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COVERING UNDOCUMENTED IMMIGRANTS: THE EFFECTS OF A LARGE-SCALE PRENATAL CARE INTERVENTION

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Covering Undocumented Immigrants: The Effects of a Large-Scale Prenatal Care Intervention
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ABSTRACT

We examine the short- and long-term effects of expanded Medicaid pregnancy coverage to undocumented immigrants using a novel dataset that links California birth records to Census surveys and administrative records on mortality, earnings, educational attainment, and public program participation. We identify siblings born to immigrant mothers before and after the policy and implement a mothers' fixed effects design to estimate policy impacts. We find the policy increased insurance and prenatal care among pregnant immigrant women, and improved birth outcomes. Later in life, their children experience better educational outcomes, have fewer children at young ages, and receive less public support.

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There are nearly 11 million immigrants without legal status in the U.S., who are ineligible for virtually all public programs (Krogstad et al., 2018; Broder and Lessard, 2023). Those who advocate in favor of excluding undocumented immigrants from public benefits highlight the direct fiscal cost of extending benefits to this group, as well as the potential to incentivize unlawful immigration or lead to dependence on government support. However, expanding public program eligibility to undocumented immigrants may come with benefits as well, if the programs improve the productivity of those individuals and enhance the well-being of their families. Surprisingly little is known about the benefits and costs associated with this exclusion of undocumented immigrants from government benefits, despite its ongoing prominence in policy discussions and debates.

Expanding public program eligibility to include undocumented immigrants may be especially beneficial when considering public health insurance for pregnant women. It is estimated that one out of every 16 births in the country is to an undocumented immigrant mother (Passel et al., 2018), but undocumented immigrants do not qualify for routine prenatal care during pregnancy through the Medicaid program in most states. Available evidence indicates that undocumented immigrants are less likely to use adequate prenatal care and experience more complications of labor and delivery than other women (Reed et al., 2005; Korinek and Smith, 2011). Expanding public coverage for prenatal care to undocumented immigrants has the potential to increase access to health services and improve the health of both mothers and their infants, who are U.S. citizens by birthright. Given existing research showing that early life and *in utero* interventions can have long-run and even multigenerational effects, expanding eligibility for this program to pregnant undocumented immigrants could generate substantial benefits for the next generation of US citizens.

In this paper, we examine one of the first expansions of prenatal coverage to undocumented immigrants: a landmark policy change in California, the state with the largest population of undocumented immigrants in the U.S. (Pew Research Center, 2019). In 1988, California extended eligibility for its Medicaid program, Medi-Cal, to undocumented pregnant immigrants who previously did not qualify for coverage due to their immigration status. Three years after this policy change, approximately 45 percent of Medicaid-funded births in the state were to undocumented immigrant women, accounting for about one-sixth of all births in the state (Norton et al., 1996).[1]

This policy change provides a unique opportunity to investigate both the short- and long-term

[1]We are including newly legalized immigrants under the Immigration Reform and Control Act (IRCA) in the "undocumented" category in our discussion here since this group also gained eligibility under the October 1988 expansion. See further discussion in Section 1.

effects of Medicaid coverage for these pregnancies since California is one of the few states with a long history of covering pregnant undocumented immigrants under its Medicaid program (Green et al., 2016). Taking advantage of new opportunities for innovative data linkages facilitated by the U.S. Census Bureau, we build a novel dataset that links confidential state birth certificate records to a variety of federal survey and administrative data including the Decennial Census and American Community Survey, Internal Revenue Service (IRS) records on earnings and EITC eligibility, childbearing information from the Census Household Composition Key, information on Medicaid enrollment from the Centers for Medicare and Medicaid Services, administrative data on mortality from the Social Security Administration, and records on post-secondary education from the National Student Clearinghouse. Our analyses evaluate the effects of this intervention on insurance coverage and health care use during pregnancy, health at birth, and the later life health and human capital for the cohorts who benefited while *in utero*.

These data linkages allow us to identify sibling relationships for approximately two-thirds of births in the state. We use this family relationship information to examine differential exposure to the Medicaid expansion based on the timing of birth using a mothers' fixed effects design. We effectively compare outcomes for siblings born to immigrant mothers before and after the policy change, and compare these differences to those observed among siblings to non-immigrant mothers. This approach allows us to avoid confounding our estimates with the dramatic changes in the composition of immigrant women in the state during this time period. We further take advantage of sibling comparisons entirely in the pre- or post-periods in the analysis, which allow us to control for birth order effects on outcomes and secular changes over time. We present several analyses that demonstrate the importance of this empirical approach in our context. We also use the rich characteristics available in the linked survey data to examine changes in outcomes for mothers who we identify as most likely to have undocumented status.

Using this approach, we find evidence of an immediate and large increase in Medi-Cal coverage for prenatal care among immigrant women.[2] Over the entire post period, we estimate that an average of 17 percent of immigrant mothers gained Medi-Cal prenatal coverage, most of whom would otherwise have been uninsured. Among mothers identified as likely to have undocumented status, we estimate a 37 percentage point increase in Medi-Cal prenatal coverage as a result of the policy change. We also find an immediate and sustained increase in the use of prenatal care among immigrant moth-

[2]Note that throughout the text we use "coverage" to indicate actual participation or enrollment in Medicaid.

ers. We estimate a 1.1 percentage point increase in prenatal care use, representing a near closure of the gap in rates of prenatal care use between immigrant and non-immigrant women in the state. When scaled by the estimated coverage change, our estimates imply that newly enrolled immigrant women were 7 percentage points more likely to use any prenatal care and increased their number of prenatal visits by approximately 4.5 visits, on average. We also find some evidence of earlier prenatal care initiation, as well as significant increases in both hospital deliveries for births and deliveries by physicians. We find no change in the method of delivery.

These changes in health care utilization translated into improved birth outcomes, as measured by increased average gestational length and birthweight among infants born to immigrant mothers. When scaled by our first stage estimate, our estimates imply an average 130 gram increase in birthweight (3.8 percent increase over baseline) and 3.7 day gestation length increase (1.3 percent over baseline) for the infants of newly covered immigrant mothers. In addition to these changes, we find a significant decrease in the incidence of small-for-gestational age representing an almost 5 percentage point decline among newly covered immigrant mothers, or a 54 percent decline over the baseline rate observed among all children of immigrant mothers.

We conduct additional analyses to explore potential mechanisms behind the infant health improvements. We first examine whether these changes might be explained by fertility responses to the policy. If any policy-induced fertility changes lead to changes in the composition of births, this could help explain the patterns observed in infant health outcomes. In our analysis of fertility response, we find that immigrant mothers are more likely to have additional births following the policy change. This could reflect changes in health during pregnancy, which may in turn reduce miscarriages and result in more live births conditional on pregnancy, or changes in desired fertility due to lower costs associated with pregnancy, which may increase conception rates or reduce abortions. However, we show that the magnitude of the fertility change is likely too small to explain our infant health findings. Next we take advantage of additional information available on the birth certificate records to look at changes in pregnancy complications following the expansion. These analyses indicate that immigrant women may experience a smaller number of pregnancy complications once the policy goes into effect, suggesting that access to medical care and improved health during pregnancy could be important mechanisms behind the infant health improvements.

Next, we investigate whether this improvement in health at birth translates into better health and human capital outcomes later in life. We find that the infants exposed to the policy change continue

to see benefits through young adulthood. We find higher enrollment in post-secondary school and college graduation, reduced teen fertility and total fertility through age 26, and lower rates of participation in childhood Medicaid and EITC receipt as an adult. We do not find effects on annual earnings as observed through age 28, although the observed increase in educational attainment suggests that these cohorts will experience earnings growth at older ages. We also find some evidence suggesting a decrease in cumulative mortality, although our estimate in the main analysis sample is not precise given the low rate of death observed at these ages.

We show that our results are robust to a variety of specification checks, including additional control variables and weighting to account for non-random participation in Census survey data. We examine the sensitivity of our results when we drop immigrants whose families likely benefited from concurrent immigration reforms. We also estimate a specification that uses only immigrant mothers and leverages differences in probable undocumented status to identify the policy effect. Estimates derived from these analyses confirm our main findings. Finally, we conduct two placebo tests. First, we estimate the effect of the program among immigrants from Cuba who were already eligible for Medicaid prior to the policy change. We find no effects for this group. Second, we re-estimate the model using later cohorts, who were not affected by the policy change, and again find no evidence of effects. These placebo tests further increase confidence in our results.

Together, this evidence indicates that expanded prenatal coverage to undocumented immigrants has important consequences for the health and economic well-being of their children. Back-of-the-envelope calculations indicate that the cost-effectiveness of this policy is higher than other interventions that target health at birth. Furthermore, once the longer-term benefits of the policy are considered, the government fully recoups its initial investment.

Our analysis of California's Medicaid expansion to undocumented immigrants provides a unique opportunity to evaluate a policy change that has been discussed and implemented in a growing number of states in recent years. Currently 22 states and DC offer some type of prenatal coverage for this group, although pregnant undocumented immigrants remain ineligible for public coverage in the majority of states. In general, U.S. public opinion and policymakers remain divided on whether government health programs should cover undocumented immigrants (e.g. Luhby, 2019). Our findings demonstrate that expansions of public prenatal coverage generate both short- and long-term benefits that should be accounted for by policymakers engaged in these debates.

1 Background

1.1 Content of Medicaid Pregnancy Coverage and Prenatal Care

Medicaid pregnancy coverage includes all pregnancy-related medical care, delivery-related care, and 60 days of postpartum care following childbirth. During the period of study, the American College of Obstetricians & Gynecologists recommended between 13 and 15 visits for an uncomplicated pregnancy (The American College of Obstetricians and Gynecologists, 1985), similar to their current guidelines (American Academy of Pediatrics and American College of Obstetricians and Gynecologists, 2017). Initial prenatal care visits include comprehensive physical exams and a review of the patient's medical history with physician assessment of any risks that may require special management. Follow up visits continue to monitor the health of the pregnancy through physical examination and laboratory tests. In the case of any medical problems or pregnancy complications, more frequent visits are necessary to monitor these conditions and speciality care may be required, which would also be covered under Medicaid pregnancy coverage. The physician also develops plans for hospital admission, labor, and delivery with the patient.

Additional components of prenatal care include nutrition counseling, health and childbirth education, and services to address psychological and social stresses (The American College of Obstetricians and Gynecologists, 1985). In a national survey administered during this time period, most women with Medicaid-funded prenatal care reported receiving guidance related to nutrition and weight gain during their pregnancies, as well as instructions to limit or discontinue use of alcohol, tobacco, and illegal drugs (Miller and Wherry, 2019). In addition, 40 percent of women reported learning about the Women, Infants, and Children (WIC) program from their health provider and 76 percent received WIC benefits during their pregnancy.[3] In California, women enrolled in Medi-Cal were also eligible for enhanced services including personalized risk assessments for nutrition, health education, and psychosocial needs, and additional support services (Korenbrot et al., 1995).

Prior to the Medi-Cal expansion, more than 30 percent of immigrant mothers in California did not receive prenatal care in the first trimester.[4] Focus group sessions held with providers delivering care to pregnant Latina women in San Francisco, and their patients, during this time period indicate that lower incomes, lack of health insurance, and the absence of legal documentation were among the

[3] Immigrant women are eligible for benefits under the WIC program regardless of their legal status, which was also true during this period of study (Bosco, 1994).

[4] Authors' calculation based on information reported on the 1983-1988 California birth records.

largest barriers to early initiation of prenatal care (Guendelman and Witt, 1991). Nearly all immigrant women, however, did receive some form of prenatal care,[5] although the average number of prenatal visits was much lower compared to non-immigrant women. In 1989, the average number of prenatal visits was 9 versus 11 for immigrant and non-immigrant women giving birth.[6]

1.2 Changes in Medi-Cal Eligibility for Undocumented Immigrants

Prior to the policy change being studied, California's Medi-Cal program limited eligibility for immigrant women to those with permanent legal U.S. residency status (Norton et al., 1996). In the late 1980s, the state took advantage of new authority under federal law to expand Medi-Cal eligibility to all low-income pregnant women regardless of immigration or documentation status. The Omnibus Budget Reconciliation Act (OBRA) of 1986 established the Emergency Medicaid program by specifying that Medicaid cover "emergency medical conditions," including emergency labor and delivery services, for immigrants who did not meet the legal residency requirements for the program (Perkins, 2004).[7] It also allowed states to newly draw down federal funds to help cover the medical expenses for these emergency medical conditions (Martucci, 1987).

While OBRA only required Medicaid coverage of labor and delivery services, California decided to go further than the federal requirement and include coverage for other pregnancy-related care as part of its OBRA expansion. The additional non-emergency pregnancy-related services were fully funded by the state (Martucci, 1987). All changes were effective starting in October 1988 under a new state law that extended Medi-Cal eligibility for pregnancy-related services, including prenatal, delivery, and postpartum care, to undocumented immigrants, as well as those with inadequate or expired documentation, or a temporary visa.[8] The state also expanded coverage to undocumented immigrants recently eligible for legal residence under the Immigration Reform and Control Act (IRCA), but who were temporarily ineligible for public benefits under the IRCA law (Martucci, 1988).[9]

[5] Uninsured women in the state, including undocumented immigrants, could receive free prenatal care from Title V funded maternal and child health clinics provided that they had family incomes below 200% FPL and lacked public or private health insurance coverage (Guendelman et al., 1994). However, only 0.04 percent of 1989 birth records for infants born to immigrant women indicate that Title V was the principal source of payment for prenatal care, as compared to 25 percent of records indicating care was paid for out-of-pocket.

[6] Authors' calculation from 1989 California birth records. This was the first year this information was collected on the birth certificate record.

[7] The Emergency Medical Treatment and Active Labor Act (EMTALA), also passed in 1986, required Medicare participating hospitals to provide emergency care, including labor and delivery services, regardless of ability to pay or immigration status.

[8] While the effective date of the federal OBRA requirement was January 1, 1987, California was given until January 1, 1989 to implement this change since state legislation was needed to authorize a limited scope of Medi-Cal services to immigrants (Martucci, 1987).

[9] In 1986, the Immigration Reform and Control Act (IRCA) created a path to amnesty for certain groups of undocumented

During the next year, the state further expanded its Medi-Cal program to pregnant women with incomes above the current income eligibility threshold, which was around 85% of the federal poverty line (Ellwood and Kenney, 1995). Effective in July 1989, the state expanded Medi-Cal coverage to all pregnant women and infants with family incomes up to 185% FPL. A further eligibility expansion to 200% FPL was implemented in January 1990 (Mitchell, 2005). Both of the income expansions included immigrants regardless of documentation status.

In Figure 1, we demonstrate that these policy changes had large impacts on the fraction of women eligible for Medi-Cal if they became pregnant, specifically immigrant women. Figure 1(a) shows the overall change in eligibility for women in California, as compared to national changes in eligibility between 1984 and 1994. Women in California saw a 36 percentage point increase in pregnancy eligibility over these 10 years, compared to a 30 percentage point change nationally. This overall change in eligibility in California, however, masks tremendous differences by maternal place of birth. As seen in Figure 1(b), the change in eligibility is much larger among immigrant than US-born women (51pp vs 31pp) and, in contrast to US-born women, was primarily concentrated between October 1988 and 1990.

Finally, Figure 1(c) shows changes in eligibility for immigrants in California by estimated documentation status. We estimate the documentation status of immigrants using information on individual characteristics available in the 1990 Census and an algorithm developed by Borjas (2017).[10] The graph shows that the total change in eligibility for undocumented immigrants is dramatic at about 77 percentage points. This increase in eligibility is more than 2.5 times the size of national eligibility changes during the study period. It also occurred roughly over one year, rather than over the span of more than a decade, making it easy to demarcate a before and after period. In addition, we observe that the bulk of the change in eligibility occurred under the initial expansion to undocumented women in October 1988 that expanded eligibility to the lowest income levels (up to 85% FPL), rather than the later income-based expansions.[11] For this reason, our analyses that follow will focus on the initial eligibility expansion, although we do trace out changes in coverage and outcomes over time.

immigrants. Individuals who had been living continuously in the U.S. since January 1, 1982 and certain agricultural workers who had been employed in the U.S. for 90 or more days between May 1985 and May 1986 could apply for legalization. For a five year period after applying for legalization, these individuals were ineligible for certain public benefits (including Medicaid) but could receive emergency medical services (Norton et al., 1996).

[10] See Appendix Section A for additional information on the eligibility calculation and Section B for further information on the undocumented estimation methodology.

[11] This is consistent with enrollment information from Medi-Cal administrative data indicating that the vast majority of undocumented (89 percent) and IRCA immigrant (83 percent) women with deliveries covered by Medi-Cal qualified with incomes under the initial income threshold (Norton et al., 1996).

Using administrative Medi-Cal data from this time period that included the immigration status of enrollees, Norton et al. (1996) notes a strong response to the Medi-Cal expansion for pregnant undocumented women.[12] The number of Medi-Cal enrollees nearly doubled between 1987 and 1991 (from 116,000 to 228,000) and the authors estimate that about 78 percent of the growth was due to the expansion of coverage to undocumented and IRCA immigrant women. In addition, Medi-Cal funded births to these groups represented 45 percent of all Medi-Cal funded births in 1991, and about 1/6 of the total number of births in the state. While some of these women enrolled only during the last month of pregnancy, 88 to 93 percent initiated coverage earlier; the average period of enrollment during pregnancy was just over 5 months. The vast majority of new immigrant enrollees (84 percent) after this policy change were undocumented immigrants rather than IRCA immigrants. Therefore, for brevity, we refer to the newly eligible as "undocumented immigrants" throughout the text. Later we show that our findings are robust to excluding IRCA eligible immigrants from the analysis.

1.3 Evaluation of Expanded Prenatal Coverage for Undocumented Immigrants

Despite the large magnitude of the undocumented coverage expansion in California, we are unaware of any existing study of this policy change. There has also been surprisingly little work examining publicly-funded prenatal coverage expansions to undocumented immigrants in other states. This may be partly due to the low prevalence of state efforts to cover this population until relatively recently. The Children's Health Insurance Program (CHIP) unborn child option was introduced in 2002 and made federal funding available to states to cover a woman's pregnancy-related care regardless of her immigration status. As of 2023, 20 states have adopted this option (Brooks et al., 2023). In addition, two states and DC have state-funded programs to cover some amount of health care services for pregnant undocumented immigrants (Fabi, 2019). In total, 22 states and DC currently offer some type of coverage for this group, leaving pregnant undocumented immigrants uncovered in the majority of states, including some states with large immigrant populations such as Florida and Georgia.

A handful of studies have examined the impact of state adoption of the CHIP unborn option on prenatal care and infant health.[13] Two papers use a difference-in-differences design to compare

[12] With the help of two of the authors in the series of papers that used these data (Howell and Brown, 1989; Ellwood and Kenney, 1995; Norton et al., 1996), we tried to track down the original data tapes for our own analyses but found they were either no longer in existence or unavailable.

[13] Predating these studies is work examining the effects of Medicaid coverage for recent legal immigrants following the contraction of their eligibility for public benefits under federal welfare reform in 1996 (Joyce et al., 2001; Royer, 2005). These papers reach different conclusions regarding the effects of contracted Medicaid coverage on prenatal care utilization but agree that birth outcomes were mostly unaffected. However, since recent legal immigrants tend to be more advantaged than immigrants without legal status (e.g. Marshall et al., 2005), these findings do not necessarily shed light on the effects of

changes in prenatal care and infant health for immigrant women in states with and without these policy options. The authors find evidence of improved prenatal care use for immigrant women associated with state adoption of these policy options, but no detectable changes in birth outcomes (Drewry et al., 2015; Wherry et al., 2017).[14] A third paper uses staggered county adoption of a policy in Oregon to examine expanded coverage for prenatal care for undocumented immigrants enrolled in the state's Emergency Medicaid program. The authors find improved prenatal care use, as well as reductions in extremely low birthweight and infant mortality (Swartz et al., 2017). Of particular interest, they also find evidence of increased use of medical care during the infant's first year of life, including the number of well child visits and higher receipt of recommended care. The analyses are limited to Medicaid claims, so this may overstate increases in medical care utilization if care would have been received elsewhere (Daw and Sommers, 2017), or be problematic if there were changes in the types of women/infants participating in Medicaid after expansion. More broadly of note, none of these papers test for differential trends in outcomes prior to policy adoption, nor do they consider changes over time in the immigrant populations in their study settings.[15] In follow-up work that examines the Oregon policy change using Medicaid claims linked to birth certificate records, the authors are unable to detect changes in newborn health (Rodriguez et al., 2021, 2022).

More recently, Hwang (2023) uses an event study design comparing children of noncitizens with low levels of education in states that do and do not adopt the CHIP unborn option to estimate effects on their birth outcomes and later childhood health, as reported in the National Health Interview Survey. While the paper finds no change in average birthweight, it documents improved parent-reported health at ages 4 to 6. These findings indicate that there may be longer-reaching effects of early coverage for children of immigrants, even if there are no health changes detected at birth.

expanded coverage to women with undocumented status.

[14] Drewry et al. (2015) focuses on immigrants from Mexico and Central/South American and finds enhanced prenatal care use among the subset who are single and have lower levels of education. Wherry et al. (2017) finds evidence of increased prenatal care use among all immigrant women and use U.S.-born women as an additional comparison group.

[15] In addition to these studies, two papers have examined the contraction of public health insurance benefits for undocumented immigrants in Nebraska in 2010. The authors find evidence of decreased prenatal care use following the termination of Medicaid benefits (Atkins et al., 2018). Also, a comparison between undocumented immigrants giving birth with and without access to Medicaid revealed higher maternal weight gain and increased abnormal conditions among newborns of undocumented immigrants with access to Medicaid (Atkins et al., 2017). However, the authors document that the characteristics of undocumented immigrants giving birth in Nebraska differ significantly between the pre- and post- periods, making it difficult to discern whether these trends are, in fact, due to changes in the state's coverage policy. Finally, another relevant study examines the effects of California's passage of Proposition 187 in November 1994, which restricted eligibility for public benefits to legal residents. Immediately challenged and never enforced, Spetz et al. (2000) document "chilling effects" following its passage in the form of a small reduction in prenatal care visits among low-education immigrant women, but no observed changes in birth outcomes. This reduction in prenatal care use is estimated as a deviation in trend for this population and, similar to the papers described above, is limited in its ability to account for compositional changes in the immigrant population over the study period.

1.4 Concurrent Changes in Immigration and the Characteristics of Immigrants

An important limitation of these existing studies is that they are unable to fully account for any concurrent changes in the characteristics of pregnant immigrant women that may affect the outcomes studied. Changes in the composition of immigrants, which may vary on both observed and unobserved dimensions, could generate spurious correlations between the timing of a Medicaid expansion and outcomes in a simple comparison across immigrant and U.S.-born groups. This is not a trivial concern with studying policies targeting undocumented immigrants, a group that has seen tremendous change in their numbers and composition over time in response to changes in national immigration policy (Massey and Pren, 2012; Krogstad et al., 2018).

This may be especially true in California over the period we study, which saw a large increase in low-income immigrants (Sun-Hee Park et al., 2000). Net undocumented immigration started at relatively low levels in the early 1980s, but surged during the mid- to late-1980s, followed by a sharp decrease in the early 1990s (Johnson, 1996). We document the relevant changes in the number and composition of immigrant women of reproductive age using data from the 2000 Census. Panel I of Appendix Figure A1 traces out changes in the number of immigrant women in California by year of entry to the US, place of birth, and education level. As may be seen in this figure, there is a large increase in the number of immigrants from Central America and the Caribbean over the period we study. In addition, there is a noticeable increase in immigrant women with lower educational attainment during this period.

As one might expect, these demographic changes also change the characteristics of women giving birth over the study period. Panel II of Appendix Figure A1 uses the same Census data to examine the characteristics of immigrant mothers for children born in the state during our study period. Notably, there is an increase in the number of births to immigrants from Central America and the Caribbean over time. The number of births to immigrant women with lower levels of education also increases over time.[16] These types of compositional changes are difficult to address using standard birth certificate data, which contain very limited data on maternal characteristics.

Characteristics of births to immigrant and non-immigrant women are changing over this period as well, mirroring the changes in maternal characteristics. Appendix Figure A2 shows the results of a simple event study that traces out changes in relative characteristics of births to immigrant and non-

[16]Note that educational attainment is measured at the time of the survey, not the time of birth, which may contribute to this trend.

immigrant women over the study period.[17] Immigrant women saw an increase in first and second births, and decline in higher order births, relative to non-immigrant women over the study period. In addition, the relative age of immigrant mothers at birth is decreasing, as well. Not adequately accounting for these types of compositional changes may lead to biased estimates of any program effects.

In addition to the challenge of a changing immigrant population, researchers also encounter difficulties in identifying the targeted population of coverage expansions. There is no information on the citizenship or legal residency status of the mother on birth certificate records, nor information on her income or socioeconomic status to determine eligibility for expanded coverage.[18] With this information absent from the birth record, studies relying on birth certificate data have been limited to examining changes in outcomes for all immigrant women, or some subset of these women such as those with low education levels, which could also make it difficult to detect program effects. Meanwhile, studies that use survey data (e.g. Hwang, 2023) may be limited by a smaller sample size.

This paper builds on this small existing literature by offering new evidence on the effects of public prenatal coverage for undocumented immigrant women. Given its historic size and the number of women covered, the Medi-Cal expansion provides a promising setting to detect program impacts. Our study also takes advantage of new data linkages to overcome these existing empirical challenges: we are able to observe changes in outcomes among births to the same mother before and after the expansion, thereby holding fixed the composition of immigrant mothers. We also use rich survey data to identify immigrant mothers who are most likely to have undocumented status and therefore benefit from the expansion. We are able to examine the trajectories of our outcomes for several years before and after the expansions occurred, allowing us to assess the validity of our approach and to document dynamic effects of the policy over time. We further use survey information to explore and rule out the potential role of concurrent changes in immigration policy in explaining our findings. Finally, we take advantage of new linkages to federal administrative data to trace out the long-run effects of the policy change, providing the first look at the adult health and human capital outcomes of the children who gained Medi-Cal eligibility.

[17] This analysis examines changes in monthly county birth characteristics for immigrant relative to non-immigrant women compared to the year prior to the expansion. Control variables in the regression are an indicator for immigrant mothers and county by month-year fixed effects. Regressions are weighted by the number of births and standard errors are clustered by county.

[18] California birth records only started including educational attainment of the mother in 1989.

2 Data and Outcomes

Our analysis of the effects of the Medi-Cal expansion uses a novel data linkage between California birth records for children born between January 1984 to October 1994 and several sources of survey and administrative data. To conduct this linkage, we received permission from the California Department of Public Health to send confidential birth records to the U.S. Census Bureau to assign a Protected Identification Key (PIK) to each individual birth record. This anonymized individual identifier allows for linkages to other Census-held data that have undergone a similar process without the retention of personally identifying information. In our case the full name of the infant, sex, exact date of birth, and county of birth are used to assign a PIK to each infant by comparing individual-level information on the birth certificate input file to the characteristics of records in the Person Identification Validation System (PVS) reference files held by Census (Wagner and Layne, 2014). The PIK rate for the California birth records during the years of our study is 97.2 percent overall and 96.2 percent for births to immigrant mothers, which are comparable to the PIK rates of federal data sources (Mulrow et al., 2011). Appendix Table A1 reports the characteristics of births over this period with and without an assigned PIK.

Following PIK assignment, we then link these infants to the 2000 Census and survey waves of the American Community Survey (ACS) from 2001 to 2011, the last year in which any cohort in our sample is below age 18. Note that the 1990 Census has not yet undergone PIK assignment by Census, so this survey is unavailable for our use. Combined, we are able to find information for both mother and child for approximately two-thirds of births during our sample period; rates of coverage are roughly similar for births to immigrant and U.S.-born women at 61 and 68 percent, respectively. For children whose families were included in these surveys, we identify siblings as those individuals of 17 years of age or younger who are residing at home with the same mother. See Appendix Section C for additional details on this process. Note that without this linkage to the Census survey data, it is not possible to otherwise link siblings in the birth records who were born before and after the policy change, since unlike their children, mothers' full identifying information was only recorded on the birth record starting in 1989, or the "post" period.[19] Therefore, researchers are unable to identify children with the same birth mother directly from the birth records.

[19]Importantly for our research design, full identifying information for the infant is available in all birth years. Using the post-1989 years of data, we validate the accuracy of our survey-based sibling identification procedure by comparing it against siblings identified using the birth mother's identity reported on the birth records. We find that the birth mother is misidentified using the survey-based method in only a very small number of cases (see Appendix Section C).

Once siblings are identified, we then restrict the sample to siblings born during the January 1984 to October 1989 period.[20] We also require that the mother reside in the state of California at the time of each birth, which is reported on the birth record, and that the birth record includes information on whether she is an immigrant. We exclude birth records with missing information on mother's county of residence, birth order, parity, or sex of the child. Less than 0.01 percent of birth records are dropped under these exclusions. This leaves us with a sample of approximately 2.13 million siblings born to 949,000 unique mothers. There are approximately 336,000 immigrant mothers and 612,000 US-born mothers with two or more births observed during our sample period. The 2.13 million siblings in our sample represent approximately 56 percent of the 3.8 million total births linked to the Census data.[21]

Our analysis is necessarily limited to children who lived in the U.S. at some point between 2000 and 2011 in order to be surveyed in the Census or ACS. Children are observed in the survey data approximately 10 years after birth, on average (see Table A3). Therefore, our estimates of the program's impact will not include effects for mothers or their children who leave the U.S. following birth or during early childhood, nor will they include families whose child dies prior to his or her inclusion in the Census or ACS. In addition, our estimates are based on individuals whose families are sampled and respond to the Census surveys, which may also miss some types of immigrant families.[22] Finally, our sample criteria requires that children reside with their mothers at the time of interview. Appendix Table A2 compares the characteristics of births to all immigrant mothers during our study period to those that receive PIKs and are included in the Census/ACS sample. The children that appear in the survey are more likely to have Asian mothers and less likely to have Hispanic mothers. Notably, the mothers of the children in the survey sample use more medical care during pregnancy and have better birth outcomes.

Depending on how the mothers and children who were excluded from our sample benefited from the Medi-Cal expansion, we may be either under- or over-stating the overall impact of the policy based on our sample alone. For example, if the policy increased survival rates of sick infants which in turn increased the probability we observe these children at later ages in the Census or ACS, we would expect this selection to attenuate any estimated health improvements. Later, we construct

[20] We start the pre-period in January 1984 since this is the oldest cohort observed below the age of 18 in the Census survey data. We define the post-period through October 1994 in order to limit the analysis to the period prior to Proposition 187, which may have had chilling effects for immigrants in California.

[21] All numbers have been rounded to comply with Census disclosure avoidance rules.

[22] While the exact undercount rate for undocumented immigrants in the Census and ACS surveys is unknown, it is assumed to be 10 percent in national counts prepared by the Department of Homeland Security (e.g. U.S. Department of Homeland Security, 2003; Baker and Rytina, 2013).

representative weights based on the universe of births observed in the birth certificate data that we apply to our Census/ACS sample. To the extent that treatment effects vary only in the observable characteristics used in the construction of these weights, this procedure will generate program effects that are representative of the population of births in the state.

In our main analyses, we restrict the sample to children whose households were surveyed in the long-form Census or in the ACS survey waves. Participation in these surveys allows us to observe additional information on the mother collected by these surveys, including detailed information on her country of birth and her year of entry in the US.[23] Table A3 presents characteristics of the 360,000 infants in this sample (born to 161,000 unique mothers) and by mother's place of birth. In the Appendix, we present results for the full sample of births linked to the 2000 Census short-form and ACS surveys, which are extremely similar to those estimated with the smaller siblings sample in the text. The characteristics for this larger sample are reported in Appendix Table A5.

As seen in Table A3, the majority (69.2 percent) of infants in the sample are either the first or second born siblings. The infants predominately have mothers whose race is non-Hispanic white. A large share of infants (35.7 percent) have mothers of Hispanic ethnicity. Approximately 36.6 percent of the infants have immigrant mothers; of these infants, the majority of their mothers were born in Mexico. Mother's age at the time of birth is similar for all infants (27 years on average). Births to immigrant mothers receive less health care during pregnancy and are less likely to be delivered by a physician. Gestation length and birthweight are also lower compared to births to U.S. born mothers, and the rate of small-for-gestational age is higher.

While we do not have information on the educational attainment of the mothers or their family structure at the time of birth, we observe this information later when the families are interviewed in the ACS or 2000 Census long-form surveys. The majority of children (69 percent) reside in married parent families at this time. This share is higher among children of immigrant mothers. In addition, the majority of children of immigrant mothers (54 percent) have mothers with less than a high school degree, compared to just 11 percent of children of U.S. born mothers.

In our main analyses, we first analyze the effects of the Medi-Cal prenatal expansions among all immigrant women and their children. We then use additional characteristics of the mother drawn from the Census surveys to examine the effects of the expansions for the infants born to mothers most likely affected by the policy change. We estimate the probability that each immigrant mother was

[23]Note that this information is not collected for siblings identified using the short-form 2000 Census and whose families were not included in the long-form survey sample in that year, nor in the later ACS surveys.

an undocumented immigrant around the time of the policy change using a procedure described in Section 3.

Appendix Table A4 provides descriptive statistics for immigrant mothers in the sample by the mother's likely undocumented status.[24] Mothers with a higher estimated probability of undocumented status are noticeably more like to have Hispanic ethnicity. They also are younger at the time of birth, have lower education levels, and are slightly more likely to be married at the time of the Census/ACS interview.

2.1 Medi-Cal Eligibility and Insurance Coverage

We do not have the information on maternal income at the time of pregnancy needed to estimate individual eligibility for Medi-Cal prenatal coverage. However, we are able to examine changes in the fraction of women of reproductive age eligible for Medi-Cal prenatal coverage in each woman's county of residence using information on California residents from the 1990 Census.[25] We construct county-level measures of eligibility for immigrant and US-born women during each month and year over our sample period (see Appendix Section A for additional information on the eligibility calculation), which we merge onto the California birth records. For analyses that examine changes in eligibility for likely undocumented immigrant mothers, we use separate county-level measures of eligibility for documented and undocumented immigrants that are merged on using the mother's estimated probability of undocumented status.[26] Given that we use a fixed sample of women drawn from the 1990 Census to estimate time-varying eligibility, any changes in eligibility observed in this analysis will reflect changes in Medi-Cal eligibility rules, rather than other demographic or socioeconomic changes. First developed by Currie and Gruber (1996a,b) and Cutler and Gruber (1996), this type of "simulated eligibility" measure is commonly used to summarize policy-induced changes in the generosity of eligibility rules for Medicaid.

For the analyses that examine changes in individual insurance coverage, we use information from the birth certificate record on the principal source of payment for prenatal care, which was collected starting in 1989. While these data are limited to the "post" period of the Medi-Cal expansion, they

[24]Note that some estimates in this table are not reported because the implied cell size did not meet Census disclosure rules. These entries are left blank.

[25]Note that only 34 counties are identified in the 1990 Census; however, these counties represent over 98 percent of the births in the state during our study period. For the 24 non-identified counties, we use the estimate of the eligibility change among respondents with non-identified counties in the 1990 Census.

[26]Specifically, for these analyses, we construct an eligibility estimate for each immigrant mother using the formula $\hat{p} * \text{Eligibility for undocumented immigrant women}_{ct} + (1 - \hat{p}) * \text{Eligibility for documented immigrant women}_{ct}$, where $\hat{p}$ is the mother's estimated probability of undocumented status, c indicates county, and t indicates the month and year.

allow us to trace out changes over time in Medi-Cal funded prenatal care relative to January - September 1989, which were during the first year of policy exposure. We might expect this to potentially attenuate our estimated effects of the policy change given that births starting in July 1989 would have a full 9-months of pregnancy exposure to the expansion, which was implemented in October 1988.

2.2 Health Care Utilization and Infant Health

We examine changes in the use of any prenatal care during pregnancy and the use of prenatal care in the first trimester, as well as the location of delivery (hospital vs. non-hospital, type of hospital), method of delivery (cesarean section vs. vaginal birth), and type of attendant (doctor vs. midwife), using information from the birth certificate record. While changes in delivery care are unlikely to affect the birth outcomes we study, they might reflect more general changes in interactions with the health care system that were likely initiated earlier during pregnancy (such as establishing care with a physician), which could matter for pregnancy outcomes.

To evaluate infant health, we examine average birthweight and gestational length, as well as whether the infant is small for gestational age (birthweight is below the 10th percentile for a given gestational age).[27] In additional analyses, we examine changes in the distributions of birthweight (by 500g bins) and gestational length (early preterm: $<$ 34 weeks, late preterm: 34-36 weeks, early term: 37-38 weeks, full term: 39+ weeks).

2.3 Long-Term Health and Human Capital

We rely on several sources of administrative data to examine later life outcomes for the cohorts who gained *in utero* eligibility. First, we examine mortality as recorded in the most recent vintage of the Census Numident file (quarter 3 of 2022). This file contains cumulative death data for individuals with a Social Security Number as collected by the Social Security Administration. Mortality measured in the Numident closely tracks with mortality as reported by the Centers for Disease Control and Prevention (CDC) during our period of study; Finlay and Genadek (2021) document that the Census Numident captures around 95 percent of annual CDC death counts in the early-1980s and coverage increases through more recent years. We construct a measure of cumulative mortality as measured through age 27, which is observed for all cohorts in the data.

Second, we examine post-secondary school enrollment and college degree attainment informa-

[27] We exclude observations with reported birthweights of less than 400 grams or more than 6000 grams from any analyses of birthweight. We also exclude observations with reported gestation lengths of less than 18 weeks or over 50 weeks from the analyses of gestational length. Cutoffs for the small-for-gestational age measure are calculated for each birth year.

tion through July 2022, when our youngest cohort is nearly 28 years old, as provided by the National Student Clearinghouse (NSC). Post-secondary school enrollment includes programs that confer associate's, bachelor's, and other certificates, as well as industry certifications and professional licensures. The NSC data cover between 87 to 97 percent of national enrollment in post-secondary, Title IV institutions, depending on the year (National Student Clearinghouse, 2021). NSC provided these data elements to the research team by linking the California birth certificate records to their administrative records using information on student name and exact date of birth. They then returned a data extract to us with an anonymized record identifier that enabled us to merge the de-identified NSC records with our birth certificate data in the Census integrated research environment.

Third, we examine fertility using information from an annual administrative dataset called the Census Household Composition Key (CHCK) available in 2016 to 2022. This dataset uses information from a variety of federal sources, including Social Security Number applications, the IRS Form 1040, and the decennial census (U.S. Census Bureau, 2020), to identify the parents of children ages 0 to 19. Together, these files capture near complete information on births occurring in the U.S. from 1997 through 2021 linked to parent information (Genadek et al., 2021). We link the CHCK files to our datafiles using individuals' PIKs to observe fertility for all of our study cohorts between the ages of 13 to 26. We examine whether individuals give birth before age 20 (teen fertility), as well as if they ever give birth by the age of 26 (cumulative fertility).

Fourth, we examine adult earnings as measured using W2 forms from the Internal Revenue Service for the 2007 to 2022 tax years that have undergone PIK assignment by the U.S. Census Bureau. This enables us to examine annual earnings for each of our cohorts during the years they turn the ages of 23 to 28. Importantly, the use of W2 reported earnings does not require that individuals file income taxes for us to be able to observe their earnings.

And, finally, we examine the use of public assistance in the forms of an EITC benefit and Medicaid enrollment. We examine the annual EITC amount received at ages 25 to 27 using information reported on the IRS 1040 form to calculate the EITC benefit amount.[28] We inflation-adjust earnings and EITC benefit amounts to 2021 dollars. Using administrative data from the Centers for Medicare & Medicaid services available from 2000 to 2016, we are able to examine annual Medicaid enrollment. Given the substantial changes in adult Medicaid eligibility rules that occurred during this period as a result of

[28]We only have access to IRS 1040 forms through the 2021 tax year, so are only able to calculate EITC amounts for all cohorts through the year they turn 27. Also, for nearly all data years, age 25 was the minimum age for EITC receipt for filers without children.

the Affordable Care Act, we focus primarily on childhood (age 16-18) enrollment but report effects on adult (ages 19-22) enrollment in the appendix.

Appendix Figure A3 provides a summary of these different data sources and elements used in the analyses.

3 Empirical Strategy

As described in Section 1.4, we aim to overcome existing empirical challenges in identifying the effects of expanded prenatal coverage for immigrant women by taking advantage of additional information available in the linked Census/ACS data. Specifically, information on family relationships allows us to examine differential exposure to the undocumented expansion across siblings for the same mother, based on their time of birth. We are able to compare differences in outcomes observed for these siblings with other siblings who were either born entirely before or after the policy change, in order to net out birth order effects. We also include children of U.S. born mothers in the analysis as an additional comparison group.

Importantly, we apply this mothers' fixed effect design in the context of an exogenous policy change that is unrelated to changes in family characteristics. Similar approaches combining policy-variation with a family fixed effect design have previously been implemented to study access to WIC in Texas (Rossin-Slater, 2013), expansion in pre-primary education in Uruguay (Berlinski et al., 2008), and a public prenatal intervention in Chile (Clarke et al., 2020). Most directly related to this paper, Aizer et al. (2007) use a similar research design to examine the impact of a change in the mid-1990s in Medi-Cal pregnancy coverage from fee-for-service to managed care.

Our research design relies on an assumption that in the absence of the Medi-Cal expansion to undocumented immigrant women, outcomes among the children of immigrant and U.S.-born women would have evolved similarly, after accounting for fixed differences in the characteristics of their families via a mother fixed effect. While this assumption is not directly testable, we examine whether the pre-treatment trends are similar for the children of immigrant and U.S.-born women using an event study design. If trends are similar prior to the intervention across the two groups and diverge only after the policy change, this pattern lends credence to the assumption that the children of U.S.-born mothers are an appropriate counterfactual for the children of immigrant mothers. This test for pre-policy differential trends represents an innovation over existing mother fixed effects analyses, which implement static models.

In addition to investigating the plausibility of our identifying assumptions, the event study design offers another advantage in that it allows us to examine time-varying treatment effects. In our specification below, we consider the policies to "turn on" for children born during the implementation year. However, the effects of the policy change may not always be observed immediately for several reasons. First, some of the outcomes studied are unable to or unlikely to have immediate effects. For example, none of the births occurring during the six months following the policy change were able to benefit from increased prenatal care access during the first trimester, since this period had already passed when the policy went into place. And, prenatal interventions received later in the gestational period may be less likely to affect certain birth outcomes. Second, for many of the outcomes, it may be the case that it took time for the newly eligible to learn about the policy change, enroll in the program, and initiate care. These types of informational and administrative barriers to take-up have been previously documented in Medi-Cal and are higher among groups facing language barriers or immigration-specific considerations (Aizer, 2007). Third, the state made several changes following the policy change to make it easier for women to enroll in the program.[29] These were state-wide changes but may have differentially affected take-up among immigrant women and contribute to a potential ramp up in the expansion's impact over time. For example, Aizer (2003, 2007) documents that later state outreach efforts to increase Medi-Cal take-up had larger effects on Hispanic and Asian families, who faced greater barriers related to language or immigration concerns.

We implement the event study analysis using the following specification:

$$y_{imt} = \sum_{\substack{y=-5 \\ y\neq -1}}^{6} \beta_y I(t - \text{Oct. } 1988 = y) \times Immigrant_m + \delta_t + \delta_m + \gamma X_{imt} + \epsilon_{imt}. \quad (1)$$

We regress outcomes for births (i) to U.S. and immigrant mothers (m) in month-year (t) on month-year (δ_t) and mother fixed effects (δ_m). We control for the following characteristics of birth (X_{imct}): sex, plurality, and the sibling birth order (first birth, second birth, third birth, fourth birth or higher). We cluster the standard errors by mother.

[29] California adopted several improvements to their Medicaid enrollment systems in an effort to increase coverage among eligible pregnant women. These types of changes during the study period including expedited eligibility processes (January 1989), outstationed eligibility workers at high-volume clinics (May 1990), continuous eligibility during pregnancy and the postpartum periods despite changes in income (January 1991), shortened application forms (November 1991), and presumptive eligibility for pregnant women that allowed women to receive services while their application was pending (1993). In addition, the state launched a media campaign called Baby-Cal designed to disseminate information about Medi-Cal and the importance of prenatal care (July 1991). General descriptions of these state efforts are available in Hill (1992), Dubay et al. (1995), and California Department of Health Care Services (2016).

The estimated coefficients β_y trace out the evolution of outcomes for births to immigrant mothers compared to U.S.-born mothers, conditional on the mother fixed effect and other birth characteristics, relative to the implementation of the undocumented expansion. These are estimated using an indicator for immigrant mothers interacted with an indicator for each year relative to the implementation date of October 1988.[30] The year just prior to implementation ($y = -1$) is the excluded year from the event coefficients. Estimates for β_y for years prior to $y = 0$ should be close to zero if there are no differential pre-expansion trends in outcomes for the two groups of births. We would expect the outcomes to diverge starting with β_0 if there are effects of the policy change.

In addition to the event study specification, we also estimate the effects of the expansion using a difference-in-differences comparison. This gives an estimate of the average effect of the policy over the entire post-expansion period. It is equivalent to the specification above except that the event study coefficients are replaced with an indicator variable for immigrant mothers during the post-period.

3.1 Variation in Likely Undocumented Status at Time of Policy

The estimates in the analysis described above tell us the impact of the Medi-Cal expansion for the children of all immigrant mothers. However, for respondents to the long-form decennial Census and ACS surveys, we are able to take advantage of the rich information available to estimate effects for the immigrant women (and their children) who we think were most likely to gain eligibility under the policy. While these surveys do not collect information on the legal status of non-citizens, they do have detailed information on the mother's country of birth with over one hundred country codes, as well as her year of entry in the U.S. Combining this information with her age and county of residence, we estimate the individual likelihood that each immigrant mother had undocumented status at the time of the policy change in order to estimate the effects for the policy's targeted population.

To do this, we use a prediction model estimated with publicly available 1990 Census data that also relies on imputed individual undocumented status using the Borjas algorithm mentioned earlier (also see further details in Appendix Section B). We first estimate the probability of undocumented status among immigrant women with young children in the 1990 Census as a function of time-invariant characteristics: country of birth, year of entry in the U.S, age in 1990, and county of residence. The coefficients from this model are then applied to the same characteristics observed for the mothers in our linked sample to predict the probability that they were undocumented in 1990. More details on this

[30] Note that β_{-5} signifies 5 calendar years before the undocumented expansion and includes births occurring between January and September in 1984. Meanwhile, β_6 captures births that occurred in October 1994 only. Since these represent only partial years, we do not report them in the event study figures.

procedure are available in Appendix Section D. We then interact this estimated probability with the event time dummies in equation (1) and the post-treatment dummy in the difference-in-differences model. The estimated coefficients from these specifications provide an estimate of the effect of the policy for an undocumented mother and her infant. In order to account for the additional estimation required in constructing the mother's likely undocumented status, we estimate the standard errors using a bootstrapping procedure that first resamples the 1990 Census to estimate the probability of undocumented status and then resamples the birth records by cluster to estimate the regression models described here.

4 Results

4.1 Medi-Cal Eligibility and Coverage

We begin by examining the changes in Medi-Cal eligibility and prenatal coverage resulting from the undocumented expansion. Figure 2(a) presents the estimated event study coefficients for Medi-Cal eligibility for all immigrants. We see a large jump in the first year of the policy, estimating approximately a 17 percentage point increase in county-level Medi-Cal eligibility for immigrant mothers, when compared to US-born mothers. This increases to 23 percentage points in the next year, following the income-based eligibility expansions discussed in Section 1, and remains flat over the remainder of the study period. Column (1) of Table 1 reports the difference-in-differences coefficient indicating an average increase in eligibility of 21.6 percentage points over the entire post-period.

Panel (b) of Figure 2 shows the event study estimates for Medi-Cal prenatal coverage. The change in Medi-Cal coverage is immediate but continues to climb over the study period, appearing to stabilize during the fifth year that the policy is in effect. The difference-in-differences estimate (column (2) of Table 1) indicates a 16.8 percentage point increase, on average, during the post-period. Because we measure the increase in prenatal Medi-Cal coverage relative to a partially treated year, the true increase in Medi-Cal prenatal coverage due to the policy may be even larger.

A similar pattern is seen in analyses that focus on likely undocumented immigrant women, reported in Appendix Figure A4 and panel (B) of Table 1. We estimate an average increase in eligibility of 64 percentage points during the post-period, accompanied by a 37 percentage point increase in Medi-Cal prenatal coverage. Appendix Figure A4(b) again indicates that enrollment increases over the study period with the largest effects observed in years 3 to 5 after expansion.

Figure 2 and Table 1 also show results for uninsurance, private insurance, and other sources of

coverage for prenatal care. The drop in uninsurance for immigrant women following the first year of the policy (panel c of Figure 2) is of similar magnitude to the increase observed in Medi-Cal prenatal coverage. The difference-in-differences estimate indicates an average decrease of 15.1 percentage points among all immigrant women during the post period, with a 36.7 percentage point decline among likely undocumented women (column (3) of Table 1). We observe only very small changes in private coverage and other sources of coverage; see columns (4) and (5) in Table 1. In general, other sources of coverage do not tend to be very relevant, reported for only 2.7 percent of immigrant women at baseline.

Overall, the estimates show substantial declines in uninsurance for immigrant women for prenatal care following the Medi-Cal expansion in eligibility for undocumented immigrants. In contrast to studies of income-based Medicaid expansions during this period (e.g. Cutler and Gruber, 1996; Dave et al., 2011), we do not find meaningful evidence of crowd-out of private coverage. This may be unsurprising given that private coverage is predominately employer-sponsored (Cohen et al., 2009), and undocumented immigrants are overrepresented in low-skilled occupations that tend not to offer these benefits (Fortuny et al., 2007). We also do not find crowd out of other sources of public coverage.

4.2 Health Care Utilization

Next we examine changes in health care utilization among immigrant mothers in terms of prenatal and delivery care. Figure 3 reports the coefficient estimates from the event study analysis for all immigrant women (comparable graphs for likely undocumented women are reported in Appendix Figure A5), while Table 2 reports the corresponding difference-in-differences estimates for all immigrant women (panel A) and likely undocumented immigrant women (panel B). Of note, the baseline means for the likely undocumented subset of women indicate that this group had lower rates of prenatal care use, later initiation of prenatal care, and was less likely to have a physician-attended delivery than the full sample of immigrant women.

As seen in Figure 3, there is little evidence of differential trends in utilization for immigrant and U.S.-born women prior to the Medi-Cal expansion.[31] However, there is an immediate increase in the use of prenatal care by immigrant women after the policy change. In the first year of implementation, there is a 0.5 percentage point increase in any prenatal care utilization. Mirroring the increase in the policy's dynamic effects on prenatal Medi-Cal enrollment, the effect of the policy on use of prenatal

[31] For some outcomes, the event studies for the likely undocumented specification in Appendix Figure A5 show significant event study coefficients in the pre-policy period. In general, these event studies tend to be noisier than those estimated for all immigrant women.

care grows over time, reaching over a 1 percentage point increase in the program's second year and over a 2 percentage point increase by its fifth year. The difference-in-differences estimate summarizes the post-period change as a 1.1 percentage point increase for all immigrant women, which is approximately the size of the gap in prenatal care use observed between immigrant and U.S.-born women in our sample (see Table A3). For likely undocumented immigrant women, we find a 2.5 percentage point increase in any prenatal care use after the policy change. This represents approximately a 64 percent reduction in the share of undocumented immigrant women without prenatal care during the baseline period, which was 3.9 percent (see Table 2).

We observe an increase in the number of prenatal visits during pregnancy, with the event study estimates in Figure 3(b) reflecting a similar increase over time as observed for Medi-Cal coverage. The difference-in-differences estimates in column (2) of Table 2 indicate an average increase of 0.75 visits among all immigrant women in the post-period, and an average increase of 1.5 visits among likely undocumented women.

We also see some evidence of an increase in early prenatal care utilization (i.e. initiation during the first trimester). This effect, however, is delayed and does not emerge until the fourth year of program implementation, see Figure 3(c). We would expect there to be a delay for this particular outcome, since it requires women to know about and enroll in the program at the start of their pregnancy. However, this seems like a particularly long lag and indicates that immigrant women may still have faced barriers to enrollment during their first trimester. The later increase may be related to other state efforts to increase awareness of the importance of prenatal care and Medi-Cal eligibility starting in 1991,[32] as well as the adoption of a presumptive eligibility policy in 1993.

Next we examine changes in delivery care. We find evidence of an increase in hospital deliveries for immigrant women starting in the year following the policy change. The difference-in-differences estimate indicates a 0.3 percentage point increase over the post period, which represents a 43 percent reduction over the baseline share of immigrant women without hospital deliveries (see column (4) of Table 2).[33]

[32]The BabyCal informational campaign was initially launched in July 1991 and expanded beginning in November 1992. It featured TV and radio ads and billboard advertisements with the messages "Get prenatal care. The State of California can help you," or "Take care of yourself while pregnant, your baby is counting on you" along with a state hotline number. Ads were targeted to Spanish language outlets in addition to English language outlets (Department of Health Services, 1992).

[33]We also examined whether the birth is more likely to occur in a public hospital, as opposed to a private hospital. While our estimates indicate a decrease in deliveries at public hospitals among immigrant mothers, we also observed a strong pre-trend for this outcome (see Appendix Figure A6). It appears that births to immigrant women in public hospitals were already decreasing relative to those of U.S. born women prior to the policy change, possibly due to the Emergency Medical Treatment and Labor Act (EMTALA), which required hospitals to admit women in labor regardless of her ability to pay for

We also looked at whether the birth was delivered by a doctor (as opposed to a midwife or other type of attendant) and the rate of c-section delivery. We find evidence of a significant increase in doctors delivering the births of immigrant women starting in the second year of the policy. The difference-in-differences estimates indicate a 1.7 percentage point increase in doctor deliveries for all immigrant women and a 5.4 percentage point increase for likely undocumented immigrant women (column (5) of Table 2. This represents a 47 percent decrease in the share of likely undocumented immigrant women with midwives or other attendants, as measured during the baseline period. We find no evidence of a change in the likelihood of a c-section associated with the Medi-Cal expansion.

4.3 Health at Birth

Next we examine the effects of the Medi-Cal expansion on birth outcomes for immigrant women. We estimate whether there were changes in gestational length, birthweight, and the incidence of small for gestational age under the policy. The event study estimates are reported in Figure 3(g)-(i) (Appendix Figure A5 for likely undocumented immigrant women) and the difference-in-differences estimates in columns (7)-(9) in Table 2. As seen from the baseline means in this table, infants of likely undocumented women had shorter gestational lengths, lower birthweights, and were more likely to be small for gestational age than infants to other immigrant women.

The event study estimates reveal changes in all three measures of health at birth that are increasing over time. We find little evidence of differential pre-trends in outcomes prior to the policy change. The difference-in-differences estimates indicate a 22 gram increase in average birthweight, an increase in gestation length of 0.6 days, and a 0.8 percentage point decrease in small for gestational age among births to immigrant women. This latter estimate represents a 9 percent decrease in prevalence relative to the baseline mean (8.9 percent). The estimates for likely undocumented immigrants are approximately 2.5 or 3 times larger.

In additional analyses, we examine distributional changes in birthweight and gestation length under the policy. Figure 4(a) presents estimates for birthweight that examine changes by 500 gram bins. Two bars are shown for each birthweight bin, where the first represents the baseline distribution for immigrant mothers and the second shows the estimated change after the policy.[34] As may be seen here, the birthweight distribution shifted to the right after the policy change, decreasing the number of births with birthweights between 2500 and 3499 grams and increasing the number of births with

services.

[34]This is estimated by adding the difference-in-differences estimate (and its confidence interval) to the baseline mean.

birthweights of 3500 grams and greater. We do not find evidence of significant changes in the low birthweight range (<2500 grams).

In Figure 4(b), we report estimates for changes in the distribution of gestational length. Consistent with our results on the birthweight distribution, we find a shift in births from early term (37-38 weeks) to full term (39 weeks+) under the policy change. We do not find significant effects on the frequencies of early and late preterm births. The patterns are identical when using the estimates for likely undocumented immigrant mothers (see Appendix Figure A7).

Note that the nature of these shifts is consistent with the finding of a decrease in small-for-gestational age. The median birthweight for infants with the small-for-gestational age designation during our study period is 2660 grams, above the low birthweight threshold of 2500 grams, while the median gestation length is 39 weeks.

4.4 Assessing the Mothers' Fixed Effects Design

Are Mothers' Fixed Effects Really Necessary? Our research design relies on a mother's fixed effect to account for non-time varying factors common to siblings. To better understand the importance of this approach for detecting the policy's health benefits, we undertake two additional analyses. First, we show the results of a "naïve" difference-in-differences analysis that compares changes in outcomes for immigrant and non-immigrant women and their infants before and after the policy change, adjusting for observable characteristics available on the birth certificate records.[35] Presented in the first column under each birth outcome in Appendix Figure A8, these estimates indicate lower average birthweights and higher incidence of small-for-gestational age for the infants of immigrant women after the policy change, as compared to non-immigrant women. This perverse "effect" is not surprising given the large changes in the composition of immigrant women over this period that we discuss in Section 1.4. The next columns present very similar estimates for the sample of births that are linked to Census survey data. Once we incorporate controls for additional observable characteristics available in the survey data (detailed indicators for mother's country of birth and her year of entry to the US), the estimates for birthweight and small-for-gestational age noticeably shrink, but still indicate worse infant health for immigrants after the policy change. In the next two columns, we restrict the sample to siblings observed in the linked data and then include the additional control variables from

[35]This analysis examines changes in individual birth outcomes for immigrant relative to non-immigrant women after the undocumented immigrant expansion. Control variables in the regression are indicators for birth order, mother's race and ethnicity, mother's country of birth, age, singleton birth, and female birth, county by month-year fixed effects, and county by immigrant interaction dummies. Robust standard errors are clustered by county.

the survey data. The estimates for average birthweight and small-for-gestational age flip signs in this last specification, and the estimate for gestational length increases in size, indicative of improvements in infant health after the policy change. This sequence of estimates tells us that both the use of the siblings sample and controls for additional observable characteristics remove any evidence of negative health "effects" after the policy change. Comparing the estimates to our main findings (last column of Appendix Figure A8) also indicates the importance of the mothers' fixed effect in detecting the health benefits of the policy, or that immigrant women giving birth during the post-period may still vary in unobservable ways from those who gave birth during the pre-period.

Second, we examine the estimated mothers' fixed effects directly. If these mothers' fixed effects are capturing time-invariant family characteristics that are important to account for in our analysis of the prenatal expansion, they are likely correlated with other determinants of socioeconomic status that we know to be related to birth outcomes. Using the estimates from the difference-in-differences specification for birthweight, we regress the mothers' fixed effects on indicators for the mother's race and ethnicity, nativity, year of entry to the US, marital status and educational attainment at the time of the Census survey, and county-level income per capita at the time of birth. The results, presented in Appendix Table A6, show that the fixed effects estimates are negatively correlated with non-white racial and ethnic groups, later years of entry to the US, lower educational attainment, and county-level per capita income. The fixed effects estimates are positively correlated with married status at the time of the survey, although not associated with mother's being born outside of the US or with specific countries of origin. This analysis demonstrates that mothers' fixed effects are related to observable, non-time-varying maternal characteristics that are known determinants of infant health. It is therefore reasonable to expect that they also capture other, *unobservable* characteristics that drive variation in health outcomes across infants, further bolstering the rationale for their inclusion in regression (1).

Does the Within Family Design Generate Spurious Effects? We also show that the use of a within family design does not mechanically generate the findings. Such spurious effects might occur if, for example, there were differential effects of birth order or birth spacing among immigrants vs. non-immigrants. However, several pieces of evidence suggest this is unlikely to be the case. First, we find no evidence of effects during the pre-period in Figure 3, which we would expect to be present if differential birth order effects were driving the results. Second, we conduct an additional check where

we run a parallel analysis using only birth cohorts born after the policy change.[36] We use the 2010-2021 waves of the ACS to identify siblings born between 1994 and 2004 using the same method for sample construction as used in our main analysis. We estimate the effects of a placebo policy change in October 1998, which allows us to estimate the same number of pre- and post- event terms as in our main model. If our research design generates health at birth "effects" mechanically, we would expect to find significant coefficients in this model. The results may be found in Appendix Figure A9. We do not find any evidence of "policy effects" under this exercise, which provides reassurance that neither the mothers' fixed effect approach, nor the method of sample construction, may be responsible for the patterns we observe in our main analysis.

We ultimately conclude that the mother's fixed effects design is necessary to obtain an unbiased estimate of the Medicaid expansion and that this approach is likely to be successful in capturing the impact of the policy we study.

Are The Event Studies Picking Up Compositional Changes? A separate concern about the research design is that the event studies necessarily rely on an "unbalanced" panel since mothers do not give birth in every year. To assess whether this change in the sample of mothers giving birth from period to period might contribute to the patterns we observe in our event study estimates, we follow the approach used in Chyn and Shenhav (2022) and restructure event time as birth order relative to the timing of the expansion. We then present estimates using the full sample of births in addition to those under alternative balanced sample restrictions.

The results may be found in Appendix Figure A10. As may be seen here, the specification using the full sample of births (denoted in blue) presents estimates very similar to our main event studies presented in calendar time. For all three birth outcomes, we find no evidence of pre-trends and significant estimates indicating health improvements post-expansion. Furthermore, the magnitude of these coefficient increase for later ordered births in the post-period, depicting a similar pattern to our main event studies.

The remaining estimates on Appendix Figure A10 present results from analyses that use three different balanced samples, defined as (1) mothers that have two births during the sample period with one occurring after the expansion, (2) mothers that have three births with two births occurring after

[36] We run this exercise using post-period rather than pre-period cohorts since we are only able to identify siblings born in 1983 and later using the Census data. This provides just less than six pre-period cohorts, while we are able to use a full eleven post-period cohorts to mirror the set-up of our main analysis.

the expansion, and (3) mothers that have three births with two births occurring after the expansion. In general, the estimates are very similar to those from the unbalanced sample, providing reassurance that the results are not being driven by the unbalanced nature of our panel.

4.5 Additional Analyses: Exploring Mechanisms

Fertility Changes: We conduct additional analysis to explore whether there were any changes in fertility associated with the policy change. This policy could plausibly affect fertility in two ways. First, to the extent that the additional prenatal care improved maternal and fetal health, it could prevent miscarriages or stillbirths, resulting in more live births for a fixed number of pregnancies. Second, it could affect births through the number of pregnancies carried to term, increasing births even if rates of pregnancy loss did not change. This could occur if Medi-Cal prenatal coverage reduced the costs (both monetary and otherwise) associated with pregnancy and childbirth, making pregnancy more appealing and resulting in more conceptions and/or fewer abortions. Changes on either of these margins could lead to changes in average birth outcomes, depending on the average health of the "marginal" child.

To investigate this, ideally, we would have data on women's conception decisions, abortions, and pregnancy loss over the study period. Given that these type of data are unavailable, we explore fertility responses by evaluating changes in birth rates. In the context of our analysis, the sample is comprised of births with at least one sibling born during the study period. Therefore, any changes in fertility associated with the policy would most directly affect sample composition, and therefore our policy estimates, by changing a mother's decision to have (or timing) of a subsequent birth.

For this reason, we examine whether, conditional on having an initial birth during the study period, there are changes in subsequent birth rates following the policy change. We construct a panel dataset for every mother identified in the linked birth-ACS/Census records with information on whether they gave birth during each month and year following their first observed birth. Changes in observed birth rates will therefore capture the net effect of both changes in health during pregnancy and changes in fertility.

As seen in the first column of Table 3, we find a statistically significant increase in subsequent births among immigrant mothers associated with the Medi-Cal expansion (event study estimates may be found in panel A of Appendix Figure A11). Our estimates indicate a 0.1 percentage point increase in the likelihood of a subsequent birth among immigrant mothers with at least one child, a 14 percent

increase over the observed baseline rate. Since 28 percent of births in our sample are first births, this increase in subsequent births implies a meaningful increase in the overall birth rate of about 10 percent (0.28 + 0.72*1.14=1.10), with these marginal births representing about 9.1 percent of all births in the post-expansion era.[37]

If these births are more likely to be healthier than the average birth among this population, then this increase in childbearing is one potential mechanism behind the improvements in birth outcomes documented under the policy change. To examine how much of our policy effect might be attributable to this mechanism, we conduct a bounding exercise that assumes that all marginal births receive prenatal care, have higher than average birth weight (3500 grams) and experience a 40 week gestation.[38] This procedure implies that selection due to changes in childbearing can, at most, explain 20.0% (prenatal care usage), 40.3% (birthweight), and 14.7% (gestation length) of the policy effect when examining changes among immigrant women. Furthermore, this analysis implies that it is possible that changes in fertility fully explain the policy effect if no marginal births were small for gestational age. It is important to note that these are upper bounds that assume all marginal births are maximally healthy and receiving prenatal care; in reality, marginal births may in fact be negatively selected (e.g. if they result from averted miscarriages that lead to less healthy infants). Therefore, while a potentially important mechanism and an interesting outcome in its own right, changes in fertility do not appear to be the sole mechanism underlying the effect of the Medicaid expansion for most of the key outcomes we consider.

Maternal Health During Pregnancy: We next examine the presence of any pregnancy complications as reported on the birth record. Our measure of complications includes pregnancy-specific complications (placenta previa, pre-eclampsia or pregnancy induced hypertension, hemoglobinopathy, kidney infection/pyelonephritis, anemia, and transport of mother from another facility prior to delivery) and pregnancy complications related to chronic diseases (chronic hypertension, cardiac disease, diabetes, lung disease, rubella, Rh sensitization, uterine bleeding before labor, and renal disease).[39] Changes

[37] Normalizing the number of pre-period births to 1, marginal births are 0.72*0.14=0.1008. When compared to the post-policy period, these births represent about 9.1 percent of all births (0.1008/(1.14*.72+0.28)).

[38] We assume there were no policy effects other than the change in selection. We use the fact that marginal births represent 9.1 percent of all post policy births and calculate the pre-post policy change among immigrants as $\bar{Y} - (\bar{Y} \times 0.909 + \bar{V} \times 0.091)$, where $\bar{Y}$ is the pre-policy average for the immigrant group and $\bar{V}$ is our imposed "healthy" outcome (receiving prenatal care, birth weight of 3500 grams, or 40 weeks gestation). We then compare this "selection effect" to the policy effects estimated in Table 2.

[39] This measure was constructed in consultation with Dr. Priya Batra, an obstetrician-gynecologist, who helped to review medical data worksheets available on the birth records and identify pregnancy complications that were consistently captured over the study period.

in these types of pregnancy complications might indicate either changes in the diagnosis of or the prevention of conditions that might impact health during pregnancy and infant development.

We find some evidence of a decrease in pregnancy complications following the policy change (panel B of Appendix Figure A11, although we note that there does appear to be a slight upward trend in the pre-policy period. The estimates in Table 3 indicate declines for all immigrant and likely undocumented immigrant women in the post-period. The estimate is only statistically significant in the latter specification.

These findings suggest that improved access to prenatal care may have translated into better health during pregnancy. Unfortunately, the birth certificate record did not collect any additional information during this period that might provide additional insights into changes in maternal behaviors during pregnancy, such as nutrition, smoking, or drinking, nor does it provide information on participation in other public programs.

4.6 Later Life Health and Human Capital

The first cohorts who gained *in utero* eligibility under this policy change are now in their early thirties. We are therefore able to examine the longer-term effects of this early health intervention. The event study estimates are reported in Figure 5 (Appendix Figure A12 for likely undocumented immigrant women) and the difference-in-differences estimates in Table 4. As seen from the baseline means in this table, infants born to likely undocumented mothers have lower educational attainment and wages as adults when compared to infants born to other immigrant mothers. They also have higher fertility and participation in public programs, although experience slightly lower cumulative mortality.

The event study estimates indicate increases in post-secondary enrollment and college completion for children of immigrants following the policy change.[40] We also find decreases in teen fertility and any fertility experienced by age 26. Furthermore, the estimates also show that public program participation in the form of EITC receipt and childhood Medicaid decreased for cohorts affected by the prenatal expansion. We also examined adult (ages 19-22) Medicaid participation. While the difference-in-differences estimate indicates no change in Medicaid enrollment at these ages, we observe a strong pre-trend for this outcome (see Appendix Figure A6).[41] The event studies do not show strong evidence of changes in cumulative mortality or annual wages under the policy.

[40] Similar to the estimates for short-term effects, the event studies for longer-term outcomes for children of likely undocumented mothers in Appendix Figure A12 tend to be noisier and, in some cases, show significant event study coefficients in the pre-policy period.

[41] There is also a peculiar post-expansion pattern in the estimates for this outcome that we suspect is related to the the Affordable Care Act Medicaid expansions for adults in 2014, which only affected the last three cohorts in the sample.

The difference-in-differences estimates in Table 4 show significant increases in educational attainment, accompanied by declines in fertility, mirroring the patterns shown in the event study figures. We find a 1.7 percentage-point increase in post-secondary school enrollment and 1.2 percentage-point increase in college graduation among children of all immigrants, and a decline in teen fertility and any fertility of 1.1 and 2.0 percentage points respectively. We observe no change in annual wages or cumulative mortality, but significant decreases in average EITC amount ($69 per year); this decline is likely closely related to the fertility effects we documented, given the tight link between EITC eligibility and number of children. Finally, we find that childhood Medicaid participation declines by 1.1 percentage points. Each of these estimates is larger in magnitude for likely undocumented immigrants. These results indicate that not only did children of immigrants experience better health at birth as a result of the prenatal eligibility expansion, but that expanding access to health care *in utero* put these cohorts on a trajectory of improved economic and health outcomes that extends far beyond the period of the initial intervention and may continue to yield benefits in the future.

5 Sensitivity Analyses

5.1 Alternative Specifications and Samples

To assess the sensitivity of our results to alternative specification and sample criteria, we present the results of several additional analyses in Figures 6-7 (for all immigrant women) and Appendix Figures A13-A14 (for likely undocumented immigrant women). The first coefficient in each figure (in red) presents the difference-in-difference estimate from our main specification. The next two coefficients show results from analyses with additional control variables. First, we add county by month-year fixed effects ($\delta_c \times \delta_t$) to control for county-specific changes in outcomes over time. Next, we add immigrant mother by county fixed effects ($Foreign_m \times \delta_c$) to control for any fixed differences across counties by immigrant status. The inclusion of these controls aim to address any concerns, for example, that there are concurrent changes in the local healthcare infrastructure or environment that differentially affect the localities of immigrant and U.S. born women, or that either group of women are relocating between births to lower or higher resourced counties in a manner coinciding with the policy change. The estimates are extremely similar for all outcomes, with the exception of the early initiation of prenatal care, which becomes smaller in size.

Next, we examine the sensitivity of our results when we cluster the standard errors by county, rather than at the individual mother level. All results remain statistically significant with this change,

with the exception of early initiation of prenatal care for all immigrants and the fertility decline estimated for likely undocumented immigrants.

We next examine estimates when we include controls for the length of time between births in the regression specification. If the undocumented expansions changed the timing of births and led to differential birth spacing between immigrant and U.S.-born women, this could be one mechanism driving the changes in birth outcomes observed under the policy. To investigate this, we include controls for time since the prior birth (less than 18 months, 18-23 months, 24-35 months, 36-47 months, 48-59 months, and 60+ months) and interact them with the birth order dummies in equation (1). In this specification, first births are the omitted category and all subsequent birth order dummies are interacted with the birth spacing categories. We find very similar results under this specification.

We next re-estimate our main analyses applying weights to account for differential sampling rates in the Census survey data. As described in Section 2, our analysis sample is necessarily limited to children who were born in California during the study period and who also lived in the U.S. at some point between 2000-2011 in order to be surveyed by the Census Bureau. In addition, to be included in our analysis, it also had to be the case that their family was sampled and responded to either the 2000 Census or 2001-2011 ACS. The analysis of our linked data, therefore, does not provide any information on program effects for children who left the U.S. during early childhood, or for other types of families not captured in the survey data.

While the impacts for these missed groups are unknowable without additional sources of data, we are able to take advantage of the fact that we observe the population of California births–not just survey respondents–in our birth certificate data. Using the data on all California births, we are able to estimate what the overall program effects would be if the effects are similar for all children in the state with a given set of observable characteristics, which we select based on their availability for all birth records. The weights are equal to the inverse ratio of the number of individuals in our linked sample to the population of births in the state in each cell defined using birth year, birth month, birth order, mother's ethnicity and race, mother's country of birth, sex, plurality, mother's age, and county of residence. As seen in the figures, the estimates are very similar when we apply these weights.

Next, we explore the potential role of concurrent immigration reforms by dropping women who were likely to directly benefit. If these reforms changed a mother's legal status or those of other family members, this may have had effects on her well-being, as well as that of her offspring. This is a concern for our research design if these changes are implemented at the same time as the Medi-Cal expansion

since they differentially affect immigrant women.

There were two important federal immigration reforms during this period. First, the Immigration Reform and Control Act (IRCA) became law in November 1986 and created an amnesty program for some undocumented immigrants to become legal U.S. residents. Individuals who had been living continuously in the U.S. since January 1, 1982, as well as special agricultural workers who had been employed in the U.S. for 90 or more days between May 1985 and May 1986, were eligible to apply for legalization (Norton et al., 1996). Second, the 1990 Immigration Act (IMMACT) provided protection from deportation and work authorization for spouses and unmarried children who were related to legal immigrants, including newly legalized IRCA immigrants, and who entered the United States without legal status prior to May 5, 1988. The law also provided immigrant visas for the spouses and children of legalized immigrants who had attained permanent resident status (Guendelsberger, 1992).

To explore the potential role of these concurrent reforms, we re-run our analyses dropping immigrant women who entered the U.S. prior to January 1, 1982, since this indicates that they may have been eligible for IRCA legalization. We also excluded women who resided with a spouse who entered the U.S. prior to this date, since she and any existing children may have benefited either indirectly from his IRCA legalization, or from the later family unity policy described above.[42] The estimates in this analysis are similar to those for the main sample.

Next, in the last column of Appendix Figures A13 and A14, we re-run our analyses for the sample of births to immigrant women only, using variation in the estimated likelihood of undocumented status as a measure of treatment. This model does not rely on the U.S. born mothers as a comparison group and instead compares immigrant mothers whose characteristics made them less versus more likely to have undocumented status at the time of the policy. Our results overall are very similar to our main analysis, although some of the estimates are slightly smaller in magnitude, perhaps due to the measurement error involved in identifying probable undocumented status. The fertility results in Appendix Figure A14 are particularly sensitive to this sample exclusion.

Finally, we re-run all analyses using the larger sample of siblings that were linked to the Census data, including the 2000 Census short-form. The difference-in-differences estimates are reported in Appendix Table A7. The results are extremely similar with this larger sample of births, and also suggest a significant decrease in cumulative mortality for the cohorts who gained *in utero* Medicaid el-

[42]We did not attempt to classify workers as IRCA eligible based on their occupation since it was not clear that this information at the time of the ACS/Census interview would accurately reflect 90 days of agricultural work during the year required under IRCA requirements.

igibility. The estimate indicates one fewer death per 1,000 individuals, or approximately a 13.5 percent decline over the baseline mortality rate.

5.2 Placebo Test

To further test the validity of our empirical approach, we conduct a "placebo" analysis that re-runs our main analysis but restrict the births to immigrant women to those occurring among women born in Cuba. Refugees from Cuba were eligible for Medi-Cal coverage prior to the 1988 undocumented immigrant expansion under the Cuban Refugee Program and then Cuban Program Phasedown (Martinez, 1981), and should not have been directly affected by the 1988 eligibility expansion. At the same time, Cuban immigrants exhibit similar patterns of fertility and birth spacing as non-Cuban immigrants and were likely subject to similar economic, cultural, and policy shocks as non-Cuban immigrants. In sum, this group shares many similarities with non-Cuban immigrants but did not experience a change in their Medi-Cal eligibility, making them an ideal group for a placebo test.

To conduct this analysis, we use the larger sample of births linked to the 2000 Census short-form and ACS in order to secure sufficient sample sizes of children born to Cuban immigrants. We have approximately 3,000 births to Cuban immigrants in this sample (see Table A5). When we re-run the analysis focusing on births to this group of immigrant women, as expected, we find no evidence of significant changes in Medi-Cal coverage or other outcomes associated with the undocumented immigrant expansion (see Table 5 and Appendix Figures A15 (short-term outcomes) and A16 (long-term outcomes)). This provides additional reassurance that our main analysis is not somehow picking up differences in the characteristics of births to immigrant and non-immigrant women that are unrelated to the policy change.

6 Discussion

We find strong evidence that expanded Medi-Cal coverage to pregnant undocumented immigrants led to increased insurance coverage, prenatal care use, and better infant health. We also find longer-term improvements in well-being for the cohorts who were *in utero* with higher educational attainment and less reliance on public support programs.

To better understand the magnitude of our reduced form estimates, we can scale the changes in prenatal care and infant health by the corresponding change in prenatal coverage under the policy. We use our estimate of a 16.8 percentage point increase in Medi-Cal prenatal coverage to conduct this

scaling.[43] Applying this scaling implies that newly enrolled immigrant women were 7 percentage points more likely to use any prenatal care and increased their number of prenatal visits by roughly 4.5 visits, on average. These changes translated into higher average birthweights of 130 grams (a 4 percent increase over baseline) and 3.7-day longer gestational lengths among new enrollees. They also experienced a 5 percentage point decrease in the likelihood of a birth being small-for-gestational age, which represents a 54 percent decrease compared to the baseline rate among all immigrant mothers. In the likely case that baseline infant health outcomes were worse among the undocumented immigrants who actually took up coverage, the proportionate effects would be smaller.

In terms of longer-term outcomes, we estimate that the children of newly enrolled immigrant women were 9.9 percentage points more likely to enroll in post-secondary school (a 14 percent increase over baseline) and 7.3 percentage points more likely to graduate from college (a 26 percent increase). These schooling gains were accompanied by decreases in teen fertility (6.5 percentage points, or a 50 percent decline) and any fertility by age 26 (11.9 percentage points, or a 33 percent decline). Reductions in public supports were on the order of 6.3 percentage points for childhood Medicaid enrollment (21 percent decline) and $413 in annual EITC receipt as an adult (a 63 percent decline over baseline).

6.1 Are Effects of Prenatal Eligibility Different Among Undocumented Mothers?

Nearly all prior work on expansions of prenatal Medicaid focused on income-based expansions that excluded undocumented immigrants. Given the different economic, social, and cultural position of undocumented immigrant mothers, the effects of prenatal coverage expansions could differ substantially for this group. For instance, the benefits of expanded coverage for undocumented immigrant families, who have lower family incomes and higher rates of uninsurance than U.S.-born families (Fortuny et al., 2007), could be larger than for non-immigrants. However, limited English language proficiency, confusion around program eligibility rules, or fears about repercussions for using public benefits are potential barriers to enrollment (Feld and Power, 2000). In addition, language-, cultural-, and discrimination-related challenges to navigating the health care system and receiving quality care (Flavin et al., 2018) are additional reasons that expanded access may not lead to better outcomes.

Most directly related to our results are two papers that examine the impact of income-based prenatal Medicaid expansions on average birthweight. Dave et al. (2008) examine national prenatal expansions between 1985 and 1999 and find a 35.9 gram increase in average birthweight for the children

[43] We note, however, that this may understate the effect of the policy on coverage (and thereby overstate the effect of coverage on outcomes) given that it is measured relative to a partially-treated year.

of women gaining coverage. Meanwhile, East et al. (2023) look at slightly earlier expansions in prenatal Medicaid (1980 to 1985) and their estimates imply an average increase of 13 grams, although these estimates are imprecise and not statistically significant.[44] In contrast, we find that birthweight increases by 130 grams for each newly covered mother, many times larger than these previous estimates.[45] This difference is notable given that the prior literature also suggests that these income-based expansions had large effects on prenatal care utilization. The estimates in Dave et al. (2011) indicate that newly covered mothers had 10.5 additional prenatal visits, while analyses in Currie and Gruber (1996b) find that newly eligible mothers were half as likely to delay prenatal care initiation beyond the first trimester. This suggests that access to prenatal care may have a larger impact among undocumented immigrant mothers, or that other benefits of Medicaid enrollment are particularly important to this population - such as the financial benefit or potential knowledge gained of the WIC program. In addition, California's Medicaid program offered enhanced psychosocial services and supports to pregnant enrollees not available in many states, possibly leading to greater benefits of expanded eligibility in this state relative to what has been documented at the national level.

At the same time, many previous studies of income-based prenatal coverage expansions focus their analyses on the incidence of low birthweight. These papers find mixed evidence regarding impacts on low birthweight, with any effects concentrated among the most disadvantaged subgroups (e.g. Currie and Gruber, 1996b; Epstein and Newhouse, 1998; Dubay et al., 2001; Levine and Schanzenbach, 2009; Dave et al., 2008; East et al., 2023). In contrast, we find most of the gain in birthweight occurs towards the middle of the distribution, with the probability of having an infant in the lowest birthweight category essentially unaffected by the policy (see Figure 4). One notable difference between our study and these existing analyses is our use of a mothers' fixed effect design that relies on comparisons between siblings born before and after the policy change. Under this design, we cannot estimate the impact of the policy change on first births who are at higher risk for low birthweight. To the extent that prenatal interventions are potentially more beneficial for first births, when mothers have less experience with pregnancy and childbearing, it may be the case that we are understating the benefits of the program on this outcome. Notably, our birthweight results are consistent with the patterns observed in studies estimating changes in access to WIC (Rossin-Slater, 2013) and prenatal care in Chile (Clarke et al., 2020), also estimated using sibling comparisons.

[44] As these authors present event study estimates only, we calculated this by taking the average of the post-expansion effects for birthweight and scaling them by the corresponding average of post-expansion effects for Medicaid coverage.

[45] Note that this may be an overestimate given the limitations of our first stage data; see section 2.1.

Finally, the one study of the long-term effects of income-based prenatal Medicaid eligibility expansions found improvements in high school graduation but did not detect changes in college enrollment or attendance (Miller and Wherry, 2019). In contrast, in this study we find significant increases in post-secondary school enrollment and degree attainment. It is possible that this difference reflects a higher return to human capital of early life health investments for the children of undocumented immigrants.

6.2 Benefits and Costs

To quantify the short-run costs relative to benefits observed under the Medi-Cal expansion, we calculate the cost per gram of birthweight gained. Norton et al. (1996) report that the cost of Medi-Cal prenatal services was approximately $480 per pregnancy in 1991,[46] which translates into roughly $1,000 today. Combined with the estimated change in birthweight among new enrollees of 130 grams, this indicates that the cost per gram of birthweight for the Medi-Cal expansions was just under $8. This estimate is slightly less than the amounts for two different early health interventions presented in Clarke et al. (2020). The authors calculate $11 per gram under a Chilean prenatal program and $14-15 per gram for the WIC program in the US, based on estimates from Rossin-Slater (2013); Hoynes et al. (2011). Thus, our estimates appear to be in line with, or less than, other interventions that target health at birth.

We next consider the long-run benefits of the Medi-Cal expansion, both in terms of government savings and the value to the recipients. For each individual who gained Medi-Cal coverage while *in utero*, we estimate government savings of $290 in 2022 dollars from reduced participation in Medicaid at ages 16 to 18, when we discount to the time of birth (i.e. the initial investment).[47] We calculate additional discounted savings from reduced EITC receipt at ages 25 to 27 of $621. Combined, these later savings ($911) nearly offset the cost of the initial Medi-Cal benefit ($1,011). This calculation does not include potential savings at other ages not included in our analyses.

The higher rate of college graduation is expected to lead to higher lifetime earnings for recipients, also leading to higher tax revenue for the government. We do not yet observe this change at the ages for which we observe earnings (ages 23-28). However, estimates of lifetime earnings by educational attainment indicate that a Bachelor's degree results in $2.8 million in cumulative earnings over the

[46] This estimate excludes the cost of labor and delivery.

[47] This calculation uses the average annual Medicaid payment for a non-disabled child of $1,627 in 2004 (when the 1988 cohort is 16 years of age) from Centers for Medicare & Medicaid Services (2007), applies the implied 6.3 percentage point decrease in Medicaid enrollment among recipients, and discounts to the time of birth using a 3 percent interest rate.

ages of 25 to 64, as compared to $1.7 million for an Associate's degree (in 2009 dollars, Carnevale et al., 2021). Combined with the 7.3 percentage point increase in college graduation among Medi-Cal recipients, we might, therefore, expect $11,278 in additional after-tax earnings and $2,628 in additional tax revenue for the government (2022 $) for each Medi-Cal recipient, if we follow Hendren and Sprung-Keyser (2020) and assume an effective tax rate of 18.9 percent, and discount back to the time of birth.[48] We can then net out the additional costs associated with the estimated 9.9 percentage point increase in post-secondary school enrollment among recipients, both in terms of their private costs and costs to the government.[49] Once we take into account these increases in educational expenses, the net increase in earnings is $8,721 and the net increase in government revenue is $823 for each Medi-Cal recipient.

These calculations suggest that the ratio of the value of the program to beneficiaries over their lifetimes to the net cost of the program to the government (i.e. the "marginal value of public funds " (MVPF), see Hendren, 2016; Hendren and Sprung-Keyser, 2020) will be infinite. That is, net government spending will be negative over the lifetimes of recipients (i.e. the program is cost-saving).[50] This conclusion is consistent with previous calculations of the MVPF for Medicaid prenatal coverage under income-based expansions in Hendren and Sprung-Keyser (2020). We have not considered here, however, the potential expense to the government of any additional births that were induced by the policy change, as documented in Section 4.5. It is difficult to know the net fiscal costs associated with these births, but existing evidence indicates that second generation immigrants use similar levels of government benefits but pay more in tax revenues than the US-born population overall (National Research Council, 1997; National Academies of Sciences, Engineering, and Medicine, 2017).

Finally, we note that the value of Medi-Cal coverage to recipient families is likely much larger than what is calculated here, and observed in our data, and include other meaningful improvements in quality of life and well-being over their lifetimes. These benefits may even extend to future generations, similar to the pattern observed under prenatal Medicaid expansions that excluded undocumented immigrants (East et al., 2023).

[48] Note, this is a conservative estimate since it assumes that individuals would have received an Associate's degree otherwise and ignores the possibility of graduate education once receiving a Bachelor's. The estimates of lifetime earnings from Carnevale et al. (2021) do not apply a discount rate. We, therefore, discount the difference in lifetime earnings between the two degrees back to the time of birth calculated as of age 45, which is halfway in the age period used by the authors to compute lifetime earnings.

[49] We use the OECD estimate of total annual expenditure per student for tertiary education in the US in 2004 ($24,074), assume 2 years of attendance, and apply the shares of public vs. private spending from education in the US in 2004 from Organisation for Economic Co-Operation and Development (2006). We discount back to the time of the initial investment.

[50] Our calculations here do not differentiate between state or federal spending.

7 Conclusion

One out of every thirteen births in the United States is to an undocumented immigrant. But despite their large presence, in most states, pregnant undocumented immigrants do not qualify for Medicaid coverage of routine prenatal care during pregnancy. In this paper, we demonstrate the impact of the removal of this exclusion from publicly-funded health services on insurance coverage, the use of care during pregnancy, and the health and well-being of the resulting infants, who are themselves U.S. citizens by birthright.

To investigate this question, we take advantage of a dramatic expansion of eligibility for prenatal Medicaid coverage that occurred in California in 1988. After the policy went into effect, nearly half of all births paid for by the state's Medicaid program were to undocumented immigrant mothers (Norton et al., 1996). And, as one of the first states to expand eligibility to this population, the study of California's expansion offers a unique opportunity to examine the long-term effects of Medicaid coverage for these families and their children.

We use a novel dataset that links the universe of California birth records to Census survey and national administrative data, allowing us to overcome several empirical challenges in our setting. Using this newly linked data, we are able to identify family linkages for children and their families observed in the Census survey data. This enables us to take advantage of variation in exposure to the policy of children born to the same mother before and after the expansion occurred, as compared to births occurring entirely before or after the expansion was implemented. This within-mother approach is crucial in our setting, as we observe large changes in the composition and number of immigrants over our sample period. We also take advantage of variation in exposure across immigrant mothers, who were targeted by the expansion, and U.S.-born mothers, who were not, to net out secular changes in outcomes over time. Finally, we use detailed maternal characteristics from the linked survey data to estimate changes among women who are predicted to have undocumented status and directly benefit from the policy change.

We find that the expansion of prenatal coverage to undocumented immigrant mothers significantly increased use of health care by the mother in the prenatal period, and significantly improved the birth outcomes of their children. We find that the cohorts who benefited *in utero* not only go on to achieve higher levels of education attainment, but are also less reliant on government support programs. Furthermore, calculations based on our estimates indicate that, over the long-run, the gov-

ernment more than recoups its initial investment. Our results demonstrate that expanding prenatal Medicaid eligibility to undocumented immigrants has a significant impact on the health and economic outcomes of the next generation of Americans.

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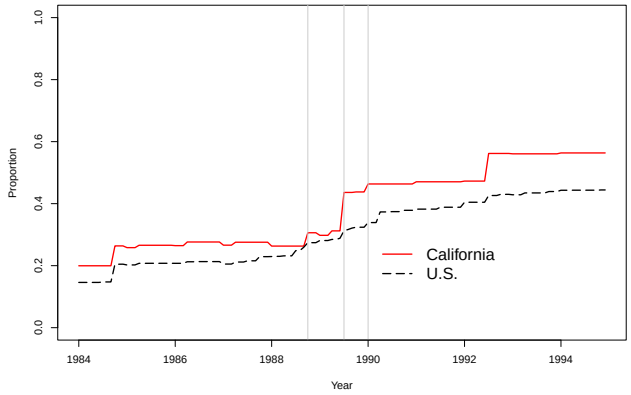
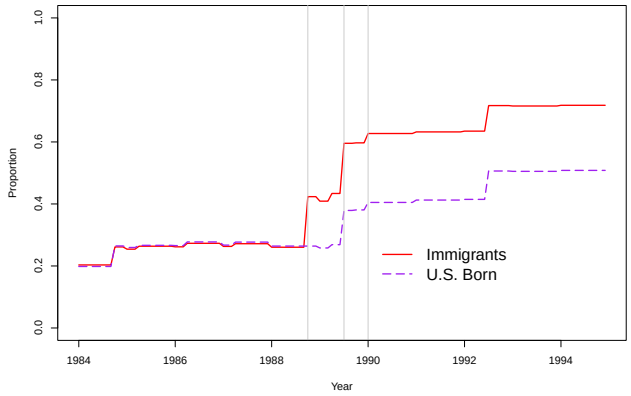
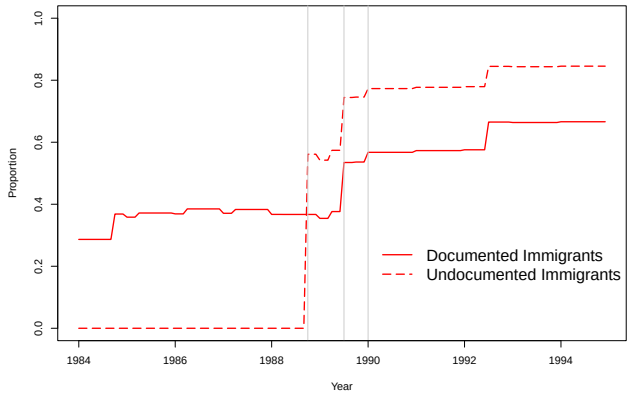
Figure 1: Eligibility by Pregnancy Medicaid Among Women of Reproductive Age, 1984-1994



(a) Medicaid eligibility



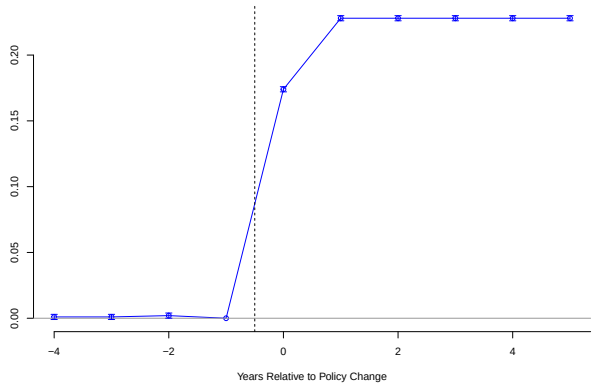
(b) California Medicaid eligibility by mother's place of birth



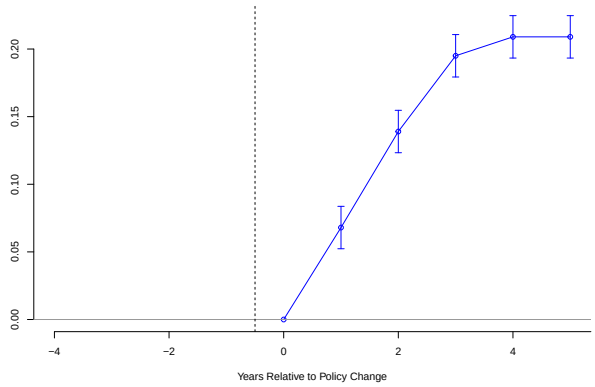
(c) California Medicaid eligibility by documentation status

Note: Eligibility for women ages 15-44 in the event of pregnancy estimated using the 1990 Census. Details on eligibility and undocumented status imputation in Appendix Sections A and B.

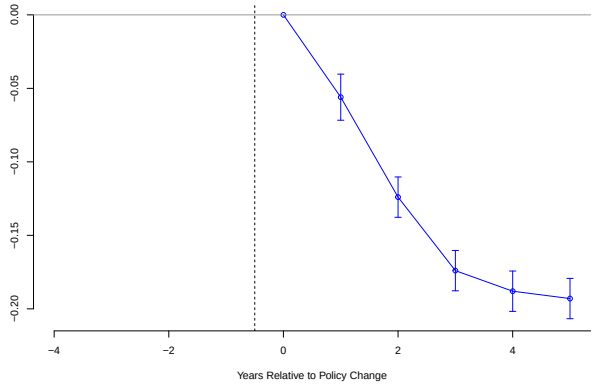
Figure 2: Effects of the Undocumented Expansion on Eligibility and Prenatal Coverage



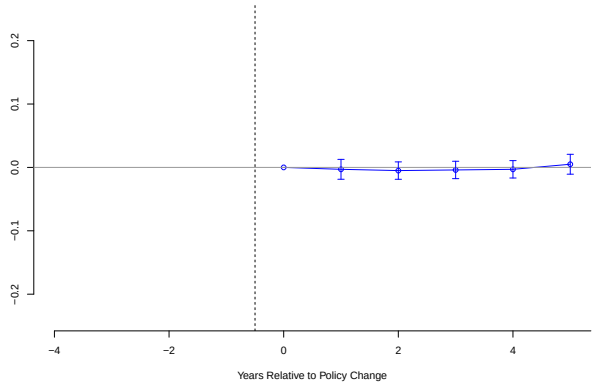
(a) Medi-Cal eligibility



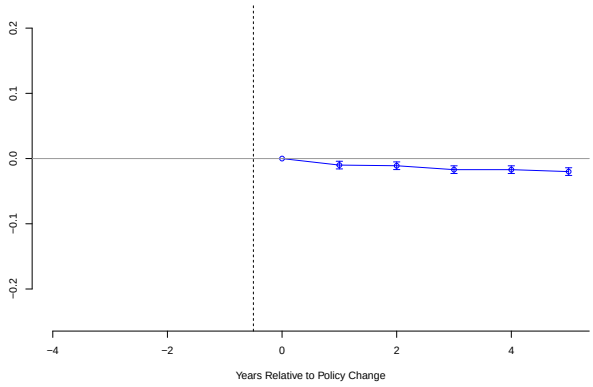
(b) Medi-Cal



(c) No insurance



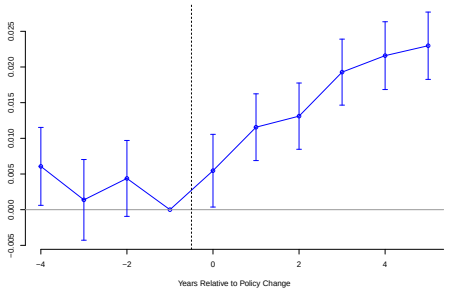
(d) Private coverage



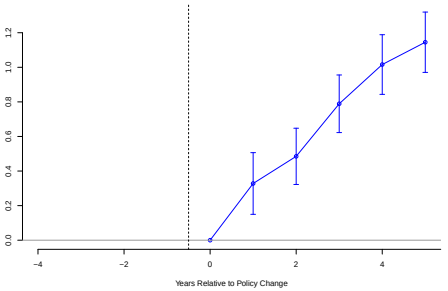
(e) Other coverage

Note: Estimated coefficients and confidence intervals from the event study specification described in the text. All results were approved for release by the U.S. Census Bureau, authorization number CBDRB-FY22-CES018-007. Numbers have been rounded to comply with disclosure avoidance guidelines.

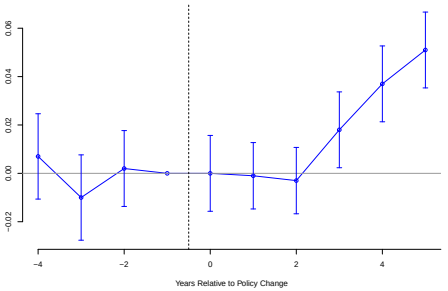
Figure 3: Effects of the Undocumented Expansion on Health Care Utilization and Infant Health



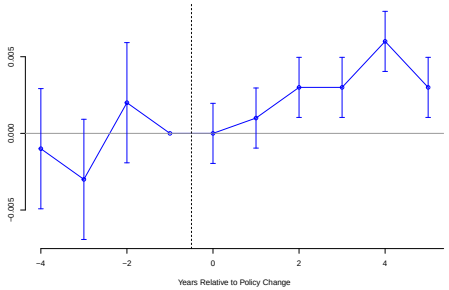
(a) Any prenatal care



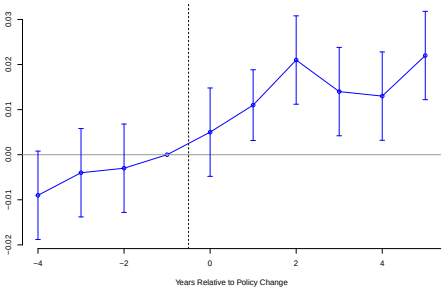
(b) Number of prenatal visits



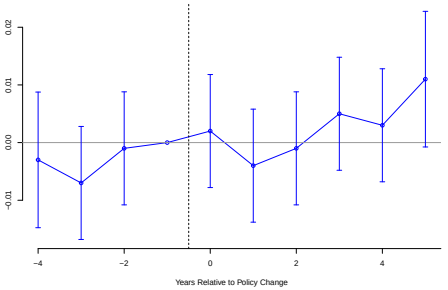
(c) Prenatal care in first trimester



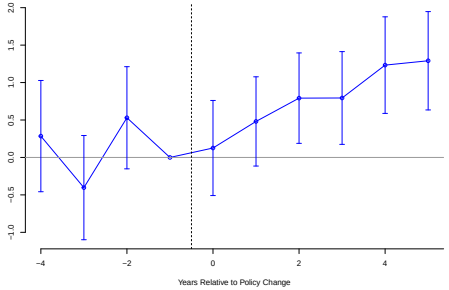
(d) Hospital delivery



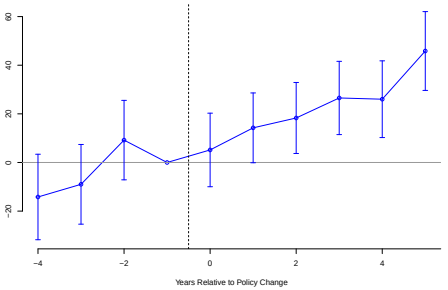
(e) Doctor delivery



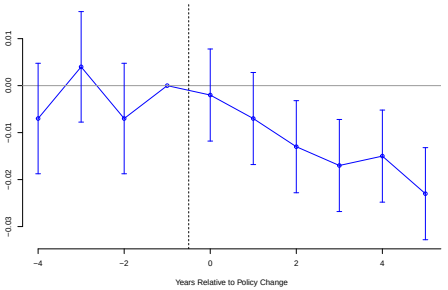
(f) C-section



(g) Gestation age (in days)



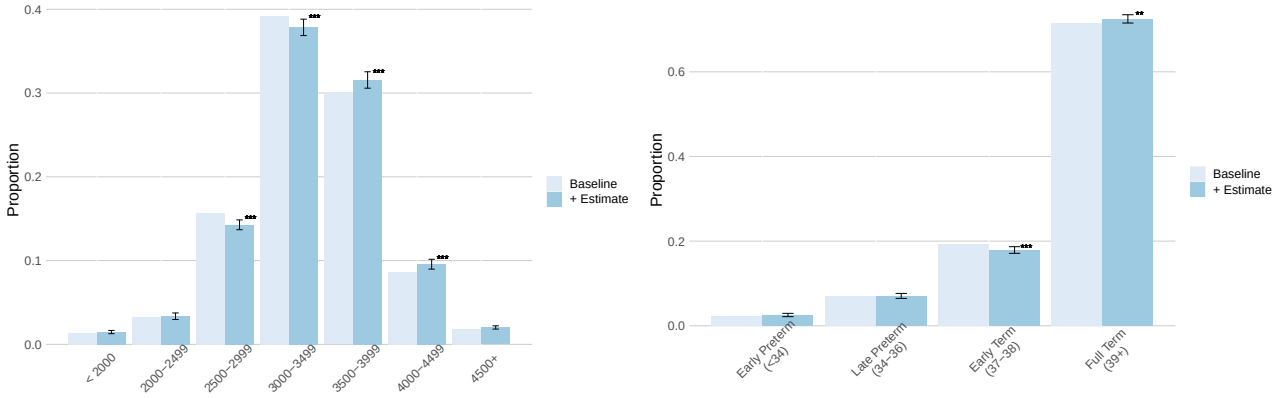
(h) Birthweight (in grams)



(i) Small for gestational age

Note: Estimated coefficients and confidence intervals from the event study specification described in the text. All results were approved for release by the U.S. Census Bureau, authorization numbers CBDRB-FY20-183 and CBDRB-FY22-CES018-015. Numbers have been rounded to comply with disclosure avoidance guidelines.

Figure 4: Effects of the Undocumented Expansion on Distribution of Birth Outcomes

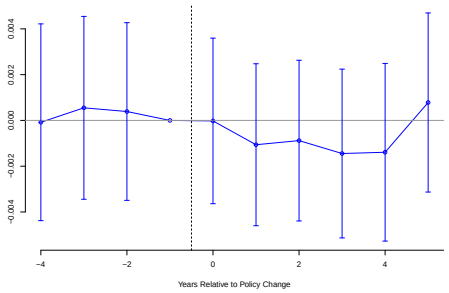


(a) Birthweight (grams)

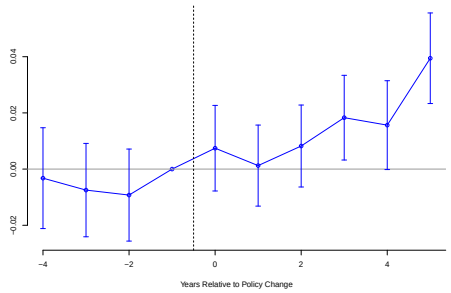
(b) Gestational length (weeks)

Note: Estimates for the post-period calculated by using the baseline mean for immigrant mothers and adding the difference-in-differences estimate and its confidence interval. All results were approved for release by the U.S. Census Bureau, authorization number CBDRB-FY20-183. Numbers have been rounded to comply with disclosure avoidance guidelines.

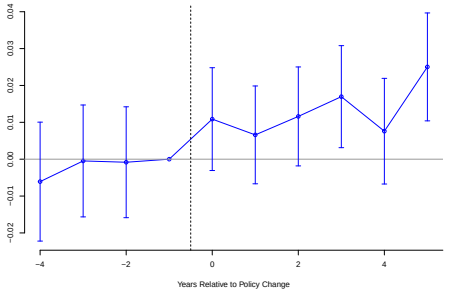
Figure 5: Effects of the Undocumented Expansion on Long-Term Health and Human Capital



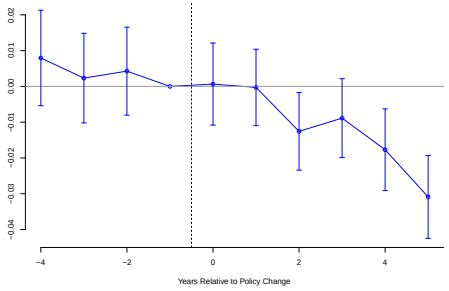
(a) Cumulative mortality



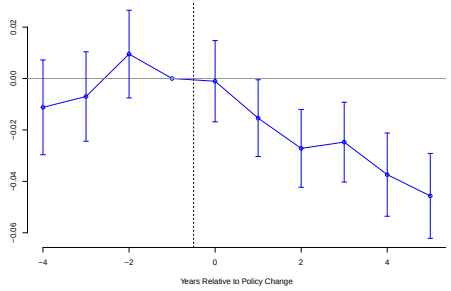
(b) Post-secondary enrollment



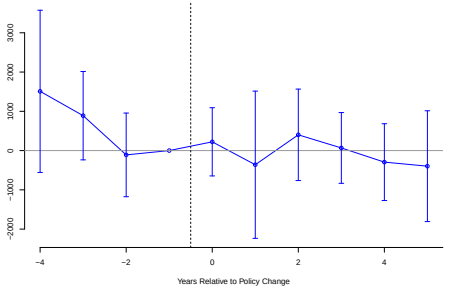
(c) College completion



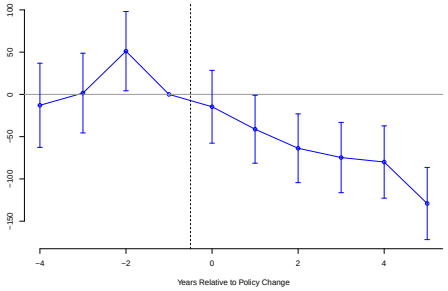
(d) Teen fertility



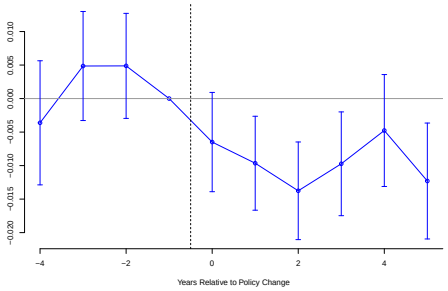
(e) Any fertility



(f) Annual wages



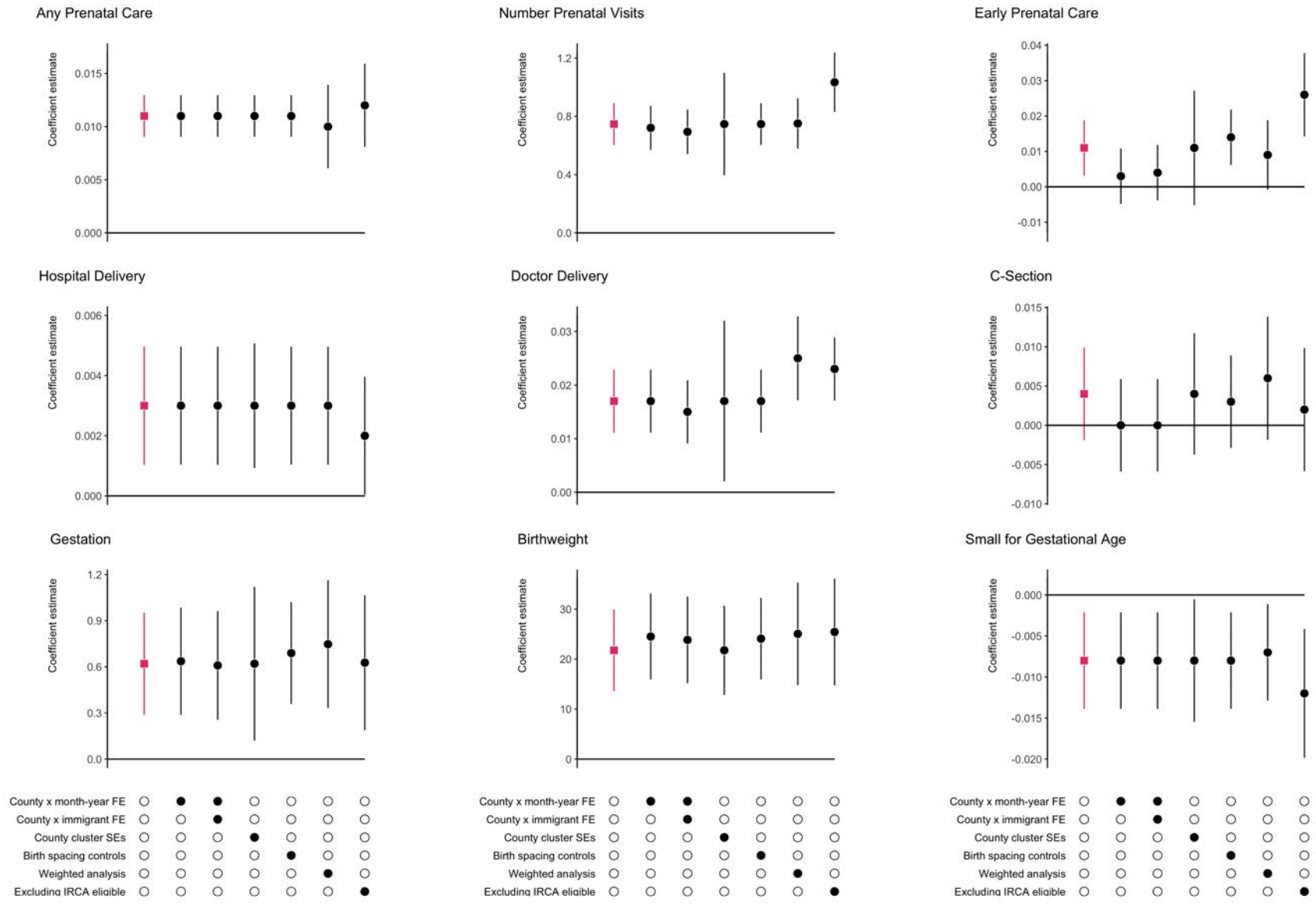
(g) EITC amount



(h) Childhood Medicaid

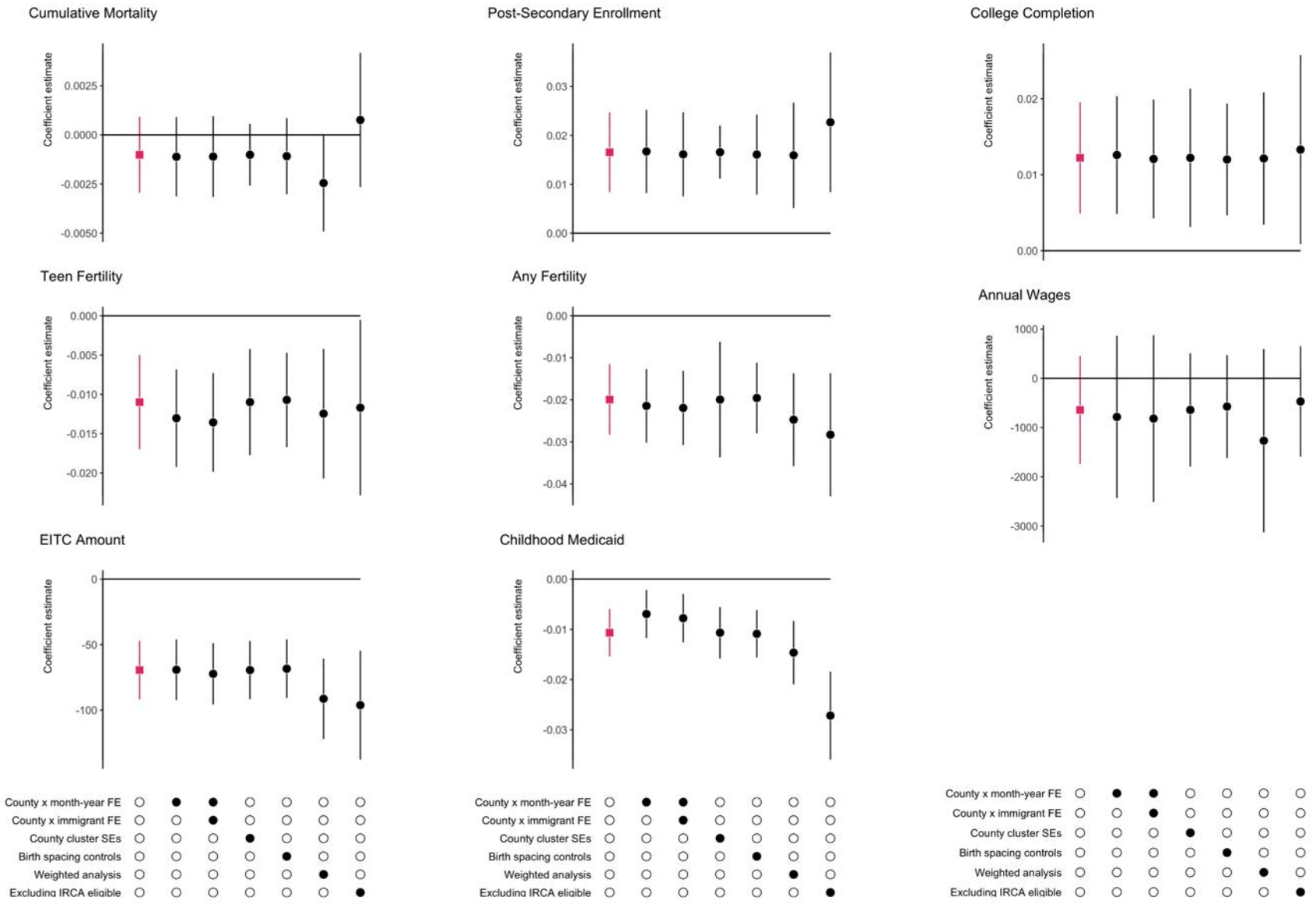
Note: Estimated coefficients and confidence intervals from the event study specification described in the text. All results were approved for release by the U.S. Census Bureau, authorization number CBDRB-FY23-CES-021-001. Numbers have been rounded to comply with disclosure avoidance guidelines.

Figure 6: Alternative Specifications for Health Care Utilization and Infant Health



Notes: Analyses use 1984-1994 California birth records linked to the 2000 Census and 2001-2011 American Community Survey; see text for more specific sample information. Each estimate and 95% CI are for a different specification or sample, as described in the text. All regressions include birth-specific controls, birth year x birth month fixed effects, and mother fixed effects. Robust standard errors are clustered by mother unless indicated otherwise. Significance levels: *=10%, **=5%, ***=1%. All results were approved for release by the U.S. Census Bureau, authorization numbers CBDRB-FY20-183, CBDRB-FY23-CES-021-001, and CBDRB-FY24-0182. Numbers have been rounded to comply with disclosure avoidance guidelines.

Figure 7: Alternative Specifications for Long-Term Health and Human Capital



Notes: Analyses use 1984-1994 California birth records linked to the 2000 Census and 2001-2011 American Community Survey; see text for more specific sample information. Each estimate and 95% CI are for a different specification or sample, as described in the text. All regressions include birth-specific controls, birth year x birth month fixed effects, and mother fixed effects. Robust standard errors are clustered by mother unless indicated otherwise. Significance levels: *=10%, **=5%, ***=1%. All results were approved for release by the U.S. Census Bureau, authorization numbers CBDRB-FY23-CES-021-001 and CBDRB-FY24-0182. Numbers have been rounded to comply with disclosure avoidance guidelines.

Table 1: Effect of Undocumented Expansion on Medi-Cal Eligibility and Prenatal Coverage

	Medi-Cal Eligibility	Primary Payer for Prenatal Care			
		Medi-Cal	No Insurance	Private	Other
	(1)	(2)	(3)	(4)	(5)
A.Effects for All Immigrant Mothers					
Undocumented expansion x immigrant mother	0.216***	0.168***	-0.151***	-0.002***	-0.015***
	(0.000)	(0.007)	(0.006)	(0.006)	(0.003)
Baseline mean for immigrant mothers	0.2358	0.2695	0.2520	0.4518	0.0266
N	360,000		167,000		
B. Effects for Likely Undocumented Immigrant Mothers					
Undocumented expansion x probability undocumented	0.637***	0.366***	-0.367***	0.034***	-0.033***
	(0.002)	(0.015)	(0.014)	(0.012)	(0.006)
Baseline mean for likely undocumented mothers	0.1261	0.2933	0.3879	0.2930	0.0258
N	360,000		167,000		

Notes: Analyses use 1984-1994 California birth records linked to the 2000 Census long-form and 2001-2011 American Community Survey; see text for more specific sample information. Coefficient and standard errors are estimated using a difference-in-differences model with birth-specific controls, birth year x birth month fixed effects, and mother fixed effects. Regression models for prenatal insurance coverage estimate changes in outcomes relative to the first year the policy was in place, due to the limited period of data available. Robust standard errors are clustered by mother; standard errors for panel B are estimated using a bootstrap procedure. Significance levels: *=10%, **=5%, ***=1%. Baseline means calculated for cohorts born before October 1988 for Medi-Cal eligibility, and for cohorts born before October 1989 for primary payer for prenatal care. Baseline means for likely undocumented mothers are calculated for births with a mother whose predicted probability of undocumented status is greater or equal to 0.5. All results were approved for release by the U.S. Census Bureau, authorization numbers CBDRB-FY22-CES018-007, and CBDRB-FY22-CES018-015. Numbers have been rounded to comply with disclosure avoidance guidelines.

Table 2: Effect of Undocumented Expansion on Mother's Health Care Utilization and Birth Outcomes

	Any prenatal	Number of prenatal visits	Early prenatal care	Hospital delivery	Doctor delivery	C-section	Gestation days	Birthweight (gram)	Small for gestational age
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
A. Effects for All Immigrant Mothers									
Undocumented expansion x immigrant mother	0.011***	0.747***	0.011***	0.003***	0.017***	0.004	0.620***	21.76***	-0.008***
	(0.001)	(0.073)	(0.004)	(0.001)	(0.003)	(0.003)	(0.169)	(4.156)	(0.003)
Baseline mean for immigrant mothers	0.9759	9.51	0.6892	0.9930	0.9231	0.1860	279	3404	0.089
N	354,000	163,000	354,000	357,000	360,000	359,000	338,000	360,000	338,000
B. Effects for Likely Undocumented Immigrant Mothers									
Undocumented expansion x probability undocumented	0.025***	1.533***	0.039***	0.004**	0.054***	0.006	1.540***	69.38***	-0.021***
	(0.004)	(0.151)	(0.011)	(0.002)	(0.007)	(0.007)	(0.394)	(9.897)	(0.006)
Baseline mean for likely undocumented mothers	0.9612	8.49	0.5899	0.9941	0.8857	0.1502	278.4	3347	0.106
N	354,000	163,000	354,000	357,000	360,000	359,000	338,000	360,000	338,000

Notes: Analyses use 1984-1994 California birth records linked to the 2000 Census and 2001-2011 American Community Survey; see text for more specific sample information. Coefficient and standard errors are estimated using a difference-in-differences model with birth-specific controls, birth year x birth month fixed effects, and mother fixed effects. Robust standard errors are clustered by mother; standard errors for panel B are estimated using a bootstrap procedure. Significance levels: *=10%, **=5%, ***=1%. Baseline means are calculated for cohorts born before October 1988. Baseline means for likely undocumented mothers are calculated for births with a mother whose predicted probability of undocumented status is greater or equal to 0.5. All results were approved for release by the U.S. Census Bureau, authorization numbers CBDRB-FY20-183, and CBDRB-FY22-CES018-007. Numbers have been rounded to comply with disclosure avoidance guidelines.

Table 3: Effect of Undocumented Expansion on Fertility and Access to Care

	Birth Rate	Pregnancy Complications
	(1)	(2)
A.Effects for All Immigrant Mothers		
Undocumented expansion x immigrant mother	0.001***	-0.003
	(0.000)	(0.002)
Baseline mean for immigrant mothers	0.007	0.031
N	31,850,000	360,000
N (unique individuals)	514,000	360,000
B. Effects for Likely Undocumented Immigrant Mothers		
Undocumented expansion x probability undocumented	0.005***	-0.0198***
	(0.000)	(0.005)
Baseline mean for likely undocumented mothers	0.007	0.028
N	31,850,000	360,000
N (unique individuals)	514,000	360,000

Notes: Analyses use 1984-1994 California birth records linked to the 2000 Census long-form and 2001-2011 American Community Survey; see text for more specific sample information. Coefficient and standard errors are estimated using a difference-in-differences model with birth-specific controls, birth year x birth month fixed effects, and mother fixed effects. Robust standard errors are clustered by mother; standard errors for panel B are estimated using a bootstrap procedure. Significance levels: *=10%, **=5%, ***=1%. Baseline means calculated for cohorts born before October 1988 for birth rates and pregnancy complications, and for cohorts born before October 1989 for prenatal visits. Baseline means for likely undocumented mothers are calculated for births with a mother whose predicted probability of undocumented status is greater or equal to 0.5. All results were approved for release by the U.S. Census Bureau, authorization number CBDRB-FY22-CES018-015. Numbers have been rounded to comply with disclosure avoidance guidelines.

Table 4: Effect of Undocumented Expansion on Long-Term Health and Human Capital

	Cumulative mortality Ages 0-27 (1)	Ever enrolled post-secondary (2)	Graduated college (3)	Teen fertility Ages 14-19 (4)	Any fertility Ages 14-26 (5)	Annual wages Ages 23-28 (6)	EITC amount Ages 25-27 (7)	Childhood Medicaid Ages 16-18 (8)
A. Effects for All Immigrant Mothers								
Undocumented expansion x immigrant mother	-0.001013	0.0166***	0.0122***	-0.0110***	-0.0200***	-640.9	-69.41***	-0.0107***
	(0.000985)	(0.0041)	(0.0037)	(0.0031)	(0.0043)	(560.0)	(11.39)	(0.0024)
Baseline mean for immigrant mothers	0.007879	0.7024	0.2747	0.1304	0.3599	24,590	658.1	0.2981
B. Effects for Likely Undocumented Immigrant Mothers								
Undocumented expansion x probability undocumented	-0.000394	0.0517***	0.0238***	-0.0138*	-0.0394***	-796.3	-140.0***	-0.0348***
	(0.002480)	(0.0099)	(0.0083)	(0.0079)	(0.0106)	(810.5)	(30.44)	(0.0063)
Baseline mean for likely undocumented mothers	0.007597	0.6299	0.1733	0.1775	0.4571	22,990	870.8	0.3775
N	360,000	360,000	356,000	360,000	360,000	2,160,000	1,080,000	1,079,000

Notes: Analyses use 1984-1994 California birth records linked to the 2000 Census long-form and 2001-2011 American Community Survey; see text for more specific sample information. Coefficient and standard errors are estimated using a difference-in-differences model with birth-specific controls, birth year x birth month fixed effects, and mother fixed effects. Calendar year fixed effects are included in analyses of annual outcomes (wages, EITC, Medicaid). Robust standard errors are clustered by mother; standard errors for panel B are estimated using a bootstrap procedure. Significance levels: *=10%, **=5%, ***=1%. Baseline means are calculated for cohorts born before October 1988. Baseline means for likely undocumented mothers are calculated for births with a mother whose predicted probability of undocumented status is greater or equal to 0.5. All results were approved for release by the U.S. Census Bureau, authorization number CBDRB-FY23-CES-021-001. Numbers have been rounded to comply with disclosure avoidance guidelines.

Table 5: Placebo Test for Effects of Undocumented Expansion on Cuban Immigrants

	Medi-Cal	No insurance	Private	Other
Undocumented expansion x	0.02186	-0.008051	0.01762	-0.03144*
immigrant mother	(0.02701)	(0.02076)	(0.03517)	(0.01764)
N	532,000	532,000	532,000	532,000

	Any prenatal care	Number of prenatal visits	Early prenatal care	Doctor delivery	C-section	Gestation days	Birthweight (grams)	Small for gestational age
Undocumented expansion x	0.003	-0.280	0.011	0.004	0.018	-1.154*	-3.28	0.005
immigrant mother	(0.004)	(0.427)	(0.014)	(0.009)	(0.014)	(0.671)	(18.21)	(0.011)
N	1,361,000	521,000	1,361,000	1,377,000	1,374,000	1,294,000	1,377,000	1,294,000

	Cumulative mortality	Ever enrolled post-secondary	Graduated college	Teen fertility	Any fertility	Annual wages	EITC amount	Childhood Medicaid
Undocumented expansion x	-0.000522	0.0298*	-0.0008	-0.0107	-0.0126	950.9	7.697	-0.0061
immigrant mother	(0.003780)	(0.0177)	(0.0194)	(0.0110)	(0.0189)	(1131)	(44.72)	(0.0096)
N	1,378,000	1,378,000	1,365,000	1,378,000	1,378,000	8,266,000	4,133,000	4,127,000

Notes: Analyses use 1984-1994 California birth records linked to the 2000 Census short-form and 2001-2011 American Community Survey; see text for more specific sample information. Coefficient and standard errors are estimated using a difference-in-differences model with birth-specific controls, birth year x birth month fixed effects, and mother fixed effects. Robust standard errors are clustered by mother. Significance levels: *=10%, **=5%, ***=1%. All results were approved for release by the U.S. Census Bureau, authorization number CBDRB-FY23-CES-021-001. Numbers have been rounded to comply with disclosure avoidance guidelines.

Covering the Undocumented: The Effects of A Large-Scale Prenatal Care Intervention

Appendix

Sarah Miller Laura R. Wherry Gloria Aldana

A Estimating Medi-Cal Eligibility

We estimate eligibility for female California and US residents ages 15-44 in the event of a pregnancy using detailed information on state eligibility rules over the time period. Our eligibility calculation applies federal and state eligibility rules for Medicaid under AFDC, Medically Needy, and state-specific optional eligibility groups.[2]

Note, we are unable to use the Current Population Survey for this exercise since the survey only began collecting citizenship information in 1994. We, therefore, use the 1990 Census and inflate or deflate the dollar amounts of household income and earnings to estimate eligibility in each year. The use of a fixed sample to estimate eligibility in each year produces information on eligibility changes over the period that are due to state law changes, rather than changes in state demographic or economic characteristics. This type of measure is often referred to as "simulated eligibility" and has been used as a policy instrument in a large body of work pioneered with Currie and Gruber (1996a,b) and Cutler and Gruber (1996).

Information on California's optional Aid to Families with Dependent Children (AFDC)-related coverage groups prior to the Medi-Cal expansion were drawn from Hill (1987). Information on Ribicoff child programs was drawn from the 1983 Health Care Financing Administration (HCFA)'s *Analysis of State Medicaid Program Characteristics*, the Urban Institute's Transfer Income Model, version 3 (TRIM 3) Database, and from materials provided by Bruce Meyer and used in Meyer and Rosenbaum (2001). State Medically Needy thresholds were taken from TRIM3 and the 1984 and 1986 *Medicare and Medicaid Data Books* issued by the HCFA. Details on state changes under the Medi-Cal undocumented expansion and later income expansions were drawn from guidelines issued by the state in Martucci (1988) and Mitchell (2005).

The period of study also included some later changes in California eligibility rules regarding the consideration of family assets, which we do not consider here since information on family assets is not available in the Census. Beginning on January 1, 1992, assets were disregarded for eligibility for women and infants with incomes between 185-200% FPL; assets were disregarded for all effective February 1, 1994 (Mitchell, 2005).

Also not studied here, California adopted a statewide program in 1992 to subsidize private health insurance coverage for pregnant women and infants with incomes between 200-300% FPL called the Access for Infants and Mothers Program. This was a small program with about 300 women participating each year (Zuckerman et al., 1998).

[2]Please refer to the appendix of East et al. (2023) for a more detailed description of these eligibility rules; source information is described below.

B Identifying Likely Undocumented Immigrants in the Census

We adapt an algorithm created by Borjas (2017) based on a methodology developed by Passel and Cohn (2014) to identify immigrant individuals with undocumented status. This methodology builds on earlier work by Warren and Passel (1987) to estimate the number of undocumented immigrants in the U.S., which is the methodology applied by the Department of Homeland Security in their annual estimates of the size of the undocumented population (see Borjas (2017) for more detailed background information). While not publicly available, the methodology was reverse engineered by Borjas (2017) based on individual Current Population Survey (CPS) data with the undocumented status identifier provided to him by Jeffrey Passel. We use the program previously made available by Borjas on his website in order to apply it in our context.

Under this methodology, an individual is considered to be a legal immigrant if they: are a citizen or arrived in the U.S. before 1980; receives Social Security benefits, SSI, Medicare, or military insurance; are a veteran or are currently in the armed forces; works in the government sector; receives housing assistance (public housing or rental subsidies), or are the spouse of someone who receives housing assistance; was born in Cuba; are in an occupation that requires licensing; or their spouse is a legal immigrant or citizen. The Borjas (2017) algorithm also considers an individual legal if they receive Medicaid; however, we drop this rule given that undocumented immigrants were able to benefit under the Medi-Cal expansion studied here. We substitute the rule that immigrants are of legal status if they receive cash welfare under AFDC. Individuals who do not meet any of these criteria to be determined legal are considered "undocumented."

While Borjas was working with CPS data, we apply this algorithm to the 1990 Census since the CPS only started collecting information on citizenship status in 1994. The two surveys collect nearly identical information under the variables needed to assign undocumented status. There are two exceptions: the 1990 Census does not include information on receipt of health insurance through Medicare or the military, nor the receipt of housing assistance. We, therefore, are unable to consider these criteria when determining undocumented status. However, we examine how the absence of these survey items might affect undocumented assignment by applying the algorithm with and without their inclusion in the 1994-1997 CPS files. We find that the two versions perform nearly identically.

C Identifying Siblings Using the 2000 Census and 2001-2011 ACS

Among children in the 2000 Census and 2001-2011 ACS, we identify siblings as individuals 17 years of age or younger who are residing at home with the same mother. We use the following household and subfamily relationships reported in the survey to identify mothers:

- Rule 1: If female is wife of householder and child is identified as natural-born child, step child, or adopted child of householder, we consider her to be the mother of the child.
- Rule 2: If female is the householder and child is identified as natural-born son or daughter of householder, we consider her to be the mother of the child.
- Rule 3: If the child is identified as a child in a married couple subfamily or a mother-child subfamily and the female is a member in the same subfamily and identified as either a hus-

band/wife subfamily with child or single parent subfamily, we consider her to be the mother of the child.

Note that, unlike for children of the head of a household, information is not available that distinguishes between natural, step, or adopted child relationships between the child in a household and the wife of the household head. Therefore, under Rule 1, we will capture all mother-child relationships including those that are not biological in nature.[3] In addition, the household relationship variable used in Rule 2 to identify the natural-born child of the householder, did not have this level of detail in the 2001-2007 ACS years. In these years, the survey did not distinguish between biological and other types of children. Thus, for Rule 2 in these years, we only require that the child is the son or daughter of the householder, rather than the biological child. Finally, subfamily relationship information is not available in the short-form 2000 Census as needed to implement Rule 3 when using this data source. These data limitations will introduce some noise into the identification of mother-child relationships, but we do not expect this measurement error to differ in any systematic way across children depending on their exposure to the Medicaid expansions while *in utero*.

As additional checks on this assignment procedure, we exclude siblings to mothers who have disconcordant information on her place of birth or age across the birth certificate records. We consider her age at time of birth to be discordant if her reported age for a sibling does not fall within a 2-year window of the age expected based on her reported age and the year of birth of the prior birth observed during our study period. We also exclude siblings to mothers who have disconcordant information on her place of birth on the birth certificate record and Census/ACS report.

Because the 1989 and later birth records do have identifying information available for the mother, we are able to check the performance of this assignment procedure during the later years of our sample. We find that 96.2 percent of the birth records in our analysis sample had the same mother PIK assigned based on the birth record fields as that assigned using our ACS/Census assignment procedure.

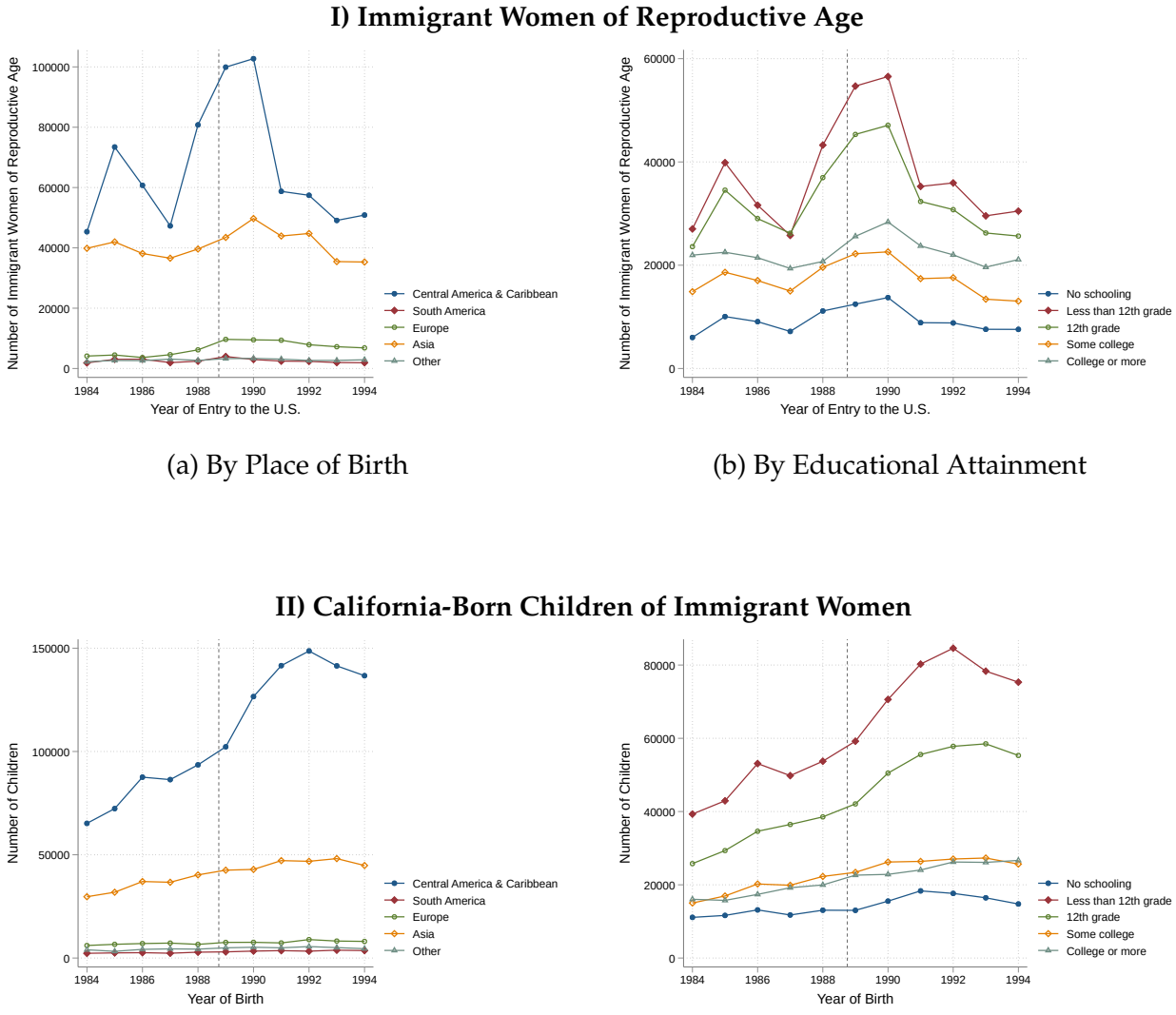
D Predicting Undocumented Status in the Linked Natality Data

In our analyses, we estimate the likely undocumented status of mothers in our sample around the time of the policy change. While the data are unavailable to do this for 1988, we can use 1990 Census data. To do this, we construct a sample of immigrant women in the state with children under 6 years of age. We then run a prediction model for undocumented status, as identifed using the Borjas methodology, where the predictors are fixed maternal characteristics that are also observed in the 2000-2011 Census/ACS data linked to the birth records. We need the maternal characteristics to be fixed since mothers are observed around 11 years later in the 2000-2011 Census/ACS data and time-varying characteristics may have changed noticeably during this period. We use the mother's age, her country of birth, her year of entry in the U.S., and her county of residence as the predictors. We estimate a probit model and use estimated coefficients from this model to predict her likely undocumented status in 1990 based on the characteristics we observe in the birth records linked to 2000-2011 Census/ACS data. We use information on mother's county of residence and age in 1990 from the birth record and

[3]Note, in the handful of cases where both the household head and spouse are female, we consider the household head to be the mother.

information on her year of entry into the U.S. and detailed country of birth from Census/ACS data. When implementing this prediction, we assume that women who entered the U.S. after 1990 have the same likelihood of undocumented status as those who entered in 1990.

Figure A1: Number of Immigrant Women in California by Year of Entry to the U.S. and Number of California-Born Children of Immigrant Women by Year of Birth



(a) By Place of Birth

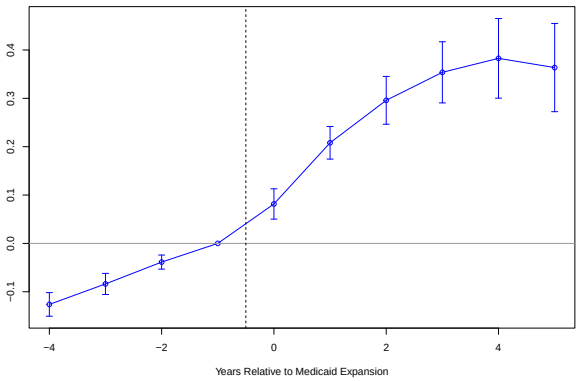
(b) By Educational Attainment

(c) By Mother's Place of Birth

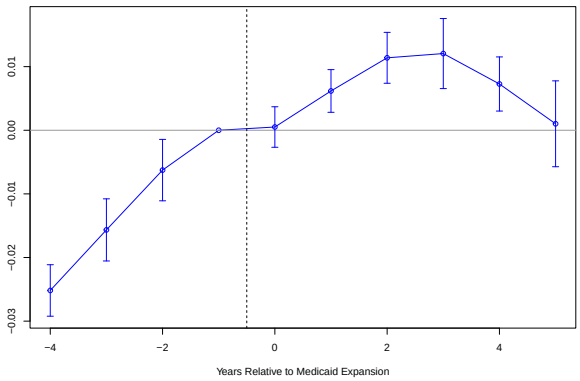
(d) By Mother's Educational Attainment

Notes: Numbers of immigrant women of reproductive age during 1984-1994 in California by year of entry to the U.S. are estimated using the 2000 Census. Information on place of birth and educational attainment are from the 2000 survey.

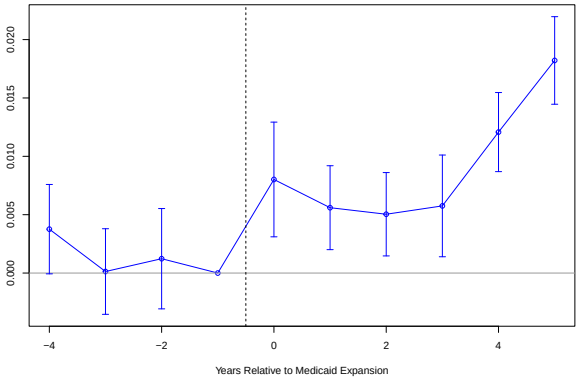
Figure A2: Changes in Relative Birth Rate and Characteristics of Immigrant and Non-Immigrant Births



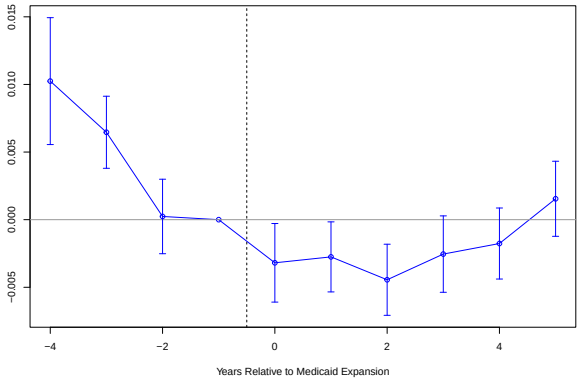
(a) Log number of births



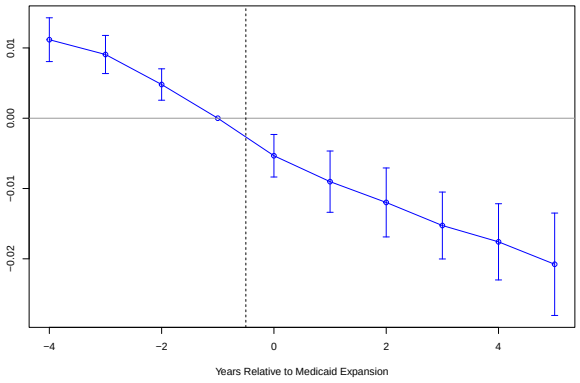
(b) Proportion first births



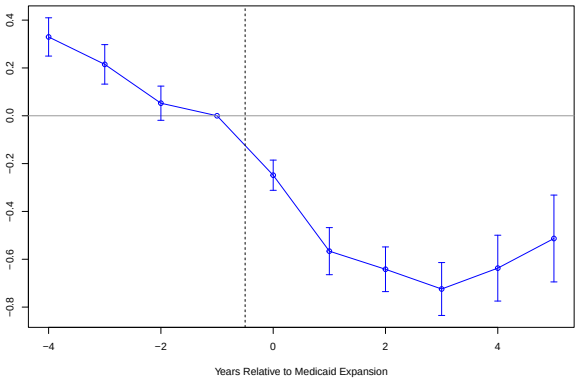
(c) Proportion second births



(d) Proportion third births



(b) Proportion fourth or higher births



(e) Average mother's age

Note: Analyses use January 1984-October 1994 CDPH natality data files collapsed to month x year x county x immigrant cells. Estimated coefficients and confidence intervals from event study specification described in the text. All regression models include county x birth year x birth month fixed effects and an indicator for births to immigrant women. Regressions are weighted by the number of births and robust standard errors are clustered by county. Significance levels: *=10%, **=5%, ***=1%.

Figure A3: Summary Information on Data Sources and Elements Used in Analyses

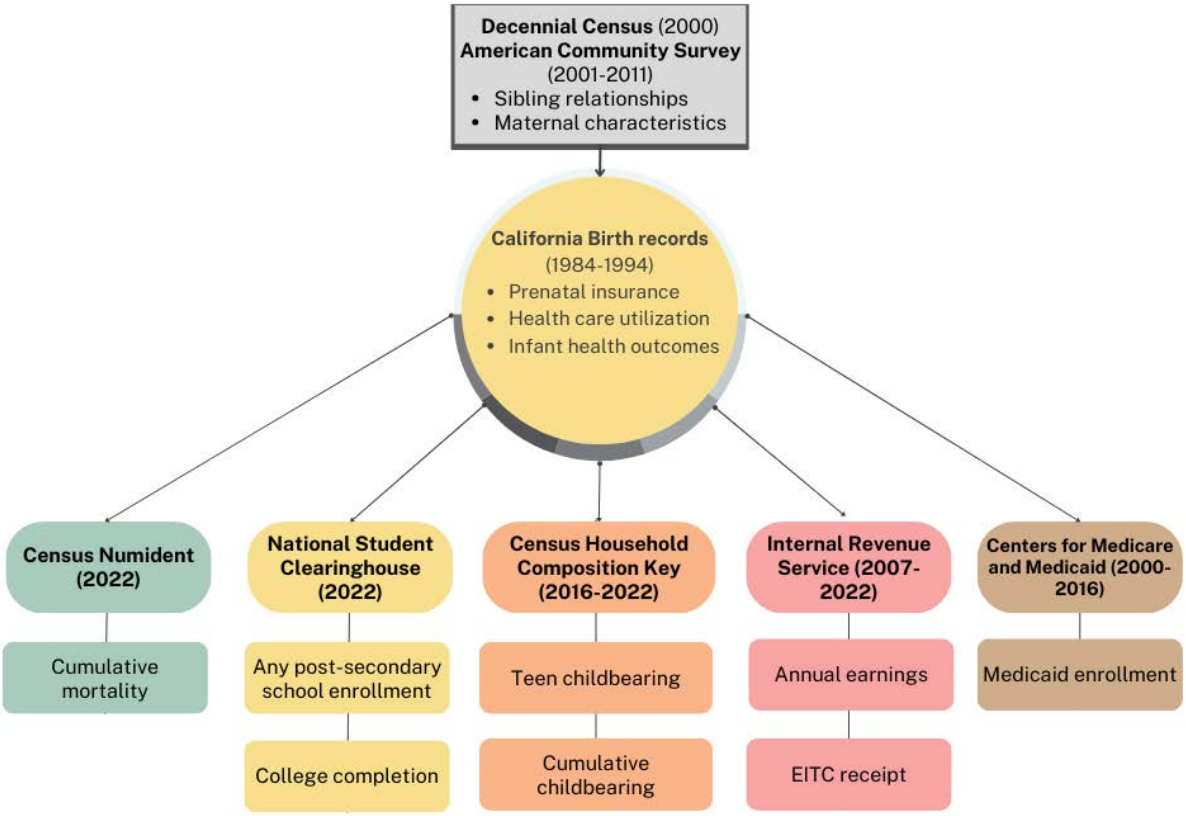
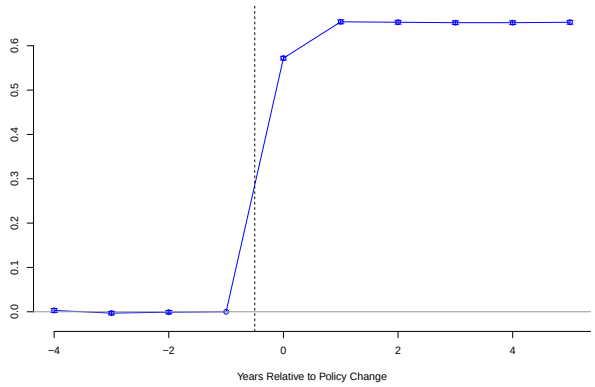
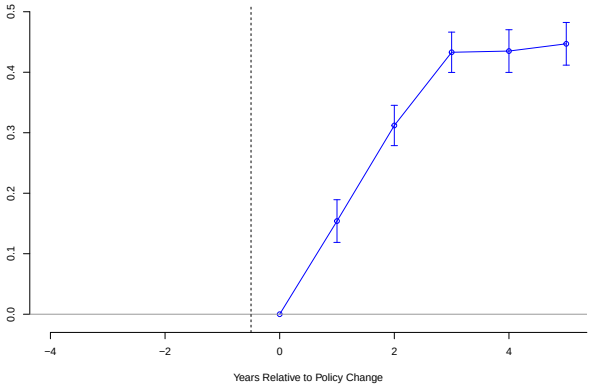


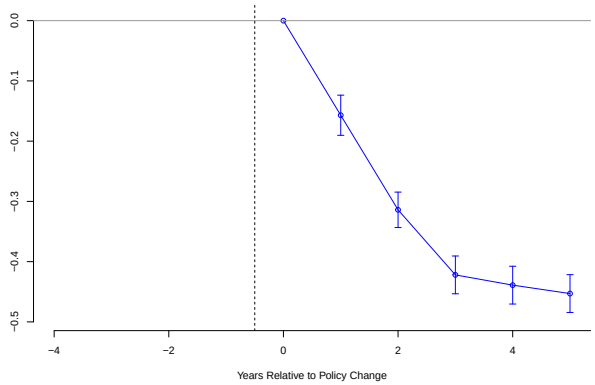
Figure A4: Effects on Prenatal Coverage for Likely Undocumented Immigrant Mothers



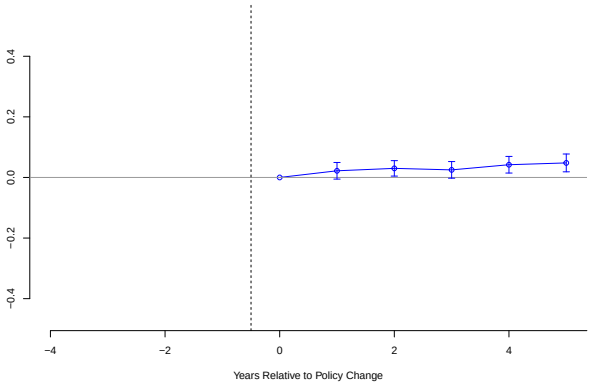
(a) Medi-Cal Eligibility



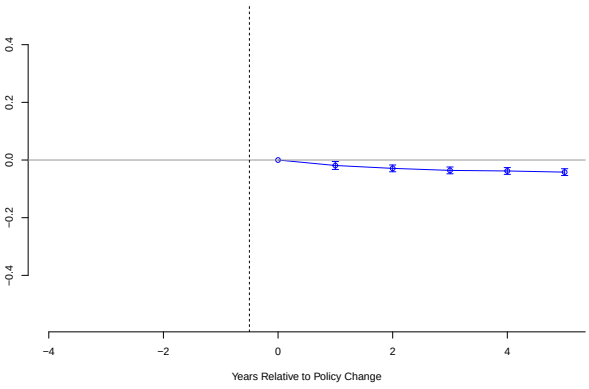
(b) Medi-Cal



(c) No insurance



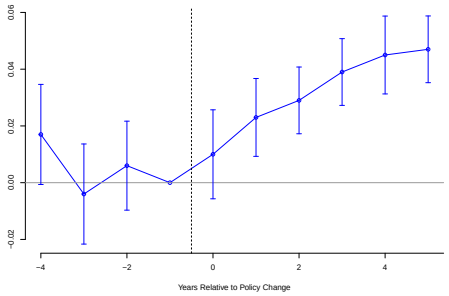
(d) Private Coverage



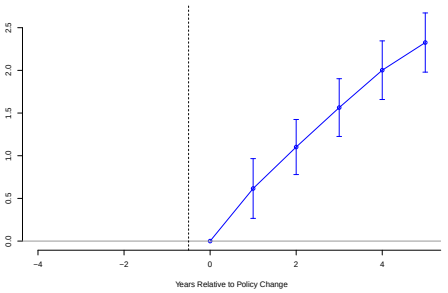
(e) Other Coverage

Note: Estimated coefficients and confidence intervals from the event study specification described in the text. All results were approved for release by the U.S. Census Bureau, authorization numbers CBDRB-FY22-CES018-007 and CBDRB-FY22-CES018-015. Numbers have been rounded to comply with disclosure avoidance guidelines.

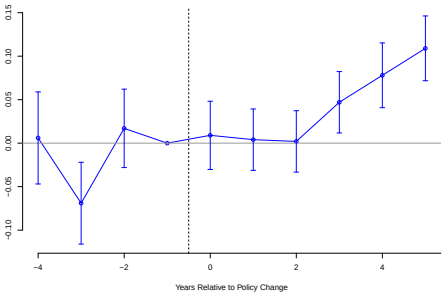
Figure A5: Effects on Health Care Utilization and Infant Health for Likely Undocumented Immigrant Mothers



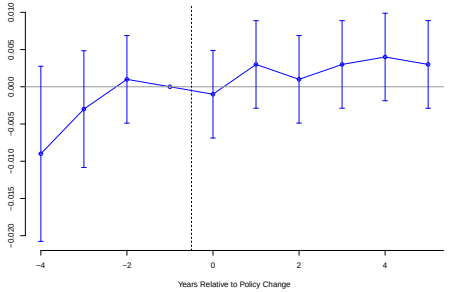
(a) Any Prenatal Care



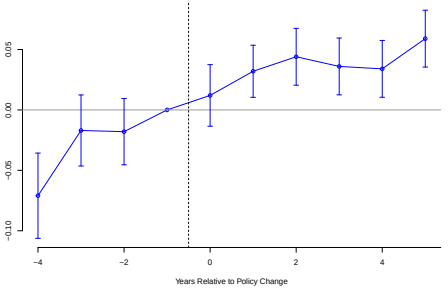
(b) Number of Prenatal Visits



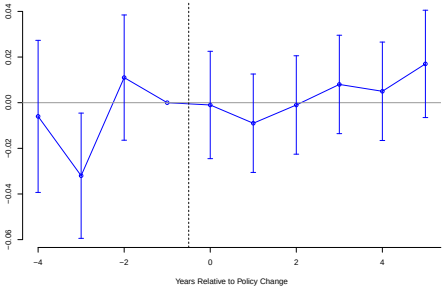
(c) Prenatal Care in the First Trimester



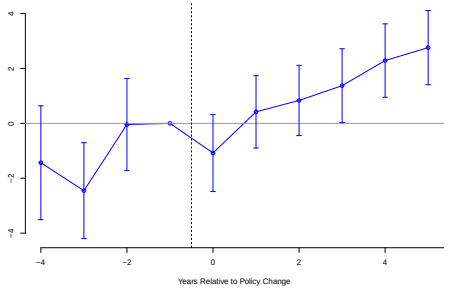
(d) Hospital Delivery



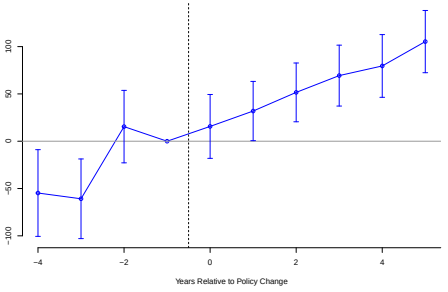
(e) Doctor Delivery



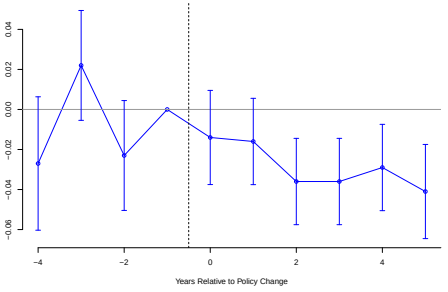
(f) C-Section



(g) Gestation age (in days)



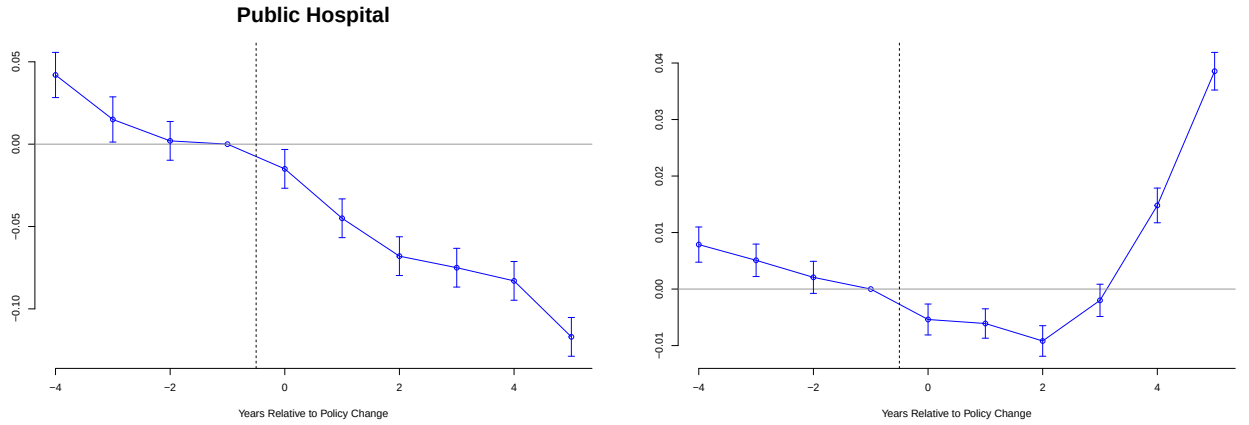
(h) Birthweight (in grams)



(i) Small for gestational age

Note: Estimated coefficients and confidence intervals from the event study specification described in the text. All results were approved for release by the U.S. Census Bureau, authorization number CBDRB-FY22-CES018-007. Numbers have been rounded to comply with disclosure avoidance guidelines.

Figure A6: Effects of Undocumented Expansions on Public Hospital Use and Adult Medicaid Enrollment

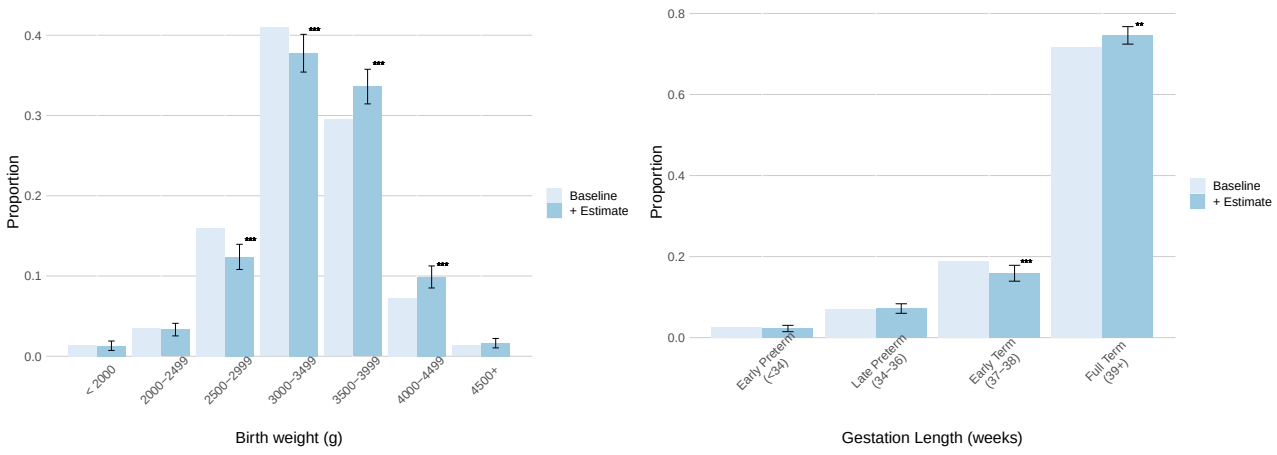


(a) Birth delivered in a public hospital

(b) Adult Medicaid enrollment (ages 19-22)

Note: Estimated coefficients and confidence intervals from the event study specification described in the text. All results were approved for release by the U.S. Census Bureau, authorization numbers CBDRB-FY20-183 and CBDRB-FY23-CES-021-001. Numbers have been rounded to comply with disclosure avoidance guidelines.

Figure A7: Effects on Distribution of Birth Outcomes for Likely Undocumented Immigrant Mothers

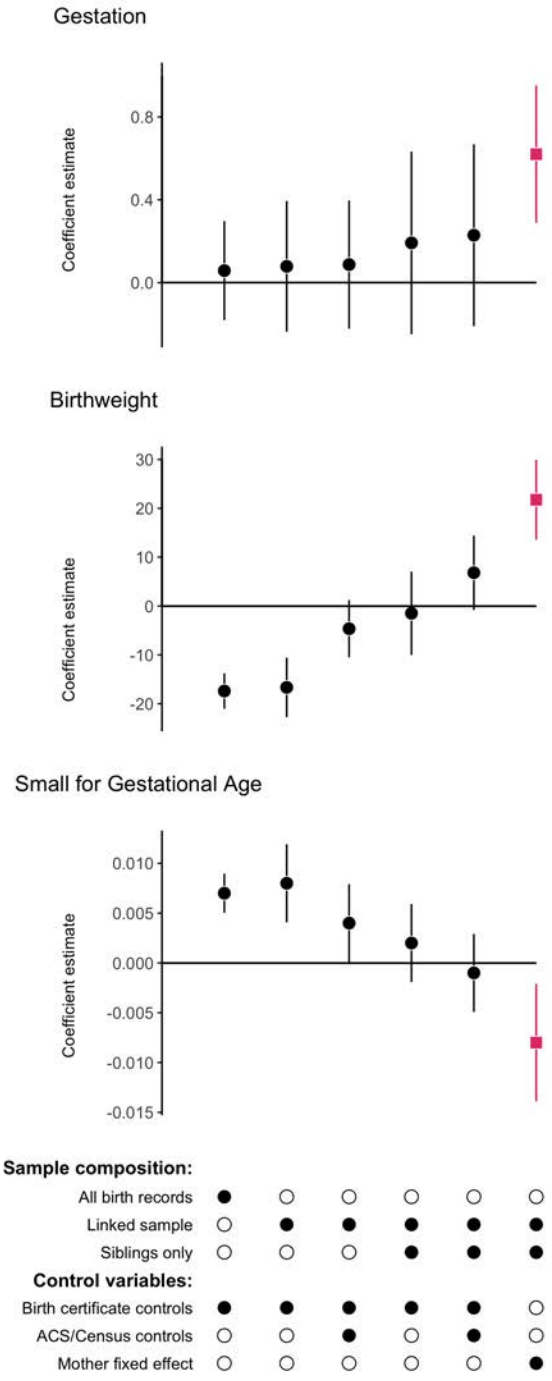


(a) Birthweight (grams)

(b) Gestational length (weeks)

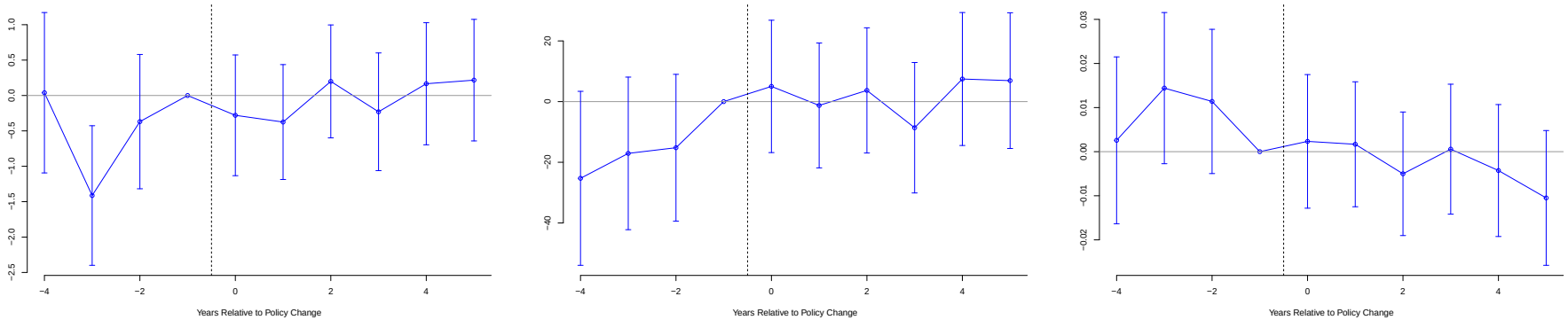
Note: Estimates for the post-period calculated by using the baseline mean for immigrant mothers and adding the difference-in-differences estimate and its confidence interval. All results were approved for release by the U.S. Census Bureau, authorization number CBDRB-FY22-CES018-007. Numbers have been rounded to comply with disclosure avoidance guidelines.

Figure A8: Difference-in-Differences Estimates by Sample and Specification



Notes: Analyses use January 1984-October 1994 CDPH natality data files. All regression models include birth-specific controls: birth order dummies, plurality, and sex indicators, as well as birth year x birth month indicators. Birth certificate controls as noted in table are: mother's age, race, ethnicity, and country of birth, county x birth year x birth month fixed effects, and county x immigrant fixed effects. ACS/Census controls as noted in table are: detailed county of birth indicators and indicators for year of entry in the US. Robust standard errors are clustered by county in the first five specifications, and by mother in the specification that includes mothers' fixed effects. Significance levels: *=10%, **=5%, ***=1%. All results using ACS/Census linked data were approved for release by the U.S. Census Bureau, authorization numbers CBDRB-FY20-183 and CBDRB-FY23-CES-021-001. Numbers have been rounded to comply with disclosure avoidance guidelines.

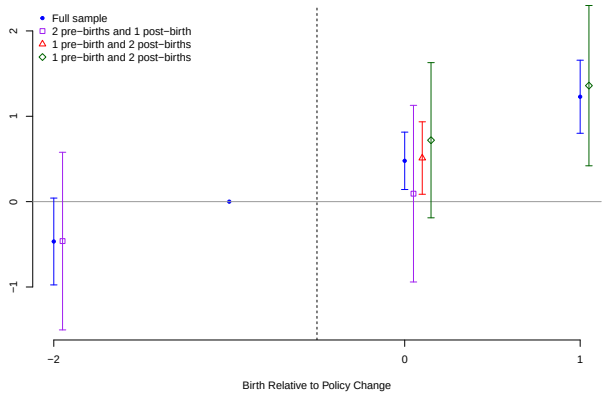
Figure A9: Event Study Estimates for Placebo Policy in October 1998 for Cohorts Born in 1994-2004



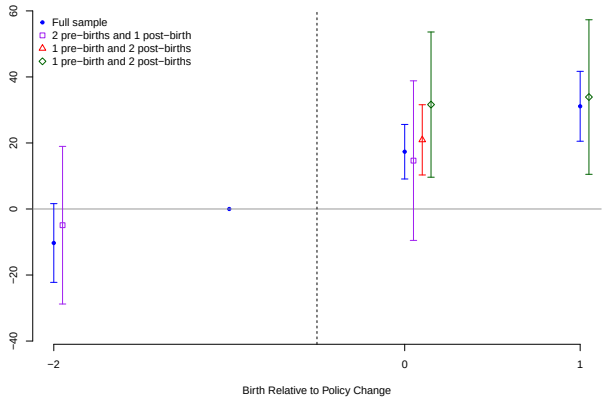
(a) Gestation age (in days) (b) Birthweight (in grams) (c) Small for gestational age

Note: Estimated coefficients and confidence intervals from the event study specification described in the text. All results were approved for release by the U.S. Census Bureau, authorization number CBDRB-FY23-CES021-003. Numbers have been rounded to comply with disclosure avoidance guidelines.

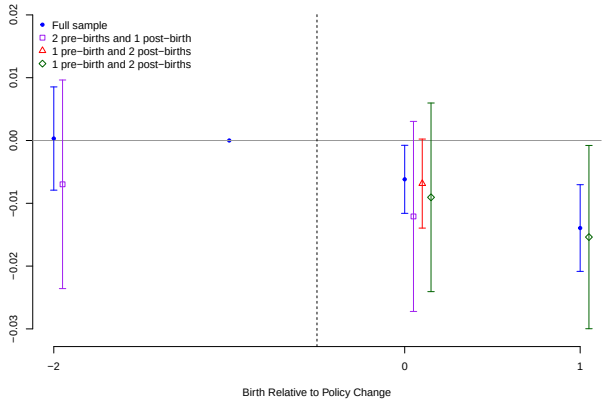
Figure A10: Balanced Sample Event Study Checks Using Birth Order Relative to Time of Expansion



(a) Gestation age (in days)



(b) Birthweight (in grams)

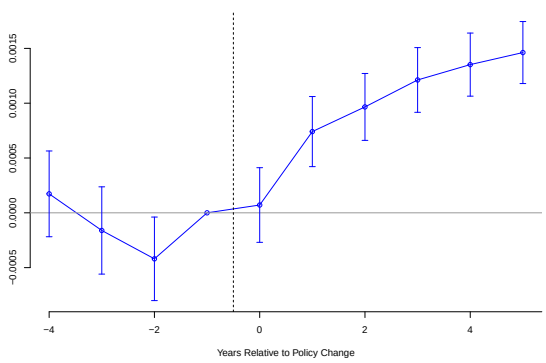


(c) Small for gestational age

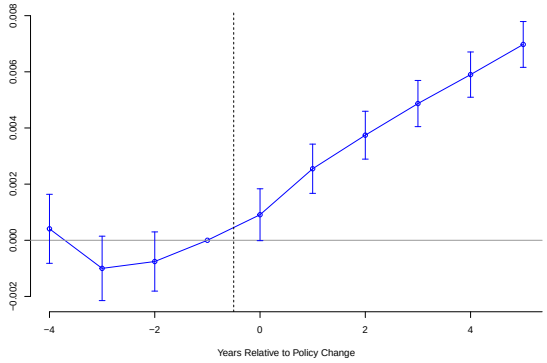
Note: Estimated coefficients and confidence intervals from the event study specification described in the text. All results were approved for release by the U.S. Census Bureau, authorization number CBDRB-FY24-0182. Numbers have been rounded to comply with disclosure avoidance guidelines.

Figure A11: Effects of Undocumented Expansion on Fertility and Maternal Health

A) Birth Rate

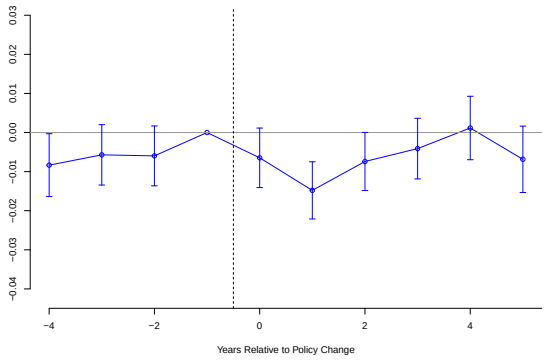


(i) All immigrants

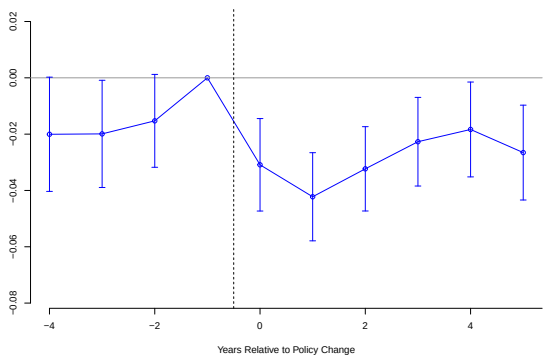


(ii) Likely undocumented immigrants

B) Pregnancy complications



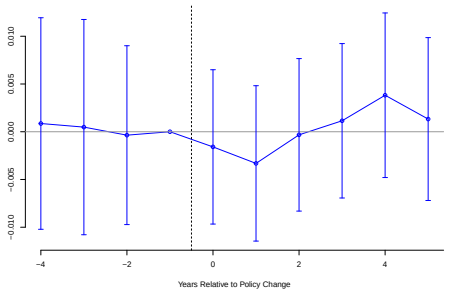
(i) All immigrants



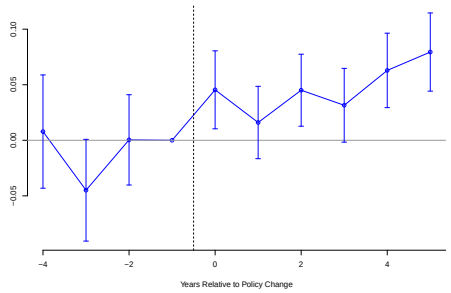
(ii) Likely undocumented immigrants

Note: Estimated coefficients and confidence intervals from the event study specification described in the text. All results were approved for release by the U.S. Census Bureau, authorization numbers CBDRB-FY22-CES018-015. Numbers have been rounded to comply with disclosure avoidance guidelines.

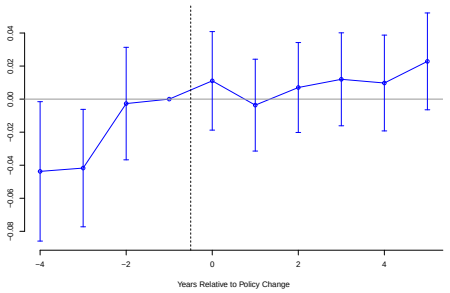
Figure A12: Effects on Long-Term Health and Human Capital for Children of Likely Undocumented Immigrant Mothers



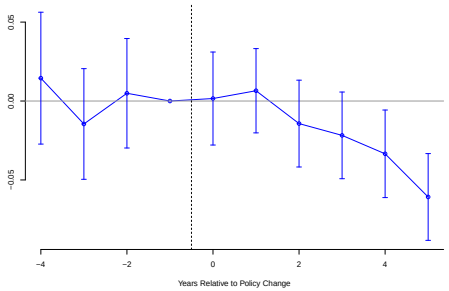
(a) Cumulative Mortality



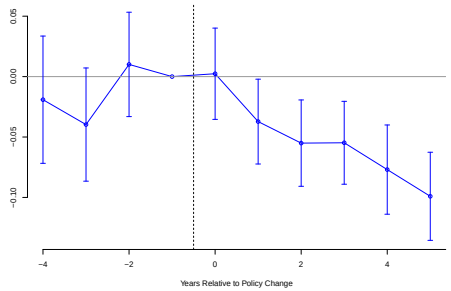
(b) Post-Secondary Enrollment



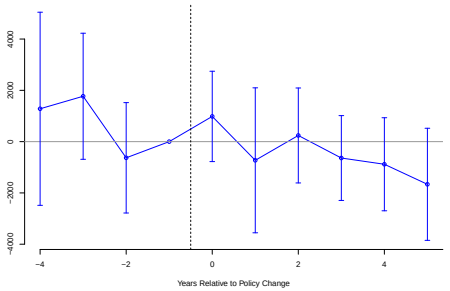
(c) College Completion



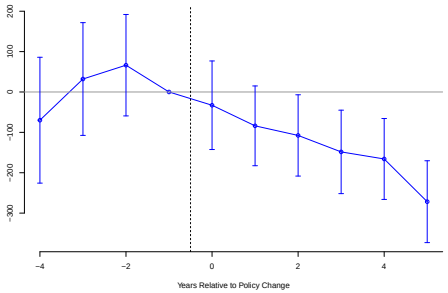
(d) Teen Fertility



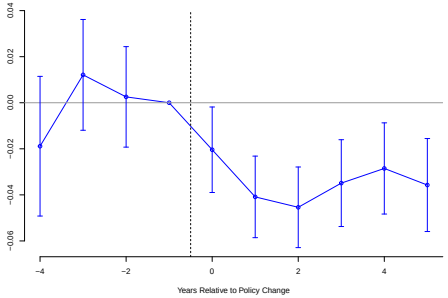
(e) Any Fertility



(f) Annual Wages



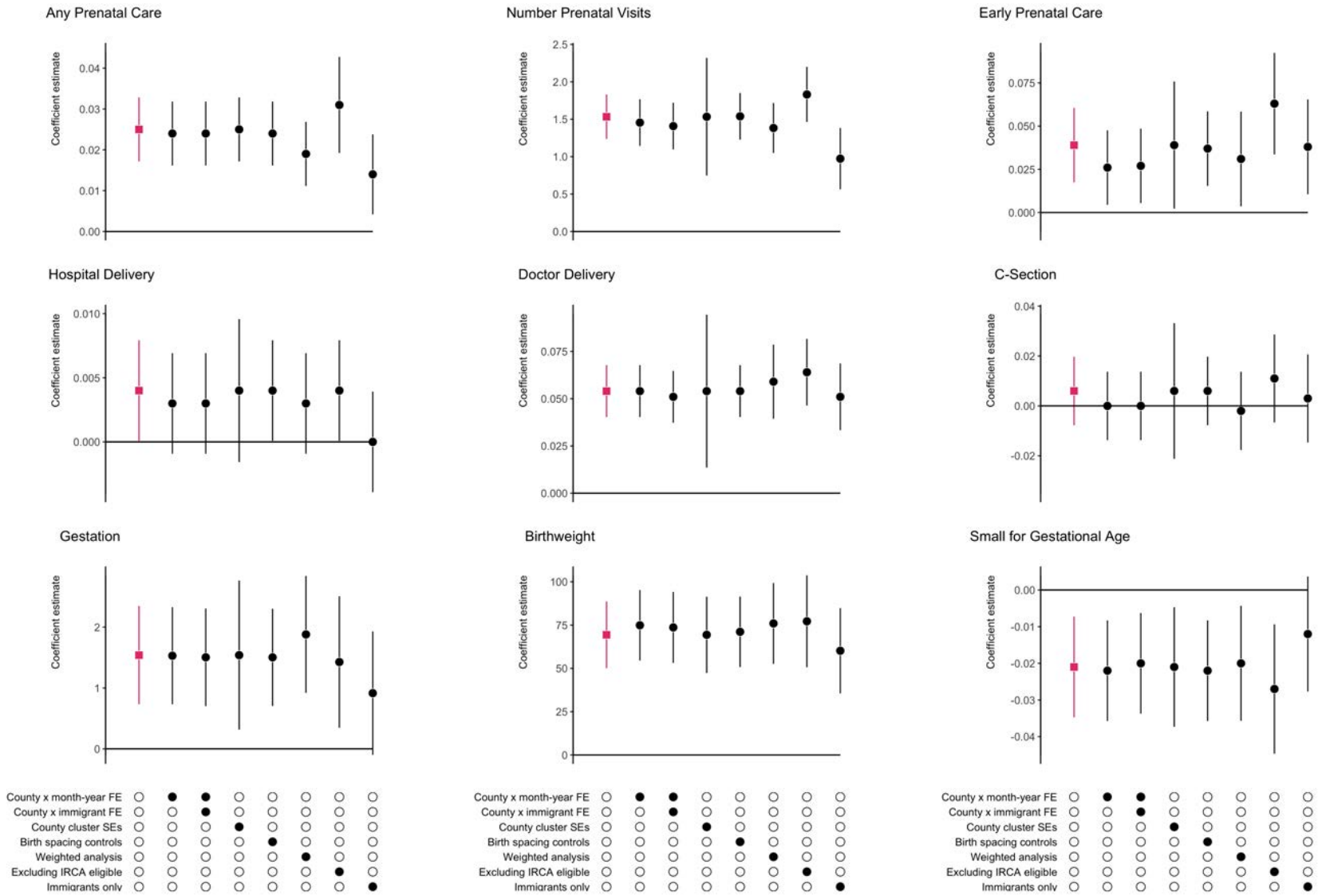
(g) EITC Amount



(h) Childhood Medicaid

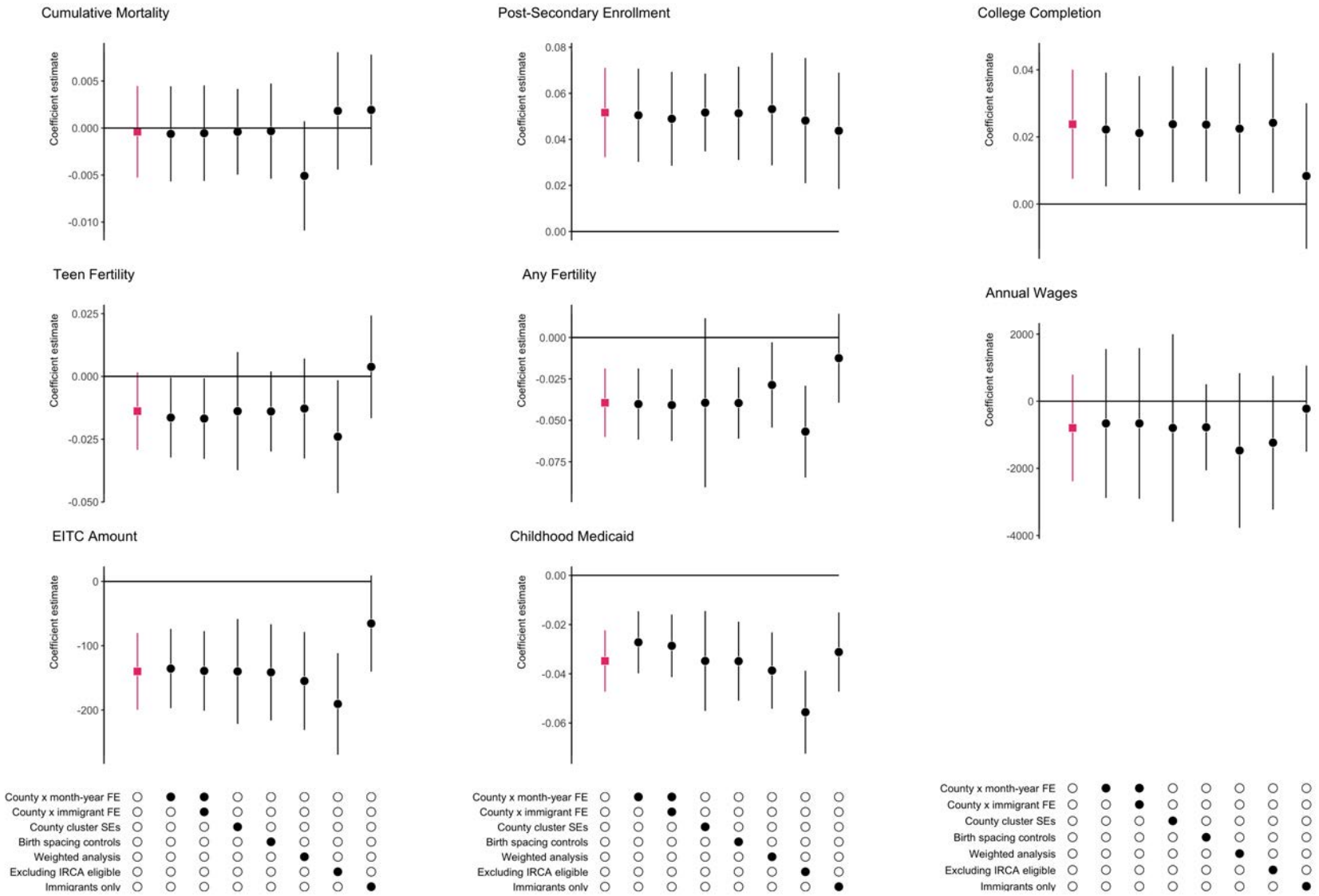
Note: Estimated coefficients and confidence intervals from the event study specification described in the text. All results were approved for release by the U.S. Census Bureau, authorization number CBDRB-FY23-CES-021-001. Numbers have been rounded to comply with disclosure avoidance guidelines.

Figure A13: Alternative Specifications for Health Care Utilization and Infant Health: Likely Undocumented Immigrant Mothers



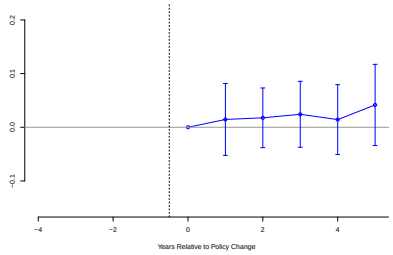
Notes: Analyses use 1984-1994 California birth records linked to the 2000 Census and 2001-2011 American Community Survey; see text for more specific sample information. Each estimate and 95% CI are for a different specification or sample, as described in the text. All regressions include birth-specific controls, birth year x birth month fixed effects, and mother fixed effects. Standard errors are clustered by mother and estimated using a bootstrap procedure. Significance levels: *=10%, **=5%, ***=1%. All results were approved for release by the U.S. Census Bureau, authorization numbers CBDRB-FY20-183, CBDRB-FY22-CES018-007, CBDRB-FY22-CES018-015, and CBDRB-FY23-CES-021-001. Numbers have been rounded to comply with disclosure avoidance guidelines.

Figure A14: Alternative Specifications for Long-Term Health and Human Capital: Likely Undocumented Immigrant Mothers

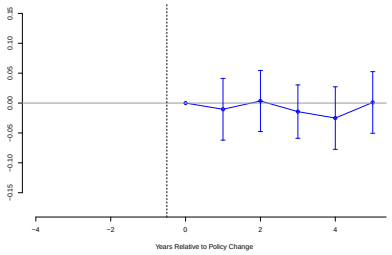


Notes: Analyses use 1984-1994 California birth records linked to the 2000 Census and 2001-2011 American Community Survey; see text for more specific sample information. Each estimate and 95% CI are for a different specification or sample, as described in the text. All regressions include birth-specific controls, birth year x birth month fixed effects, and mother fixed effects. Robust standard errors are clustered by mother and estimated using a bootstrap procedure. Significance levels: *=10%, **=5%, ***=1%. All results were approved for release by the U.S. Census Bureau, authorization number CBDRB-FY23-CES-021-001. Numbers have been rounded to comply with disclosure avoidance guidelines.

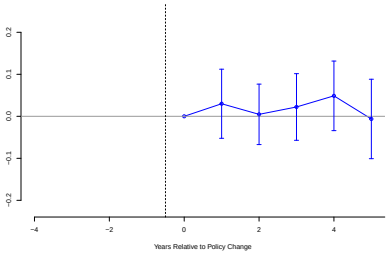
Figure A15: Placebo Tests for Short-Term Effects of Undocumented Expansion on Cuban Immigrants



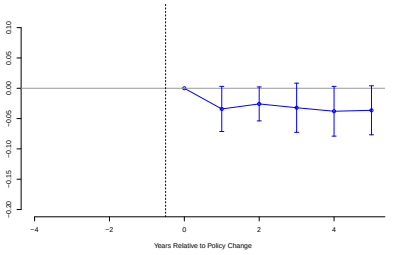
(a) Medi-Cal



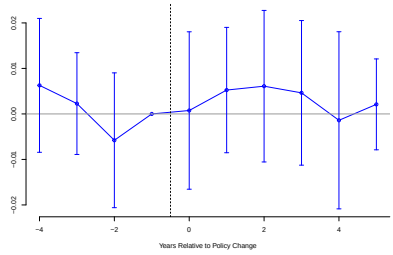
(b) No Insurance



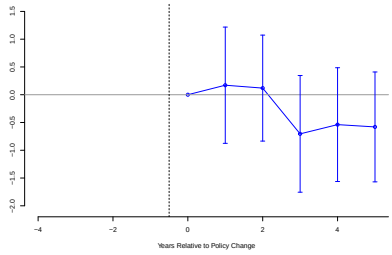
(c) Private Coverage



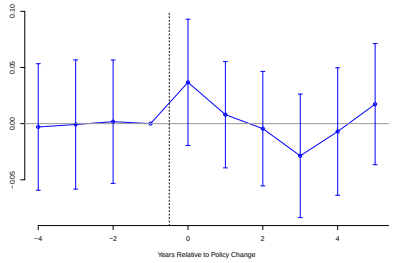
(d) Other Coverage



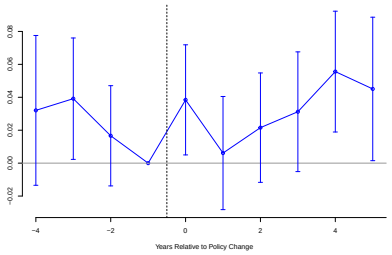
(e) Any Prenatal Care



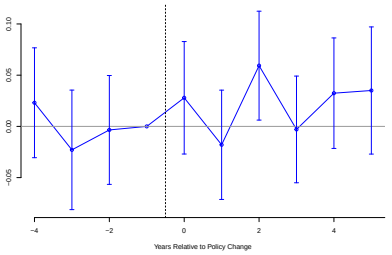
(f) Number of Prenatal Visits



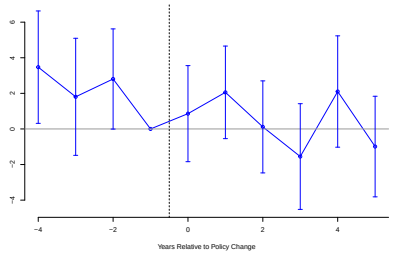
(g) Prenatal Care in First Trimester



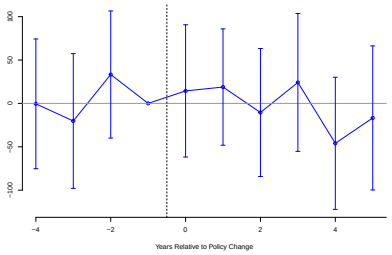
(h) Doctor Delivery



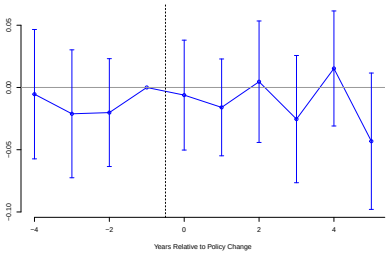
(i) C-Section



(j) Gestation age (in days)



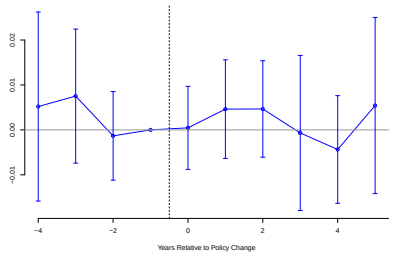
(k) Birthweight (in grams)



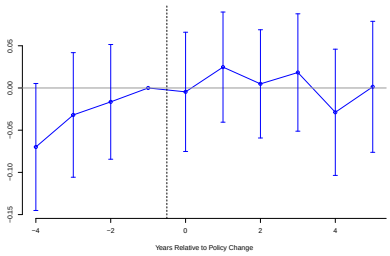
(l) Small for gestational age

Note: Estimated coefficients and confidence intervals from the event study specification described in the text. All results were approved for release by the U.S. Census Bureau, authorization number CBDRB-FY23-CES-021-001. Numbers have been rounded to comply with disclosure avoidance guidelines.

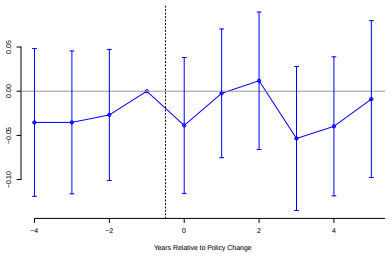
Figure A16: Placebo Tests for Long-Term Effects of Undocumented Expansion on Cuban Immigrants



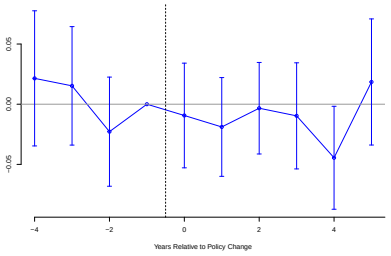
(a) Cumulative mortality



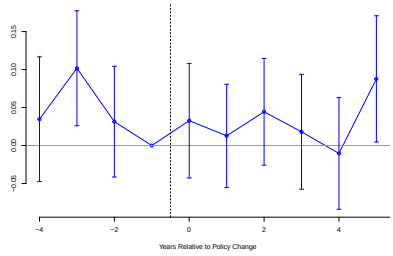
(b) Post-secondary enrollment



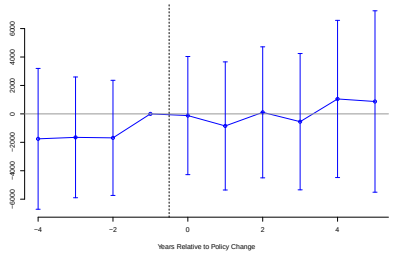
(c) College completion



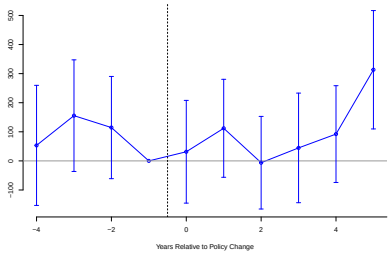
(d) Teen fertility



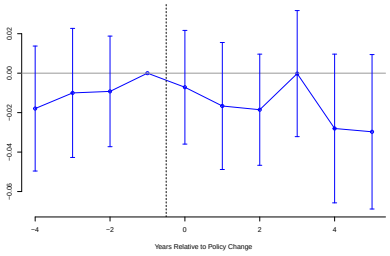
(e) Any fertility



(f) Annual wages



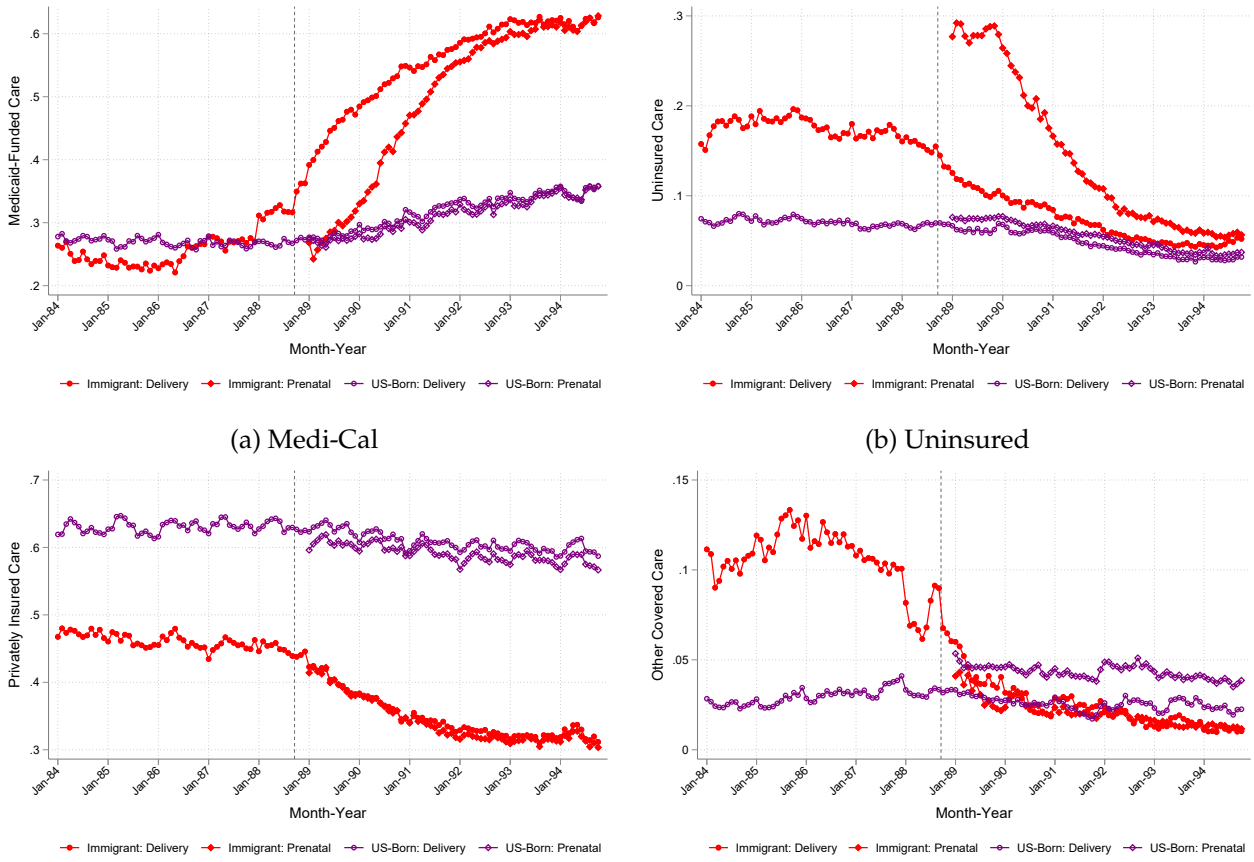
(g) EITC amount



(h) Childhood Medicaid

Note: Estimated coefficients and confidence intervals from the event study specification described in the text. All results were approved for release by the U.S. Census Bureau, authorization number CBDRB-FY23-CES-021-001. Numbers have been rounded to comply with disclosure avoidance guidelines.

Figure A17: Delivery Coverage by Mother's Place of Birth, 1984-1994



(a) Medi-Cal

(b) Uninsured

(c) Private Coverage

(d) Other Coverage

Note: Expected payer for delivery calculated using the birth records linked to California Department of Health Care Access and Information hospital discharge data. Vertical dashed line depicts the implementation of the October 1988 prenatal coverage expansion to undocumented immigrants.

Table A1: Information on Characteristics of Births With and Without PIKs, 1984-1996

	PIK	No PIK
Singleton	0.979	0.469
Female	0.489	0.967
Birth number	2.24 (3.71)	3.63 (11.40)
First birth	0.399	0.393
Second birth	0.313	0.267
Third birth	0.165	0.167
Fourth birth or higher	0.124	0.173
Mother's age	26.82 (5.91)	26.00 (6.20)
Race		
White	0.815	0.823
Black	0.080	0.078
Asian	0.092	0.086
Other	0.013	0.013
Hispanic	0.394	0.523
Mexican	0.321	0.455
Puerto Rican	0.003	0.003
Cuban	0.002	0.001
Other	0.068	0.063
Foreign-born	0.390	0.539
China	0.009	0.006
Canada	0.003	0.002
Cuba	0.001	0.001
Japan	0.004	0.005
Mexico	0.222	0.373
Philippines	0.021	0.025
Vietnam	0.014	0.012
Rest of the world	0.116	0.114
Health care utilization		
Any prenatal care use	0.986	0.946
Prenatal care during first trimester	0.763	0.622
Delivery in a hospital	0.993	0.992
Delivery in a public hospital	0.249	0.314
Delivery by a doctor	0.931	0.920
Delivery by a midwife	0.057	0.061
C-section	0.219	0.208
Birth outcomes		
Birth weight	3380 (565.4)	3155 (809.4)
Low birth weight	0.056	0.134
Gestational length	277.7 (17.95)	269.9 (31.12)
Preterm birth	0.097	0.183
Small for gestational age	0.097	0.138
Number of obs.	6,786,000	194,000

Note: Table presents average characteristics from the birth certificate records, as well as standard deviations in parentheses for non-binary variables. All results were approved for release by the U.S. Census Bureau, authorization number CBDRB-FY19-532. All numbers have been rounded to comply with disclosure avoidance guidelines.

Table A2: Characteristics of Births to Immigrant Mothers By PIK and Survey Sample Status

	Total	With PIK	With PIK and in 2000 SF Census/ACS	With PIK and in 2000 LF Census/ACS
Number of records meeting study criteria*	2208000	2123000	1373000	270000
Singleton	0.9822	0.9824	0.9835	0.9837
Female	0.4884	0.489	0.4899	0.4883
Birth number	2.308 (1.524)	2.307 (1.522)	2.254 (1.412)	2.274 (1.447)
First birth	0.3657	0.3655	0.3587	0.3593
Second birth	0.2946	0.2954	0.3101	0.3061
Third birth	0.1736	0.1736	0.1805	0.1784
Fourth birth or higher	0.1661	0.1655	0.1507	0.1562
Mother's age	26.93 (5.844)	26.95 (5.838)	27.44 (5.718)	27.44 (5.759)
Mother's race				
White	0.7705	0.7679	0.7444	0.7513
Black	0.0119	0.012	0.0119	0.0105
Asian	0.2069	0.2092	0.2340	0.2293
Other	0.0107	0.0108	0.0100	0.009
Mother's Hispanic ethnicity	0.6855	0.6817	0.6469	0.6575
Mother's country of birth				
China	0.0214	0.0218	0.0267	0.0269
Canada	0.0088	0.0089	0.0105	0.0104
Cuba	0.0034	0.0035	0.0041	0.0036
Japan	0.0096	0.0096	0.0099	0.0097
Mexico	0.5669	0.562	0.5237	0.5403
Philippines	0.0539	0.0541	0.0615	0.0592
Vietnam	0.0342	0.0347	0.0400	0.0401
Rest of the world	0.3018	0.3053	0.3237	0.3097
Health care utilization				
Any prenatal care use	0.9766	0.9773	0.9837	0.9837
Prenatal care during first trimester	0.6763	0.6792	0.7171	0.7145
Delivery in a hospital	0.9944	0.9944	0.9951	0.9951
Delivery in a public hospital	0.3377	0.3366	0.3058	0.3066
Delivery by a doctor	0.9168	0.9172	0.9213	0.995
C-section	0.1956	0.1958	0.2030	0.2024
Birth outcomes				
Birth weight	3364 (549.1)	3369 (541.3)	3378 (536.8)	3380 (538.2)
Gestational length	277.2 (17.87)	277.4 (17.46)	277.6 (17.00)	277.5 (16.97)
Small for gestational age	0.0982	0.0940	0.0940	0.0935

Note: Table presents average characteristics from the birth certificate records, as well as standard deviations in parentheses for non-binary variables. Study criteria defined as mother resided in state of California at time of birth and non-missing information on mother's county of residence, parity, birth order, sex, and mother's country of birth. All results were approved for release by the U.S. Census Bureau, authorization numbers CBDRB-FY20-183 and CBDRB-FY23-CES-021-001. All numbers have been rounded to comply with disclosure avoidance guidelines.

Table A3: Descriptive Statistics for Siblings Sample by Mother's Place of Birth

	All	Immigrant Mother	U.S. Born Mother
	(1)	(2)	(3)
Singleton	0.9643	0.9719	0.9599
Female	0.4915	0.4928	0.4907
Birth order	2.212	2.425	2.089
First birth	0.3149	0.2811	0.3344
Second birth	0.3769	0.3488	0.3932
Third birth	0.1835	0.1952	0.1767
Fourth birth or higher	0.1247	0.1749	0.0957
Mother's age	27.17	26.98	27.27
Mother's race and ethnicity			
Non-Hispanic white	0.4848	0.0907	0.7129
Non-Hispanic Black	0.0523	0.0081	0.0779
Hispanic	0.3571	0.6936	0.1817
Non-Hispanic Asian	0.0845	0.2000	0.0179
Non-Hispanic other race	0.0089	0.0076	0.0097
Immigrant mother	0.3660	1.0000	0.0000
China	0.0060	0.0163	0.0000
Canada	0.0039	0.0107	0.0000
Cuba	0.0012	0.0034	0.0000
Japan	0.0032	0.0087	0.0000
Mexico	0.2128	0.5813	0.0000
Philippines	0.0170	0.0463	0.0000
Vietnam	0.0145	0.0397	0.0000
Rest of the world	0.1075	0.2936	0.0000
Health care utilization			
Any prenatal care use	0.9890	0.9814	0.9934
Number of prenatal visits	11.26	10.09	11.98
Prenatal care during first trimester	0.7887	0.6942	0.8428
Delivery in a hospital	0.9930	0.9943	0.9923
Delivery in a public hospital	0.2356	0.3169	0.1884
Delivery by a doctor	0.9326	0.9151	0.9428
C-section	0.2151	0.1865	0.2317
Birth outcomes			
Birthweight (grams)	3416	3388	3432
Gestational length (days)	278.1	277.5	278.4
Small for gestational age	0.0854	0.0907	0.0824
Child's age at time of survey	11.44	11.27	11.54
Mother's age at time of survey	38.61	38.25	38.82
Married parent family at time of survey	0.6942	0.7485	0.6628
Mother's education at time of survey			
Less than high school degree	0.2634	0.5356	0.1063
High school degree or GED	0.2026	0.1641	0.2248
Some college	0.3353	0.1853	0.4220
College or more	0.1986	0.1149	0.2469
Number of births	360,000	132,000	228,000
Number of unique mothers	161,000	59,000	102,000

Notes: Analyses use 1984-1994 California birth records linked to the 2000 Census long-form and 2001-2011 American Community Survey; see text for more specific sample information. All results were approved for release by the U.S. Census Bureau, authorization numbers CBDRB-FY20-183 and CBDRB-FY23-CES-021-001. Numbers have been rounded to comply with disclosure avoidance guidelines.

Table A4: Descriptive Statistics for Immigrant Mothers, By Undocumented Status

	Pr(Undocumented)≥.5	Pr(Undocumented)<.5
Age at first birth in sample	23.34	26.34
Number of kids in sample	2.209	2.268
Total kids at time of last birth in sample	2.791	3.135
Mother's race and ethnicity		
Non-Hispanic white	0.0360	0.1255
Non-Hispanic Black	0.0019	0.0117
Hispanic	0.9001	0.5738
Non-Hispanic Asian	0.0568	0.2802
Non-Hispanic other race	0.0049	0.0084
Country of birth (from birth record)		
China	0.0149	0.0185
Canada	S	0.0167
Cuba	S	0.0054
Japan	0.0059	0.0106
Mexico	0.7078	0.5051
Philippines	S	0.0747
Vietnam	S	0.0625
Rest of the world	0.2713	0.3066
Other common countries of birth (from ACS/Census)		
Cambodia	S	0.0189
Germany	S	0.0143
India	0.0080	0.0125
El Salvador	0.1044	0.0266
Guatemala	0.0576	0.0090
Nicaragua	0.0151	0.0038
Korea	0.0142	0.0206
Taiwan	0.0067	0.0139
Probability undocumented	0.6503	0.1452
Year of entry into the U.S. (from ACS/Census)		
Before 1982	0.0522	0.7473
1982-1984	0.1480	0.1303
1985-1986	0.2417	0.0553
1987-1990	0.4484	0.0502
1991 or later	0.1097	0.0169
Age at time of survey	35.65	39.75
Education at time of survey		
Less than high school degree	0.6603	0.4504
High school degree or GED	0.1669	0.1656
Some college	0.1137	0.2302
College or more	0.0591	0.1538
Married parent family at time of survey	0.7665	0.2350
Number of observations	21000	38000

Notes: Analyses use 1984-1994 California birth records linked to the 2000 Census and 2001-2011 American Community Survey; see text for more specific sample information. All results were approved for release by the U.S. Census Bureau, authorization numbers CBDRB-FY20-183 and CBDRB-FY23-CES-021-001. "S" denotes that estimate has been suppressed due to small cell sizes. All numbers have been rounded to comply with disclosure avoidance guidelines.

Table A5: Descriptive Statistics for 2000 Census Short-Form and ACS Siblings Sample by Mother's Place of Birth

	All	Immigrant Mother	U.S. Born Mother
	(1)	(2)	(3)
Singleton	0.9670	0.9735	0.9635
Female	0.4917	0.4931	0.4909
Birth number	2.191	2.376	2.089
First birth	0.3177	0.2869	0.3346
Second birth	0.3774	0.3522	0.3913
Third birth	0.1849	0.1977	0.1779
Fourth birth or higher	0.1201	0.1632	0.0962
Mother's age	27.18	27.05	27.25
Mother's race and ethnicity			
Non-Hispanic white	0.4860	0.0953	0.7024
Non-Hispanic Black	0.0600	0.0093	0.0880
Hispanic	0.3571	0.6720	0.1827
Non-Hispanic Asian	0.087	0.213	0.0181
Non-Hispanic other race	0.0091	0.0096	0.0089
Immigrant mother	0.3559	1.0000	0.0000
China	0.0085	0.0238	0.0000
Canada	0.0037	0.0105	0.0000
Cuba	0.0015	0.0041	0.0000
Japan	0.0032	0.0090	0.0000
Mexico	0.1971	0.5538	0.0000
Philippines	0.0180	0.0504	0.0000
Vietnam	0.0143	0.0402	0.0000
Rest of the world	0.1097	0.3082	0.0000
Health care utilization			
Any prenatal care use	0.9895	0.9821	0.9936
Number of prenatal visits	11.33	10.20	12.00
Prenatal care during first trimester	0.7954	0.7049	0.8450
Delivery in a hospital	0.9931	0.9945	0.9923
Delivery in a public hospital	0.2293	0.3073	0.1860
Delivery by a doctor	0.9346	0.9176	0.9439
C-section	0.2159	0.1876	0.2316
Birth outcomes			
Birthweight	3417	3385	3435
Gestational length	278.2	277.5	278.5
Small for gestational age	0.0857	0.0916	0.0825
Child's age at time of survey	9.96	9.76	10.07
Mother's age at time of survey	37.14	36.81	37.32
Married parent family at time of survey	0.7100	0.7617	0.6815
Number of births	2,134,000	760,000	1,375,000
Number of unique mothers	949,000	336,000	612,000

Notes: Analyses use 1984-1994 California birth records linked to the 2000 Census short-form and 2001-2011 American Community Survey; see text for more specific sample information. All results were approved for release by the U.S. Census Bureau, authorization number CBDRB-FY23-CES-021-001. Numbers have been rounded to comply with disclosure avoidance guidelines.

Table A6: Correlates of Mother's Fixed Effects Estimated for Birthweight

	(1)	(2)
Hispanic ethnicity	-67.48***	-78.96***
	(3.197)	(3.375)
Non-Hispanic, Black race	-246.7***	-246.3***
	(5.432)	(5.439)
Non-Hispanic, other race	-16.41	-8.101
	(12.31)	(12.30)
Non-Hispanic, Asian race	-226.9***	-195.3***
	(4.549)	(5.685)
Born Outside the US	18.27	
	(32.73)	
China		21.90
		(35.29)
Canada		48.27
		(36.80)
Cuba		-14.98
		(47.82)
Japan		8.693
		(37.89)
Mexico		46.43
		(32.77)
Phillipines		-26.28
		(33.97)
Vietnam		-49.37
		(33.91)
Rest of the World		-13.1
		(32.81)
Entered US before 1982	-2.039	-1.384
	(32.72)	(32.69)
Entered US between 1982-1987	-31.35	-29.26
	(32.86)	(32.82)
Entered US in 1988 or later	-67.37**	-69.94**
	(32.95)	(32.91)
Married at time of survey	36.00***	34.89***
	(2.449)	(2.450)
Less than high school education at time of survey	-38.20***	-44.40***
	(3.035)	(3.098)
County-level income per capita	-0.9976***	-0.9292***
(in 1000s)	(0.2977)	(0.2986)
N	160,000	160,000

Notes: Analyses use 1984-1994 California birth records linked to the 2000 Census and 2001-2011 American Community Survey; see text for more specific sample information. Robust standard errors. Significance levels: *=10%, **=5%, ***=1%. All results were approved for release by the U.S. Census Bureau, authorization number CBDRB-FY23-CES-021-001. Numbers have been rounded to comply with disclosure avoidance guidelines.

Table A7: Effects of Undocumented Expansion Estimated with 2000 Census Short-Form and ACS Sample

	Medi-Cal eligibility	Medi-Cal	No insurance	Private	Other
Undocumented expansion x immigrant mother	0.216***	0.156***	-0.147***	0.002	-0.011***
	(0.000)	(0.003)	(0.003)	(0.003)	(0.001)
Baseline mean for immigrant mothers	0.2328	0.2594	0.2389	0.4752	0.0265
N	2,134,000	863,000	863,000	863,000	863,000

	Any prenatal visits	Number of prenatal	Early prenatal	Hospital delivery	Doctor delivery	C-section	Gestation days	Birthweight (gram)	Small for gestational
Undocumented expansion x immigrant mother	0.010***	0.563***	0.010***	0.003***	0.017***	0.005***	0.635***	21.49***	-0.009***
	(0.000)	(0.031)	(0.002)	(0.000)	(0.001)	(0.001)	(0.066)	(1.634)	(0.001)
Baseline mean for immigrant mothers	0.9774	9.67	0.6992	0.9934	0.9268	0.1857	278.3	3369	0.098
N	2,099,000	842,000	2,099,000	2,116,000	2,133,000	2,129,000	2,002,000	2,133,000	2,001,000

	Cumulative mortality	Ever enrolled post-secondary	Graduated college	Teen fertility	Any fertility	Annual wages	EITC amount	Childhood Medicaid
Undocumented expansion x immigrant mother	-0.001041***	0.0152***	0.0170***	-0.0099***	-0.0183***	-83.37	-60.12***	-0.0119***
	(0.000377)	(0.0016)	(0.0015)	(0.0012)	(0.0017)	(162.4)	(4.457)	(0.0009)
Baseline mean for immigrant mothers	0.007703	0.7119	0.2837	0.1253	0.3506	24,860		0.2859
N	2,134,000	2,134,000	2,112,000	2,134,000	2,134,000	12,810,000	6,403,000	6,393,000

Notes: Analyses use 1984-1994 California birth records linked to the 2000 Census short-form and 2001-2011 American Community Survey; see text for more specific sample information. Coefficient and standard errors are estimated using a difference-in-differences model with birth-specific controls, birth year x birth month fixed effects, and mother fixed effects. Robust standard errors are clustered by mother. Significance levels: *=10%, **=5%, ***=1%. All results were approved for release by the U.S. Census Bureau, authorization number CBDRB-FY23-CES-021-001. Numbers have been rounded to comply with disclosure avoidance guidelines.