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PRECONCEPTION MEDICAID AND MATERNAL AND INFANT HEALTH: EVIDENCE FROM LINKED ADMINISTRATIVE DATA

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Preconception Medicaid and Maternal and Infant Health: Evidence from Linked Administrative Data

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ABSTRACT

Despite pregnancy-focused public insurance coverage in the U.S., low-income mothers and infants face persistent health disadvantages. Using linked birth, tax, and enrollment data, we examine the effects of preconception coverage from California's 2014 Medicaid expansion, comparing changes in outcomes for first-time mothers just below and above the income eligibility threshold. Expansion increased preconception Medicaid enrollment by 3.4 months (+23 percentage points in 12-month continuous coverage), first-month pregnancy enrollment by 24 percentage points, and adequate prenatal care and STI screening. Yet we find no improvements in maternal or infant health, suggesting preconception coverage alone cannot close health disparities.

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1 Introduction

Maternal and infant health in the United States lags behind that of other high-income countries (Gunja et al., 2024; Bronstein et al., 2018)—a gap driven largely by the stark inequality in outcomes within the U.S. (Chen et al., 2016). In California, for instance, infants and mothers in the poorest five percent of families are two and three times more likely to die following childbirth, respectively, than those in the richest five percent (Kennedy-Moulton et al., 2025). While many factors may explain this income gradient, two frequently cited explanations are the absence of universal health insurance and the high cost of medical care in the U.S. (Gunja et al., 2023). Yet, despite multiple expansions of public insurance coverage during pregnancy in recent decades—policy efforts shown to improve infant health and long-term outcomes (Currie and Gruber, 1996; Miller and Wherry, 2019; East et al., 2023)—income-based health disparities have persisted. Scientific consensus has increasingly converged on *preconception* healthcare (i.e., healthcare before pregnancy begins) as possibly a more fundamental determinant of maternal and infant outcomes than pregnancy care alone (Wise, 2008; Currie, 2011; Aizer and Currie, 2014; Fleming et al., 2018). Yet evidence regarding the causal effects of insurance coverage *before* pregnancy on low-income mothers and infants remains limited.

The scarcity of evidence on preconception coverage reflects a fundamental data limitation. While recent insurance expansions under the Affordable Care Act (ACA) provide the opportunity to study changes in preconception coverage, birth certificate records—the most commonly used data source for studying maternal and infant health—capture insurance status only during pregnancy and at delivery, and contain no information on income, which is necessary to identify mothers likely to benefit from means-tested insurance expansions. In this paper, we use a novel data linkage between California birth certificates, federal tax records, and administrative Medicaid enrollment files to study how a large expansion in Medicaid eligibility among non-pregnant adults impacts insurance coverage in the year before conception, prenatal care, pregnancy-related diagnoses and procedures, and maternal and infant health outcomes.

Preconception insurance coverage could affect maternal and infant outcomes by facilitating access to healthcare before conception (Johnston et al., 2018; Margerison et al., 2020; Myerson et al., 2020). Such coverage may enable earlier detection and management of chronic conditions including diabetes and hypertension, support modification of behaviors like smoking and diet, and enhance prevention and treatment of sexually transmitted infections (STIs), all of which may reduce the risks

of pregnancy complications and adverse birth outcomes.[1] Early intervention matters because these conditions and behaviors require time to bring under control—for example, hypertensive patients typically need around three months to reach blood pressure targets, while individuals with diabetes may require up to a year to achieve optimal glycemic control (Hong et al., 2013; Kassie et al., 2025). Treatment that is only initiated after conception may leave insufficient time to meaningfully reduce risks to maternal and infant health (Ray et al., 2001; Nie et al., 2024). Additionally, preconception insurance coverage may allow women to recognize pregnancy earlier and therefore initiate prenatal care sooner.

We leverage the income-based variation in eligibility created by California's 2014 ACA Medicaid expansion that extended coverage to childless adults. We focus on U.S.-born first-time mothers who are at least 27 years old, as they are not eligible for dependent coverage and are, therefore, most likely to be impacted by the expansion in the pre-pregnancy period. We use a difference-in-differences design that compares changes in outcomes after the ACA expansion between those with incomes just below and above the eligibility threshold. Our individual-level linkage to tax records data allows us to precisely measure household incomes that determine eligibility, while maintaining a large sample size.

We find that the ACA expansion substantially increased Medicaid enrollment in the year before conception by an average of 3.4 months from a baseline of 0.7 months. This effect is driven primarily by a higher likelihood of enrollment for the full twelve months: the probability of continuous enrollment in the entire year before conception rose by 23 percentage points, nearing an eight-fold increase from a baseline mean of three percent. We also observe a 24 percentage point increase in the probability of Medicaid enrollment in the first month of pregnancy, indicating that preconception enrollment facilitates earlier pregnancy coverage.

To examine whether these increases in Medicaid enrollment translate into gains in overall insurance coverage, we supplement these findings with an analysis of American Community Survey (ACS) Public Use Microdata.[2] We construct a similar sample of U.S.-born female California residents between the ages of 27 and 44 who are not residing with any children at the time of the survey,[3] and

[1] These include preeclampsia, postpartum hemorrhage, maternal mortality, stillbirth, neonatal and perinatal death, congenital anomalies, macrosomia, preterm birth, and low birthweight (Al Khalaf et al., 2021; Ankumah and Sibai, 2017; Ankumah et al., 2014; Yanit et al., 2012; Centers for Disease Control and Prevention, 2024).

[2] While the restricted-use microdata could be linked to our administrative dataset, the sample size of low-income women who gave birth in California during our study period and also appear in the ACS is too small to yield reliable estimates.

[3] An important limitation of the public-use ACS data is that it provides coverage information at a given point in time and we cannot observe women's future fertility, which means that we cannot identify the preconception year as we do in our

compare changes in different types of insurance coverage between women in the same income groups as in our linked administrative dataset. This analysis allows us to take into account any concurrent gains in insurance coverage experienced by the comparison group, which is comprised of women who are ineligible for the Medicaid expansion but are eligible for ACA Marketplace subsidies. We find a substantial increase in overall insurance coverage among the women eligible for expanded Medicaid, which is driven entirely by Medicaid take-up. This result provides additional evidence that our treatment group experienced sizeable net coverage gains relative to the comparison group.

Since our analysis of maternal and infant health outcomes relies on birth records data, we also assess whether the increase in insurance coverage affected either the number or composition of births, which could occur if women in the treatment group gained improved access to contraceptive services. We find no evidence of meaningful changes in either the number or characteristics of births, which likely reflects the fact that California already provided contraceptive coverage to low-income women before the ACA through its Family Planning, Access, Care, and Treatment (Family PACT) Program.[4] Because the ACA Medicaid expansion did not materially change access to family planning services in California, any potential effects on pregnancy or birth outcomes are more plausibly driven by changes in other types of preconception care rather than by changes in who becomes pregnant.

We then proceed to analyze measures of care received during pregnancy available in the birth records data. We find that treated mothers are 2.3 percentage points more likely to have "adequate" prenatal care according to the Kotelchuck index (Kotelchuck, 1994), representing a 3 percent increase relative to a pre-treatment mean of 77 percent.[5] We also find suggestive evidence of a 1.7 percentage point (2.6 percent) increased probability in receiving a screening for sexually transmitted infections (STI), although this estimate is not robust across all of our sensitivity analyses. We find no significant changes in the likelihoods of being diagnosed with gestational diabetes, gestational hypertension, eclampsia or any STI during pregnancy, or in the probability of having a consultation with a specialist for high-risk obstetric services.

administrative data. To make the ACS sample more comparable, we re-weight it to match the age distribution of mothers in the birth records data.

[4]Operating since 1997 and funded through a Medicaid Section 1115 waiver, Family PACT provides comprehensive family planning and reproductive health services at no cost to eligible low-income individuals. As a result, women in our treatment group could already access family planning services under Medicaid prior to the ACA expansion.

[5]The Kotelchuck index, also known as the Adequacy of Prenatal Care Utilization (APNCU) Index, is a validated measure of prenatal care adequacy derived from birth certificate data. It combines two dimensions: the timing of prenatal care initiation and the proportion of recommended visits received, calculated as the ratio of observed to expected visits based on American College of Obstetricians and Gynecologists (ACOG) guidelines for uncomplicated pregnancies, and adjusted for gestational age. Adequate prenatal care is defined as receiving at least 80 percent of recommended visits and initiating prenatal care by the fourth month of pregnancy. See Kotelchuck (1994).

Despite the substantial increases in preconception insurance coverage and some changes in prenatal care, we find no statistically significant effects on any maternal or infant health outcome that we can measure in our data. To reduce concerns about multiple hypothesis testing, we aggregate the maternal and infant health outcomes into three binary indicators capturing poor infant health, severely poor infant health, and maternal morbidity. Our estimates allow us to rule out any reductions in the probability of having a poor infant health outcome larger than 0.2 percentage points and in the probability of having a severely poor infant health outcome larger than 0.5 percentage points. We can rule out reductions in maternal morbidity larger than 2.7 percentage points. We also do not detect any significant changes in any of the individual components of these aggregate measures.

One possible explanation for the absence of detectable effects of preconception Medicaid coverage on maternal and infant health is that the coverage gains did not change preconception healthcare utilization. Because we cannot observe utilization in our main linked administrative dataset, we turn to Medicaid claims data for a separate descriptive analysis of whether and how Medicaid-covered women use care in the year before conception in the post-expansion period. We construct a sample of women ages 27–44 who had a first pregnancy and were continuously enrolled in California's Medicaid program (Medi-Cal) under the Expansion Adult eligibility category throughout the year before conception, between 2016 and 2019. Among these women, utilization was widespread: 86 percent had at least one claim during the preconception year. Nearly half received blood or genetic testing (47 percent) or were screened or managed for chronic conditions (46 percent), 41 percent were seen for screening, prevention, or treatment of STIs, and 36 percent received preventive care or counseling. Smaller shares were seen for immunity screening or vaccination (19 percent), depression screening or treatment (nine percent), and screening or treatment of substance use disorders or smoking (six percent); six percent were prescribed vitamins or folic acid.[6] Women newly covered as Expansion Adults thus used a broad range of services. While we cannot observe what they would have done in the absence of the expansion, given the coverage gains we document and the well-established price sensitivity of medical care (Manning et al., 1987; Trivedi et al., 2008; Brot-Goldberg et al., 2017), a null utilization response seems unlikely. However, even if the coverage expansion led to changes in healthcare utilization in the year preceding conception, it is possible that meaningful health improvements require a longer period of sustained coverage. Other work has noted that detecting the health effects of insurance expansions may require long follow-up windows (Baicker et al., 2013; Sommers et al.,

[6]Note we can only capture vitamins and folic acid that are in the Medicaid prescription drug claims data, and cannot observe over-the-counter purchases of these items.

2017). Moreover, it is possible that the care newly covered women receive is not of sufficient quality to generate measurable health gains.

This paper bridges two strands of related literature. First, we add to the research on the ACA Medicaid expansion, which has focused on its impacts on non-elderly and non-pregnant adults more generally (e.g., Miller and Wherry, 2017; Miller et al., 2021; Sommers et al., 2017; Cawley et al., 2018; Courtemanche et al., 2018). A smaller number of studies have examined the ACA Medicaid expansion in the context of preconception care and its potential effects on pregnancy outcomes. Myerson et al. (2020) show that the expansion led to increased preconception health counseling and daily folic acid intake among low-income women before pregnancy, but findings on downstream impacts on pregnancy care and health outcomes are mixed (Bellerose et al., 2022). There is some evidence of earlier prenatal care initiation (Palmer, 2020), but no changes in infant or maternal health (Palmer, 2020; Margerison et al., 2021; Chatterji et al., 2023; Guglielminotti et al., 2026). However, these studies largely rely on birth certificate records or hospital discharge data, which lack information on preconception insurance coverage or income. Without a reliable first-stage estimate of the effect of the expansion on preconception coverage—or the ability to accurately identify expansion-eligible women—it is difficult to determine whether null findings reflect low statistical power or measurement error. More broadly, this points to a common limitation in the Medicaid literature, including studies of earlier pregnancy coverage expansions: income data are available only in surveys that are limited by small sample sizes and possible measurement error, while studies using administrative birth or hospital records data must proxy for Medicaid eligibility through maternal characteristics such as education, marital status, or insurance status at delivery, or rely on aggregated geographic measures of eligibility. Our novel data linkages allow us to directly observe income and Medicaid enrollment before pregnancy at the individual level, thereby addressing this limitation.

We also contribute to the literature on the determinants of maternal and early-life health, which has largely focused on the impacts of various factors affecting the pregnancy period (see reviews in Almond and Currie, 2011a,b; Almond et al., 2018). For example, studies have examined the effects of *in utero* exposure to disease (Almond, 2006; Barreca, 2010; Almond et al., 2012; Schwandt, 2018), nutritional adequacy (Almond and Mazumder, 2011; Rossin-Slater, 2013; Almond et al., 2011; Hoynes et al., 2016), environmental pollutants (Currie and Walker, 2011; Currie and Neidell, 2005; Currie et al., 2011; Sanders, 2012; Isen et al., 2017), extreme temperature (Kim et al., 2021; Cil and Cameron, 2017), violence (Aizer, 2011; Currie et al., 2022, 2023), maternal stress (Lauderdale, 2006; Currie and

Rossin-Slater, 2013; Black et al., 2016; Persson and Rossin-Slater, 2018), physician-patient racial concordance (Greenwood et al., 2020), and pregnancy insurance coverage (Currie and Gruber, 1996; Miller and Wherry, 2019; East et al., 2023; Miller et al., 2022). The research on the relationship between a woman's health *before* pregnancy and maternal and infant health outcomes is more sparse and largely descriptive.[7] Studies on the health effects of interventions during the preconception period—which include both small-scale randomized trials and descriptive correlational analyses—suggest some positive impacts on maternal and infant health outcomes among women with chronic conditions such as diabetes, hypertension, chronic kidney disease, and obesity (Wahabi et al., 2020; Dude et al., 2022; Schenkelaars et al., 2021).[8] We build on this body of work by examining whether having insurance coverage before pregnancy—which can facilitate access to preconception healthcare—has causal impacts on maternal and infant health outcomes.

2 Background

This section provides institutional background on preconception healthcare, the ACA Medicaid expansion, and California's Medicaid program.

Preconception Healthcare. The importance of preconception health has been recognized by providers and public health agencies for decades (Johnson et al., 2006). Broadly, preconception healthcare includes the prevention and management of chronic and infectious diseases and the adoption of healthy lifestyle habits that contribute to better maternal and child health outcomes (Benedetto et al., 2024). Most preconception healthcare occurs as part of primary care and focuses on addressing conditions and behaviors that lead to higher-risk pregnancies and births, such as obesity, diabetes, hypertension, smoking, and sexually transmitted infections. Providers may also suggest folic acid supplementation and share guidance on alcohol consumption and its risks during pregnancy (Johnson et al., 2006; Benedetto et al., 2024; Chingara et al., 2026).

The Affordable Care Act's Medicaid Expansion. The 2010 Patient Protection and Affordable Care Act represents one of the most significant transformations to the US healthcare system in recent

[7] For example, various medical conditions and behaviors—including obesity, diabetes, hypertension, smoking, alcohol misuse, folic acid deficiency, and sexually transmitted infections—have been shown to be associated with poor pregnancy and delivery outcomes (Johnson et al., 2006; Al Khalaf et al., 2021; Yanit et al., 2012; Ankumah et al., 2014; Centers for Disease Control and Prevention, 2024).

[8] There is also evidence that educational interventions are associated with healthier behaviors among women planning to become pregnant (Hemsing et al., 2017; Withanage et al., 2022), although these studies do not examine downstream birth outcomes.

decades. The law introduced a suite of reforms aimed at expanding insurance coverage, including an individual mandate, insurance market regulations, and the creation of subsidized Marketplace insurance exchanges. A key component of the ACA was the Medicaid expansion, which allowed states to extend eligibility to all non-elderly adults with incomes up to 138 percent of the federal poverty level. Prior to this expansion, Medicaid eligibility was restricted to "categorically-eligible" individuals, including children, pregnant women, those with disabilities, and the elderly. The 2012 Supreme Court ruling in *National Federation of Independent Business v. Sebelius* allowed states to opt out of the expansion, however, resulting in substantial cross-state variation in implementation. As of 2026, 40 states and the District of Columbia have adopted the expansion (KFF, 2026).

California's Medicaid Program. California's Medicaid program, Medi-Cal, implemented the expansion in January 2014, enrolling 2.5 million newly eligible adults by December 2014 and 3.7 million by October 2016 (California Department of Health Care Services, 2017). The 2014 expansion represented a significant increase in the number of Medicaid enrollees, despite the existence of an earlier "bridge" program. Of the 2.5 million adults who enrolled in Medicaid in 2014, only about one-quarter had previously been enrolled through the Low Income Health Program (LIHP), a county-level initiative established under California's "Bridge to Reform" Section 1115 waiver in 2011 with a goal of expanding coverage in anticipation of the ACA in 53 of California's 58 counties (Tatar et al., 2016; California Department of Health Care Services, 2017).[9]

Importantly, while the ACA expansion significantly affected Medicaid coverage for childless and non-pregnant women, it left pregnancy-related coverage largely unchanged. Specifically, prior to the ACA, pregnancy-related coverage was provided by two different programs. Pregnant women with incomes below 200% FPL were eligible for pregnancy-related Medi-Cal from conception until sixty days postpartum. Pregnancy-related Medi-Cal covered prenatal care, labor and delivery, postpartum care, family planning services, and other care needed to "assure the health of the pregnant woman and the fetus" (California Department of Health Care Services, n.d.). These services were covered with zero cost-sharing from the enrollee. Women with incomes between 200% and 300% FPL were eligible for the Access for Infants and Mothers (AIM) program (Robert Wood Johnson Foundation, 2010; California Department of Health Care Services, 2025) from conception until sixty days postpartum.

[9]Prior to the Bridge to Reform, California operated another Section 1115 waiver program, the Health Care Coverage Initiative (HCCI), which provided coverage to low-income childless adults in select counties (Harbage and King, 2012). Approximately 192,000 individuals were enrolled as of June 2010 (Kominski et al., 2010), of whom around 105,000 subsequently transitioned into the LIHP (Kominski et al., 2013).

Enrolling in the program required a one-time payment of 1.5% of yearly household income (Managed Risk Medical Insurance Board, n.d.).

In 2015, small changes were made to both pregnancy-related Medi-Cal and AIM. Because of the new "expansion adult" eligibility group, women without children with incomes below 138% FPL could now qualify for full-scope Medi-Cal coverage, which includes non-pregnancy related medical care. Coverage for the pregnancy-related care that we examine in our analyses, however, did not change over the study period. In addition, the upper eligibility threshold for pregnancy-related Medi-Cal was increased from 200% to 213% FPL in 2015 (California Department of Health Care Services, n.d.), while AIM eligibility changed from 213% FPL to 322% FPL.[10] Although the coverage details of the AIM program remained similar, its administration was transferred to the Department of Health Care Services (DHCS) and it was re-branded as the Medi-Cal Access Program.

3 Preconception Healthcare Utilization in Medi-Cal After the ACA Expansion

A key limitation of our main analysis is that we cannot observe healthcare utilization in the year before conception, since our linked data include Medicaid enrollment files but no claims. Therefore, we turn to standalone administrative Medicaid claims data to shed light on whether and how women enrolled in Medi-Cal in the year before conception use care post-ACA.

These data are curated by the Centers for Medicare & Medicaid Services (CMS), and we access them through a data reuse agreement for the files stored at Stanford University's Center for Population Health Sciences. We use the Transformed Medicaid Statistical Information System (T-MSIS) Analytic Files, or TAF, including the Demographic and Eligibility, Inpatient, Other Services, and Prescription files (Stanford Center for Population Health Sciences, 2023c,a,b,d). We restrict our attention to female beneficiaries aged 27–44 who have a first pregnancy and are continuously enrolled in California's Medicaid program in the year before conception in years 2016–2019, under the Expansion Adult eligibility category.[11] Appendix B provides more details on the data and sample construction. Our final sample includes 11,944 women.

[10] As described later, the comparison group used in our analyses is defined as women with incomes between 200% and 300% FPL. Thus, a small portion of the comparison group (those with incomes between 200-213% FPL) had their eligibility change from AIM to Medi-Cal pregnancy coverage during the post-period.

[11] Note that we identify first pregnancies based having a claim for a "consultation for a first-time pregnancy" during the pregnancy window. Therefore, our sample criteria also include the implicit restriction to women who have at least one Medicaid-funded visit during pregnancy.

We then construct binary indicators capturing the receipt of different types of care at any point during the year before conception: (1) any claim, (2) any general office visit, (3) a preventive care or counseling or procreative management visit, (4) screening or management of chronic conditions (diabetes, hypertension, hypercholesterolemia, overweight, and obesity), (5) screening, prevention, or treatment of STIs (chlamydia, gonorrhea, syphilis, HIV, and hepatitis B and C), (6) screening or treatment for substance abuse disorders (opioids and alcohol) or smoking, (7) screening or treatment for depression, (8) contraceptive care, (9) immunity screening or vaccination (for varicella, MMR, Tdap, hepatitis B, influenza, and HPV), (10) blood or genetic test, and (11) a prescription fill for a prenatal vitamin or folic acid supplement.[12]

Table 1 reports the shares of women in the sample receiving these different types of care, along with the mean number of days before the estimated conception date that the first instance of the care occurred. We find that the vast majority of women in our sample—around 86%—access healthcare services at least once during the preconception year, and many receive some form of recommended preconception care. The most common categories are blood and genetic tests (48%), screening for or management of chronic conditions (46%), and screening for, prevention of, or treatment of STIs (41%); the least common are screening or treatment for substance use disorders or smoking (6%) and prescription fills for prenatal vitamins or folic acid (7%).[13] Although claims data carry some uncertainty about the true conception date (see Appendix B for more details), the last column of Table 1 suggests that these rates are not driven by the mis-classification of pregnancy-related claims as preconception claims: on average, the first qualifying claim occurs more than 180 days before pregnancy for all categories.[14]

Overall, this analysis suggests that a large share of women who gained preconception coverage as Expansion Adults in Medi-Cal and were continuously enrolled in the year before pregnancy do have contact with the healthcare system, often for services recommended as part of preconception care. The question of whether this care translates into changes in downstream infant and maternal health outcomes remains open, however, and we consider it in the remainder of the paper.

[12] More information on the justification for and the construction of these indicators is available in Appendix B.

[13] Although Medicaid may cover certain over the counter (OTC) drugs at states' option, coverage applies only when the drug is prescribed by a provider, even though purchasing the drug over the counter does not otherwise require one (Coursolle and McCaman, 2019). Beneficiaries seeking a Medicaid-covered OTC drug therefore face a tradeoff: pay out of pocket, or bear the "hassle costs" of obtaining a prescription. We expect this tradeoff to tilt toward the prescription route for beneficiaries who are especially sensitive to out-of-pocket costs, or who already have planned contact with a provider (e.g., for a preventive or preconception care visit). As a result, our 6% estimate likely understates true prenatal vitamin and folic acid use, since women who purchase these products out of pocket do not appear in the claims.

[14] The median timing of the first qualifying claim is likewise more than 180 days before pregnancy, and even the 25th percentile of this timing exceeds 90 days.

4 Data and Sample

For the remainder of our analysis, we link California birth certificate records for years 2010–2019 with information on maternal income, earnings, and Medicaid enrollment from the IRS 1040 and W-2 forms and the CMS Medicaid Analytic eXtract (MAX) and TAF enrollment files. This linkage was made possible by the U.S. Census Bureau and the Person Identification Validation System (PVS), which probabilistically assigned Protected Identification Keys (PIKs) to the birth certificate records based on name, address, and date of birth. Using the PVS, each record in the dataset was assigned up to three PIKs, corresponding to the child, mother, and father (if available). In cases where the PVS was unable to determine a mother's PIK because of incomplete birth record information, we use other Census survey and administrative datasets to help identify the mother.[15] The PIKs on the birth certificate records can then be used to link to other Census-held individual-level datasets that also contain PIKs, including the Medicaid enrollment files and the IRS data.[16]

We use the information on birth year and month and gestational age from the birth certificate to estimate an approximate conception year-month, and then restrict our attention to mothers who conceived between January 2010 and December 2018. We next apply several additional sample restrictions to focus on women most likely to have been affected by the ACA Medicaid expansion. We restrict to first-time singleton births since parents with incomes below 100% FPL were already eligible for full-scope Medicaid prior to expansion and were, therefore, largely unaffected. We exclude Supplemental Security Income (SSI) recipients for the same reason, as they were automatically eligible for Medicaid before the ACA. We observe SSI receipt through linked administrative records from the Social Security Administration, which provide an annual snapshot of SSI participation. We further restrict the sample to U.S.-born women since eligibility for the ACA expansion includes only specific groups of lawfully present immigrants with qualifying status. Finally, we restrict to women aged 27-44 because a separate ACA provision allowed dependents to remain on a parent's private insurance plan until age 26, meaning younger women may have gained coverage through that channel rather than the Medicaid expansion.

Treatment and Control Groups. To construct our treatment and control groups, we use information on household and maternal income from the IRS 1040 and W-2 forms for 2009 to 2018 to calculate

[15] See Appendix A of Kennedy-Moulton et al. (2025) for more information on this process. As described there, we are able to assign a maternal PIK to approximately 95 percent of the birth certificate records.

[16] We have access to Census-held Medicaid enrollment files, but not to any claims data on healthcare utilization.

income during the twelve months before conception.[17] We prioritize data from the 1040 form, but include W-2 income to capture non-filers. For women with Form 1040 data, we use Adjusted Gross Income (AGI) as the income measure and determine household size from the total number of individuals on the filing. For women without a 1040 form, we use total annual earnings reported in the W-2 data (summed across multiple employers, where relevant) and assume a household size of one. For women without a Form 1040 or W-2, we assume an income of zero and a family size of one. We then divide household income by the relevant FPL cutoff for that year.

Our treatment group consists of women with incomes below 150% FPL, while our control group includes women with incomes between 200% and 300% FPL. We exclude women with incomes between 150% and 200% FPL from the analysis. Although the true eligibility cutoff for expansion adults is 138% FPL, we use 150% as our treatment cutoff and drop the intervening band to account for potential error in our income or household size calculations. Additional details on our measure of income as it relates to ACA Medicaid eligibility rules may be found in Appendix A.

Table 2 presents summary statistics on maternal demographic characteristics separately for mothers in the treatment and control groups, respectively. The sample skews young, as expected given our focus on first-time births, with over 80% of both groups between ages 27 and 35; the treatment group skews slightly younger. The treatment and control groups are broadly similar in racial and ethnic composition, though the treatment group has a somewhat higher share of non-Hispanic Black mothers and the control group a somewhat higher share of non-Hispanic white mothers. The treatment group is less educated than the control group, with a lower share of college graduates (25% versus 43%), as might be expected given their lower incomes.

4.1 Key Outcomes

Medicaid Enrollment. We have information on monthly Medicaid enrollment from the MAX Personal Summary file for years 2009–2015 and the TAF Demographic and Eligibility file for 2016–2018.[18]

[17] Because tax data are annual and the twelve months before conception usually span two calendar years, our preconception income measure is a weighted average of income as a percent of FPL in each of those years, weighted by the number of preconception months that fall in each year. For example, for a July 2016 conception, the preconception period runs from July 2015 through June 2016, so 2015 and 2016 each receive a weight of one-half.

[18] During our study period, the Centers for Medicare and Medicaid Services introduced new reporting guidelines, transitioning state Medicaid programs from the Medicaid Statistical Information System (MSIS), which included MAX files, to the Transformed Medicaid Statistical Information System (T-MSIS), which included TAF files. States adopted T-MSIS on a rolling basis, with California beginning submissions in the final quarter of 2015 (Chronic Conditions Warehouse, 2025). We only have T-MSIS data for California starting in 2016, however, so we impute enrollment data for the final quarter of 2015 using each individual's enrollment status in the surrounding months. Specifically, if an individual is enrolled in the quarters both before and after the missing period, they are considered enrolled for all three months of the quarter. If an individual is not enrolled before or after, they are considered not enrolled for all three months. If an individual is enrolled in either the

These data allow us to observe Medicaid enrollment for the mothers in our sample in the year before conception and during pregnancy. We construct three outcomes: (1) the number of months (ranging from 0 to 12) that a woman is enrolled in the year before conception, (2) a binary indicator for continuous enrollment in all twelve months of the preconception year, and (3) a binary indicator for enrollment in the first month of pregnancy.

Overall Health Insurance Coverage. In addition to studying Medicaid enrollment, we are also interested in studying the effects of the ACA expansion on *overall* insurance coverage. This distinction matters because our control group includes women who became eligible for subsidized ACA Marketplace coverage at the same time that Medicaid eligibility expanded.[19] If coverage gains in the control group (via the Marketplace) were comparable to those in the treatment group (via Medicaid expansion), and if both sources provided similar benefits, the net difference between groups could be attenuated. A related concern is crowd-out: if some women who gained Medicaid coverage through the expansion would have otherwise obtained insurance elsewhere, the expansion's net effect on overall coverage would be smaller than the increase in Medicaid enrollment alone implies.

Unfortunately, we do not have administrative data on other insurance coverage for the women in our analysis sample. Instead, to shed light on these issues, we supplement our analysis with data from the American Community Survey (ACS) for 2009 through 2019.[20] The ACS asks respondents about insurance coverage at the time of interview, including information on the type of insurance coverage. To approximate our primary study sample, we identify low-income, U.S.-born female California residents aged 27–44 who were not receiving SSI or living with any of their own children at the time of the survey. As in our main analyses, we compare women with incomes below 150% FPL to those with incomes between 200 and 300% FPL. Because the "not living with children" criterion captures both women who have never had children and women whose older children have left home, this group skews older than our primary study sample; we therefore re-weight the ACS sample to match the age distributions of the treatment and control groups. We construct three outcomes: (1) an indicator for any health insurance coverage at the time of the survey, (2) an indicator for Medicaid coverage, and (3) an indicator for private insurance coverage. The first outcome allows us to measure the net change

month before or after but not both, their enrollment is randomly assigned for each month in the missing quarter with a 50% probability.

[19] Under the ACA, individuals with incomes below 400% FPL are eligible for subsidized Marketplace coverage beginning in 2014.

[20] We were able to link the restricted-use ACS microdata to our main administrative dataset, but too few women who meet our sample criteria also appear in the ACS during their preconception year to yield reliable estimates.

in coverage experienced by the treatment group, accounting for any Marketplace-related gains in the control group, and for any crowd-out from other insurance in the treatment group. Outcomes (2) and (3) allow us to further decompose net insurance coverage changes by insurance type.

To evaluate the comparability of the two samples, we consider their age, race and ethnicity, and education. Table D1 provides summary statistics for these characteristics for each sample. After reweighting, the age distributions are nearly identical and minor differences exist for race and ethnicity. Since we are considering only low-income U.S.-born women in both samples, it is not obvious that these small differences in their racial and ethnic makeup would lead to different enrollment behavior. However, after reweighting, meaningful differences in education remain. Women in the ACS sample are more likely to have a high school education or less, compared to women in the main sample. To address this, we conduct additional analyses, reweighting the ACS sample by education level rather than age; these analyses yield qualitatively similar results, as shown in Figure D3.

Pregnancy and Delivery Outcomes. Although the ACA expansion did not change Medicaid coverage for pregnancy or labor and delivery services, the increase in preconception coverage could lead to more or higher quality prenatal care, or improved health during pregnancy, as previously discussed. We study four outcomes related to maternal pregnancy care and health. First, we construct an indicator that is equal to one if prenatal care is rated at least "adequate" on the Adequacy of Prenatal Care Utilization index developed by Milton Kotelchuck. This index provides a comprehensive measure of prenatal care adequacy, considering both the timing of care initiation and the ratio of actual to recommended prenatal visits based on gestational length. Using these inputs, it classifies care as "adequate plus," "adequate," "intermediate," or "inadequate" (Kotelchuck, 1994). Our second outcome is an indicator equal to one if the mother was screened for any sexually transmitted infection (STI) during pregnancy, including chlamydia, gonorrhea, group B streptococcus, hepatitis B, HIV, or syphilis. The third outcome is an indicator equal to one if the mother was diagnosed with gestational diabetes, gestational hypertension, eclampsia, or any STI during pregnancy.[21] The fourth outcome is an indicator equal to one if the mother received a consultation with a specialist for high-risk obstetric services.

We also study infant and maternal health outcomes. To reduce concerns about multiple hypothesis testing, we aggregate these outcomes into three indicator variables capturing poor infant health, severely poor infant health, and maternal morbidity. The "poor infant health" indicator equals one if

[21] The infections we consider are those included on the birth record: chlamydia, gonorrhea, group B streptococcus, hepatitis B, hepatitis C, herpes simplex virus, and syphilis.

the infant has any of the following: low birth weight (less than 2,500 grams), preterm birth (gestation length less than 37 weeks), a 1-minute APGAR score below 7, NICU admission, assisted ventilation following delivery, surfactant replacement therapy, antibiotics for suspected neonatal sepsis, serious neurological dysfunction, or transfer to another facility within 24 hours of delivery. The "severely poor infant health" indicator is identical, except that low birth weight and preterm birth are replaced with very low birth weight (less than 1,500 grams) and very preterm birth (gestation length less than 34 weeks). The "maternal morbidity" indicator equals one if the mother experiences any of the following: steroid or antibiotic administration during labor, a diagnosis of clinical chorioamnionitis, blood transfusion, third- or fourth-degree perineal laceration, ruptured uterus, unplanned hysterectomy, ICU admission, or an unplanned operating room procedure following delivery.[22] Our approach of aggregating individual measures into composite indicators follows Currie et al. (2022) and Kling et al. (2007), though the specific outcomes we include differ.

5 Empirical Strategy

To study the effects of the ACA Medicaid expansion in California on Medicaid enrollment in the year before conception and pregnancy and birth outcomes, we use an event-study design that compares changes in outcomes in the treatment group relative to those in the control group among women who conceived before and after the expansion. Specifically, we define cohorts using conception half-years (i.e., January through June and July through December of every calendar year).

We estimate the following event-study model:

$$y_{it} = \sum_{k=-8, k\neq -1}^{k=9} \beta_k (D_i \times \mathbf{1}[t - T = k]) + \delta_{ym} + \kappa' X_i + \varepsilon_{it} \tag{1}$$

where y_{it} is an outcome of interest for each birth i conceived in half-year t.

The coefficients of interest are estimated using a set of event-time dummies, $\mathbf{1}[t - T = k]$, indicating the half-year of conception relative to the Medicaid expansion and D_i, an indicator variable equal to 1 if the birth is to a mother in the treatment group. The estimated coefficients trace out the evolution of outcomes for the treatment group relative to the control group with the second half-year of 2013 ($k = -1$) serving as the reference period. Since the Medicaid expansion went into effect in January 2014, the first treated cohort with a full year of potential pre-conception Medicaid coverage

[22] Comparisons of birth records with hospital discharge data suggest that maternal morbidity is under-reported on birth records (Gemmill et al., 2024). We still include it as an outcome, but note that our measure likely contains error.

had conceptions that occurred in the first half-year of 2015 ($k = 2$).

Also included in the specification, δ_{ym} is a fixed effect for each year-month of conception, controlling for time trends common to both the treatment and control groups. X_i is a vector of individual-level characteristics including indicator variables for maternal race/ethnicity (non-Hispanic White, non-Hispanic Black, non-Hispanic Asian, Hispanic, and other/missing), maternal age categories (27-29, 30-34, 35-39, 40-44), maternal education level (less than high school, high school or some college, 4-year college or more, missing), preconception income in 20% FPL bins (0-20% FPL, 21-40 % FPL, 41-60% FPL, etc.), and county of maternal residence.[23] To account for any geographic correlation in outcomes, we cluster our standard errors based on the mother's county of residence.

In addition to event study coefficients for each half-year cohort, we also estimate a two-period difference-in-difference coefficient using Equation 2 shown below.

$$y_{it} = \beta(Treat_i \times ShareMonths_t) + \delta_{ym} + \kappa' X_i + \varepsilon_{it} \tag{2}$$

To account for partial treatment of some cohorts, we replace the standard post-period indicator with a continuous measure equal to the share of months in the preconception year during which an individual was exposed to the expansion. This variable takes the value 0 for cohorts with no exposure (those that conceived between 2010 and 2013), 1 for cohorts with full exposure (those that conceived between 2015 and 2018), and values between 0 and 1 for partially exposed cohorts (those that conceived in 2014).

Causal identification of the treatment effect of interest, β_k (β for the two-period design), requires that in the absence of Medicaid expansion, the outcomes of interest would have evolved in parallel in the treatment and control groups. Although this assumption is inherently untestable, we use the event study specification to examine pre-trends and assess whether they provide evidence of potential violations of this assumption.

Assessing Changes in the Number and Composition of Births. Since our sample is defined based on women who gave birth, any changes in the number or composition of births due to the ACA Medicaid expansion would lead to potential selection bias. As already mentioned, the ACA expansion did not meaningfully affect access to family planning services for the women in our sample because

[23] Because there is no variation in treatment status within the 20% FPL bins, they also absorb any time-invariant differences in outcomes across the treatment and control group.

of the pre-existing Family PACT program that was funded through a Medicaid Section 1115 waiver. However, gaining insurance coverage for a broad range of medical services (beyond family planning) could potentially influence women's decisions regarding when and whether to have children. To examine this possibility, we first plot the total number of births by women in the treatment and control groups over time in Figure D1. There is no detectable shift in the trends at the time of the ACA expansion. Additionally, we estimate equation (1) using as outcomes the demographic characteristics of the mother and find no evidence of meaningful systematic changes in maternal education, race/ethnicity, or age (Figure D2). Therefore, we think it is unlikely that changes in childbearing explain the results that follow.

6 Results

This section presents our results in five parts. We begin with preconception Medicaid enrollment, followed by a supplemental analysis of overall health insurance enrollment using the ACS. We then turn to pregnancy outcomes and birth outcomes, followed by sensitivity analyses.

Medicaid Enrollment. We first examine the impact of the Medicaid expansion on Medicaid enrollment during the preconception year and the first month of pregnancy. Figure 1 plots event study estimates for our two preconception enrollment outcomes of interest: (a) the average number of months of enrollment in the preconception year, and (b) the share of women with twelve months of continuous enrollment in the year before conception. The solid vertical line demarcates the start of policy exposure, beginning with the 2014 half-year cohorts who gained partial access during their preconception year. Meanwhile, the dashed vertical line represents cohorts conceived from 2015 onward, indicating full exposure during the entire year prior to conception. We report baseline means and the difference-in-differences estimates underneath each plot.

Both of the figures indicate that the treatment and control groups had similar trends in these outcomes in the three years leading up to the expansion. There is some evidence of small differential trends at the start of the pre-period. After the expansion, however, preconception enrollment rose markedly in the treatment group, with women averaging an additional 3.4 months relative to a baseline mean of 0.7 months in the pre-period. This increase does not appear to be the result of modest coverage gains spread across the population. As seen in Figure 1(b), we find a 23–percentage point increase in the share of women continuously enrolled for all twelve months of the preconception year,

a very large jump over a baseline of 2.9 percent. In other words, the expansion significantly enhanced the likelihood of sustained, full-year coverage for a large subset of women. Notably, the effects for both preconception enrollment outcomes are most apparent for the conception cohorts with full exposure to the policy and also appear to grow over time. The estimates for number of enrolled months (continuous enrollment) start near 3 months (18 percentage points) for the first fully treated cohorts and end near 4 months (28 percentage points) for the later treated cohorts. These increases in coverage are far larger than those documented in earlier studies of the ACA expansions (e.g., Miller et al., 2021 report an increase in annual Medicaid coverage of about 13 percentage points), indicating that this sample was particularly likely to benefit from the policy change.

In addition to the preconception enrollment outcomes, we also consider Medicaid enrollment in the first month of pregnancy (Figure 1(c)). While both the treatment and control groups would have been eligible for pregnancy-related subsidized coverage prior to the ACA, women enrolled in Medicaid at the time of conception would not have needed to apply for separate pregnancy-related coverage. Since most of the enrollment increase we observe appears to be driven by continuous enrollment, we would expect many women to be automatically enrolled in the first month of pregnancy. These women would only experience interrupted coverage if they dropped their coverage voluntarily, did not complete their regular annual eligibility redetermination,[24] or became ineligible immediately prior to the first month of pregnancy. Similar to the plots above, this outcome trended similarly for the two groups prior to the policy change. As with the previous enrollment outcomes, there is some evidence of small differential trends at the start of the pre-period, but these disappear by the second half of 2010. As expected, we observe a large increase in first-month enrollment in the treatment group. At 24 percentage points, the estimated effect is almost identical in magnitude to the increase in continuous enrollment (23 percentage points). This finding indicates that nearly a quarter of low-income women gained early pregnancy coverage as a result of expanded preconception Medicaid, approximately a 140 percent increase over the baseline coverage rate of 17.3 percent.

Overall Health Insurance Coverage. We next examine the change in overall health insurance coverage for our reweighted sample of childless women from the ACS, as well as changes in insurance cov-

[24]The Medi-Cal program only requires annual redetermination of eligibility, unless the enrolled individual has a qualifying event that triggers earlier redetermination (Santa Clara County Social Services Agency, n.d.). Since the preconception year we examine is based on the conception date and not the date of first enrollment, the women in our sample would only be going through redetermination at the time of conception if their enrollment in Medicaid (or last redetermination) coincided with the start of the preconception year.

erage by type. Figure 2 shows the event study estimates for each of these outcomes. Pre-expansion, the treatment and control groups appear to follow mostly parallel trends. After the expansion, panel (a) shows a significant increase of 12.6 percentage points in the share of treatment group women with any health insurance coverage, relative to the control group. This increase is of approximately the same magnitude as the estimated increase in Medicaid coverage of 13.8 percentage points (as shown in panel (b)), indicating that the Medicaid coverage was not replacing other sources of coverage for this population. Finally, panel (c) indicates that any relative change in private insurance coverage is close to zero and not statistically significant, despite the control group gaining access to subsidized Marketplace coverage in 2014.

Overall, these results indicate that access to health insurance coverage increased significantly for U.S.-born childless California resident women between the ages of 27 and 44 with household incomes under 150% of the federal poverty level, relative to similar women with incomes between 200% and 300% of the federal poverty level. To the extent that the ACS sample is representative of our main analysis sample, we can conclude that our treatment group did experience a meaningful change in overall preconception insurance coverage as a result of the Medicaid expansion.

Maternal Health and Receipt of Care During Pregnancy. Next, we examine the impact of the Medicaid expansion on maternal health and receipt of care during pregnancy using our main analysis sample. Figure 3 (a) displays the event study coefficients for the indicator for "adequate" prenatal care as defined by the Kotelchuck index. Before the expansion, treatment and control groups followed parallel trends. After the expansion, the probability of receiving "adequate" prenatal care rose in the treatment group by approximately 2.3 percentage points. If this effect were concentrated among the 24 percent of women who gained Medicaid coverage during the first month of pregnancy, it implies that about one out of ten of them had corresponding improvements in their prenatal care use.

Next, we examine whether there is any change in STI screenings and find some evidence of an increase in the post-period, as shown in Figure 3 (b). The difference-in-difference estimate indicates a statistically significant increase of 1.7 percentage points, closing roughly one-third of the baseline gap between the treatment and control groups.[25] However, this estimate is sensitive to sample definition: it is not statistically significant when we restrict to women with Form 1040 income data (see the end of the Results section for our discussion of robustness).

[25]The baseline mean for the control group is 70.6 percent, compared to the baseline for the treatment group of 65.8 percent.

The increase in "adequate" prenatal care receipt could result from treated women initiating prenatal care earlier, completing a greater proportion of recommended visits, or both. Earlier initiation could follow naturally from the observed increase in Medicaid enrollment during the first month of pregnancy. It could also reflect that women with preconception coverage already have a primary care physician who can provide prenatal care, are better able to recognize the signs of pregnancy, or have greater knowledge of the benefits of early care.

The increased receipt of screening could similarly result from multiple pathways. Preconception coverage could improve access to screening if, for example, women with such coverage are better able to identify physicians who provide thorough prenatal care. It could also lead to greater recognition of the need for screening, if these women are more likely to be aware of their own STI risk. Finally, although less likely, preconception coverage could increase the need for screening if women engage in riskier behavior knowing that any resulting condition can be treated.

The remaining panels of Figure 3 present event study coefficients for the other pregnancy outcomes: Figure 3(c) shows results for any pregnancy complication (STI, gestational diabetes, gestational hypertension, or eclampsia), and Figure 3(d) for receipt of consultation for high-risk pregnancy. We might expect there to be decreases in the prevalence of these outcomes if preconception coverage leads to better maternal health or health care management prior to pregnancy. Alternatively, if improved connection to the healthcare system leads to increased diagnoses of maternal health conditions or observation of high-risk criteria, we might expect increases in the prevalence of these outcomes. Pre-expansion trends are parallel for both outcomes. After the expansion, however, we detect no significant changes in either outcome. The difference-in-difference estimates allow us to rule out effects larger than 1.9 percentage points or smaller than -0.4 percentage points for pregnancy complications and larger than 0.5 percentage points or smaller than -0.5 percentage points for high-risk consultations.

Maternal and Infant Health During Labor and Delivery. Our final analyses examine the impact of Medicaid expansion on maternal and infant health during labor and delivery. Figure 4 plots event study estimates for three outcomes: Figure 4(a) and Figure 4(b) show poor and severely poor infant health, and Figure 4(c) reports the results for maternal morbidity. The pre-period trends are generally parallel and the coefficients remain close to zero following expansion. The difference-in-difference estimates allow us to rule out reductions in poor infant health larger than 0.2 percentage points, in

severely poor infant health larger than 0.5 percentage points, and in maternal morbidity larger than 2.7 percentage points.[26] If anything, the estimate for poor infant health outcomes is suggestive of worsening health. Taken together, these findings suggest that the observed increases in preconception coverage and prenatal care adequacy did not translate into measurable improvements in infant or maternal health during delivery.

Robustness of Our Results to Alternative Income Calculations. In order to capture a more complete sample of low-income women, we generate our income measure using a combination of administrative sources, each of which may include some measurement error. In this section, we focus on the sources of measurement error that we expect to be most important, and present robustness checks confirming that they do not meaningfully affect our results. Appendix A discusses the other potential sources of measurement error.

When constructing our analytic sample, we prioritized information taken from the IRS Form 1040 tax return. In cases where we did not observe a 1040 form, we use any total household earnings reported on Form W-2 data as our measure of income. If neither Form 1040 or W2s are observed, we assume an income of zero. We anticipate greater potential for measurement error in our FPL calculations in both of these latter cases. While Form W-2 captures labor income, it excludes other sources such as interest and dividends, self-employment income, rental income, unemployment compensation, and taxable Social Security benefits; similarly, the absence of a Form W-2 indicates no wage income but is uninformative about non-labor income. Many of these sources (particularly rental income, interest and dividends, and Social Security) are likely uncommon among the relatively young, low-income women in our sample, but not all. For this reason, our FPL measure may be underestimating income in some cases. Furthermore, without a Form 1040 for these women, we also fail to capture spouses or dependents in our household size measure, along with their earnings. Given our restriction to first births, the women in our sample should not generally have existing dependents, though spouses are likely more common. In these cases, we would be underestimating household size and income if the spouse has positive earnings.

To assess whether this potential measurement error may meaningfully affect our results, we first examine whether Medicaid enrollment behavior differs across income data sources. Figure 5 plots preconception enrollment trends disaggregated by income source for two measures: (a) the average

[26] As previously noted, the maternal morbidity reported on the birth record may be an underestimate and so should be interpreted with caution.

number of months enrolled in the preconception year and (b) the proportion of women enrolled in the first month of pregnancy.[27] If misclassification were more common among women with Form W-2 or missing income data, we would expect the treatment and control group lines to lie closer together for these income sources, as eligible women are placed into the control group or ineligible women into the treatment group. Instead, treatment and control group enrollment trends are similarly separated across all income sources, suggesting that our eligibility measure performs comparably regardless of income data source. As a further check, we re-run our main analyses restricting to women with Form 1040 data (approximately 80% of our original sample). As shown in Figures A1–A3, our results are largely unchanged in the restricted sample. The exception is STI screening: the estimate falls to 1.2 percentage points and is no longer statistically significant. This attenuation could reflect larger screening gains among women without Form 1040 data, or it could indicate that the full-sample estimate is less robust than our other results. Our other findings are not sensitive to including women without Form 1040 data, and including them has the benefit of capturing a relevant population of low-income women who are not required to file federal income taxes.

7 Conclusion

Despite decades of subsidized pregnancy coverage, low-income mothers and their infants in the United States still experience significantly worse outcomes than their higher-income counterparts. In light of this, practitioners and advocacy groups have broadened their focus beyond the pregnancy period, identifying preconception coverage as an important next step to reduce income-based disparities (Johnson et al., 2006; Salganicoff and An, 2008; American Public Health Association, 2021; Bailit Health, 2021; Ranji et al., 2021).

In this paper, we show that expanding access to preconception coverage leads to improvements in coverage and care receipt during pregnancy, but does not measurably influence downstream health outcomes. Using a novel data linkage between California birth certificates, federal tax records, and Medicaid enrollment files, we study California's 2014 ACA Medicaid expansion, exploiting income-based variation in eligibility. Our sample consists of first-time, singleton births to U.S.-born mothers aged 27–44 who did not receive SSI in the year before conception. We compare outcomes for women with incomes above and below the eligibility threshold.

Among women with incomes below 150% FPL, the expansion increased Medicaid enrollment in

[27] We do not include a plot for the proportion of women with continuous enrollment in the preconception year because of cell size restrictions.

the preconception year by an average of 3.4 months. This increase is driven primarily by roughly a quarter of the treatment group gaining continuous preconception enrollment, and it is followed by a comparable increase in Medicaid enrollment during the first month of pregnancy.

To test whether higher Medicaid enrollment reflects a net gain in insurance coverage, we use ACS microdata on a comparable sample: U.S.-born female California residents aged 27–44 not living with their children. Relative to women with incomes between 200% and 300% FPL, women below 150% FPL experienced a substantial increase in overall preconception insurance coverage following the expansion. The expansion therefore raised net coverage, not just Medicaid enrollment, after accounting for Marketplace coverage and any crowd-out of private insurance.

Because our health outcomes are observed only for live births, we also test whether the expansion changed the number or composition of births. We find no meaningful effects on the number of births, the share of births to non-white or non-college-educated mothers, or average maternal age at delivery, suggesting our results are not driven by changes in who becomes pregnant.

Using the birth records, we then examine measures of care receipt and infant and maternal health. We observe a significant increase of approximately 2.3 percentage points in the receipt of "adequate" prenatal care and suggestive evidence of a 1.7 percentage point increase in STI screening, although the latter is sensitive to sample definition. Despite these gains, we find no evidence of improvements in maternal health during pregnancy or in maternal and infant health at delivery.

One potential explanation for these null effects is that coverage gains did not change preconception health care use. Using California Medicaid claims from 2016–2019, we describe preconception-year utilization among women aged 27–44 who were continuously enrolled as expansion adults during that year and had a Medicaid-covered claim for a first pregnancy. Over 86% had at least one claim in the preconception year, and many received some recommended preconception care services. While we cannot observe counterfactual utilization, these patterns suggest that newly covered women did use care.

Overall, our results suggest that preconception Medicaid coverage is not sufficient to substantively improve maternal and infant health outcomes for low-income women. Reducing income-based health disparities may instead require longer periods of continuous coverage, or complementary interventions to translate coverage into better health outcomes.

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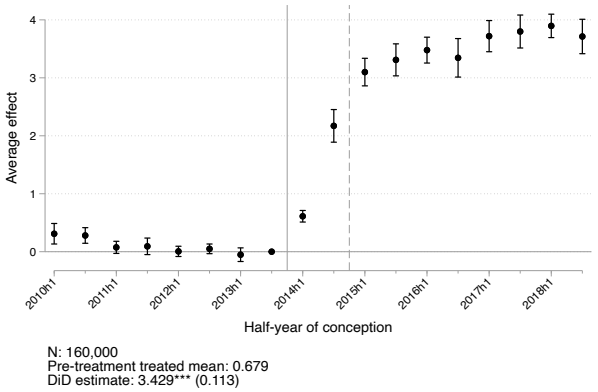
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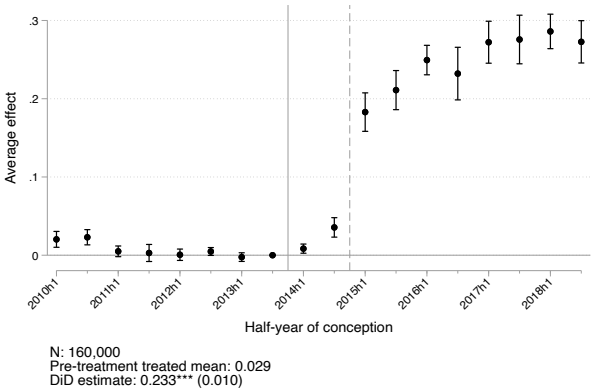
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8 Figures and Tables

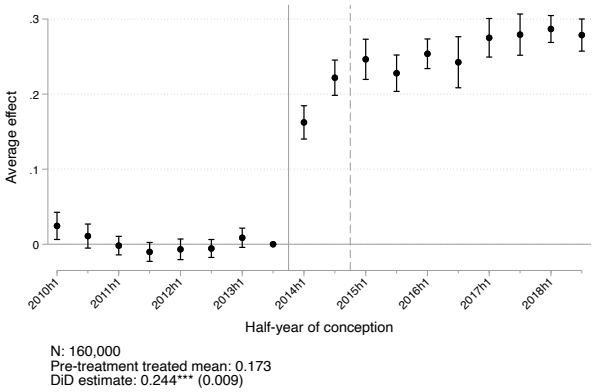
Figure 1: Effect of Medicaid Expansion on Preconception and Pregnancy Medicaid Enrollment



(a) Number of enrolled months in preconception year



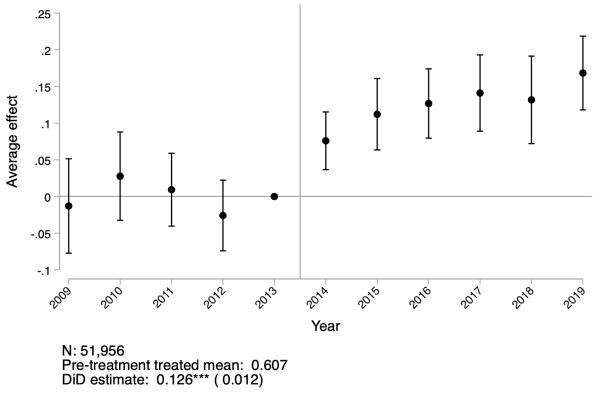
(b) Continuous enrollment in preconception year



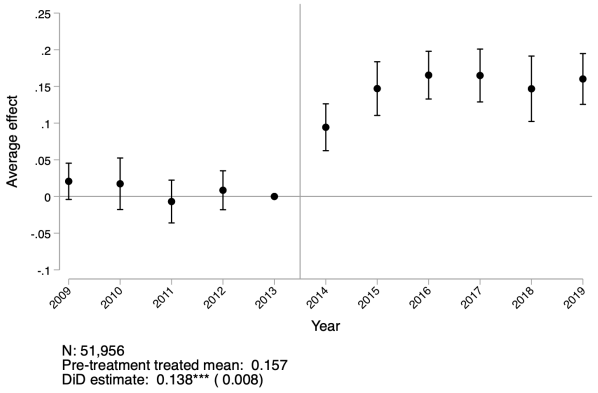
(c) Enrollment in first month of pregnancy

Note: These figures report event-study coefficients and 95% confidence intervals comparing Medicaid enrollment outcomes for women with preconception incomes below 150 percent of the federal poverty level (FPL) to women with preconception incomes between 200 and 300 percent FPL. The sample includes first-time, live, singleton births to U.S.-born California residents over 27 years of age who were not receiving SSI in the preconception year. Each estimate corresponds to a half-year conception cohort, defined using the predicted conception date from the birth record. The solid vertical line marks the start of Medicaid expansion in January 2014; the dashed vertical line marks January 2015, when women in the treatment group first became eligible for a full year of preconception coverage. Cohorts to the left of the solid line were untreated, cohorts to the right of the dashed line were fully treated, and cohorts in between were partially treated. Each figure reports the sample size, the pre-expansion treatment-group mean, and a difference-in-differences estimate that accounts for partial treatment, with its standard error in parentheses. Outcomes are: (a) months of Medicaid enrollment during the preconception year; (b) an indicator for twelve months of preconception Medicaid enrollment; and (c) an indicator for enrollment in the first month of pregnancy. Specifications control for maternal race and ethnicity, age, education, preconception FPL bin, year and month of conception, and county of residence. Standard errors are clustered by maternal county of residence. Sample sizes are rounded to the nearest 1,000 per Census Bureau rules. Results approved for release by the U.S. Census Bureau (CBDRB-FY26-CES018-001; CBDRB-FY26-0081). $^{*}p < 0.1$ $^{**}p < 0.05$ $^{***}p < 0.01$

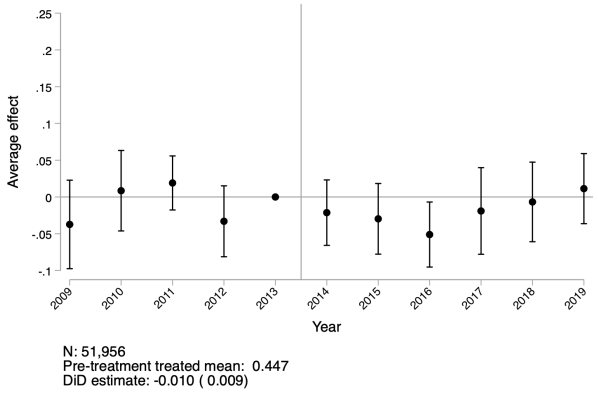
Figure 2: Effect of Medicaid Expansion on Insurance Coverage (ACS Sample)



(a) Any Health Insurance Coverage



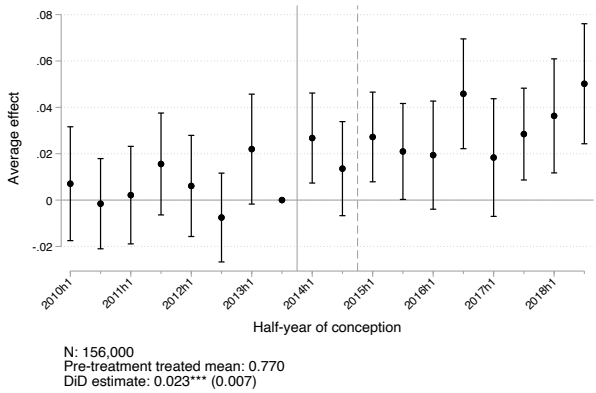
(b) Medicaid Coverage



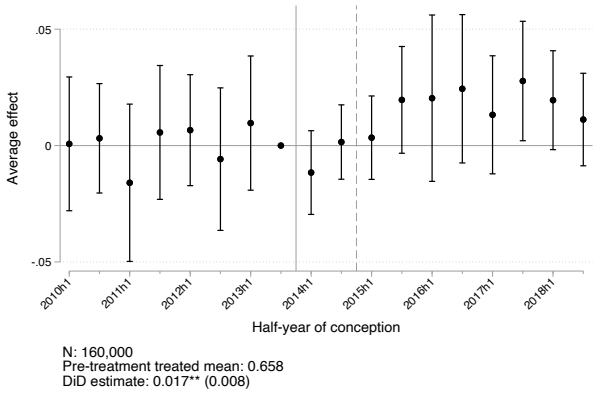
(c) Private Coverage

Note: These figures report event-study coefficients and 95% confidence intervals comparing rates of insurance coverage for women with incomes below 150 percent of the federal poverty level (FPL) to women with incomes between 200 and 300 percent FPL. The sample includes female, U.S.-born American Community Survey respondents between ages 27 and 44 who were California residents, were not receiving SSI, and were not living with any of their own children at the time of the survey, reweighted within the treatment and control groups to match the age distribution of the main birth records sample. Each estimate corresponds to one calendar year between 2009 and 2019. The solid vertical line marks the start of Medicaid expansion in January 2014. Outcomes are: (a) an indicator for any health insurance coverage at the time of the survey; (b) an indicator for Medicaid coverage at the time of the survey; and (c) an indicator for private health insurance coverage at the time of the survey. Specifications control for respondent's race and ethnicity, age, education, percent FPL bin, year of survey, and county of residence or Public Use Microdata Area (PUMA). Standard errors are clustered by county of residence or PUMA. Data from the American Community Survey (U.S. Census Bureau, 2009–2019), accessed via IPUMS USA (Ruggles et al., 2024). $^{*}p < 0.1$ $^{**}p < 0.05$ $^{***}p < 0.01$

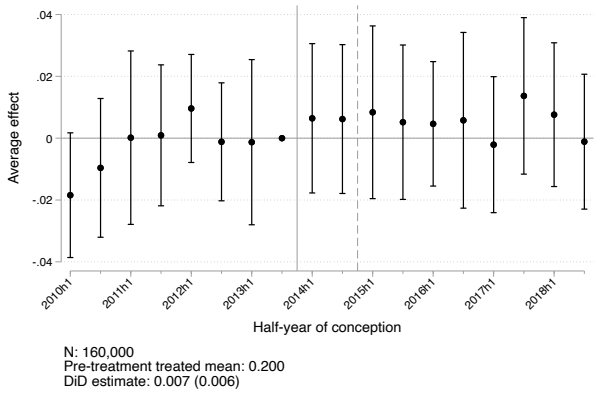
Figure 3: Effect of Preconception Medicaid Coverage on Care Receipt and Maternal Health during Pregnancy



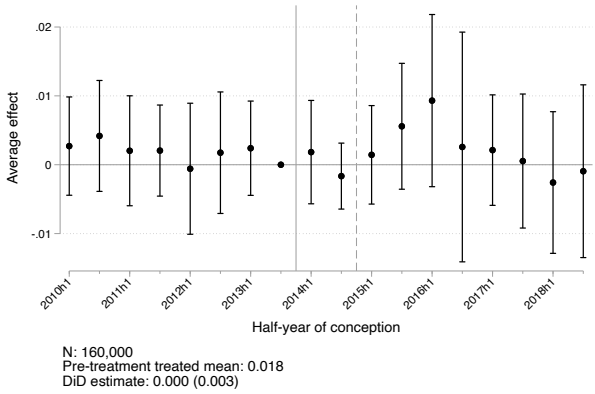
(a) Received adequate prenatal care



(b) Screened for Sexually Transmitted Infection



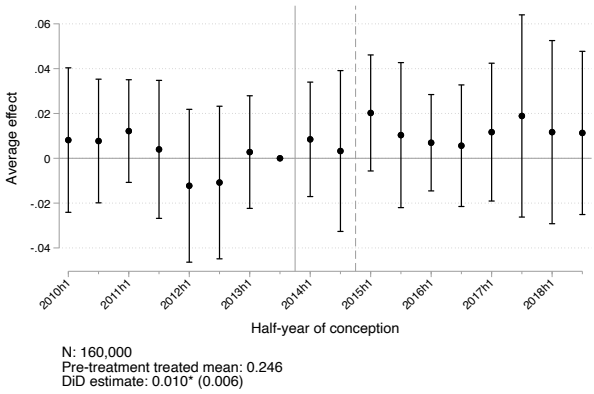
(c) Any pregnancy complication



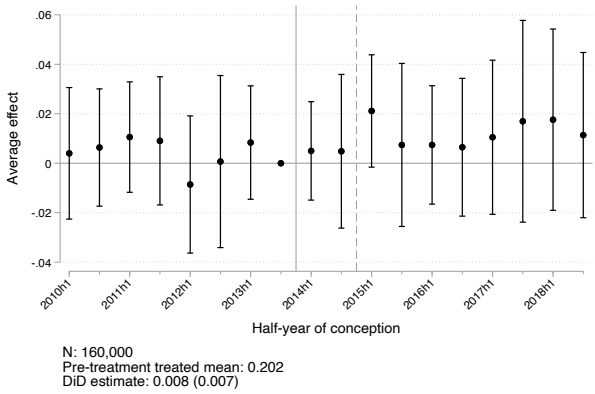
(d) Consultation for high-risk pregnancy

Note: These figures report event-study coefficients and 95% confidence intervals comparing care receipt and maternal health outcomes for the treatment and control groups. See Figure 1 for details on the sample and plot layout. Outcomes are: (a) adequate prenatal care (Kotelchuck index); (b) STI screening; (c) any pregnancy diagnosis (STI, gestational diabetes, gestational hypertension, or eclampsia); and (d) high-risk pregnancy consultation. The sample size for panel (a) is smaller because of missing inputs for the Kotelchuck index calculation. Specifications match Figure 1. Standard errors are clustered by maternal county of residence. Sample sizes are rounded to the nearest 1,000 per Census Bureau rules. Results approved for release by the U.S. Census Bureau (CBDRB-FY26-CES018-001; CBDRB-FY26-0081). $^{*}p < 0.1$ $^{**}p < 0.05$ $^{***}p < 0.01$

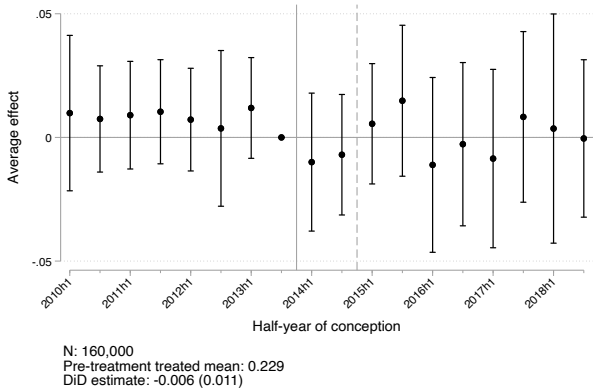
Figure 4: Effect of Preconception Medicaid Coverage on Maternal and Infant Health During Labor and Delivery



(a) Poor infant health outcome



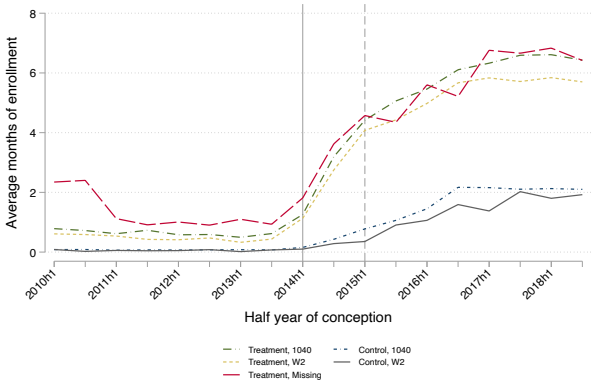
(b) Severely poor infant health outcome



(c) Maternal morbidity

Note: These figures report event-study coefficients and 95% confidence intervals comparing infant and maternal health outcomes for the treatment and control groups. See Figure 1 for sample details and plot layout. Outcomes are: (a) poor infant health (any of the following: low birthweight (<2500g), preterm birth (<37 weeks), 1-minute APGAR <7, serious neurological dysfunction, NICU admission, assisted ventilation, surfactant therapy, neonatal sepsis antibiotics, or transfer within 24 hours); (b) very poor infant health (same as (a), but replacing low birthweight and preterm birth with very low birthweight (<1500g) and very preterm birth (<34 weeks)); (c) any maternal morbidity (any of the following: steroids or antibiotics during labor, chorioamnionitis, transfusion, third- or fourth-degree laceration, ruptured uterus, unplanned hysterectomy, ICU admission, or unplanned procedure). See Figure 1 for additional information on the specification. Standard errors are clustered by maternal county of residence. Sample sizes are rounded to the nearest 1,000 per Census Bureau rules. Results approved for release by the U.S. Census Bureau (CBDRB-FY26-CES018-001; CBDRB-FY26-0081). $^{*}p < 0.1$ $^{**}p < 0.05$ $^{***}p < 0.01$

Figure 5: Enrollment Behavior of Mothers with Different Income Sources



(a) Number of enrolled months in preconception year



(b) Enrollment in first month of pregnancy

Note: These figures show Medicaid enrollment outcomes averaged within conception cohorts by income source and treatment assignment. See Figure 1 for sample details and plot layout. Outcomes are: (a) months of Medicaid enrollment during the preconception year and (b) an indicator for Medicaid enrollment in the first month of pregnancy. Results approved for release by the U.S. Census Bureau (CBDRB-FY26-CES018-001; CBDRB-FY26-0081).

Table 1: Preconception Care Utilization Among Women Continuously Enrolled in Medicaid

Outcome	Proportion	Mean days before pregnancy
Any claim	0.86	289
General office visits	0.71	255
Preventive care or counseling, procreative management	0.36	200
Screening for or management of chronic conditions	0.46	216
Screening for or prevention or treatment of STIs	0.41	206
Screening for or treatment of substance use disorders or smoking	0.06	227
Screening for or treatment of depression	0.09	212
Immunity screening or vaccination	0.19	194
Blood and genetic tests	0.48	213
Vitamins and folic acid	0.07	189
Sample size	11,944	Varies

Note: The sample consists of women aged 27 to 44 who had a first-time, California Medicaid–funded birth between 2017 and 2019 and were continuously enrolled throughout the preconception year, primarily under the Expansion Adult eligibility category. For each category, "Proportion" is the share of these women with at least one qualifying claim of the indicated type during the preconception year. "Mean days" is the average number of days before pregnancy onset at which the first qualifying claim occurred, computed only among women with a qualifying claim.

Table 2: Means of Maternal and Birth Characteristics for Selected Sample

	Treatment	Control
Age		
27–29 years old	0.49	0.42
	(0.50)	(0.49)
30–34 years old	0.36	0.42
	(0.48)	(0.49)
35–39 years old	0.12	0.14
	(0.33)	(0.34)
40–44 years old	0.03	0.03
	(0.17)	(0.16)
Race and ethnicity		
Non-Hispanic White	0.41	0.46
	(0.49)	(0.50)
Non-Hispanic Black	0.10	0.06
	(0.30)	(0.23)
Non-Hispanic Asian	0.04	0.06
	(0.20)	(0.24)
Other race	0.09	0.08
	(0.29)	(0.28)
Hispanic	0.37	0.36
	(0.48)	(0.48)
Missing race	0.03	0.03
	(0.18)	(0.18)
Education		
Less than high school	0.05	0.01
	(0.21)	(0.09)
High school	0.25	0.15
	(0.43)	(0.36)
Some college	0.41	0.37
	(0.49)	(0.48)
College or more	0.25	0.43
	(0.43)	(0.49)
Missing education	0.05	0.05
	(0.21)	(0.21)
Sample size	89,000	71,000

Note: The sample includes first-time, live, singleton births to U.S.-born California residents 27-44 years of age who were not receiving SSI in the preconception year, with conception occurring between January 2010 and December 2018. Sample sizes are rounded to the nearest 1000 per Census Bureau rules. All results were approved for release by the U.S. Census Bureau, authorization numbers CBDRB-FY26-CES018-001 and CBDRB-FY26-0081.

ONLINE APPENDIX

Manuscript Title: Preconception Medicaid and Maternal and Infant Health: Evidence from Linked Administrative Data

Author Names: Genna Campain, Sarah Miller, Petra Persson, Maya Rossin-Slater, Laura R. Wherry, and Katlyn King

A Additional Details on Medicaid Eligibility Determination

MAGI Rules. For all eligibility groups subject to the Modified Adjusted Gross Income (MAGI) rules introduced by the ACA, Medicaid eligibility is determined by whether household income as a proportion of the Federal Poverty Level (FPL) falls below the relevant cutoff for one's household size.[28] We identify low-income women and determine treatment status by constructing a measure of household income as a proportion of the FPL for the corresponding year.

Income Sources and Filing Status. Our primary data source is Form 1040 from the IRS. However, because some of the women who gained access to Medicaid during the expansion may have incomes below the filing threshold, we also include women with income data from Form W-2, as well as those with no income data.[29] We observe Forms 1040 and W-2 for our full analysis period, from 2009 through 2018.[30] We expect women with Form 1040 data to be those with incomes above the filing threshold, or who filed for other reasons — for example, to receive tax refunds or credits or because they were self-employed with earnings above $400 (Internal Revenue Service, n.d.). We have Form 1040 information for approximately 77% of the women in our analysis sample. Women with only Form W-2 data are likely employed women with incomes below the filing threshold, while women with no income data are likely not employed, or are self-employed with net earnings below the $400 filing requirement (Internal Revenue Service, n.d.). Some women in both groups may also have been required to file but did not. Women with only Form W-2 data make up around 17% of the analysis sample, while women with no income data make up around 6%.

Additional Sources of Measurement Error. We expect our Medicaid eligibility determination to be most accurate for women with Form 1040 data, as the MAGI methodology used to determine Medicaid eligibility largely follows the federal definition of Adjusted Gross Income (AGI) and household size (Turner, 2018). The few cases where discrepancies arise are unlikely to affect our results given our focus on non-elderly, low-income women with no existing children. While MAGI includes some income sources not captured in AGI — foreign income, tax-exempt interest, and non-taxable Social Security benefits — we would expect these to be uncommon among our sample.

As discussed in the Results section, our Medicaid eligibility determination may have more error for women without Form 1040 data, as we are missing non-labor income sources, and cannot observe the presence or earnings of spouses or other dependents in our calculation of household size and income. However, as we show in Appendix Figures A1–A3, excluding women without 1040 data from our analysis does not appear to substantively affect our results.

One final form of error affects all income sources: Medicaid eligibility is technically determined at the monthly level, while our income data are aggregated annually.[31] For individuals with volatile month-to-month income, which is more prevalent among low-income households (Bauer et al., n.d.),

[28] Eligibility groups subject to MAGI rules include expansion adults, pregnant women, parents and caretaker relatives, and children, as well as some more limited categories such as limited scope Medicaid and family planning. For groups not subject to MAGI rules, Medicaid eligibility has both income and asset limits (Turner, 2018).

[29] In 2010, the filing threshold was $9,350 for single filers and $18,700 for joint filers. In 2018, it was $12,000 for single filers and $24,000 for joint filers (Tax Policy Center, n.d.; Congressional Research Service, n.d.).

[30] Form 1040 data are reported at the tax-unit level, so for women who filed jointly we observe the couple's combined income rather than the woman's own income. Form W-2 data are reported at the individual level.

[31] 42 C.F.R. § 435.603(h)(1)

eligibility status may change throughout the year in ways our annual measure does not capture. This limitation is common to studies that determine Medicaid eligibility using annual income (e.g. Wyse and Meyer, 2025; Miller et al., 2021) and is largely unavoidable, as most surveys and administrative data sources do not provide more granular income measures.

B Additional Details on Medicaid Claims Analysis

Sample Construction Our Medicaid claims analysis draws on the Transformed Medicaid Statistical Information System (T-MSIS) Analytic Files (TAF) stored at Stanford University's Center for Population Health Sciences. We include information from the Inpatient (IP), Other Services (OT), and Pharmacy (RX) files for 2016–2019. Because our focus is preconception care, we restrict attention to women aged 27 to 44 who have a California Medicaid-funded birth between 2017 and 2019 and for whom we observe the entire preconception year.[32] Since the conception date is not readily available in claims data, we estimate the start of pregnancy as 280 days before the birth and the start of the preconception year as 645 days before the birth (280 days of pregnancy plus 365 days for a full year); the earliest births in our sample therefore occur in October 2017. We further restrict the sample to women continuously enrolled in California Medicaid throughout their preconception year, since our interest is in care utilization among women who take up Medicaid coverage once they become eligible. Finally, to approximate the first-birth restriction in our main sample, we keep each woman's first birth within the sample period, retain women whose preconception-year eligibility is primarily through an ACA Expansion Adult pathway, and keep only those with at least one outpatient claim for a "consultation for a first-time pregnancy."[33] Our final sample contains 11,944 women.

Outcome Definitions and Construction We then construct a variety of measures of overall care receipt during the preconception year, along with receipt of specific types of care that may influence downstream infant and maternal health. The first outcome is an indicator for whether a woman has any inpatient, outpatient, or pharmacy claim during the preconception year. Because our sample includes only continuously enrolled women, this measure reflects the share of covered women who use their coverage at all during the year.

The next two outcomes are indicators for having any general office visit and for having any office visit specifically related to preventive care or counseling, or procreative management. Together these capture care used for preventive purposes or to address specific medical complaints treatable in an office setting.

Our third set of outcomes captures care related to specific medical conditions: chronic conditions (diabetes, hypertension, hypercholesterolemia, and overweight and obesity), STIs (chlamydia, gonorrhea, syphilis, HIV, and hepatitis B and C), substance use disorders (opioids and alcohol) and smoking, and depression. Each is an indicator equal to one if the woman has an outpatient or pharmacy claim related to the screening, prevention, management, or treatment of the condition of interest.

Our final set of outcomes captures preventive or diagnostic care reasonably related to well-woman or preconception care. These are indicators for an outpatient or pharmacy claim related to a recommended immunity screening or vaccination (for varicella, MMR, Tdap, hepatitis B, influenza, and HPV); an outpatient claim related to blood or genetic testing; and a pharmacy claim for a prenatal vitamin or folic acid .[34]

[32] We follow Approach 4 from Auty et al. (2024) to identify live births. The 19 IDC-10 codes used in this approach are listed in Table B1.

[33] Includes ICD-10 codes Z34.00, Z34.01, Z34.02, and Z34.03.

[34] During our study period, women enrolled in Medi-Cal who were seeking to become pregnant likely could obtain folic acid—and potentially prenatal vitamins—through their coverage. Folic acid appears on Medi-Cal's covered OTC drug list without a pregnancy-related restriction. Prenatal vitamin coverage is less certain: although Medi-Cal's *current* contract drug list restricts prenatal vitamins to pregnant or lactating women (California Department of Health Care Services, 2026c), the study-period managed care plan formularies we reviewed cover them with no such restriction (Molina Healthcare of California, 2017; San Francisco Health Plan, 2016).

In constructing our outcome variables, we first identify the relevant ICD-10 diagnosis codes and CPT and HCPCS procedure codes to use with the OT files. We start from the Medi-Cal Preventive Services Provider Manual, which lists the preventive services covered by the California Medicaid program; from this source we obtain codes related to office and preventive care visits, diabetes screenings, medical nutrition therapy, behavioral counseling for obesity, STI screenings, tobacco and alcohol misuse screenings, and depression screenings. Because many Medi-Cal enrollees are in managed care plans that may cover a different set of codes or services, and because not all of the services we are interested in are considered preventive, we then expand our search to other sources, including documents from the National Committee for Quality Assurance (NCQA), the Centers for Medicare and Medicaid Services (CMS), the American Academy of Family Physicians (AAFP), the American Medical Association (AMA), the American College of Obstetricians and Gynecologists (ACOG), and other published papers. Using these additional sources, we compile a list of relevant codes for each outcome. As a final step, we check each code definition and conduct an additional search for relevant codes using the American Academy of Professional Coders (AAPC) Codify product.

We then identify relevant pharmaceuticals from several data sources to use with the RX file. For outcomes related to specific medical conditions, we rely primarily on clinical guidelines for treating the condition, prioritizing guidelines available during the years our data cover (2016–2019). We obtain guidelines for most of the conditions we consider, including hypertension, diabetes, hypercholesterolemia, depression, substance use, and alcohol and tobacco misuse. When guidelines are not readily available, we instead rely on published studies of how the condition is treated in claims data, as we do for the sexually transmitted infections (chlamydia, gonorrhea, syphilis, HIV, and hepatitis B and C). For outcomes related to general care—vaccination and folic acid and vitamin supplementation—we rely primarily on the relevant 4- or 5-digit ATC codes, supplemented with a list of prenatal vitamin products compiled from state Medicaid formularies.

Because Medicaid claims contain only NDC codes, we translate our list of drug names and 4- and 5-digit ATC codes into product-level NDCs. We use RxNav for this, as it provides a comprehensive list of the active and obsolete NDCs on the US market. Our drug names and our 4- and 5-digit ATC categories sit at different levels of the ATC hierarchy, so we use a separate search process for each. For the 4- and 5-digit ATC codes, we directly pull every drug product in the relevant ATC category and match each product to its active and obsolete NDCs.

For the individual drug names, we begin by building a master list of every ingredient that appears in these drugs, whether alone or as part of a combination product. We take this ingredient-level approach for two reasons. First, many of the clinical guidelines we reference list only single-ingredient formulations, even when combination drugs are commonly used or recommended in the United States. Second, even when a combination drug appears in a recommendation and has a designated 7-digit ATC code, its RxNav entry is not always reachable through that code, because RxNav's coverage of 7-digit ATC codes for combination drugs is incomplete. Working from ingredients lets us recover the combination drugs that these two gaps would otherwise miss. We match each ingredient on the master list to its corresponding 7-digit ATC code and use the RxNav API to pull all single-ingredient or combination drug products that contain that ingredient. We then drop any single-ingredient product that is not specifically recommended, and any combination-drug product that is both not specifically recommended and contains at least one non-listed ingredient. The resulting set of drug products contains the recommended single-ingredient drugs, the recommended combination drugs, and any combination drugs composed entirely of listed ingredients. Finally, we pull all of the active and obsolete NDCs attached to these products. Our final dataset contains all of the active and obsolete NDCs for all of the drugs products relevant to our outcomes of interest.

Once we have assembled the relevant ICD-10, HCPCS, and CPT codes, along with the NDCs, for each outcome, we use them to identify qualifying outpatient and pharmacy claims.[35] As noted above,

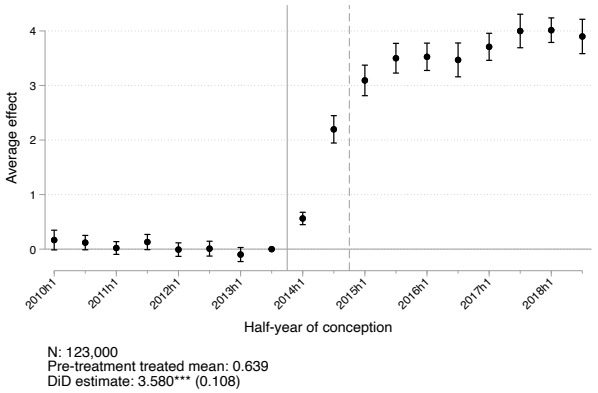
[35]Table B2 lists the ICD-10, HCPCS, and CPT codes used to define each outcome. Because our data contain thousands of

we define the preconception year as the window beginning 645 days and ending 280 days before the birth, and we include any claim falling within it. For each woman, we flag any claim containing one of our outcome codes and record its reported date of service. For most outcomes, a claim qualifies if it contains a relevant service code (ICD-10, HCPCS, or CPT) or NDC. For STI- and depression-related outcomes, however, we count a pharmacy claim only if it occurs within 30 days of a relevant diagnosis. Many medications used to treat these conditions are also prescribed for other indications, and this restriction keeps us from counting those unrelated prescriptions. For each outcome, we then create an indicator equal to one if the woman has at least one qualifying claim during the preconception year, and we compute the number of days before pregnancy at which her earliest qualifying claim occurred. We examine the timing of this first qualifying claim to confirm that our utilization results are not driven by the mis-classification of pregnancy-related claims as preconception claims. The final results report, for each outcome, the proportion of women in our sample with at least one qualifying preconception claim and the average number of days before pregnancy at which the first claim occurred.

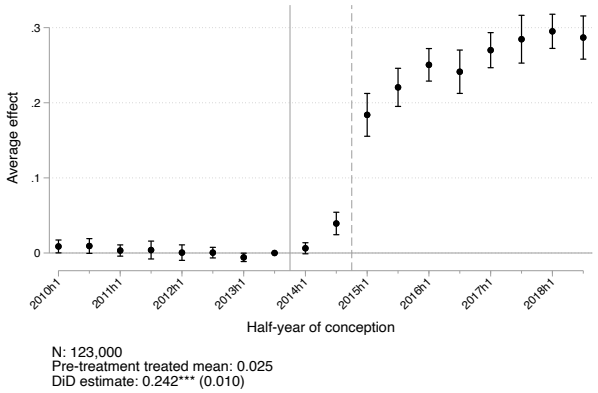
C Appendix Figures and Tables

relevant NDCs, we report pharmaceutical products by their 7-character ATC codes instead.

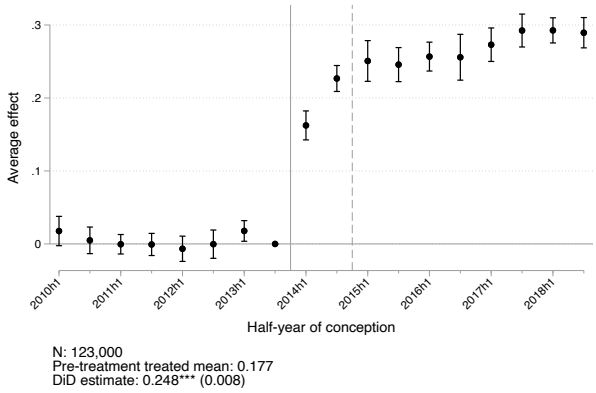
Figure A1: Effect of Medicaid Expansion on Preconception and Pregnancy Medicaid Enrollment (Only Women with Form 1040 Data)



(a) Number of enrolled months in preconception year



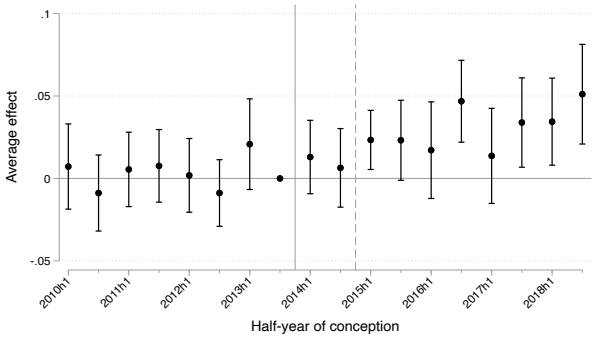
(b) Continuous enrollment in preconception year



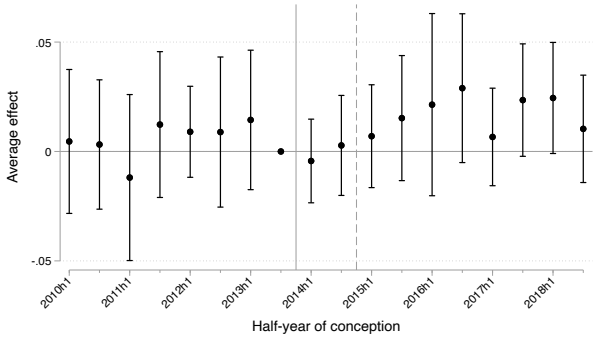
(c) Enrollment in first month of pregnancy

Note: These figures report event-study coefficients and 95% confidence intervals comparing Medicaid enrollment outcomes for women with preconception incomes below 150 percent of the federal poverty level (FPL) to women with preconception incomes between 200 and 300 percent FPL. The sample includes first-time, live, singleton births to U.S.-born California residents over 27 years of age who were not receiving SSI in the preconception year, restricted to only women with income and family size information from IRS Form 1040. Each estimate corresponds to a half-year conception cohort, defined using the predicted conception date from the birth record. The solid vertical line marks the start of Medicaid expansion in January 2014; the dashed vertical line marks January 2015, when women in the treatment group first became eligible for a full year of preconception coverage. Cohorts to the left of the solid line were untreated, cohorts to the right of the dashed line were fully treated, and cohorts in between were partially treated. Each figure reports the sample size, the pre-expansion treatment-group mean, and a difference-in-differences estimate that accounts for partial treatment, with its standard error in parentheses. Outcomes are: (a) months of Medicaid enrollment during the preconception year; (b) an indicator for twelve months of preconception Medicaid enrollment; and (c) an indicator for enrollment in the first month of pregnancy. Specifications control for maternal race and ethnicity, age, education, preconception FPL bin, year and month of conception, and county of residence. Standard errors are clustered by maternal county of residence. Sample sizes are rounded to the nearest 1,000 per Census Bureau rules. Results approved for release by the U.S. Census Bureau (CBDRB-FY26-CES018-001; CBDRB-FY26-0081). $^{*}p < 0.1$ $^{**}p < 0.05$ $^{***}p < 0.01$

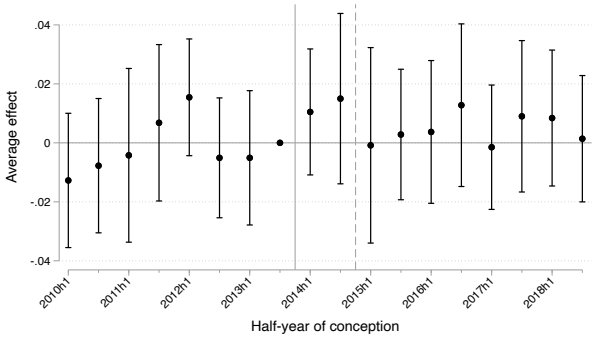
Figure A2: Effect of Preconception Medicaid Coverage on Care Receipt and Maternal Health during Pregnancy (Only Women with Form 1040 Data)



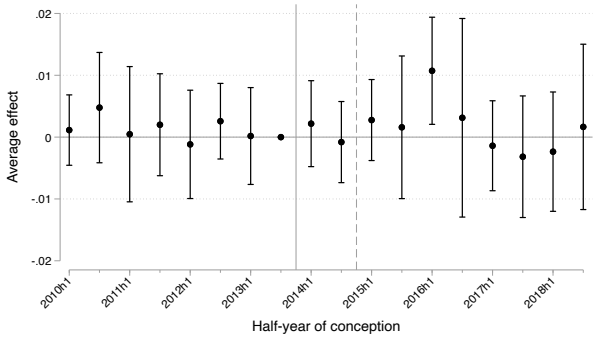
(a) Received adequate prenatal care



(b) Screened for Sexually Transmitted Infection



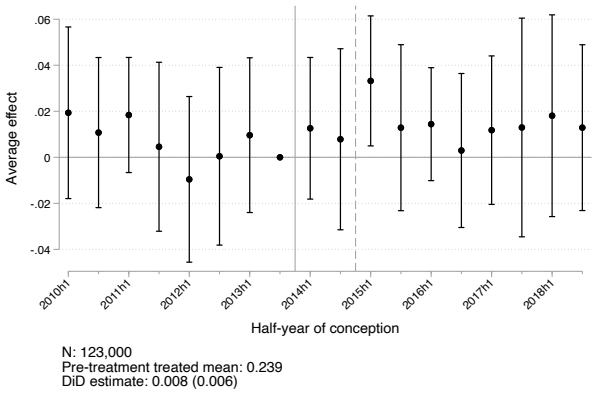
(c) Any pregnancy complication



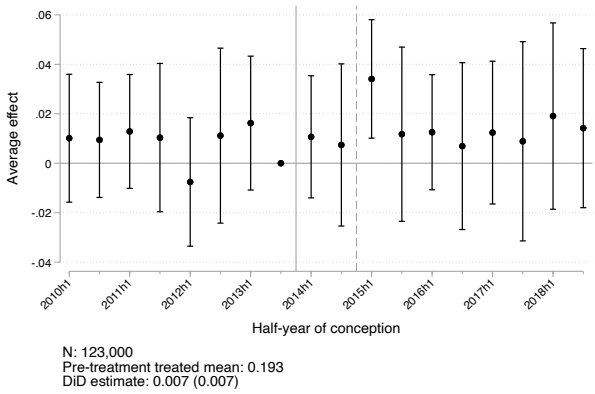
(d) Consultation for high-risk pregnancy

Note: These figures report event-study coefficients and 95% confidence intervals comparing care receipt and maternal health outcomes for the treatment and control groups. See Figure A1 for details on the sample and plot layout. Outcomes are: (a) adequate prenatal care (Kotelchuck index); (b) STI screening; (c) any pregnancy diagnosis (STI, gestational diabetes, gestational hypertension, or eclampsia); and (d) high-risk pregnancy consultation. Specifications match Figure A1. Standard errors are clustered by maternal county of residence. Sample sizes are rounded to the nearest 1,000 per Census Bureau rules. Results approved for release by the U.S. Census Bureau (CBDRB-FY26-CES018-001; CBDRB-FY26-0081). $^{*}p < 0.1$ $^{**}p < 0.05$ $^{***}p < 0.01$

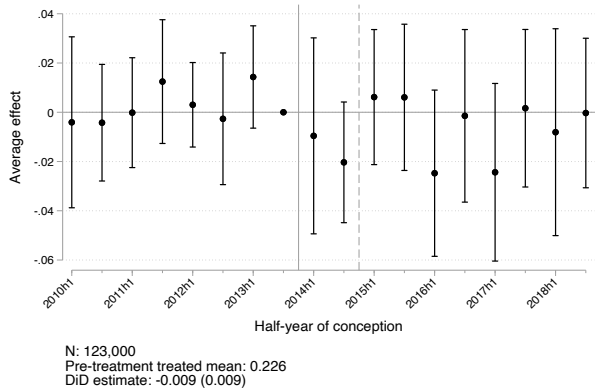
Figure A3: Effect of Preconception Medicaid Coverage on Maternal and Infant Health During Labor and Delivery (Only Women with Form 1040 Data)



(a) Poor infant health outcome



(b) Severely poor infant health outcome



(c) Maternal morbidity

Note: These figures report event-study coefficients and 95% confidence intervals comparing infant and maternal health outcomes for the treatment and control groups. See Figure A1 for sample details and plot layout. Outcomes are: (a) poor infant health (any of the following: low birthweight (<2500g), preterm birth (<37 weeks), birthweight <1500g, gestation <34 weeks, 1-minute APGAR <7, serious neurological dysfunction, NICU admission, assisted ventilation, surfactant therapy, neonatal sepsis antibiotics, or transfer within 24 hours); (b) very poor infant health (same as (a), but replacing low birthweight and preterm birth with very low birthweight (<1500g) and very preterm birth (<34 weeks)); (c) any maternal morbidity (any of the following: steroids or antibiotics during labor, chorioamnionitis, transfusion, third- or fourth-degree laceration, ruptured uterus, unplanned hysterectomy, ICU admission, or unplanned procedure). See Figure A1 for additional information on the specification. Standard errors are clustered by maternal county of residence. Sample sizes are rounded to the nearest 1,000 per Census Bureau rules. Results approved for release by the U.S. Census Bureau (CBDRB-FY26-CES018-001; CBDRB-FY26-0081). $^{*}p < 0.1$ $^{**}p < 0.05$ $^{***}p < 0.01$

Table B1: ICD-10 Codes Used to Identify Live Births

Code	Definition
O80	Encounter for full-term uncomplicated delivery
O82	Encounter for cesarean delivery without indication
Z37.0	Single live birth
Z37.2	Twins, both liveborn
Z37.3	Twins, one liveborn and one stillborn
Z37.50	Multiple births, unspecified, all liveborn
Z37.51	Triplets, all liveborn
Z37.52	Quadruplets, all liveborn
Z37.53	Quintuplets, all liveborn
Z37.54	Sextuplets, all liveborn
Z37.59	Other multiple births, all liveborn
Z37.60	Multiple births, unspecified, some liveborn
Z37.61	Triplets, some liveborn
Z37.62	Quadruplets, some liveborn
Z37.63	Quintuplets, some liveborn
Z37.64	Sextuplets, some liveborn
Z37.69	Other multiple births, some liveborn
Z37.9	Outcome of delivery, unspecified
Z39.0	Encounter for care and examination of mother immediately after delivery

Note: Table adapted from Auty et al. (2024), Methodological Appendix Table 3, "Codes used to identify live births in Approach 4 (Approach Excluding Infant Claims)".

Table B2: Procedure, Diagnosis, and Pharmaceutical Codes Used to Identify Preconception Care Services in Medicaid Claims

Outcome	Code type	Codes
General office visits[a]	CPT/HCPCS	99202–99205, 99211–99215, 99242–99245
	Other	All codes for preventive care or counseling, or procreative care (listed below)
Preventive care or counseling, procreative management[b]	CPT/HCPCS	99385–99387, 99395–99397, 99401–99404, 99411, 99412, 99429
	ICD-10-CM	Z00, Z01.4, Z31
Screening for or management of chronic conditions[c]	CPT/HCPCS	80047, 80048, 80050, 80053, 80061, 82465, 82947, 82948, 82950, 82951, 83036, 83037, 83700, 83701, 83704, 83718, 83721, 84478, 93784, 93786, 93788, 93790, 95249–95251, 97802–97804, 98960–98962, 99091, 99424–99427, 99453, 99454, 99457, 99458, 99473, 99474, 99487, 99489, 99490, 99491, G0108, G0109, G0270, G0271, G0447, G0473, S9449, S9452, S9470
	ICD-10-CM	Z13.1, Z13.220, Z13.6, Z71.3, Z71.82
	Pharmaceuticals (ATC)	*Antihypertensives:* C03AA03, C03BA04, C03BA11, C08CA01, C08CA02, C08CA03, C08CA04, C08CA05, C08CA07, C08DA01, C08DB01, C09AA01, C09AA02, C09AA03, C09AA04, C09AA05, C09AA06, C09AA07, C09AA09, C09AA13, C09BA01, C09BA02, C09BA03, C09BA06, C09BA07, C09BA09, C09BA13, C09BB04, C09BB13, C09CA01, C09CA02, C09CA03, C09CA04, C09CA06, C09CA07, C09CA08, C09CA09, C09DA01, C09DA02, C09DA03, C09DA04, C09DA06, C09DA07, C09DA08, C09DA09, C09DB01, C09DB02, C09DB04, C09DX01, C09DX03, C09DX10
		Non-insulin glucose-lowering: A10BA02, A10BB01, A10BB07, A10BB12, A10BD02, A10BD03, A10BD04, A10BD05, A10BD06, A10BD07, A10BD09, A10BD10, A10BD11, A10BD13, A10BD15, A10BD16, A10BD19, A10BD20, A10BD21, A10BD23, A10BD24, A10BD25, A10BD27, A10BG02, A10BG03, A10BH01, A10BH03, A10BH04, A10BH05, A10BJ01, A10BJ02, A10BJ04, A10BJ05, A10BJ06, A10BK01, A10BK02, A10BK03, A10BK04
		Insulins: A10AB01, A10AB04, A10AB05, A10AB06, A10AC01, A10AC04, A10AD01, A10AD04, A10AD05, A10AE01, A10AE04, A10AE05, A10AE06, A10AE54, A10AE56, A10AF01
		Lipid-lowering: C10AA01, C10AA02, C10AA03, C10AA04, C10AA05, C10AA07, C10AA08, C10AX09, C10AX13, C10AX14, C10BA02, C10BA05, C10BA06, C10BX03
Screening for or prevention or treatment of STIs[d]	CPT/HCPCS	86592, 86593, 86689, 86701, 86703, 86704–86706, 86780, 86803, 86804, 87110, 87270, 87320, 87340, 87341, 87389, 87390, 87490–87492, 87494, 87534, 87535, 87590–87592, 87800, 87806, 87810, 87850, 0064U, 0065U, 0210U, 0402U, 0455U, G0011–G0013, G0432, G0433, G0435, G0472, G0475, G0499, J0456, J0558, J0561, J0696–J0698, J0715, J0738, J0739, J0744, J0750–J0752, J0799, J1580, J2510, J2540

Continued on next page

Table B2 continued

Outcome	Code type	Codes
	ICD-10-CM	A51–A53*, A54*, A55*, A56*, B16*, B17–B19*, B20–B24*, Z11.3, Z11.4, Z29.81
	Pharmaceuticals (ATC)	*HIV antiretrovirals:* J05AE01, J05AE02, J05AE03, J05AE04, J05AE05, J05AE07, J05AE08, J05AE09, J05AE10, J05AF01, J05AF02, J05AF03, J05AF04, J05AF05, J05AF06, J05AF07, J05AF09, J05AF13, J05AG01, J05AG02, J05AG03, J05AG04, J05AG05, J05AG06, J05AJ01, J05AJ03, J05AR01, J05AR02, J05AR03, J05AR04, J05AR05, J05AR06, J05AR08, J05AR09, J05AR10, J05AR11, J05AR12, J05AR13, J05AR14, J05AR15, J05AR17, J05AR18, J05AR19, J05AR20, J05AR21, J05AR22, J05AR24, J05AR25, J05AX07, J05AX09, J05AX23, V03AX03
		Hepatitis B and C, syphilis, gonorrhea, and chlamydia treatment: J01AA02, J01CA04, J01CE08, J01DC01, J01DD01, J01DD04, J01DD07, J01DD08, J01FA10, J01GB03, J01MA12, J05AF05, J05AF07, J05AF08, J05AF10, J05AF11, J05AF13, J05AP01, J05AP05†, J05AP07†, J05AP08, J05AP51, J05AP52†, J05AP53†, J05AP54, J05AP55, J05AP56, J05AP57, L03AB11
Screening for or treatment of substance use disorders or smoking[e]	CPT/HCPCS	99406, 99407, 99408, 99409, G0396, G0442, G0443, G9902, G9903, G9906, H0001, H0002, H0003, H0004, H0005–H0016, H0020, H0022, H0047, H0049, H0050, H2035, H2036, J0570–J0575, J2315, Q9991, Q9992, T1006, T1012
	ICD-10-CM	Z71.41, Z71.51, Z71.6
	Pharmaceuticals (ATC)	N06AX12, N07BA01, N07BA03, N07BB01, N07BB03, N07BB04, N07BC01, N07BC02, N07BC51
Screening for or treatment of depression[f]	CPT/HCPCS	90791, 90792, 90832–90834, 90836–90838, 96127, G0444, G8431, G8510, H0004
	ICD-10-CM	F32*, F33*, F34.1*, Z13.31, Z13.32
	Pharmaceuticals (ATC)	N04BD01, N06AA01, N06AA02, N06AA06, N06AA09, N06AA10, N06AA11, N06AA12, N06AA21, N06AB03, N06AB04, N06AB05, N06AB06, N06AB08, N06AB10, N06AF01, N06AF03, N06AF04, N06AX05, N06AX06, N06AX11, N06AX12, N06AX16, N06AX21, N06AX23, N06AX24, N06AX28
Immunity screening or vaccination[g]	CPT/HCPCS	86648, 86704, 86706, 86735, 86762, 86765, 86774, 86787, 90471, 90472, 90649–90651, 90653, 90655–90658, 90660–90662, 90672–90674, 90682, 90686–90689, 90695, 90707, 90715, 90716, 90739, 90740, 90746, 90747, 90756, G0008, G0010
	ICD-10-CM	Z23
	Pharmaceuticals (ATC)	J07AJ, J07AM, J07BB, J07BC, J07BD, J07BE, J07BJ, J07BK, J07BM
Blood and genetic tests[h]	CPT/HCPCS	81220–81224, 81243, 81244, 81257–81259, 81269, 81329, 81336, 81337, 81361–81364, 81400, 81403, 81405, 81412, 81443, 82746, 83020, 84439, 84443, 85018, 85025, 85027, 86900, 86901

Continued on next page

Table B2 continued

Outcome	Code type	Codes
Vitamins and folic acid[i]	Pharmaceuticals (ATC)	B03AD, B03BB
	Pharmaceuticals	NDCs compiled from state Medicaid and Medicaid managed care plan formularies

[*] Only used in combination with pharmaceuticals to determine whether a given treatment is related to the outcome.
[†] Withdrawn from the US market and so unavailable in RxNav; NDC information obtained from the RxList and NDC List websites.

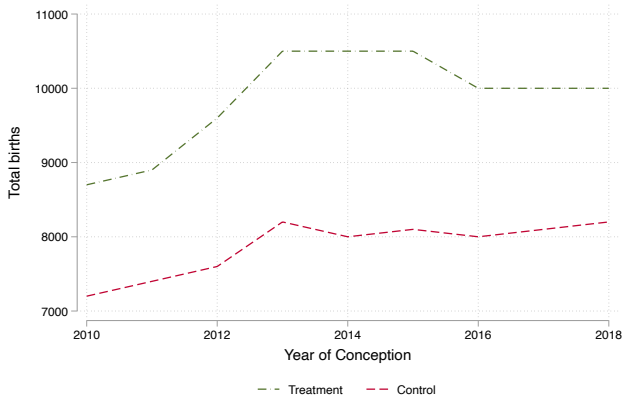
Notes: Pharmaceuticals are listed by Anatomical Therapeutic Chemical (ATC) code; the corresponding National Drug Codes (NDCs) are the products mapped to each ATC code. Five-character ATC codes (e.g., J07BB) denote ATC classes, which include all products in the class. Ranges (e.g., 99202–99205) include all codes in between. ICD-10-CM categories listed without a subcode (e.g., Z00) include all subcodes.

Abbreviations: Current Procedural Terminology (CPT); Healthcare Common Procedure Coding System (HCPCS); International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM); sexually transmitted infection (STI).

[a] *Sources:* California Department of Health Care Services (2026a).
[b] *Sources:* AAPC (2026); California Department of Health Care Services (2026a); Centers for Medicare & Medicaid Services (2026); National Committee for Quality Assurance (2019).
[c] *Sources:* AAPC (2026); American Academy of Family Physicians (2026); American Diabetes Association (2019); Andersen et al. (2024); Bond et al. (2023); Bonnesen and Schmidt (2024); California Department of Health Care Services (2026a); Carey et al. (2018); Centers for Medicare & Medicaid Services (2020); Centers for Medicare & Medicaid Services (2025); Centers for Medicare & Medicaid Services (2026); Corn et al. (2024); Golestani et al. (2025); Grundy et al. (2019); National Committee for Quality Assurance (2019); Qaseem et al. (2017); RxList (2022); Thein et al. (2020); Whelton et al. (2018).
[d] *Sources:* California Department of Health Care Services (2026a); Centers for Disease Control and Prevention (2021); Centers for Medicare & Medicaid Services (2026); Chen et al. (2023); Ferrante et al. (2022); Hao et al. (2025); Harris et al. (2020); Kumar et al. (2021); National Committee for Quality Assurance (2019); NDC List (2026a); NDC List (2026b); Parker et al. (2025); RxList (2026a); RxList (2026b); RxList (2026c); Šmit et al. (2022).
[e] *Sources:* AAPC (2026); California Department of Health Care Services (2026a); Centers for Medicare & Medicaid Services (2020); Fiore et al. (2008); Indian Health Service (2005); National Committee for Quality Assurance (2019); U.S. Department of Veterans Affairs and U.S. Department of Defense (2015).
[f] *Sources:* AAPC (2026); American Medical Association (2020); American Psychiatric Association (2010); California Department of Health Care Services (2026a); Centers for Medicare & Medicaid Services (2020); Centers for Medicare & Medicaid Services (2026); National Committee for Quality Assurance (2019); Qaseem et al. (2023).
[g] *Sources:* AAPC (2026); American College of Obstetricians and Gynecologists (2026); American Medical Association (2020); National Committee for Quality Assurance (2019).
[h] *Sources:* AAPC (2026); Health Net (2022).
[i] *Sources:* Alabama Medicaid Agency (2024); Amerigroup District of Columbia (2018); California Department of Health Care Services (2026b); CareSource (2026); Gardiner et al. (2008); Iowa Total Care (2023); Mississippi Division of Medicaid (2022); Missouri Department of Social Services, MO HealthNet Division (2023); Molina Healthcare (2021); National Institutes of Health, Office of Dietary Supplements (2026); Nevada Medicaid (2022); Oklahoma Health Care Authority (2026); Oregon Health Authority (2026); YouthCare HealthChoice Illinois (2020).

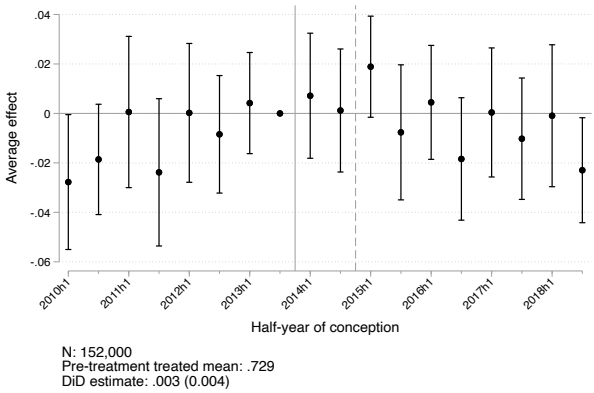
D Additional Results

Figure D1: Total Number of Births

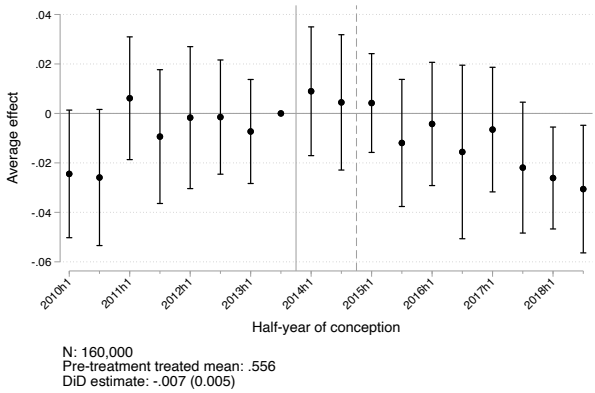


Note: The figure shows the count of births by conception-year cohort for women with preconception incomes below 150 percent FPL (treatment group) and women with preconception incomes between 200 and 300 percent FPL (control group). The sample includes first-time, live, singleton births to U.S.-born California residents over 27 years of age who were not receiving SSI in the preconception year. The counts are rounded to the nearest hundred per Census Bureau rules. Results approved for release by the U.S. Census Bureau (CBDRB-FY26-CES018-001; CBDRB-FY26-0081)

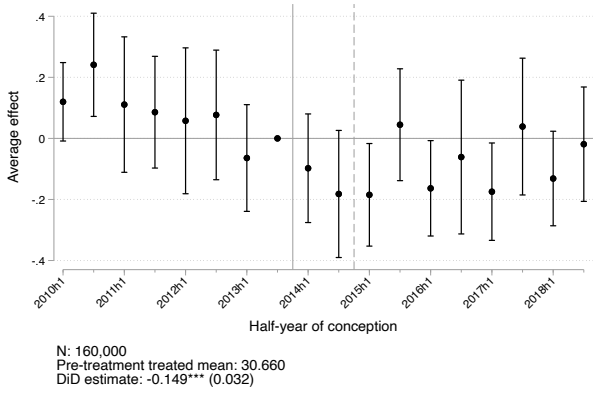
Figure D2: Effect of Preconception Medicaid Coverage on Composition of Births



(a) Non-college-educated mother



(b) Non-White or Hispanic mother



(c) Maternal Age at Delivery

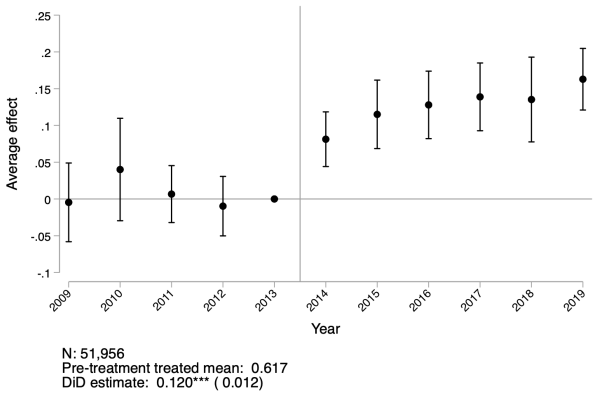
Note: These figures report event-study coefficients and 95% confidence intervals comparing maternal characteristics for women with preconception incomes below 150 percent of the federal poverty level (FPL) to women with preconception incomes between 200 and 300 percent FPL. The sample includes first-time, live, singleton births to U.S.-born California residents over 27 years of age who were not receiving SSI in the preconception year. Each estimate corresponds to a half-year conception cohort, defined using the predicted conception date from the birth record. The solid vertical line marks the start of Medicaid expansion in January 2014; the dashed vertical line marks January 2015, when women in the treatment group first became eligible for a full year of preconception coverage. Cohorts to the left of the solid line were untreated, cohorts to the right of the dashed line were fully treated, and cohorts in between were partially treated. Each figure reports the sample size, the pre-expansion treatment-group mean, and a difference-in-differences estimate that accounts for partial treatment, with its standard error in parentheses. Outcomes are: (a) an indicator for a birth to a mother without a college education; (b) an indicator for a birth to a non-White or Hispanic mother; and (c) maternal age at delivery. Specifications control for preconception FPL bin, year and month of conception, and county of residence. Standard errors are clustered by maternal county of residence. Sample sizes are rounded to the nearest 1,000 per Census Bureau rules. Results approved for release by the U.S. Census Bureau (CBDRB-FY26-CES018-001; CBDRB-FY26-0081). $^{*}p < 0.1$ $^{**}p < 0.05$ $^{***}p < 0.01$

Table D1: Means of Maternal Characteristics for Main and ACS Samples

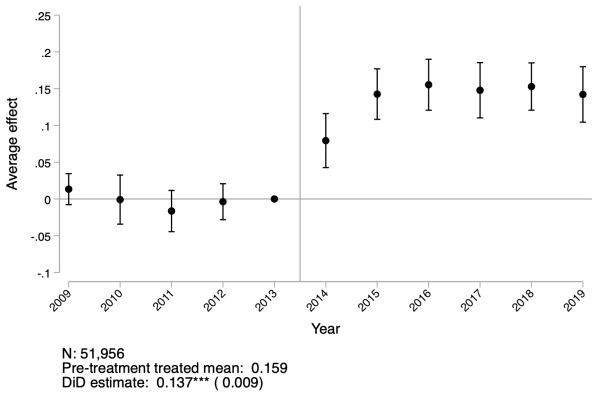
	Main Sample		ACS Sample (Age weights)	
	Treatment	Control	Treatment	Control
Age				
27–29 years old	0.49	0.42	0.50	0.43
30–34 years old	0.36	0.42	0.36	0.42
35–39 years old	0.12	0.14	0.12	0.13
40–44 years old	0.03	0.03	0.03	0.02
Race and ethnicity				
Non-Hispanic White	0.41	0.46	0.43	0.45
Non-Hispanic Black	0.10	0.06	0.09	0.08
Non-Hispanic Asian	0.04	0.06	0.09	0.08
Other race	0.09	0.08	0.05	0.04
Hispanic	0.37	0.36	0.34	0.34
Missing race	0.03	0.03		
Education				
Less than high school	0.05	0.01	0.08	0.02
High school	0.25	0.15	0.30	0.24
Some college	0.41	0.37	0.30	0.34
College or more	0.25	0.43	0.31	0.40
Missing education	0.05	0.05		
Sample size	160,000		51,956	

Note: The Main Sample column reports characteristics for conception cohorts constructed from California birth certificate records linked to federal tax data. The ACS Sample column reports characteristics for female respondents to the American Community Survey. Both samples include U.S.-born women aged 27–44 who reside in California, do not receive SSI, and have incomes of 0–150 percent of the federal poverty level (treatment group) or 200–300 percent (control group). The Main Sample includes only first births. Because the ACS does not allow us to identify women in their preconception year, the ACS Sample includes both women who have never had children and women whose children are older and no longer reside with them, resulting in a higher share of older women than in the Main Sample. To improve comparability, ACS observations are reweighted within treatment status by age bins to match the age distribution of the Main Sample. Sample sizes for the Main Sample column are rounded to the nearest 1000 per Census Bureau rules. All Main Sample results were approved for release by the U.S. Census Bureau, authorization numbers CBDRB-FY26-CES018-001 and CBDRB-FY26-0081. ACS sample data from the American Community Survey (U.S. Census Bureau, 2009–2019), accessed via IPUMS USA (Ruggles et al., 2024).

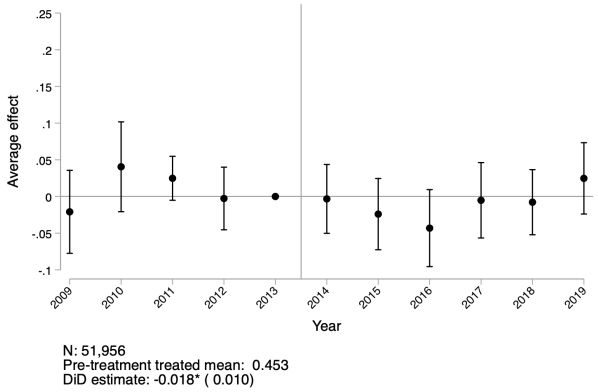
Figure D3: Effect of Medicaid Expansion on Insurance Coverage (ACS Sample, education reweighted)



(a) Any Health Insurance Coverage



(b) Medicaid Coverage



(c) Private Coverage

Note: These figures report event-study coefficients and 95% confidence intervals comparing rates of insurance coverage for women with incomes below 150 percent of the federal poverty level (FPL) to women with incomes between 200 and 300 percent FPL. The sample includes female, U.S.-born American Community Survey respondents between ages 27 and 44 who were California residents, were not receiving SSI, and were not living with any of their own children at the time of the survey, reweighted within the treatment and control groups to match the education distribution of the main birth records sample. Each estimate corresponds to one calendar year between 2009 and 2019. The solid vertical line marks the start of Medicaid expansion in January 2014. Outcomes are: (a) an indicator for any health insurance coverage at the time of the survey; (b) an indicator for Medicaid coverage at the time of the survey; and (c) an indicator for private health insurance coverage at the time of the survey. Specifications control for respondent's race and ethnicity, age, education, percent FPL bin, year of survey, and county of residence or Public Use Microdata Area (PUMA). Standard errors are clustered by county of residence or PUMA. Data from the American Community Survey (U.S. Census Bureau, 2009–2019), accessed via IPUMS USA (Ruggles et al., 2024).