescents, at greater risk of poverty, food insecurity, poor nutrition, and obesity. Yet, there is limited research examining if additional income for food for those who are single mothers or with an adolescent would improve their purchasing habits or if it would simply al-

low households to purchase more food as a whole and not necessarily those with a higher nutritional value. In this paper, I explore the impact of the purchasing power of SNAP on the dietary quality of food acquisitions of households with children. I measure purchasing power by accounting for food prices at the county level as well as the increased dietary needs of adolescents. The sample includes SNAP and SNAP–eligible households with children and includes households with adolescents and single mother households. While other work such as Bronchetti et al. (2018) explores the relationship between SNAP purchasing power and child health outcomes, this paper uses finer geographic price information and household food diaries to test for one possible mechanism of improved health: improved nutritional acquisitions.

Using data from the Food Acquisition and Purchase Survey (FoodAPS), a rich dataset on household food acquisitions and county food prices from April 2012 to January 2013, I find that a ten percent increase in purchasing power is associated with increased per person weekly acquisition of grains, proteins, dairy, and vegetables by 1.5-2.5 percent. However the quantity of added sugars also increases by approximately two percent. In line with these modest changes in quantity, I do not find a statistically significant impact of purchasing power on food insecurity rates. Households with adolescents and single mother households exhibit similar purchasing patterns. The results are robust to an alternative measurement of the local food prices. The findings here have implications for the public health benefits of SNAP and the purchasing habits of disadvantaged households with children.

4.2 Background

The Supplemental Nutrition Assistance Program is the largest food assistance program and one of the largest safety net programs in the United States. Benefits are received monthly and can be used towards the purchase of food to be prepared in the home. SNAP is somewhat unique among welfare programs in that conditional on

meeting the income requirements it offers universal access regardless of age, gender, family or employment status. SNAP benefits in 2018 totaled more than 60.88 billion dollars for an average of $125 per person per month. SNAP has been shown to be beneficial on a variety of adult well-being measures including improving food security, alleviating poverty, and improving health outcomes. However, there has been equal criticism that SNAP may contribute to high rates of obesity and chronic disease among those participating in the program (Pruitt et al., 2016). While others have found that long-term participation decreases rates of obesity (Schmeiser, 2012; Hoynes et al., 2016; Almada and Tchernis, 2018).

For children, SNAP is one of the largest anti-poverty programs, second only to the Earned Income Tax Credit (EITC) (Renwick and Fox, 2016). In addition to improving childhood food security (Kreider et al., 2012; Klerman et al., 2017) SNAP has been shown to improve mutliple childhood health measures. Almond et al. (2011) exploit the county-by-county rollout in food stamps in the 1960's and find that pregnancies exposed to the program three months before birth lead to higher birth weights for children. While East (2018) studies changes in food stamp eligibility among immigrants post-welfare reform and finds that childhood participation before age 5 improves parent reported health from ages 6-16.

Despite these benefits found in the literature, some have raised concerns over the dietary intake of SNAP participants. Gu and Tucker (2016) track dietary quality using the Healthy Eating Index (HEI), a composite nutritional index associated with obesity, of children and adolescents from 1999 to 2012. While the mean HEI increased over this time period, the authors observe a downward trend in the HEI of SNAP participants from 2004 to 2012. Among adults, Gregory and Coleman-Jensen (2013) find that SNAP participation leads to modest changes in diet quality. Controlling for selection into the program, the authors find that SNAP participation induces more fruit consumption but less consumption of dark green/orange vegetables, a

key component of the HEI. Other food categories are unchanged. Additionally, food insecurity rates remain quite high among SNAP households as seen in Coleman-Jensen et al. (2013) and Coleman-Jensen et al. (2018). These findings have led some to question the adequacy of SNAP benefits to meet the nutritional needs of participants in the program. Many of these potential shortfalls are outlined by Caswell et al. (2013) and Ziliak (2016a). In this paper I will focus on two potential shortcomings: the dietary needs of adolescent children and the variation in local food prices across the country.

Maximum SNAP benefit amounts are determined by the Thrifty Food Plan (TFP), which is the lowest cost plan that the USDA uses to outline the types and quantities of foods that can be prepared at home to provide a diet meeting the nutritional needs of the individuals. The reference family for the TFP is a family of four consisting of a male and female adult, a child aged 6-8, and a child aged 11-12. The cost is then adjusted for different family sizes to reflect economies of scale in food purchases. There is however, no adjustment for families with differing compositions.

The maximum benefit amount is the same for a family of four with two adolescent boys as it is for a family of four with two elementary aged children. This is despite the fact that adolescent children need as much, and in some cases more, calorie intake as adults do as outlined by the *2015-2020 Dietary Guidelines for Americans*. For households with multiple adolescent children, particularly single mother households with adolescent children, this gap between the received benefit and the amount actually necessary to afford a healthful diet could have negative consequences for the households dietary intake and the household's food security. These households may opt for calorically dense meals instead of healthy, balanced meals. To my knowledge, this paper is the first to estimate the potential size of this gap and its impact on well-being.

Secondly, the TFP is calculated using the CPI to determine national average food prices paid by low-income houses. This assumes that food prices do not vary across the country, with the exception of Alaska and Hawaii. However, the literature shows that there are sizeable regional and urban differences in food prices which can affect the purchasing power of SNAP benefits. Waxman et al. (2018) use a unique dataset, based on Nielsen price data, from Feeding America to calculate the average cost of a low-income meal at the county level. Across the continental US, they find that the average cost of a low-income meal is $2.36 which is 27 percent higher than the SNAP maximum benefit per meal of $1.86. This average masks differences between urban and rural counties however, with the average SNAP shortfall being 21 percent in rural counties and 28 percent in urban counties.

Using the FoodAPS, Bronchetti et al. (2016) examine the adequacy of SNAP taking into account the store prices where SNAP households report shopping for food. The authors use a variety of store prices including the households primary and secondary food store and stores within varying radii of their census block centroid. From their sample of SNAP and SNAP–eligible households, they find that 20–30 percent of households do not have sufficient funds, SNAP benefit amount plus 30% of net income, to purchase the TFP[1]. They estimate that the average dollar shortfall can be as large as $150 per month, though this figure decreases the further they assume households are willing to travel for groceries.

These differences in food prices can influence the dietary composition of household food purchases. Basu et al. (2016) also use the FoodAPS and observe that households living higher area-level costs of living were associated with less healthy food acquisitions, including significantly fewer acquisitions of vegetables, fruits, and whole grains, and significantly greater acquisitions of refined grains, fats and oils, and

[1]Simulated benefits are used for SNAP–eligible households

added sugars. Overall, living in a high-cost area was associated with an 11 percent reduction in the Healthy Eating Index. Similar results have been shown before. Todd et al. (2011) find that whole grains and dark-green vegetables, important components of the TFP, were more expensive than their less healthy counterparts by 23–60 and 20–80 percent, respectively.

Insufficient SNAP benefit amounts can lead to food insecurity and a variety of negative outcomes as outlined by Gundersen and Ziliak (2015). For children, food insecurity is associated with iron deficiency, lower rated health, more behavioral problems, and worse dental hygiene. Further, Bronchetti et al. (2018) use regional variation in food prices to test for a direct connection between SNAP purchasing power and child health. Linking regional food prices from the Quarterly Food-at-home Price Database to the nationally representative National Health Interview Survey, the authors find that lower purchasing power is associated with lower utilization of preventative care and more missed days of school due to illness. However, the authors find no effect on the reported health status of children.

For households with adolescents, the shortfall in benefits generated by the construction of the TFP and choice of reference family is potentially exacerbated by living in an area with a high cost food. While single mothers in high cost areas with or without adolescents may also face higher food insecurity and worse nutrition due to individual and cultural factors. This paper seeks to estimate the impact of SNAP purchasing power on dietary composition and adult food security among households with children, by using county variation in food prices and detailed nutrition information about households food purchases from the FoodAPS, given the adolescent adjustment and the family dynamics that could lead single mothers to be food insecure.

4.3 Methodology

4.3.1 Data

Data for this project comes from the National Household Food Acquisition and Purchase Survey (FoodAPS). The FoodAPS is a nationally representative survey of American households with the aim of collecting extensive information about food-at-home (FAH) and food-away-from-home (FAFH) purchases. The survey includes data from 4,826 households and oversampled SNAP households and low-income households not participating in SNAP but can be weighted to be representative. The survey was fielded between April 2012 and January 2013 and collects detailed information on household demographics as well as income and monthly expenditure measures.

Each sampled household member over the age of 11 was asked to provided a food-diary on food acquisitions made over a 7-day period. Households were asked to scan barcodes on foods, save their receipts from stores and restaurants, and write information in their food books. For food-at-home acquisitions, the scanned barcodes were intended to be the primary source of item-level descriptions, while the receipts were intended to provide the price or expenditure information for each item. The FAH purchases were then matched to nutrient databases to measure the food pattern equivalent and the caloric macro/micronutrients of each item, reported as the amount per 100 grams. These measures form the dietary outcomes of the analysis.

Another unique feature of the FoodAPS is that it allows researchers to construct a precise food environment for every household in the dataset. For each household, there is rich geographic information on the distance between retail food outlets visited and each household's residence, as well the number and types of outlets in proximity to each household. Given the role of food environment on food purchases and health (Walker et al., 2010; Courtemanche and Carden, 2011; Bowen et al., 2016), I account for households' store access and vehicle ownership.

Weighted descriptive statistics for the nutrition and food security outcomes as well as relevant controls for sample of SNAP and SNAP–eligible households with children are found in Table 4.1. Here I have defined SNAP–eligible households to be households that are below 185% of the federal poverty line (FPL) and do not report receiving SNAP benefits. Descriptive statistics for households with adolescents and single mothers are shown in Tables 4.2 & 4.3, respectively. The dietary outcomes are the household's total amount of grains, proteins, dairy, fruits, vegetables, and added sugars per person that the households acquired over the course of their reporting week. Grains and proteins are measured in oz. equivalents per 100g. Fruits, vegetables, and dairy are measured in cup equivalents per 100g, and added sugars are measured in teaspoon equivalents per 100g. The final outcome is an indicator for if the household is food insecure. Being food insecure is measured as having an affirmative response to three or more items from the 10 item food security questionnaire given to each household.[2]

Households acquired an average of 7.1 oz. of grain and 4.5 oz. of protein foods per person over their reporting week. For fruits, vegetables and dairy, households acquired an average of 1.2 cups of dairy over the week, 0.5 cups of fruit, and 1.3 cups of vegetables. Households also acquired an average of 18.3 tsp. of added sugars per person. Households with adolescents and single mother households acquire similar amounts of these food groups with households with adolescents consuming slightly less per person of each category and single mother households consuming slightly more of each category. Food insecurity is faced by 39 percent of households with children, a rate equivalent to what's reported by Coleman-Jensen et al. (2013) among households

[2]While the full household food security module in the Current Population Survey consists of 18 questions, the FoodAPS only fielded the first 10 questions which concern adult hunger.

with children that are under 185% of the FPL. Households with adolescents and single mother households experienced slightly higher rates of food insecurity at 40 and 41 percent, respectively.

Tables 4.1, 4.2, & 4.3 also contain descriptive statistics for the control variables used in the analysis. I include demographic information on the household size and the household's primary food shopper/meal planner including their gender, race, education, and marital status. In order to control for the role food access has on food security and dietary intake, I also control for a multitude of household and geographic characteristics. This includes if the household lives in a rural census tract, has possession of a vehicle, and their census region. I also account for the geodetic distance to the closest superstore, supermarket, combination grocery, convenience store, and medium-large grocery store as classified by the USDA. In terms of these covariates, the adolescent sample is similar to the whole sample while single mother households tend to be less white and less rural. Single mother households are also closer to stores on average, but are less likely to have their own vehicle.

4.3.2 SNAP Purchasing Power

My main independent variable for this analysis is the real purchasing power of SNAP that each household faces. SNAP purchasing power is function of the amount of SNAP benefits each household receives and the local food prices they face. For households with adolescents, purchasing power is also determined by the additional benefits needed for the teenage children to meet their dietary needs. Households that report being on SNAP also report their monthly SNAP benefit amount. For SNAP–eligible households, their SNAP benefits are simulated.

The monthly SNAP benefit allotment for a household is based on the maximum benefit as determined by the TFP, the benefit reduction rate, and the household's net income:

$$\text{SNAP Benefit} = \text{Maximum Benefit} - 0.3 * \text{Net Income}. \tag{4.1}$$

Households without any net income receive the maximum benefit amount for their family size. The benefit reduction rate is 30% reflecting the assumption that households are able to contribute 30 percent of their net income toward food purchases. A household's net income is their gross income, minus deductions for child care, housing, and a portion of earnings. Specifically, the formula for calculating net income is:

$$\begin{aligned} \text{Net Income} \quad = \quad & \text{Gross Income} - 0.2 * \text{Earnings} - \text{Child Support} \\ & - \text{Standard Deduction} - \text{Excess Shelter} \\ & - \text{Dependent Care} - (\text{Out-of-pocket Medical} - 35), \end{aligned} \tag{4.2}$$

where earnings refers to labor market income, child support is payments made for children whom paternity is established, the standard deduction is a deduction received by all households and varies with household size, dependent care includes child and adult care expenses, the shelter deduction covers households facing high housing costs relative to their income, and out-of-pocket medical expenses can be deducted over

$35 for those aged 60 or older and the disabled.[3] All of the necessary components to calculate a household's net income can be found in the FoodAPS, with the exception of the presence of a disabled person in the household.[4]

Using equations (4.1) and (4.2), I simulate SNAP benefits for SNAP–eligible households. As a test of the simulation, I also simulate SNAP benefits for SNAP households and compare them to the household's self reported benefit amount. Given the statutory definition of benefit levels, these two measures should be identical with perfect reporting. On average the estimate is within a few dollars of the reported amount, giving me confidence in the simulation. There are, however, some cases of large under and over estimating which I attribute to measurement error given the near equal likelihood of each case.

The next component of SNAP purchasing power is the adjustment to benefits for households with adolescents, given their increased dietary needs. To calculate this adjustment, I alter the maximum SNAP benefit available for the family according to the number and gender of adolescents in their household. Recall that the maximum SNAP benefit is derived from the TFP for a reference family of 4 people containing a 19-50 male and female adult, one child aged 6-8, and a child aged 9-11. The TFP estimates each of their monthly food costs and the maximum benefit for a family of four is the sum of these food costs. The maximum SNAP benefit per person is also derived from this amount by dividing the sum by four. This per person amount is what is used for families of different sizes along with an economies of scale adjustment, regardless of the family's composition.

[3]Further details about the net income determination can be found at the USDA FNS website at https://www.fns.usda.gov/snap/recipient/eligibility

[4]I am grateful to Kameron Burt & Bob Dalrymple at USDA FNS and Michele Ver Ploeg at USDA ERS for providing the standard utility allowance amounts for FY 2012, necessary to accurately calculate the excess shelter deduction.

In 2012, the maximum benefit for a family of four was $668 and the per person benefit was $167. Note, this differs from the reported TFP food costs for 2012 because the American Recovery and Reinvestment Act (ARRA) uniformly increased benefit levels. The ARRA mandated that the maximum monthly benefit levels would remain 13.6% higher than their March 2009 levels until November 2013, when the ARRA expired (Valizadeh and Smith, 2019). For households of smaller or larger sizes than four, an economies of scale adjustment is made to the per person benefit to obtain the maximum benefit. The economies of scale adjustments that are used and the resulting maximum benefits are shown in Table 4.4.

Although family composition, beyond the selection of the reference family, is not a factor in calculating SNAP benefits, the monthly food cost under the TFP is also calculated for different age-gender groups. For families with adolescents, I use the TFP cost for the child's age-gender group in place of the per person amount allocated to them. This provides an estimate of how much more in benefits the family needs to provide the adolescents with a nutritious diet according to the TFP. Under the TFP, in 2012 a male aged 12-13 had a monthly food cost of $173.81, a male aged 14-18 had a monthly food cost of $180.51, a female aged 12-13 had a monthly food cost of $174.26, and a female aged 14-18 had a monthly food cost of $172.33. All of which exceed the maximum $167 per person they would be allocated in SNAP benefits.

Table 4.5 shows the resulting monthly benefit and the net increase in benefit each additional adolescent would bring to a household of each size, taking economies of scale into account. The table shows that if a family of 3 that includes a 15 year old boy were to get the TFP allotment for the adolescent instead of the base per person benefit, they would receive $189.54 in benefits for the boy instead of $175.35. This is an increase of $14.19 a month. If a family of 5 included a 12 year old boy and a

16 year old girl, their benefits would increase by $\$6.47 + \$5.06 = \$11.53$ a month. For households with multiple adolescents, particularly teenage boys, this shortfall in needed benefits can reach a sizable portion of their monthly benefit.

Local food prices are the final component of SNAP purchasing power. A strength of the FoodAPS compared to other datasets, such as the Quarterly Food-At-Home Price Database, is that households can be linked to very fine levels of geographic food prices, including county level store prices. County level store-week prices were constructed by the teams at the University of Illinois and the University of Florida from IRI scanner data. The team created a TFP basket cost for a family of four for each store-week in the IRI data by finding the median price-per-pound for each TFP category, multiplying that price by the quantity (in pound equivalents) recommended by the TFP, and then summing across the categories for a final basket price. To get an accurate estimation of each household's local food environment, I assign each household a county level TFP cost based on the median basket price of every store-week in their county. This measure is also converted to a monthly cost and is adjusted for family size using the same economies of scale adjustments that the SNAP benefit calculation uses. I will refer to this measure as the county TFP basket price.

However, the county TFP basket price is a potentially flawed measure because prices are calculated using all items in a TFP category, including high price food items, and may not be representative of the actual spending habits of SNAP and SNAP–eligible households. To address this, the team created another price measure that calculates the median price-per-pound using only the lowest quintile of prices for the TFP category. I will refer to this measure as the county low-cost TFP basket price. Each basket measure has its advantages and drawbacks but to better match the existing literature on SNAP purchasing power, such as Bronchetti et al. (2018), I

will use the county TFP basket price in the baseline analysis and the county low-cost TFP basket price as a robustness check to ensure that the results are not being driven by basket choice.

I measure the purchasing power of SNAP using the ratio of SNAP benefits plus 30 percent of net income minus the adolescent adjustment to the county level TFP basket price faced by the household:

$$\text{Ratio} = \frac{\text{SNAP Benefit} + 0.3 * \text{Net Income} - \text{Teen Adjustment}}{\text{County TFP Basket Price}}. \tag{4.3}$$

The household's SNAP benefit plus 30 percent of net income is the assumed amount households should spend on food, as seen in equation (4.1). The adjustment for adolescents is subtracted from expected food expenditures to represent the additional purchasing power needed to provide adolescents with a healthy diet. In the robustness checks the county low-cost basket price is used instead. A ratio greater than 1 indicates that the household's expected food expenditures are greater than the actual cost of the TFP, while a ratio less than 1 indicates that the TFP exceeds what households are expected to spend on food. In the regression analysis, I use the natural log of this ratio as the key independent variable for ease of interpretation.

Table 4.6 provides survey weighted summary statistics for the relevant SNAP purchasing power measurements. Table 4.6 shows the descriptive statistics for the entire sample and the descriptive statistics for households with adolescents and single mother households. The average reported and simulated monthly SNAP benefit amount is $311 and is slightly higher for households with adolescents and single mother households. The average expected monthly food expenditure, SNAP benefit plus 30% of net income, is $776. Expected expenditures are slightly larger for households with adolescents at $805 and are smaller for single mother households at $709.

The purchasing power of the household's food expenditure is also determined by the adjustment for adolescents and their local food prices. For households with adolescents, the average adjustment needed to provide the teens with a nutritious diet according to the TFP is $12.5, as seen in Table 4.6. This would represent a 4 percent increase to the average SNAP benefit amount, or about one-third the percentage increase implemented by the ARRA. The estimated local cost of the TFP can vary dramatically based on the assumptions of the shopping habits of low-income households. Using median price-per-pound measures, the average monthly cost of the TFP adjust for family size is $1206 which exceeds the average estimated food expenditures of $776, suggesting the SNAP benefits are not sufficient once one accounts for local food prices. However, if low-income households regularly buy the cheaper food available, expected food expenditures exceed the estimated cost of the TFP using the lowest quintile of prices at $632.

4.3.3 Empirical Model

I estimate the impact of variation in SNAP purchasing power, given the dietary needs of adolescents and local food prices, on the dietary quality of household's food acquisitions and food security. The sample includes SNAP and SNAP–eligible households with children, with special attention given to households with adolescents and single mother households. The regressions take the following form:

$$y_{irt} = \alpha + \beta ln(Ratio_i) + \gamma SNAP_i + X_i\theta + \lambda_r + \delta_t + u_i, \tag{4.4}$$

where y_{irt} is the nutrition measure or food security outcome for household i living in census region r and completed their food diary in month t. The key independent variable is the natural log of the ratio of the household's expected food expenditure minus any necessary benefit adjustment for adolescents to the county TFP price as

outlined in equation (4.3). $SNAP_i$ is a binary indicator for if the household is a SNAP household vs SNAP–eligible, to account for any consumption differences the two groups may have. X_i is a vector of demographic characteristics and food access measures. Census region fixed effects and survey month fixed effects are also included and are represented by λ_r and δ_t, respectively. All standard errors are clustered at the county level.

4.4 Results

I first present results using the average price-per-pound TFP basket cost. Table 4.7 shows the regression results for the whole sample. For ease of interpretation, Table 4.7 and each subsequent table will also show the effect of a 10% increase in purchasing power and the resulting change as a percent of baseline consumption. An increase in purchasing power is associated with an increase in amount of food acquired in every food category, though not always at a statistically significant level. A ten percent increase in purchasing power is associated with households acquiring 0.108 more ounces of grains per person per week and 0.095 more ounces of proteins, a 1.5 and 2.1 percent increase from baseline, respectively. A ten percent increase in purchasing power also increase acquisitions of dairy and vegetables at a statistically significant level, increasing acquisitions of dairy by 2.5 percent and vegetables by 1.6 percent. The effect on fruit is also positive but not statistically significant at any traditional level.

In tandem with the acquisition of more grains, vegetables, and other food categories, households also increase their consumption of added sugars as purchasing power increases. A ten percent increase in purchasing power is associated with a 0.32 more teaspoons of added sugar a week per person, a 1.7 percent increase from baseline. Compared to SNAP–eligible households, households that report participating in SNAP report greater quantities of grains, proteins, dairy, and added sugars per

person. These households also acquire less fruits and more vegetables but the difference is not statistically significant. More purchasing power also leads to a modest decline in the likelihood that a household is food insecure, with a 10 percent increase in power decreasing the likelihood by one percent at a statistically insignificant level.

Table 4.8 reports the results for households with adolescents and Table 4.9 contains the results for the sample of single mother households. The results here are qualitatively similar to those in Table 4.7, though they are estimated less precisely due to the smaller sample size. For households with adolescents, a ten percent increase in purchasing power is associated with higher quantities of all food groups, though is only statistically significant for vegetables and added sugars. A ten percent increase in purchasing power is associated with a 2.5 percent increase in the vegetables and a 2.9 percent increase in added sugars. A ten percent increase in purchasing power for single mother households has an estimated effect very close to that of the whole sample, as seen in Table 4.9. A ten percent increase in purchasing power increases the quantity of grains by 1.9 percent, proteins by 2.5 percent, dairy by 1.7 percent, and added sugars by 2.3 percent, all at a statistically significant level. Across the major food groups, the results imply an elasticity of approximately 0.2 in magnitude, suggesting the demand for these goods to be quite inelastic.

As in the whole sample, an increase in purchasing power leads to a reduction in the likelihood of being food insecure for households with adolescents but not at a significant level. Strangely, the effect is positive for single mother households, though again the effect is not statistically different from zero. SNAP households with adolescents and single mother SNAP households also generally acquire larger quantities of each food type relative to their SNAP–eligible counterparts. The results in Tables 4.8 & 4.9 suggests that the food purchasing decisions of households with adolescents

and single mother households are largely similar to those of other households with children despite the increased dietary needs of adolescents and the gender dynamics for the single mother households.

To test that the results are not being driven by the assumptions on the purchasing habits of low income households, I also run the model in equation (4.4) using the low cost TFP basket price to construct the ratio from equation (4.3). These results are shown in Tables 4.10, 4.11, & 4.12. Across each of the samples, the results when using the low cost TFP basket are very similar to the baseline specifications showing that the findings are robust to the choice of basket price, though they tend to be slightly smaller and less precisely estimated. An increase in purchasing power is associated with an increase in the consumption of all food groups for the sample of all households. For all households, a ten percent increase in purchasing power increases the quantity of grains by 1.5 percent, proteins and dairy by 2.3 percent, and vegetables by 1.5 percent, all at a statistically significant level. Households with adolescents and single mother households have similar food purchasing patterns as seen in Tables 4.11 & 4.12 compared to the results in Tables 4.8 & 4.9. Although the coefficient are slightly larger in magnitude, there is still not a statistically significant effect of purchasing power on food insecurity.

It is helpful to put the results presented here into context compared to their recommended daily allotment. While the effects presented here tend to be statistically significant, as seen by the modest percent increases, they aren't very large in magnitude. For example, in the whole sample, the predicted increase in vegetable acquisitions is 0.022 cups of vegetables per person per week. For children over the age of nine, the recommended amount of vegetables is at least 2 cups a day. Assuming all food acquired in a week is consumed that week and is split evenly amongst the household, this increase is minimal compared to what is needed for a healthy diet. The effect on unhealthy foods that contain added sugars is equally modest. The

predicted increase in added sugars from a 10 percent increase is 0.32 teaspoons per person per week which translates to about 1.28 grams of sugar. This is well below the amount of sugar one would find in any sugar sweetened beverage.

Our estimated elasticity of approximately 0.2 is also smaller than what other studies have found. Studying the impact of the USDA FNS led Healthy Incentives Pilot, Klerman et al. (2014) find that a 30 percent reduction in the price of fruits and vegetables increased their consumption by 20 percent, an implied elasticity of approximately 0.66 in magnitude. Estimating a demand system with a Bayesian procedure, Lin et al. (2014) also find elasticities of 0.6–0.8 in magnitude across several food groups, including the ones studied in this paper.

These relative small changes in acquisition amounts may suggest that households are acquiring more "high quality" foods, such as those that are low in sodium or saturated fats, rather than simply more of the same food. Another possibility is that households are buying healthier varieties of food such as whole grains instead of refined and dark green vegetables instead of starchy ones. This shift towards higher quality could also explain why a ten percent increase does not lead to a decline in rates of food insecurity at a significant level, though the estimated effect is still negative. The results presented here are similar to Gregory and Coleman-Jensen (2013) who found that the benefits gained from participation have at best a modest effect on dietary quality. If going from no benefits to full benefits doesn't induce much change, it seems unlikely that a ten percent increase in real benefits would have much effect either.

4.5 Conclusion

The Supplemental Nutrition Assistance Program is a critical component of the social safety net, particularly for low income households with children. However, given food insecurity rates remain high among participants, there is concern that the

benefits are not sufficient to provide all households with a healthy, nutritious diet. This is especially true for households with adolescents and single mother households. Here I focus on two potential shortfalls of SNAP benefits: the lack of a benefit adjustment for family composition and no adjustment for local food prices. I explore the effects of an increase to household's SNAP purchasing power on dietary intake and food insecurity.

For the analysis, I use the Food Acquisition and Purchase Survey, a rich dataset that contains thorough information on household food acquisitions, local food environment, and household demographics. I construct a measure food purchasing power for SNAP and SNAP–eligible households with children by calculating the ratio between expected food expenditures and local food prices, taking into account any necessary adjustments for adolescents. I find that an increase in purchasing power is associated with an increase in the acquisition of nearly every major food group. I find that, for the full sample, a ten percent increase in purchasing power is associated with increased per person weekly acquisition of grains, proteins, dairy, and vegetables by 1.5-2.5 percent. The quantity of added sugars also increases by approximately two percent. The magnitudes and the resulting percent changes are similar when I separate the sample into households with adolescents and the sample of single mother households. A ten percent increase in purchasing power also reduces the likelihood of being food insecure by 1 percent, though not at a statistically significant level. The results are robust to an alternative specification of local food prices that uses the lowest quintile of prices instead of the average.

Though I find positive effects of purchasing power on the acquisition of all foods, the magnitudes are fairly modest. The implied weekly increase per person is a fraction of the daily requirement recommended for a healthy diet. The relatively small changes in the total quantities of each food may be masking substitution within each group. Households may use the increase in purchasing power to acquire higher quality foods

in each category such as more whole grains or dark leafy green vegetables or foods with less sodium or saturated fats. However, it may also be the case that household diet is relatively fixed for these demographics of people. Gregory and Coleman-Jensen (2013) find that when individuals participate in SNAP, the new benefits have at best a modest effect on dietary quality, similar to what I have shown here. Further research is needed to explore the relationship between SNAP benefit amounts and dietary acquisitions as well as any interaction benefit levels may have with food access, local food environments, and nutrition education.

Tables

Table 4.1: Descriptive Statistics - SNAP and SNAP–eligible Households With Children

	Mean	SD	Observations
Outcomes			
Grain per Person (oz.)	7.14	7.75	1217
Meat, Soy, Nuts per Person(oz.)	4.57	5.77	1217
Dairy per Person (cup)	1.18	1.43	1217
Fruit per Person (cup)	0.59	0.96	1217
Vegetables per Person (cup)	1.38	1.70	1217
Added Sugar per Person (tsp.)	18.37	23.69	1217
Food Insecure	0.39	0.49	1217
Demographics			
SNAP Household	0.56	0.50	1217
Have an Adolescent	0.47	0.50	1217
Household Size	4.27	1.65	1217
White	0.61	0.49	1217
Black	0.24	0.43	1217
Hispanic	0.11	0.32	1217
Less than HS Edu	0.27	0.44	1217
HS Degree	0.27	0.45	1217
Some College Edu.	0.36	0.48	1217
College Degree	0.08	0.27	1217
Postgraduate	0.01	0.10	1217
Married	0.42	0.49	1217
Single Mother	0.50	0.50	1217
Access			
Rural	0.25	0.43	1217
Has Vehicle	0.82	0.38	1217
Distance to Superstore	2.52	3.56	1217
Distance to Supermarket	2.55	4.60	1217
Distance to Combination Grocery	1.44	2.36	1217
Distance to Convenience Store	1.17	2.08	1217
Distance to Medium, Large Grocery	3.88	5.35	1217
Northeast Region	0.09	0.29	1217
Midwest Region	0.27	0.45	1217
South Region	0.42	0.49	1217
West Region	0.21	0.41	1217

Table 4.2: Descriptive Statistics - Households With Adolescents

	Mean	SD	Observations
Outcomes			
Grain per Person (oz.)	6.99	7.78	579
Meat, Soy, Nuts per Person(oz.)	4.32	5.06	579
Dairy per Person (cup)	1.09	1.32	579
Fruit per Person (cup)	0.51	0.65	579
Vegetables per Person (cup)	1.32	1.52	579
Added Sugar per Person (tsp.)	17.29	25.37	579
Food Insecure	0.40	0.49	579
Demographics			
SNAP Household	0.47	0.50	579
Household Size	4.58	1.74	579
White	0.64	0.48	579
Black	0.22	0.41	579
Hispanic	0.10	0.30	579
Less than HS Edu	0.26	0.44	579
HS Degree	0.30	0.46	579
Some College Edu.	0.33	0.47	579
College Degree	0.10	0.30	579
Postgraduate	0.01	0.12	579
Married	0.50	0.50	579
Single Mother	0.43	0.50	579
Access			
Rural	0.28	0.45	579
Has Vehicle	0.85	0.35	579
Distance to Superstore	2.79	3.76	579
Distance to Supermarket	2.69	4.85	579
Distance to Combination Grocery	1.66	2.79	579
Distance to Convenience Store	1.33	2.44	579
Distance to Medium, Large Grocery	3.98	5.21	579
Northeast Region	0.09	0.29	579
Midwest Region	0.27	0.44	579
South Region	0.39	0.49	579
West Region	0.26	0.44	579

Table 4.3: Descriptive Statistics - Single Mother Households

	Mean	SD	Observations
Outcomes			
Grain per Person (oz.)	7.69	8.64	619
Meat, Soy, Nuts per Person(oz.)	4.99	6.87	619
Dairy per Person (cup)	1.27	1.53	619
Fruit per Person (cup)	0.57	0.82	619
Vegetables per Person (cup)	1.41	1.66	619
Added Sugar per Person (tsp.)	21.53	28.63	619
Food Insecure	0.41	0.49	619
Demographics			
SNAP Household	0.73	0.44	619
Adolescent	0.41	0.49	619
Household Size	3.83	1.55	619
White	0.53	0.50	619
Black	0.34	0.47	619
Hispanic	0.08	0.28	619
Less than HS Edu	0.27	0.44	619
HS Degree	0.27	0.44	619
Some College Edu.	0.39	0.49	619
College Degree	0.06	0.24	619
Postgraduate	0.01	0.10	619
Access			
Rural	0.20	0.40	619
Has Vehicle	0.74	0.44	619
Distance to Superstore	2.22	3.40	619
Distance to Supermarket	2.18	3.92	619
Distance to Combination Grocery	1.09	1.56	619
Distance to Convenience Store	0.85	1.39	619
Distance to Medium, Large Grocery	3.63	5.37	619
Northeast Region	0.09	0.29	619
Midwest Region	0.27	0.44	619
South Region	0.46	0.50	619
West Region	0.19	0.39	619

Table 4.4: SNAP Maximum Benefits FY2012

HH Size	Economies of Scale	Benefit Per Person	Maximum Benefit
1	1.2	200.4	200.4
2	1.1	183.7	367.4
3	1.05	175.35	526.1
4	1	167	668
5	0.95	158.65	793.3
6	0.95	158.65	951.9
7 (or more)	0.9	150.3	1052.1

Table 4.5: SNAP Benefit Increases for Adolescents

		12-13 Male TFP Cost: $173.81		14-18 Male TFP Cost: $180.51		12-13 Female TFP Cost: $174.26		14-18 Female TFP Cost: $172.33	
HH Size	Economies of Scale	Adjusted Benefit	Monthly Increase	Adjusted Benefit	Monthly Increase	Adjusted Benefit	Monthly Increase	Adjusted Benefit	Monthly Increase
1	1.2	208.57	8.17	216.61	16.21	209.11	8.71	206.8	6.40
2	1.1	191.19	7.49	198.56	14.86	191.69	7.99	189.56	5.86
3	1.05	182.5	7.15	189.54	14.19	182.97	7.62	180.95	5.60
4	1	173.81	6.81	180.51	13.51	174.26	7.26	172.33	5.33
5 or 6	0.95	165.12	6.47	171.48	12.83	165.55	6.90	163.71	5.06
7 (or more)	0.9	156.43	6.13	162.46	12.16	156.83	6.53	155.1	4.80

Table 4.6: SNAP Purchasing Power Statistics

	Whole Sample		Adolescent HH		Single Mothers	
	Mean	SD	Mean	SD	Mean	SD
Monthly SNAP Benefit	311	235	313	263	329	208
Monthly Food Expenditure	776	685	805	713	709	829
County TFP Basket Price	1207	436	1276	451	1095	419
County Low Cost TFP Basket Price	633	209	663	215	577	198
Teen Adjustment for SNAP	5.89	7.90	12.54	7.03	5.10	7.73
Food Spending to TFP Basket Price Ratio	0.71	0.75	0.72	0.86	0.71	0.75
Food Spending to Low Cost TFP Basket Price Ratio	1.33	1.40	1.38	1.67	1.31	1.34
Observations	1217		579		619	

Table 4.7: SNAP Purchasing Power & Nutrition

	Grains	Proteins	Dairy	Fruits	Vegetables	Added Sugar	Food Insecure
log(ratio)	1.080**	0.946**	0.285***	0.009	0.222**	3.198*	-0.027
	(0.526)	(0.426)	(0.102)	(0.065)	(0.104)	(1.809)	(0.036)
SNAP HH	1.280*	1.286***	0.360***	-0.038	0.053	4.455**	-0.018
	(0.653)	(0.391)	(0.117)	(0.124)	(0.178)	(1.834)	(0.042)
Outcome Mean	7.14	4.57	1.18	0.59	1.38	18.37	0.39
10% Increase in SNAP Purchasing Power	0.108	0.095	0.029	0.001	0.022	0.320	-0.003
As a % of Outcome Mean	1.5%	2.1%	2.5%	0.2%	1.6%	1.7%	-0.8%
Obs.	1,217	1,217	1,217	1,217	1,217	1,217	1,217

Results from weighted OLS regressions. Standard errors clustered at the county level; * p <0.10, ** p <0.05, *** p <0.01. Controls include household size, urban residency, automobile ownership, store distances, primary shopper gender, race, education, and marital status. All models include region fixed effects and survey month fixed effects.

Table 4.8: SNAP Purchasing Power & Nutrition - Adolescents

	Grains	Proteins	Dairy	Fruits	Vegetables	Added Sugar	Food Insecure
log(ratio)	1.281	0.521	0.320	0.106	0.332**	4.997*	-0.044
	(0.869)	(0.451)	(0.205)	(0.084)	(0.162)	(2.718)	(0.054)
SNAP HH	2.273**	1.675**	0.393**	0.099	0.185	6.418**	-0.065
	(1.099)	(0.657)	(0.175)	(0.078)	(0.207)	(2.669)	(0.050)
Outcome Mean	6.99	4.32	1.09	0.51	1.32	17.29	0.40
10% Increase in SNAP Purchasing Power	0.128	0.052	0.032	0.011	0.033	0.500	-0.004
As a % of Outcome Mean	1.8%	1.2%	2.9%	2.2%	2.5%	2.9%	-1.0%
Obs.	579	579	579	579	579	579	579

Results from weighted OLS regressions. Standard errors clustered at the county level; * p <0.10, ** p <0.05, *** p <0.01. Controls include household size, urban residency, automobile ownership, store distances, primary shopper gender, race, education, and marital status. All models include region fixed effects and survey month fixed effects.

Table 4.9: SNAP Purchasing Power & Nutrition - Single Mothers

	Grains	Proteins	Dairy	Fruits	Vegetables	Added Sugar	Food Insecure
log(ratio)	1.478**	1.259**	0.224**	-0.047	0.192	4.998**	0.034
	(0.665)	(0.600)	(0.110)	(0.075)	(0.123)	(2.031)	(0.047)
SNAP HH	1.338	1.360**	0.448**	0.089	-0.014	6.872*	-0.060
	(1.058)	(0.626)	(0.182)	(0.119)	(0.224)	(3.558)	(0.056)
Outcome Mean	7.69	4.99	1.27	0.57	1.41	21.53	0.41
10% Increase in SNAP Purchasing Power	0.148	0.126	0.022	-0.005	0.019	0.500	0.003
As a % of Outcome Mean	1.9%	2.5%	1.7%	-0.9%	1.3%	2.3%	0.7%
Obs.	619	619	619	619	619	619	619

Results from weighted OLS regressions. Standard errors clustered at the county level; * p <0.10, ** p <0.05, *** p <0.01. Controls include household size, urban residency, automobile ownership, store distances, primary shopper race and education. All models include region fixed effects and survey month fixed effects.

Table 4.10: Low Cost Basket SNAP Purchasing Power & Nutrition

	Grains	Proteins	Dairy	Fruits	Vegetables	Added Sugar	Food Insecure
log(ratio_low)	1.071*	1.033**	0.266**	0.031	0.207*	2.811	-0.031
	(0.548)	(0.461)	(0.109)	(0.069)	(0.110)	(1.855)	(0.037)
SNAP HH	1.289*	1.299***	0.362***	-0.037	0.054	4.466**	-0.018
	(0.656)	(0.392)	(0.117)	(0.124)	(0.179)	(1.852)	(0.042)
Outcome Mean	7.14	4.57	1.18	0.59	1.38	18.37	0.39
10% Increase in SNAP Purchasing Power	0.107	0.103	0.027	0.003	0.021	0.281	-0.003
As a % of Outcome Mean	1.5%	2.3%	2.3%	0.5%	1.5%	1.5%	-0.8%
Obs.	1,217	1,217	1,217	1,217	1,217	1,217	1,217

Results from weighted OLS regressions. Standard errors clustered at the county level; * p <0.10, ** p <0.05, *** p <0.01. Controls include household size, urban residency, automobile ownership, store distances, primary shopper gender, race, education, and marital status. All models include region fixed effects and survey month fixed effects.

Table 4.11: Low Cost Basket SNAP Purchasing Power & Nutrition - Adolescents

	Grains	Proteins	Dairy	Fruits	Vegetables	Added Sugar	Food Insecure
log(ratio_low)	1.215	0.535	0.275	0.120	0.324*	4.443	-0.047
	(0.909)	(0.472)	(0.222)	(0.091)	(0.165)	(2.815)	(0.056)
SNAP HH	2.291**	1.684**	0.396**	0.102	0.190	6.468**	-0.066
	(1.108)	(0.659)	(0.179)	(0.078)	(0.208)	(2.721)	(0.050)
Outcome Mean	6.99	4.32	1.09	0.51	1.32	17.29	0.40
10% Increase in SNAP Purchasing Power	0.122	0.054	0.028	0.012	0.032	0.444	-0.005
As a % of Outcome Mean	1.7%	1.3%	2.6%	2.4%	2.4%	2.6%	-1.3%
Obs.	579	579	579	579	579	579	579

Results from weighted OLS regressions. Standard errors clustered at the county level; * p <0.10, ** p <0.05, *** p <0.01. Controls include household size, urban residency, automobile ownership, store distances, primary shopper gender, race, education, and marital status. All models include region fixed effects and survey month fixed effects.

Table 4.12: Low Cost Basket SNAP Purchasing Power & Nutrition - Single Mothers

	Grains	Proteins	Dairy	Fruits	Vegetables	Added Sugar	Food Insecure
log(ratio_low)	1.252*	1.290**	0.207*	-0.031	0.167	4.329**	0.034
	(0.652)	(0.641)	(0.118)	(0.077)	(0.128)	(1.992)	(0.049)
SNAP HH	1.348	1.376**	0.450**	0.089	-0.013	6.910*	-0.060
	(1.063)	(0.627)	(0.181)	(0.120)	(0.225)	(3.563)	(0.056)
Outcome Mean	7.69	4.99	1.27	0.57	1.41	21.53	0.41
10% Increase in SNAP Purchasing Power	0.125	0.129	0.021	-0.003	0.017	0.433	0.003
As a % of Outcome Mean	1.6%	2.6%	1.7%	-0.5%	1.2%	2.0%	0.7%
Obs.	619	619	619	619	619	619	619

Results from weighted OLS regressions. Standard errors clustered at the county level; * p <0.10, ** p <0.05, *** p <0.01. Controls include household size, urban residency, automobile ownership, store distances, primary shopper race and education. All models include region fixed effects and survey month fixed effects.

Appendix

Chapter 2 Appendix

Table A.1: Description of Woodcock-Johnson-R Subtests

Subscale	**Description**
Letter-Word Identification	Tests for symbolic learning (matching pictures with words) as well as reading identification skills (identifying letters and words).
Applied Problems	Measures skill in analyzing solving practical problems in mathematics
Passage Comprehension	Measures comprehension and vocabulary skills using multiple-choice and fill-in-the-blank format

Table A.2: Behavior Problems Index Factors and Reliabilities

For the next set of statements, decide whether they are not true, sometimes true, or often true, of (CHILD)s behavior.	External	Internal	Total
(He/She) has sudden changes in mood or feeling	X		X
(He/She feels or complains that no one loves him/her		X	X
(He/She) is rather high strung and nervous	X		X
(He/She) cheats or tells lies	X		X
(He/She) is too fearful or anxious		X	X
(He/She) argues too much	X		X
(He/She) his difficulty concentrating, cannot pay attention for long	X		X
(He/She) is easily confused, seems to be in a fog		X	X
(He/She) bullies or is cruel or mean to others	X		X
(He/She) is disobedient	X		X
(He/She) does not seem to feel sorry after (he/she misbehaves)	X		X
(He/She) has trouble getting along with other children	X	X	X
(He/She) is impulsive, or acts without thinking	X		X
(He/She) feels worthless or inferior		X	X
(He/She) is not liked by other children		X	X
(He/She) has difficulty getting (his/her) mind off certain thoughts		X	X
(He/She) is restless or overly active, cannot sit still	X		X
(He/She) is stubborn, sullen, or irritable	X		X
(He/She) has a very strong temper and loses it easily	X		X
(He/She) is unhappy, sad, or depressed		X	X
(He/She) is withdrawn, does not get involved with others		X	X
(He/She) breaks things on purpose or deliberately destroys things	X		X
(He/She) clings to adults	*	*	X
(He/She) cries too much	X		X
(He/She) demands a lot of attention	X		X
(He/She) is too dependant on others		X	X
(He/She) feels others are out to get (him/her)		X	X
(He/She) hands around with kids who get into trouble	*	*	X
(He/She) is secretive, keeps things to (himself/herself)		X	X
(He/She) worries too much		X	X
Number of Items	16	13	30
Cronbach's alpha	0.86	0.81	0.9

Source: Hofferth et al. (1997)

Table A.3: Child Care Use - Boys

	Childcare Use	Informal Care	Formal Care
Welfare Treatment (β)	0.115	0.059	0.072*
	(0.075)	(0.072)	(0.038)
Welfare Exposure (γ)	-0.042	-0.052	0.006
	(0.051)	(0.052)	(0.033)
At-Risk (δ)	0.011	0.029	-0.013
	(0.021)	(0.020)	(0.019)
Outcome Mean	0.20	0.15	0.06
Percent Change	58.00	39.29	110.84
Treatment at Mean W_{isb}	0.034	0.017	0.021
Perc. Change at Mean	17.06	11.55	32.60
Obs.	3,142	3,142	3,142

Note: standard errors clustered at the state level, * p <0.10, ** p <0.05, *** p <0.01. Controls include child race, number of siblings, child age, mother's age, mother education, birth weight, if breastfed, if raised by grandparent, urban residency, state unemployment rate, state minimum wage, state EITC, maximum TANF benefit for 2,3,4 person families. State, interview year, and birth-year fixed effects included.

Table A.4: Child Care Use - Girls

	Childcare Use	Informal Care	Formal Care
Welfare Treatment (β)	0.071	-0.006	0.053*
	(0.069)	(0.063)	(0.026)
Welfare Exposure (γ)	0.021	0.017	0.008
	(0.036)	(0.042)	(0.028)
At-Risk (δ)	0.010	0.035*	-0.027
	(0.026)	(0.020)	(0.019)
Outcome Mean	0.22	0.16	0.08
Percent Change	32.35	-3.89	68.20
Treatment at Mean W_{isb}	0.021	-0.002	0.016
Perc. Change at Mean	9.73	-1.17	20.50
Obs.	3,067	3,067	3,067

Note: standard errors clustered at the state level, * p <0.10, ** p <0.05, *** p <0.01. Controls include child race, number of siblings, child age, mother's age, mother education, birth weight, if breastfed, if raised by grandparent, urban residency, state unemployment rate, state minimum wage, state EITC, maximum TANF benefit for 2,3,4 person families. State, interview year, and birth-year fixed effects included.

Table A.5: Childhood Human Capital Family Fixed Effects - Nonmovers

	Letter Word	Passage Comp.	Applied Problems	BPI
Welfare Treatment (β)	6.805*	3.713	2.655	-1.086
	(4.040)	(3.258)	(2.218)	(1.108)
Welfare Exposure (γ)	-4.927*	0.668	-3.656	-0.254
	(2.456)	(4.558)	(3.826)	(1.021)
Outcome SD	18.15	16.90	16.10	6.37
Percent Change	37.49	21.96	16.49	-17.06
Treatment at Mean W_{isb}	1.979	1.080	0.772	-0.316
Perc. Change at Mean	10.91	6.39	4.80	-4.96
Obs.	2,793	2,475	2,782	3,087
Sibling Pairs	716	709	716	736

Note: standard errors clustered at the state level, * p <0.10, ** p <0.05, *** p <0.01. Controls include child gender, child race, number of siblings, child age, mother's age, birth weight, if breastfed, urban residency, state unemployment rate, state minimum wage, state EITC, maximum TANF benefit for 2,3,4 person families. State, interview year, and birth-year fixed effects included.

Table A.6: Adulthood Human Capital Family Fixed Effects - Nonmovers

	Attend College	College Degree	Married	Single Parent
Welfare Treatment (β)	0.015	0.202**	0.075	0.051
	(0.135)	(0.086)	(0.053)	(0.078)
Welfare Exposure (γ)	-0.086	-0.231***	-0.110	-0.114
	(0.095)	(0.078)	(0.068)	(0.107)
Sample Mean	0.72	0.28	0.10	0.14
Percent Change	2.04	72.21	73.47	35.62
Treatment at Mean W_{isb}	0.003	0.035	0.013	0.009
Perc. Change at Mean	0.35	12.44	12.66	6.14
Obs.	3,544	2,470	3,586	3,584
Sibling Pairs	673	625	674	674

Note: standard errors clustered at the state level, * p <0.10, ** p <0.05, *** p <0.01. Controls include gender, race, age, birth weight, if breastfed, state unemployment rate, state minimum wage. State, interview year, and birth-year fixed effects included.

Table A.7: Childhood Human Capital Family Fixed Effects - Time Trend

	Letter Word	Passage Comp.	Applied Problems	BPI
Welfare Treatment (β)	7.396*	3.341	2.318	-1.496
	(3.746)	(2.871)	(2.285)	(1.074)
Welfare Exposure (γ)	-6.482**	-1.052	-5.104	0.634
	(2.511)	(4.906)	(3.955)	(1.188)
Outcome SD	18.11	16.78	16.12	6.37
Percent Change	40.84	19.92	14.39	-23.47
Treatment at Mean W_{isb}	2.158	0.975	0.676	-0.436
Perc. Change at Mean	11.92	5.81	4.20	-6.85
Obs.	3,063	2,705	3,050	3,414
Sibling Pairs	786	777	786	813

Note: standard errors clustered at the state level, * p <0.10, ** p <0.05, *** p <0.01. Controls include child gender, child race, number of siblings, child age, mother's age, birth weight, if breastfed, urban residency, state unemployment rate, state minimum wage, state EITC, maximum TANF benefit for 2,3,4 person families. State, interview year, and birth-year fixed effects included.

Table A.8: Adulthood Human Capital Family Fixed Effects -Time Trends

	Attend College	College Degree	Married	Single Parent
Welfare Treatment (β)	0.059	0.224**	0.055	-0.058
	(0.139)	(0.095)	(0.055)	(0.094)
Welfare Exposure (γ)	-0.068	-0.218*	-0.085	-0.054
	(0.109)	(0.126)	(0.070)	(0.100)
Sample Mean	0.73	0.28	0.10	0.14
Percent Change	8.06	79.32	53.16	-41.12
Treatment at Mean W_{isb}	0.010	0.039	0.010	-0.010
Perc. Change at Mean	1.40	13.81	9.25	-7.16
Obs.	3,878	2,689	3,921	3,919
Sibling Pairs	733	680	734	734

Note: standard errors clustered at the state level, * p <0.10, ** p <0.05, *** p <0.01. Controls include gender, race, age, birth weight, if breastfed, state unemployment rate, state minimum wage. State, interview year, and birth-year fixed effects included.

Table A.9: Childhood Letter Word Reading Score

	(1)	(2)	(3)	(4)	(5)
Welfare Treatment (β)	3.597**	4.095***	4.227***	4.340***	4.305***
	(1.500)	(1.287)	(1.169)	(1.128)	(1.122)
Welfare Exposure (γ)	-1.253	-1.588	-0.901	-1.195	-1.368
	(2.017)	(2.099)	(2.046)	(2.012)	(1.991)
At-Risk (δ)	-9.033***	-6.498***	-3.839***	-3.715***	-3.732***
	(0.815)	(0.659)	(0.655)	(0.697)	(0.695)
Child/HH Controls	NO	YES	YES	YES	YES
Mother Controls	NO	NO	YES	YES	YES
Early Health	NO	NO	NO	YES	YES
State Controls	NO	NO	NO	NO	YES
Obs.	4,884	4,884	4,884	4,884	4,884

Note: standard errors clustered at the state level, * p <0.10, ** p <0.05, *** p <0.01. Child/HH Controls: child gender, child race, number of siblings, child age, if raised by grandparent, and urban residency. Mother's Controls: mother's age and mother education. Early Health: birth weight and if breastfed. State Controls: state unemployment rate, state minimum wage, state EITC, maximum TANF benefit for 2,3,4 person families. State, interview year, and birth-year fixed effects included in all specification.

Table A.10: Adulthood College Completion

	(1)	(2)	(3)	(4)	(5)
Welfare Treatment (β)	0.110***	0.125***	0.145***	0.144***	0.146***
	(0.038)	(0.035)	(0.036)	(0.036)	(0.036)
Welfare Exposure (γ)	0.048	0.049	0.041	0.040	0.040
	(0.049)	(0.046)	(0.042)	(0.041)	(0.042)
At-Risk (δ)	-0.143***	-0.115***	-0.042*	-0.039*	-0.039*
	(0.018)	(0.020)	(0.023)	(0.023)	(0.023)
Demographics	NO	YES	YES	YES	YES
Mother Controls	NO	NO	YES	YES	YES
Early Health	NO	NO	NO	YES	YES
State Controls	NO	NO	NO	NO	YES
Obs.	4,397	4,397	4,397	4,397	4,397

Note: standard errors clustered at the state level, * p <0.10, ** p <0.05, *** p <0.01. Demographics: gender, race, number of siblings, age, and if raised by grandparent. Mom Controls: mother's education. Early Controls: birth weight and if breastfed. State Controls: state unemployment rate and state minimum wage. State, interview year, and birth-year fixed effects included in all specifications.

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