The Impact of Access to Prenatal Health Insurance on Child Health: Evidence from the Children's Health Insurance Program Unborn Child Option*

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Abstract

There has been a lack of evidence on the causal impact of *in utero* public health insurance on child health beyond the neonatal period, mainly due to difficulties in disentangling the effect of *in utero* coverage from that of early childhood coverage. The implementation of the Unborn Child Option (UCO) as part of the Children's Health Insurance Program (CHIP) provides a unique opportunity to isolate the causal effects of prenatal coverage on child health beyond the neonatal period. This federal reform allowed pregnant noncitizens to obtain public health insurance for prenatal care. Prior to the reform, the majority of pregnant noncitizens were ineligible for public health insurance, but their children were eligible for insurance regardless of the reform because they were U.S. citizens upon birth. Using state-level variation in whether and when the UCO was adopted, I find that female noncitizens of childbearing age experienced an increase in public health insurance coverage, number of doctor's office visits, and a reduction in the incidence of feeling depressed, providing suggestive evidence on a possible mechanism. For child health and development outcomes, the reform caused improvement in parent-reported health status and cognitive ability among children at ages four to six.

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1 Introduction

The literature in various fields has shown that the prenatal environment is critical to the subsequent health trajectory experienced by an individual (Almond and Mazumder, 2011; Almond and Currie, 2011; Barker, 1992; Gluckman and Hanson, 2004). Given the importance of the fetal environment, the U.S. government provides public health insurance for the prenatal care of low-income pregnant women. However, there is surprisingly little evidence of the causal impact of *in utero* public health insurance on subsequent child health beyond the neonatal period. There are two reasons for this.

First, it has been difficult to isolate the effect of *in utero* health insurance coverage from the effect of early childhood coverage because the two types of coverage are almost always combined in a given public health insurance plan. For instance, Medicaid, the largest public health insurance program for the low-income population, provides coverage for both children and pregnant women; low-income children can receive both *in utero* and early childhood coverage through Medicaid. Even the large Medicaid expansion in the late 1980s and early 1990s increased coverage for both children and pregnant women. To expedite the enrollment of newborns, Medicaid allows the newborn to be deemed automatically eligible until age one if the mother was enrolled in Medicaid at the date of the child's birth. These features have made it difficult for researchers to use Medicaid reforms in quasi-experimental research designs to estimate the effects of obtaining *in utero* health insurance coverage, holding childhood coverage fixed.

Second, data limitations have also made it difficult to follow children over long enough periods of time to observe subsequent health *beyond* birth outcomes.[1] Most previous literature has focused on birth outcomes using the Vital Statistics data, for which state of birth is available (Currie and Grogger, 2002; Currie and Gruber, 1996; Dubay et al., 2001; Sonchak, 2015).[2] However, the fetal environment affects the developmental trajectory of health above and beyond the impact on birth weight so it is important to examine child health beyond birth outcomes (Almond and Currie, 2011; Hoynes et al., 2016). As far as I know, there are only two studies that explored the effects of early-life public health insurance on long-run health, but these recent papers, using Medicaid reforms as quasi-experimental settings, do not disentangle the causal effects of *in utero* coverage from postnatal or early childhood coverage (Boudreaux et al., 2016; Miller and Wherry,

[1]Publicly accessible survey data rarely include both children's health-related variables (i.e., chronic/temporary diseases, health status, and cognitive development) and state-level geographic identifiers (i.e., state of residence and state of birth); these are essential for studying the causal effect of prenatal coverage on child health beyond birth outcomes when using state variations derived from policy changes.

[2]The existing literature has found mixed results on the effects of prenatal insurance on birth outcomes. Currie and Gruber (1996) showed that a 30-percentage-point increase in Medicaid eligibility caused reductions in infant mortality and the incidence of low birth weight of 8.5 and 1.9 percent, respectively. Likewise, Currie and Grogger (2002) found that an increase in prenatal care caused by policy changes had no significant effect on the frequency of low birth weight, but affected the rate of fetal death. Dubay et al. (2001) also showed that Medicaid expansion decreased the rate of late initiation of prenatal care, while overall no change is found in the rate of low birth weight. More recently, Sonchak (2015) found that an increase in the Medicaid reimbursement rate was associated with a higher number of antenatal care visits by pregnant women, but showed little evidence of an increase in birth weight.

2017).[3]

In an attempt to fill this gap in the literature, this paper takes advantage of a public health policy reform in the U.S. that provided public health insurance for unborn children of pregnant noncitizens who would not have had access to such coverage in the absence of the reform.[4] Upon birth, the children of these women would have been U.S. citizens and so automatically eligible for public health insurance. Critical to the identification strategy used in this paper, this was true both before and after the reform of interest. Thus, the only thing changed by the reform for U.S.-born children of noncitizen mothers was access to *in utero* public health insurance. This provides a unique opportunity to evaluate the impact of *in utero* public health insurance coverage on subsequent child health beyond the neonatal period.

This paper makes three key contributions. First, I am able to isolate the effects of *in utero* health insurance coverage, holding constant early childhood coverage, on child health beyond birth outcomes. In 2002, the Department of Health and Human Services (HHS) added "fetus" to the definition of the term "child" in the Children's Health Insurance Program (CHIP). Under this so-called Unborn Child Option (UCO), a previously ineligible pregnant woman could receive public health insurance for her unborn child, who would be a U.S. citizen and so eligible for public health insurance after birth. Thus, implementation of the UCO affected U.S.-born children of noncitizens only in terms of *in utero* insurance coverage, not after birth.

Second, I focus on the effects on child health *beyond* the neonatal period. The National Health Interview Survey (NHIS) include individual-level information on children's health indicators beyond birth outcomes, which allows for analysis of children's health up to age six. Ideally, I would like to analyze the effects on adult health outcomes, but the reform is too recent to make this feasible.[5] To link a child back to *in utero* eligibility generated from a policy-based quasi-experimental setting, I use variables that can identify children's state and year of birth, and mothers' citizenship status.

Third, I provide suggestive evidence on a specific mechanism through which *in utero* public health insurance affects child health beyond the neonatal period: increased number of prenatal care visits and improved mental health of mothers. According to the previous literature, public health insurance can encourage pregnant women to get more prenatal care and this may cause the improvement in mothers' mental health, health behaviors, and intake of healthy food and key nutrients (Currie and Grogger, 2002;

[3]A few recent papers have examined the effects of early-life public health insurance on long-run health. Boudreaux et al. (2016) found that cohorts who gained exposure to the Medicaid program between conception and age six had better health at ages 25–54, as measured by a composite index measure of chronic health conditions. Miller and Wherry (2017) showed that cohorts whose mothers had higher eligibility rates for prenatal coverage had better health outcomes, higher educational attainments, and less healthcare utilization related to preventable health conditions in adulthood. However, these recent papers do not disentangle the causal effects of *in utero* intervention from postnatal or early life intervention.

[4]Access to public health insurance programs has been restrictive for pregnant noncitizens, particularly recent migrants and the undocumented, since the 1996 welfare reform.

[5]The last treatment year is 2008, and I only have access to the restricted-version of the 1998–2014 NHIS.

Finkelstein et al., 2012; Miller and Wherry, 2017; Williams et al., 2002).[6] These changes can subsequently affect children's chronic health condition and cognitive development (Aizer et al., 2016; Bublitz et al., 2012; Karp et al., 1995; Prado et al., 2012, 2017). Using available variables in the NHIS, I test the relationship between the implementation of UCO and mothers' mental health and health behaviors.[7] Although the estimates have low statistical power, I found some evidence that the UCO improved mental health, while no change is detected in health behaviors.[8] I cannot directly link these changes to subsequent child outcomes, so the evidence is only suggestive.

States were allowed to choose whether to adopt the UCO, and 14 states took up the option as of 2012.[9] I utilize this cross-state variation in when and where the UCO was implemented to conduct a flexible event-study analysis (Bailey and Goodman-Bacon, 2015; Jacobson et al., 1993). The key identifying assumption of this approach is that whether and when a state implemented the UCO is uncorrelated with unobserved state-level determinants of children's health. I test this assumption in various ways, and all test results support the identification strategy. For instance, I confirm that neither pre-reform child health status nor the number of undocumented immigrants as a share of total residents in each state correlates with the timing of the UCO. Also, I verify that there are no differential shocks in the influx of immigrants or naturalization rate between treatment and control states at the implementation of the UCO. Lastly, I make sure that the UCO did not coincide with any other public health policies for fetuses or children, thus verifying that other public policies are unlikely to confound the identification strategy.[10]

The analysis has three parts. First, I estimate the effects of the UCO on the public health insurance coverage of female noncitizens using the NHIS. If there is no impact on public health insurance, any effects on child health would likely be spurious. I do not restrict the sample to pregnant women, but rather use a sample of low-educated female noncitizens between the ages of 22 and 45 regardless of pregnancy status.[11] My results show that the UCO increases female noncitizens' public health insurance coverage, specifically

[6]Mother's mental health could be improved without the interaction with doctors, because holding health insurance itself may relieve the stress and concerns of expectant mothers.

[7]I use two indicators of maternal mental health found in the NHIS: the Kessler Psychological Distress Scale (K6), and the incidence of feeling sad, hopeless, or worthless at least some of the time during the past 30 days. For health behaviors, I use the variables on smoking now and number of alcoholic beverages per day.

[8]This is consistent with the findings in Dave et al. (2018), showing that expanded public health insurance does not always induce better health behaviors of mothers.

[9]I do not consider the Unborn Child Option implementation after 2012. States where the UCO was implemented up to 2012: AR, CA, IL, LA, MA, MI, MN, OK, OR, RI, TN, TX, WA, WI. Sources: [Covering Pregnant Women: CHIPRA Offers a New Option], (Families USA, [July 2010]), `familiesusa.org/sites/default/files/product_documents/Covering-Pregnant-Women.pdf`, [CHIP Coverage for Pregnant Women], (March of Dimes, [Oct. 2013]), `https://www.marchofdimes.org/materials/chip-coverage-for-pregnant-women-may-2014.pdf`

[10]The tests are explained in detail in Section 6.

[11]There are two reasons for this: first, the variable *"pregnant now"* is available in the "Sample Adult" file in the NHIS, which includes one sample adult for each family. If I restrict the sample to those who responded *"Yes"* to the *"pregnant now,"* variable, it drops not only non-pregnant women but also pregnant women who are not selected as a sample adult. Thus, the estimates may result in a small sample size. Second, the NHIS questions on healthcare utilization refer to the previous 12 months, while the pregnancy variable refers to current status. If I confine the sample to *currently* pregnant women, this will detect changes during the year preceding pregnancy rather than during pregnancy itself. Therefore, I use a sample of low-educated female noncitizens between the ages of 22 and 45 regardless of pregnancy status.

in CHIP and State/Other public health insurance categories, by 3.7 percentage points. The entire increase can be accounted for by the corresponding decrease in the uninsured rate, indicating that there is on net no substitution away from private health insurance. My sample is larger than the eligible group, so I translate the estimates into intent-to-treat impact to consider their magnitudes. Under the assumption that the entire 3.7-percentage-point increase in public health insurance is due to take-up by eligible pregnant women, and using the fact that on average 10.23%[12] of this population was pregnant at a given survey date, the estimated intent-to-treat (ITT) impact of the UCO on public health insurance coverage among the pregnant subsample is a 36-percentage-point increase (0.037/0.102).

The second part of the analysis focuses on the effect on healthcare utilization of female noncitizens using the NHIS. The estimates indicate that the UCO caused an increase of 0.48 in the annual frequency of doctor's office visits.[13] Based on the assumption described above, the intent-to-treat (ITT) impact on the yearly number of doctor visits for pregnant noncitizens is 4.7 visits (0.48/0.102). As the UCO provides coverage only for "pregnancy-related care", any changes in the number of doctor's office visits are likely to be for prenatal care.[14] Compared to the pre-reform mean of 2.53 visits, the additional 4.7 visits bring pregnant women closer to the standard recommendation of 13–14 prenatal care visits, implying that the UCO encouraged pregnant women to receive the appropriate level of prenatal care.[15]

Third, I estimate the effects of the UCO on children's health and development outcomes beyond the neonatal period. Children between the ages of four and six whose mothers became eligible for the UCO when the children were *in utero* experienced a rise in parent-reported overall health status by 0.180 on a five-point scale, a roughly 7% increase compared to the pre-reform mean of 4.07.[16] I also use American Community Survey (ACS) data to examine the effects of the reform on cognitive difficulties with learning or concentrating due to a physical, mental, or emotional condition. The existence of a cognitive difficulty decreased by 0.8 percentage points among 5–6 years old children, which is a 42% reduction relative to the mean of 1.9%. To sum up, children who were eligible for the UCO *in utero* had better health conditions and fewer cognitive difficulties at ages 4–6 while no improvements are shown at earlier ages. There exist several

[12] Using the ACS 2001–2013, I use a variable asking "whether the respondent had given birth to any children in the past 12 months", and calculate the weighted mean of fertility rate among low-educated female noncitizens aged 22–45 as a proxy for pregnancy rate.

[13] Specifically, the exact questionnaire I use is "During the past 12 months, how many times have you seen a doctor or other healthcare professional about your own health at a doctor's office, a clinic, or some other place? Do not include times you were hospitalized overnight, visits to hospital emergency rooms, dental visits, or telephone calls".

[14] The UCO provides insurance coverage for pregnant women but only for "pregnancy-related care", which is to say, only for care related to the health of the fetus rather than the woman's own health. Each state defines "pregnancy-related" services in a different way, but most treatment states cover regular prenatal check-ups, prescription drug services, disease management for pre-existing conditions, mental health services, emergency services, or dental benefits. See Table A2 for more details.

[15] Typically, routine checkups occur once each month for weeks four through 28, twice a month for weeks 28 through 36, and weekly for weeks 36 to birth. Women with high-risk pregnancies need to see their doctors more often. *Source:* [Office on Women's Health, U.S. Department of Health & Human Services], https://www.womenshealth.gov/pregnancy/youre-pregnant-now-what/prenatal-care-and-tests

[16] Parent-reported general health status is a five-point scale indicator, with 1 being the lowest and 5 the highest. (Poor=1, Fair=2, Good=3, Very good=4, Excellent=5)

underlying mechanisms how *in utero* public health insurance can affect children's health and development outcomes *beyond* the neonatal period (Aizer et al., 2016; Bublitz et al., 2012; Eidelman and Schanler, 2012; Karp et al., 1995; Prado et al., 2012, 2017). Notably, Aizer et al. (2016) showed that increased *in utero* levels of the stress hormone negatively affect children's cognition and health at age seven, even after controlling for birth weight. Consistent with this literature, I provide a empirical, suggestive evidence on one possible mechanism: the UCO may improve maternal mental health and subsequently affect children's health and development beyond birth outcomes.

Health and developmental problems in early childhood may result in long-lasting health problems and low labor market productivity for an individual's entire life (Bleakley, 2010; Case et al., 2005; Reyes, 2007). Thus, the results in this paper imply that offering public health insurance to disadvantaged pregnant women is an important element of policies aimed at improving children's health and future economic productivity in the U.S. To consider policy implications, I conduct a cost-benefit analysis of the UCO and find that the UCO produces a net societal benefit of $1 billion and a social rate of return of 43%, even when I do not account for the fact that the improved child outcomes persist over time.

This paper is organized as follows. Section 2 provides background on the Children's Health Insurance Program, Medicaid, and the enactment of the Unborn Child Option, as well as the alternative sources of health insurance potentially available to the population of interest. It provides details on the classification of states into treatment, control, and not utilized groups. Also, Section 2 explains the underlying mechanisms of how prenatal insurance may improve children's health. Section 3 describes the data and key variables used in this study. Section 4 presents empirical strategies, and Section 5 shows the primary results. Section 6 presents various validity tests for key identifying assumptions, potential threats, and the cost-benefit analysis. Lastly, Section 7 concludes the paper.

2 Background

2.1 The Children's Health Insurance Program (CHIP), Medicaid, and the Enactment of the Unborn Child Option

The majority of low income U.S. citizens, children, and pregnant women receive health insurance through Medicaid, which is a joint federal and state program that assists with medical costs for people with limited income and resources. In 2018, two-thirds of states covered pregnant women and infants with income up to 200% of the Federal Poverty Line (FPL), and one-third of states covered those with income up to 138% of the FPL. States have slightly lower limits of income eligibility for children between the ages of 1 and 18.

Initiated in 1997, the Children's Health Insurance Program (CHIP) grants federal matching funds to states to provide public health insurance for children who are ineligible for Medicaid because their family income exceeds the income eligibility limit, but do not have private health insurance. In 2018, most states offered CHIP coverage to children with incomes at or below 200% of the FPL.[17]

A key point to note about these programs is their different treatment of citizens and noncitizens. For noncitizens, the Personal Responsibility and Work Opportunity Reconciliation Act of 1996 (PRWORA) restricted the use of federal funds to provide public health insurance for noncitizens during their first five years in the U.S.[18] Some states did not offer public health insurance for noncitizens even after the five years.[19] However, a limited number of states employed state funds to offer public health insurance to noncitizen residents, especially for pregnant women. This occurred through four programs and Figure 1 presents them in a timeline. First, under Section 1115 of the Social Security Act in 2000, states were allowed to apply for waivers to federal CHIP law and provide comprehensive public health benefits to pregnant women who would otherwise be ineligible for public health insurance. However, only six states covered pregnant noncitizens under these waivers because the funding is capped and states were required to prioritize coverage for children over adults.[20] Figure 1 shows these six states under the "Section 1115 Waiver" arrow. Second, seventeen states had provided state-funded Medicaid to pregnant noncitizens since 1997; Figure 1 presents these 17 states under the "State-funded Medicaid" arrow.[21] Third, the Children's Health Insurance Program Reauthorization Act of 2009 (CHIPRA) enabled states to get federal matching funds to provide lawfully residing children and expectant mothers with Medicaid and CHIP coverage regardless of their date of entry, officially lifting the five-year bar imposed by PRWORA. Twenty states opted in to the new option; Figure 1 displays these 20 states under the "CHIPRA New Option" arrow.[22] All of these three policies

[17]Source: [Tricia Brooks, Karina Wagnerman, Samantha Artiga, Elizabeth Cornachione], [Medicaid and CHIP Eligibility, Enrollment, Renewal, and Cost-Sharing Policies as of January 2018: Findings from a 50-State Survey], (Georgetown University Center for Children and Families, The Henry J. Kaiser Family Foundation, [March, 2018]), http://files.kff.org/attachment/Report-Medicaid-and-CHIP-Eligibility-Enrollment-Renewal-and-Cost-Sharing-Policies-as-of-January-2018, last accessed on September 2018.

[18]Two studies examined the impact of Medicaid eligibility contraction due to the PRWORA on pregnant immigrants' prenatal care utilization and infant health. Royer (2005) found a decrease in prenatal care utilization among Hispanic women of low socioeconomic status while Joyce et al. (2001) showed no evidence that PRWORA had any substantial impact on the healthcare utilization of Hispanic immigrants. Both papers found no impact on birth outcomes.

[19][National Immigrant Womens Advocacy Project (NIWAP, pronounced newapp)], (American University, Washington College of Law, [July 2012]), http://library.niwap.org/wp-content/uploads/2015/pdf/PB-Chart-MedicalAssistanceProgramsState-11.28.14.pdf

[20]CO, ID, NV, NJ, RI, VA (6 states) (*Source:* [Covering Pregnant Women: CHIPRA Offers a New Option], (Families USA, [July 2010]), familiesusa.org/sites/default/files/product_documents/Covering-Pregnant-Women.pdf, last accessed on June 2018

[21]CA, CO, CT, DC, DE, HI, IL, MA, MD, MN, ME, NJ, NY, PA, RI, NE, WA (16 states and District of Columbia) *Source:* [New Option for States to Provide Federally Funded Medicaid and CHIP Coverage to Additional Immigrant Children and Pregnant Women], (The Kaiser Family Foundation, [July 2009]), https://kaiserfamilyfoundation.files.wordpress.com/2013/01/7933.pdf

[22]*Sources:* [Expanding Coverage for Recent Immigrants: CHIPRA Gives States New Options], (Families USA, [August 2010]), research.policyarchive.org/96110.pdf, last accessed on June 2018, [Immigration Reform and Access to Health Coverage: Key Issues to Consider], (The Henry J. Kaiser Family Foundation, [February 2013]), https://kaiserfamilyfoundation.files.wordpress.com/2013/02/8420.pdf, last accessed on June 2018, [New Option for States to Provide Federally Funded Medicaid and CHIP Coverage to Additional Immigrant Children and Pregnant Women], (The Henry J. Kaiser Family Foundation,

targeted documented pregnant noncitizens, especially those who have reside in the U.S. for less than or equal to five years.

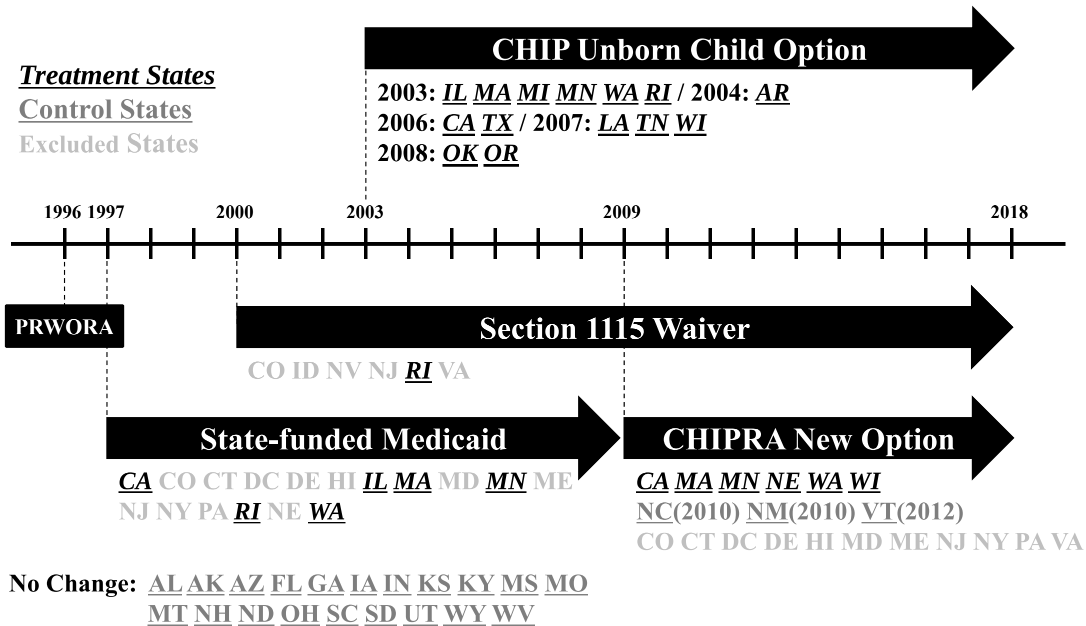

Figure 1: Timeline of Related Public Health Insurance Policies for Pregnant Noncitizens

Note: Treatment states are underlined, italicized, and in black-colored font, while Control states are underlined and in gray-colored font. Excluded states are distinguished by light gray font.
Source: Kaiser Family Foundation, Families USA [August 2010], Families USA, [July 2010], March of Dimes, [October 2013], Congressional Research Service [January 2008], and Guide to Immigrant Eligibility for Federal Programs from National Immigration Law Center

The fourth policy is the focus of my analysis. In 2002, the Department of Health and Human Services (HHS) added "fetus" into the "child" category of the CHIP, creating the so-called Unborn Child Option (UCO). Thus, the UCO expanded CHIP coverage to fetuses, who would be U.S. citizens after birth. There are three unique features of the UCO that provide the basis for my analysis. First and the most importantly,

[July 2009]) https://kaiserfamilyfoundation.files.wordpress.com/2013/01/7933.pdf, last accessed on June 2018, [Martha Heberlein, Tricia Brooks, Joan Alker, Samantha Artiga, and Jessica Stephens], [Getting into Gear for 2014: Findings from a 50-State Survey of Eligibility, Enrollment, Renewal, and Cost-Sharing Policies in Medicaid and CHIP, 20122013], (The Henry J. Kaiser Family Foundation, [January 2013]), https://kaiserfamilyfoundation.files.wordpress.com/2013/05/8401.pdf, last accessed on June 2018) the UCO provides only *in utero* coverage, which allows me to disentangle the effect of prenatal coverage even from the effect of postnatal or infant coverage.[23] Second, the UCO coverage is restricted to "pregnancy-related care", so any healthcare utilization under this coverage is confined to prenatal care access.[24] Third, the UCO is available to pregnant noncitizens including undocumented noncitizens, targeting all previously ineligible pregnant noncitizens without exclusion. As a result of these features, the UCO provides a useful research setting for examining the impact of public health insurance for prenatal care on child health. Fourteen states chose the UCO from 2003–2008, and these states are shown in Figure 1 with the timing of implementation under the "CHIP Unborn Child Option" arrow.[25]

To my knowledge, only three previous papers studied the impact of the UCO on child health (Drewry et al., 2015; Jarlenski et al., 2014; Wherry et al., 2017). However, these papers focused on birth outcomes and found no improvement, using the sample of immigrants or Hispanic mothers as a proxy of noncitizen mothers due to data limitations.[26] My paper contributes to this literature: I examine child health beyond birth outcomes utilizing the sample of U.S.-born children of noncitizen mothers.

More recently, a large Medicaid expansion has been implemented under the Affordable Care Act (ACA), but I do not consider ACA expansion in my quasi-experimental setting, as the ACA Medicaid expansion principally aimed at low-income childless adults. The only possible mechanism through which the ACA affects pregnant noncitizens is the 2014 introduction of the Health Insurance Marketplace. As the Health Insurance Marketplace provides documented immigrants with premium tax credits if they purchase health insurance through the Marketplace, it may have changed pregnant noncitizens' health insurance coverage rates.[27] However, the Health Insurance Marketplace was implemented nationwide, and I restrict the span of this study to 1998–2012 for female noncitizens, so it does not affect my research setting. Figure A4 confirms

[23] Medicaid for pregnant women involves the deemed eligibility of newborns.

[24] Other public health insurance programs for pregnant women cover both "pregnancy-related care" and any healthcare for her own health.

[25] WA, OR, CA, OK, TX, MN, AR, LA, WI, IL, TN, MI, MA, RI (14 states) (*Sources:* [Evelyne P. Baumrucker], [SCHIP Coverage for Pregnant Women and Unborn Children], (Congressional Research Service, [January 2008]), https://www.everycrsreport.com/files/20080108_RS22785_4f51015bc760f79ee2e4bd95542b832be54b0292.pdf, [Covering Pregnant Women: CHIPRA Offers a New Option], (Families USA, [July 2010]), familiesusa.org/sites/default/files/product_documents/Covering-Pregnant-Women.pdf and [CHIP Coverage for Pregnant Women], (March of Dimes, [October 2013]), https://www.marchofdimes.org/materials/chip-coverage-for-pregnant-women-may-2014.pdf, last accessed on June 2018).

[26] Drewry et al. (2015) use the Natality data and studied the impact of the UCO on prenatal care utilization and subsequent birth outcomes, focusing on Hispanic immigrants in six states which opted in the UCO in 2003. The authors found no significant changes in prenatal care utilization among the overall sample, but found some impact among single mothers with low education. They did not find any changes in birth outcomes. Jarlenski et al. (2014) utilized data from the Pregnancy Risk Assessment Monitoring System (PRAMS), examining the impact of the UCO on public health insurance coverage and prenatal care use during pregnancy. They found that the UCO was associated with a greater probability of public health insurance coverage rate during pregnancy, but they did not find differences in the adequacy of prenatal care use. Lastly, Wherry et al. (2017) studied the effects of states adoption of coverage policies for pregnant immigrant women, including state-funded Medicaid, CHIP Unborn Child Option, and CHIPRA new option. The authors found the improved prenatal care utilization, but no changes in infant health or mortality.

[27] The Health Insurance Marketplace is also known as the "Marketplace" or the "Exchange." It provides health plan shopping and enrollment services through websites, call centers, and in-person help. Based on income and household information, an individual may qualify for premium tax credits and other savings. ***Source***: The U.S. Centers for Medicare & Medicaid Services https://www.healthcare.gov/glossary/health-insurance-marketplace-glossary/, last accessed on June 2018, https://www.healthcare.gov/immigrants/lawfully-present-immigrants/, last accessed on June 2018

that there was no differential impact of the ACA on the eligibility of children and pregnant women across treatment and control states following the Medicaid expansion of 2014.

Table 1: Treatment and Control States

Treatment year	(1) Treatment States	(2) Control States
2003	IL, MA, MI, MN, WA, RI	
2004	AR	AL, AK, AZ, FL, GA, IA, IN,
2006	CA, TX	KS, KY, MO, MS, MT, NH, NC, ND,
2007	LA, TN, WI	NM, OH, SC, SD, UT, VT, WY, WV
2008	OK, OR	
# of States	14	23
Policy change	Excluded States	
Section 1115 waiver	CO, ID, NV, NJ, VA	
State-funded Medicaid	CT, DC, DE, HI, MD, ME, NE, NY, PA	
# of States	14	

Source: Kaiser Family Foundation, Families USA [August 2010], Families USA, [July 2010], Washington CMS (July 2000), March of Dimes, [October 2013], Congressional Research Service [January 2008], and Guide to Immigrant Eligibility for Federal Programs from the National Immigration Law Center

I classify states into treatment, control, and excluded states as follows. Treatment refers to the Unborn Child Option (UCO). First, I set all states that opted into the UCO from 2003 to 2008 as treatment states (14 states). Among them, six states had previously provided state-funded coverage for pregnant noncitizens, but they did not change the eligibility of state-funded coverage for at least the previous four years before the UCO implementation. Also, as the UCO provides coverage for a more comprehensive population including undocumented noncitizens, I do not exclude those six states.[28] Second, I set all states that had not provided any coverage for pregnant noncitizens until 2012 as control states (20 states). Third, I added three more control states which opted in only to the CHIPRA new option because the policy affects a small portion of noncitizens (recently arrived legal residents) and the implementation date does not coincide with that of the UCO. In Figure 1, treatment states are underlined, italicized, and written in black font while control states are underlined and written in gray font. Lastly, all the other states are excluded to avoid entangled effects from multiple policies. These states are written in light gray font in Figure 1 (13 states and the District of Columbia).[29] The upper part of Table 1 shows the list of states classified by treatment status and includes year of implementation. The lower part of Table 1 displays the list of states excluded due to the pre-implementation of "Section 1115 waivers" or "State-funded Medicaid".

[28]CA, IL, MA, MN, RI, WA

[29]CO, ID, NE, NV, NJ, VA, CT, DC, DE, HI, MD, ME, NY, PA

2.2 Mechanisms Underlying the Effects of *in utero* Public Health Insurance on Child Outcomes beyond Birth

There exist various underlying mechanisms by which public health insurance *in utero* may affect child health beyond birth outcomes. First, public health insurance *in utero* may enhance children's health through the early detection and treatment of health problems both for pregnant women and fetuses during regular prenatal care check-ups, which can reduce the risk of harm during pregnancy and delivery.[30] Almond et al. (2010) and Bharadwaj et al. (2013) found that medical intervention at birth lowers the infant mortality rate and improves children's educational attainment.

Second, *in utero* public health insurance may enhance expectant mothers' mental health.[31] If insurance relieves maternal stress and anxiety, it may significantly affect the health and development of children. Many studies have supported the close association between prenatal maternal stress and adverse child outcomes (Aizer et al., 2016; Beydoun and Saftlas, 2008; Currie and Rossin-Slater, 2013; Schetter and Tanner, 2015; Torche, 2011). Specifically, Aizer et al. (2016) found that increased *in utero* levels of cortisol, the stress hormone, negatively affect children's cognition and health at age seven.

Third, *in utero* public health insurance may enhance pregnant women's health behaviors that can directly affect child development and health. Recently, smoking or alcohol cessation treatment and breastfeeding education have become typical characteristics of prenatal care.[32] Several studies found that mothers' health behaviors are strongly associated with the incidence of children's chronic health conditions, such as diabetes, obesity, asthma, and neuro-developmental delays (Bublitz et al., 2012; Eidelman and Schanler, 2012; Karp et al., 1995; Wehby et al., 2011).[33] Notably, chronic health conditions start to appear later in life, implying

[30] Currie and Gruber (1996) found that pregnant women who were eligible for Medicaid started to use prenatal care at the recommended pregnancy duration while those who were not eligible for Medicaid tended to delay the start date. Dubay et al. (2001) and Dave et al. (2008) also found some evidence that Medicaid expansion brings forward the start date of antenatal care. Other studies showed that the availability of public health insurance was associated with a higher number of prenatal care visits, increasing the likelihood of receiving timely medical care (Currie and Grogger, 2002; Sonchak, 2015). Besides the improvements regarding the number of visits and initiation timing, the quality of health care may also improve with public health insurance. Several studies found that Medicaid expansion increases the use of medical technologies (i.e., cesarean section, the induction of labor, and the use of a fetal monitor and ultrasound), which can reduce the risk of harm during pregnancy and delivery (Currie and Gruber, 1996, 2001; Dave et al., 2008)

[31] Finkelstein et al. (2012) presented some supporting evidence that Medicaid coverage improves the psychological health and self-reported happiness of recipients. In addition to the improved self-reported happiness, the authors found that self-reported health status was elevated only a month after they won the lottery for coverage from the Oregon Health Insurance Experiment, which is too short a period to promote health objectively.

[32] *Source:* [Williams, L.; Morrow, B.; Shulman, H.; Stephens, R.; DAngelo, D.; Fowler, CI], [PRAMS 2002 surveillance report], (Atlanta, GA: Division of Reproductive Health, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, [2006]), http://s3.amazonaws.com/zanran_storage/www.cdc.gov/ContentPages/19738568.pdf, [The Health Consequences of Involuntary Exposure to Tobacco Smoke: A Report of the Surgeon General], (U.S. Department of Health and Human Services, Atlanta, Georgia, U.S., [2006]) https://www.surgeongeneral.gov/library/reports/secondhand-smoke/fullreport.pdf

[33] Karp et al. (1995) first suggested that the incidence of abnormalities at birth appeared to be elevated among children of alcoholic mothers. Moreover, it is well-known that fetuses exposed to second-hand smoke are at increased risk for respiratory infections and asthma. Bublitz et al. (2012) and Wehby et al. (2011) showed that interventions for prenatal smoking is strongly associated with child health and development outcomes. Eidelman and Schanler (2012) also showed that breastfeeding decreases the incidence of infectious diseases and chronic health problems, such as diabetes, obesity, asthma, and neuro-developmental delays.

that they are usually not detected at early ages.[34]

Lastly, *in utero* public health insurance may enhance children's health through their mothers' intake of vital nutrients and healthy food. Miller and Wherry (2017) showed that the majority of pregnant women with Medicaid coverage were part of the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) because they heard about it from healthcare providers.[35] In addition, during prenatal check-ups, doctors usually recommend or prescribe proper prenatal vitamins and mineral supplements to expectant mothers, to reduce the risk of maternal micronutrient deficiency. Some studies in the public health literature have linked increased prenatal intake of vitamin D to a reduction in asthma among children (Camargo et al., 2011; Litonjua and Weiss, 2007). Other studies have shown that maternal micronutrient supplementation improves children's cognitive abilities at preschool and school ages (Bougma et al., 2013; Prado et al., 2012, 2017).

Although each of mechanisms may cause the improvements in both at- and beyond-birth outcomes, I focus on the possible channels that can explain the benefits on child health and development beyond the neonatal period.[36] Given the inconclusive findings on birth outcomes from previous studies, I extend my analysis to *beyon*d the neonatal period to capture the benefits on child that are not detected at birth.

3 Data

I use two data sets to conduct my analysis: the National Health Interview Survey (NHIS) and the American Community Survey (ACS). The NHIS 1998–2014 is used to examine impact on female noncitizen's health insurance coverage, healthcare utilization, mental health status, and health behaviors as well as children's health outcomes up to age six. The ACS 2001–2016 is utilized to investigate the impact on children's cognitive abilities.[37]

The NHIS is the principal data source for the health of the civilian non-institutionalized population in the U.S.; it is collected by the National Center for Health Statistics (NCHS). The data include individual-level information on demographic characteristics, citizenship status, health insurance coverage, health care utilization, the existence of chronic or temporary diseases, and various health status indicators.[38] I utilize

[34]However, Dave et al. (2018) showed that expanded public health insurance does not always induce better health behaviors of mothers.

[35]The WIC program provides pregnant women, infants, and children with a select list of essential food items.

[36]Almond and Currie (2011) summarized the biological mechanisms of how early life environment generates latent health effects through fetal "programming", or early-life metabolic adaptations. For instance, if a fetus is exposed to a poor *in utero* environment, the fetus's metabolic system may adapt to survive in that poor environment. However, if the environment after birth turns out to be different, this bad match would generate the likelihood of metabolic disorders, such as obesity, diabetes, and high blood pressure. Another possible clinical mechanism is that a poor prenatal environment may impair the development of the brain and spinal cord of the fetus, which can subsequently affect the child's cognitive development (Georgieff, 2007; Prado and Dewey, 1992; Roza et al., 2007; Yu et al., 2004).

[37]*Source:* IPUMS USA: Version 8.0, Ruggles et al. (2018)

[38]State-level geographic variables (i.e., state of residence and state of birth) were used to classify whether expectant mothers

five separate NHIS files; household, family, person, sample adult, and sample child; I merge all files using household, family, and person identifiers. Most basic demographic variables are included in the person file, but many core items are only included in the sample adult or sample child file. One sample adult and one sample child are randomly chosen from each family in the NHIS, and data are obtained on health status, healthcare utilization, and health behaviors. Thus, the number of observation is different across outcome variables depending on the source files; sample adult and sample child files have fewer observations than person files.

The ACS is the largest household survey that the Census Bureau administers; annually, it gathers information about educational attainment, income, migration, disability, employment, and housing characteristics. I use a variable indicating whether a child at age five or older has cognitive difficulties because of a physical, mental, or emotional condition. Both datasets have individual-level information on citizenship status, year of birth, state of birth, and state of residence, which are used to classify an individual into treatment, control, and excluded groups.

To capture the impact of the UCO, I restrict the sample to female noncitizens of childbearing age (ages 22–45) whose highest level of education is a high school degree. I also utilize children between the ages of 0 and 6 whose mothers are noncitizens between the ages of 22 and 45 with at most a high school education. Due to the endogenous selection problem, I cannot define the sample based on income level, as it can be manipulated according to CHIP eligibility. Instead, I use a relatively low-educated group as a proxy for the low-income population, those who are eligible for CHIP coverage (Kaestner et al., 2017).

The NHIS data contain a variable that can distinguish pregnant from non-pregnant women, but as noted above I do not restrict the sample to pregnant women for two reasons: first, the variable *"Pregnant Now"* is available in the "Sample Adult[39]" file in the NHIS, which consists of one sample adult per each family. If I restrict the sample to those who responded *"Yes"* to the *"Pregnant Now"* variable, it drops not only non-pregnant women but also pregnant women not selected as a sample adult. Thus, the estimates may lose their power due to small sample size. Second, the healthcare utilization variables in the NHIS refer to the past 12 months, while *"Pregnant Now"* refers to current status. If I restrict the sample to currently pregnant women, it becomes infeasible to detect changes in healthcare utilization during pregnancy; instead, it detects changes during the year preceding pregnancy. Lastly, pregnancy status could be endogenous. Accordingly, I use a sample of low-educated female noncitizens aged 22–45 regardless of pregnancy status.

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and children were affected by the Unborn Child Option (UCO) implementation. However, because state-level geographic variables are included in restricted-version of the NHIS, these data were accessed through ANDRE and the Research Data Center.

[39]From each family in the NHIS, one sample adult and one sample child (if any children are present) are randomly selected; information on each is collected with the sample adult core and the sample child core surveys. *Source:* Centers for Disease Control and Prevention, *Source:*https://www.cdc.gov/nchs/nhis/about_nhis.htm

To examine the effects of the UCO on health insurance coverage, I use the following health insurance questions from the NHIS: "What kind of health insurance or healthcare coverage does a person have? Include those that pay for only one type of service and exclude private plans that only provide extra cash while hospitalized." As the categories of health insurance coverage in the NHIS are quite detailed, and because these questions cover forms of insurance that pay for only one type of service (i.e., prenatal care), they can more precisely capture changes in health insurance coverage resulting from the UCO compared to other datasets.[40]

To measure the effects of the UCO on the healthcare utilization of female noncitizens, I use two variables from the NHIS: whether the respondent was seen by or talked to a health care professional in the past 12 months and number of doctor's office visits during the same period.[41] In addition, I use two indicators of maternal mental health found in the NHIS: the Kessler Psychological Distress Scale (K6)[42], and the incidence of feeling sad, hopeless, or worthless at least some of the time during the past 30 days. Moreover, I examine health behaviors, such as smoking and number of alcoholic beverages per day, to understand the mechanism linking prenatal insurance to child health.

For health measurement at birth, I utilize birth weight and the incidence of low birth weight (less than 2500 g). I examine children's health up to age six, using the incidence of having a chest cold or stomach illness in the past two weeks, the presence of chronic health conditions (i.e., asthma, diabetes, cerebral palsy, arthritis, cystic fibrosis, sickle cell, and congenital heart disease), and parent-reported health status[43]. Lastly, I study cognitive difficulties among children between ages of 5 and 6, employing cognitive difficulties with learning or concentrating as a variable. Data for this variable come from the ACS.

[40]Usually, health insurance questions in the March Annual Social and Economic Supplement to the Current Population Survey (March CPS) are used to study the health insurance take-up rate. March CPS is not suitable here, however, because the distinction of a specific kind of public health insurance is essential in this research setting. To check whether any increase in health insurance coverage is attributable to the UCO, I need to detect particular types of health insurance. In the March CPS health insurance questions, interviewers define Medicaid as "the government assistance that pays for health care", and it captures most public health insurance. Thus, March CPS is hard to use in this context. *Source:*https://cps.ipums.org/cps-action/variables/HIMCAID#description_section, https://www.cdc.gov/nchs/nhis/data-questionnaires-documentation.htm

[41]Other economic studies have utilized different measures of prenatal care. For instance, Rosenzweig and Schultz (1982) examined the number of months elapsed during pregnancy until a pregnant woman first visits a doctor; Currie and Grogger (2002) investigated whether prenatal care was initiated at an appropriate point of time.

[42]The Kessler Psychological Distress Scale (K6) is calculated from six questions about the individuals' experience of depressive or fear symptoms in past 30 days. Scores range between 0 and 24, with a higher score denoting greater severity of psychological distress. It is consistently available in the NHIS during the sample period.

[43]Five-point scale, with 1 lowest and 5 highest

4 Empirical Strategy

4.1 A Flexible Event-Study Framework

To investigate the impact of the Unborn Child Option (UCO), I estimate the following flexible event-study model using states' take up of the UCO and the timing of policy adoption (Bailey and Goodman-Bacon, 2015; Jacobson et al., 1993);

$$\begin{aligned} Y_{ismy} = & \delta_y + \alpha_s + \beta_m + \theta_{r(s)y} + \Sigma_{k=-4}^{-2} \lambda_k I\{s = Treat\} * I\{y - T_s^* = k\} \\ & + \Sigma_{k=0}^{3} \phi_k I\{s = Treat\} * I\{y - T_s^* = k\} + X_{ismy}\Gamma + \epsilon_{ismy} \end{aligned} \tag{1}$$

where Y_{ismy} is the outcome variable for individual i in state s in year y who has lived in the U.S. for m years; δ_y is calendar year fixed effects (year of birth fixed effects, for child analysis); α_s is state fixed effects (state of birth fixed effects, for child analysis); β_m is number of years in the U.S. fixed effects (mother's number of years in the U.S. fixed effects, for child analysis); $\theta_{r(s)y}$ is region by year fixed effects (region of birth by year of birth fixed effects, for child analysis); $I\{s = Treat\}$ is an indicator variable for states that adopted the UCO; T_s^* is the year when the UCO was awarded in state s; k is the event-year[44]; and X_{ismy} is a set of demographic characteristics including age, race, education (mother's education, for child analysis), marital status (mother's marital status, for child analysis), number of children in household, and family size. With the set of interaction terms of the binary indicator of adopted states and event year dummies which are equal to 1 when the year of observation is $k = -4, ..., 0, ..., 3$ ($k = -1$ is omitted), the specification captures how the effects of the UCO evolve over time. All the other interactions are expressed relative to the omitted period, $k = -1$, which serves as the baseline. For statistical inference, I use standard errors that are heteroskedasticity-robust and clustered by state of residence.[45] In all estimations, I apply the final annual person weight, final annual sample adult weight, or final annual sample child weight in analyzing outcome variables from the person, sample adult, and sample child files in the NHIS, respectively. I also use person weight from the ACS in my analysis of children's cognitive difficulties.

To summarize the magnitude of the event study estimates in the pre- and post-period, I replace the individual event-year dummies with grouped event-year dummies in the flexible event-study model.

[44] k is defined by calendar year minus the year when the UCO was adopted in each state, so-called event year (year of birth minus the year when the UCO was adopted in each state of birth, for child analysis)

[45] Standard errors are clustered by state of birth when using children population.

$$
\begin{aligned}
Y_{ismy} = &\delta_y + \alpha_s + \beta_m + \theta_{r(s)y} + \lambda * I\{s = Treat\} * I\{-4 \leq k \leq -2 | y - T_s^* = k\} \\
&+ \phi * I\{s = Treat\} * I\{0 \leq k \leq 3 | y - T_s^* = k\} + X_{ismy}\Gamma + \epsilon_{ismy}
\end{aligned}
\tag{2}
$$

In this specification, I include the interaction terms of the indicator of adopted states and the indicators for pre- and post-period coefficients. I can get the joint statistical significance of the event study estimates from the key coefficient, ϕ. If the UCO affects the outcome variables, ϕ would be significantly different from zero, while λ would not. The estimates captures the effects of the UCO on outcome variables relative to the year before the policy began ($k = -1$). For consistency, I include four pre-periods and four post-periods in both female and child specifications.

5 Results

5.1 Health Insurance Coverage of Female Noncitizens

The rise in health insurance coverage rates resulting from the CHIP Unborn Child Option (UCO) should appear in the CHIP category.[46] However, due to the unique characteristics of the UCO, there is some possibility of misreporting type of health insurance. First, CHIP coverage is mainly for children, not adults. A pregnant noncitizen can be covered by the UCO because of her unborn child and she may be confused about the funding source for her health insurance. Second, when the respondents are asked about their health insurance coverage in the NHIS, they receive NHIS flash cards as a guideline for reporting, including the names of Medicaid, CHIP, and other public programs. Each state has a different name for CHIP, but no flash card mentions "the Unborn Child Option" in the CHIP category, while the State/Other category[47] includes the names of various other public health insurance programs for children and mothers, which can cause confusion among respondents.[48]

Figures A5a–A5d present the weighted estimates of coefficients on the set of interaction terms of the binary indicator for treatment states and event-year dummies from my baseline event-study specification, $\Sigma_{k=-4}^{-2}\lambda_k$ and $\Sigma_{k=0}^{3}\phi_k$ of equation (1), referring to the impact of the UCO on public health insurance coverage. The capped line represents a 95% confidence interval. The results indicate that the clear rise only appears in CHIP and State/Other public health insurance in event year 0. "State/Other public health insurance" refers

[46]Even when the UCO became available for pregnant noncitizens, they may not have taken-up the option due to fear of deportation or informal deterrence (Watson, 2014). Thus, it is important to examine the impact of the UCO on health insurance coverage rate and healthcare utilization among female noncitiznes to check whether the option was in effect.

[47]"State/Other category" refers to publicly funded health insurance which are not included in CHIP, Medicaid, Medicare, and Military health insurance.

[48]The flash cards are shown in Figures A22a–A24b

to publicly funded health insurance programs that are not included as part of CHIP, Medicaid, Medicare, or Military health insurance. The recipients may not know their specific kind of coverage but at least recognize that their coverage is not from well-known public health insurance programs, so they may choose "State/Other public health insurance" instead.

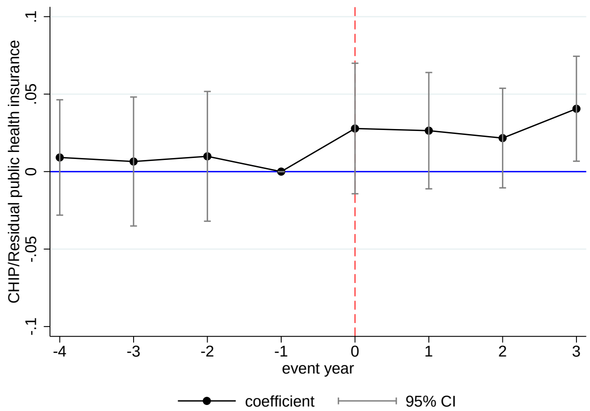
To verify that the UCO causes the increase in State/Other public health insurance, I have conducted a parallel analysis with the male population. Figures A6a–A6d compare estimates of health insurance coverage rate between the female and male populations. They show that rates of CHIP and State/Other public health insurance rise in event year 0 only among females. Although there is a slight increase in State/Other public health insurance among the male population in event year 3, the magnitude is much smaller than that for females. The clear increase in CHIP and State/Other public health insurance in event year 0 only for the female population can be attributed to take-up of the UCO.

The main results for health insurance coverage are shown in Figures 2a–2d.[49] The event study estimates in the pre-period show no evidence of a differential trend in any health insurance coverage rate before initiation of the UCO. Notably, CHIP and State/Other public health insurance coverage increase sharply at the policy adoption year, $k = 0$. Subsequently, the public health insurance coverage rate rises after the treatment year, and the uninsured rate decreases accordingly.

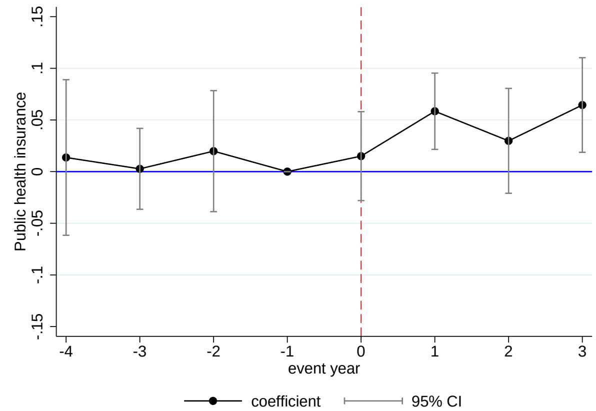
Table 2 shows the results from the event study specification with event-year-group dummies. "Years -4 to -2" represents an estimated coefficient on the interaction term of the indicator for treatment states and the indicator for pre-period, λ of equation (2). "Years 0 to 3" represents an estimated coefficient on the interaction term of the indicator for treatment states and the indicator for post-period, ϕ of equation (2). Consistent with the Figures A5a–A5d, CHIP and State/Other public health insurance coverage increase significantly after the UCO implementation while no significant change in Medicaid coverage. More specifically, CHIP coverage rates increase by 0.8 percentage points, which is an 800% increase compared to the baseline mean of 0.1%. State/Other public health insurance coverage increases by 2.9 percentage points, which is a 700% increase compared to the baseline mean of 0.4% (See Table A9 in Appendix). Although the public health insurance rate rises by 4.7 percentage points and the uninsured rate decreases by 5.0 percentage points after UCO implementation, I conservatively regard only the rises in CHIP and State/Other public health insurance categories as effects of the UCO. My sample is larger than the eligible group, so I translate the estimates into intent-to-treat impact to consider their magnitudes. Under the assumption that the entire 3.7 percentage-point increase in public health insurance is due to take-up by eligible pregnant women, and using

[49]Each point represents an estimate of differences in outcome variables between treated and untreated states at a certain calendar year ("treated" refers to the implementation of the UCO at a certain calendar year), which are summarized by each event-year equals 'k', after controlling for calendar year fixed effects, state fixed effects, number of years in the U.S. fixed effects, and region by year fixed effects; they are adjusted by age, education, race, marital status, number of children in household, and family size.

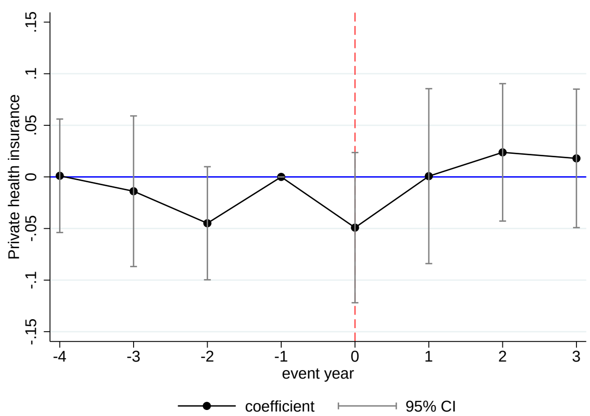
Figure 2: Health Insurance Coverage of Female Noncitizens



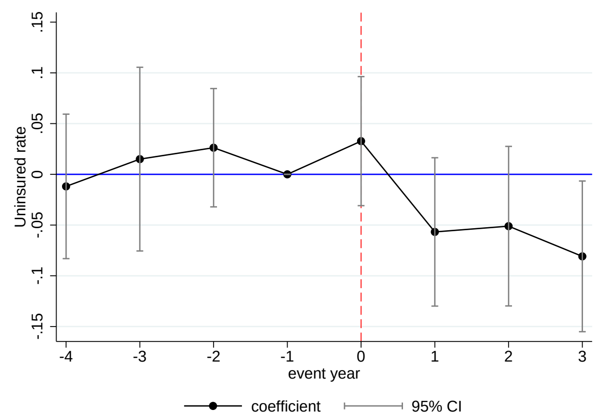
(a) CHIP and State/Other public health insurance



(b) Public health insurance



(c) Private health insurance



(d) Uninsured rate

Note: Each point represents a parameter estimate on the sets of interaction terms of the indicator for treatment states and event-year dummies, $\Sigma_{k=-4}^{-2}\lambda_k$ and $\Sigma_{k=0}^{3}\phi_k$ of equation (1). Event-year is defined by calendar year minus the year when the Unborn Child Option (UCO) was adopted in each state, so 'event year= 0' implies the year when the UCO was initiated. The capped line represents a 95% confidence interval. For all estimations, the sample includes female noncitizens between the ages of 22 and 45 with at most a high school education in 37 states in the 1998–2014 National Health Interview Survey (NHIS). The analysis is weighted by the NHIS final annual person weight. The models incorporate calendar year fixed effects, state fixed effects, number of years in the U.S. fixed effects, and region by year fixed effects; they are adjusted by age, education, race, marital status, number of children in household, and family size. The standard errors are heteroskedasticity-robust and clustered by state of residence.

Table 2: The Effects on Health Insurance Coverage of Female Noncitizens

	Public Health Insurance				
	CHIP and State/Other Public Health Insurance	Medicaid Coverage	All	Private Health Insurance	Uninsured Rate
Years -4 to -2	0.005 (0.018)	0.005 (0.014)	0.012 (0.018)	-0.020 (0.019)	0.009 (0.020)
Years 0 to 3	0.037* (0.020)	0.008 (0.008)	0.047*** (0.013)	0.003 (0.010)	-0.050*** (0.018)
Y-mean	0.005	0.031	0.049	0.270	0.681
Observations	20711	20711	20711	20711	20711

Note: "Years -4 to -2" represents an estimated coefficient on the interaction term of the indicator for treatment states and the pre-period indicator, λ of equation (2). "Years 0 to 3" represents an estimated coefficient on the interaction term of the indicator for treatment states and the post-period indicator, ϕ of equation (2). For all estimations, the sample includes female noncitizens between the ages of 22 and 45 with at most a high school education in 37 states in the 1998–2014 National Health Interview Survey (NHIS). The analysis is weighted by NHIS final annual person weight. The models incorporate calendar year fixed effects, state fixed effects, number of years in the U.S. fixed effects, and region by year fixed effects; they are adjusted by age, education, race, marital status, number of children in household, and family size. The standard errors are heteroskedasticity-robust and clustered by state of residence. "Y-mean" refers to the mean value of each outcome variable in event year -1.
* $p \leq 0.1$, ** $p \leq 0.05$, *** $p \leq 0.01$

the fact that on average 10.23%[50] of this population was pregnant at a given survey date, the estimated intent-to-treat (ITT) impact of the UCO is a 36-percentage-point increase in public health insurance coverage among pregnant noncitizens (0.037/0.102).[51]

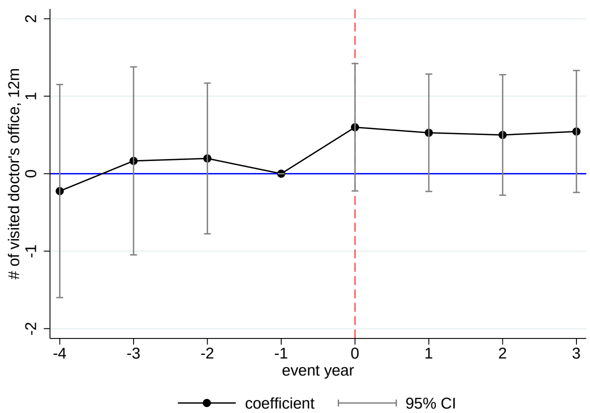
5.2 Healthcare Utilization of Female Noncitizens

To examine the effects of the Unborn Child Option (UCO) on the healthcare utilization of female noncitizens, I used the following variables: whether an individual has interacted with doctors in the 12 months previous to the survey, and the number of doctor's office visits in the same period. As all healthcare utilization variables refer to the past 12 months at the time of the survey, I shifted observations one year earlier to match with the range of questions in the analysis. First, I examined how effects evolve using the coefficients from the event study specification, $\Sigma_{k=-4}^{-2}\lambda_k$ and $\Sigma_{k=0}^{3}\phi_k$ of equation (1). Figure 3a reveals a clear rise in the frequency of doctor's office visits in the past 12 months following implementation of the UCO, while Figure 3b shows no change in the incidence of ever interacted with a doctor.

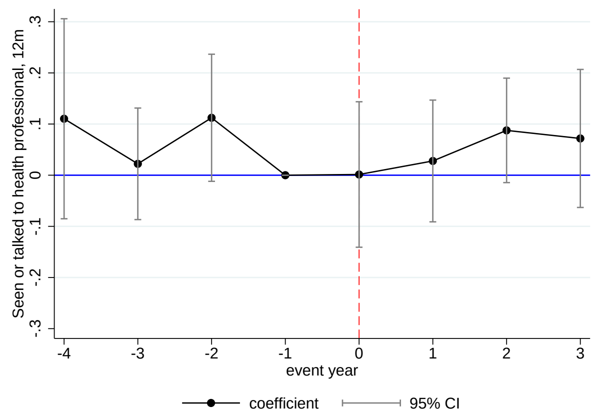
[50] Using the ACS 2001–2012, I calculated the weighted mean of the fertility rate among low-educated female noncitizens between the ages of 22 and 45. The actual pregnancy rate might be slightly higher than this because of abortions or miscarriage.

[51] The flexible event study method provides more information than the standard Difference-in-difference (DD) approach, as it allows me to check that there were no statistically significant changes in the pre-period while significant changes are found in the post-period. The DD estimate is approximately equal to the post-period estimate minus the pre-period estimate, or $0.037 - 0.005 = 0.032$ for CHIP and State/Other. Rescaling by the incidence of pregnancy results in an estimate of the ITT of 31 percentage points (0.032/0.102).

Figure 3: Healthcare Utilization of Female Noncitizens



(a) # of doctor visits, 12 months



(b) Ever interact with a doctor, 12 months

Note: Each point represents a parameter estimate on the sets of interaction terms of the indicator for treatment states and event-year dummies, $\Sigma_{k=-4}^{-2}\lambda_k$ and $\Sigma_{k=0}^{3}\phi_k$ of equation (1). Event-year is defined by calendar year minus the year when the Unborn Child Option (UCO) was adopted in each state, and I subtract one more to match with the range of questions, in the past 12 months at the time of the survey. So 'event year= 0' implies the year when the UCO was implemented. The capped line represents a 95% confidence interval. For all estimations, the sample includes female noncitizens between the ages of 22 and 45 with at most a high school education in 37 states in the 1998–2014 National Health Interview Survey (NHIS). The analysis is weighted by NHIS final annual sample adult weight. The models incorporate calendar year fixed effects, state fixed effects, number of years in the U.S. fixed effects, and region by year fixed effects; they are adjusted by age, education, race, marital status, number of children in household, and family size. The standard errors are heteroskedasticity-robust and clustered by state of residence.

Table 3: The Effects on Healthcare Utilization of Female Noncitizens

	# of Doctor Visits, 12m	10+ Doctor Visits, 12m	Interact with a Doctor, 12m
Years -4 to -2	0.123	0.012	0.028
	(0.248)	(0.018)	(0.033)
Years 0 to 3	0.481*	0.035**	0.020
	(0.265)	(0.013)	(0.047)
Y-mean	2.529	0.013	0.611
Observations	8124	8124	8145

Note: "Years -4 to -2" represents an estimated coefficient on the interaction term of the indicator for treatment states and the pre-period indicator, λ of equation (2). "Years 0 to 3" represents an estimated coefficient on the interaction term of the indicator for treatment states and the post-period indicator, ϕ of equation (2). For all estimations, the sample includes female noncitizens between the ages of 22 and 45 with at most a high school education in 37 states in the 1998–2014 National Health Interview Survey (NHIS). The analysis is weighted by NHIS final annual sample adult weight. The models incorporate calendar year fixed effects, state fixed effects, number of years in the U.S. fixed effects, and region by year fixed effects; they are adjusted by age, education, race, marital status, number of children in household, and family size. The standard errors are heteroskedasticity-robust and clustered by state of residence. "Y-mean" refers to the mean value of each outcome variable in event year -1.
* $p \leq 0.1$, ** $p \leq 0.05$, *** $p \leq 0.01$

Table 3 presents the regression results from the event study specification with event-year-group dummies, λ and ϕ of equation (2). The number of doctor's office visits in the past 12 months significantly increases by 0.48 times, and the incidence of visiting 10 or more times rises by 3.5 percentage points after implementation of the UCO. However, there is no change in the incidence of ever interacted with a doctor in the past 12 months. The results imply that even before implementation of the UCO, most pregnant women had visited a doctor's office at least once during their pregnancy, possibly when they deliver their baby. It is also consistent with the fact that nearly all immigrant women use at least some healthcare for prenatal check-ups and delivery (See Wherry et al. (2017)). However, the option increases the frequency of doctors visits among recipients, including a higher share of female noncitizens who have visited doctors more than 10 times in the past 12 months. Under the same assumption described in the health insurance section, the ITT impact of the UCO on healthcare utilization is 4.7 (0.48/0.102) more visits during pregnancy and a 34% (0.035/0.102) of pregnant women started to get regular prenatal check-ups, which amounts to more than 10 times in 12 months.[52] As the UCO covers only "pregnancy-related care", any changes in the number of doctor's office

[52]When I estimate these changes relative to the pre-period (event years -4 to -2) instead of baseline period (event year -1), similar to the DD estimate, the increases in number of visits and incidence of visiting doctors more than 10 times are

visits are likely to be for prenatal care. Compared to the pre-reform mean of 2.53 visits, this is evidence that the UCO encourages pregnant noncitizens to get closer to the standard recommendation of 13–14 prenatal care visits.[53]

5.3 Health and Development Outcomes for Children

I have analyzed children between the ages of 0 and 6 whose mothers were noncitizens between the ages of 22 and 45 with at most a high school education when their children were born. In my analysis of the child population, I reconstructed the event year, defined as a child's year of birth minus the year when the UCO was implemented in the child's state of birth. Importantly, in order for a child to fully benefit from the UCO *in utero*, the child needs to be born one year after the initiation date. Thus, the causal impact of the UCO may appear between event years 0 and 1. I examined the effects on health by different age groups defined by child developmental stages: infancy (ages 0–1), toddler (ages 2–3), and preschooler (ages 4–6).

5.3.1 Health Outcomes for Children Ages 0–1 and 2–3

Consistent with previous literature, neither birth weight nor the incidence of low birth weight changed substantially after the implementation of UCO (Drewry et al., 2015; Jarlenski et al., 2014) (See Appendix A). To examine other child outcomes, I used the presence of chronic health conditions, parent-reported health status of children on a five-point scale, very good or excellent health status generated by parent-reported health status variable, and the incidence of cognitive difficulty.[54]

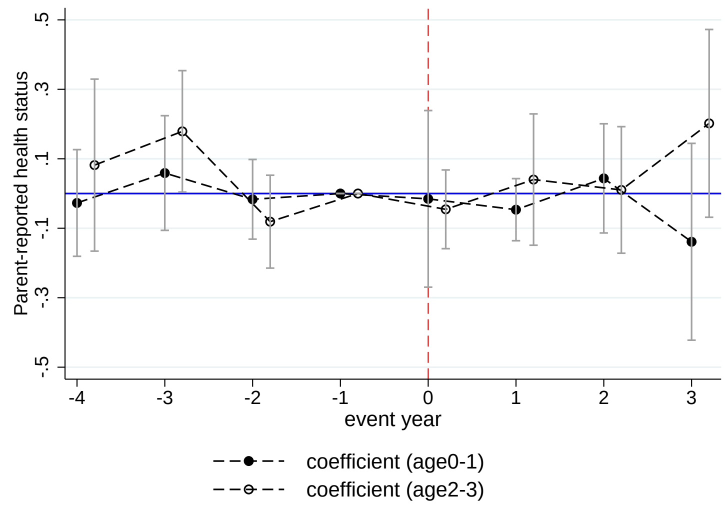
First, I examined the health outcomes among children in infancy (ages 0–1) and toddler period (ages 2–3). Figures 4a-4b present two series of plotted points of the coefficients from the event study specifications: black circles represent the set of event study coefficients among children ages 0–1, and hollow black circles represent those among children ages 2–3. Notably, no changes were detected in both chronic health conditions and parent-reported health status. For children ages 2–3, the rate of chronic health conditions increased temporarily but became negative very quickly, implying no causal effect from the UCO. Table 4 also confirms that there is no statistically significant change in any variable.

approximately 0.36 visits and 2.3 percentage points, respectively. These can be translated into 3.5 more visits and 22%-percentage-point of ITT impact.

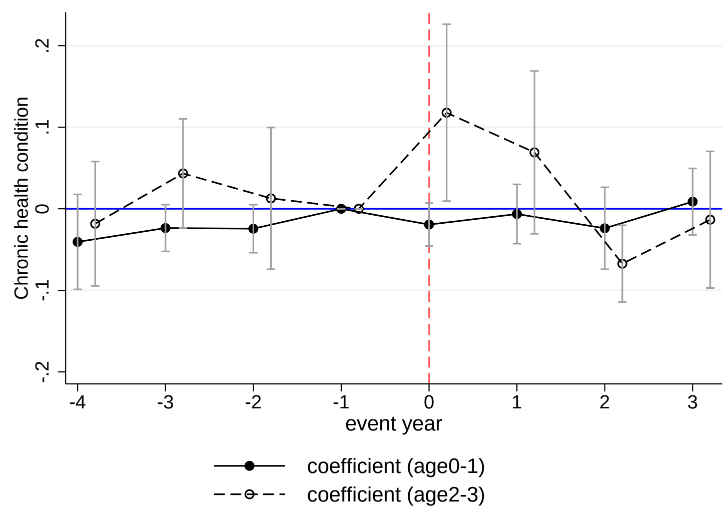
[53]Typically, routine checkups occur once each month for weeks four through 28, twice a month for weeks 28 through 36, and weekly for weeks 36 to birth. Women with high-risk pregnancies need to see their doctors more often. *Source:* [Office on Women's Health, U.S. Department of Health & Human Services], `https://www.womenshealth.gov/pregnancy/youre-pregnant-now-what/prenatal-care-and-tests`

[54]For general short-term conditions, the variable for incidence of getting a chest cold or stomach illness in the past two weeks is available. I found no effect on these short, acute health conditions. See Table A11

Figure 4: Health Outcomes for Children Ages 0–1 and 2–3



(a) Parent-reported health status



(b) Chronic health conditions

Note: Each point represents a parameter estimate on the sets of interaction terms of the indicator for treatment states and event-year dummies, $\Sigma_{k=-4}^{-2}\lambda_k$ and $\Sigma_{k=0}^{3}\phi_k$ of equation (1). Event-year is defined as a child's year of birth minus the year when the Unborn Child Option was implemented in the child's state of birth. The capped line represents a 95% confidence interval. For all estimations, the sample includes children ages 0–3 whose mothers were female noncitizens ages 22–45 with at most a high school education in 37 states in the 1998–2014 National Health Interview Survey (NHIS). The analysis of chronic health conditions is weighted by NHIS final annual sample child weight; analysis of parent-reported health status is weighted by NHIS final annual person weight. The models incorporate year of birth fixed effects, state of birth fixed effects, mother's number of years residing in the U.S. fixed effects, and region by year of birth fixed effects; they are adjusted by age, mother's education, race, mother's marital status, number of children in household, and family size. The standard errors are heteroskedasticity-robust and clustered by state of birth.

Table 4: The Effects on Health Outcomes for Children Ages 0–1 and 2–3

	Parent-reported Health Status		
	Five-point Scale	Very Good or Excellent	Chronic Health Conditions
Panel A. Children Aged 0–1			
Years -4 to -2	0.027	-0.014	-0.016
	(0.040)	(0.016)	(0.010)
Years 0 to 3	-0.014	-0.050	0.003
	(0.091)	(0.049)	(0.015)
Y-mean	4.215	0.762	0.0317
Observations	3893	3893	1732
Panel B. Children Aged 2–3			
Years -4 to -2	0.095*	0.025	0.001
	(0.052)	(0.019)	(0.014)
Years 0 to 3	0.093	0.024	0.032
	(0.066)	(0.042)	(0.019)
Y-mean	4.082	0.700	0.060
Observations	4138	4138	1718

Note: "Years -4 to -2" represents an estimated coefficient on the interaction term of the indicator for treatment states and the pre-period indicator, λ of equation (2). "Years 0 to 3" represents an estimated coefficient on the interaction term of the indicator for treatment states and the post-period indicator, ϕ of equation (2). For all estimations, the sample includes children between the ages of 0 and 3 whose mothers were female noncitizens between the ages of 22 and 45 with at most a high school education in 37 states in the 1998–2014 National Health Interview Survey (NHIS). The analysis of chronic health conditions is weighted by NHIS final sample child weight; analysis of parent-reported health status is weighted by NHIS final annual person weight. The models incorporate year of birth fixed effects, state of birth fixed effects, mother's number of years in the U.S. fixed effects, and region of birth by year of birth fixed effects; they are adjusted by age, mother's education, race, mother's marital status, number of children in household, and family size. The standard errors are heteroskedasticity-robust and clustered by state of birth. "Y-mean" refers to the mean value of each outcome variable in event year -1.

* $p \leq 0.1$, ** $p \leq 0.05$, *** $p \leq 0.01$

5.3.2 Health and Development Outcomes for Children Ages 4–6

Next, I analyzed the effects of the UCO among children ages 4–6. Because the variable for cognitive difficulty is available for children over age five, I studied the impact on cognitive difficulties among children ages 5–6.[55] Figure 5a indicates that parent-reported health status shows a sharp increase in the post-period. Figure 5b shows that the incidence of having chronic health conditions began to decrease at event year 0 and dropped more at event year 1, maintaining its magnitude over the following years, although the pre-period coefficients are somewhat unstable. Moreover, Figure 6 shows that the incidence of cognitive difficulty began to decrease in the post-period.[56] All results support the idea that the benefits of the UCO start to appear several years after birth.

Table 5 consistently indicates the improvements in health at ages 4–6. The rate of chronic health conditions decreases by 4.8 percentage points during the post period, which is more than a 60% decrease compared to the baseline mean of 7.7%. Parent-reported health status rises significantly, by 0.180 on a five-point scale, which is a 7% increase compared to the baseline mean of 4.07. The incidence of having very good or excellent health status rises significantly, by 7 percentage points, which is a 10% increase compared to the baseline mean of 0.7. The presence of cognitive difficulty decreases by 0.8 percentage points among children who benefited from the UCO, which is approximately a 42% decrease compared to the baseline mean of 1.9%.[57]

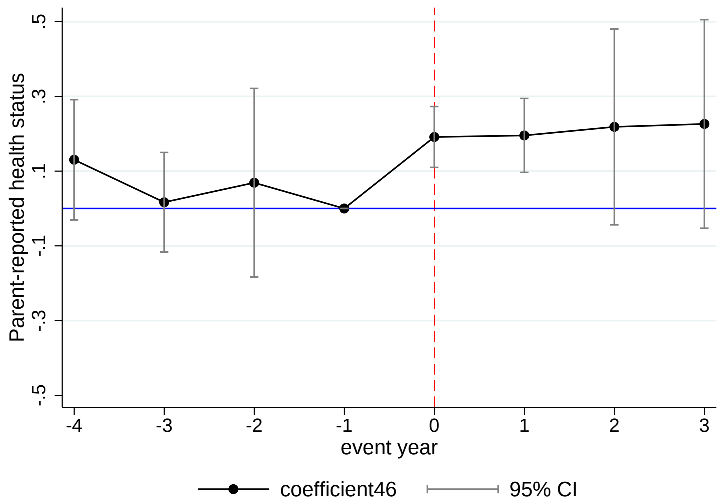
The evidence of improvement in chronic health conditions is relatively weak: one of the pre-period coefficients of chronic health conditions is significantly different from zero, and the coefficient among children ages 2–3 has an opposite sign with a substantial magnitude. On the other hand, parent-reported health status shows an apparent rise, and the rate of cognitive difficulty clearly decreases in the post-period with stable pre-trends. The concern here is that improved parent-reported health status may not represent actual improvement in child's health, but instead a positive bias in mothers' *perceptions* of their child's health as a result of *in utero* public health insurance coverage. However, parent-reported health status shows a sharp increase only among children ages 4–6, while no change is detected among children ages 0–3. This suggests that better parent-reported health status is not solely derived from mothers' biased reporting. If this were the case, mothers would begin to report better health status of children right after childbirth because they

[55] This variable is from the American Community Survey (ACS), indicating whether a child has cognitive difficulties (such as learning, remembering, concentrating, or making decisions) because of a physical, mental, or emotional condition.

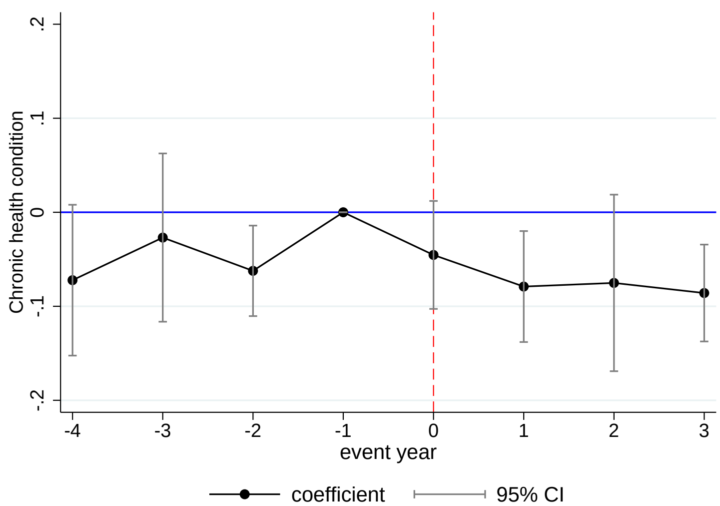
[56] For analysis of cognitive disability variables, I used data from 2008 to 2016 because the ACS questionnaires changed between 2007 and 2008. It is hard to identify the real differences in difficulty rates between 2007 and 2008 due to the revised questionnaires. Dropping years 1998–2007 restricts the sample to children between the ages of 5 and 6 who were born after or in 2003, and it loses some pre-period estimates for early implementation states. I also ran the analysis without dropping any years, and the outcomes are robust across both analyses.

[57] The DD estimates are approximately equal to the post-period estimate minus the pre-period estimate: the rate of chronic health conditions decreases by 1.4 percentage points; parent-reported health status rises by 0.158 on a five-point scale; the incidence of having very good or excellent health status rises by 5.3 percentage points; the rate of cognitive difficulty decreases by 1 percentage point. Notably, the DD estimate in chronic health conditions becomes much smaller than the event-study estimate, while those of parent-reported health status and cognitive difficulty remains similar to event-study estimates.

Figure 5: Health Outcomes for Children Ages 4–6



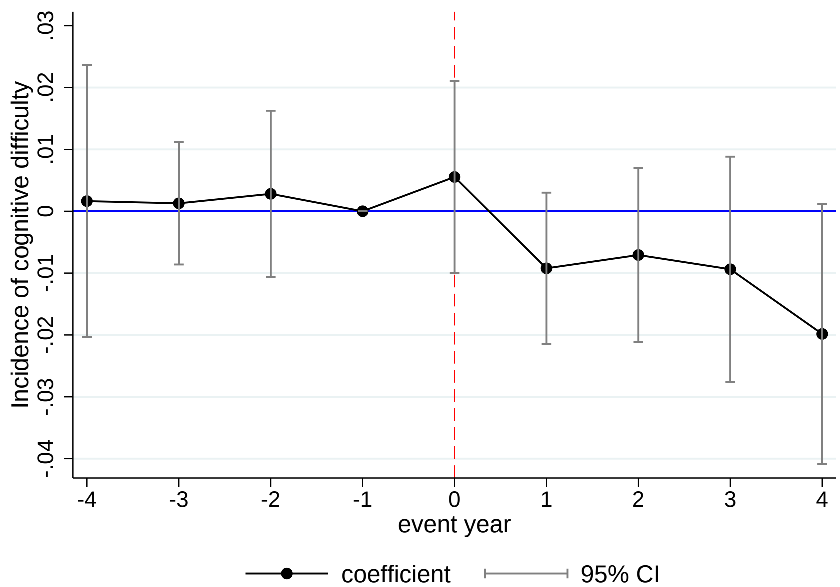
(a) Parent-reported health status



(b) Chronic health conditions

Note: Each point represents a parameter estimate on the sets of interaction terms of the indicator for treatment states and event-year dummies, $\Sigma_{k=-4}^{-2}\lambda_k$ and $\Sigma_{k=0}^{3}\phi_k$ of equation (1). Event-year is defined as a child's year of birth minus the year when the Unborn Child Option was implemented in the child's state of birth. The capped line represents a 95% confidence interval. For all estimations, the sample includes children ages 4–6 whose mothers were female noncitizens ages 22–45 with at most a high school education in 37 states in the 1998–2014 National Health Interview Survey (NHIS). The analysis of chronic health conditions is weighted by NHIS final annual sample child weight; analysis of parent-reported health status is weighted by NHIS final annual person weight. The models incorporate year of birth fixed effects, state of birth fixed effects, mother's number of years residing in the U.S. fixed effects, and region by year of birth fixed effects; they are adjusted by age, mother's education, race, mother's marital status, number of children in household, and family size. The standard errors are heteroskedasticity-robust and clustered by state of birth.

Figure 6: Cognitive Difficulty Rate for Children Ages 5–6



Note: Each point represents a parameter estimate on the sets of interaction terms of the indicator for treatment states and event-year dummies, $\Sigma_{k=-4}^{-2}\lambda_k$ and $\Sigma_{k=0}^{3}\phi_k$ of equation (1). Event-year is defined by a child's year of birth minus the year when the Unborn Child Option was adopted in the child's state of birth. The capped line represents a 95% confidence interval. For this estimation, the sample includes children between the ages of 5 and 6 whose mothers were female noncitizens between the ages of 22 and 45 with at most a high school education in 37 states in the 2003–2016 American Community Survey (ACS). The analysis is weighted by ACS final annual person weight. The models incorporate year of birth fixed effects, state of birth fixed effects, mother's number of years in the U.S. fixed effects, and region by year of birth fixed effect; they are adjusted by age, mother's education, race, mother's marital status, number of children in household, and family size. The standard errors are heteroskedasticity-robust and clustered by state of birth.

become positively biased due to favorable experiences during pregnancy.[58]

Table 5: The Effects on Health and Development Outcomes for Children Ages 4–6

	Children ages 4–6			Children ages 5–6
	Parent-reported Health Status			
	Five-point Scale	Very Good or Excellent	Chronic Health Conditions	Cognitive Difficulty
Years -4 to -2	0.022 (0.048)	-0.017 (0.026)	-0.034 (0.021)	0.002 (0.006)
Years 0 to 3	0.180*** (0.040)	0.070** (0.026)	-0.048* (0.028)	-0.008* (0.005)
Y-mean	4.068	0.697	0.077	0.019
Observations	6085	6085	2336	31,313

Note: "Years -4 to -2" represents an estimated coefficient on the interaction term of the indicator for treatment states and the pre-period indicator, λ of equation (2). "Years 0 to 3" represents an estimated coefficient on the interaction term of the indicator for treatment states and the post-period indicator, ϕ of equation (2). For estimations for health outcomes, the sample includes children between the ages of 4 and 6 whose mothers were female noncitizens between the ages of 22 and 45 with at most a high school education in 37 states in the 1998–2014 National Health Interview Survey (NHIS). For estimation for cognitive difficulty, the sample includes children between the ages of 5 and 6 whose mothers were female noncitizens between the ages of 22 and 45 with at most a high school education in 37 states in the 2008–2016 American Community Survey (ACS). The analysis of chronic health conditions is weighted by NHIS final sample child weight; analysis of parent-reported health status is weighted by NHIS final annual person weight; analysis for cognitive difficulty is weighted by the ACS final annual person weight. The models incorporate year of birth fixed effects, state of birth fixed effects, mother's number of years in the U.S. fixed effects, and region of birth by year of birth fixed effects; they are adjusted by age, mother's education, race, mother's marital status, number of children in household, and family size. The standard errors are heteroskedasticity-robust and clustered by state of birth. "Y-mean" refers to the mean value of each outcome variable in event year -1.
Cognitive Difficulty: Whether a child has cognitive difficulties (such as learning, remembering, concentrating, or making decisions) because of a physical, mental, or emotional condition.
* $p \leq 0.1$, ** $p \leq 0.05$, *** $p \leq 0.01$

Although parent-reported health status is a subjective measure, it has two advantages: (1) it may capture the subtle aspects of health that are neither detected by particular, often rare conditions, nor diagnosed by doctors, and (2) it expedites comparisons across studies since it is used broadly in population-based surveys. For instance, Hogan et al. (2000) have shown a systematic correlation of children's functional limitations and parent-reported health status of children using the 1994–1995 National Health Interview Survey-Disability Survey (NHIS-D).[59] Moreover, public medical literature has found that parent-reported health status of

[58] For reference, I examined the health indicators for children ages 0–6 altogether. Table A10 shows that the only significant coefficient is for parent-reported health status, which improved by 0.09 on a five-point scale.

[59] According to the Hogan et al. (2000), children with and without mobility limitations rate as 3.382 and 4.292 on a five-point scale health status; severe and no communication limitations rate as 3.43 and 4.308, respectively; with and without self-care limitations rate as 3.109 and 4.295, respectively; and severe and no learning ability rate as 3.661 and 4.324, respectively. Thus, the improvement of parent-reported health status by 0.180 on a five-point scale is equivalent to one-fifth of the difference between with and without mobility limitations, one-fifth of the difference between with and without communication limitations, one-sixth of the difference between with and without self-care limitations, and one-fourth of the difference between with and without learning ability limitations among children between the ages of 5 and 17.

children is associated with objective indicators of children's health status.[60]

To sum up, the effects of *in utero* public health insurance on child health begin to be revealed from ages 4–6 and are mainly captured by better parent-reported health status and the reduction in cognitive difficulty. These findings can provide one possible explanation for the inconclusive findings in birth weight: the majority of benefits of *in utero* public health insurance may not be captured by birth weight, but start to be uncovered several years after birth.[61]

Almond and Currie (2011) summarized the biological mechanisms of how early life environment generates latent effects through fetal "programming", or early-life metabolic adaptations, referred as "the action of a factor during a sensitive period or window of fetal development that exerts organizational effects that persist throughout life" (Seckl, 1998).[63] In addition to the possibility of the latent effects of *in utero* coverage, the findings can be explained by the idea that health or cognitive problems begin to manifest when children reach to certain ages when they start to do some activities related to their cognitive abilities and parents begin to recognize their children's health or developmental problems from that period. In both cases, to generate a complete assessment of *in utero* coverage, it is important to study the effects on child outcomes beyond the neonatal period

There exist several underlying mechanisms how *in utero* public health insurance can affect children's health and development outcomes *beyond* the neonatal period: Aizer et al. (2016) showed that increased *in utero* levels of the stress hormone negatively affect children's cognition and health at age seven, even after controlling for birth weight; Bublitz et al. (2012) showed that interventions for prenatal smoking is strongly associated with health and development outcomes among older children and adolescents; Eidelman and Schanler (2012) summarized that breastfeeding decreases the incidence of infectious diseases and chronic

Mobility limitation: A person 5 years of age or older "has difficulty" with or "is unable" to do the following: walk up stairs, walk three city blocks, or transfer to or from a bed or chair.
Communication limitation: A person 5 years or older "has serious difficulty communicating so the family cannot understand" or "has serious difficulty understanding others when they talk or ask questions."
Self-care limitation: A person 5 years or older "has a lot of difficulty" or "is unable" to dress, eat, bathe, get in and out of bed or chairs, use the toilet, or get around the house.
Learning ability limitation: A person 5 years or older has a diagnosis of mental retardation or autism and "has serious difficulty learning how to do things most people their age can learn."
Source: 1994/1995 NHIS-D, https://rtc3.umn.edu/nhis/define.asp

[60]Wake et al. (2002) found that parents are more likely to report poorer health for obese children, and Waters et al. (2000) showed that parents respond that their children are in worse health if their children have diabetes. Moreover, Wake et al. (2004) and Arnaud et al. (2010) showed that lower parent-reported health status for children is associated with the existence of hearing loss and cerebral palsy, respectively.

[61]The results in this paper are also compatible with the public health insurance context: Miller and Wherry (2017) found a substantial effect of Medicaid expansion on the health and educational attainment of cohorts ages 18–35 who were eligible for Medicaid during the prenatal period.[62] These findings in adult outcomes are much greater in range and magnitude compared to the birth outcomes found in Currie and Gruber (1996), although both papers used the same policy and the corresponding identification strategy.

[63]For instance, if a fetus is exposed to a poor *in utero* environment, the fetus's metabolic system may adapt to survive in that poor environment. However, if the environment after birth turns out to be different, this bad match would generate the likelihood of metabolic disorders, such as obesity, diabetes, and high blood pressure. In addition, a poor prenatal environment may impair the development of the brain and spinal cord of the fetus, which can subsequently affect the child's cognitive development (Georgieff, 2007; Prado and Dewey, 1992; Roza et al., 2007; Yu et al., 2004).

health problems, such as diabetes, obesity, asthma, and neuro-developmental delays; Prado et al. (2012) showed that maternal multiple micronutrient supplementation during pregnancy improves children's motor and cognitive abilities at preschool age. In the following section, I test two mechanisms, mother's mental health and health behavior, given the data availability in the NHIS.

5.4 Underlysing Mechanisms: Mental Health and Health Behaviors of Female Noncitizens

To investigate underlying mechanisms of how *in utero* public health insurance promotes child health and development beyond the neonatal period, I study the effects of the UCO on the mental health and health behaviors of female noncitizens, that are available in the NHIS. I use two indicators of maternal mental health found in the NHIS: the Kessler Psychological Distress Scale (K6)[64], and the incidence of feeling depressed[65] during the past 30 days. Moreover, I examine health behaviors, using variables on smoking now and number of alcoholic beverages per day.

Table 6: The Effects on Mental Health and Health Behaviors of Female Noncitizens

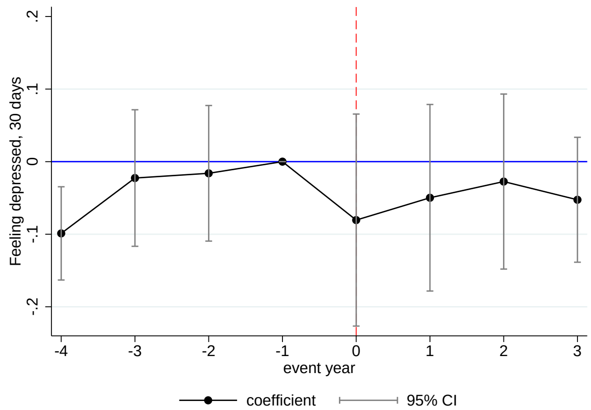
	Mental Health		Health Behavior	
	Feeling Depressed	Psychological Distress	Number of Alcoholic Beverages per Day	Smoking Now
Years -4 to -2	-0.027	-0.025*	0.010	-0.013
	(0.022)	(0.013)	(0.011)	(0.096)
Years 0 to 3	-0.037*	-0.015	0.014	-0.007
	(0.018)	(0.011)	(0.012)	(0.061)
Y-mean	0.092	0.17	0.571	0.054
Observations	8146	8123	8216	8238

Note: "Years -4 to -2" represents an estimated coefficient on the interaction term of the indicator for treatment states and the pre-period indicator, λ of equation (2). "Years 0 to 3" represents an estimated coefficient on the interaction term of the indicator for treatment states and the post-period indicator, ϕ of equation (2). For all estimations, the sample includes female noncitizens between the ages of 22 and 45 with at most a high school education in 37 states in the 1998–2014 National Health Interview Survey (NHIS). The analysis is weighted by NHIS final annual sample adult weight. The models incorporate calendar year fixed effects, state fixed effects, number of years in the U.S. fixed effects, region by year fixed effects; they are adjusted by age, education, race, marital status, number of children in household, and family size. The standard errors are heteroskedasticity-robust and clustered by state of residence. "Y-mean" refers to the pre-reform mean value of each outcome variable.
K6 score is rescaled to range between 0 and 1.
* $p \leq 0.1$, ** $p \leq 0.05$, *** $p \leq 0.01$

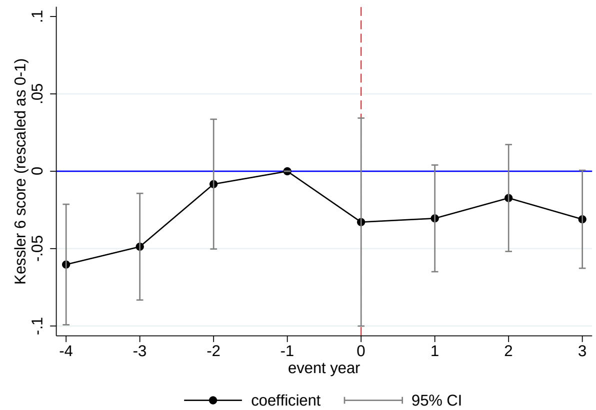
[64] The Kessler Psychological Distress Scale (K6) is calculated from six questions about the individuals' experience of depressive or fear symptoms in past 30 days. Scores range between 0 and 24, with a higher score denoting greater severity of psychological distress. It is consistently available in the NHIS during the sample period.

[65] specifically expressed as sad, hopeless, or worthless at least some of the time

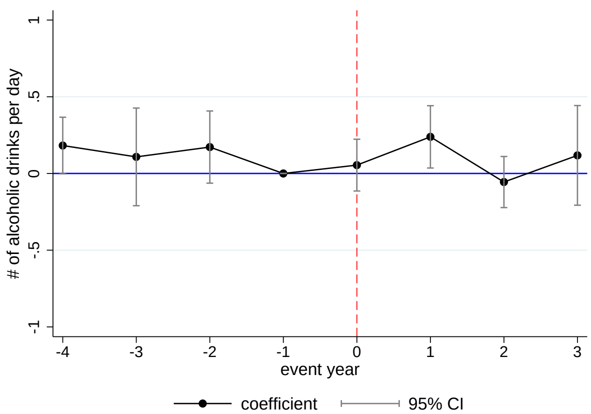
Figure 7: Mental Health and Health Behaviors



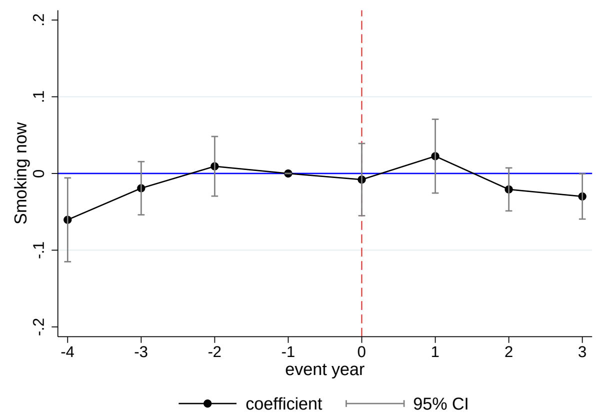
(a) Feeling Depressed, 30 days



(b) Kessler Psychological Distress Scale (K6 score)



(c) # of Alcoholic Beverages per Day



(d) Smoking Now

Note: Each point represents a parameter estimate on the sets of interaction terms of the treatment-state indicator and event-year dummies, $\Sigma_{k=-4}^{-2}\lambda_k$ and $\Sigma_{k=0}^{3}\phi_k$ of equation (1). Event-year is defined by calendar year minus the year when the Unborn Child Option (UCO) was adopted in each state, so 'event year= 0' implies the year when the UCO was implemented. The capped line represents a 95% confidence interval. For all estimations, the sample includes female noncitizens between the ages of 22 and 45 with at most a high school education in 37 states in the 1998–2014 National Health Interview Survey (NHIS). The analysis is weighted by NHIS final annual adult weight. The models incorporate calendar year fixed effects, state fixed effects, number of years in the U.S. fixed effects, and region by year fixed effects; they are adjusted by age, education, race, marital status, number of children in household, and family size. The standard errors are heteroskedasticity-robust and clustered by state of residence. K6 score is rescaled to range between 0 and 1.

Figures 7a-7d present the yearly weighted event-study estimates on the mental health and health behavior of female noncitizens ($\Sigma_{k=-4}^{-2}\lambda_k$ and $\Sigma_{k=0}^{3}\phi_k$ of equation (1)). All mental health indicators seem to improve at event year 0 though the pre-period trends are somewhat volatile. None of health behavior variables presents systematic changes following the implementation of the UCO. Table 6 shows that the incidence of feeling depressed in past 30 days significantly decreases by 3.7 percentage points in the post-period. Although the estimates are somewhat volatile, the results here can provide suggestive evidence on one possible mechanism: the UCO may enhance the mental health of expectant mothers and subsequently affect child health and development shown at preschooler ages. Further study is needed to confirm this underlying mechanism and examine more specific mechanisms, such as the type of medical treatment given to pregnant women, prescribed or recommended medicines or prenatal vitamins during prenatal check-ups following the implementation of the UCO.

6 Discussion

6.1 Key Identifying Assumption

The empirical strategy in this paper is based on state variation in whether and when the Unborn Child Option (UCO) was adopted. The key identifying assumption of this approach is that the timing of the UCO initiation is uncorrelated with other determinants of children's health. There are several potential threats to the validity of this assumption. First, mothers' health insurance coverage rates and healthcare utilization in the pre-reform period may be positively associated with both the timing of UCO implementation and children's health. States with pregnant noncitizens who were previously more insured and used more medical care may have higher incentives to adopt the option earlier because they recognize the importance of healthcare. Mothers in these states would care more about their children at the same time.[66] However, the pre-period health insurance rate and healthcare utilization of female noncitizens in each state (shown in Table A3) fails to predict when the UCO was implemented (Table A6).[67]

Next, states with a larger share of undocumented immigrants or noncitizens may tend to implement the UCO earlier to promote children's health because these populations are more impoverished and more uninsured than other populations on average. If states with more undocumented immigrants or noncitizens adopt the UCO earlier and their children are in worse health before the option, this could bias the effects. However, neither the share of unauthorized immigrants nor the share of noncitizens among total residents is

[66] On the other hand, the opposite case is also possible; states with pregnant noncitizens who were previously less insured and used less medical care may apply for the UCO earlier, as the marginal benefit would be greater.

[67] I conduct a linear regression of UCO implementation on the pre-period health insurance rate and healthcare utilization of female noncitizens, and there is no statistically significant coefficient. See Table A6.

correlated with the timing of policy initiation, according to Panel A of Table A6.[68]. The linear and quadratic fitted values of the year of UCO implementation on the pre-period share of unauthorized immigrants or noncitizens in each state are also shown in Figure A14a–A14c, confirming that no estimated slopes are statistically significant.

Lastly, I examine whether the timing of the UCO is correlated with levels of pre-period children's health. In Figure 8, each circle plot denotes a state where the UCO was implemented between 2003–2008. The size of the circle represents the number of U.S.-born children of noncitizen mothers in each state. The x-axis represents the implementation date, and the y-axis represents the state-level pre-period mean value of each variable. The orange line represents the prediction for y-axis variables from a linear regression of y-axis variables on the year of the UCO implementation and plots the resulting line. Similarly, the green line represents the prediction for y-axis variables from a quadratic regression plot. The capped dash line is a 95% confidence interval. This shows that none of the estimated slopes are statistically significant, so there is no evidence of correlation between UCO implementation and pre-levels of children's health conditions. Panel C of Table A6 also confirms that the children's pre-period health conditions shown in Table A5 cannot predict the timing of the UCO. Overall, all tests support the key identifying assumption.

6.2 Other Potential Threats

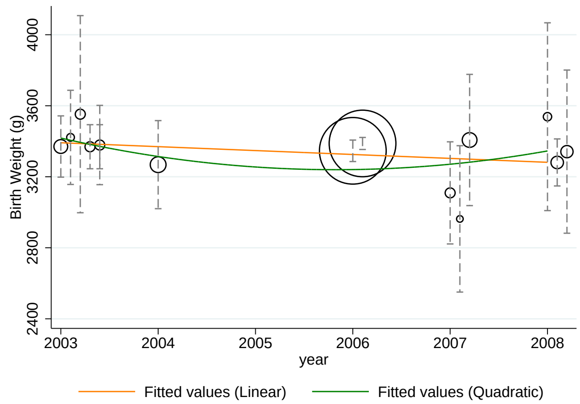
One of the major concerns with the empirical method used in this paper is the possibility of differential trends in the outcome variables for individuals who live in states where the UCO was implemented earlier, later, and never, due to unobservable factors. Figures 2, 3, 5, and 6 detect no differential pre-trends in the main outcome variables graphically. Tables A7–A8 confirm that all pre-period coefficients from the event study specification are statistically insignificant and small in magnitude compared to post-period coefficients, except in pre-period for chronic health conditions. It indicates that the trends in outcome variables are similar over time regardless of whether and when the UCO was implemented.

The most notable contribution of this paper is that the UCO only affects *in utero* coverage, not early childhood coverage of U.S.-born children of noncitizen mothers. However, the Children's Health Insurance Program Reauthorization Act of 2009 (CHIPRA) introduced the Express Lane Eligibility (ELE) option, which allowed newborns to be deemed eligible for Medicaid or CHIP until age one if their mothers were enrolled in Medicaid or CHIP on the date of the child's birth.[69] Even though eligibility for U.S.-born

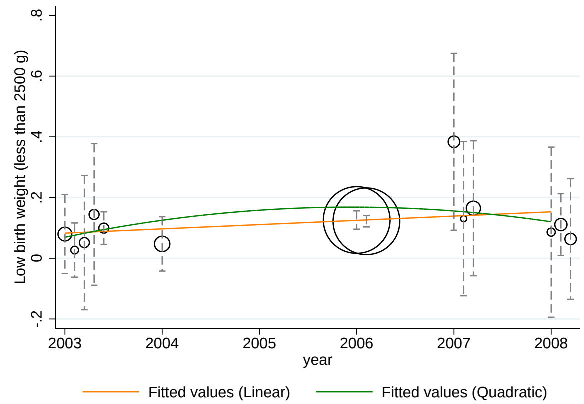
[68] *Source:* [Office of Policy and Planning, U.S. Immigration and Naturalization Service], [Estimates of the Unauthorized Immigrant Population Residing in the United States: 1990 to 2000], `https://www.dhs.gov/xlibrary/assets/statistics/publications/Ill_Report_1211.pdf`

[69] Prior to CHIPRA, deemed newborn eligibility status applied only to the Medicaid program, implying that the UCO did not have deemed newborn eligibility before ELE. Other requirements for ELE eligibility include that the newborn must return from the hospital with the mother and remain a member of the mother's household, and that the woman must remain Medicaid-eligible. *Source:* [Center for Medicaid and State Operations], (Department of Health and Human Services, [August 2009]),

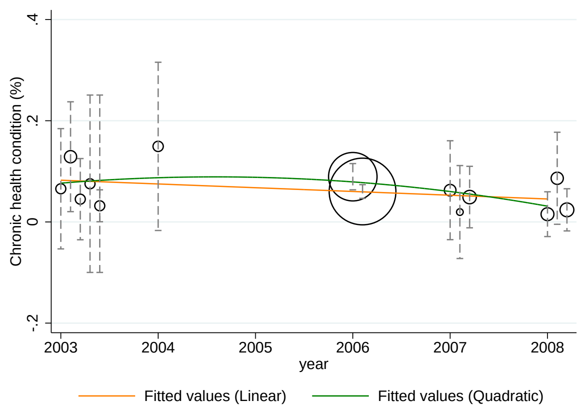
Figure 8: The Relationship between the Unborn Child Option Award Date and Pre-period Children's Health



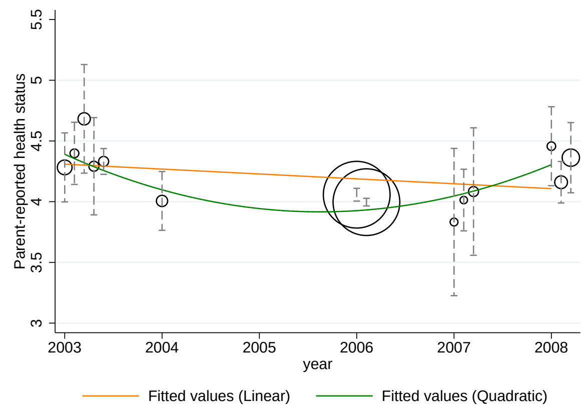
(a) Birth Weight (g)



(b) Low Birth Weight (less than 2500 g)



(c) Chronic Health Conditions



(d) Parent-reported Health Status

Note: Each circle plot denotes a state where the Unborn Child Option was implemented between 2003 and 2008. The size of the circle represents the number of observations in each state. The x-axis represents the implementation date, and the y-axis represents the state-level pre-period mean value of each variable. The capped dash line represents a 95% confidence interval. The solid orange line represents the prediction for y-axis variables from a linear regression of y-axis variables on the year of Unborn Child Option implementation. Similarly, the solid green line represents the prediction for y-axis variables from a quadratic regression plot. The estimated slopes are as follows: 0.004 (SE = 0.004) for birth weight, 8.581 (SE = 6.694) for low birth weight, -21.670 (SE = 14.292) for chronic health conditions, and -3.523 (SE = 2.501) for parent-reported health status. None of the estimated slopes are statistically significant, and the signs are mixed. The coefficients from quadratic regressions are also statistically insignificant.

children is technically identical, within the eligible income range, the ELE option may expedite Medicaid or CHIP enrollment of newborns.[70] As of 2016, 14 states had opted into the ELE option but only three states (Louisiana, Massachusetts, and Oregon)[71] had implemented the UCO, indicating that states' decisions regarding the UCO did not coincide with ELE adoption.[72] However, relatively more control states opted for ELE, which would cause the estimates to be biased toward zero. To check whether ELE affects infant's health insurance coverage in treatment and control states differently, I conduct an event study analysis using children between the ages of 0 and 1. Figures A11a–A11d confirm that there is no systematic difference in the health insurance coverage rate of U.S.-born infants of noncitizen mothers between treatment and control states, eliminating the concern regarding the ELE option.

In addition, there was a differential change in the Medicaid and CHIP income eligibility levels for children across states in the 2000s. If this generates disproportionate changes in children's eligibility between treatment and control states and it coincides with the UCO, it may confound the causal effects. I investigate the trends in Medicaid and CHIP income eligibility for children between 2001 and 2017.[73] Figure A17 displays income eligibility trends, both by calendar year and event year; it confirms that the rise in eligibility does not coincide with the UCO. To confirm that there is no systematic change in health insurance coverage rate and subsequent healthcare utilization for sample children between the ages of 0 and 6, I conduct an event-study analysis. Table 7 and Figure 9 present event study coefficients among children between the ages of 0 and 6, revealing no notable changes during the post-period.

Another potential concern for the identification strategy is the existence of other local shocks that affect children's health and occur concurrently with or just after the UCO. For instance, coincident changes in other federal assistance could threaten the identification strategy. First, I construct state-by-year level information on per capita government transfers from the Bureau of Economic Analysis Regional Economic Information System (REIS)[74] and investigate their event-year trends. Figures A15a–A15d show that no per-capita government transfer measures changed concurrently with the UCO, eliminating this local shock

https://www.medicaid.gov/federal-policy-guidance/downloads/sho-08-31-09b.pdf

[70]If treatment states are more likely to opt into ELE compared to control states and ELE increases the Medicaid or CHIP coverage of U.S.-born infants of noncitizen mothers in treatment states, it is hard to distinguish the benefits of the UCO from those of ELE.

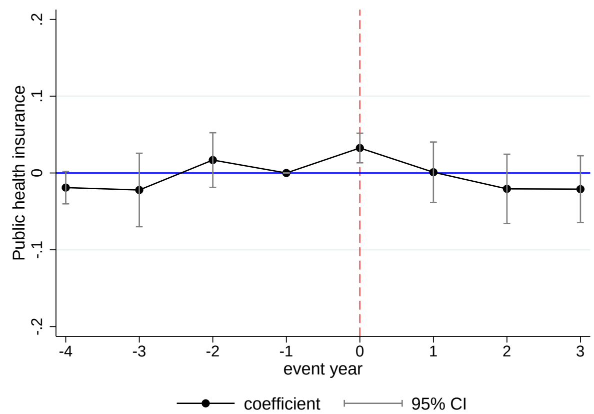
[71]Six states are the control states; five states are excluded states.

[72]ELE adoption states: AL, CO, GA, IA, LA, MA, MD, NJ, NY, OR, PA, SC, SD, UT (14 states), *Sources:* [Suzanne Murrin], [State Use of Express Lane Eligibility for Medicaid and CHIP enrollment], (Department of Health and Human Services, [October 2016]), https://oig.hhs.gov/oei/reports/oei-06-15-00410.pdf, last accessed on June 2018, [Center for Medicaid and State Operations], (Department of Health and Human Services, [October 2016]), https://www.medicaid.gov/federal-policy-guidance/downloads/sho10003.pdf, last accessed on June 2018

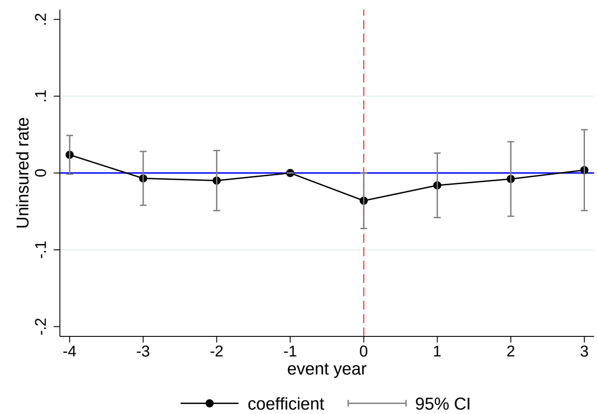
[73]*Sources:* A national survey conducted by the Kaiser Commission on Medicaid and the Uninsured with the Center on Budget and Policy Priorities, 2000-2009, and with the Georgetown University Center for Children and Families, 2011-2017. Available at: http://kff.org/medicaid/report/annual-updates-on-eligibility-rules-enrollment-and/

[74]I construct three different measures for government transfers: (1) income maintenance benefits (Supplemental Security Income (SSI) benefits, Earned Income Tax Credit (EITC), and the Supplemental Nutrition Assistance Program (SNAP)), (2) medical benefits (Public assistance medical care benefits), and (3) retirement and disability insurance benefits (Social Security, Disability Insurance, other).

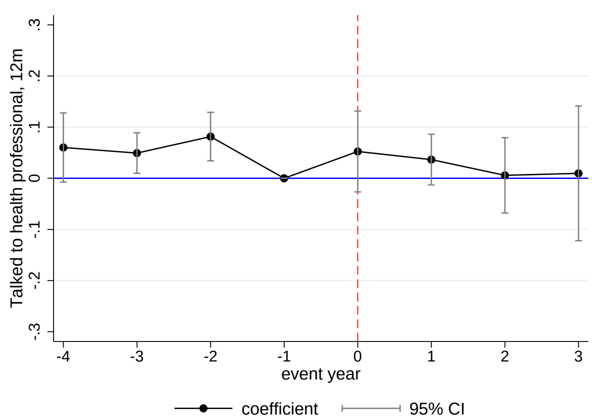
Figure 9: Health Insurance and Healthcare Utilization for Children Ages 0–6



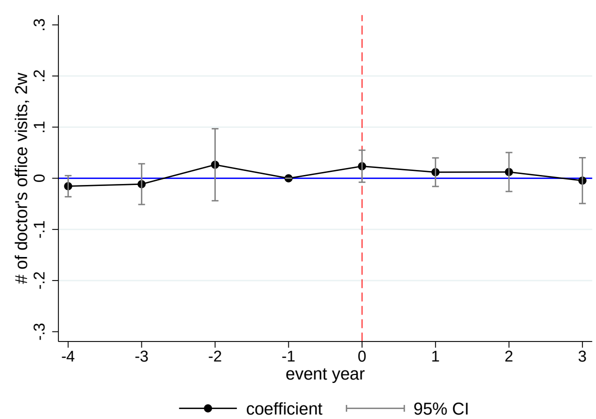
(a) Public health insurance



(b) Uninsured



(c) Spoke to health professional



(d) # of doctor visits

Note: Each point represents a parameter estimate on the sets of interaction terms of the indicator for treatment states and event-year dummies, $\Sigma_{k=-4}^{-2}\lambda_k$ and $\Sigma_{k=0}^{3}\phi_k$ of equation (1). Event-year is defined by a child's year of birth minus the year when the Unborn Child Option was adopted in the child's state of birth. The capped line represents a 95% confidence interval. For all estimations, the sample includes children between the ages of 0 and 6 whose mothers were female noncitizens between the ages of 22 and 45 with at most a high school education in 37 states in the 1998–2014 National Health Interview Survey (NHIS). The analyses for public health insurance coverage, uninsured rate are weighted by NHIS final annual person weight; analyses for the incidence of ever interacted with any healthcare professional and # of doctors visits are weighted by NHIS final sample child weight. The models incorporate year of birth fixed effects, state of birth fixed effects, mother's number of years in the U.S. fixed effects, and region of birth by year of birth fixed effects; they are adjusted by age, mother's education, race, mother's marital status, number of children in household, and family size. The standard errors are heteroskedasticity-robust and clustered by state of birth.

Table 7: The Effects on Health Insurance and Healthcare Utilization for Children, Ages 0–6

	Public Health Insurance	Uninsured Rate	Interacted with Doctors	# of Doctor visits
Years -4 to -2	-0.003	0.001	0.014	-0.003
	(0.010)	(0.011)	(0.023)	(0.011)
Years 0 to 3	0.008	-0.017	-0.004	0.010
	(0.012)	(0.020)	(0.036)	(0.012)
Y-mean	0.810	0.164	0.812	0.365
Observations	11269	14070	5762	5757

Note: "Years -4 to -2" represents an estimated coefficient on the interaction term of the indicator for treatment states and the pre-period indicator, λ of equation (2). "Years 0 to 3" represents an estimated coefficient on the interaction term of the indicator for treatment states and the post-period indicator, ϕ of equation (2). For all estimations, the sample includes children between the ages of 0 and 6 whose mothers are female noncitizens between the ages of 22 and 45 with at most a high school education in 37 states in the 1998–2014 National Health Interview Survey (NHIS). The analyses for public health insurance coverage, uninsured rate are weighted by NHIS final annual person weight; analyses for the incidence of ever interacted with any healthcare professional and # of doctors visits are weighted by NHIS final sample child weight. The models incorporate year of birth fixed effects, state of birth fixed effects, mother's number of years in the U.S. fixed effects, and region of birth by year of birth fixed effects; they are adjusted by age, mother's education, race, mother's marital status, number of children in household, and family size. The standard errors are heteroskedasticity-robust and clustered by state of birth. "Y-mean" refers to the mean value of each outcome variable in event year -1.

* $p \leq 0.1$, ** $p \leq 0.05$, *** $p \leq 0.01$

concern. To be more specific, instead of considering state-level public assistance, I examine the trends of public assistance income payments[75] given to households with noncitizen mothers and U.S.-born children between the ages of 0 and 6 using the ACS. Figure A16 offers little evidence that UCO implementation coincided with an increase in other public assistance funding.

Similarly, I also investigate state policy reports related to Federally Qualified Health Center (FQHC), which provides healthcare services to individuals regardless of immigration status, ability to pay, or health insurance status. I consider funding trends, the number of FQHC clinics, and the number of patient visits to those clinics. Nationally, FQHCs saw increases in funding, number of clinics, and patient visits in the 2000s. I specifically look at these patterns in California, Texas, and Florida, which have the largest sample size among treatment and control states, but they show no differential trends. Besides, the highest increases in California and Texas appeared in 2001–2002, before the UCO became available in 2006.[76] This eliminates the concern that the coincident expansion in FQHCs may have confound the effects of the UCO.

Two other potential concerns are differential fertility and infant death rates. If the UCO altered these rates, there could be selection bias in the results. To measure the fertility rate, I use the variable asking whether the respondent had given birth to any children in the past 12 months, from the 2001–2014 American Community Survey (ACS). For the infant death rate, I use all infants whose mothers were Hispanic ages 20–44 with at most a high school education in 37 states in the 1998–2014 Natality and Linked Birth/Infant Death Records from the National Vital Statistics System (NVSS). As the Linked Birth/Infant Death Records do not have a variable for mother's citizenship status, I use Hispanic as a proxy for noncitizen. All the other demographic characteristics are same as in my main sample. Figures A18–A19 confirm that the UCO causes no differential trends in either the fertility rate or the infant death rate.[77]

An additional potential concern for the identification strategy is the possibility that individuals may migrate more into treatment states to get UCO benefits. If pregnant noncitizens are informed that the adjacent state has implemented the UCO, they may migrate into the treatment state to receive the option's

[75] Aid to Families with Dependent Children (AFDC), General Assistance (GA), and federal or state Supplemental Security Income (SSI)

[76] *Source:* [The Texas Health Care Primer], (Center for Public Policy Priorities, [2011]), http://library.cppp.org/files/3/TxHlthPrimer_2011_Side_by_Side.pdf,[Pete Perialas], [Leveraging Community Health Center Status across Central Texas], (Lone Star Circle of Care, [March 2010], https://www.utsystem.edu/sites/default/files/documents/health/Code%20Red%3A%20Health%20Homes%20for%20Children%20and%20for%20Adults%20with%20Chronic%20Illness/perialas.pdf [California Community Clinics, A Financial Profile, 20052008], (Capital Link, the California HealthCare Foundation, [2010]), http://ambulatory.healthdesign.org/sites/default/files/Capita%20Link_California%20Community%20Clinics.pdf, [Andrew R Behrman], [Federally Qualified Health Centers: Florida's Safety Net], (Florida Association of Community Health Centers, Inc., [2010]), http://www.fdhc.state.fl.us/medicaid/Finance/finance/LIP-DSH/LIP/Archive/docs/2010/FACHC_LIP_Council_11-17-10.pdf

[77] Different abortion law in each state may affect the state's fertility rate. However, there is no evidence that treatment states have more hostile abortion law than control states, and vice versa. This is consistent with no differential trends in the fertility rate between treatment and control states. *Source:* [An Overview of Abortion Laws], (The Guttmacher Institute, [October 1, 2018]), https://www.guttmacher.org/state-policy/explore/overview-abortion-laws, [The number of states considered hostile to abortion skyrocketed between 2000 and 2014], (The Guttmacher Institute, [January 5, 2015]), https://www.guttmacher.org/infographic/2015/number-states-considered-hostile-abortion-skyrocketed-between-2000-and-2014

benefits. Similarly, if new immigrants are informed about the UCO, they may immigrate into the treatment state in the first place. If this is the case, the assignment of pregnant noncitizens to treatment states and control states is not random, and selection bias may exist.[78] To examine whether systematic cross-state migration happens after the UCO, I use two variables from the ACS, state of residence one year ago and current state of residence, to generate a variable that captures the cross-state migration in each year. Figure A20a presents the calendar-year trends of cross-state migration and Figure A20b summarizes them in event year, indicating that female noncitizens are not likely to move into states with the UCO. Next, to study new immigration patterns, I construct estimates of the share of new immigrants among noncitizens in each state-by-year using variables for number of years residing in the U.S. and citizenship status from the ACS. Figure A21a shows that no differential immigration trend is detected between treatment and control states.

Lastly, if different naturalization trends exist between treatment and control states, this can cause non-random composition of noncitizens as well. I construct the state-by-year estimates of newly naturalized citizens from U.S. Department of Homeland Security immigration statistics.[79] Figure A21b, however, verifies that there have been no distinct trends in naturalization rate between treatment and control states. To sum up, I find little evidence that potential concerns undermine the internal validity of my research design.

6.3 Robustness Check

I report the results of several robustness checks here. First, all main results are robust to whether the specification incorporates region by year fixed effects (region of birth by year of birth fixed effects, for child analysis) (See Tables A13–A19). In addition, as the Unborn Child Option (UCO) grants benefits regardless of legal immigration status, undocumented noncitizens are more likely to take up this option, because documented noncitizens may have public health insurance options other than the UCO.[80] However, neither the NHIS nor the ACS can identify whether noncitizens are documented or undocumented. I use Hispanic origin as a proxy for unauthorized noncitizens, to provide some suggestive evidence on whether the impact of the UCO is mainly driven by unauthorized noncitizens. In the United States, 75% of undocumented immigrants originated from Hispanic countries in 2008.[81] Also, more than half of the Hispanic immigrants

[78]For instance, pregnant women who moved into treatment states after UCO implementation may take care of their fetuses more and provide better prenatal environments as compared to those who did not migrate. Also, they could be more financially well-off.

[79]*Source:* U.S. Department of Homeland Security https://www.dhs.gov/immigration-statistics/yearbook/2017/table22, https://www.dhs.gov/immigration-statistics/yearbook/2014/table22, https://www.dhs.gov/immigration-statistics/yearbook/2011

[80]All policies except the UCO explained in Section 2 have targeted authorized noncitizens.

[81][Bryan Baker and Nancy Rytina], [Estimates of the Unauthorized Immigrant Population Residing in the United States],(Population Estimates, Office of Immigration Statistics, Department of Homeland Security [January 2012]), https://immigration.procon.org/sourcefiles/illegal-immigration-population-2012.pdf

in the U.S. were unauthorized, while 14%–24% of Asian immigrants, the second largest immigrant population following Hispanic immigrants, were unauthorized as of 2008.[82] Thus, for a robustness check I look at how the results vary by Hispanic origin. Tables A20–A21 show my results for the subsample of individuals who identified as Hispanic and non-Hispanic separately. Only the Hispanic population shows significant coefficients, similar to the primary results, while the non-Hispanic group shows no significant effect. This analysis presents two implications: first, all of the primary outcomes consistently appear only among the Hispanic population, implying that those outcomes are not just coincidental, but are rather consequences of the UCO. Second, the effects of the UCO are mainly driven by the take-up of undocumented noncitizens.

6.4 Cost-benefit Analysis

To assess the effectiveness of the Unborn Child Option (UCO), I present a cost-benefit analysis (CBA) considering societal costs and benefits. For societal costs, I focus only on the incremental CHIP expenditure for the newly enrolled population, neglecting increased administrative costs. For societal benefits, I use the main benefit on child health revealed in the primary results: improved parent-reported child health status. To estimate the incremental CHIP spending due to the newly enrolled population, I utilize the coefficient ϕ with CHIP or State/Other health insurance coverage as an outcome variable in equation (2) (See Table A9). Applying the coefficient to the post-period survey-weighted population of noncitizens in the treatment states using the ACS, I estimate a newly enrolled population of 287,831 noncitizens during the four-years post-period.[83]

The annual UCO expenditure per enrollee was $6178 in 2008.[84] Since the UCO is publicly-funded, they generate a deadweight loss: the marginal cost of public funding (MCPF).[85] I use a baseline value of 30% in this analysis and 15% and 50% for the sensitivity analysis (Sommers, 2010).[86] Thus, the increased cost due to newly enrolled noncitizens equals (1+MCPF)×(Medicaid spending per adult)×(the number of newly

[82] *Source:* [Pew Research Center, Migration Policy institute], http://www.pewhispanic.org/2009/04/15/mexican-immigrants-in-the-united-states-2008/, https://www.migrationpolicy.org/article/filipino-immigrants-united-states-2, https://www.migrationpolicy.org/article/korean-immigrants-united-states-0, https://www.migrationpolicy.org/article/chinese-immigrants-united-states-2

[83] Number of newly enrolled individuals=(# female noncitizens in the U.S. on treatment states in post-period)× coefficient from regression=7,779,242×0.037 = $287,831$

[84] The amount is the average cost of prenatal care, delivery, and postpartum service in California ($7171) and Texas ($5710) as of 2008. I assume that it is on average similar across other states. For California, I use the estimated cost of prenatal care, delivery, and postpartum service from Medi-Cal as of 2008, and for Texas, I use the exact amount of expenditure on the UCO per enrollee in 2015 and convert it into 2008 dollars. *Source*: [Emily Monea and Adam Thomas], [The Public Cost of Pregnancy], (The Brookings Institution, [March 2011]), https://www.brookings.edu/wp-content/uploads/2016/06/03_pregnancy_public_cost_monea_thomas.pdf, [Overview of Programs Providing Prenatal Services], (Legislative Budget Board, [May, 2016]), http://www.lbb.state.tx.us/Documents/Publications/Issue_Briefs/3101_Providing_Prenatal_Service_Progs.pdf

[85] The marginal cost of public funds (MCPF) measures the loss generated by society in raising additional revenues to finance government spending. Formally, it is defined as the ratio of the marginal value of a monetary unit made by the government and the value of that marginal private monetary unit.

[86] Browning (1987) utilized estimates ranging from 30% to 47%, while Ballard et al. (1985) employed estimates from 15% to 50%.

registered noncitizens) = (1+0.3)$\times$ \$6,178$\times$ 287,831 = \$2.3 billion. As the UCO allows pregnant noncitizens access to prenatal care, I set the span of coverage to one year.

To estimate benefits from the UCO on child health, I attempt to quantify improved health status. Quality-adjusted life year (QALY) is often used in cost-benefit analyses to evaluate the effectiveness of a public health intervention. One QALY denotes one year in perfect health, while zero QALY indicates death. According to the previous health economics literature, I assume that the value of an additional year of life in the absence of disease is \$75,000 in this analysis, and use \$50,000 and \$100,000 for the sensitivity analyses (Cutler and Mcclellan, 2001; Murphy and Topel, 1999; Viscusi, 1993).

To calculate the weight of QALY from the five-point scale health status, I use Nyman et al. (2007), which constructs nationally representative quality of life weights for the five-point self-reported health status category using a large sample of Americans using the Medical Expenditure Panel Survey (MEPS).[87] From the estimates from Nyman et al. (2007), I set up the baseline weights by parent-reported health status of children: poor as 0.527, fair as 0.748, good as 0.868, very good as 0.923, and excellent as 0.951.[88] The incidence of very good or excellent health status increased by 7 percentage points, and the parent-reported health status rose by 0.180 on a five-point scale among children between the ages of 4 and 6 who were born in the treatment states. From these two results, I can infer that 7% of children have better parent-reported health status by approximately 2.57 out of a five-point scale[89] Thus, I can assume that this improvement is caused by four different changes: from "fair" to "very good", from "good" to excellent", from "poor" to "very good", and from "fair" to "excellent", referring to the changes in weight of QALY by 0.175, 0.083, 0.396, and 0.203, respectively.[90]. To make the CBA as simple as possible, I use the average value of the four changes in QALY weight, 0.214.

To calculate the value of improved health for children between the ages of 4 and 6, I estimate the number of affected children between the ages of 4 and 6 whose mothers were noncitizens in treatment states during the post-reform period as 204,563 using the survey-weighted population in the ACS.[91] The estimated value of the improved child health is \$3.3 billion.[92]

Table 8 shows the results of the cost-benefit analysis. The UCO produces a net societal benefit of \$1

[87]However, I need a couple of assumptions to apply the estimates in this analysis. First, I assume that parents between the ages of 22 and 45 report their children's health status in the same way they report their own health. Second, I also assume that there is no difference in reporting health status between U.S. citizens and noncitizens.

[88]The weights are based on the self-reported health status of individuals between the ages of 25 and 44 estimated by Nyman et al. (2007).

[89]Under the assumption that only 7% of children have better parent-reported health status, while 93% have the same health status, a rise of 0.180 among all children can be caused by a rise of 2.57 among 7% of children.

[90]0.923 (Weight as very good)-0.748 (Weight as fair)=0.175, 0.951 (Weight as excellent)-0.868 (Weight as good)=0.083, 0.923 (Weight as very good)-0.527 (Weight as poor)=0.396, 0.951 (Weight as excellent)-0.748 (Weight as fair)=0.203

[91]To calculate the affected number of children, I utilize the coefficient ϕ, with "Very good or Excellent health status," as an outcome variable from equation (2) (Table 4).

[92]The increments in the value of better health estimated by better parent-reported health status in children ages 4–6: the increase in the weight of QALY $\times$ the value of an additional year of life in the absence of disease $\times$ the number of affected children=0.214 $\times$ \$75,000 $\times$(0.07$\times$ 2,922,332) = \$3.3 billion

billion, and the social rate of return is 43%, indicating that the UCO is a cost-effective policy. The benefit surpasses the cost in most of the sensitivity analysis as well (See Table A22).

Table 8: Cost-benefit Analysis of the UCO, in 2008 dollars

	Marginal Cost of Public Funds (MCPF)
	30%
The Increments in the Value of Life Year for Ages 4–6	Societal cost: \$2.3 billion Societal benefit: \$3.3 billion Social rate of return: 43%

Formulae:
(A) Societal cost due to the newly enrolled noncitizens=(1+MCPF)×(Unborn Child Option expenditure per enrollee)×(the number of newly enrolled noncitizens)
(B) Societal benefit =(the number of affected children)× (the increments in the value of life based on the QALY method)
(C) Social rate of return: $\frac{Benefit-Cost}{Cost}$

The cost-benefit analysis conducted here is not precise due to many assumptions and simplifications. The results, however, are helpful for understanding the policy's effectiveness as well as its future implications. If improved child health at ages 4–6 persists in the long run, the societal benefit could be magnified over time. Overall, the cost-benefit analysis shows that the UCO is cost-effective and supports the idea that *in utero* public health insurance, regardless of mothers' citizenship or legal immigration status, generates long-lasting health benefits in citizen children.

7 Conclusion

To my knowledge, this is the first study to isolate the effects of *in utero* public health insurance on child health beyond the neonatal period; to do this, I employ a reform of public health insurance for previously ineligible pregnant noncitizens, the so-called the Unborn Child Option (UCO).[93] I find that the UCO increased public health insurance coverage and the number of doctor's office visits among female noncitizens of childbearing age in treatment states. According to the main results on child health, the improvements begin to appear at ages 4–6 while no improvement is shown at earlier ages; the benefits are only captured by parent-reported general health status and cognitive difficulty rates. These findings are consistent with previous literature that discovered latent effects of the prenatal environment (Aizer et al., 2016; Almond and Currie, 2011; Bublitz et al., 2012; Miller and Wherry, 2017; Prado et al., 2012, 2017; Stein et al., 1975). Although the estimates are

[93]For prenatal care itself, Noonan et al. (2013) used a variation in the timing of prenatal care initiation to examine the impact on child health at age five but found no significant improvement. Noonan et al. (2013) could not fully resolve the issue of potential omitted variable bias, because the timing of prenatal care is closely associated with other unobserved characteristics of mothers which can subsequently affect child health. They also utilized the Fragile Families and Child Well-being (FFCWB) data comprising only the urban population without sampling weights, which is much different from my sample population, low-income noncitizens and their children. This may provide possible explanations for why Noonan et al. (2013) and my paper have different results.

not robust, I also provide suggestive evidence on one possible mechanism by which public health insurance *in utero* may affect child health beyond birth outcomes: the improved mental health of expectant mothers.

This paper has a couple of limitations. First, as the UCO targets noncitizens, the sample size is inherently small and may cause a lack of statistical significance. However, I still find some notable changes in essential outcome variables following the implementation of the policy. Second, among various underlying mechanisms, I only empirically examine the role of increased number of doctor's visits and improved mental health of mothers so it is hard to specify the mechanism beyond them. Further study is needed to focus on more specific mechanisms, such as the type of medical treatment, prescribed or recommended medicines/prenatal vitamins during prenatal check-ups following the implementation of the UCO. Third, this analysis examine child outcomes up to age six due to short post-reform period. To conduct more rigorous and comprehensive assessment of the UCO, further study needs to extend the analysis to older age groups.

Despite its limitations, this paper isolates the causal impact of *in utero* public health insurance on child health beyond birth outcomes and finds that the benefits seem to appear around ages 4–6. There has been a lack of evidence on what type of interventions during what point in early life matter for long-term health outcomes. The findings here fill this gap to some extent, providing the causal impact of *in utero* public health insurance on mid- or possibly long-run outcomes. Notably, this paper has policy implications especially for U.S.-born children of noncitizen mothers, because many states still prohibit noncitizens from accessing public health insurance, even for prenatal care.[94] The improvements in children's health found in this paper suggest that guaranteed access to prenatal care for any disadvantaged pregnant woman may improve children's long-lasting outcomes.

[94] [National Immigrant Womens Advocacy Project (NIWAP, pronounced newapp)], (American University, Washington College of Law, [July 2012]), http://library.niwap.org/wp-content/uploads/2015/pdf/PB-Chart-MedicalAssistanceProgramsState-11.28.14.pdf

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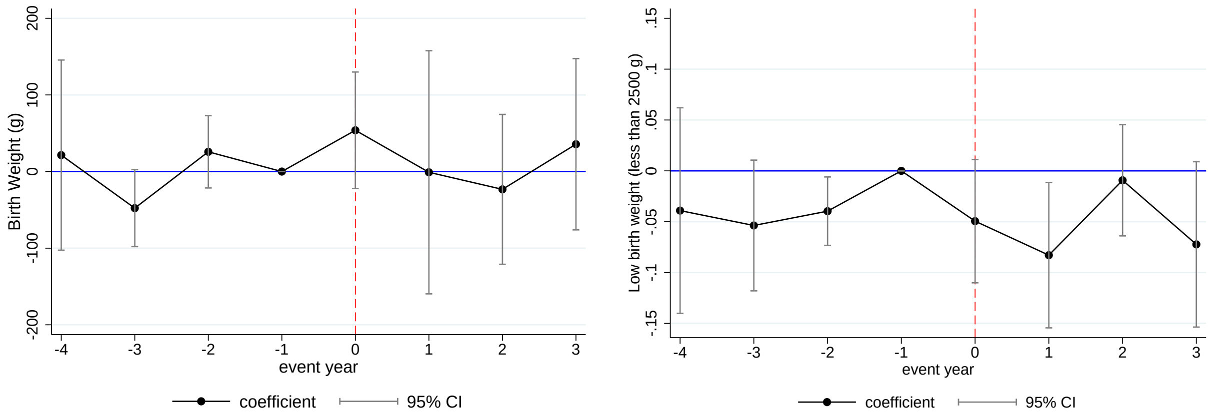
Appendix A Children's Birth Outcomes

Figure A1: Birth Outcomes for Children



(a) Birth weight (g)

(b) Low birth weight (less than 2500 g)

Note: Each point represents a parameter estimate on the sets of interaction terms of the indicator for treatment states and event-year dummies, $\Sigma_{k=-4}^{-2}\lambda_k$ and $\Sigma_{k=0}^{3}\phi_k$ of equation (1). Event-year is defined as a child's year of birth minus the year when the Unborn Child Option was implemented in that child's state of birth. The capped line represents a 95% confidence interval. For all estimations, the sample includes children between the ages of 0 and 6 whose mothers were female noncitizens between the ages of 22 and 45 with at most high school education in 37 states in the 1998–2014 National Health Interview Survey (NHIS). The analysis is weighted by NHIS final annual sample child weight. The models incorporate year of birth fixed effects, state of birth fixed effects, mother's number of years residing in the U.S. fixed effects and region by year of birth fixed effects; they are adjusted by age, mother's education, race, mother's marital status, number of children in household, and family size. The standard errors are heteroskedasticity-robust and clustered by state of birth.

I analyze the effects of the Unborn Child Option (UCO) on birth outcomes to check the consistency with previous literature. Figures A1a-A1b show that there is no notable change in birth weight after implementation of the UCO. The incidence of low birth weight in the post-period seems to decrease, but the yearly trend of coefficients is somewhat unstable in the post period. Table A1 shows a statistically significant decrease in the incidence of low birth weight in the post-period. However, I cannot argue that it is attributable to the UCO because the pre-reform coefficient is not negligible in magnitude and the overall trends are volatile.[95]

[95] The DD estimate is approximately equal to the post-period estimate minus the pre-period estimate, or $(-0.030)-(-0.016) = -0.014$ for low birth weight. It consistently shows that the reduction in the rate of low birth weight is small and hard to be attributable to the UCO.

Table A1: The Effects on Birth Outcomes for Children

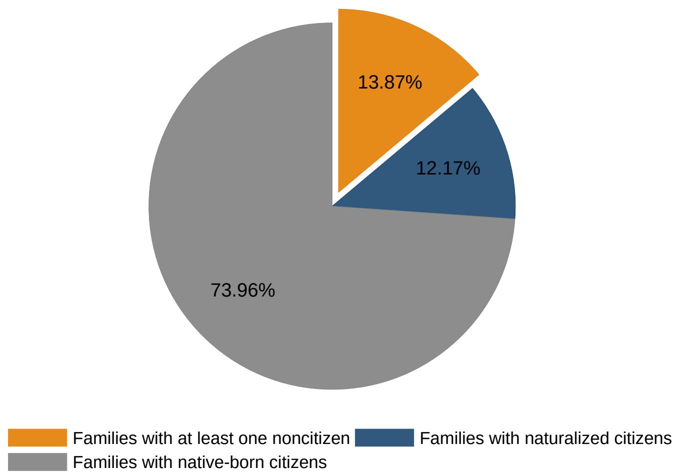
	Birth Weight (g)	Low Birth Weight ($\leq$ 2500 g)
Years -4 to -2	15.564	-0.016
	(24.523)	(0.016)
Years 0 to 3	24.298	-0.030*
	(33.461)	(0.016)
Y-mean	3249	0.173
Observations	5401	5786

Note: "Years -4 to -2" represents an estimated coefficient on the interaction term of the indicator for treatment states and the pre-period indicator, λ of equation (2). "Years 0 to 3" represents an estimated coefficient on the interaction term of the indicator for treatment states and the post-period indicator, ϕ of equation (2). For all estimations, the sample includes children between the ages of 0 and 6 whose mothers were female noncitizens between the ages of 22 and 45 with at most a high school education in 37 states in the 1998–2014 National Health Interview Survey (NHIS). The analysis is weighted by NHIS final sample child weight. The models incorporate year of birth fixed effects, state of birth fixed effects, mother's number of years in the U.S. fixed effects, and region of birth by year of birth fixed effects; they are adjusted by age, mother's education, race, mother's marital status, number of children in household, and family size. The standard errors are heteroskedasticity-robust and clustered by state of birth. "Y-mean" refers to the mean value of each outcome variable in event year -1, $k = -1$.
* $p \leq 0.1$, ** $p \leq 0.05$, *** $p \leq 0.01$

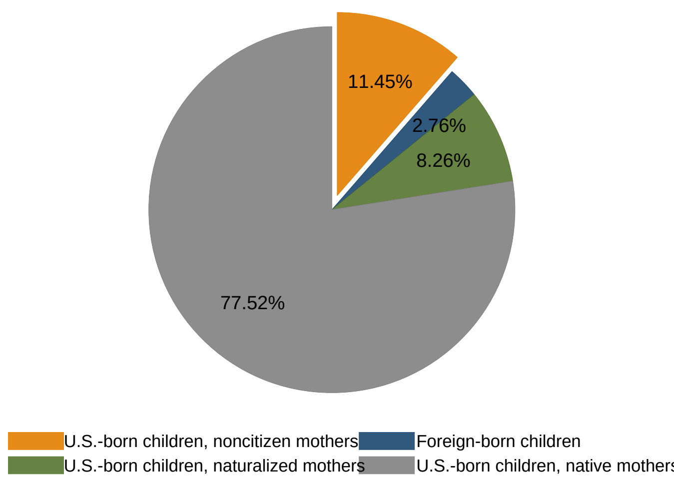
Appendix B Figures

Figure A2: The Share of Mixed-citizenship Families and U.S.-born Children with Noncitizen Mothers (Ages 0–6)

(a) The share of mixed-citizenship families as a percent of the U.S. population



(b) The share of U.S.-born children with noncitizen mothers as a percent of total children in the U.S. (Ages 0–6)



Source: The American Community Survey (ACS) in 2016

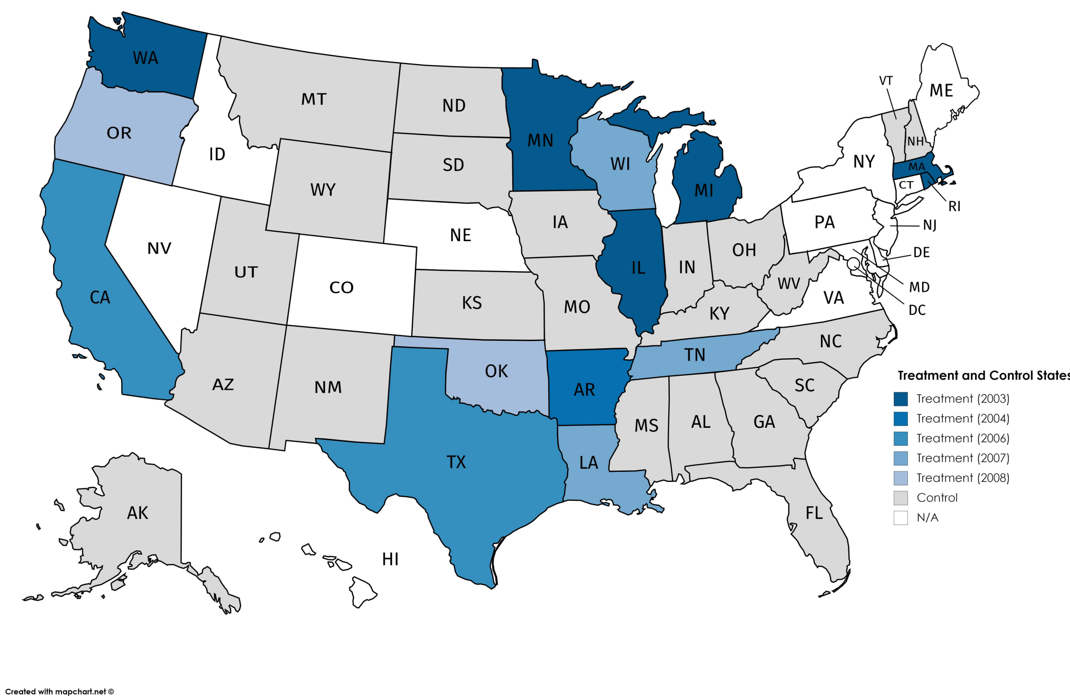
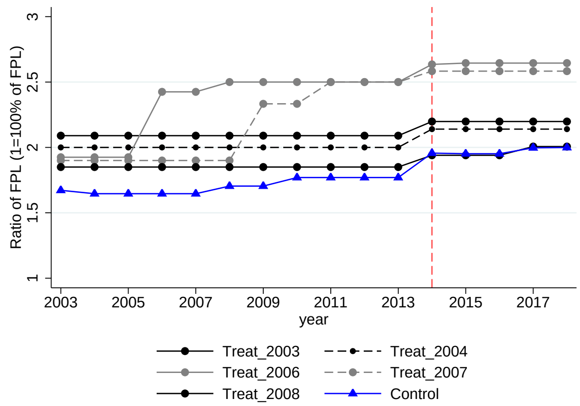


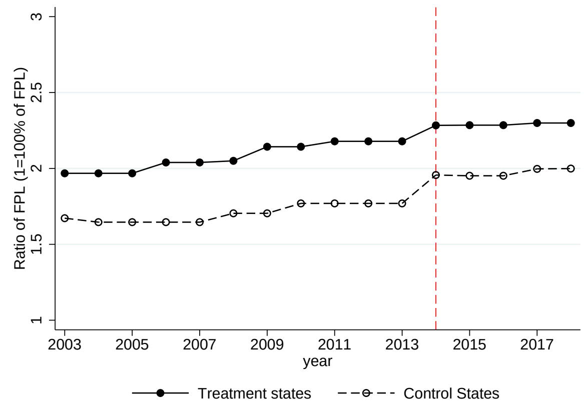
Figure A3: Treatment States and Control States

Source: Kaiser Family Foundation, Families USA [August 2010], Families USA, [July 2010], March of Dimes, [October 2013], Congressional Research Service [January 2008], and Guide to Immigrant Eligibility for Federal Programs from the National Immigration Law Center

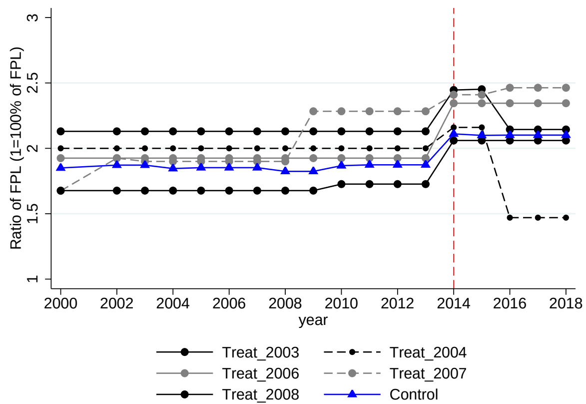
Figure A4: The Trends of Medicaid Income Eligibility Limits for Pregnant Women and Children



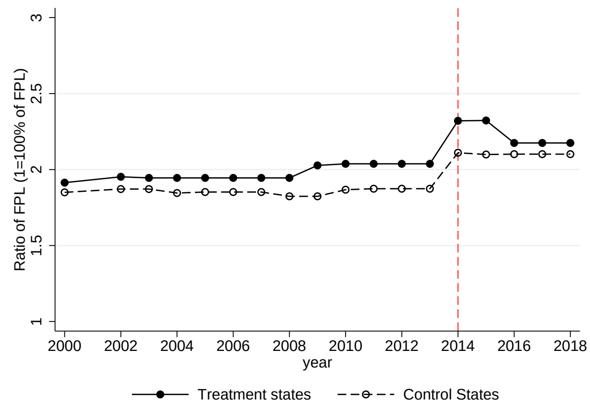
(a) Medicaid income eligibility, pregnant women



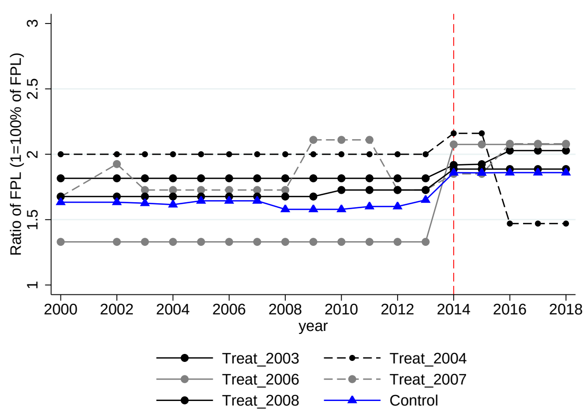
(b) Medicaid income eligibility, pregnant women



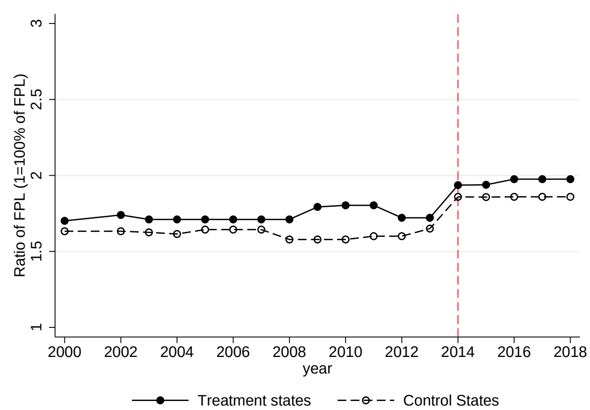
(c) Medicaid income eligibility, ages 0–1



(d) Medicaid income eligibility, ages 0–1



(e) Medicaid income eligibility, ages 1–5



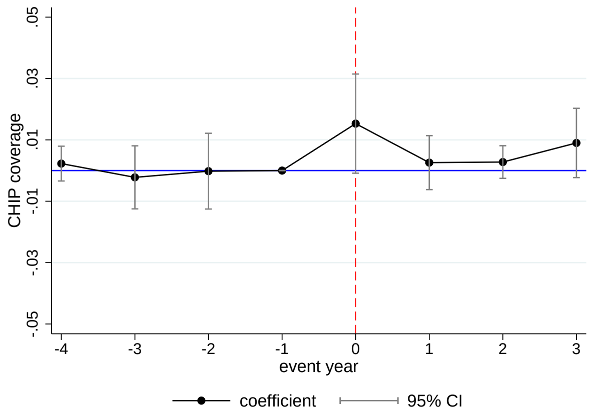
(f) Medicaid income eligibility, ages 1–5

Note: Each set of two graphs in a row shows the trends of Medicaid income eligibility of pregnant women, infants between the ages of 0 and 1, and children between the ages of 1 and 5, respectively. All eligibility limits are calculated as a ratio of the Federal Poverty Level (FPL) (1 = 100% of FPL). Changes over time reflect policy changes and, in some cases, changes in state reporting. Some changes between 2013 and 2014 reflect conversion to MAGI-based income eligibility standards.

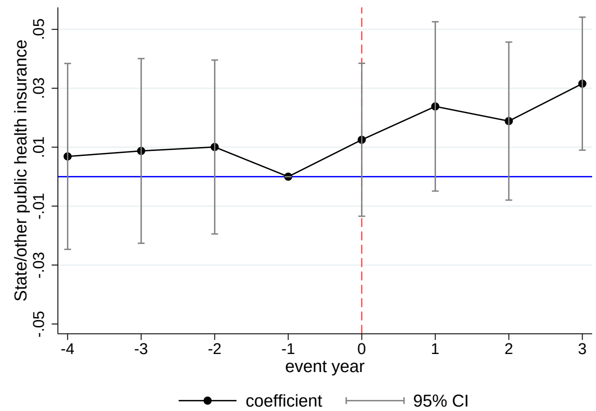
***Treat_'year'** refers to states where the Unborn Child Option is implemented in 'year'.

***Control** refers to Control states.

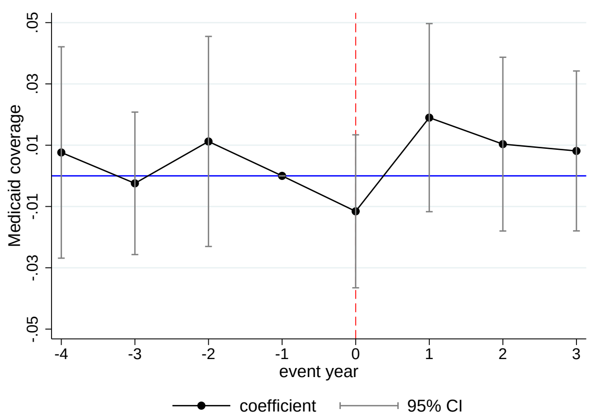
Figure A5: Public Health Insurance Coverage of Female Noncitizens



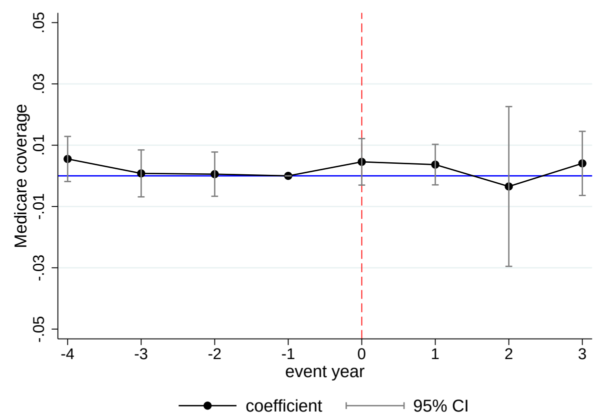
(a) CHIP



(b) State/Other public health insurance



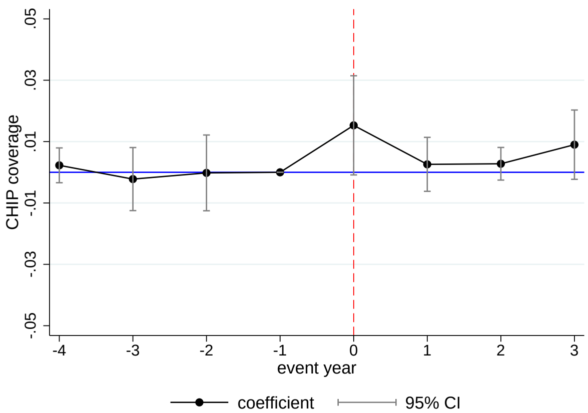
(c) Medicaid



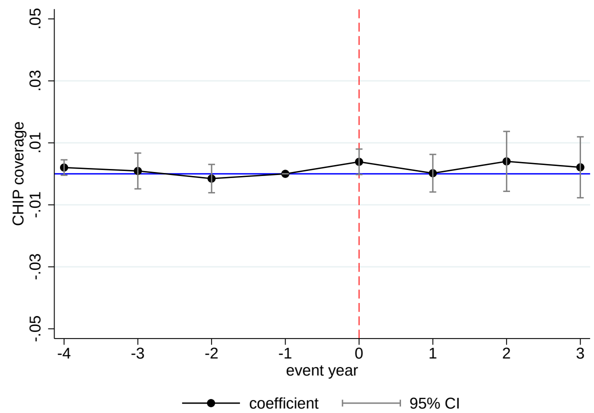
(d) Medicare

Note: Each point represents a parameter estimate on the sets of interaction terms of the indicator for treatment states and event-year dummies, $\Sigma_{k=-4}^{-2}\lambda_k$ and $\Sigma_{k=0}^{3}\phi_k$ of equation (1). Event-year is defined by calendar year minus the year when the Unborn Child Option (UCO) was adopted in each state, so 'event year= 0' implies the year when the UCO was initiated. The capped line represents a 95% confidence interval. For all estimations, the sample includes female noncitizens between the ages of 22 and 45 with at most a high school education in 37 states in the 1998–2014 National Health Interview Survey (NHIS). The analysis is weighted by the NHIS final annual person weight. The models incorporate calendar year fixed effects, state fixed effects, number of years in the U.S. fixed effects, and region by year fixed effects; they are adjusted by age, education, race, marital status, number of children in household, and family size. The standard errors are heteroskedasticity-robust and clustered by state of residence.

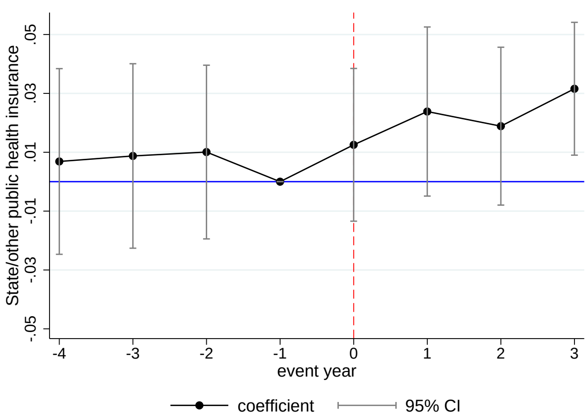
Figure A6: Health Insurance Coverage of Female and Male Noncitizens



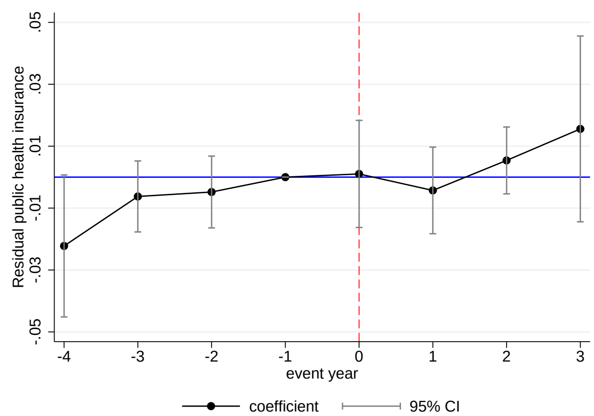
(a) CHIP coverage (female)



(b) CHIP coverage (male)



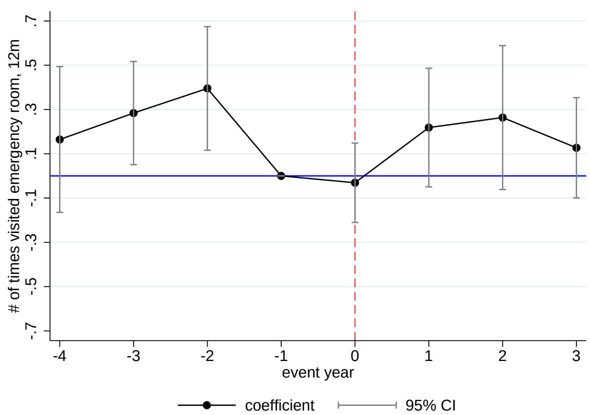
(c) Other public health insurance (female)



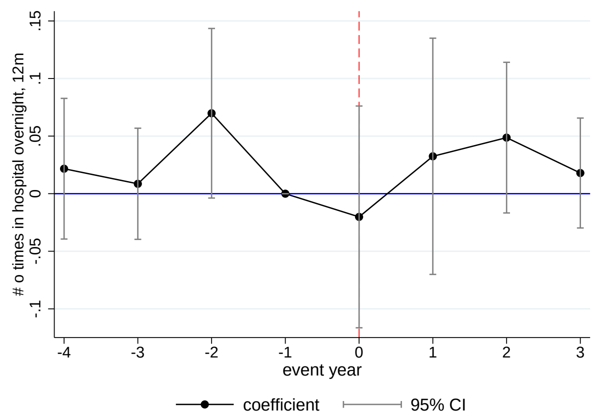
(d) Other public health insurance (male)

Note: Each point represents a parameter estimate on the sets of interaction terms of the indicator for treatment states and event-year dummies, $\Sigma_{k=-4}^{-2}\lambda_k$ and $\Sigma_{k=0}^{3}\phi_k$ of equation (1). Event-year is defined by calendar year minus the year when the Unborn Child Option (UCO) was adopted in each state. So 'event year= 0' implies the year when the UCO was implemented. The capped line represents a 95% confidence interval. For all estimations, the sample includes female and male noncitizens between the ages of 22 and 45 with at most a high school education in 37 states in the 1998–2014 National Health Interview Survey (NHIS). The analysis is weighted by the NHIS final annual person weight. The models incorporate calendar year fixed effects, state fixed effects, number of years in the U.S. fixed effects, and region by year fixed effects; they are adjusted by age, education, race, marital status, number of children in household, and family size. The standard errors are heteroskedasticity-robust and clustered by state of residence.

Figure A7: Healthcare utilization of Female Noncitizens, Not Related to Prenatal Care



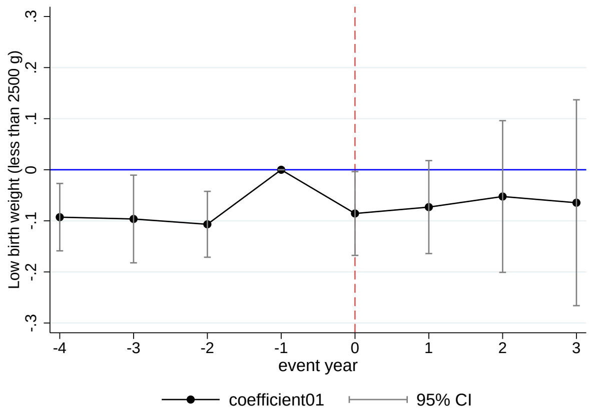
(a) # of emergency room visits



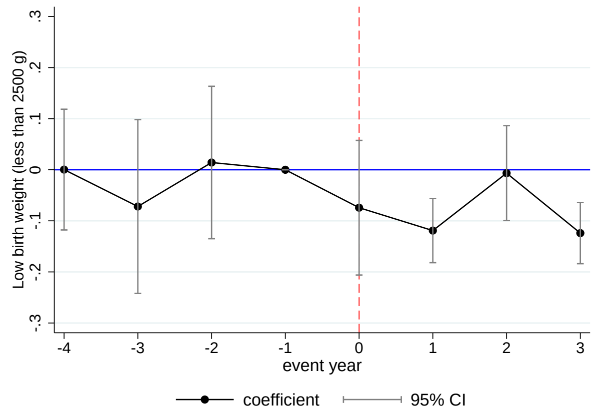
(b) # of times in hospital overnight

Note: Each point represents a parameter estimate on the sets of interaction terms of the indicator for treatment states and event-year dummies, $\Sigma_{k=-4}^{-2}\lambda_k$ and $\Sigma_{k=0}^{3}\phi_k$ of equation (1). Event-year is defined by calendar year minus the year when the Unborn Child Option (UCO) was adopted in each state, and I subtract one more to match with the range of questions, in the past 12 months at the time of the survey. So 'event year= 0' implies the year when the UCO was implemented. The capped line represents a 95% confidence interval. For all estimations, the sample includes female noncitizens between the ages of 22 and 45 with at most a high school education in 37 states in the 1998–2014 National Health Interview Survey (NHIS). The analysis is weighted by the NHIS final annual sample adult weight. The models incorporate calendar year fixed effects, state fixed effects, number of years in the U.S. fixed effects, and region by year fixed effects; they are adjusted by age, education, race, marital status, number of children in household, and family size. The standard errors are heteroskedasticity-robust and clustered by state of residence.

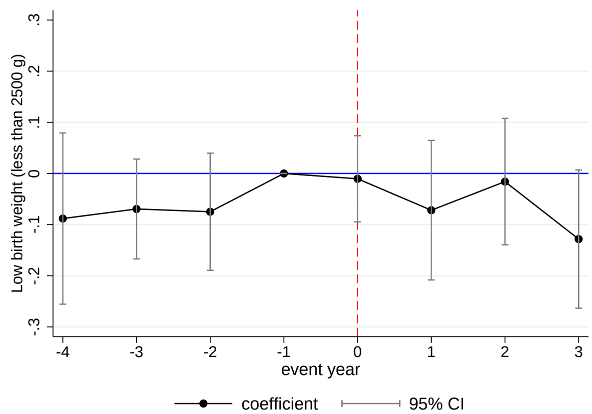
Figure A8: Birth Outcomes for Children Ages 0–1, 2–3, and 4–6



(a) Low birth weight (less than 2500 g), Ages 0–1



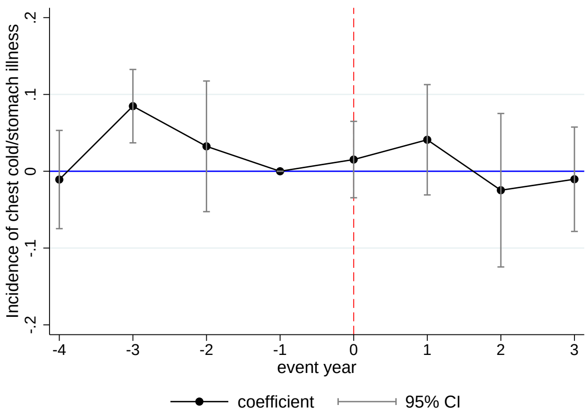
(b) Low birth weight (less than 2500 g), Ages 2–3



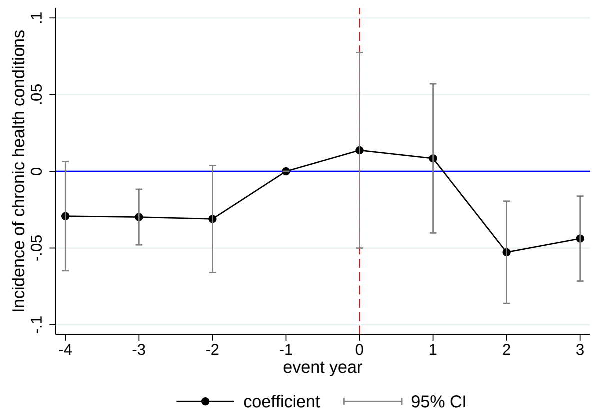
(c) Low birth weight (less than 2500 g), Ages 4–6

Note: Each point represents a parameter estimate on the sets of interaction terms of the indicator for treatment states and event-year dummies, $\Sigma_{k=-4}^{-2}\lambda_k$ and $\Sigma_{k=0}^{3}\phi_k$ of equation (1). Event-year is defined as a child's year of birth minus the year when the Unborn Child Option was implemented in the child's state of birth. The capped line represents a 95% confidence interval. For all estimations, the sample includes children ages 0–6 whose mothers were female noncitizens ages 22–45 with at most a high school education in 37 states in the 1998–2014 National Health Interview Survey (NHIS). The analyses are weighted by NHIS final sample child weight. The models incorporate year of birth fixed effects, state of birth fixed effects, mother's number of years residing in the U.S. fixed effects, and region by year of birth fixed effects; they are adjusted by age, mother's education, race, mother's marital status, number of children in household, and family size. The standard errors are heteroskedasticity-robust and clustered by state of birth.

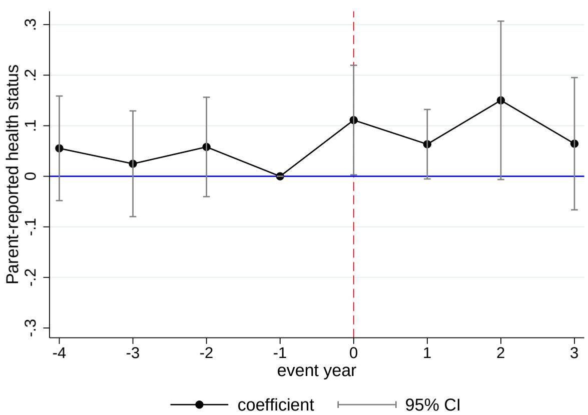
Figure A9: Health Outcomes for Children Ages 0–6



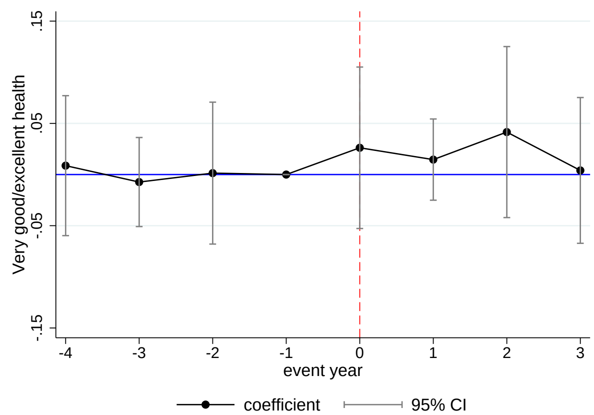
(a) Chest cold or stomach illness, 2 weeks



(b) Chronic health condition



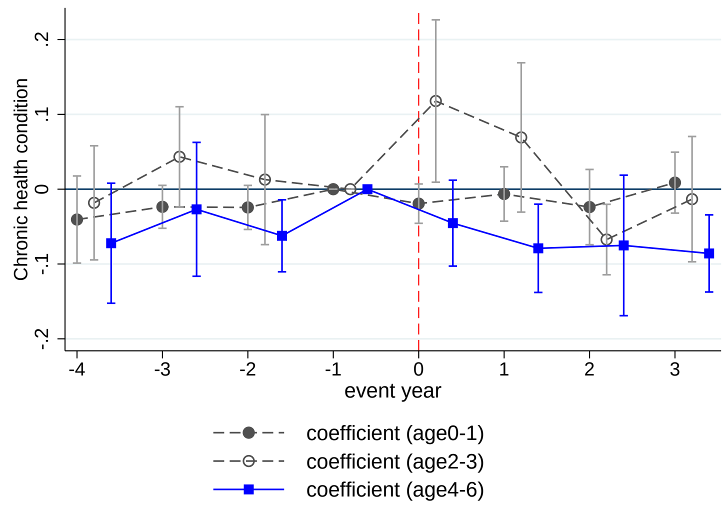
(c) Parent-reported health status



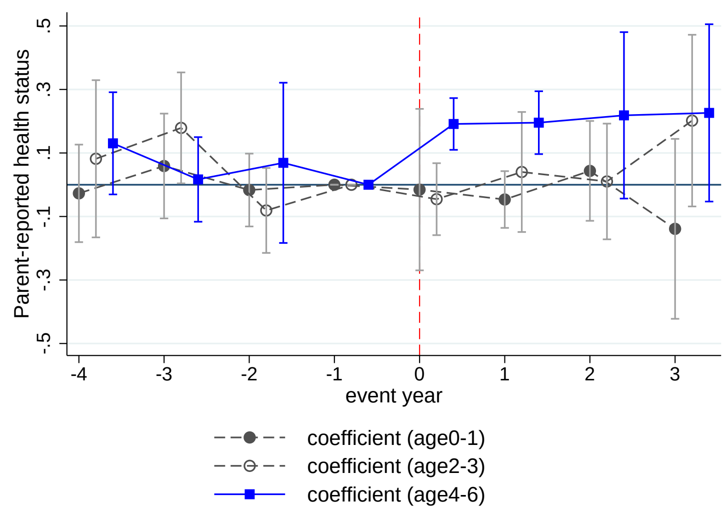
(d) Very good or excellent health

Note: Each point represents a parameter estimate on the sets of interaction terms of the indicator for treatment states and event-year dummies, $\Sigma_{k=-4}^{-2}\lambda_k$ and $\Sigma_{k=0}^{3}\phi_k$ of equation (1). Event-year is defined as a child's year of birth minus the year when the Unborn Child Option was implemented in the child's state of birth. The capped line represents a 95% confidence interval. For all estimations, the sample includes children ages 0–6 whose mothers were female noncitizens ages 22–45 with at most a high school education in 37 states in the 1998–2014 National Health Interview Survey (NHIS). The analyses of chest cold/stomach illness and chronic health conditions are weighted by NHIS final sample child weight; analyses of parent-reported health status and very good/excellent health status are weighted by NHIS final annual person weight. The models incorporate year of birth fixed effects, state of birth fixed effects, mother's number of years residing in the U.S. fixed effects, and region by year of birth fixed effects; they are adjusted by age, mother's education, race, mother's marital status, number of children in household, and family size. The standard errors are heteroskedasticity-robust and clustered by state of birth.

Figure A10: Health Outcomes for Children Ages 0–1, 2–3, and 4–6



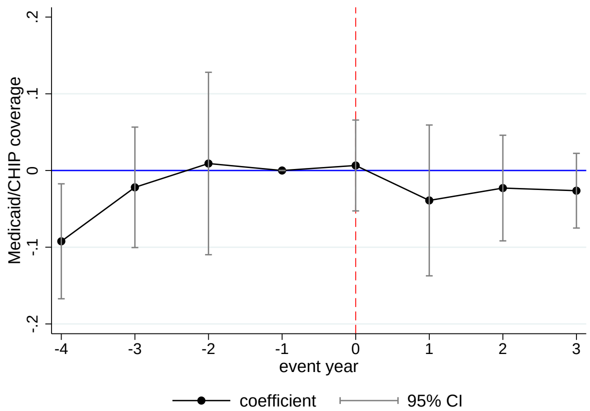
(a) Chronic health conditions



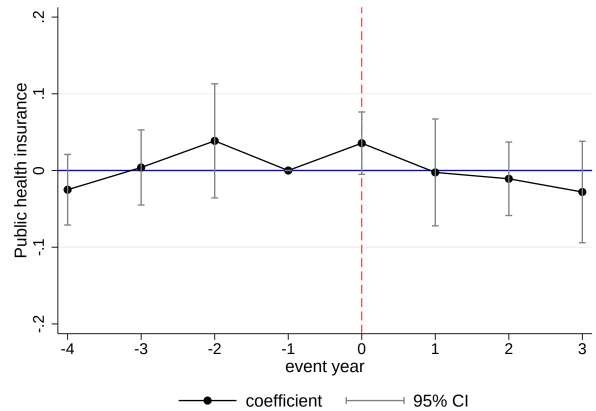
(b) Parent-reported health status

Note: Each point represents a parameter estimate on the sets of interaction terms of the indicator for treatment states and event-year dummies, $\Sigma_{k=-4}^{-2}\lambda_k$ and $\Sigma_{k=0}^{3}\phi_k$ of equation (1). Event-year is defined as a child's year of birth minus the year when the Unborn Child Option was implemented in the child's state of birth. The capped line represents a 95% confidence interval. For all estimations, the sample includes children ages 0–6 whose mothers were female noncitizens ages 22–45 with at most a high school education in 37 states in the 1998–2014 National Health Interview Survey (NHIS). The analyses of chest cold/stomach illness and chronic health conditions are weighted by NHIS final sample child weight; analyses of parent-reported health status and very good/excellent health status are weighted by NHIS final annual person weight. The models incorporate year of birth fixed effects, state of birth fixed effects, mother's number of years residing in the U.S. fixed effects, and region by year of birth fixed effects; they are adjusted by age, mother's education, race, mother's marital status, number of children in household, and family size. The standard errors are heteroskedasticity-robust and clustered by state of birth.

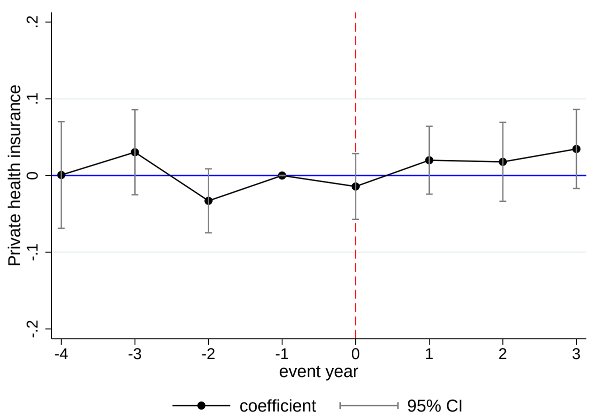
Figure A11: Health Insurance Coverage for Children Ages 0–1



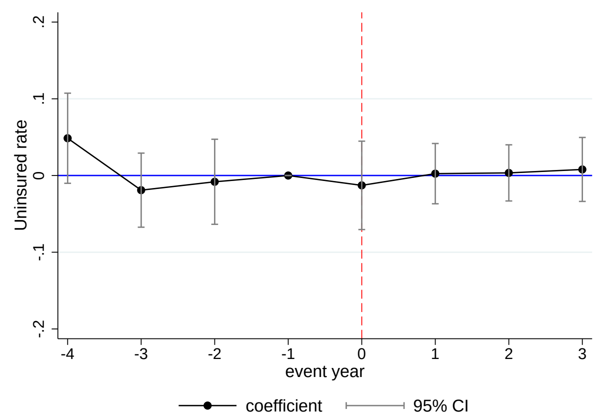
(a) Medicaid or CHIP coverage



(b) Public health insurance



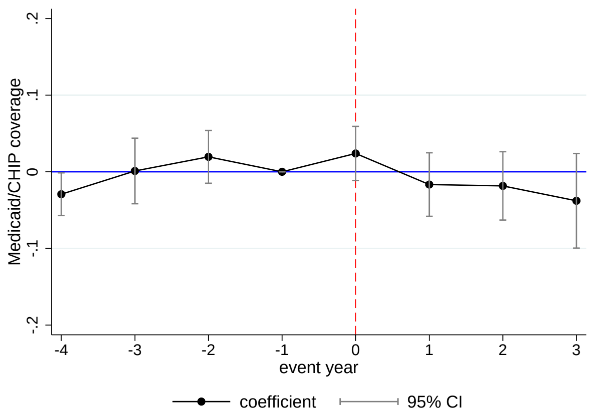
(c) Private health insurance



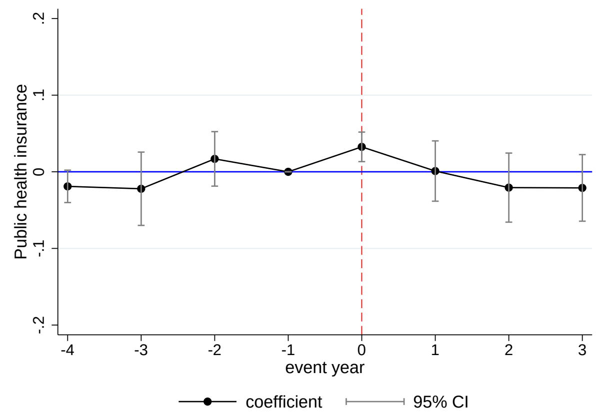
(d) Uninsured rate

Note: Each point represents a parameter estimate on the sets of interaction terms of the indicator for treatment states and event-year dummies, $\Sigma_{k=-4}^{-2}\lambda_k$ and $\Sigma_{k=0}^{3}\phi_k$ of equation (1). Event-year is defined as a child's year of birth minus the year when the Unborn Child Option was implemented in the child's state of birth. The capped line represents a 95% confidence interval. For all estimations, the sample includes children between the ages of 0 and 1 whose mothers were female noncitizens between the ages of 22 and 45 with at most a high school education in 37 states in the 1998–2014 National Health Interview Survey (NHIS). The analysis is weighted by the NHIS final annual person weight. The models incorporate year of birth fixed effects, state of birth fixed effects, mother's number of years residing in the U.S. fixed effects, and region by year of birth fixed effects; they are adjusted by age, mother's education, race, mother's marital status, number of children in household, and family size. The standard errors are heteroskedasticity-robust and clustered by state of birth.

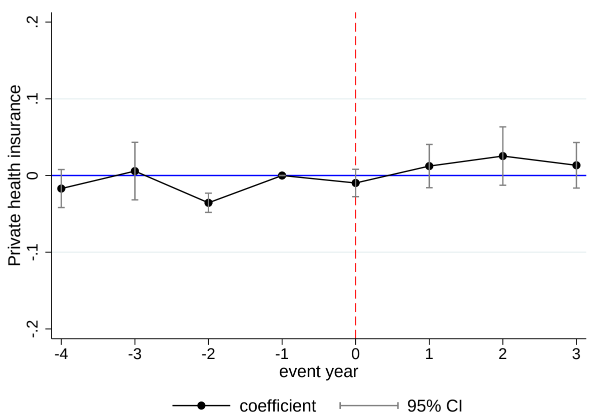
Figure A12: Health Insurance Coverage for Children Ages 0–6



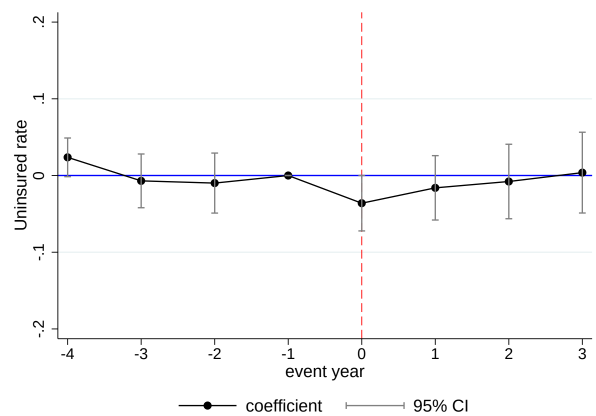
(a) Medicaid or CHIP coverage



(b) Public health insurance



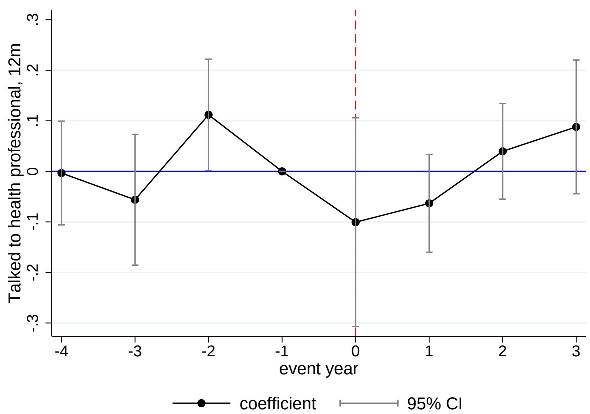
(c) Private health insurance



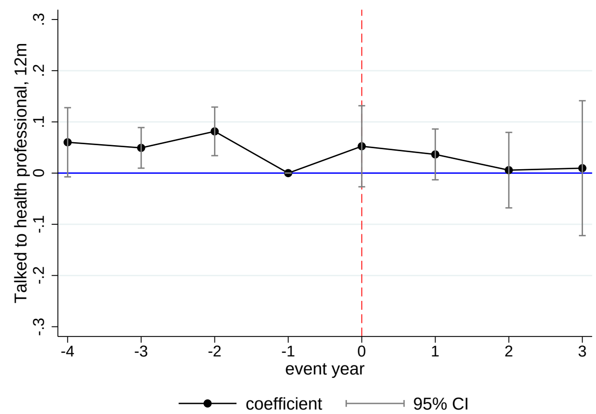
(d) Uninsured rate

Note: Each point represents a parameter estimate on the sets of interaction terms of the indicator for treatment states and event-year dummies, $\Sigma_{k=-4}^{-2}\lambda_k$ and $\Sigma_{k=0}^{3}\phi_k$ of equation (1). Event-year is defined as a child's year of birth minus the year when the Unborn Child Option was implemented in the child's state of birth. The capped line represents a 95% confidence interval. For all estimations, the sample includes children between the ages of 0 and 6 whose mothers were female noncitizens between the ages of 22 and 45 with at most a high school education in 37 states in the 1998–2014 National Health Interview Survey (NHIS). The analysis is weighted by the NHIS final annual person weight. The models incorporate year of birth fixed effects, state of birth fixed effects, mother's number of years residing in the U.S. fixed effects, and region by year of birth fixed effects; they are adjusted by age, mother's education, race, mother's marital status, number of children in household, and family size. The standard errors are heteroskedasticity-robust and clustered by state of birth.

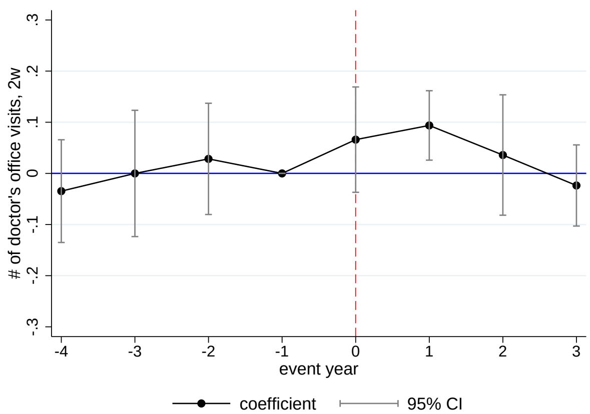
Figure A13: Healthcare Utilization of Children Ages 0–1 and 0–6



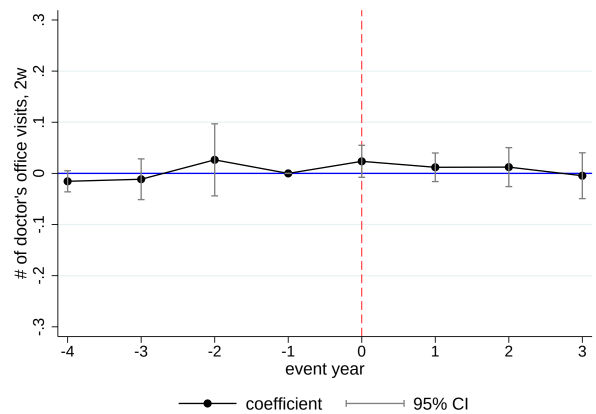
(a) Talked to health professional (12 months), Ages 0–1



(b) Talked to health professional (12 months), Ages 0–6



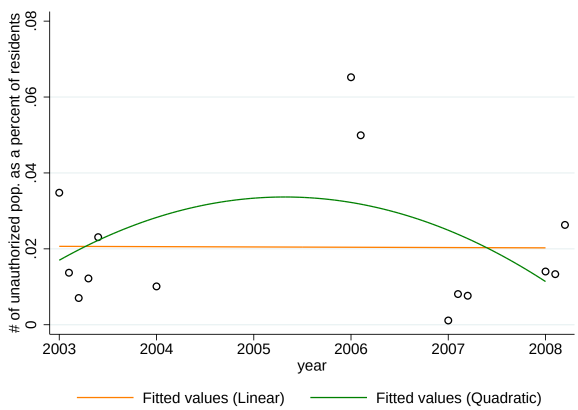
(c) # of doctor visits (2 weeks), Ages 0–1



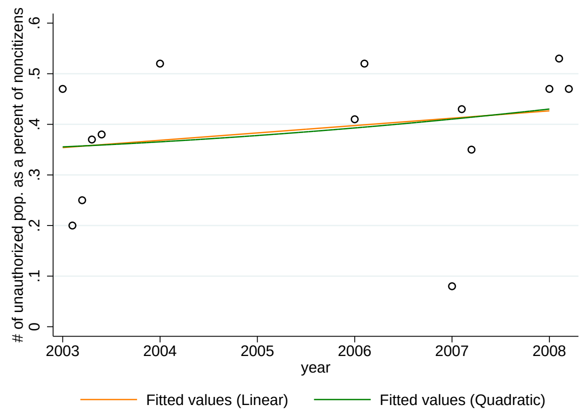
(d) # of doctor visits (2 weeks), Ages 0–6

Note: Each point represents a parameter estimate on the sets of interaction terms of the indicator for treatment states and event-year dummies, $\Sigma_{k=-4}^{-2}\lambda_k$ and $\Sigma_{k=0}^{3}\phi_k$ of equation (1). Event-year is defined as a child's year of birth minus the year when the Unborn Child Option was implemented in the child's state of birth. The capped line represents a 95% confidence interval. For all estimations, the sample includes children between the ages of 0 and 6 whose mothers were female noncitizens between the ages of 22 and 45 with at most a high school education in 37 states in the 1998–2014 National Health Interview Survey (NHIS). The analysis of the incidence of interacted with a healthcare professional is weighted by NHIS final annual sample child weight; analysis of # of doctors office visits is weighted by NHIS final person weight. The models incorporate year of birth fixed effects, state of birth fixed effects, mother's number of years residing in the U.S. fixed effects, and region by year of birth fixed effects; they are adjusted by age, mother's education, race, mother's marital status, number of children in household, and family size. The standard errors are heteroskedasticity-robust and clustered by state of birth.

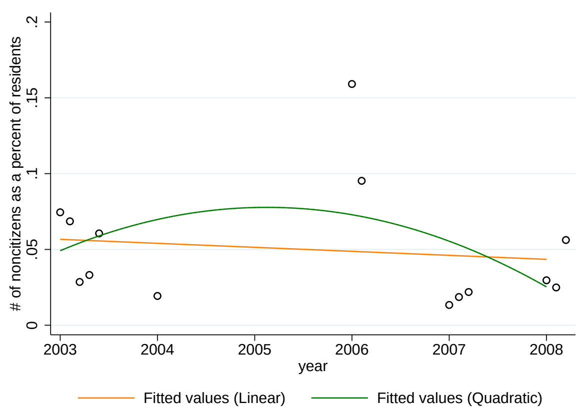
Figure A14: The Relationship between the Unborn Child Option Award Date and Pre-period Share of Undocumented Noncitizens or Total Noncitizens



(a) # of undocumented as % of total residents



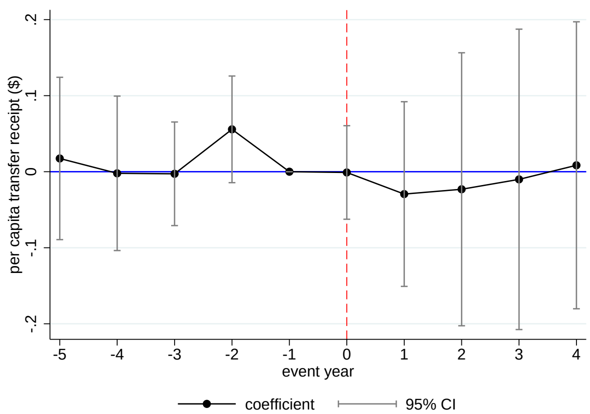
(b) # of undocumented as % of total noncitizens



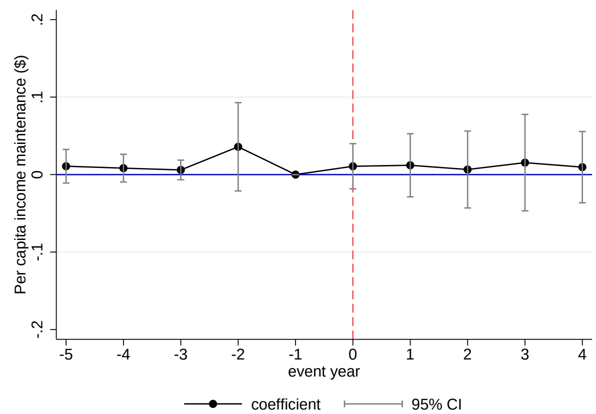
(c) # of noncitizens as % of total residents

Note: Each circle plot denotes a state where the Unborn Child Option was implemented between 2003 and 2008. The x-axis represents the implementation date, and the y-axis represents the state-level pre-period mean value of each variable. The solid orange line represents the prediction for y-axis variables from a linear regression of y-axis variables on the year of the Unborn Child Option implementation. Similarly, the solid green line represents the prediction for y-axis variables from a quadratic regression plot. Linear fitted values are from regressions of the state-level pre-period share on the year of the Unborn Child Option implementation among the 14 treated states in the estimation sample. The estimated slopes are as follows: -1.090 (SE = 33.925) for the share of unauthorized population as a percent of total residents, 3.783 (SE = 4.526) for the share of unauthorized population as a percent of noncitizens, -7.509 (SE = 15.244) for the share of noncitizens as a percent of total residents. None of the estimated slopes are statistically significant. In addition, all coefficients from quadratic regressions are also statistically insignificant.

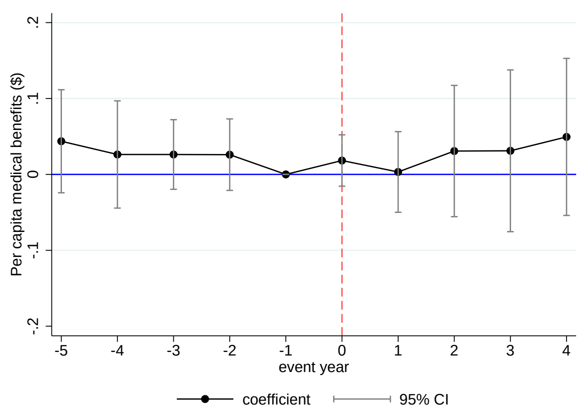
Figure A15: Per Capita Government Transfer, REIS



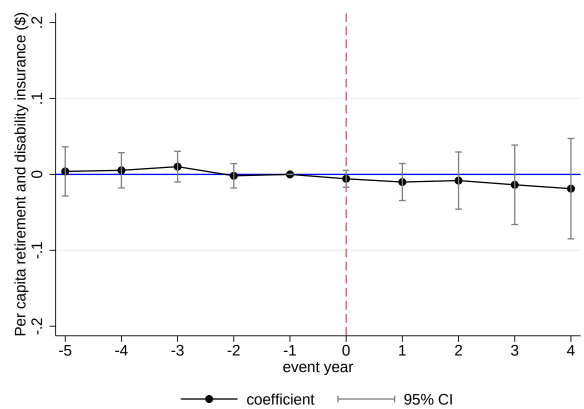
(a) Per capita government transfers



(b) Per capita income maintenance benefits



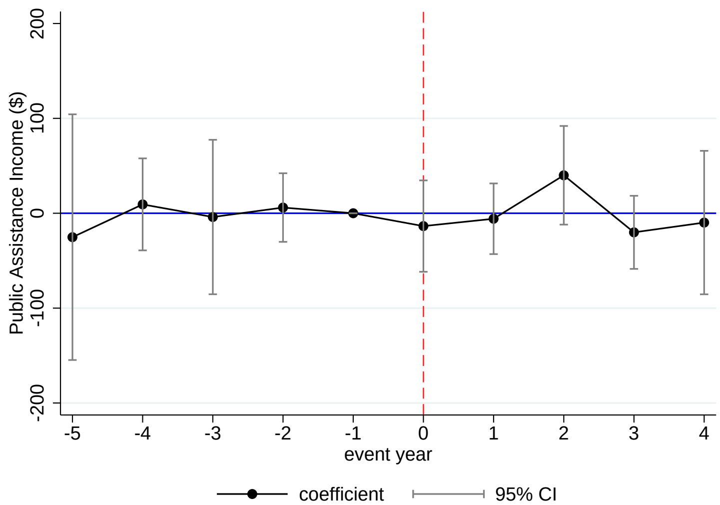
(c) Per capita medical benefits



(d) Per capita retirement and disability benefits

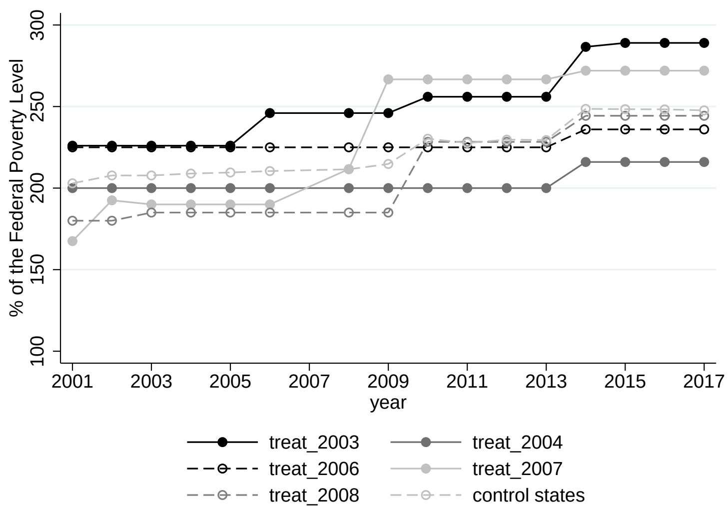
Note: I use data from the 1998–2016 Bureau of Economic Analysis Regional Economic Information System (REIS). I construct three measures for per-capita government transfers at the state-by-year level: income maintenance benefits (Supplemental Security Income (SSI) benefits, Earned Income Tax Credit (EITC), and Supplemental Nutrition Assistance Program (SNAP)), medical benefits (Public assistance medical care benefits), and retirement and disability insurance benefits (Social Security, Disability Insurance, other). Each point represents a parameter estimate on the sets of interaction terms of the indicator for treatment states and event-year dummies, $\Sigma_{k=-4}^{-2}\lambda_k$ and $\Sigma_{k=0}^{3}\phi_k$ of equation (1). Event-year is defined by calendar year minus the year when the Unborn Child Option was adopted in each state. The capped line represents a 95% confidence interval. However, the unit of observation here is state-by-year estimates, so the models incorporate only calendar year fixed effects and state fixed effects. The standard errors are heteroskedasticity-robust and clustered by state.

Figure A16: Public Assistance Income to Household with Noncitizen Mothers and U.S.-born Children

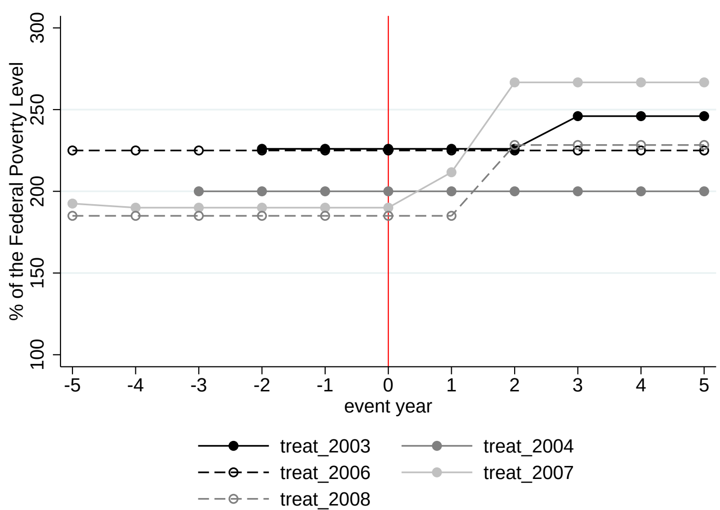


Note: Each point represents a parameter estimate on the sets of interaction terms of the indicator for ever adopted states and event-year dummies, $\Sigma_{k=-4}^{-2}\lambda_k$ and $\Sigma_{k=0}^{3}\phi_k$ of equation (1). Event-year is defined by cal year of birth minus the year when the Unborn Child Option was adopted in the child's state of birth. The capped line represents a 95% confidence interval. For this estimation, the sample includes all households that include female noncitizens between the ages of 22 and 45 with at most a high school education and their children between the ages of 0 and 6 in 37 states in the 2001–2016 American Community Survey (ACS). The analysis is weighted by ACS person weight. The model incorporates year fixed effects, state fixed effects, mother's number of years in the U.S. fixed effects, and region by year fixed effects, and are adjusted by mother's age, education, race, marital status, number of children in household, and family size. The standard errors are heteroskedasticity-robust and clustered by state of residence.
***Public Assistance Income:** Aid to Families with Dependent Children (AFDC), General Assistance (GA), and federal or state Supplemental Security Income (SSI)

Figure A17: Trends in Income Eligibility for Children in Medicaid or CHIP



(a) Medicaid or CHIP Income Eligibility, year

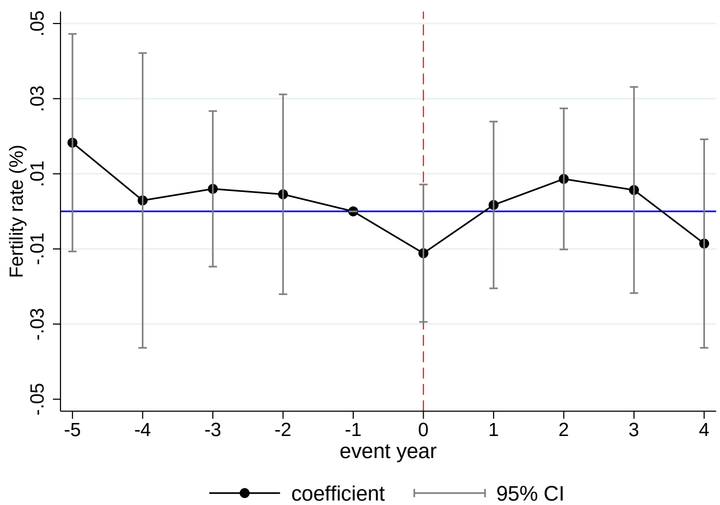


(b) Medicaid or CHIP Income Eligibility, event year

1. *Sources*: A national survey conducted by the Kaiser Commission on Medicaid and the Uninsured with the Center on Budget and Policy Priorities, 2000-2009, and with the Georgetown University Center for Children and Families, 2011-2017. Available at: `http://kff.org/medicaid/report/annual-updates-on-eligibility-rules-enrollment-and/`

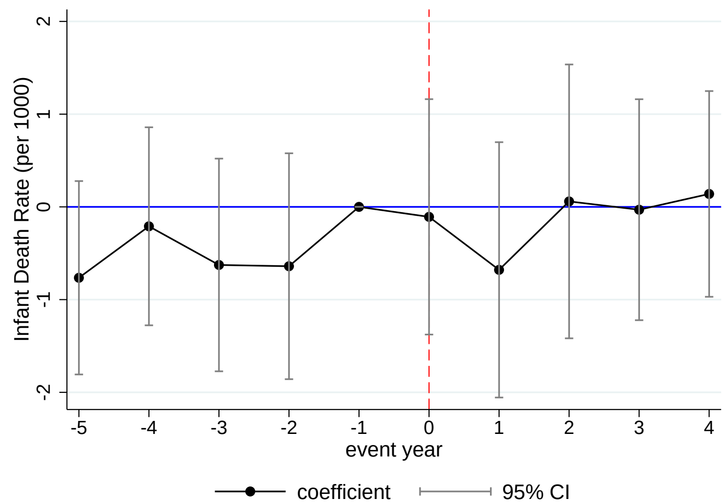
2. **treat_'year'**: States where the Unborn Child Option was implemented in the 'year'

Figure A18: Fertility Rate of Female Noncitizens

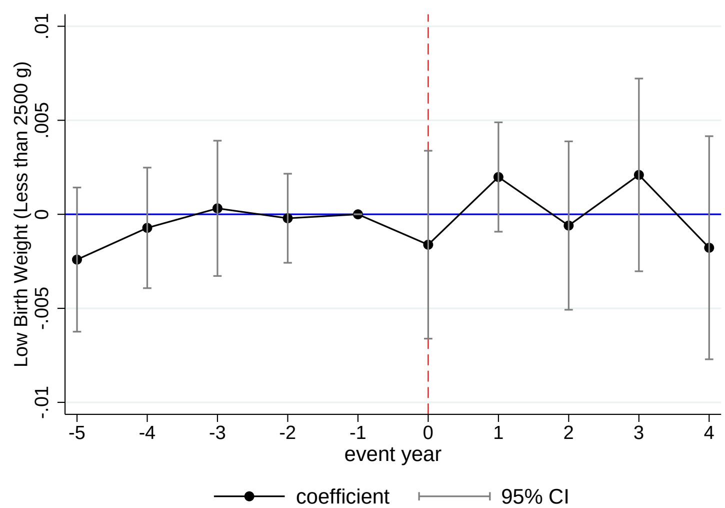


Note: Each point represents a parameter estimate on the sets of interaction terms of the indicator for treatment states and event-year dummies, $\Sigma_{k=-4}^{-2}\lambda_k$ and $\Sigma_{k=0}^{3}\phi_k$ of equation (1). Event-year is defined by calendar year minus the year when the Unborn Child Option (UCO) was adopted in each state. So 'event year= 0' implies the year when the UCO was implemented. The capped line represents a 95% confidence interval. For all estimations, the sample includes female noncitizens between the ages of 22 and 45 with at most a high school education in 37 states in the 1998–2014 National Health Interview Survey (NHIS). The analysis is weighted by the NHIS final annual person weight. The models incorporate calendar year fixed effects, state fixed effects, number of years in the U.S. fixed effects, and region by year fixed effects; they are adjusted by age, education, race, marital status, number of children in household, and family size. The standard errors are heteroskedasticity-robust and clustered by state of residence.

Figure A19: Infant Death Rate (Per 1000) and Low Birth weight ($\leq$ 2500 g)



(a) Infant Death Rate (Per 1000)

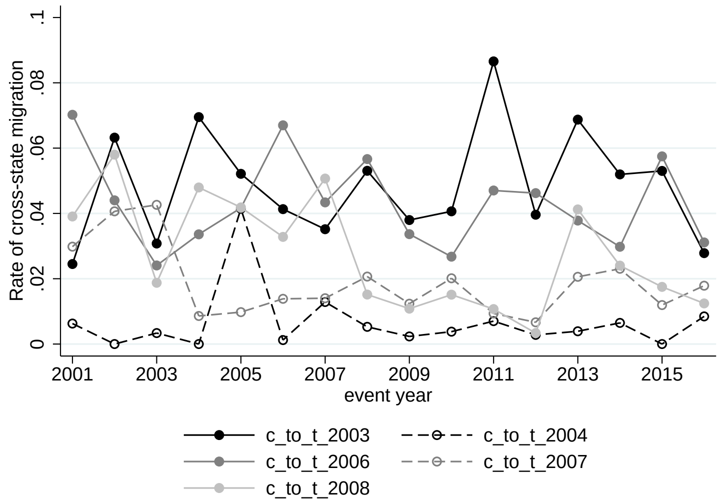


(b) Low Birthweight ($\leq$ 2500 g)

Note: Each point represents a parameter estimate on the sets of interaction terms of the indicator for ever adopted states and event-year dummies, $\Sigma_{k=-4}^{-2}\lambda_k$ and $\Sigma_{k=0}^{3}\phi_k$ of equation (1). However, the unit of observation here is state-by-year estimates, so the model only incorporates state and year fixed effects. Event-year is defined by an infant's year of death minus the year when the Unborn Child Option was adopted in the infant's state of birth. The capped line represents a 95% confidence interval. For this estimation, the sample includes all infants whose mothers were Hispanic, between the ages of 20 and 45, and with at most a high school education in 37 states in the 1998–2014 Natality and Linked Birth/Infant Death Records from CDC WONDER. There are several suppressed values. (*Source:* https://wonder.cdc.gov/lbd.html)

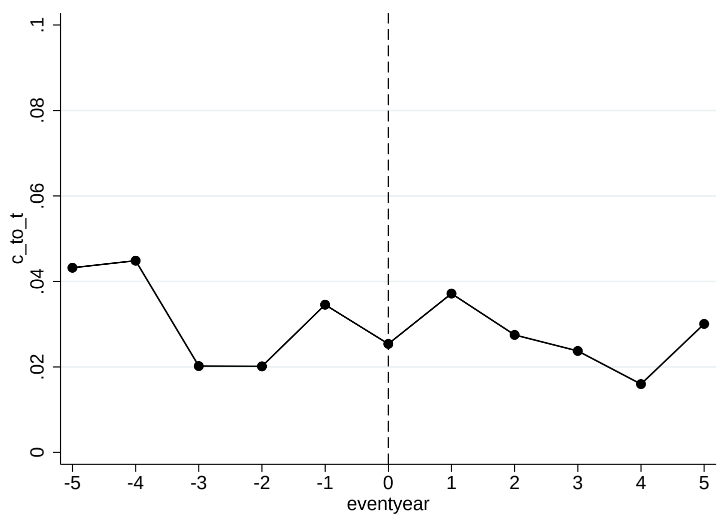
*Natality and Linked Birth/Infant Death Records do not have a variable for citizenship status, so I use Hispanic population as a proxy for noncitizens. All the other demographic characteristics are the same as in my main sample.

Figure A20: Cross-state Migration of Female Noncitizens, ACS



(a) Calendar year trends of cross-state migration

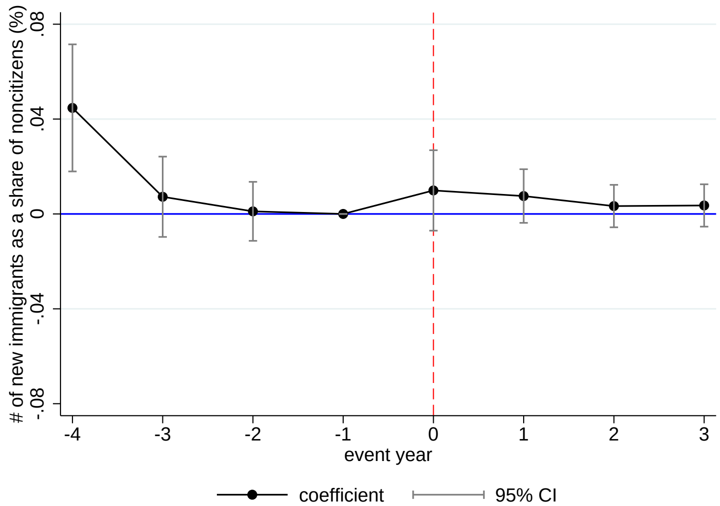
1. I use two variables from the 2001–2016 American Community Survey, state of residence one year ago and the current state of residence, to generate the variable that captures cross-state migration in each year.
2. **c_to_t_"Y"** refers to the migration from control states to treatment states that implemented the Unborn Child Option in year "Y", where Y=2003, 2004, 2006, 2007, and 2008



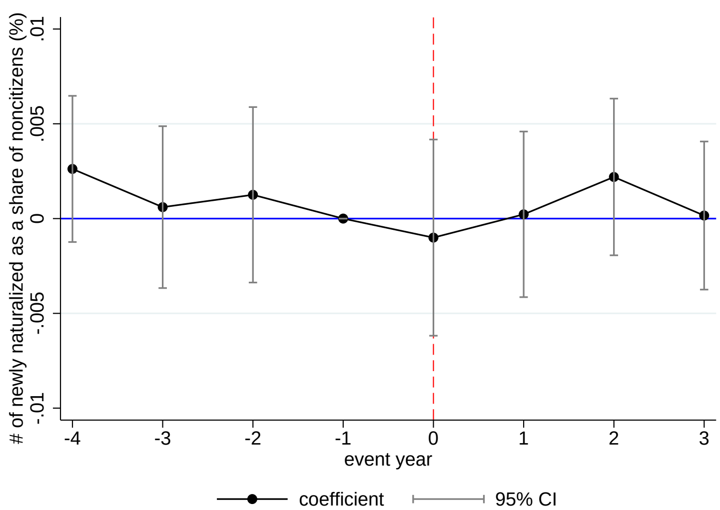
(b) Event year trends of cross-state migration

1. The trends are based on same questions used in Figure A20a. However, the trend here is normalized by event year, setting the timing of the Unborn Child Option initiation as event year = 0.
2. **c_to_t** refers to the migration from control states to treatment states in each event year, where event year=0 refers to the year when Unborn Child Option was implemented in each state.

Figure A21: The Number of New Immigrants and Naturalized Citizens as a Share of Noncitizens



(a) # of new immigrants as a share of noncitizens



(b) # of newly naturalized as a share of noncitizens

Note: I construct state-by-year estimates of total noncitizens and newly arrived noncitizens from the American Community Survey 2001–2011. I combine this with the state-by-year estimates of newly naturalized citizens from U.S. Department of Homeland Security immigration statistics. Subsequently, I construct the share of newly arrived noncitizens and newly naturalized citizens in the total population of noncitizens. Each point represents a parameter estimate on the sets of interaction terms of the indicator for treatment states and event-year dummies, $\Sigma_{k=-4}^{-2}\lambda_k$ and $\Sigma_{k=0}^{3}\phi_k$ of equation (1). Event-year is defined by calendar year minus the year when the Unborn Child Option was adopted in each state. The capped line represents a 95% confidence interval. However, the unit of observation here is state-by-year estimates, so the models incorporate only calendar year fixed effects and state fixed effects. The standard errors are heteroskedasticity-robust and clustered by state.
Source: U.S. Department of Homeland Security https://www.dhs.gov/immigration-statistics/yearbook/2017/table22, https://www.dhs.gov/immigration-statistics/yearbook/2014/table22, https://www.dhs.gov/immigration-statistics/yearbook/2011

Figure A22: NHIS Health Insurance Coverage Questionnaire Flashcards

CARD F14-IL

STATE NAMES FOR MEDICAID, CHIP, STATE-/LOCAL-SPONSORED, AND OTHER HEALTH INSURANCE PROGRAMS

Note: Some Medicaid programs are called "Medical Assistance Program," "Title 19" or "{State} Medicaid," such as "Alabama Medicaid." CHIP or S-CHIP programs can also be under "Title XXI Program" or "{State} CHIP," such as "Pennsylvania CHIP." The names provided below offer additional names for the public health insurance programs for each state.

ILLINOIS

Medicaid: Medical Assistance; Healthy Start; Family Care; Parent Assist; Kidcare Assist; Moms and Babies

CHIP: KidCare Share; KidCare Premium; KidCare Rebate; All Kids

State/Other: Comprehensive Health Insurance Plan (ICHIP); Specialized Care for Children (DSCC); Health Care for Workers with Disabilities (HBWD)

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(a) Illinois

CARD F14-MA

STATE NAMES FOR MEDICAID, CHIP, STATE-/LOCAL-SPONSORED, AND OTHER HEALTH INSURANCE PROGRAMS

Note: Some Medicaid programs are called "Medical Assistance Program," "Title 19" or "{State} Medicaid," such as "Alabama Medicaid." CHIP or S-CHIP programs can also be under "Title XXI Program" or "{State} CHIP," such as "Pennsylvania CHIP." The names provided below offer additional names for the public health insurance programs for each state.

MASSACHUSETTS

Medicaid: MassHealth

CHIP: MassHealth

State/Other: Children's Medical Security Plan (CMSP); Commonhealth; Medical Security Plan (MSP); Special Kids/Special Care; Insurance Partnership; Division of Special Health Care Needs; Uncompensated Care Pool (UCP)

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(b) Massachusetts

CARD F14-MI

STATE NAMES FOR MEDICAID, CHIP, STATE-/LOCAL-SPONSORED, AND OTHER HEALTH INSURANCE PROGRAMS

Note: Some Medicaid programs are called "Medical Assistance Program," "Title 19" or "{State} Medicaid," such as "Alabama Medicaid." CHIP or S-CHIP programs can also be under "Title XXI Program" or "{State} CHIP," such as "Pennsylvania CHIP." The names provided below offer additional names for the public health insurance programs for each state.

MICHIGAN

Medicaid: Medical Assistance Program; Healthy Kids; MICHOICE

CHIP: MIChild Program

State/Other: Children's Special Health Care Services; Trust Fund for Children with Special Health Care Needs

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(c) Michigan

CARD F14-MN

STATE NAMES FOR MEDICAID, CHIP, STATE-/LOCAL-SPONSORED, AND OTHER HEALTH INSURANCE PROGRAMS

Note: Some Medicaid programs are called "Medical Assistance Program," "Title 19" or "{State} Medicaid," such as "Alabama Medicaid." CHIP or S-CHIP programs can also be under "Title XXI Program" or "{State} CHIP," such as "Pennsylvania CHIP." The names provided below offer additional names for the public health insurance programs for each state.

MINNESOTA

Medicaid: Medical Assistance (MA)

CHIP: Children's Health Insurance Program

State/Other: Minnesota Care; Minnesota General Assistance Medical Care Program (GAMC); HIV/AIDS Insurance Continuation Program; Minnesota Children with Special Health Care Needs (MCSHN); Minnesota Comprehensive Health Association (MCHA)

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(d) Minnesota

CARD F14-WA

STATE NAMES FOR MEDICAID, CHIP, STATE-/LOCAL-SPONSORED, AND OTHER HEALTH INSURANCE PROGRAMS

Note: Some Medicaid programs are called "Medical Assistance Program," "Title 19" or "{State} Medicaid," such as "Alabama Medicaid." CHIP or S-CHIP programs can also be under "Title XXI Program" or "{State} CHIP," such as "Pennsylvania CHIP." The names provided below offer additional names for the public health insurance programs for each state.

WASHINGTON

Medicaid: Apple Health for Kids; Family Medicaid; Healthy Options; Basic Health Plus

CHIP: Apple Health for Kids with premium

State/Other: Basic Health; Children with Special Health Care Needs (CSHCN); Washington State Health Insurance Pool; Children's Health Program (CHP); General Assistance Unemployable (GA-U); Healthcare for Workers with Disabilities (HWD)

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(e) Washington

CARD F14-AR

STATE NAMES FOR MEDICAID, CHIP, STATE-/LOCAL-SPONSORED, AND OTHER HEALTH INSURANCE PROGRAMS

Note: Some Medicaid programs are called "Medical Assistance Program," "Title 19" or "{State} Medicaid," such as "Alabama Medicaid." CHIP or S-CHIP programs can also be under "Title XXI Program" or "{State} CHIP," such as "Pennsylvania CHIP." The names provided below offer additional names for the public health insurance programs for each state.

ARKANSAS

Medicaid: ConnectCare; Katie Beckett; TEFRA; ARKids First A; HIFA Waiver Safety Net Benefit Program

CHIP: ARKids First B

State/Other: Arkansas Comprehensive Health Insurance Plan; Children's Medical Services (CMS)

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(f) Arkansas

Source: Centers for Disease Control and Prevention, National Center for Health Statistics, National Health Interview Survey Related Documentation, https://www.cdc.gov/nchs/nhis/data-questionnaires-documentation.htm

Figure A23: NHIS Health Insurance Coverage Questionnaire Flashcards, Continued

CARD F14-CA

STATE NAMES FOR MEDICAID, CHIP, STATE-/LOCAL-SPONSORED, AND OTHER HEALTH INSURANCE PROGRAMS

Note: Some Medicaid programs are called "Medical Assistance Program," "Title 19" or "{State} Medicaid," such as "Alabama Medicaid." CHIP or S-CHIP programs can also be under "Title XXI Program" or "{State} CHIP," such as "Pennsylvania CHIP." The names provided below offer additional names for the public health insurance programs for each state.

CALIFORNIA

Medicaid: Medi-Cal; Health Insurance Premium Payment Program (HIPP)

CHIP: Healthy Families Program (HFP)

State/Other: Access for Infants & Mothers (AIM); County Medical Services Program (CMSP); California Children's Services (CCS); Major Risk Medical Insurance Program (MRMIP); CARE Health Insurance Premium Payment Program; California Major Risk Medical Insurance Program; Healthy Kids Program

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(a) California

CARD F14-TX

STATE NAMES FOR MEDICAID, CHIP, STATE-/LOCAL-SPONSORED, AND OTHER HEALTH INSURANCE PROGRAMS

Note: Some Medicaid programs are called "Medical Assistance Program," "Title 19" or "{State} Medicaid," such as "Alabama Medicaid." CHIP or S-CHIP programs can also be under "Title XXI Program" or "{State} CHIP," such as "Pennsylvania CHIP." The names provided below offer additional names for the public health insurance programs for each state.

TEXAS

Medicaid: State of Texas Access Reform (STAR); Star+Plus

CHIP: Texas CHIP

State/Other: Texas Health Insurance Risk Pool; State Kid Insurance Program (SKIP); Children with Special Health Care Needs (CSHCN)

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(b) Texas

CARD F14-LA

STATE NAMES FOR MEDICAID, CHIP, STATE-/LOCAL-SPONSORED, AND OTHER HEALTH INSURANCE PROGRAMS

Note: Some Medicaid programs are called "Medical Assistance Program," "Title 19" or "{State} Medicaid," such as "Alabama Medicaid." CHIP or S-CHIP programs can also be under "Title XXI Program" or "{State} CHIP," such as "Pennsylvania CHIP." The names provided below offer additional names for the public health insurance programs for each state.

LOUISIANA

Medicaid: CommunityCARE; LaMoms

CHIP: LACHIP

State/Other: Louisiana Health Plan; Children's Special Health Services; Louisiana Health Insurance Association

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(c) Louisiana

CARD F14-TN

STATE NAMES FOR MEDICAID, CHIP, STATE-/LOCAL-SPONSORED, AND OTHER HEALTH INSURANCE PROGRAMS

Note: Some Medicaid programs are called "Medical Assistance Program," "Title 19" or "{State} Medicaid," such as "Alabama Medicaid." CHIP or S-CHIP programs can also be under "Title XXI Program" or "{State} CHIP," such as "Pennsylvania CHIP." The names provided below offer additional names for the public health insurance programs for each state.

TENNESSEE

Medicaid: TennCare

CHIP: Cover Kids

State/Other: Children's Special Services (CSS); CoverTN; Access TN

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(d) Tennessee

CARD F14-WI

STATE NAMES FOR MEDICAID, CHIP, STATE-/LOCAL-SPONSORED, AND OTHER HEALTH INSURANCE PROGRAMS

Note: Some Medicaid programs are called "Medical Assistance Program," "Title 19" or "{State} Medicaid," such as "Alabama Medicaid." CHIP or S-CHIP programs can also be under "Title XXI Program" or "{State} CHIP," such as "Pennsylvania CHIP." The names provided below offer additional names for the public health insurance programs for each state.

WISCONSIN

Medicaid: Medical Assistance MA; Wisconsin Medicaid; Healthy Start; Forward Health

CHIP: BadgerCare

State/Other: Health Insurance Risk Sharing Program (HIRSP); Wisconsin AIDS/HIV Health Insurance Premium Subsidy Program; Children with Special Health Needs (CSHN); Children and Youth with Special Health Care Needs (CYSHCN)

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(e) Wisconsin

CARD F14-RI

STATE NAMES FOR MEDICAID, CHIP, STATE-/LOCAL-SPONSORED, AND OTHER HEALTH INSURANCE PROGRAMS

Note: Some Medicaid programs are called "Medical Assistance Program," "Title 19" or "{State} Medicaid," such as "Alabama Medicaid." CHIP or S-CHIP programs can also be under "Title XXI Program" or "{State} CHIP," such as "Pennsylvania CHIP." The names provided below offer additional names for the public health insurance programs for each state.

RHODE ISLAND

Medicaid: RIte Care; RI Medical Assistance; Katie Beckett

CHIP: RIte Care

State/Other: Subsidy for Health Insurance for Center-Based Child-Care Providers; Office of Children with Special Health Care Needs (OCSHN); RIte Share Premium Assistance Program; Child Care Provider RIte Care Program (CCPRC)

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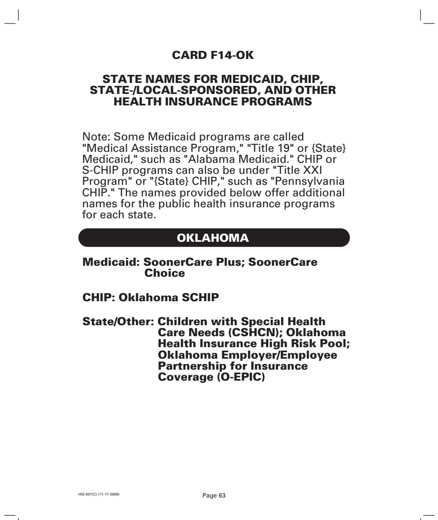
(f) Nebraska

Source: Centers for Disease Control and Prevention, National Center for Health Statistics, National Health Interview Survey Related Documentation, https://www.cdc.gov/nchs/nhis/data-questionnaires-documentation.htm

Figure A24: NHIS Health Insurance Coverage Questionnaire Flashcards, Continued



CARD F14-OK

STATE NAMES FOR MEDICAID, CHIP, STATE-/LOCAL-SPONSORED, AND OTHER HEALTH INSURANCE PROGRAMS

Note: Some Medicaid programs are called "Medical Assistance Program," "Title 19" or {State} Medicaid," such as "Alabama Medicaid." CHIP or S-CHIP programs can also be under "Title XXI Program" or "{State} CHIP," such as "Pennsylvania CHIP." The names provided below offer additional names for the public health insurance programs for each state.

OKLAHOMA

Medicaid: SoonerCare Plus; SoonerCare Choice

CHIP: Oklahoma SCHIP

State/Other: Children with Special Health Care Needs (CSHCN); Oklahoma Health Insurance High Risk Pool; Oklahoma Employer/Employee Partnership for Insurance Coverage (O-EPIC)

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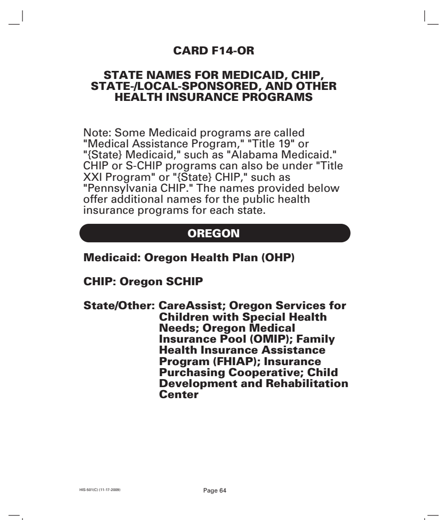
(a) Oklahoma



CARD F14-OR

STATE NAMES FOR MEDICAID, CHIP, STATE-/LOCAL-SPONSORED, AND OTHER HEALTH INSURANCE PROGRAMS

Note: Some Medicaid programs are called "Medical Assistance Program," "Title 19" or "{State} Medicaid," such as "Alabama Medicaid." CHIP or S-CHIP programs can also be under "Title XXI Program" or "{State} CHIP," such as "Pennsylvania CHIP." The names provided below offer additional names for the public health insurance programs for each state.

OREGON

Medicaid: Oregon Health Plan (OHP)

CHIP: Oregon SCHIP

State/Other: CareAssist; Oregon Services for Children with Special Health Needs; Oregon Medical Insurance Pool (OMIP); Family Health Insurance Assistance Program (FHIAP); Insurance Purchasing Cooperative; Child Development and Rehabilitation Center

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(b) Oregon

Source: Centers for Disease Control and Prevention, National Center for Health Statistics, National Health Interview Survey Related Documentation, https://www.cdc.gov/nchs/nhis/data-questionnaires-documentation.htm

Appendix C Tables

Table A2: Services Provided under the Unborn Child Option

Treatment States	Services provided under the Unborn Child Option						
	Regular Check-ups and Delivery	Prescription Drug Services	Disease Management for Pre-existing Conditions	Oral Health	Mental Health	Emergency Services	Post-partum care
AR	•	N/A	N/A	N/A	N/A	N/A	N/A
CA	•	•	•	•	•	•	•
IL	•	•	•	•	•	•	•
LA	•	•		•	•	•	
MA	•	•		•	•	•	•
MI	•	•	•				•
MN	•	•	•	•	•	•	•
OK	•	•	•	•	•	•	
OR	•	•		•	•	•	•
RI	•	•	•	•	•	•	•
TN	•	•	•				•
TX	•	•					•
WA	•	•	•	•	•	•	•
WI	•	•	•	•	•	•	•

Source: Kaiser Family Foundation, Families USA [August 2010], Families USA, [July 2010], March of Dimes, [October 2013]
*Black dot denotes that a corresponding service is available in the state.

Table A3: Pre-period Health-related Characteristics of Female Noncitizens

	Unborn Child Option implemented in					
	2003	2004	2006	2007	2008	Never
1. Health Insurance Coverage Rate (%)						
Medicaid	0.07	0.02	0.12	0.05	0.04	0.07
Medicare	0.01	0.00	0.00	0.00	0.00	0.00
CHIP	0.00	0.00	0.00	0.02	0.03	0.00
Military health insurance	0.00	0.00	0.00	0.00	0.03	0.01
Residual public health insurance	0.05	0.00	0.01	0.01	0.00	0.01
Public health insurance	0.19	0.02	0.13	0.07	0.09	0.09
Private health insurance	0.43	0.37	0.29	0.41	0.32	0.24
Uninsured	0.38	0.61	0.59	0.54	0.59	0.67
2. Health Care Utilization						
Has seen or spoken to a doctor, past 12 months (%)	0.72	0.75	0.68	0.72	0.75	0.59
# of doctor's office visits, past 12 months	3.08	3.25	2.87	3.20	2.90	2.26
3. Health status						
Self-reported health status (five-point scale, 1=poor, 5=excellent)	3.84	3.85	3.68	3.71	4.13	3.89
The Kessler-6 scale (rescaled to 0–1, 0=best, 1=worst)	0.13	0.14	0.10	0.10	0.04	0.07
4. Health Behaviors						
Smoking now (%)	0.13	0.13	0.06	0.02	0.08	0.06
# of alcoholic beverages per day	0.70	0.07	0.54	0.34	0.13	0.48
Number of Observations	652	N/A	4448	N/A	N/A	2062

Note: Samples consist of female noncitizens between the ages of 22 and 45, high school dropouts, and high school graduates in the pre-reform period of the Unborn Child Option from the NHIS. I do not reveal number of observations in some columns for confidentiality purposes.

Table A4: Pre-period Demographic Characteristics for Female Noncitizens

	Unborn Child Option implemented in					
	2003	2004	2006	2007	2008	Never
1. Race and Ethnicity (%)						
Non-Hispanic						
White	0.25	0.04	0.03	0.12	0.03	0.12
Black	0.00	0.00	0.01	0.05	0.05	0.08
Asian	0.15	0.09	0.03	0.02	0.04	0.08
Other	0.01	0.06	0.03	0.13	0.00	0.01
Hispanic	0.53	0.80	0.91	0.68	0.88	0.71
2. Age	33	31	33	30	33	33
3. Marital Status (%)						
Married	0.73	0.66	0.72	0.76	0.78	0.73
Partners	0.08	0.17	0.08	0.03	0.05	0.07
Separated/Divorced/Widowed	0.08	0.11	0.09	0.00	0.11	0.08
Never Married	0.11	0.06	0.11	0.22	0.06	0.13
4. Education (%)						
High School Dropouts	0.548	0.784	0.763	0.641	0.763	0.589
High School Graduates	0.452	0.216	0.237	0.359	0.237	0.411
Observations	652	N/A	4448	N/A	N/A	2062

Note: Samples consist of female noncitizens between the ages of 22 and 45, high school dropouts, and high school graduates in the pre-reform period of the Unborn Child Option from the NHIS. I do not reveal number of observations in some columns for confidentiality purposes.

Table A5: Pre-period Children's Health-related Characteristics

	Unborn Child Option Implemented in					
	2003	2004	2006	2007	2008	Never
1. Health Insurance/ Health Care Utilization						
Public health insurance (%)	0.78	0.66	0.79	0.76	0.83	0.78
Uninsured (%)	0.07	0.19	0.11	0.09	0.12	0.10
Saw or spoke to a doctor, past 12 months (%)	0.85	0.63	0.83	0.84	0.85	0.86
2. Health Status						
Birth Weight (g)	3368	3268	3376	3222	3342	3276
Low birth weight (less than 2500 g) (%)	0.10	0.05	0.12	0.15	0.06	0.11
Chronic health conditions (%)	0.04	0.00	0.07	0.05	0.02	0.03
Parent-reported health status	4.30	4.03	4.01	3.98	4.36	4.27
Number of Observations	556	N/A	4126	N/A	N/A	762

Note: Samples consist of children between the ages of 0 and 6 whose mothers were female noncitizens between the ages of 22 and 45, high school dropouts, and high school graduates in the pre-reform period of the Unborn Child Option from the NHIS. I do not reveal number of observations in some columns for confidentiality purposes.

Table A6: The Determinants of When the Unborn Child Option Was Implemented

DV: Year the Unborn Child Option implemented	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Unauthorized population (2000)						
# of unauthorized noncitizens as a % of total resident	115.40	-188.75				
	(109.99)	(322.79)				
(Squared)		15392				
		(9446)				
# of noncitizen pop. as a percent of total residents	-94.61	-68.64				
	(74.21)	(257.02)				
(Squared)		-86.32				
		(2675.05)				
Panel B: Health-related characteristics of female noncitizens (pre-period)						
Medicaid			-18.35			
			(19.42)			
CHIP			108.06			
			-(63.70)			
Uninsured			8.94			
			(8.31)			
Saw or spoke to a doctor, past 12 months				109.87		
				(266.76)		
Number of doctor's office visits, past 12 months				-2.29		
				(4.70)		
Panel C: Health status of children (pre-period)						
Birth weight (g)					0.00	-0.03
					(0.05)	(0.30)
(Squared)						0.00
						(0.00)
Incidence of low birth weight					-3.30	-13.09
					(9.08)	(69.44)
(Squared)						30.80
						(143.64)
Presence of chronic health conditions					-31.94	-61.40
					(22.50)	(106.55)
(Squared)						176.78
						(717.73)
Parent-reported health status					-6.56	36.63
					(4.55)	(202.04)
(Squared)						-5.20
						(24.13)
Observations	14	14	14	14	14	14
R-square	0.2615	0.5628	0.6974	0.5418	0.4136	0.4495
F-statistics	1.23	1.14	1.29	1.45	1.59	0.51

Note: Each column reports estimates from a separate linear regression. The unit of observation is a state. Robust standard errors are presented in brackets. The regressions include the state-share of Hispanic, non-Hispanic white, black, or Asian, and those who are high school dropouts. *Sample:* 14 states implementing the Unborn Child Option.

Table A7: The Effects on Health Insurance and Healthcare Utilization of Female Noncitizens

	Health Insurance				Healthcare Utilization
	CHIP Coverage	State/Other Public Health Insurance	Public Health Insurance	Uninsured Rate	# of Times Visited Health Professional, 12m
Unborn Child Option * Pre_4	0.002 (0.003)	0.007 (0.016)	0.014 (0.037)	-0.012 (0.035)	-0.224 (0.675)
Unborn Child Option * Pre_3	-0.002 (0.005)	0.009 (0.015)	0.003 (0.019)	0.015 (0.045)	0.165 (0.596)
Unborn Child Option * Pre_2	0.000 (0.006)	0.010 (0.015)	0.020 (0.029)	0.026 (0.029)	0.197 (0.477)
Unborn Child Option * Post_0	0.015* (0.008)	0.013 (0.013)	0.015 (0.021)	0.033 (0.031)	0.701 (0.588)
Unborn Child Option * Post_1	0.003 (0.004)	0.024* (0.014)	0.058*** (0.018)	-0.057 (0.036)	0.944 (0.651)
Unborn Child Option * Post_2	0.003 (0.003)	0.019 (0.013)	0.030 (0.025)	-0.051 (0.039)	0.727 (0.517)
Unborn Child Option * Post_3	0.009* (0.006)	0.032*** (0.011)	0.064*** (0.023)	-0.081** (0.037)	0.768 (0.476)
Y-mean	0.001	0.004	0.049	0.681	2.529
Observations	19493	20711	20711	20711	8124

Note: "Unborn Child Option*Pre_4"–"Unborn Child Option*Post_3" represent parameter estimates on the interaction terms of the treatment-state indicator and the event year dummies, $\Sigma_{k=-4}^{-2}\lambda_k$ and $\Sigma_{k=0}^{3}\phi_k$ of equation (1). Pre_4 refers to $k = -4$ and Post_3 refers to $k = 3$. Event-year is defined by calendar year minus the year when the Unborn Child Option was adopted in each state. For all estimations, the sample includes female noncitizens between the ages of 22 and 45, high school graduates, and high school dropouts in 37 states in the 1998–2014 National Health Interview Survey (NHIS). The analysis on health insurance is weighted by NHIS final annual person weight, while the analysis on healthcare utilization is weighted by NHIS final annual sample adult weight. The models incorporate calendar year fixed effects, state fixed effects, number of years residing in the U.S. fixed effects, and region by year fixed effects; they are adjusted by age, education, race, marital status, number of children in household, and family size. The standard errors are heteroskedasticity-robust and clustered by state of residence. "Y-mean" refers to the mean value of each outcome variable in event year -1.
* $p \leq 0.1$, ** $p \leq 0.05$, *** $p \leq 0.01$

Table A8: The Effects on the Health and Development of Children

	Children Aged 4–6				Children Aged 5–6
	Chest Cold or Stomach Illness	Chronic Health Conditions	Parent-reported Health Status	Very Good or Excellent Health Status	Cognitive Difficulty
Unborn Child Option *Pre_4	0.005 (0.056)	-0.072* (0.039)	0.130 (0.079)	0.007 (0.040)	0.002 (0.011)
Unborn Child Option *Pre_3	0.069 (0.047)	-0.027 (0.044)	0.017 (0.066)	-0.011 (0.033)	0.001 (0.005)
Unborn Child Option *Pre_2	0.131 (0.089)	-0.062** (0.024)	0.069 (0.124)	0.01 (0.079)	0.003 (0.007)
Unborn Child Option *Post_0	0.005 (0.035)	-0.045 (0.028)	0.191*** (0.040)	0.059 (0.037)	0.006 (0.008)
Unborn Child Option *Post_1	0.031 (0.047)	-0.079** (0.029)	0.195*** (0.049)	0.090*** (0.023)	-0.009 (0.006)
Unborn Child Option *Post_2	0.047 (0.032)	-0.075 (0.046)	0.219* (0.129)	0.101* (0.061)	-0.007 -0.007
Unborn Child Option *Post_3	-0.029 (0.083)	-0.086*** (0.025)	0.226* (0.137)	0.083 (0.084)	-0.009 -0.009
Y-mean	0.169	0.077	4.07	0.697	0.019
Observations	2335	2336	6085	6085	31,313

Note: "Unborn Child Option*Pre_4"–"Unborn Child Option*Post_3" represent parameter estimates on the interaction terms of the indicator for treatment states and the event year dummies, $\Sigma_{k=-4}^{-2}\lambda_k$ and $\Sigma_{k=0}^{3}\phi_k$ of equation (1). Pre_4 refers to $k = -4$ and Post_3 refers to $k = 3$. Event-year is defined by year of birth minus the year when the Unborn Child Option was adopted in each state of birth. For all estimations in columns (2)–(5), the sample includes children between the ages of 4 and 6 whose mothers were female noncitizens between the ages of 22 and 45 with at most a high school education in 37 states in the 1998–2014 National Health Interview Survey (NHIS). The analysis is weighted by NHIS final sample child weight and NHIS final annual person weight. For an estimation in column (6), the sample includes children between the ages of 5 and 6 whose mothers were female noncitizens aged 22–45 with at most a high school education in 37 states in the 2008–2016 American Community Survey (ACS). The analysis is weighted by ACS annual person weight. The models incorporate year of birth fixed effects, state of birth fixed effects, mothers' number of years in the U.S. fixed effects, and region of birth by year of birth fixed effects; they are adjusted by age, mother's education, race, mothers' marital status, number of children in household, and family size. The standard errors are heteroskedasticity-robust and clustered by state of birth. "Y-mean" refers to the mean value of each outcome variable in event year -1.
* $p \leq 0.1$, ** $p \leq 0.05$, *** $p \leq 0.01$

Table A9: The Effects on Health Insurance Coverage of Female Noncitizens

	Public Health Insurance				
	CHIP Coverage	State/Other Public Health Insurance	Medicaid Coverage	Medicare Coverage	Military Health Insurance
Years -4 to -2	0.000 (0.004)	0.005 (0.014)	0.005 (0.014)	0.000 (0.001)	0.001 (0.004)
Years 0 to 4	0.008* (0.005)	0.029** (0.014)	0.008 (0.008)	0.000 (0.003)	0.003 (0.003)
Y-mean	0.001	0.004	0.031	0.004	0.001
Observations	19493	20711	20711	20711	20711

	Summary Health Insurance			
	CHIP and State/Other Public Health Insurance	Public Health Insurance	Private Health Insurance	Uninsured Rate
Years -4 to -2	0.005 (0.018)	0.012 (0.018)	-0.020 (0.019)	0.009 (0.020)
Years 0 to 4	0.037* (0.020)	0.047*** (0.013)	0.003 (0.010)	-0.050*** (0.018)
Y-mean	0.005	0.049	0.270	0.681
Observations	20711	20711	20711	20711

Note: "Years -4 to -2" represents an estimated coefficient on the interaction term of the indicator for treatment states and the pre-period indicator, λ of equation (2). "Years 0 to 3" represents an estimated coefficient on the interaction term of the indicator for treatment states and the post-period indicator, ϕ of equation (2). For all estimations, the sample includes female noncitizens between the ages of 22 and 45 with at most a high school education in 37 states in the 1998–2014 National Health Interview Survey (NHIS). The analysis is weighted by NHIS final annual person weight. The models incorporate calendar year fixed effects, state fixed effects, number of years in the U.S. fixed effects, and region by year fixed effects; they are adjusted by age, education, race, marital status, number of children in household, and family size. The standard errors are heteroskedasticity-robust and clustered by state of residence. "Y-mean" refers to the mean value of each outcome variable in event year -1.
* $p \leq 0.1$, ** $p \leq 0.05$, *** $p \leq 0.01$

Table A10: The Effects on Health Outcomes for Children, Ages 0–6

	Chest Cold or Stomach Illness	Chronic Health Conditions	Parents-reported Health Status	Very Good or Excellent Health Status
Years -4 to -2	0.027**	-0.018**	0.019	-0.012
	(0.012)	(0.009)	(0.019)	(0.011)
Years 0 to 3	0.003	-0.004	0.090*	0.020
	(0.027)	(0.016)	(0.044)	(0.028)
Y-mean	0.228	0.068	4.138	0.721
Observations	5782	5786	14116	14116

Note: "Years -4 to -2" represents an estimated coefficient on the interaction term of the indicator for treatment states and the pre-period indicator, λ of equation (2). "Years 0 to 3" represents an estimated coefficient on the interaction term of the indicator for treatment states and the post-period indicator, ϕ of equation (2). For all estimations, the sample includes children between the ages of 0 and 6 whose mothers were female noncitizens between the ages of 22 and 45 with at most a high school education in 37 states in the 1998–2014 National Health Interview Survey (NHIS). The analyses of chest cold/stomach illness and chronic health conditions are weighted by NHIS final sample child weight; analyses of parent-reported health status and very good/excellent health status are weighted by NHIS final annual person weight. The models incorporate year of birth fixed effects, state of birth fixed effects, mother's number of years in the U.S. fixed effects, and region of birth by year of birth fixed effects; they are adjusted by age, mother's education, race, mother's marital status, number of children in household, and family size. The standard errors are heteroskedasticity-robust and clustered by state of birth. "Y-mean" refers to the mean value of each outcome variable in event year -1.
* $p \leq 0.1$, ** $p \leq 0.05$, *** $p \leq 0.01$

Table A11: The Effects on Health Outcomes for Children Ages 0–1, 2–3, and 4–6, With Region-by-year Fixed Effects

Children by Age Group	Chest Cold or Stomach Illness	Chronic Health Conditions	Parent-reported Health Status	Very Good or Excellent Health Status
Panel A. Children Ages 0–1				
Years -4 to -2	-0.008 (0.039)	-0.016 (0.010)	0.027 (0.040)	-0.014 (0.016)
Years 0 to 3	0.005 (0.065)	0.003 (0.015)	-0.014 (0.091)	-0.050 (0.049)
Y-mean	0.273	0.0317	4.215	0.762
Observations	1729	1732	3893	3893
Panel B. Children Ages 2–3				
Years -4 to -2	0.003 (0.022)	0.001 (0.014)	0.095* (0.052)	0.025 (0.019)
Years 0 to 3	0.087 (0.062)	0.032 (0.019)	0.093 (0.066)	0.024 (0.042)
Y-mean	0.259	0.060	4.082	0.700
Observations	1718	1718	4138	4138
Panel C. Children Ages 4–6				
Years -4 to -2	0.065 (0.041)	-0.034 (0.021)	0.022 (0.048)	-0.017 (0.026)
Years 0 to 3	0.011 (0.034)	-0.048* (0.028)	0.180*** (0.040)	0.070** (0.026)
Y-mean	0.169	0.077	4.068	0.697
Observations	2335	2336	6085	6085

Note: "Years -4 to -2" represents an estimated coefficient on the interaction term of the indicator for treatment states and the pre-period indicator, λ of equation (2). "Years 0 to 3" represents an estimated coefficient on the interaction term of the indicator for treatment states and the post-period indicator, ϕ of equation (2). For all estimations, the sample includes children between the ages of 0 and 6 whose mothers were female noncitizens between the ages of 22 and 45 with at most a high school education in 37 states in the 1998–2014 National Health Interview Survey (NHIS). The analyses of chest cold/stomach illness and chronic health conditions are weighted by NHIS final sample child weight; analyses of parent-reported health status and very good/excellent health status are weighted by NHIS final annual person weight. The models incorporate year of birth fixed effects, state of birth fixed effects, mother's number of years in the U.S. fixed effects, and region of birth by year of birth fixed effects; they are adjusted by age, mother's education, race, mother's marital status, number of children in household, and family size. The standard errors are heteroskedasticity-robust and clustered by state of birth. "Y-mean" refers to the mean value of each outcome variable in event year -1.

* $p \leq 0.1$, ** $p \leq 0.05$, *** $p \leq 0.01$

Table A12: The Effects on Difficulty Rate for Children Ages 5–6, With Region-by-year Fixed Effects

	Cognitive Difficulty	Physical Difficulty	Self-care Difficulty	Vision or Hearing Difficulty	Any Difficulty
Panel A. Using 2008-2016 ACS					
Years -4 to -2	0.002	0.001	0.005	-0.001	-0.000
	(0.006)	(0.004)	(0.004)	(0.006)	(0.004)
Years 0 to 4	-0.008*	0.005	0.001	-0.002	-0.010*
	(0.005)	-0.003	(0.003)	(0.003)	(0.006)
Y-mean	0.019	0.006	0.009	0.011	0.028
Observations	31,313	31,313	31,313	31,313	31,313
Panel B. Using 2003-2016 ACS					
Years -4 to -2	-0.002	0.000	0.003	-0.001	-0.005
	(0.005)	(0.003)	(0.003)	(0.005)	(0.004)
Years 0 to 4	-0.008*	0.004	-0.000	-0.002	-0.010*
	(0.005)	(0.003)	(0.004)	(0.003)	(0.005)
Y-mean	0.019	0.007	0.009	0.011	0.028
Observations	39,181	39,181	39,181	39,181	39,181

Note: "Years -4 to -2" represents an estimated coefficient on the interaction term of the indicator for treatment states and the indicator for the pre-period, λ of equation (2). "Years 0 to 4" represents an estimated coefficient on the interaction term of the indicator for treatment states and the indicator for the post-period, ϕ of equation (2). For all estimations, the sample includes children between the ages of 5 and 6 whose mothers were female noncitizens between the ages of 22 and 45 with at most a high school education in 37 states in the 2003–2016 American Community Survey (ACS). The analysis is weighted by the ACS final annual person weight. The models incorporate year of birth fixed effects, state of birth fixed effects, mother's number of years in the U.S. fixed effects, and region by year of birth fixed effects; they are adjusted by age, mother's education, race, mother's marital status, number of children in household, and family size. The standard errors are heteroskedasticity-robust and clustered by state of birth. "Y-mean" refers to the mean value of each outcome variable in event year -1.

Cognitive Difficulty: Whether a child has cognitive difficulties (such as learning, remembering, concentrating, or making decisions) because of a physical, mental, or emotional condition.

Physical Difficulty: Whether a child has a condition that substantially limits one or more basic physical activities, such as walking, climbing stairs, reaching, lifting, or carrying.

Self-care Difficulty: Whether it is difficult for a child to take care of their own personal needs, such as bathing, dressing, or getting around inside the home.

Vision or Hearing Difficulty: Whether a child has a long-lasting condition of blindness, deafness, or a severe vision or hearing impairment.

* $p \leq 0.1$, ** $p \leq 0.05$, *** $p \leq 0.01$

Table A13: The Effects on Health Insurance Coverage of Female Noncitizens, Without Region-by-year Fixed Effects

	Public Health Insurance				
	CHIP Coverage	State/Other Public Health Insurance	Medicaid Coverage	Medicare Coverage	Military Health Insurance
Years -4 to -2	0.000 (0.003)	-0.009 (0.007)	0.004 (0.019)	0.002 (0.002)	0.000 (0.003)
Years 0 to 4	0.008** (0.003)	0.024*** (0.008)	0.010 (0.013)	0.002 (0.002)	0.002 (0.003)
Y-mean	0.001	0.004	0.031	0.004	0.001
Observations	19493	20711	20711	20711	20711

	Summary Health Insurance			
	CHIP and State/Other Public Health Insurance	Public Health Insurance	Private Health Insurance	Uninsured Rate
Years -4 to -2	-0.005 (0.005)	-0.010 (0.024)	0.023 (0.020)	-0.015 (0.020)
Years 0 to 4	0.030** (0.010)	0.036** (0.015)	0.023 (0.013)	-0.050*** (0.018)
Y-mean	0.005	0.049	0.270	0.681
Observations	20711	20711	20711	20711

Note: "Years -4 to -2" represents an estimated coefficient on the interaction term of the indicator for treatment states and the pre-period indicator, λ of equation (2). "Years 0 to 3" represents an estimated coefficient on the interaction term of the indicator for treatment states and the post-period indicator, ϕ of equation (2). For all estimations, the sample includes female noncitizens between the ages of 22 and 45 with at most a high school education in 37 states in the 1998–2014 National Health Interview Survey (NHIS). The analysis is weighted by the NHIS final annual person weight. The models incorporate calendar year fixed effects, state fixed effects, and number of years in the U.S. fixed effects; they are adjusted by age, education, race, marital status, number of children in household, and family size. The standard errors are heteroskedasticity-robust and clustered by state of residence. "Y-mean" refers to the mean value of each outcome variable in event year -1.

* $p \leq 0.1$, ** $p \leq 0.05$, *** $p \leq 0.01$

Table A14: The Effects on Healthcare Utilization of Female Noncitizens, Without Region-by-year Fixed Effects

	Extensive Margin	Intensive Margin	
	Saw or Spoke to Health Professional, 12m	# of Times Visited Health Professional, 12m	10+ Times Visited Health Professional, 12m
Years -4 to -2	0.035 (0.029)	0.225 (0.150)	-0.002 (0.006)
Years 0 to 3	0.012 (0.036)	0.303* (0.160)	0.027* (0.014)
Y-mean	0.611	2.529	0.013
Observations	8145	8124	8124

Note: "Years -4 to -2" represents an estimated coefficient on the interaction term of the indicator for treatment states and the pre-period indicator, λ of equation (2). "Years 0 to 3" represents an estimated coefficient on the interaction term of the indicator for treatment states and the post-period indicator, ϕ of equation (2). For all estimations, the sample includes female noncitizens between the ages of 22 and 45 with at most a high school education in 37 states in the 1998–2014 National Health Interview Survey (NHIS). The analysis is weighted by the NHIS final annual sample adult weight. The models incorporate calendar year fixed effects, state fixed effects, and number of years in the U.S. fixed effects; they are adjusted by age, education, race, marital status, number of children in household, and family size. The standard errors are heteroskedasticity-robust and clustered by state of residence. "Y-mean" refers to the mean value of each outcome variable in event year -1.

* $p \leq 0.1$, ** $p \leq 0.05$, *** $p \leq 0.01$

Table A15: The Effects on Mental Health and Health Behaviors of Female Noncitizens, Without Region-by-year Fixed Effects

	Mental Health		Health Behavior	
	K6 Score	Feeling Depressed, 30 days	Number of Alcoholic Beverages per Day	Smoking Now
Years -4 to -2	-0.015 (0.010)	0.007 (0.024)	0.000 (0.053)	0.005 (0.014)
Years 0 to 3	0.000 (0.010)	-0.026 (0.022)	-0.030 (0.048)	0.009 (0.009)
Y-mean	0.17	0.092	0.571	0.054
Observations	8123	8152	8216	8238

Note: "Years -4 to -2" represents an estimated coefficient on the interaction term of the indicator for treatment states and the pre-period indicator, λ of equation (2). "Years 0 to 3" represents an estimated coefficient on the interaction term of the indicator for treatment states and the post-period indicator, ϕ of equation (2). For all estimations, the sample includes female noncitizens between the ages of 22 and 45 with at most a high school education in 37 states in the 1998–2014 National Health Interview Survey (NHIS). The analysis is weighted by the NHIS final annual sample adult weight. The models incorporate calendar year fixed effects, state fixed effects, and number of years in the U.S. fixed effects; they are adjusted by age, education, race, marital status, number of children in household, and family size. The standard errors are heteroskedasticity-robust and clustered by state of residence. "Y-mean" refers to the mean value of each outcome variable in event year -1.
K6 score is rescaled to range between 0 and 1.

* $p \leq 0.1$, ** $p \leq 0.05$, *** $p \leq 0.01$

Table A16: The Effects on Birth weight of Children, Without Region-by-year Fixed Effects

	Birth Weight (g)	Low Birth Weight (Less Than 2500 g)
Years -4 to -2	14.069	-0.041**
	(25.522)	(0.019)
Years 0 to 3	19.891	-0.039**
	(31.527)	(0.016)
Y-mean	3249	0.173
Observations	5401	5786

Note: "Years -4 to -2" represents an estimated coefficient on the interaction term of the indicator for treatment states and the pre-period indicator, λ of equation (2). "Years 0 to 3" represents an estimated coefficient on the interaction term of the indicator for treatment states and the post-period indicator, ϕ of equation (2). For all estimations, the sample includes children between the ages of 0 and 6 whose mothers were female noncitizens between the ages of 22 and 45 with at most a high school education in 37 states in the 1998–2014 National Health Interview Survey (NHIS). The analysis is weighted by NHIS final sample child weight. The models incorporate year of birth fixed effects, state of birth fixed effects, and mother's number of years in the U.S. fixed effects; they are adjusted by age, mother's education, race, mother's marital status, number of children in household, and family size. The standard errors are heteroskedasticity-robust and clustered by state of birth. "Y-mean" refers to the mean value of each outcome variable in event year -1.
* $p \leq 0.1$, ** $p \leq 0.05$, *** $p \leq 0.01$

Table A17: The Effects on Health Outcomes of Children Between the Ages of 0 and 6, Without Region-by-year Fixed Effects

	Chest Cold or Stomach Illness	Chronic Health Conditions	Parents-reported Health Status	Very Good or Excellent Health Status
Years -4 to -2	0.034**	-0.021**	0.026	-0.006
	(0.013)	(0.008)	(0.021)	(0.010)
Years 0 to 3	0.007	-0.005	0.083*	0.019
	(0.032)	(0.014)	(0.047)	(0.028)
Y-mean	0.228	0.068	4.138	0.721
Observations	5782	5786	14116	14116

Note: "Years -4 to -2" represents an estimated coefficient on the interaction term of the indicator for treatment states and the pre-period indicator, λ of equation (2). "Years 0 to 3" represents an estimated coefficient on the interaction term of the indicator for treatment states and the post-period indicator, ϕ of equation (2). For all estimations, the sample includes children between the ages of 0 and 6 whose mothers were female noncitizens between the ages of 22 and 45 with at most a high school education in 37 states in the 1998–2014 National Health Interview Survey (NHIS). The analyses of chest cold/stomach illness and chronic health conditions are weighted by NHIS final sample child weight; analyses of parent-reported health status and very good/excellent health status are weighted by NHIS final annual person weight. The models incorporate year of birth fixed effects, state of birth fixed effects, and mother's number of years in the U.S. fixed effects; they are adjusted by age, mother's education, race, mother's marital status, number of children in household, and family size. The standard errors are heteroskedasticity-robust and clustered by state of birth. "Y-mean" refers to the mean value of each outcome variable in event year -1.

* $p \leq 0.1$, ** $p \leq 0.05$, *** $p \leq 0.01$

Table A18: The Effects on Health Outcomes of Children Ages 0–1, 2–3, and 4–6, Without Region-by-year Fixed Effects

Children by Age Groups	Chest Cold or Stomach Illness	Chronic Health Conditions	Parent-reported Health Status	Very Good or Excellent Health Status
Panel A. Children Aged 0–1				
Years -4 to -2	-0.014	-0.026***	-0.001	-0.020
	(0.036)	(0.007)	(0.044)	(0.017)
Years 0 to 3	-0.013	0.003	-0.018	-0.053
	(0.086)	(0.015)	(0.086)	(0.044)
Y-mean	0.273	0.0317	4.215	0.762
Observations	1729	1732	3893	3893
Panel B. Children Aged 2–3				
Years -4 to -2	0.003	0.001	0.082	0.025
	(0.022)	(0.014)	(0.054)	(0.019)
Years 0 to 3	0.087	0.032	0.074	0.024
	(0.062)	(0.019)	(0.070)	(0.042)
Y-mean	0.259	0.060	4.082	0.700
Observations	1718	1718	4138	4138
Panel C. Children Aged 4–6				
Years -4 to -2	0.064	-0.028	0.024	-0.012
	(0.041)	(0.021)	(0.035)	(0.019)
Years 0 to 3	0.022	-0.043	0.149***	0.058*
	(0.034)	(0.028)	(0.047)	(0.029)
Y-mean	0.169	0.077	4.068	0.697
Observations	2335	2336	6085	6085

Note: "Years -4 to -2" represents an estimated coefficient on the interaction term of the indicator for treatment states and the pre-period indicator, λ of equation (2). "Years 0 to 3" represents an estimated coefficient on the interaction term of the indicator for treatment states and the post-period indicator, ϕ of equation (2). For all estimations, the sample includes children between the ages of 0 and 6 whose mothers were female noncitizens between the ages of 22 and 45 with at most a high school education in 37 states in the 1998–2014 National Health Interview Survey (NHIS). The analyses of chest cold/stomach illness and chronic health conditions are weighted by NHIS final sample child weight; analyses of parent-reported health status and very good/excellent health status are weighted by NHIS final annual person weight. The models incorporate year of birth fixed effects, state of birth fixed effects, and mother's number of years in the U.S. fixed effects; they are adjusted by age, mother's education, race, mother's marital status, number of children in household, and family size. The standard errors are heteroskedasticity-robust and clustered by state of birth. "Y-mean" refers to the mean value of each outcome variable in event year -1.
* $p \leq 0.1$, ** $p \leq 0.05$, *** $p \leq 0.01$

Table A19: The Effects on Difficulty Rates for Children Ages 5–6, Without Region-by-year Fixed Effects

	Cognitive Difficulty	Physical Difficulty	Self-care Difficulty	Vision or Hearing Difficulty	Any Difficulty
Panel A. Using 2008-2016 ACS					
Years -4 to -1	-0.001	-0.001	0.002	-0.001	-0.000
	(0.004)	(0.002)	(0.002)	(0.003)	(0.004)
Years 1 to 4	-0.008*	-0.001	-0.004*	-0.005	-0.011*
	(0.005)	(0.002)	(0.002)	(0.003)	(0.006)
Y-mean	0.019	0.006	0.009	0.011	0.028
Observations	31,313	31,313	31,313	31,313	31,313
Panel B. Using 2003-2016 ACS					
Years -4 to -1	-0.004	-0.003	-0.002	-0.000	-0.006
	(0.004)	(0.002)	(0.003)	(0.003)	(0.004)
Years 1 to 4	-0.006	-0.001	-0.004	-0.005*	-0.011**
	(0.004)	(0.002)	(0.003)	(0.003)	(0.005)
Y-mean	0.019	0.007	0.009	0.011	0.028
Observations	39,181	39,181	39,181	39,181	39,181

Note: "Years -4 to -2" represents an estimated coefficient on the interaction term of the indicator for treatment states and the pre-period indicator, λ of equation (2). "Years 0 to 3" represents an estimated coefficient on the interaction term of the indicator for treatment states and the post-period indicator, ϕ of equation (2). For all estimations, the sample includes children between the ages of 0 and 6 whose mothers were female noncitizens between the ages of 22 and 45 with at most a high school education in 37 states in the 20012016 American Community Survey (ACS). The analysis is weighted by ACS final annual person weight. The models incorporate year of birth fixed effects, state of birth fixed effects, and mother's number of years residing in the U.S. fixed effects; they are adjusted by age, mother's education, race, mother's marital status, number of children in household, and family size. The standard errors are heteroskedasticity-robust and clustered by state of birth. "Y-mean" refers to the mean value of each outcome variable in event year -1.

Cognitive Difficulty: Whether a child has cognitive difficulties (such as learning, remembering, concentrating, or making decisions) because of a physical, mental, or emotional condition.

Physical Difficulty: Whether a child has a condition that substantially limits one or more basic physical activities, such as walking, climbing stairs, reaching, lifting, or carrying.

Self-care Difficulty: Whether it is difficult for a child to take care of personal needs, such as bathing, dressing, or getting around inside the home.

Vision or Hearing Difficulty: Whether a child has a long-lasting condition of blindness, deafness, or a severe vision or hearing impairment.

* $p \leq 0.1$, ** $p \leq 0.05$, *** $p \leq 0.01$

Table A20: The Effects on Health Insurance and Healthcare Utilization for Female Noncitizens by Ethnicity

	Health Insurance				Healthcare Utilization
	CHIP Coverage	Residual Public Health Insurance	Public Health Insurance	Uninsured Rate	# of Times Visited Health Professional, 12m
A. Hispanic					
Years -4 to -2	-0.004	-0.005	-0.013	0.008	0.195
	(0.001)	(0.006)	(0.014)	(0.018)	(0.242)
Years 0 to 3	0.008*	0.034***	0.046***	-0.053***	0.482**
	(0.005)	(0.011)	(0.012)	(0.017)	(0.231)
Y-mean	0.003	0.03	0.156	0.645	2.628
Observations	17522	18608	18608	18608	7294
B. Non-Hispanic					
Years -4 to -2	-0.003	-0.0025	0.057	-0.075	-0.682
	(0.018)	(0.009)	(0.048)	(0.064)	(0.570)
Years 0 to 3	0.008	-0.006	0.054	-0.077	0.125
	(0.009)	(0.008)	(0.032)	(0.050)	(0.818)
Y-mean	0.004	0.029	0.209	0.384	2.916
Observations	1971	2103	2103	2103	830

Note: "Years -4 to -2" represents an estimated coefficient on the interaction term of the indicator for treatment states and the pre-period indicator, λ of equation (2). "Years 0 to 3" represents an estimated coefficient on the interaction term of the indicator for treatment states and the post-period indicator, ϕ of equation (2). For all estimations, the sample includes female noncitizens between the ages of 22 and 45, high school graduates, and high school dropouts in 37 states in the 1998–2014 National Health Interview Survey (NHIS). The analysis on health insurance is weighted by NHIS final annual person weight; analysis on healthcare utilization is weighted by NHIS final annual sample adult weight. The models incorporate calendar year fixed effects, state fixed effects, number of years residing in the U.S. fixed effects, and region by year fixed effects; they are adjusted by age, education, race, marital status, number of children in household, and family size. The standard errors are heteroskedasticity-robust and clustered by state of residence. "Y-mean" refers to the mean value of each outcome variable in event year -1.

* $p \leq 0.1$, ** $p \leq 0.05$, *** $p \leq 0.01$

Table A21: The Effects on Health Outcomes for Children by Ethnicity

	Children Ages 0–6				Children Ages 5–6
	Chest Cold or Stomach Illness	Chronic Health Conditions	Parent-reported Health Status	Very Good or Excellent Health Status	Cognitive Difficulty
A. Hispanic					
Years -4 to -2	0.028	-0.020**	0.018	-0.006	-0.002
	(0.019)	(0.008)	(0.012)	(0.007)	(0.003)
Years 0 to 3	0.014	0.001	0.087*	0.016	-0.013**
	(0.029)	(0.019)	(0.044)	(0.028)	(0.005)
Y-mean	0.225	0.062	4.07	0.694	0.017
Observations	5292	5295	13004	13004	30223
B. Non-Hispanic					
Years -4 to -2	0.023	-0.014	0.016	-0.015	0.002
	(0.055)	(0.036)	(0.126)	(0.056)	(0.017)
Years 0 to 3	-0.056	0.003	0.102	-0.007	-0.005
	(0.059)	(0.088)	(0.144)	(0.075)	(0.015)
Y-mean	0.206	0.066	4.27	0.780	0.015
Observations	490	489	1112	1112	4571

Note: "Years -4 to -2" represents an estimated coefficient on the interaction term of the indicator for treatment states and the pre-period indicator, λ of equation (2). "Years 0 to 3" represents an estimated coefficient on the interaction term of the indicator for treatment states and the post-period indicator, ϕ of equation (2). For all estimations, the sample includes children whose mothers were female noncitizens between the ages of 22 and 45, high school graduates, and high school dropouts in 37 states in the 1998–2014 National Health Interview Survey (NHIS) and the 1998–2016 American Community Survey (ACS). The analyses for chest cold/stomach illness and chronic health conditions are weighted by NHIS final annual sample child weight; analyses for parent-reported health status and very good/excellent health status are weighted by NHIS final annual person weight; analysis of cognitive difficulty is weighted by ACS final annual person weight. The models incorporate year of birth fixed effects, state of birth fixed effects, mother's number of years in the U.S. fixed effects, and region by year of birth fixed effects; they are adjusted by age, mother's education, race, mother's marital status, number of children in household, and family size. The standard errors are heteroskedasticity-robust and clustered by state of birth. "Y-mean" refers to the mean value of each outcome variable in event year -1.

* $p \leq 0.1$, ** $p \leq 0.05$, *** $p \leq 0.01$

Table A22: Cost-benefit Analysis of the Unborn Child Option, Sensitivity Analysis, in 2008 dollars

		Marginal Cost of Public Funds (MCPF)		
		15%	30%	50%
The Value of One Year of Life	\$50,000	cost: \$2.0 billion benefit: \$2.2 billion social rate of return: 10%	cost: \$2.3 billion benefit: \$2.2 billion social rate of return: -4%	cost: \$2.7 billion benefit: \$2.2 billion social rate of return: -19%
	\$75,000	cost: \$2.0 billion benefit: \$3.3 billion social rate of return: 65%	cost: \$2.3 billion benefit: \$3.3 billion social rate of return: 43%	cost: \$2.7 billion benefit: \$3.3 billion social rate of return: 22%
	\$100,000	cost: \$2.0 billion benefit: \$4.4 billion social rate of return: 110%	cost: \$2.3 billion benefit: \$4.4 billion social rate of return: 91%	cost: \$2.7 billion benefit: \$4.4 billion social rate of return: 63%

Formulae:
(A) Societal cost due to the newly enrolled noncitizens=(1+MCPF)×(Unborn Child Option expenditure per enrollee)×(the number of newly enrolled noncitizens)
(B) Societal benefit =(the number of affected children)× (the increments in the value of life based on the QALY method)
(C) Social rate of return: $\frac{Benefit-Cost}{Cost}$