The Long-Term Health Effects of Early Life Medicaid Coverage*

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Abstract

Although the link between the fetal environment and later life health and achievement is well-established, few studies have evaluated the extent to which public policies aimed at improving fetal health have effects that persist into adulthood. In this study, we evaluate how a rapid expansion of prenatal and child health insurance coverage through the Medicaid program affected the adult health and health care utilization of individuals born between 1979 and 1993 who gained coverage in utero and as children. We find that those whose mothers gained eligibility for prenatal coverage under Medicaid have lower rates of obesity and lower body mass indices as adults. Using administrative data on hospital discharges, we find that cohorts who gained in utero Medicaid eligibility have fewer preventable hospitalizations and fewer hospitalizations related to endocrine, nutritional and metabolic diseases, and immunity disorders as adults. We find effects of public eligibility in other periods of childhood on hospitalizations later in life, but these effects are small. Our results indicate that expanding Medicaid prenatal coverage had long-term benefits for the health of the next generation.

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I. Introduction

A large and growing literature has documented the link between the fetal environment and later life health and achievement. However, there is little evidence as to whether policy interventions designed to improve fetal health have persistent later life effects. Our project is the first to evaluate the long-term health consequences of improved in utero health that resulted from a widespread, rapid expansion of Medicaid benefits to pregnant women from 1979 to 1993. While the impact of Medicaid expansions on fetal, infant, and child health is well-documented (e.g. Currie and Gruber 1996a, b, Aizer 2007, Levine and Schanzenbach 2008, Meyer and Wherry 2013), little is known about whether these improvements had lasting effects on adult health.

We exploit variation in the timing and generosity of Medicaid coverage expansions for pregnant women and children across states to identify how coverage in utero and at different points in childhood affects health in adulthood. We do this using a simulated eligibility approach that constructs a measure of generosity of state eligibility rules to instrument for the fraction of individuals eligible for Medicaid coverage as in Currie and Gruber (1996a,b). Using this technique, we evaluate the effect of public health insurance eligibility in utero and at other ages during childhood, documenting the marginal effect on adult health of an additional year of eligibility at ages 1-4, 5-9, 10-14 and 15-18.

We find that the provision of Medicaid benefits had lasting effects on the health of individuals who were in utero during the expansions. A ten percentage point increase in eligibility for pregnant women decreases the probability that adults born during the expansion are obese by 1.4 percentage points, or approximately 7 percent. Furthermore, we find that a ten percentage point increase in prenatal coverage lowers preventable hospitalizations for those who were in utero during the expansion by 7 percent, reduces chronic illness related preventable hospitalizations by 9 percent, and reduces hospitalizations related to endocrine, nutritional, metabolic and immunity disorders by 8 percent. We also find that Medicaid coverage in other periods of childhood reduces the incidence of obesity in adulthood and decreases later life hospitalizations, although these effects are considerably smaller than those associated with in utero coverage.

In addition to documenting the link between in utero Medicaid coverage and later life health, our study also provides new evidence on the relationship between health insurance coverage and the use of health care services. Contemporaneous health insurance coverage may lower the propensity to use hospital services by improving a patient's underlying health (the "health effect"), but it may also increase the propensity to use health services by lowering a patient's out-of-pocket expenses (the "access effect") (Dafny and Gruber, 2007). Most research has found that the access effect dominates the health effect, resulting in higher utilization when an individual gains coverage. In our study, we look at how eligibility in utero and during childhood affects utilization later in life, after childhood eligibility has lapsed. This allows us to isolate any persistent health effect of Medicaid eligibility from its short-run access effect. Our results indicate that there is a sizeable "health effect" of public health insurance eligibility for infants and children that materializes later in life and results in a lower hospitalization rate for some types of illnesses as adults.

Our analysis links two well-developed literatures: studies on the "fetal origins hypothesis" that overwhelmingly find that the fetal environment has a strong and persistent effect on adult health (e.g., Hoynes, Schanzenbach, and Almond, 2012, Almond, 2006, Almond and Mazumder 2011, Almond, Edlund, and Palme 2007) and the literature on the effect Medicaid coverage on the utilization of services, birth outcomes, and health (e.g., Currie and Gruber 1996a, b, Finkelstein et al. 2012, Baicker et al. 2013). These findings suggest that the expansions of prenatal coverage through the Medicaid program thirty years ago had long-term benefits that are present today. Furthermore, our results highlight that some health improvements and cost-savings resulting from public health insurance expansions may manifest in the long-term, many years after the expansions take place.

II. Background

The fetal origins hypothesis (Barker 1995) proposes that the fetal environment has a critical impact on health outcomes such as obesity, diabetes, hypertension, and mental health that do not materialize until later in life. The evidence documenting the link between the fetal environment and later life outcomes is extensive in both the economics and epidemiology literature. In this section, we briefly summarize select findings from this literature; for a more detailed overview, see Almond and Currie (2011).

Many studies have investigated the fetal origins hypothesis by analyzing how insults to the fetal environment – such as poor nutrition or maternal infection - affect later life outcomes. For example, one of the earliest investigations into the hypothesis analyzed outcomes of cohorts that were in utero during the Dutch Famine of 1944 (Ravelli, Stein, and Susser, 1976). The authors found that cohorts that had been in utero during the famine were twice as likely to be obese at age 18 as cohorts who were not exposed to the famine. Follow-up studies found that the exposed cohorts had higher incidence of coronary heart disease and greater glucose intolerance (Painter, Roseboom, and Bleker 2005) and higher incidence of schizophrenia (Hoek, Brown, and Susser 1998) later in life. Similar studies have explored the later-life effects of in utero exposure to flu pandemics (Almond 2006), malaria (Barreca 2010), and pollution (Sanders 2012). Economists have linked negative shocks that occur in utero to adult outcomes ranging from educational achievement (Almond, Edlund, and Palme 2009, Barreca 2010), to adult disability (Almond and Mazumder 2010), and to poverty later in life (Barreca 2010).

A smaller literature has documented how negative shocks that occur after birth, but during childhood, have effects that persist into adulthood. For example, Bleakley (2010) finds that exposure to malaria in childhood results in lower incomes in adulthood. Reyes (2007) links childhood exposure to lead to criminal activity later in life. Case, Fertig, and Paxson (2005) show that poor health in childhood is associated with lower earnings and worse health in middle age.

While a substantial body of research exists on the long term effects of negative shocks that occur in utero, few studies have evaluated the positive impacts of public policies in the United States affecting in utero and early childhood health on adult health outcomes. One recent exception, by Hoynes, Schanzenbach, and Almond (2012), evaluates how the introduction of the food stamps program affected later life outcomes for those who were in utero and under age 5 during its implementation. Using the staggered timing of the food stamps program adoption across counties, the authors find that children gaining access to the food stamps program in utero and in early childhood experienced lowered incidence of metabolic diseases (such as diabetes, hypertension, and obesity) in adulthood. The authors also found that women experienced higher rates of economic self-sufficiency as adults from childhood exposure to the program. Although the authors do not have sufficient power to separately identify the impacts of in utero and early childhood exposure, exploratory analysis suggests that the impact on metabolic diseases is driven by exposure to the food stamp program during the pre- and early post-natal period.

A separate strand of literature has investigated the effect of educational interventions in early childhood on health later in life. For example, young children who received intensive early childhood education through the Abecedarian education experiment in North Carolina had lower levels of hypertension, obesity, and metabolic syndrome in their mid-30s relative to children in the control group (Campbell et al. 2014). Similarly, the pre-school program Head Start has been found to reduce childhood obesity (Frisvold and Lumeng 2011), and this reduction in obesity persists among teenagers who attended Head Start as children (Carneiro and Ginja 2013).

Finally, recent work by Aizer, Eli, Ferrie, and Lleras-Muney (2014) analyzes the long-run impact of means-tested cash transfers via the Mother's Pension Program, a precursor to AFDC. The authors find that male children in families that received these transfers lived approximately one year longer than those in families who applied for, but did not receive, cash transfers.

In our study, we analyze the impact of a major public policy designed specifically to improve birth outcomes and child health: the expansion of Medicaid health insurance coverage for pregnant women and children. While other research has found that these expansions improved infant and child mortality, ours is the first to document that access to Medicaid during the prenatal period had long-term effects on health that persisted into adulthood. In the next section, we provide background on these coverage expansions and their effect on health care utilization and the contemporaneous health of those who gained coverage.

III. The Medicaid Expansions and Child Health

a. Background on the Medicaid expansions

Established in 1965, the Medicaid program provides basic medical coverage to certain low-income individuals. Jointly financed by federal and state governments, states administer the program following federal guidelines, which include limitations on the categories of individuals who can be covered. Until the 1980s, coverage for pregnant women and children was primarily limited to recipients of cash welfare under the Aid to Families with Dependent Children (AFDC) program.[1] Historically, AFDC payments were paid to single-mother families with very low incomes. Income eligibility thresholds for the program varied by state but were typically well below the poverty line.[2]

Starting in 1984, eligibility for the Medicaid program was broadened to include coverage for low-income pregnant women and children not tied to the welfare system. Motivated by a comparatively high U.S. infant mortality rate in the early 1980s, a major national focus at the time was increasing access to timely and comprehensive prenatal care for low-income women (Howell 2001). Improvements in Medicaid coverage for pregnant women and children aimed to improve infant health and increase access to child health services (Congressional Research Service 1993). Changes in Medicaid eligibility began with new requirements for state programs to cover all pregnant women meeting the financial standards for cash welfare, regardless of their family structure or participation in the AFDC program. In addition, the children born to women receiving Medicaid were deemed automatically eligible for coverage during their first year of life (Currie 1995).

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[1] There were a few other programs under which non-disabled pregnant women and children could qualify for Medicaid. However, these programs were optional for states, had narrow eligibility criteria, and limited eligibility to very poor women and children. Additional information on these eligibility pathways may be found in the Appendix.

[2] In 1989, state income limits ranged from 14 to 79 percent of the federal poverty line, with an average eligibility threshold of 48 percent of poverty (U.S. General Accounting Office 1989).

Between 1986 and 1990, Congress took larger steps to expand Medicaid eligibility for pregnant women and their newborns. New options allowed states to expand coverage to pregnant women and infants below the age of 1 with incomes exceeding AFDC thresholds. States were first able to extend eligibility to pregnant women and infants with incomes up to the poverty line and later to 185 percent of the poverty line. These options were followed by a mandatory requirement for all states to extend coverage to pregnant women and young children with family incomes under 133 percent of the poverty line. Additional information on these changes is available in Table A.1 in the Appendix.

First demonstrated in seminal work by Currie and Gruber (1996b), these changes led to dramatic growth in Medicaid eligibility for pregnant women at the national level, as well as considerable variation across states in both the timing and generosity of eligibility changes. Using data from the March Current Population Survey (CPS) and detailed eligibility rules from this period, we estimate that the fraction of 15-44-year-old women who would be eligible for Medicaid coverage in the event of a pregnancy grew from 13 percent in 1979 to a staggering 44 percent in 1993. Figure 1 depicts national eligibility over this time period (in a solid black line), as well as state levels of eligibility for each year (in grey). Meanwhile, Figure 2 shows the change in the fraction of women eligible for prenatal coverage in each state during this period. While there was growth in eligibility across all states, there was tremendous variation in the timing and size of the expansions in each state. This heterogeneity has been the main source of variation used in the literature to identify the effects of the Medicaid expansions on changes in coverage and infant health.

These changes in Medicaid eligibility for pregnant women were accompanied by additional expansions in eligibility for children. A series of acts by Congress expanded eligibility to children who were not traditionally eligible for AFDC and with family income levels exceeding AFDC cutoffs. Mirroring the changes for pregnant women, these eligibility changes were first introduced as a state option and later by federal mandate. By 1992, almost one-third of children in the U.S. were eligible for public health insurance coverage (Cutler and Gruber 1996). Eligibility levels for children continued to grow through the 1990s as Medicaid eligibility changes continued to be phased in and later through the 2000s under optional state expansions to higher income children under the Children's Health Insurance Program (CHIP) (Lo Sasso and Buchmueller 2004).

This meant that, in addition to differences in in utero Medicaid coverage, cohorts born between 1979 and 1993 faced different eligibility criteria for public health insurance during childhood. To demonstrate this, we estimate cumulative eligibility during childhood for each birth cohort by calculating the fraction of children belonging to that cohort that were eligible for coverage at each age during childhood. We then sum the fraction eligible across ages 1-18 to construct a cumulative measure of public eligibility expressed as the average number of years of eligibility during childhood. Additional information on the methods used in this calculation follow in Section V.

Figures 3 and 4 depict changes in national and state-level childhood eligibility for public health insurance for cohorts born between 1979 and 1993. Children born in 1993 had almost 8 years of eligibility on average, more than twice the 3 years of eligibility for those born in 1979. Similar to the variation seen in prenatal eligibility, there is substantial variation across states in both the timing and size of the changes in childhood eligibility for these cohorts.

b. Medicaid, infant and child health, and utilization

Given the magnitude of the expansions in Medicaid eligibility for pregnant women and children, there has been ample study of their effects on health care utilization and child health. In addition, as described above, the nature of the expansions led to tremendous variation across states in the timing and size of eligibility changes. With this variation plausibly unrelated to health and other determinants of health insurance coverage, the Medicaid expansions provided a unique natural experiment for researchers interested in the impact of health insurance on health.[3] In general, the causal relationship between the two has been difficult to disentangle given unobserved differences between individuals with and without health insurance coverage (Levy and Meltzer 2008).

Arguably the most influential studies in this literature, Cutler and Gruber (1996) and Currie and Gruber (1996a,b) evaluate the impact of the Medicaid expansions on health insurance coverage, medical care utilization and child health outcomes. The authors of these studies instrument for state-level changes in Medicaid eligibility with an index of generosity of state Medicaid rules in order to identify changes in outcomes related to Medicaid policy. This index is calculated by applying state eligibility rules to a national sample of women or children to determine the fraction eligible for Medicaid in a given state and year. This nets out any changes in state demographic or economic characteristics that influence state-level eligibility but are unrelated to

[3] Although states had some discretion in the timing of their expansions, Cutler and Gruber (1996) find that changes in eligibility were primarily the result of federally imposed expansions for states with different initial eligibility thresholds. They estimate that 70 percent of newly eligible women and 90 percent of newly eligible children gained their eligibility under federally mandated minimum eligibility guidelines rather than state-specific expansions.

Medicaid policy. This “simulated eligibility” approach has since been adopted by many studies to examine changes in outcomes resulting from expanded public health insurance eligibility.

Using this methodology, Currie and Gruber (1996b) find evidence of increased Medicaid coverage and improved infant health under the eligibility expansions for pregnant women occurring between 1979 and 1992. The authors estimate a takeup rate of 34 percent for newly eligible women, which implies an increase in Medicaid coverage of 10 percentage points for the 30-percentage-point change in eligibility over this period. They also find evidence suggesting that pregnant women gaining eligibility were approximately half as likely to delay prenatal care. Importantly, the authors find a significant 8.5 percent decline in the infant mortality rate associated with the expansions during this period. They find a smaller and less significant reduction in the incidence of low birth weight of 1.9 percent. When restricting the analysis to eligibility changes that occurred for the lowest income women over this period– those with incomes below AFDC levels–the authors find much stronger effects for both measures of infant health.

Findings from other studies (Dubay and Kenney 1997, Dave et al. 2008) confirm an increase in Medicaid coverage for pregnant women during the period of expansion. In addition, other studies (Dubay et al. 2001, Dave et al. 2008) find evidence of increased use or improved timing and adequacy of prenatal care among women of low-economic status who were most likely to be affected by the policy change. In a full review of the literature, Howell (2001) finds that the weight of evidence points to a clear increase in Medicaid coverage and improvements in the use of prenatal care services among low-income women under the Medicaid expansions. There is also strong evidence of increased utilization of medical technology and obstetric procedures during childbirth associated with the expansions (Currie and Gruber 2001, Dave et al. 2008). Increased use of prenatal care and medical treatment at childbirth are consistent with significant increases in Medicaid physician and inpatient hospital spending documented by Currie and Gruber (1996b) under the eligibility expansions.

Given this increase in utilization and spending, the main question remains whether this policy led to measurable improvements in child health. Studies of the expansions mainly examined two measures of infant health: birth weight and infant mortality. Evidence from Currie and Gruber (1996b) and other studies (Levine and Schanzenbach 2009, Dave et al. 2008, Dubay et al. 2001) appears to indicate that any effects on birth weight or the incidence of low birth weight were relatively small and concentrated among more disadvantaged groups of women. However, Currie and Gruber (1996b) and others (Currie and Gruber 1997, Currie and Grogger 1997) find evidence of sizeable declines in infant or fetal mortality associated with expanded Medicaid prenatal eligibility.[4]

c. The content of prenatal care

These findings are consistent with documented improvements in infant mortality attributed to advancements in medical technology and neonatal care in the 1980s and 1990s (Alexander and Kotelchuck 2001). In addition, given new evidence on the impact of prenatal care, it is perhaps unsurprising that evaluations of Medicaid did not turn up greater evidence of changes in fetal health as measured by the incidence of low birth weight. Recent reviews of the medical literature have been unable to definitively link prenatal care with improvements in birth weight. In a review commissioned by the Agency for Healthcare Research and Quality, Lu and coauthors (2003) conclude that the standard model of prenatal care is not particularly effective in detecting or preventing preterm birth or restricted intrauterine growth. Furthermore, the authors cite a growing body of evidence that perinatal outcomes are not only the product of 9 months of pregnancy, but may be traced to experiences and exposures that are accumulated over the life course of the mother. While prenatal care provides women with obstetric services that are necessary for healthy fetal outcomes, interventions during pregnancy are unlikely to address or reverse the underlying causes of low birth weight. However, the authors do not rule out the benefit of prenatal care for other pregnancy outcomes, including fetal and infant morbidity and mortality and improved maternal health and parenting behaviors.

The same life-course perspective that suggests that prenatal interventions offer “too little, too late” to have a large effect on perinatal outcomes (i.e. birth weight) also emphasizes the importance of prenatal care for in utero health and development over the lifespan (Lu et al. 2003). As reviewed earlier, the fetal origins literature has established strong links between the intrauterine environment and health and disease later in life. Prenatal care may influence the baby’s development and functional capacity in ways not captured by birthweight or other available measures of health at birth. In addition, prenatal care experiences may continue to influence the health and behavior of both the mother and infant well after delivery (Alexander and Kotelchuck 2001).

In a 1989 report, the U.S. Public Health Service described the standard components of prenatal care to include early and continuing assessment of fetal growth and well-being, as well as health

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[4] Levine and Schanzenbach (2009) also find some evidence of reduced infant mortality concentrated among less educated mothers associated with the expansions. Also, a small number of state-specific studies examine infant mortality and Medicaid expansions with mixed findings (see Howell (2001) for additional discussion).

promotion activities and interventions designed to promote the ongoing health and well-being of the child and family (Public Health Service 1989). In addition, while prenatal care is primarily delivered in the context of an obstetric visit, it holds important ties to social support services including the Special Supplemental Food Program for Women, Infants, and Children (WIC) (Alexander and Kotelchuck 2001). Joyce (1999) finds increased enrollment in WIC associated with participation in enhanced prenatal care initiatives adopted under Medicaid expansions in New York during this period. Prenatal interventions related to nutrition and breastfeeding, smoking cessation, and other healthy behaviors, as well as education regarding pregnancy and parenting, may have important consequences for healthy child development and later life health. Furthermore, for women who previously had private insurance coverage or paid out of pocket for health services, Medicaid coverage for pregnancy care may free up household resources for other investments with long-term impacts for children.

d. Long-term effects of prenatal and childhood coverage

This is the first study to examine the impact of expanded Medicaid prenatal coverage on later life health. There is some existing evidence that exposure to public health insurance at birth influences developmental outcomes. Levine and Schazenbach (2009) find evidence linking eligibility for public health insurance at birth to improved performance on standardized tests of reading ability at ages 9 and 13. The authors attribute at least part of this gain to direct improvements in child health status at birth.

In addition, a few studies have examined the longer-term health effects of public coverage during other periods of childhood. Currie et al. (2008) find evidence of improved health status among adolescents residing in states with greater levels of eligibility when they were at ages 2, 3, and 4. Similarly, Cohodes et al. (2014) find evidence of improved teenage health and later educational attainment among cohorts with better Medicaid eligibility during childhood. In addition, Meyer and Wherry (2013) find a sizeable decline in mortality among black teenagers gaining public eligibility at ages 8 to 14. In contrast, De la Mata (2012) finds no evidence of improvements in health associated with public eligibility for children at ages 5-18 either in the short-term or five years after a given year of eligibility. None of these studies considers the long-term effects of public coverage during the prenatal period when children are at their most receptive stage of development and interventions may yield the highest return (Doyle et al. 2009).

In addition to providing new evidence on the Medicaid expansions, this study also contributes to a broader literature on the effects of prenatal care. In general, little is known about the long-term effects of prenatal care and, to our knowledge, only one study has examined the relationship between prenatal care and health after infancy. Noonan et al. (2013) estimate the association between prenatal care and child health at age 5 using measures of general health status, asthma diagnosis, overweight, and height from a national urban birth cohort study. The authors are unable to detect a significant relationship with child health but may be limited by the absence of exogenous variation in prenatal care and the short follow-up period in their study. In our study, we are able to exploit large changes in access to prenatal care across birth years and states under the Medicaid expansions in order to evaluate health much later in life.

In our analysis, we also test for the long-run effects of public health insurance eligibility at other ages during childhood. An extensive literature documents increased health care utilization for children under the expansions in public health insurance eligibility that occurred over this period (see Howell and Kenney (2012) for a comprehensive review). This paper contributes to the small but growing literature on the long-term effects of access to public coverage during childhood.

IV. Data

We use data from both survey and administrative sources to estimate the effects of prenatal and childhood Medicaid coverage on adult health. To document changes in subjective health, we analyze a restricted-use version of the National Health Interview Survey (NHIS). This nationally-representative survey is conducted annually by the U.S. Census Bureau and contains self-reported information on an individual's health status and use of health services. The survey includes year of birth and, in the restricted-use version, state of birth. We use data from years 1998 to 2012 of the National Health Interview Survey, and include only individuals born between 1979 and 1993 who are over the age of 18. We exclude residents of Arizona because Arizona did not adopt a Medicaid program until 1983.

Within sampled households in the NHIS, all members are asked a set of questions on physical limitations, self-reported health, and health care utilization that occurred within the last year. These responses are recorded in the "person" file. Among adult household members, a randomly selected subset ("sample adults") is given more detailed interviews. We use both the person file and the sample adult file to conduct our analysis. The outcomes we consider from the person file are the probability of reporting health status to be "very good" or "excellent" and whether the individual reports having any health-related limitations. From the sampled adult file, we examine the individual's body mass index (BMI, calculated as mass in kilograms divided by height in meters squared), whether or not the individual is obese (BMI > 30), and the presence of a chronic health condition.[5] We also examine a measure of psychological distress, the Kessler 6 (K6) scale,

[5] We construct a measure indicating the presence of a chronic health condition if the individual reported ever being diagnosed with asthma or emphysema, cancer, diabetes (excluding

derived from six questions about the individual's recent experiences of depressive or anxiety symptoms.[6]

In addition to the survey data, we also analyze administrative data on hospitalizations from the Nationwide Inpatient Sample (NIS) provided by the Healthcare Cost and Utilization Project. There are several advantages to using administrative data to examine health care utilization. First, administrative records are likely to present a more accurate picture of health care use. Self-reported healthcare utilization is subject to substantial recall bias (Bhandari and Wagner 2006). In addition, the accuracy of self-reported information varies by individual characteristics including health status with healthier individuals more likely to accurately report utilization (Short et al. 2009). Other advantages to using administrative hospital data are the large sample sizes and the ability to look more closely into the reason for hospitalization. For young adults, pregnancy and delivery care are overwhelmingly the most frequent reasons for hospitalization, representing over 60 percent of all visits. As described below, we are able to exclude hospitalizations related to delivery from the NIS analysis, as well as examine other types of hospitalization that may be influenced by both underlying health and access to medical care during the prenatal or childhood periods.

The NIS samples hospitals within a state, and provides discharge-level data on all hospital visits to selected hospitals in each year.[7] These data contain a sample of approximately 20 percent of all community hospitals among states that contribute to the project. In 1998, the first year of our sample, 22 states contributed to the NIS. By 2011, the latest year of our sample, 46 states contributed.[8] Appendix Table A.2 lists the states included in our sample in each year. We observe about 3 million hospital visits, excluding hospitalizations related to pre gnancy and delivery, from patients born between 1979 and 1993 who are over the age of 18. As with the

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gestational diabetes), ulcer, heart trouble (coronary heart disease, angina pectoris, heart attack, a heart condition or heart disease), or stroke; or if the individual was told they had chronic bronchitis, any kind of liver condition, or weak or failing kidneys during the past 12 months. The selection of these conditions is based on a list of self-reported conditions assembled by Chaudhry, Jin, and Meltzer (2005) to approximate the enumerated conditions of the Charlson Comorbidity Index. We were unable to include two conditions (arthritis and HIV) due to their inconsistent availability in the NHIS data.

[6] The K6 scale has been used by other studies to assess adult mental health, including Kling, Liebman, and Katz (2007). Alternative measures of adult mental health, such as depression, were not available in the NHIS during our sample period.

[7] Because the hospitals selected to be reported in the NIS change each year, in models that use NIS data, we include state by year fixed effects.

[8] We find qualitatively similar results when we restrict our data to states that participated in the NIS sample in every year.

NHIS, we exclude Arizona from our sample. The data include information on diagnoses, procedures, patient demographics, and insurance status.

Using the Prevention Quality Indicator software provided by the Agency for Healthcare Research and Quality, we are able to classify whether a hospitalization could have been prevented with effective outpatient care. Additionally, we further analyze preventable conditions that are related to chronic conditions such as asthma or diabetes, as childhood coverage is more likely to have persistent effects for diseases that are present over long periods. Finally, we also separately classify visits relating to endocrine, nutritional and metabolic diseases, and immunity disorders (such as diabetes), as both the literature in epidemiology (e.g., Ravelli, Stein, and Susser 1976) and economics (e.g., Hoynes, Schanzenbach, and Almond 2012) suggests that early life health has a strong impact on these types of diseases later in life.

A limitation of the NIS is that it does not contain information on either birth year or birth state. We assign birth state to be the state in which the hospitalization took place, which is problematic for our analysis if Medicaid influences sorting across states. However, in the NHIS, we estimate that only 27 percent of adults in our sample have moved from their state of birth. We assign birth year probabilistically based on the age of the patient at the time of the visit and the year and quarter during which the patient was admitted to the hospital, following a method similar to the technique used in Rotz (2012). This procedure is described in greater detail in the Appendix Section C. Because this method will result in some misclassification, it will bias our estimates towards zero.

The first panel of Table 1 displays descriptive statistics from the NHIS. The mean age in our sample is 23.5. Within the person file, 18 percent of the sample is black and 19 percent is Hispanic. Fifty-two percent of the sample is female. Demographic characteristics are similar in the sample adult subset. In the person file, we observe that 74.3 percent of respondents report that they are in very good or excellent health and 5.6 percent report having any health-related limitations. The person file includes 97,413 individuals over the age of 18 who were born between 1979 and 1993. In the sampled adult file, we observe that 20.9 percent of respondents are obese and the average BMI is 26.2. About 24.5 percent of respondents report having at least one chronic health condition. The average score on the Kessler 6 psychological distress measure is 2.6, with 24 indicating the highest level of psychological distress. In total, there are 40,982 adults born between 1979 and 1993 in the sample adult file.

The second panel of Table 1 displays descriptive statistics from the NIS. Of the 2.9 million non-pregnancy-related hospital visits we observe, about 9 percent are for conditions that are considered preventable with routine care, and about 5 percent are for preventable conditions related to chronic illnesses. The most common diagnoses associated with preventable hospitalizations in our sample are short-term complications related to diabetes, urinary tract infection, and asthma. The most common diagnoses associated with chronic, preventable hospitalizations are short- and long-term complications related to diabetes and asthma.[9] About 6 percent of all admissions are for endocrine, nutritional and metabolic diseases and immunity disorders. On average, patients are 23.6 years old and 51 percent of patients are female. Some states do not provide information on the race of the patient; as a result, patient race is missing for about 10 percent of discharges. Among hospitalizations that include information on patient race, 16 percent of patients are black, 12 percent are Hispanic, and 47 percent are white.

V. Empirical Strategy

a. IV strategy

To examine the effects of Medicaid prenatal eligibility on adult health, we regress individual-level outcomes from the NHIS and cohort-level outcomes from the NIS on measures of state-level eligibility for each birth cohort. Following Currie and Gruber (1996b), we estimate the fraction of women of reproductive age (15-44) who would have been eligible for coverage if they became pregnant in each state and year during the 1979-1993 period. Eligibility is calculated using detailed federal and state Medicaid eligibility rules and individual information on state of residence, family structure, and income from the Current Population Survey (CPS) March Supplement for each year (see Appendix for additional information on criteria used to determine eligibility).[10]

Also following the innovation of Currie and Gruber (1996a, 1996b), as well as Cutler and Gruber (1996), we instrument the actual fraction eligible in each state and year with a measure of "simulated eligibility" that relies only on state eligibility rules for Medicaid prenatal coverage. To create this instrument, we select a national sample of 3,000 women from each year and estimate the fraction that would be eligible for prenatal coverage in each state in that year. The use of the national sample allows us to isolate changes in state-level eligibility resulting from Medicaid eligibility policy rather than state-level demographic differences or changes in local economic conditions.

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[9] Full details on the prevention quality indicator classification system, including a complete list of what diagnoses are included, are available on the Agency for Healthcare and Quality website, http://www.ahrq.gov.

[10] We use the 1980-1994 CPS survey years since income information is for the previous calendar year.

We interpret these measures as representing Medicaid eligibility during pregnancy but also during the postnatal period. Prenatal and infant eligibility are highly correlated, in part because children born after 1984 to mothers covered by Medicaid were automatically deemed eligible for coverage until their first birthday (Congressional Research Service 1988). For that reason, we do not separately estimate the effects of prenatal eligibility and eligibility before the age of one. We do, however, examine these two periods of coverage separately in a robustness analysis in Section VIIa.

States with more generous prenatal coverage may offer better coverage for children at other ages. For this reason, we also construct measures of public health insurance eligibility at ages 1-4, 5-9, 10-14, and 15-18 for each birth year and state. Since year of birth is not available in the CPS, we estimate the individual's birth year as the calendar year minus age. For a given birth year, we then calculate the fraction of children eligible for coverage at each age during childhood in each state. We sum the fraction eligible across ages to construct cumulative measures of public eligibility over four different age ranges for each birth year and state. We interpret these measures as the average number of years of public eligibility during a given age range.

Since state-level eligibility during childhood may also be influenced by changes in state demographics or economic conditions, we construct instruments that capture differences in eligibility resulting from state-specific eligibility criteria. These simulated childhood eligibility measures are constructed in a manner similar to that for simulated prenatal eligibility. First, we draw a national sample of 1,000 children at each age during childhood for a given birth year. We then estimate the fraction of this national sample that would have been eligible for coverage in each state in order to create state-age-birth year measures of eligibility. Again, we sum the fraction eligible across ages in order to construct cumulative measures of eligibility for each age range.

All eligibility measures are linked to the NHIS data using state of birth and birth year. We link the measures to the NIS sample using state of hospitalization and assigned birth year, as previously discussed.

VI. Results

a. First stage

Our model contains five endogenous variables: prenatal Medicaid eligibility (which we interpret as capturing both in utero and infant coverage) and cumulative eligibility occurring between the ages of 1 and 4, 5 and 9, 10 and 14, and 15 and 18. We use simulated prenatal eligibility and simulated cumulative eligibility over each age range during childhood as instruments for these endogenous variables.

Tables 2 and 3 present the first stage results using the NHIS and the NIS data. In the first five rows of each column of Tables 2 and 3, we report the Angrist-Pischke (AP) F-statistic (Angrist and Pischke 2009) for a given sample and specification.[11] This statistic is constructed for each endogenous variable by first regressing each instrument on the other four endogenous variables and collecting the residuals. The AP F-statistic is the standard F-statistic from a regression where these residuals are included as an explanatory variable and the remaining endogenous variable is the dependent outcome. In this way, the AP F-statistic asks whether there is enough variation in the instruments to explain the endogenous variable after accounting for the fact that the variation in the instruments will also be used to predict the other four endogenous variables. In the final row, we report the Kleibergen-Paap rank statistic (Kleibergen and Paap 2006). Whereas the AP F-statistic measures the first stage for each endogenous variable separately, the rejection of each null hypothesis separately does not require that there is enough variation to identify the structural parameters when taken together. The Kleibergen-Paap rank statistic tests whether the full set of instruments is able to identify the full set of structural parameters.

Both analyses using the AP F statistics and the Kleibergen-Paap rank statistic show that the simulated eligibility instruments are strongly predictive of actual eligibility within each state and birth-year cohort. That is, our analysis confirms that a meaningful amount of the variation in state and birth-year cohort eligibility results from changes in the law rather than changes in the demographic composition of the state.

b. NHIS results

We first examine the effects of Medicaid eligibility during pregnancy and childhood on later life health using a range of self-reported measures from the NHIS. If early life exposure to medical care improves the underlying health of the fetus or child, we may observe better health in adulthood. In addition to a measure of overall health status, we examine mental health using the Kessler 6 scale, which captures psychological distress but may also assess unmet mental health needs (CDC 2013). We also examine body weight and obesity, as well as the presence of chronic health conditions or limitations, all of which have been linked to the fetal environment and early life exposures. However, for chronic conditions and health limitations, it may be too early in the

[11] In the NHIS, each dependent variable has a different number of missing values. Because of this, there are minor differences in these first stage statistics across models. In Table 2, we present the results using health status and BMI as the dependent variables for the person file model and sample adult model respectively.

lifespan to expect noticeable effects given their low prevalence rate among the young adults in our sample.[12]

Our regression model is given by

$$y_{ibsy} = \beta_s + \beta_b + \beta_y + \beta_1\, Prenatal_{bs} + \beta_2\, Elig\ Age\ 1-4_{bs} + \beta_3\, Elig\ Age\ 5-9_{bs} + \beta_4\, Elig\ Age\ 10-14_{bs} + \beta_5\, Elig\ Age\ 15-18_{bs} + \beta_6\, X_{ibsy} + \beta_7\, Z_{bs} + \varepsilon_{ibsy}$$

where each outcome y_{ibsy} for individual *i* observed in survey year *y* is regressed on prenatal and childhood eligibility measures corresponding to their state of birth *s* and year of birth *b*. We also include individual-level control variables X_{ibsy} (race, sex, and a quadratic in age), state of birth, year of birth, and survey year dummies. In certain specifications, a vector of additional variables Z_{bs} control for time-varying state-specific characteristics that may be related to birth outcomes. These variables include state demographic (population age distribution, marital status, educational attainment, race) and economic characteristics (per capita income, per capita transfers, unemployment rate), as well as the ratio of abortions to live births in the state for each birth year cohort.[13] Standard errors are heteroskedasticity-robust and clustered by state of birth.

Table 4 reports the coefficient estimates for each period of Medicaid eligibility during childhood for adult health outcomes, while Figure 5 presents them visually. The first two outcomes in the table are perceived health status and the presence of any health limitations. We find no evidence of an impact of eligibility during the prenatal period or at other ages during childhood for either of these outcomes.

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[12] While some studies (e.g., Ravelli, Stein, and Susser, 1976) document effects of the fetal environment on adult outcomes among young adults or teenagers, some conditions can only be present among older adults. For example, Almond and Mazumder (2011) found that in utero exposure to maternal fasting for Ramadan increased the probability of having a disability specifically related to aging.

[13] For each state and year, we construct variables indicating the share of the population that is married, black, or other race; the share of adults that are high school dropouts, high school graduates, or have at least some college; and, the percent of the population that is age 0-4, 5-17, 18-24, 25-44, 45-64, and 65 and older using March Current Population Survey data. We use data on the unemployment rate by birth year from the Bureau of Labor Statistics and data on income and transfers from the Bureau of Economic Analysis Regional Economic Information System. The abortion rate is provided by the Center for Disease Control Abortion Surveillance System. Because no abortion data are available for 1982 and 1983, we use a linear interpolation to predict the values for these years.

The next two columns present the results for BMI and obesity. For both outcomes, we find significant evidence of an impact of prenatal Medicaid eligibility. The coefficient estimates for obesity are strongly significant and robust to the inclusion of time-varying state of birth characteristics. The estimates for BMI are only modestly significant when we include the additional controls. A 10-percentage-point increase in prenatal eligibility is associated with a decrease in BMI of 0.15 kg/m^2 and a 1.4 percentage-point reduction in the likelihood of adult obesity, which represents almost a 7 percent decrease over the sample mean. In addition, there is some evidence that eligibility at ages 10-14 matters for obesity in adulthood. With the inclusion of time-varying state characteristics, the coefficient is only significant at the 10 percent level. The magnitude of the estimate is smaller than that for prenatal eligibility and suggests that a 0.15 percentage-point decline in obesity is associated with a 10-percentage-point increase in eligibility for a given year during this period. The implied cumulative effect for an increase in eligibility for all ages in this age range is a 0.75-percentage-point decline in obesity, or a 3.6 percent decline.

Finally, we examine the presence of chronic health conditions and psychological distress as measured by the Kessler 6 scale. We find no significant evidence of an impact of eligibility at any period during childhood. However, the coefficient estimates are suggestive of improvements on both measures associated with Medicaid prenatal eligibility.

The coefficients reported in the first row of Table 4 can be interpreted as the treatment effect of Medicaid eligibility in utero on later life health. Similarly, the coefficients describing eligibility during childhood can be interpreted as the treatment effect of an additional year of eligibility during each age period. Assuming that eligibility only affects health among those who actually enroll in Medicaid, we can use these estimates to back out the implied treatment effect of enrollment in the Medicaid program during the prenatal period on the adult health of children who were in utero. Currie and Gruber (1996b) report that about 30 percent of women who gained eligibility over this period actually enrolled in Medicaid. We therefore scale our coefficients by 1/0.30 to provide a back-of-the-envelope calculation of the implied treatment effect of individual Medicaid enrollment. Our results imply that in utero Medicaid coverage lowers BMI in early adulthood by 5 kg/m^2, and decreases the probability of being obese by 47 percentage points.[14]

[14] A potentially appealing exercise would be to scale our reduced form coefficients by the change in insurance coverage to arrive at a treatment effect of insurance coverage on health. However, because Medicaid coverage could affect fetal, infant, and child health through mechanisms other than moving mothers from being uninsured to insured (e.g., by crowding out more expensive private insurance and thus increasing the available household resources), we believe this approach would ultimately be misleading.

These results indicate that Medicaid eligibility early in childhood holds important consequences for adult health. In particular, we find evidence of decreases in obesity and BMI associated with eligibility during the prenatal period and first year of life. We also find some evidence suggesting that eligibility at ages 10-14 may also influence the development of obesity in adulthood.

In addition to measuring the effect of Medicaid eligibility in early life on adult health, we also estimated the effect on self-reported utilization of medical care using the NHIS data.[15] This analysis did not detect any significant effects of in utero or childhood Medicaid coverage on the likelihood of an overnight hospital stay, ER visit or reporting 10 or more health visits during the last 12 months. The coefficient estimates suggest a decrease in overnight hospital stays and ER visits associated with Medicaid prenatal eligibility but are not statistically significant. As described earlier, there are several limitations associated with survey data on health care utilization relative to administrative records, including smaller samples, recall biases, and the inability to separate pregnancy and delivery related hospitalizations (by far the most common hospitalization for this age group) from hospitalizations for diagnoses that are more likely to be affected by early life Medicaid coverage. The next section provides a closer look at adult health care utilization using administrative hospital records.

c. Hospitalization results

In this section, we analyze how Medicaid eligibility at different times during childhood affects the utilization of hospital services as adults. While contemporaneous Medicaid eligibility is usually associated with higher rates of health care utilization (e.g. Dafny and Gruber 2005, Finkelstein et al. 2012, Taubman et al. 2014), the effect of health insurance coverage in childhood on utilization later in life remains largely unexplored. Providing coverage in childhood may lower hospitalizations in adulthood if the use of health services in childhood improves underlying health or helps manage chronic health conditions. Alternatively, coverage in childhood may lead to higher rates of utilization later in life by increasing contact and familiarity with the health care system and the Medicaid program, or by resulting in diagnoses that may not have been discovered without childhood coverage.

We aggregate the total number of hospital discharges and the number of discharges by diagnosis group (preventable, chronic illness related preventable, and metabolic-syndrome related) over admission year periods by state and birth year cohort. We group admissions years into groups of two (i.e., 1998-1999, 2000-2001, 2002-2003, etc.) in order to reduce the number of cells with zero admissions. For some small states, there are some admission year group, state, and birth year cohort cells with zero admissions. We drop these states from the analysis; details on which

[15] Results are available upon request.

states are included are reported in the results tables.[16] In the appendix, we report the results from alternative data aggregations that group admissions years into one year and three year groups; the results are qualitatively similar.

To analyze the effect of Medicaid coverage in childhood on later life utilization, we estimate

$$\log(y_{bsy}) = \beta_b + \beta_s \times \beta_y + \beta_1\, Prenatal_{bs} + \beta_2\, Elig\ Age\ 1-4_{bs} + \beta_3\, Elig\ Age\ 5-9_{bs} + \beta_4\, Elig\ Age\ 10-14_{bs} + \beta_5\, Elig\ Age\ 15-18_{bs} + \beta_6\, Z_{by} + \varepsilon_{bsy}$$

where y_{bsy} is the total number of hospitalizations for a given birth year *b* and state *s* in admission year group *y*. In addition to prenatal and childhood eligibility measures for each birth year and state, we include birth year dummies to control for fixed differences in hospitalizations across cohorts. Because different hospitals within a state are sampled each year, we also include state by admission year group fixed effects ($\beta_s \times \beta_y$). Combined with the birth year fixed effects, these state-by-admission year group fixed effects account for any differences in hospitalization rates that vary by age. These models estimate the change in the number of admissions observed, which might be affected by the size of the birth year cohort in each state. To account for this, we add birth cohort size as a variable in models that include additional controls with characteristics for each state and birth year.[17] As in the previous section, models with additional controls (Z_{by}) test whether state characteristics at the time of birth can explain our results and include controls for the age composition, education composition, race composition, per capita income, per capita transfers, unemployment rate, and the abortion rate of the state. For all models, standard errors are heteroskedasticity-robust and clustered by state.

Table 5 presents the results. We also present the point estimates with confidence intervals in Figure 6 to illustrate the differences in relative magnitudes. We find no significant effect of prenatal Medicaid coverage on adult hospitalizations overall, although the point estimate indicates that the effect is negative. However, we do find a significant reduction in later life hospitalizations associated with coverage between the ages of 1 and 4. Our point estimates indicate that expanding eligibility by ten percentage points for one year in childhood between the ages of 1 and 4 would reduce hospitalizations as adults by 2.4 to 2.7 percent.

The second column displays the effect of childhood Medicaid coverage on hospitalizations that are classified as preventable with effective outpatient care. These types of visits are thought to be

[16] Results are similar if we drop only the observations that have zero visits but keep other observations within the state.
[17] To the extent that expansions of the Medicaid program lowered mortality, our model will under-estimate the effect of Medicaid on hospitalizations later in life.

sensitive to the access to and utilization of health services. We find that prenatal Medicaid eligibility significantly reduces later life hospitalizations classified as preventable in the specifications with and without additional controls. A ten percentage point increase in prenatal coverage during an individual's year of birth is associated with a 7 percent reduction in preventable visits in early adulthood. We also find some evidence of an impact of eligibility at ages 15-18, although the estimate is smaller and only modestly significant with the addition of state-birth year controls. A ten percentage point increase in eligibility for one year between the ages of 15 and 18 (i.e., an increase in the expected number of Medicaid-eligible years in that age period of 0.1) is associated with just under a 2 percent reduction in preventable visits. As displayed in Figure 6, the point estimates of the effects of coverage throughout childhood are small relative to the effect of coverage during the prenatal period.

Additionally, we look separately at preventable hospital visits that are associated with chronic illness in Column 3. Chronic illnesses are long-lasting and therefore visits later in life may be especially amenable to access to care in utero, as infants, or during childhood. We find that a ten percentage point increase in prenatal eligibility is associated with a 9 to 10 percent reduction in later life preventable chronic illnesses. An increase in the expected number of Medicaid-eligible years between the ages of 15 and 18 of 0.1 is associated with a reduction in these types of hospitalizations of about 2 percent, although it is not significant in models that include state-birth year controls.

Finally, we look specifically at visits for diagnoses that are in the diagnosis group related to endocrine, nutritional and metabolic diseases, and immunity disorders. We find that a ten percentage point increase in prenatal eligibility is associated with a reduction in hospitalizations related to these disorders of between 8 and 10 percent. We do not find significant effects of Medicaid coverage during other periods of childhood on these types of visits.

Across all outcomes, there is some suggestion of an increase in hospitalizations associated with eligibility at ages 5-9. The magnitude of the point estimates is small indicating changes in hospitalizations of around 1 percent or less associated with a 10-percentage point increase in eligibility for a given year of age. However, the estimates are not consistently significant across specifications and are particularly sensitive to the inclusion of additional controls.

We can perform a similar back-of-the-envelope calculation of the implied treatment effect of Medicaid coverage on hospitalizations using the take-up rate (30 percent) to scale our coefficients. Our results suggest that enrolling in Medicaid reduces preventable, chronic preventable, and nutritional/endocrine/metabolic and immunity-related visits by greater than 100 percent. Although it is surprising to uncover treatment effects larger than 100 percent, we note several reasons why this may occur: first, because this age group experiences relatively few hospital visits in these categories, even very small changes in the number of visits per capita represent large percent changes. For example, on average there are about 1.2 preventable hospitalizations per 1000 individuals between the ages of 19 and 32. Second, because those who benefited from the Medicaid expansions were in low-income families, and low-income individuals exhibit substantially worse health than higher-income individuals, it is likely that a greater than 100 percent change relative to the sample mean represents a smaller than 100 percent change relative to the average utilization of those who actually gained coverage. Medicaid beneficiaries between the ages of 19 and 44 experience about 6.8 preventable hospitalizations per 1000 population, whereas non-Medicaid beneficiaries have preventable hospitalization rates of only 1.2 per 1000 population.[18] The treatment effect of gaining Medicaid coverage of the observed reduction in preventable visits is approximately a 233 percent reduction relative to the sample mean. However, this treatment effect represents a reduction of about 79 percent relative to average preventable visit rate among the Medicaid population. Finally, we note that the confidence intervals around our estimates are fairly large and include substantially smaller treatment effects.

We can also use our estimates to approximate cost savings from fewer preventable hospitalizations.[19] Our point estimates indicate that the 30 percentage point increase in prenatal eligibility that occurred from 1979 to 1993 reduced preventable hospitalizations in early adulthood by about 21 percent for cohorts born during this period. The preventable hospitalization rate for young adults between the ages of 19 and 32 is approximately 1.2 visits per 1000 population;[20] this suggests that the prenatal Medicaid expansions reduced preventable hospitalizations by about 0.25 visits per 10,00 population. As average charges for a preventable hospitalization are about $18,000, this represents a cost savings of about $4.50 per person annually. Over the age range of 19 to 32, this implies a savings of $63 per person. Currie and Gruber (1996b) estimate that each additional woman made eligible for Medicaid led to a $202 increase in Medicaid expenditures in 1986 dollars, or a $423 increase in Medicaid expenditures in 2013 dollars. If the reduction in preventable hospitalizations persists throughout adulthood,

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[18] Authors' calculation based on the HCUP 2009 State Inpatient Databases for Iowa, Maryland, New Jersey, New York, and Oregon, and full 2009 inpatient discharge records for Texas from the Texas Department of State Health Services. Data on population totals by age are from the US Census, and data on the number of Medicaid beneficiaries are from the Medicaid Statistical Information System. We select the age range 19 to 44 in this discussion because this range is available in the Medicaid Statistical Information System data on Medicaid enrollment.

[19] We focus on preventable hospitalizations because chronic illness related preventable hospitalizations are a subset of these hospitalizations, and metabolic syndrome related hospitalizations also overlap with this classification.

[20] Authors' calculation from the HCUP State Inpatient Databases.

our estimates suggest that the cost reduction from fewer later life hospitalizations will eventually substantially exceed the initial cost of the Medicaid expansions.

Overall, these results indicate that Medicaid coverage in childhood results in lower levels of hospital utilization in early adulthood. In particular, we find large effects of Medicaid coverage in utero, especially on preventable hospitalizations, chronic illness related preventable hospitalizations, and hospitalizations related to nutritional, endocrine, or metabolic syndrome and immunity disorders. We also find evidence of significant reductions in later life hospitalizations associated with coverage between the ages of 1 and 4.

VII. Alternative Specifications and Robustness Checks

a. Prenatal vs. infant eligibility

We did not include separate measures of eligibility in the year after birth in our analysis but instead interpret measures of prenatal eligibility as capturing both in utero coverage and coverage during the first year of life. As described earlier, measures of prenatal and infant eligibility are highly correlated. Federally mandated and optional state expansions during this period were specified to apply to both pregnant women and children under age 1 (see Appendix Table 1).[21] In addition, beginning in 1984, infants born to pregnant women receiving Medicaid were deemed automatically eligible for coverage until their first birthday.

However, infants were able to enroll in Medicaid and receive full medical coverage at any time during their first year of life, even if their births were not covered by Medicaid. In this case, coverage rules for infants may play a role separate from prenatal coverage in improving access to medical care and later life health. To further examine this possibility, we run a specification that includes eligibility at age 0 in addition to prenatal eligibility. We construct this measure of infant eligibility in the same manner as measures of eligibility at other ages during childhood. Similarly, we instrument actual eligibility at age 0 with simulated eligibility at this age in the analysis.

Table A.3 presents the results for this model using the NHIS data. For the most part, the point estimates for prenatal coverage remain in the expected direction. When compared to the coefficients on eligibility at age 0, prenatal eligibility appears to be a more critical period for obesity and BMI, as well as chronic health conditions. In general, however, the relative effects of the two periods are difficult to discern since the coefficient estimates are imprecise and not statistically significant under these models.

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[21] States choosing options to expand flexibility were unable to elect to cover only pregnant women or only infants but were required to cover both groups (Hill 1987).

We also investigate the differential effects of prenatal and infant eligibility using the NIS data on hospitalizations. The results are presented in Table A.4. The point estimates for prenatal coverage remain negative for preventable, chronic illness related preventable, and nutritional, endocrine, metabolic syndrome and immunity disorder related hospitalizations; however, the standard errors on the coefficients roughly double in magnitude in this model. Only the model of nutritional, endocrine, metabolic syndrome and immunity disorder hospitalizations remains statistically significant. The direct effect of infant coverage is not significant in any model but is negative for preventable and chronic illness related preventable hospitalizations.

b. Adult eligibility

In the previous sections, we demonstrated that expansions of Medicaid coverage for prenatal services resulted in improvements in self-reported health and lower hospitalization rates for adults who were in utero during the expansions. One threat to our identification strategy may arise if birth cohorts who experienced more generous Medicaid coverage in early childhood also were more likely to benefit from public insurance expansions as adults. If this is the case, the observed improvement in health associated with prenatal coverage may be instead capturing more generous contemporaneous coverage for these birth cohorts.

In order to control for this possibly confounding relationship between in utero coverage and coverage as an adult, we construct two measures of adult eligibility by state and birth year cohort. First, we control for contemporaneous Medicaid eligibility (i.e., eligibility during the year we observe each birth year cohort in the NHIS or NIS data) in our models. Second, we control for average cumulative adult Medicaid eligibility (i.e, the average number of Medicaid eligible years in adulthood divided by the total number of years in adulthood a birth year cohort has experienced). These measures vary by state, birth year cohort, and survey or admission year. As with our measures of childhood eligibility, we instrument for actual adult eligibility with simulated adult eligibility. Additional details on the construction of these variables are found in Section B of the Appendix.

Table A.5 reports the results for the models that include contemporaneous adult Medicaid eligibility using NHIS data. The inclusion of adult eligibility does not appreciably change the results we reported in Section VI.b. In addition, the coefficients for prenatal and childhood eligibility are nearly identical in models that control for average cumulative adult Medicaid eligibility (not included here but available from authors).

The results using NIS data are reported in Table A.6. We find very similar effects of prenatal coverage on hospitalizations when we control for contemporaneous adult Medicaid eligibility. We find that the direct effect of adult coverage reduces hospitalizations, although these effects are not statistically significant and the confidence intervals are large. As with the NHIS results, using alternative measures of adult eligibility such as the average number of years of Medicaid eligibility in adulthood results in very similar coefficients for prenatal and childhood eligibility.

Finally, we explore whether prenatal eligibility and eligibility for Medicaid during childhood are associated with individual health insurance coverage during adulthood. Using measures of health insurance coverage and public insurance coverage available in the NHIS, we regress these outcomes on childhood eligibility using the specification reported in Section VI.b. We find no evidence that prenatal eligibility or eligibility during childhood impacts health insurance coverage for the adults in our sample (results from this analysis are available from the authors).

c. State-specific linear trends

If the timing or generosity of state Medicaid expansions are related to different trends in health outcomes across birth year cohorts, our estimates of the effect of Medicaid eligibility on adult health may be biased. In this section, we test whether state-specific linear trends can explain the improvement in adult health associated with Medicaid prenatal coverage eligibility.

Table A.7 presents results from the NHIS that include state-specific linear trends. These trends are added in addition to other time-varying state characteristics. We continue to find a strong effect of prenatal Medicaid coverage on obesity and the magnitude of the estimate is robust to the inclusion of state trends. In addition, the effect of prenatal Medicaid coverage on BMI remains negative and modestly significant with the state-specific trends. Interestingly, the coefficients on prenatal eligibility for chronic health conditions and the Kessler 6 scale increase in size under this specification, although they are not statistically significant.

Table A.8 conducts a similar analysis with the NIS. In these models, we continue to find evidence that the prenatal coverage expansions reduced preventable, chronic illness related preventable, and metabolic syndrome related visits among those who were in utero during the expansions. However, the reduction in chronic illness related preventable hospitalizations is only marginally significant at the 10 percent level and the reduction in metabolic syndrome related visits is not statistically significant.

In general, the inclusion of state-specific linear trends does not alter our qualitative conclusions from the previous section. However, the inclusion of these additional variables does tend to reduce the magnitude and precision of our coefficients.

VIII. Conclusion

During the 1980s, the Medicaid program underwent ambitious coverage expansions aimed at improving the health of pregnant women and children. In this paper, we use variation in the timing and size of these expansions across states to show that adults who benefited from the expansions in utero and during early childhood exhibit better health today along several dimensions. We find that expanding Medicaid coverage to pregnant women resulted in lower rates of obesity, lower BMI, and fewer preventable and metabolic-syndrome related hospital visits during adulthood among cohorts who were in utero during the expansions. We also find that coverage expansions that affected young children between the ages of 1 and 4 resulted in small but statistically significant reductions in hospitalizations later in life.

While a well-established literature has shown that the fetal environment has large effects on adult health, relatively few papers have established how health policy choices affect long-term health outcomes. This paper provides a link between the research on the early life origins of adult disease and the broader discussion about the role of the government in providing health insurance coverage to low-income populations. Establishing evidence on the effectiveness of expanded health insurance coverage, as well as other interventions that influence early and later life health, is crucial for public policy decisions that aim to improve population health.

Finally, our paper also demonstrates new evidence about the relationship between insurance coverage and the long-run use of health care. Although most research has found that expanding health insurance coverage increases the immediate use of care among beneficiaries, our results highlight that providing health insurance coverage to low-income families during critical periods of development may reduce the need for costly care in the future. Our results suggest that public health insurance expansions have benefits that materialize years after their implementation. Furthermore, benefits of the Medicaid expansions may continue to emerge later in life for the cohorts that gained coverage. The types of chronic conditions that have generally been linked to the early life environment tend to appear starting in the middle age years. As the cohorts born during this time period continue to age, it will be possible to investigate whether there are even longer-term effects of this early intervention.

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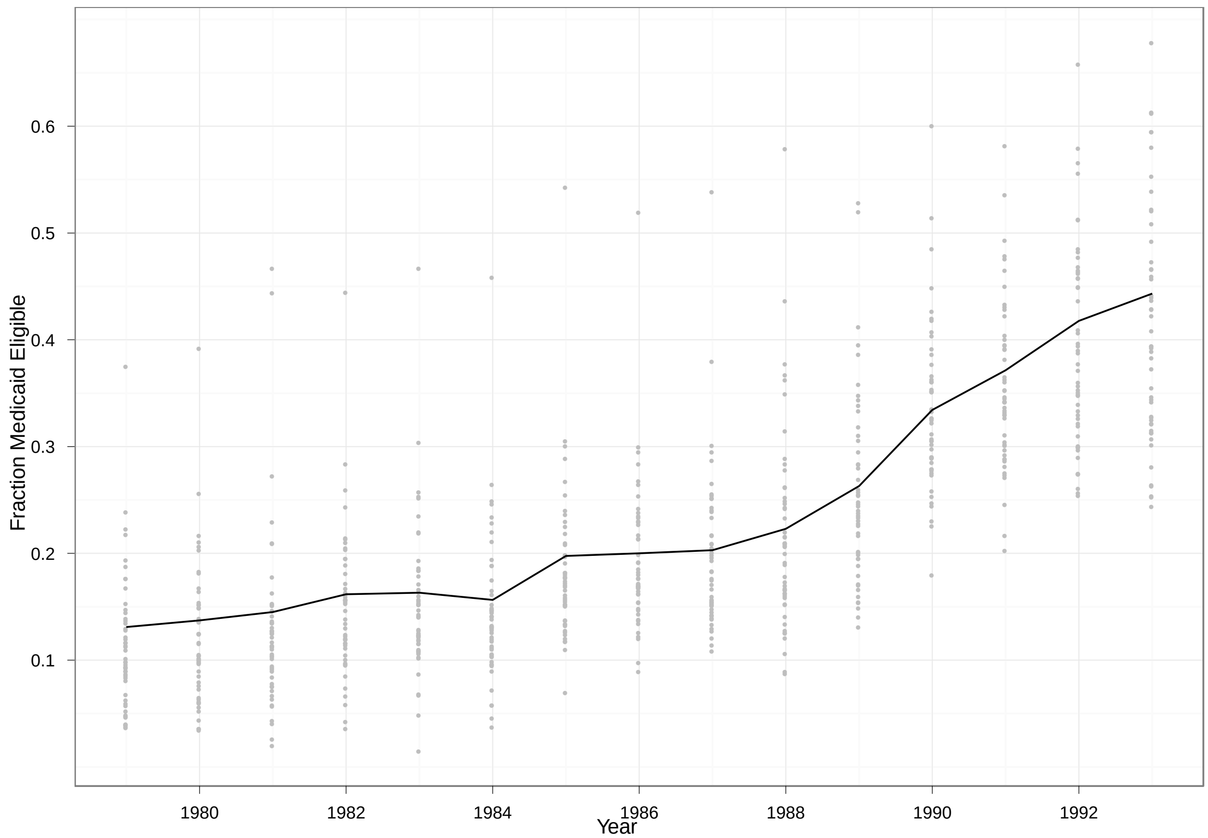
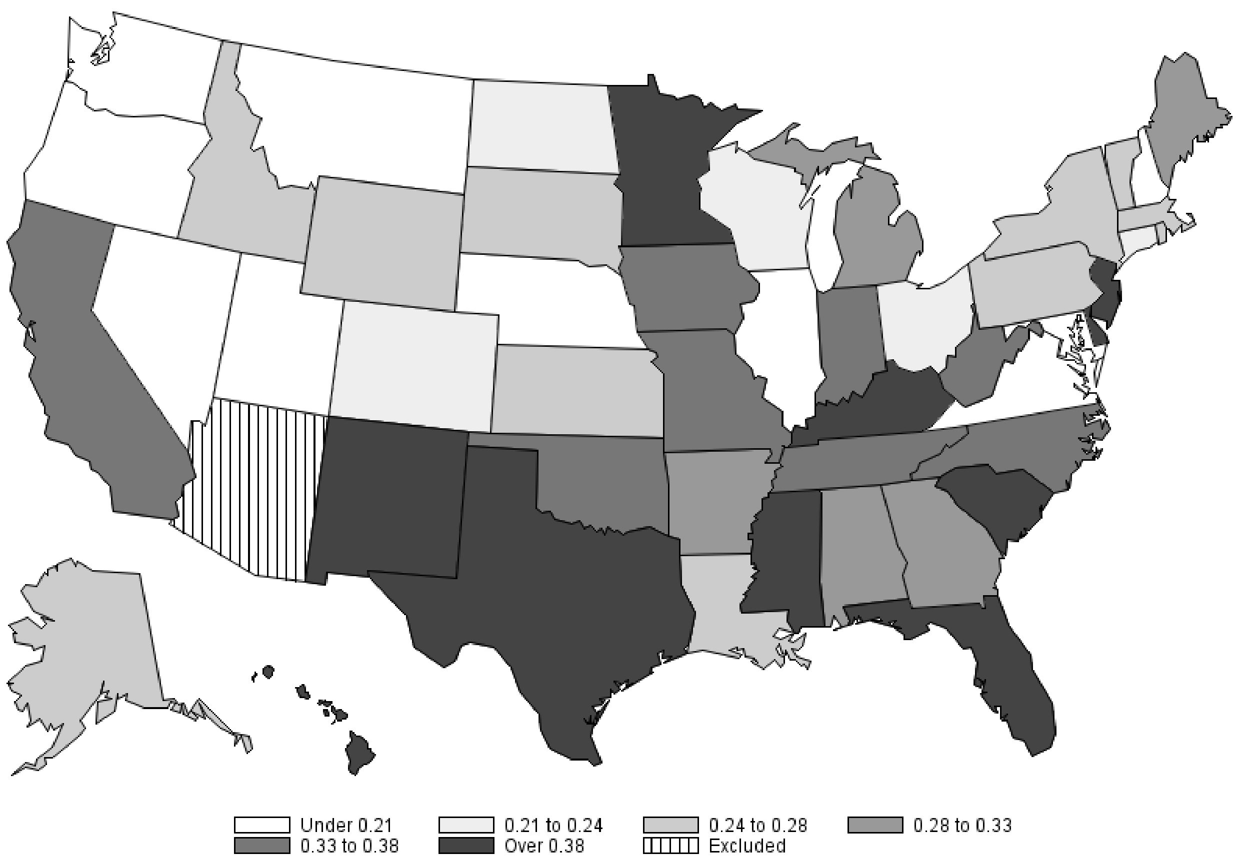
Figure 1. Fraction of women ages 15-44 eligible for Medicaid prenatal coverage in the event of a pregnancy, 1979 to 1993



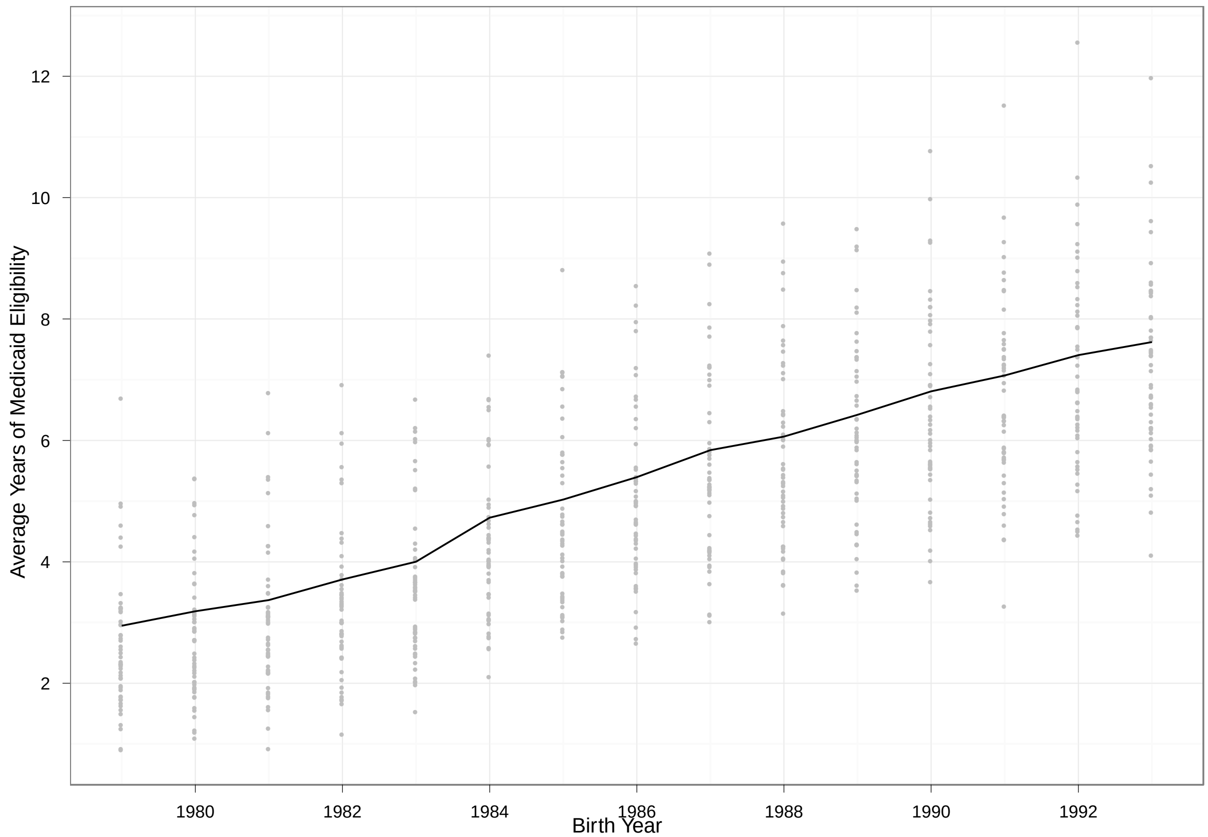
Source: Authors' calculations using Current Population Survey. See text and Appendix A for details.

Figure 2. Change in the fraction of women age 15-44 who would be eligible for Medicaid coverage in the event of a pregnancy from 1979 to 1993 by state.



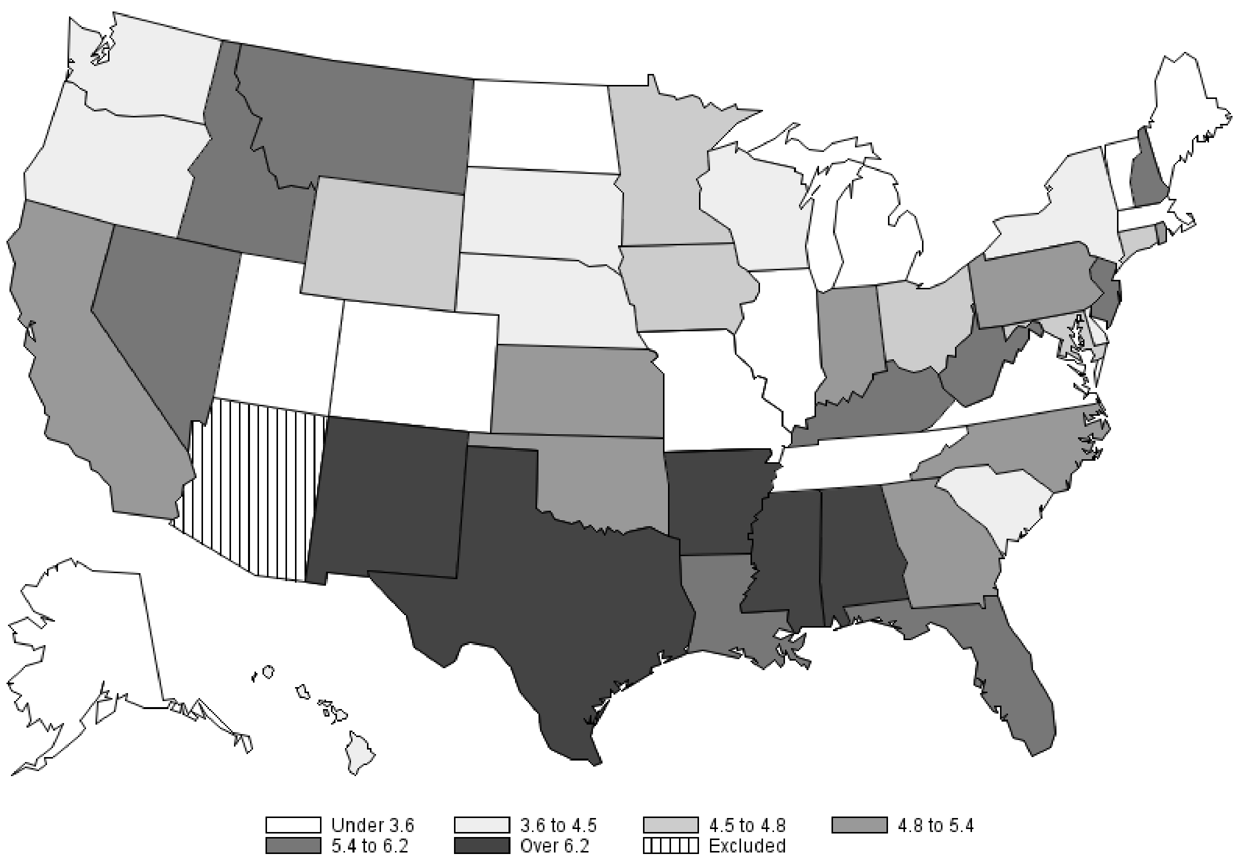
Source: Authors' calculations using Current Population Survey. See text and Appendix A for details.

Figure 3. Average number of Medicaid eligible years during childhood of cohorts born 1979 to 1993



Source: Authors' calculations using Current Population Survey. See text and Appendix A for details.

Figure 4. Change in the average number of Medicaid eligible years of cohorts born in 1979 to 1993 by state.



Source: Authors' calculations using Current Population Survey. See text and Appendix A for details.

Table 1. Descriptive Statistics, National Health Interview Survey (1998-2012) and Nationwide Inpatient Sample (1998-2011)

National Health Interview Survey		
Person file	Mean (Std. Dev)	N
Age	23.47 (3.60)	97413
Black	0.1833	97413
Hispanic	0.1856	97413
Male	0.4785	97413
Health is very good or excellent	0.7425	97366
Any health limitations	0.0555	97413
Sample adult file		
Age	23.75 (3.61)	40982
Black	0.1885	40982
Hispanic	0.1544	40982
Male	0.4415	40982
BMI	26.20 (6.06)	40025
Obesity	0.209	40025
Presence of 1 or more chronic conditions	0.2446	40889
Kessler 6 psychological distress scale	2.69 (3.72)	40702
Nationwide Inpatient Sample		
Age	23.6 (3.44)	2870606
Black	0.1581	2870606
Hispanic	0.1203	2870606
Male	0.4923	2855678
Preventable hospitalization	0.0938	2870606
Chronic illness related preventable hospitalization	0.0502	2870606
Endocrine, nutritional and metabolic diseases, and immunity disorders diagnosis	0.0557	2870606

Notes: This table displays descriptive statistics for adults born from 1979 to 1993. Nationwide Inpatient Sample discharges exclude cases where the primary diagnosis is related to pregnancy or delivery. Sample sizes vary due to missing values of dependent variable.

Table 2. First-Stage estimates, National Health Interview Survey 1998-2012.

	NHIS Persons		NHIS Sample Adult	
Prenatal eligibility	263.77	656.46	286.69	646.33
Eligibility at ages 1-4	58.81	142.99	65.21	136.64
Eligibility at ages 5-9	98.45	126.09	101.05	129.82
Eligibility at ages 10-14	50.96	90.03	54.51	91.39
Eligibility at ages 15-18	87.76	100.44	86.79	93.37
Kleibergen-Paap Rank	19.65	20.06	19.07	20.07
Statistic (P-Value)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
State-birth year controls	No	Yes	No	Yes

Notes: This table displays statistics from the first stage regressions of eligibility on simulated eligibility and include individual characteristics, state of birth, year of birth, and survey year dummies. Specifications with additional controls include unemployment rate, transfers per capita, personal income per capita, ratio of abortions to live births, and demographic controls for each state of birth and birth year.

Table 3. First-Stage estimates, Nationwide Inpatient Sample Models 1998-2011.

	All visits excluding those for pregnancy		Preventable		Chronic preventable		Endocrine, nutritional, metabolic and immunity disorder	
Pre-Natal	309.73	498.24	271.21	575.18	263.46	538.66	249.96	504.08
Age 1-4	125.63	167.31	79.88	96.13	86.34	106.24	81.29	95.30
Age 5-10	143.28	171.09	69.04	82.02	64.25	76.23	61.53	80.56
Age 11-14	41.47	71.86	32.71	65.58	33.22	66.41	32.94	66.77
Age 15-18	81.68	65.82	54.37	47.54	53.78	48.84	53.70	47.13
	13.14	13.79	13.41	16.63	12.57	16.11	12.59	15.06
Kleibergen-Paap Rank Statistic (P-Value)	(0.0003)	(0.0002)	(0.0003)	(0.00004)	(0.0004)	(0.0001)	(0.0004)	(0.0001)
Area level controls	No	Yes	No	Yes	No	Yes	No	Yes
States included	AK, AR, CA, CO, CT, FL, GA, HI, IA, IL, IN, KS, KY, LA, MA, MD, ME, MI, MN, MO, MS, MT, NC, ND, NE, NH, NJ, NM, NV, NY, OH, OK, OR, PA, RI, SC, SD, TN, TX, UT, VT, VA, WA, WI, WV, WY		AK, AR, CA, CO, CT, FL, GA, HI, IA, IL, IN, KS, KY, LA, MA, MD, ME, MI, MN, MO, MS, MT, NC, ND, NE, NH, NJ, NM, NV, NY, OH, OK, OR, PA, SC, SD, TN, TX, UT, VT, VA, WA, WI, WV, WY		AK, AR, CA, CO, CT, FL, GA, IA, IL, IN, KS, KY, LA, MA, MD, ME, MI, MN, MO, MS, MT, NC, ND, NE, NJ, NM, NV, NY, OH, OK, OR, PA, SC, TN, TX, UT, VT, VA, WA, WI, WV		AK, AR, CA, CO, CT, FL, GA, IA, IL, IN, KS, KY, LA, MA, MD, ME, MI, MN, MO, MS, MT, NC, ND, NE, NJ, NM, NV, NY, OH, OK, OR, PA, SC, SD, TN, TX, UT, VT, VA, WA, WI, WV	

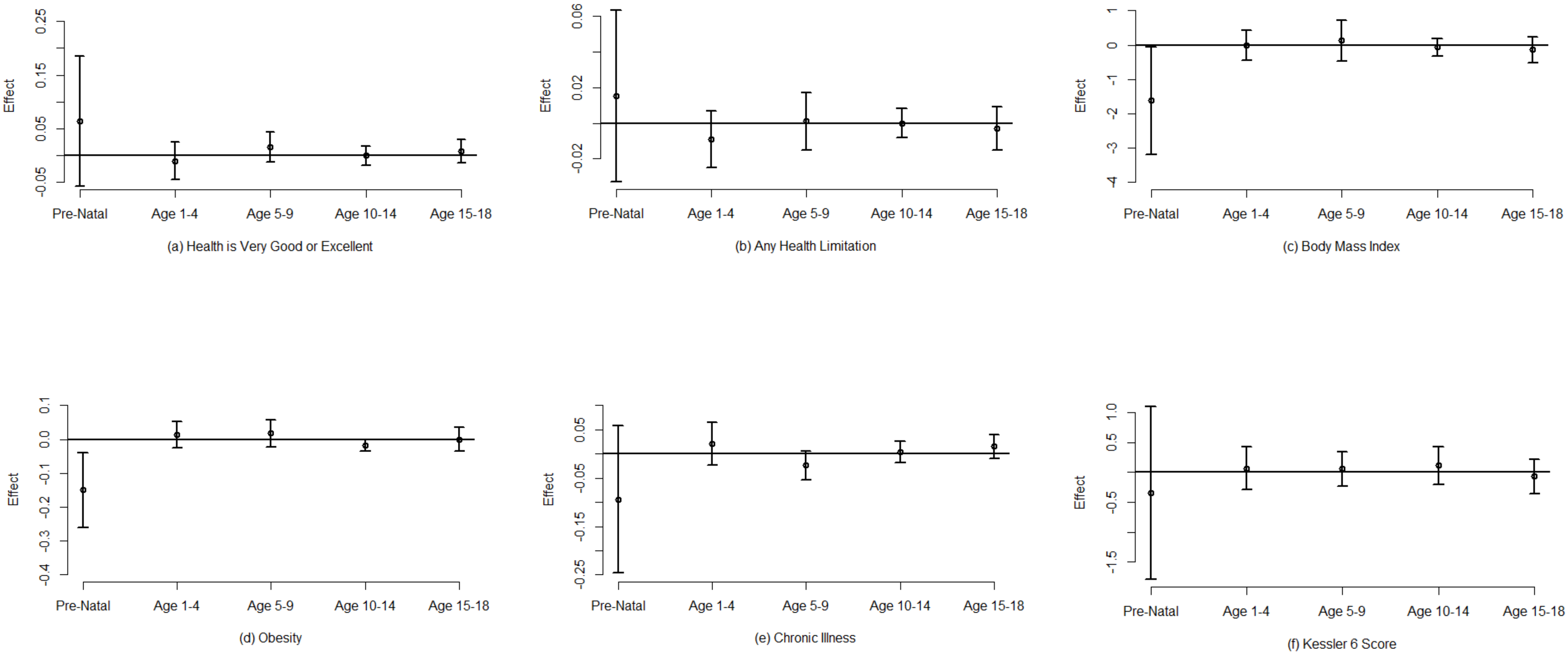
Notes: This table displays statistics from the first stage regression of eligibility on simulated eligibility using year, birth cohort and states from the NIS 1998-2011. All specifications include state, birth year, and state by survey year fixed effects. Area-level control variables are demographic characteristics of the state (age distribution, race, education, marital status), birth cohort size, unemployment rate, transfers per capita and personal income per capita in state and birth year. See text for more details.

Table 4. Instrumental Variables Estimates of the Effect of In Utero and Childhood Coverage on Adult Health, National Health Interview Survey

	Very good or excellent health		Any health limitations		BMI		Obesity		Presence of one or more chronic health conditions		Kessler 6 scale	
Prenatal eligibility	0.064	0.047	0.015	0.016	-1.621**	-1.534*	-0.150***	-0.141**	-0.094	-0.120	-0.352	-0.637
	(0.062)	(0.060)	(0.024)	(0.024)	(0.809)	(0.864)	(0.055)	(0.059)	(0.076)	(0.074)	(0.722)	(0.694)
Eligibility at ages 1-4	-0.010	0.000	-0.009	-0.007	-0.099	-0.159	0.014	0.011	0.021	0.008	0.065	0.168
	(0.018)	(0.017)	(0.008)	(0.008)	(0.232)	(0.265)	(0.019)	(0.022)	(0.022)	(0.025)	(0.177)	(0.186)
Eligibility at ages 5-9	0.016	0.009	0.001	0.004	0.125	0.243	0.018	0.022	-0.024	-0.020	0.054	0.066
	(0.014)	(0.014)	(0.008)	(0.007)	(0.313)	(0.274)	(0.020)	(0.017)	(0.015)	(0.014)	(0.141)	(0.128)
Eligibility at ages 10-14	0.000	-0.000	-0.000	-0.001	-0.065	0.041	-0.018**	-0.015*	0.004	0.012	0.114	0.068
	(0.009)	(0.009)	(0.004)	(0.004)	(0.133)	(0.138)	(0.009)	(0.009)	(0.011)	(0.012)	(0.157)	(0.168)
Eligibility at ages 15-18	0.008	0.003	-0.003	-0.002	-0.140	-0.102	-0.000	-0.003	0.015	0.016	-0.072	-0.100
	(0.011)	(0.011)	(0.006)	(0.006)	(0.192)	(0.177)	(0.018)	(0.016)	(0.012)	(0.012)	(0.141)	(0.152)
State-birth year controls	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
N	95855		95901		39414		39414		40271		40087	

Notes: This table displays instrumental variable regression results using the 1998 to 2012 National Health Interview Survey. Robust standard errors clustered by state of birth are in parenthesis. All models include individual characteristics (sex, race, quadratic in age), survey year, state of birth, and year of birth fixed effects. When specified, additional control variables include demographic and economic characteristics by birth year and state of birth as described in the text. First stage is reported in Table 2. Significance levels: * = significant at the 10% level, ** = significant at the 5% level, *** = significant at the 1% level.

Figure 5. Instrumental Variables Estimates of the Effect of In Utero and Childhood Coverage on Adult Health, National Health Interview Survey



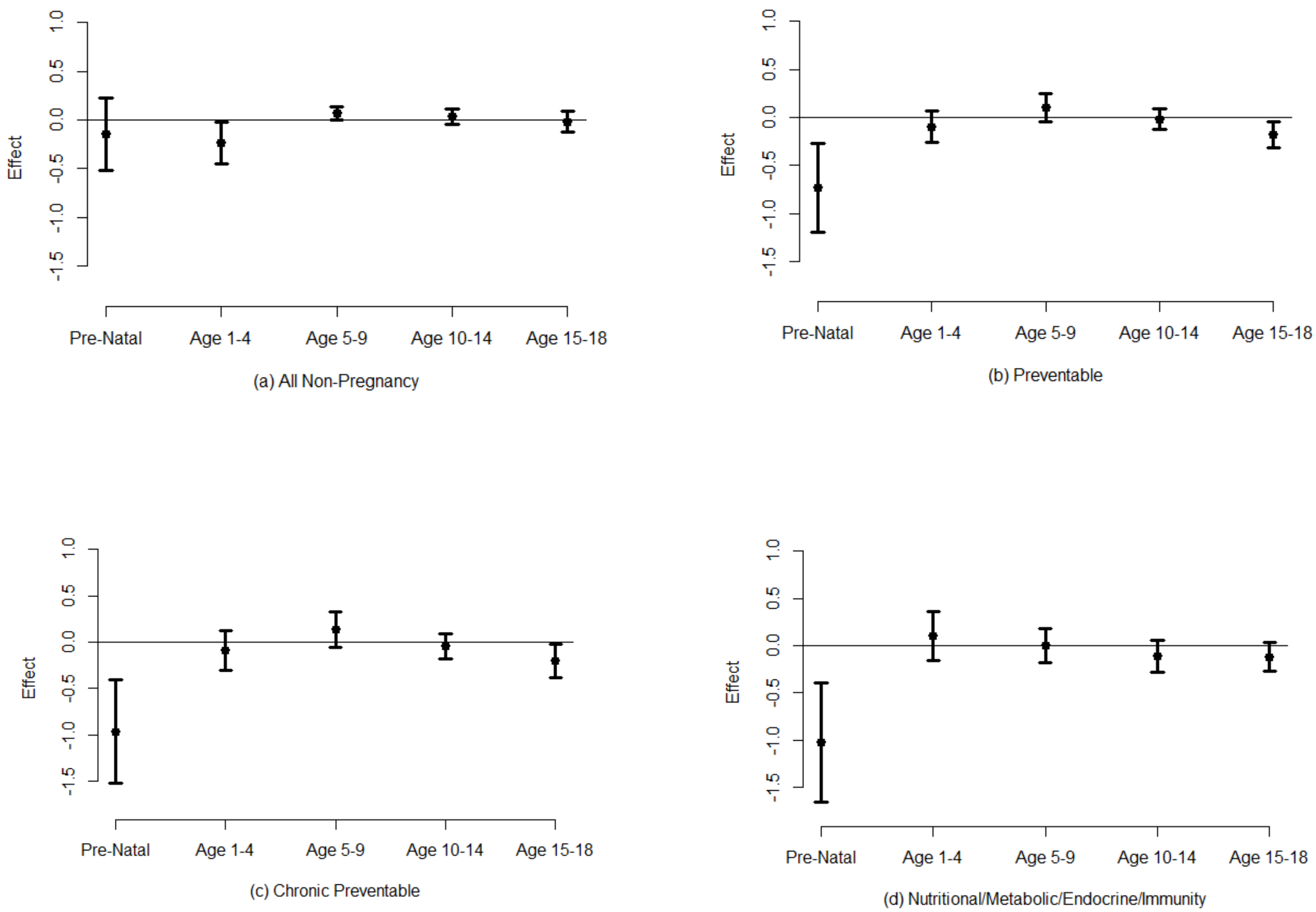
Notes: These figures present the coefficients from the instrumental variables estimates of equation (1). Horizontal line drawn at zero. These estimates are reported in Table 4; see Table 4 and the text for more details.

Table 5. Instrumental Variables Estimates of the Effect of In Utero and Childhood Coverage on Later Life Hospitalizations, Nationwide Inpatient Sample 1998-2011.

	All visits excluding those pregnancy		Preventable		Chronic preventable		Endocrine, nutritional and metabolic diseases, and immunity disorders	
Prenatal Eligibility	-0.147	-0.160	-0.732***	-0.700***	-0.968***	-0.882***	-1.026***	-0.831**
	(0.188)	(0.211)	(0.237)	(0.265)	(0.284)	(0.325)	(0.324)	(0.344)
Eligibility at ages 1-4	-0.241**	-0.267**	0.106	-0.098	-0.094	-0.092	0.102	0.101
	(0.109)	(0.126)	(0.081)	(0.209)	(0.109)	(0.113)	(0.132)	(0.131)
Eligibility at age 5-9	0.068**	0.075	0.101	0.126*	0.132	0.175**	-0.006	0.054
	(0.034)	(0.053)	(0.077)	(0.064)	(0.097)	(0.082)	(0.093)	(0.079)
Eligibility at ages 10-14	0.031	0.041	-0.023	-0.007	-0.046	-0.020	-0.117	-0.090
	(0.038)	(0.045)	(0.055)	(0.046)	(0.068)	(0.056)	(0.086)	(0.067)
Eligibility at age 15-18	-0.021	-0.012	-0.185***	-0.157*	-0.204**	-0.149	-0.120	-0.042
	(0.054)	(0.058)	(0.068)	(0.071)	(0.094)	(0.098)	(0.078)	(0.079)
State--birth cohort –year group observations	1860	1860	1685	1685	1625	1625	1580	1580
State-birth year control variables	No	Yes	No	Yes	No	Yes	No	Yes
States included	AK, AR, CA, CO, CT, FL, GA, HI, IA, IL, IN, KS, KY, LA, MA, MD, ME, MI, MN, MO, MS, MT, NC, ND, NE, NH, NJ, NM, NV, NY, OH, OK, OR, PA, RI, SC, SD, TN, TX, UT, VT, VA, WA, WI, WV, WY		AK, AR, CA, CO, CT, FL, GA, HI, IA, IL, IN, KS, KY, LA, MA, MD, ME, MI, MN, MO, MS, MT, NC, ND, NE, NH, NJ, NM, NV, NY, OH, OK, OR, PA, SC, SD, TN, TX, UT, VT, VA, WA, WI, WV, WY		AK, AR, CA, CO, CT, FL, GA, IA, IL, IN, KS, KY, LA, MA, MD, ME, MI, MN, MO, MS, MT, NC, ND, NE, NJ, NM, NV, NY, OH, OK, OR, PA, SC, TN, TX, UT, VT, VA, WA, WI, WV		AK, AR, CA, CO, CT, FL, GA, IA, IL, IN, KS, KY, LA, MA, MD, ME, MI, MN, MO, MS, MT, NC, ND, NE, NJ, NM, NV, NY, OH, OK, OR, PA, SC, SD, TN, TX, UT, VT, VA, WA, WI, WV	

Notes: This table displays instrumental variable regression results using the 1998 to 2011 Nationwide Inpatient Sample discharges excluding cases where the primary diagnosis is related to pregnancy or delivery. Robust standard errors clustered by state are in parentheses. Dependent variable is the log of the number of visits by category for each state-year group-birth cohort. States are excluded if there are zero discharges for any state-year group-birth cohort observation. All models include state by year group and birth year fixed effects. When specified, additional control variables are demographic characteristics of the state (age distribution, race, education, marital status), birth cohort size, unemployment rate, transfers per capita and personal income per capita in state and birth year. First stage is reported in Table 3. Significance levels: * = significant at the 10% level, **= significant at the 5% level, ***=significant at the 1% level. See text for more details.

Figure 6. Coefficients of Instrumental Variables Estimates, Nationwide Inpatient Sample 1998-2012



Notes: These figures present the coefficients from the instrumental variables estimates of equation (2). Horizontal line drawn at zero. These estimates are reported in Table 6; see Table 6 and the text for more details.

Appendix Tables

Table A.1. Federal Legislation Expanding Public Health Insurance Eligibility for Pregnant Women, Infants and Children

Year	Legislation	Date Effective	Mandatory Expansion	State Option
1984	Deficit Reduction Act, 1984 (DEFRA)	1-Oct-84	First-time pregnant women and those in two-parent families whose principal earner was unemployed, as well as children under age 5 born after September 30, 1983 whose families are income and resource eligible for AFDC	
1985	Consolidated Omnibus Budget Reconciliation Act, 1985 (COBRA)	1-Jul-86	Pregnant women whose families are income and resource eligible for AFDC	
1986	Omnibus Budget Reconciliation Act, 1986 (OBRA86)	1-Apr-87		Pregnant women and infants in families with incomes below 100% FPL
		1-Oct-87		Increase age level by 1 year each FY for all children under age 5 with incomes below 100% FPL
1987	Omnibus Budget Reconciliation Act, 1987 (OBRA87)	1-Jul-88		Pregnant women and infants in families with incomes below 185% FPL Children under age 2, 3, 4, or 5 and born after September 30, 1983 in families with incomes below 100% FPL
		1-Oct-88	Children under age 7 born after September 30, 1983 whose families are income and resource eligible for AFDC	Children under age 8 born after September 30, 1983 whose families are income and resource eligible for AFDC Children under age 8 born after September 30, 1983 with incomes below 100% FPL
1988	Medicare Catastrophic Coverage Act, 1988 (MCCA)	1-Jul-89	Pregnant women and infants in families with incomes below 75% FPL	
		1-Jul-90	Pregnant women and infants in families with incomes below 100% FPL	
1989	Omnibus Budget Reconciliation Act, 1989 (OBRA89)	1-Apr-90	Pregnant women and children under age 6 with family incomes below 133% FPL	
1990	Omnibus Budget Reconciliation Act, 1990 (OBRA90)	1-Jul-91	Children under age 19 born after September 30, 1983 with incomes below 100% FPL	
1996	Personal Responsibility and Work Opportunity Act of 1996 (PRWORA)	1-Jul-97	Established "Section 1931" family coverage category with minimum eligibility criteria based on 1996 AFDC eligibility standards	Families with children at higher income levels
1997	Balanced Budget Act (BBA)	5-Aug-97		Children under age 19 in families with incomes below 200% FPL or higher

Notes: Legislative history is compiled from Congressional Research Service (1988, 1993), Kaiser Family Foundation (2002), Currie and Gruber (1994), Gruber (2003), and Broaddus et al. (2001).

Table A.2. States Contributing to the Nationwide Inpatient Sample, by Year (excludes Arizona)

Year	States
1998	CA CO CT FL GA HI IL IA KS MD MA MO NJ NY OR PA SC TN UT WA WI
1999	CA CO CT FL GA HI IL IA KS MD MA ME MO NJ NY OR PA SC TN UT VA WA WI
2000	CA CO CT FL GA HI IL IA KS KY MD MA ME MO NC NJ NY OR PA SC TN TX UT VA WA WI WV
2001	AZ CA CO CT FL GA HI IL IA KS KY MD MA ME MI MN MO NC NE NJ NY OR PA RI SC TN TX UT VA VT WA WI WV
2002	CA CO CT FL GA HI IL IA KS KY MD MA ME MI MN MO NC NE NJ NY NV OH OR PA RI SC SD TN TX UT VA VT WA WI WV
2003	CA CO CT FL GA HI IL IN IA KS KY MD MA MI MN MO NC NE NH NJ NY NV OH OR PA RI SC SD TN TX UT VA VT WA WI WV
2004	AR CA CO CT FL GA HI IL IN IA KS KY MD MA MI MN MO NC NE NH NJ NY NV OH OR RI SC SD TN TX UT VA VT WA WI WV
2005	AR CA CO CT FL GA HI IL IN IA KS KY MD MA MI MN MO NC NE NH NJ NY NV OH OK OR RI SC SD TN TX UT VT WA WI WV
2006	AR CA CO CT FL GA HI IL IN IA KS KY MD MA MI MN MO NC NE NH NJ NY NV OH OK OR RI SC SD TN TX UT VA VT WA WI WV
2007	AR CA CO CT FL GA HI IL IN IA KS KY MD MA ME MI MN MO NC NE NH NJ NY NV OH OK OR RI SC SD TN TX UT VA VT WA WI WV WY
2008	AR CA CO CT FL GA HI IL IN IA KS LA KY MD MA ME MI MN MO NC NE NH NJ NY NV OH OK OR PA RI SC SD TN TX UT VA VT WA WI WV WY
2009	AR CA CO CT FL GA HI IL IN IA KS LA KY MD MA ME MI MN MO NT NC NE NH NJ NM NY NV OH OK OR PA RI SC SD TN TX UT VA VT WA WI WV WY
2010	AK AR CA CO CT FL GA HI IL IN IA KS LA KY MD MA ME MI MN MO MS MT NC NE NJ NM NY NV OH OK OR PA RI SC SD TN TX UT VA VT WA WI WV WY
2011	AK AR CA CO CT FL GA HI IL IN IA KS LA KY MD MA ME MI MN MO MS MT NC ND NE NJ NM NY NV OH OK OR PA RI SC SD TN TX UT VA VT WA WI WV WY

Notes: This table reports the states that contribute inpatient hospitalization data to the Nationwide Inpatient Sample during each year. This table excludes Arizona because it is not used in the analysis.

Table A.3. Instrumental Variables Estimates of the Effect of In Utero and Childhood Coverage on Self-Reported Adult Health, National Health Interview Survey 1998-2012, Including Eligibility in the First Year Separately

	Very good or excellent health	Any health limitations	BMI	Obesity	Chronic health conditions	Kessler 6 score
Prenatal eligibility	0.022	-0.009	-1.429	-0.102	-0.132	0.410
	(0.118)	(0.052)	(1.548)	(0.120)	(0.118)	(1.339)
Eligibility at age 0	0.034	0.034	0.020	-0.044	0.011	-1.394
	(0.107)	(0.067)	(1.748)	(0.132)	(0.162)	(1.464)
Eligibility at ages 1-4	-0.003	-0.010	-0.178	0.012	0.006	0.271
	(0.020)	(0.011)	(0.298)	(0.023)	(0.027)	(0.201)
Eligibility at ages 5-9	0.008	0.003	0.248	0.024	-0.020	0.117
	(0.013)	(0.007)	(0.253)	(0.016)	(0.015)	(0.138)
Eligibility at ages 10-14	0.001	0.001	0.057	-0.015*	0.012	0.006
	(0.009)	(0.004)	(0.141)	(0.009)	(0.013)	(0.164)
Eligibility at ages 15-18	0.003	-0.002	-0.112	-0.002	0.016	-0.091
	(0.011)	(0.006)	(0.171)	(0.016)	(0.012)	(0.164)
N	95855	95901	39414	39414	40271	40087

Notes: This table displays instrumental variable regression results using the 1998 to 2012 National Health Interview Survey. Robust standard errors clustered by state of birth are in parenthesis. All models include individual characteristics (sex, race, quadratic in age), survey year, state of birth, and year of birth fixed effects. Additional control variables include demographic and economic characteristics by birth year and state of birth as described in the text. First stage is reported in Table 2. Significance levels: * = significant at the 10% level, ** = significant at the 5% level, *** = significant at the 1% level.

Table A.4. Instrumental Variables Estimates of the Effect of In Utero and Childhood Coverage on Later Life Hospitalizations, Nationwide Inpatient Sample 1998-2011, Including Eligibility in First Year of Life Separately

	All visits excluding those pregnancy	Preventable	Chronic preventable	Endocrine, nutritional and metabolic diseases, and immunity disorders
Prenatal Eligibility	-0.556	-0.366	-0.652	-1.50***
	(0.379)	(0.564)	(0.741)	(0.512)
Eligibility at age 0	0.656	-0.483	-0.334	0.748
	(0.477)	(0.660)	(0.877)	(0.771)
Eligibility at ages 1-4	-0.314**	-0.053	-0.063	0.043
	(0.127)	(0.113)	(0.162)	(0.164)
Eligibility at age 5-9	0.063*	0.116*	0.167**	-0.013
	(0.035)	(0.058)	(0.079)	(0.091)
Eligibility at ages 10-14	0.072	-0.026	-0.034	-0.077
	(0.056)	(0.050)	(0.066)	(0.095)
Eligibility at age 15-18	0.001	-0.153**	-0.145	-0.118
	(0.070)	(0.065)	(0.093)	(0.079)
State-year-birth cohort observations	1860	1685	1625	1580
States included	AK, AR, CA, CO, CT, FL, GA, HI, IA, IL, IN, KS, KY, LA, MA, MD, ME, MI, MN, MO, MS, MT, NC, ND, NE, NH, NJ, NM, NV, NY, OH, OK, OR, PA, RI, SC, SD, TN, TX, UT, VT, VA, WA, WI, WV, WY	AK, AR, CA, CO, CT, FL, GA, IA, IL, IN, KS, KY, LA, MA, MD, MI, MN, MO, MS, NC, ND, NE, NJ, NM, NV, NY, OH, OK, OR, PA, SC, TN, TX, UT, VA, WA, WI, WV	AK, AR, CA, CO, CT, FL, GA, IA, IL, IN, KS, KY, LA, MA, MD, MI, MN, MO, MS, NC, ND, NJ, NM, NV, NY, OH, OK, PA, SC, TN, TX, VA, WA, WI	AK, AR, CA, CO, FL, GA, IA, IL, IN, KS, KY, LA, MA, MD, MI, MN, MO, MS, NC, ND, NJ, NM, NY, OH, OK, PA, SC, TN, TX, VA, WA, WI

Notes: This table displays instrumental variable regression results using the 1998 to 2011 Nationwide Inpatient Sample discharges excluding cases where the primary diagnosis is related to pregnancy or delivery. Robust standard errors clustered by state are in parentheses. Dependent variable is the log of the number of visits by category for each state-year-birth cohort. States are excluded if there are zero discharges for any state-year-birth cohort observation. All models include state by year and birth year fixed effects and additional controls variables: demographic characteristics of the state (age distribution, race, education, marital status), birth cohort size, unemployment rate, transfers per capita and personal income per capita in state and birth year. First stage is reported in Table 3. Significance levels: * = significant at the 10% level, **= significant at the 5% level, ***=significant at the 1% level. See text for more details.

Table A.5. Instrumental Variables Estimates of the Effect of In Utero and Childhood Coverage on Adult Health and Utilization, National Health Interview Survey 1998-2012, Including Adult Eligibility Measures

	Very good or excellent health	Any health limitations	BMI	Obesity	Chronic health conditions	Kessler 6 score
Prenatal eligibility	0.046	0.015	-1.530*	-0.141**	-0.141**	-0.646
	(0.060)	(0.025)	(0.869)	(0.059)	(0.059)	(0.691)
Eligibility at ages 1-4	0.003	-0.006	-0.184	0.008	0.008	0.231
	(0.019)	(0.008)	(0.273)	(0.023)	(0.023)	(0.177)
Eligibility at ages 5-9	0.009	0.003	0.249	0.022	0.022	0.052
	(0.014)	(0.007)	(0.272)	(0.017)	(0.017)	(0.129)
Eligibility at ages 10-14	-0.000	-0.001	0.042	-0.015*	-0.015*	0.064
	(0.009)	(0.004)	(0.138)	(0.009)	(0.009)	(0.165)
Eligibility at ages 15-18	0.003	-0.002	-0.107	-0.004	-0.004	-0.088
	(0.011)	(0.006)	(0.178)	(0.016)	(0.016)	(0.153)
Concurrent eligibility	0.011	0.004	-0.107	-0.011	-0.011	0.263**
	(0.011)	(0.004)	(0.177)	(0.014)	(0.014)	(0.104)
N	95852	95898	39413	39413	40270	40086

Notes: This table displays instrumental variable regression results using the 1998 to 2012 National Health Interview Survey. Robust standard errors clustered by state of birth are in parenthesis. All models include individual characteristics (sex, race, quadratic in age), survey year, state of birth, and year of birth fixed effects. Additional control variables include demographic and economic characteristics by birth year and state of birth as described in the text. First stage is reported in Table 2. Significance levels: * = significant at the 10% level, ** = significant at the 5% level, *** = significant at the 1% level.

Table A.6. Instrumental Variables Estimates of the Effect of In Utero and Childhood Coverage on Later Life Hospitalizations, Nationwide Inpatient Sample 1998-2011, Including Adult Eligibility Measures

	All visits excluding those pregnancy		Preventable		Chronic preventable		Endocrine, nutritional and metabolic diseases, and immunity disorders	
Pre-Natal/Neo-Natal	-0.117	-0.135	-0.728***	-0.695**	-0.966***	-0.882***	-0.979***	-0.790**
	(0.196)	(0.220)	(0.238)	(0.271)	(0.278)	(0.327)	(0.319)	(0.347)
Age 1-4	-0.256**	-0.278**	-0.108	-0.099	-0.955	-0.093	0.070	0.075
	(0.110)	(0.123)	(0.086)	(0.081)	(0.121)	(0.119)	(0.140)	(0.132)
Age 5-9	0.078**	0.084**	0.102	0.013	0.133	0.175**	0.011	0.071
	(0.036)	(0.036)	(0.071)	(0.057)	(0.087)	(0.072)	(0.092)	(0.079)
Age 10-14	0.030	0.038	-0.023	-0.001	-0.047	-0.020	-0.110	-0.086
	(0.037)	(0.043)	(0.055)	(0.045)	(0.068)	(0.056)	(0.085)	(0.065)
Age 15-18	-0.030	-0.025	-0.186***	-0.158**	-0.205**	-0.149	-0.136*	-0.06
	(0.048)	(0.053)	(0.065)	(0.067)	(0.091)	(0.094)	(0.080)	(0.08)
Concurrent eligibility	-0.119	-0.119	-0.011	-0.008	-0.009	-0.0002	-0.175	-0.174
	(0.106)	(0.109)	(0.160)	(0.165)	(0.221)	(0.0229)	(0.142)	(0.132)
State-birth year control variables	No	Yes	No	Yes	No	Yes	No	Yes
State-year-birth cohort observations	1860	1860	1685	1685	1625	1625	1580	1580
States included	AK, AR, CA, CO, CT, FL, GA, HI, IA, IL, IN, KS, KY, LA, MA, MD, ME, MI, MN, MO, MS, MT, NC, ND, NE, NH, NJ, NM, NV, NY, OH, OK, OR, PA, RI, SC, SD, TN, TX, UT, VT, VA, WA, WI, WV, WY		AK, AR, CA, CO, CT, FL, GA, IA, IL, IN, KS, KY, LA, MA, MD, MI, MN, MO, MS, NC, ND, NE, NJ, NM, NV, NY, OH, OK, OR, PA, SC, TN, TX, UT, VA, WA, WI, WV		AK, AR, CA, CO, CT, FL, GA, IA, IL, IN, KS, KY, LA, MA, MD, MI, MN, MO, MS, NC, ND, NJ, NM, NV, NY, OH, OK, PA, SC, TN, TX, VA, WA, WI		AK, AR, CA, CO, FL, GA, IA, IL, IN, KS, KY, LA, MA, MD, MI, MN, MO, MS, NC, ND, NJ, NM, NY, OH, OK, PA, SC, TN, TX, VA, WA, WI	

Notes: This table displays instrumental variable regression results using the 1998 to 2011 Nationwide Inpatient Sample discharges excluding cases where the primary diagnosis is related to pregnancy or delivery. Robust standard errors clustered by state are in parentheses. Dependent variable is the log of the number of visits by category for each state-year-birth cohort. States are excluded if there are zero discharges for any state-year-birth cohort observation. All models include state by year and age (year minus birth year) fixed effects. Area-level control variables are: demographic characteristics of the state (age distribution, race, education, marital status), birth cohort size, unemployment rate, transfers per capita and personal income per capita in state and birth year. First stage is reported in Table 3. Significance levels: * = significant at the 10% level, **= significant at the 5% level, ***=significant at the 1% level. See text for more details.

Table A.7. Instrumental Variables Estimates of the Effect of In Utero and Childhood Coverage on Adult Health and Utilization, National Health Interview Survey 1998-2012, with State-Specific Linear Trends

	Very good or excellent health	Any health limitations	BMI	Obesity	Chronic health conditions	Kessler 6 score
Prenatal eligibility	0.035	0.016	-1.852*	-0.150**	-0.154*	-1.195
	(0.067)	(0.025)	(1.106)	(0.072)	(0.088)	(0.814)
Eligibility at ages 1-4	0.002	-0.012	0.358	0.047	0.001	0.434*
	(0.019)	(0.011)	(0.479)	(0.029)	(0.031)	(0.235)
Eligibility at ages 5-9	0.025	0.005	0.432	0.024	-0.024	0.003
	(0.017)	(0.011)	(0.480)	(0.026)	(0.030)	(0.159)
Eligibility at ages 10-14	-0.001	0.010	0.193	-0.016	0.026	0.044
	(0.013)	(0.008)	(0.246)	(0.020)	(0.023)	(0.259)
Eligibility at ages 15-18	-0.010	0.010	-0.070	-0.008	0.037	0.077
	(0.022)	(0.009)	(0.323)	(0.027)	(0.029)	(0.187)
N	95852	95898	39413	39413	40270	40086

Notes: This table displays instrumental variable regression results using the 1998 to 2012 National Health Interview Survey. Robust standard errors clustered by state of birth are in parenthesis. All models include individual characteristics (sex, race, quadratic in age), survey year, state of birth, and year of birth fixed effects. Additional control variables include demographic and economic characteristics by birth year and state of birth as described in the text. First stage is reported in Table 2. Significance levels: * = significant at the 10% level, ** = significant at the 5% level, *** = significant at the 1% level.

Table A.8. Instrumental Variables Estimates of the Effect of In Utero and Childhood Coverage on Later Life Hospitalizations, Nationwide Inpatient Sample 1998-2011, with State-Specific Linear Trends

	All visits excluding those pregnancy	Preventable	Chronic preventable	Endocrine, nutritional and metabolic diseases, and immunity disorders
Pre-Natal/Neo-Natal	-0.094	-0.482**	-0.576*	-0.567
	(0.235)	(0.227)	(0.313)	(0.390)
Age 1-4	-0.262***	0.043	0.144	0.065
	(0.097)	(0.140)	(0.213)	(0.267)
Age 5-9	0.101	0.001	0.114	0.024
	(0.096)	(0.069)	(0.115)	(0.119)
Age 10-14	0.032	0.041	0.127	-0.049
	(0.055)	(0.068)	(0.083)	(0.094)
Age 15-18	-0.023	-0.080	-0.001	-0.017
	(0.058)	(0.077)	(0.107)	(0.133)
State-year-birth cohort observations	1860	1685	1625	1580
States included	AK, AR, CA, CO, CT, FL, GA, HI, IA, IL, IN, KS, KY, LA, MA, MD, ME, MI, MN, MO, MS, MT, NC, ND, NE, NH, NJ, NM, NV, NY, OH, OK, OR, PA, RI, SC, SD, TN, TX, UT, VT, VA, WA, WI, WV, WY	AK, AR, CA, CO, CT, FL, GA, IA, IL, IN, KS, KY, LA, MA, MD, MI, MN, MO, MS, NC, ND, NE, NJ, NM, NV, NY, OH, OK, OR, PA, SC, TN, TX, UT, VA, WA, WI, WV	AK, AR, CA, CO, CT, FL, GA, IA, IL, IN, KS, KY, LA, MA, MD, MI, MN, MO, MS, NC, ND, NJ, NM, NV, NY, OH, OK, PA, SC, TN, TX, VA, WA, WI	AK, AR, CA, CO, FL, GA, IA, IL, IN, KS, KY, LA, MA, MD, MI, MN, MO, MS, NC, ND, NJ, NM, NY, OH, OK, PA, SC, TN, TX, VA, WA, WI

Notes: This table displays instrumental variable regression results using the 1998 to 2011 Nationwide Inpatient Sample discharges excluding cases where the primary diagnosis is related to pregnancy or delivery. Robust standard errors clustered by state are in parentheses. Dependent variable is the log of the number of visits by category for each state-year-birth cohort. States are excluded if there are zero discharges for any state-year-birth cohort observation. All models include state by year and age (year minus birth year) fixed effects. Area-level control variables are: demographic characteristics of the state (age distribution, race, education, marital status), birth cohort size, unemployment rate, transfers per capita and personal income per capita in state and birth year. First stage is reported in Table 3. Significance levels: * = significant at the 10% level, **= significant at the 5% level, ***=significant at the 1% level. See text for more details.

Table A.9. Instrumental Variables Estimates of the Effect of In Utero and Childhood Coverage on Later Life Hospitalizations, Nationwide Inpatient Sample 1998-2011, Alternative Versions of NIS Admission Year Grouping

	All visits excluding those pregnancy		Preventable		Chronic preventable		Endocrine, nutritional and metabolic diseases, and immunity disorders	
Pre-Natal	-0.141	-0.258	-0.524**	-0.740**	-0.654*	-1.109***	-0.844*	-1.05**
	(0.128)	(0.324)	(0.214)	(0.349)	(0.398)	(0.377)	(0.466)	(0.471)
Age 1-4	-0.148***	-0.234*	-0.114**	0.013	-0.193	-0.017	-0.037	0.256*
	(0.042)	(0.122)	(0.046)	(0.085)	(0.081)	(0.106)	(0.114)	(0.149)
Age 5-10	0.038	0.061	0.031	-0.022	0.108**	0.190**	0.005	0.061
	(0.024)	(0.041)	(0.028)	(0.060)	(0.054)	(0.086)	(0.087)	(0.071)
Age 11-14	0.005	0.054	0.033	0.051	0.016	0.016	-0.033	-0.044
	(0.025)	(0.039)	(0.030)	(0.031)	(0.036)	(0.051)	(0.059)	(0.066)
Age 15-18	-0.026	-0.054	-0.069	-0.107*	-0.040	-0.166*	-0.036	-0.09
	(0.032)	(0.062)	(0.045)	(0.060)	(0.060)	(0.093)	(0.067)	(0.082)
Number of admission years grouped together	One	Three	One	Three	One	Three	One	Three
State-year-birth cohort observations	3383	1352	2853	1316	2493	1198	2317	1198

Notes: This table displays instrumental variable regression results using the 1998 to 2011 Nationwide Inpatient Sample discharges excluding cases where the primary diagnosis is related to pregnancy or delivery. Robust standard errors clustered by state are in parentheses. Dependent variable is the log of the number of visits by category for each state-year-birth cohort. States are excluded if there are zero discharges for any state-year-birth cohort observation. All models include state by year and birth year fixed effects and additional controls: demographic characteristics of the state (age distribution, race, education, marital status), birth cohort size, unemployment rate, transfers per capita and personal income per capita in state and birth year. First stage is reported in Table 3. Significance levels: * = significant at the 10% level, **= significant at the 5% level, ***=significant at the 1% level. See text for more details.

Table A.10. Method to Assign Birth Year using Age and Admission Quarter in the Nationwide Inpatient Sample.

Admitted to the Hospital in Quarter 1 (Jan-Mar)	
Probability of Birth Year=Admission Year – Age conditional on quarter of birth	*Probability that Birth Year=Admission Year-Age*
P(Birth Year=Admission Year – Age | Born in Q1)=0.50 P(Birth Year=Admission Year – Age | Born in Q2)=0.00 P(Birth Year=Admission Year – Age | Born in Q3)=0.00 P(Birth Year=Admission Year – Age | Born in Q4)=0.00	P(Birth Year = Admission Year – Age) = 0.25*0.50+0.25*0.00+0.25*0.00+0.25*0.00=0.125
Admitted to the Hospital in Quarter 2 (Apr-Jun)	
Probability that Birth Year=Admission Year-Age conditional on quarter of birth	*Probability that Birth Year=Admission Year-Age*
P(Birth Year=Admission Year – Age | Born in Q1)=1.00 P(Birth Year=Admission Year – Age | Born in Q2)=0.50 P(Birth Year=Admission Year – Age | Born in Q3)=0.00 P(Birth Year=Admission Year – Age | Born in Q4)=0.00	P(Birth Year=Admission Year – Age) = 0.25*1+0.25*0.50+0.25*0.00+0.25*0.00=0.375
Admitted to the Hospital in Quarter 3 (Jul-Sep)	
Probability that Birth Year=Admission Year-Age conditional on quarter of birth	*Probability that Birth Year=Admission Year-Age*
P(Birth Year=Admission Year – Age | Born in Q1) = 1.00 P(Birth Year=Admission Year – Age | Born in Q2) = 1.00 P(Birth Year=Admission Year – Age | Born in Q3)=0.50 P(Birth Year=Admission Year – Age | Born in Q4)=0.00	P(Birth Year=Admission Year – Age) = 0.25*1+0.25*1+0.25*0.50+0.25*0.00=0.625
Admitted to the Hospital in Quarter 4 (Oct-Dec)	
Probability that Birth Year=Admission Year-Age conditional on quarter of birth	*Probability that Birth Year=Admission Year – Age*
P(Birth Year=Admission Year – Age | Born in Q1) = 1.00 P(Birth Year=Admission Year – Age | Born in Q2) = 1.00 P(Birth Year=Admission Year – Age | Born in Q3)=1.00 P(Birth Year=Admission Year – Age | Born in Q4)=0.50	P(Birth Year=Admission Year-Age) = 0.25*1+0.25*1+0.25*1+0.25*0.50=0.875

Notes: Table describes the procedure of assigning probabilities to birth year based on the hospital admission quarter and the age of the patient at admission. See Appendix Section C. for more details.

APPENDIX

A. Public Health Insurance Eligibility for Pregnant Women and Children

Additional details on the federal legislation that expanded public health insurance eligibility for pregnant women and children may be found in Appendix Table 1.

As discussed in the paper, expansions for both groups served to delink public health insurance eligibility from participation in the Aid to Families with Dependent Children (AFDC) program. New rules extended Medicaid eligibility to pregnant women and children who met the financial standards for the AFDC program regardless of their family structure or participation in the program. These were followed by expansions in eligibility for pregnant women and children in families with incomes that exceeded the AFDC eligibility thresholds (i.e. "poverty-related" expansions).

To estimate Medicaid eligibility for pregnant women and children in the U.S., we use detailed eligibility rules compiled by state and year for under AFDC qualifying criteria, state Ribicoff rules and Medically Needy programs, and federal and state Medicaid expansions for the years prior to welfare reform. For 1997 forward, eligibility is calculated under the post-welfare reform eligibility rules for Medicaid family coverage ("Section 1931" eligibility), as well as under continuing state Medicaid expansions and new separate state programs funded by the Children's Health Insurance Program (CHIP). Additional details on the sources used to calculate eligibility for each of these pathways is provided below.

Eligibility is estimated using the date of the eligibility determination, child age, and family characteristics, including family structure, income, and information on parental employment.

Source Information for Eligibility Rules

For the years 1979 to 1996, Medicaid eligibility is calculated under the eligibility rules for the AFDC and the AFDC-Unemployed Parents (AFDC-UP) programs, optional state programs (e.g. Ribicoff children, Medically Needy), and poverty-related expansions for pregnant women and children. For the years 1997 to 2012, public eligibility under Medicaid and CHIP are calculated under the rules for Medicaid Section 1931 eligibility, poverty-related Medicaid expansions and additional Medicaid expansions or new state programs under CHIP.

AFDC and AFDC-UP program parameters for 1979-1996 were provided by the Urban Institute through their Transfer Income Model, version 3 (TRIM3), which may be accessed at http://trim3.urban.org/T3Welcome.php. Using these parameters, we were able to calculate whether a family was eligible for either program based on state rules, monthly total family income and family size.

Optional state programs include Ribicoff children, under which children may meet the financial standards for AFDC but do not qualify on the basis of family structure. Information on Ribicoff children programs for 1988 forward were drawn from materials provided by Bruce Meyer and used in Meyer and Rosenbaum (2001). Rules for earlier years were drawn from the TRIM3 model, as well as from the 1983 Health Care Financing Administration (HCFA)'s *Analysis of State Medicaid Program Characteristics* report. In addition, state rules regarding coverage of unborn children under Ribicoff programs, which meant coverage of pregnant women whose income qualified them for AFDC, were taken from the 1983 HCFA report as well.

General information on state options for Medicaid coverage for pregnant women prior to 1985 was drawn from the Appendix in Currie and Gruber (1994). Detailed information on states exercising options under AFDC to cover women with a first-time pregnancy, options under AFDC-UP to cover pregnant women in a two-parent family where the principal earner is unemployed, and later to provide pregnant women not yet qualifying for AFDC benefits with Medicaid were taken from the sources below.

- 1978-1981 *Characteristics of State Plans for Aid to Families with Dependent Children* reports published by the Department of Health and Human Services
- Hill IT. *Broadening Medicaid Coverage of Pregnant Women and Children*. Washington, DC: National Governors' Association; 1987.

State Medically Needy thresholds were drawn from TRIM3, Hill (1987), and the 1981, 1983, 1984, and 1986 *Medicare and Medicaid Data Books* issued by the Health Care Financing Administration.

Finally, information on federally mandated changes in eligibility were collected from a variety of sources (see Appendix Table 1). Information on expansions in eligibility by state, including the population targeted, implementation date, and income cutoffs under the poverty-related Medicaid - and later CHIP-related expansions - were compiled from the sources below. Income disregard rules by state and year were downloaded from the Urban Institute's TRIM3 database.

- Maternal and Child Update, National Governors Association: 9/97, 9/98, 2/99, 1/00, 2/01, 2/02, 2/03, 9/06, 11/08, and 1/11, accessed here: http://www.nga.org/cms/home/nga-center-for-best-practices/center-publications/page-health-publications/col2-content/main-content-list/maternal-and-child-health-mch-up.html
- Enrollment Increases in State CHIP Programs: December 1998 to June 1999, prepared by Vernon K. Smith at Health Management Associates for the Kaiser Commission on Medicaid and the Uninsured, July 30, 1999
- *Implementation of the State Children's Health Insurance Program: Momentum is Increasing After a Modest Start: First Annual Report*, January 2001 report prepared by Mathematica Policy Research, Inc. by Rosenbach, et al.
- Kaiser Commission on Medicaid and the Uninsured (mostly) annual surveys of state Medicaid/CHIP programs beginning in 2000: available for years 2000, 2002, 2003-2009, and 2011-2012 at http://www.kff.org/medicaid/50StateSurvey.cfm

B. Public Health Insurance Eligibility for Adults

When examining public health insurance eligibility for adults, we consider eligibility for low-income parents under Medicaid Section 1931 criteria in each state, as well as expanded eligibility for health care coverage for parents and childless adults under both waiver and state-funded programs. Information on state eligibility thresholds for coverage for adults for the years 1998-2012 were compiled from the sources listed below.

Federal law for family coverage under Section 1931 requires that states disregard at least $90 of earned income per month when assessing Medicaid eligibility (Birnbaum 2000). In 2000, most states were using this minimum earnings disregard in eligibility determinations (Broaddus et al. 2001). Therefore, we chose to apply this rule for all states.

- Maternal and Child Update, National Governors Association: 2002 through 2010 reports, accessed here: http://www.nga.org/cms/home/nga-center-for-best-practices/center-publications/page-health-publications/col2-content/main-content-list/maternal-and-child-health-mch-up.html
- Kaiser Commission on Medicaid and the Uninsured annual surveys of state Medicaid/CHIP programs: 2002-2005, 2007-2009, and 2011-2012 reports, accessed here: http://www.kff.org/medicaid/50StateSurvey.cfm
- Broaddus M, Blaney S, Dude A, Guyer J, Ku L, Peterson J. *Expanding Family Coverage: States' Medicaid Eligibility Policies for Working Families in the Year 2000*. Washington, DC: Center on Budget and Policy Priorities; 2001.
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- Hearne J. *Medicaid Eligibility for Adults and Children*. Washington, DC: Congressional Research Service, The Library of Congress; 2005.
- Indiana Legislative Services Agency. *The Healthy Indiana Plan and Health Coverage of Childless Adults Across the States*. Indianapolis, IN: Health Finance Committee, Indiana Legislative Services Agency; 2011.
- National Conference of State Legislatures. State Health Programs to Covered the Uninsured, 2009-10. 2010. Available at: http://www.ncsl.org/research/health/state-health-programs-to-cover-the-uninsured-2009.aspx. Accessed May 19, 2014.
- National Conference of State Legislatures. Using Medicaid Dollars to Cover the Uninsured: States Use of Medicaid Dollars to Cover the Uninsured. 2009.
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C. Assignment of Birth Year in Nationwide Inpatient Sample

In the NIS, we observe the age of a patient and the date that he or she is admitted to the hospital, but not the patient's birth year. In order to merge NIS data with information on eligibility by birth year cohort, we assign birth year probabilistically to each patient using a method similar to the one described in Rotz (2012). If we observe a patient age A in admission year Y, the patient was either born in Y-A (if the patient's birthday is prior to the admission date) or Y-A-1 (if the patient's birthday is after the admission date). Patients who are observed earlier in the year are more likely to have been born in Y-A-1, whereas patients observed later in the year are more likely to have been born in Y-A. Assuming that the probability of being born in any specific quarter is 0.25, we can assign the probability of being born in Y-A using the age at admission and the date of admission. These calculations are described in Table A.8. Conditioning on age at admission and admission quarter, we randomly assign a patient to birth year Y-A with the probabilities listed in this table, and birth year Y-A-1 with 1 minus these probabilities.

D. Additional References

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