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Impact of Medicaid Pregnancy Dental Benefits on Prenatal Dental Utilization and Birth Outcomes*

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Abstract

Despite elevated risks for oral health problems, more than half of pregnant women do not visit the dentist at least once during pregnancy. The Medicaid program covers more than 40% of US births and represents an important source of dental coverage with benefits that vary at the state level. We examine the effects of state-level pregnancy dental benefits using a difference-in-differences strategy and data from the 2012-2019 Pregnancy Risk Assessment and Monitoring System (PRAMS). We find that providing dental coverage to pregnant Medicaid recipients increases dental cleaning rates by 7.16 percentage points, or 29% relative to baseline. We also examine linked birth certificate data given evidence that poor oral health during pregnancy is associated with adverse pregnancy and birth outcomes. We find suggestive evidence of reductions in small for gestational age, preterm birth, and very low birthweight, though only the estimates for small for gestational age and very low birthweight are statistically significant at conventional levels. These findings underscore the importance of expanding access to preventive dental care during pregnancy as a strategy for improving long-term population health.

JEL Codes: I13, I14, I18, J13

Keywords: Medicaid, Dental care, Pregnant women, Birth outcomes

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1 Introduction

Poor oral health during pregnancy may have long term implications for the oral and overall health of expectant mothers and their children (Dye et al., 2011; Chaffee et al., 2014; Iheozor-Ejiofor et al.; Ide & Papapanou, 2013; Nasseh et al., 2017; Jeffcoat et al., 2014). Oral health problems can cause pain that interferes with eating, speaking, and overall quality of life (CDC, 2024a; Naito et al., 2006). Moreover, poor oral health has been linked to systemic health conditions including cardiovascular disease (Sanz et al., 2020; Oliveira et al., 2010), diabetes (Nasseh et al., 2017; Chee et al., 2013; Díaz-Romero et al., 2005), respiratory conditions (Manger et al., 2017), and adverse pregnancy and birth outcomes (Jeffcoat et al., 2014; Puertas et al., 2018). Despite elevated risks for oral health problems during pregnancy and the availability of effective interventions to address these issues, more than half of pregnant people do not visit the dentist at least once during pregnancy (Kranz & Estrada-Darley, 2022; Lee et al., 2022b), including more than one-third who report experiencing dental problems (Lee et al., 2022b).

Medicaid finances more than 40% of US births and therefore represents an important lever for improving maternal and infant health outcomes (KFF, 2023). States have flexibility in how they structure their programs, including whether or not to offer optional benefits including dental, vision, and hearing healthcare services, among others. While all states cover emergency dental services during pregnancy to relieve pain and infection (e.g., tooth extractions), Medicaid coverage of preventive and restorative dental services vary at the state level.

In this paper, we examine the effects of Medicaid pregnancy dental benefits using 2012-2019 data from the Pregnancy Risk Assessment Monitoring System (PRAMS). Our main analysis uses a stacked difference-in-differences approach to account for variation in policy timing and an enhanced dataset compiled via direct state data release requests. Our primary outcome is reported receipt of a dental cleaning during pregnancy. Given evidence that poor oral health is associated with adverse pregnancy and birth outcomes, we also use linked birth certificate data to examine preterm birth, small for gestational age (10th percentile), low birthweight (under 2500 grams), and very low birthweight (under 1500 grams).

We find that exposure to Medicaid dental benefits during pregnancy significantly increases dental cleaning rates by 7.16 percentage points, representing a 29.1% increase relative to the baseline rate (24.6%). Event study analyses generally do not indicate a violation of the parallel trends assumption and also suggest that positive impacts persist over time. We also control for Medicaid dental benefits for non-pregnant adults during the year before conception in a sensitivity analysis and our findings hold. In subgroup analyses, point estimates are larger among non-Hispanic Black compared to non-Hispanic white women, women with lower compared to higher pre-pregnancy risk factors, urban

compared to rural residents, and women ages 26-34 compared to 21-25 or 35 and older. However, only the difference for ages 21-25 compared with 26-34 is statistically significant.

In our analysis of birth outcomes, we find suggestive evidence of reductions in small for gestational age, preterm birth, and very low birthweight. We estimate that Medicaid pregnancy dental benefits reduce small for gestational age by 1.19 percentage points (10% reduction), preterm birth by 0.90 percentage points (8% reduction), and very low birthweight by 0.47 percentage points (28% reduction). However, only the estimates for small for gestational age and very low birthweight are statistically significant at conventional levels. We also estimate a relatively modest increase in low birthweight (0.50 percentage points or a 5% increase) that is not statistically significant. Overall, these findings are suggestive that policy-induced increases in dental care use may improve infant health.

While a substantial literature has examined the effects of Medicaid dental benefits for non-pregnant adults on dental care utilization and health outcomes (Decker & Lipton, 2015; Singhal et al., 2017; Meyerhoefer et al., 2019), comparatively fewer studies have focused specifically on pregnancy-related dental benefits. One notable quasi-experimental study from Virginia found increases in dental cleanings following implementation of comprehensive Medicaid pregnancy dental benefits (Naavaal & Harless, 2022); however, no prior research has examined impacts on birth outcomes. Our study addresses this gap by examining multi-state variation in pregnancy dental benefit policies and linking these policies not only to dental care use but also to important birth outcomes. In doing so, we contribute to broader literatures examining optional Medicaid benefits (Buchmueller et al., 2016; Abdus & Decker, 2019; Wehby et al., 2019), Medicaid coverage during pregnancy (**??**), and the longer-term intergenerational effects of maternal health interventions.

Overall, our findings provide evidence that pregnancy dental benefits induce meaningful increases in dental care use among a population with a high prevalence of oral health problems and a low rate of dental visits relative to other, non-pregnant adults. We also find suggestive evidence that dental benefits may improve birth outcomes, particularly small for gestational age and very low birthweight. While we did not find a significant reduction in disparities by race and ethnicity among Medicaid-enrolled pregnant women, these policies are likely to improve equity in dental care access given disproportionate Medicaid enrollment among adults with lower incomes and communities of color.

Beyond immediate healthcare utilization, our study also contributes to a broader discussion on the long-term benefits of preventive maternal health policies. Improved prenatal healthcare access not only enhances maternal well-being but also has lasting intergenerational effects on newborn health, potentially influencing early-life development

and future socioeconomic trajectories (East et al., 2023; Aizer & Currie, 2014; Brown et al., 2020; Liu et al., 2017). As policymakers consider future expansions or modifications to Medicaid, these findings provide actionable insights on how tailoring benefits to meet the needs of high-risk populations can yield meaningful improvements for current enrollees and future generations.

2 Background and Mechanisms

2.1 Pregnancy and Oral Health

In a national consensus statement, the Oral Health Care During Pregnancy Expert Workgroup recommended that pregnant people receive prenatal dental care, but pregnant people are less likely to visit the dentist (44%) than reproductive-age people who are not pregnant (65%).Moreover, significant disparities exist: non-Hispanic Black women had about 14% lower odds of receiving a dental cleaning during pregnancy compared to non-Hispanic White women, and Medicaid-enrolled pregnant people had roughly half the odds of dental visits compared to those with private insurance (Lee et al., 2022b).

Oral health problems are common among pregnant people with up to three-quarters affected by gum disease (CDC, 2024b). Hormone fluctuations during pregnancy increase the risk of developing gingivitis, a mild form of gum disease (Figuero et al., 2013; CDC, 2024b). If left untreated, gingivitis can progress to periodontitis, causing damage to the gums and bone that may lead to tooth loss. Pregnant people are also more susceptible to tooth decay given changes in eating and oral hygiene habits (e.g., reduced tooth brushing and flossing) (Boggess et al., 2010; Hunter & Yount, 2011). Poor oral hygiene and the presence of gum disease during early pregnancy are highly predictive of gum disease in later pregnancy (Gil-Montoya et al., 2023). Moreover, intervention studies suggest nonsurgical periodontal therapy is highly effective in resolving symptoms among pregnant people (Bobetsis et al., 2020; Kaur et al., 2014).

Recent U.S.-based observational studies have provided mixed evidence regarding the association between oral health during pregnancy and infant health outcomes such as preterm birth and low birth weight. For example, observational data suggest that maternal periodontal disease may modestly increase risks of adverse neonatal outcomes; pregnant people receiving dental cleanings have shown slightly lower odds of preterm delivery (Lee et al., 2025). However, the evidence remains correlational, and causation has not been firmly established due to confounding socioeconomic and behavioral factors.

Randomized controlled trials and systematic reviews have generally found inconclusive evidence regarding the benefits of periodontal treatment during pregnancy for improving birth outcomes. A Cochrane systematic review concluded there was no clear evidence that treating periodontal disease during pregnancy significantly reduces preterm birth

rates, although slight reductions in low-birth-weight infants were noted (Iheozor-Ejiofor et al., 2017). More recent reviews similarly report no statistically significant associations, emphasizing the need for further robust research to clarify these relationships (Montoya-Carralero et al., 2024). Thus, current evidence supports routine dental care for maternal well-being, but its impact on infant outcomes remains uncertain.

2.2 Medicaid Dental Benefits

Medicaid plays a vital role in providing health coverage to low-income populations in the United States, covering over 40% of all births nationwide (KFF, 2023). However, unlike mandatory benefits such as hospital or prenatal care, adult dental services are considered optional under federal Medicaid law. As a result, states have broad discretion in determining whether and how to offer dental coverage to adult enrollees, including pregnant people. While most states cover emergency-only dental services to address acute pain or infection, fewer provide comprehensive preventive and restorative dental care. This considerable variation across states and over time creates an opportunity to assess how the availability of Medicaid dental benefits affects service utilization among pregnant people—a population with elevated oral health risks but persistently low rates of dental care use.

Several recent studies suggest that dental insurance is associated with dental care utilization among pregnant people, although this research is generally cross-sectional (Robison et al., 2021; Lee et al., 2022a), based on self-report data (Naavaal & Harless, 2022; Robison et al., 2021; Lee et al., 2022a), and/or focuses on a single state (Naavaal & Harless, 2022). The only quasi-experimental study we are aware of examined Virginia's 2015 addition of a comprehensive Medicaid pregnancy dental benefit and found that reports of receiving a dental cleaning increased among Medicaid-enrolled pregnant people relative to privately insured pregnant people before and after the policy's implementation (Naavaal & Harless, 2022). A second recent cross-sectional study found that Medicaid-enrolled pregnant people with no Medicaid dental coverage (27%) were less likely to have a dental cleaning during pregnancy when compared to those with limited benefits (e.g., fewer than 100 services or an annual spending cap of less than $1,000) (37%) and extensive benefits (e.g., at least 100 services and an annual spending cap of at least $1,000) (45%) (Lee et al., 2022a). Across different population groups, Medicaid eligibility expansions to pregnant people and infants during their first year of life were associated with a significant reduction in permanent tooth loss on reaching young adulthood for non-Hispanic Black cohorts (Lipton et al., 2016). While this research could not disentangle the specific mechanisms for these effects, the importance of eligibility expansions targeting pregnant people and infants is suggestive of a critical role for Medicaid pregnancy benefits. These findings also provide support for the notion of longer

run oral health improvements following early life interventions.

While evidence on the impacts of Medicaid pregnancy dental benefits remains somewhat limited, there is a robust body of research on dental benefits for non-pregnant adults and their effects on dental care use and oral health (Choi, 2011; Decker & Lipton, 2015; Singhal et al., 2015, 2017; Abdus & Decker, 2019; Meyerhoefer et al., 2019; Wehby et al., 2019; Lyu et al., 2020; Singhal et al., 2021; Wehby et al., 2022; Lyu & Wehby, 2023) . Decker & Lipton (2015) found that when states provided adult dental benefits beyond emergency care, past-year dental visits increased by about 13 percentage points and exam-based measures of untreated caries declined by about 9 percentage points. The increase in dental visits represented a 34% increase relative to the average rate in states without dental benefits (38%). Meyerhoefer et al. (2019) also found that Medicaid dental benefits increased basic and major services use by 23% and 36%, respectively. Other researchers have found that Medicaid dental benefits reduce out-of-pocket spending on dental care (Abdus & Decker, 2019), reduce emergency department visits for oral conditionsSinghal et al. (2015), and that they induce a supply-side response with dentists increasing their acceptance of Medicaid patients (Buchmueller et al., 2016).

2.3 Mechanisms

The primary mechanism for an impact of Medicaid pregnancy dental benefits on dental visits is via a reduction in out-of-pocket costs for pregnant enrollees. According to surveys of dental practitioners, the average cost of a dental cleaning ranges from $90 to $120 and fillings from $100 to $1200 per tooth. In states that provide Medicaid dental benefits, enrollee cost-sharing amounts are typically small, ranging from $1 to $3, representing a substantial reduction in enrollee costs for dental services. Estimates suggest that providing Medicaid dental benefits to non-pregnant adults results in a reduction in annual out-of-pocket costs of $18.88 on average and $179.28 among those with a dental visit (Abdus & Decker, 2019). While not consistently available in PRAMS, our analysis will examine the association between pregnancy dental benefits and unmet needs for dental care due to cost to assess the likely contribution of cost reductions to our findings (results not yet available).

Moreover, changes in Medicaid pregnancy dental benefits may bring salience to the importance of oral health during pregnancy through news coverage and notifications to beneficiaries, further increasing demand for services. We investigate attention to dental visits and oral health around the time of policy implementation using google trends. Searches for "dentist" and "dental" generally increase in treatment states around the time that dental benefits are added, though we observe little pattern in searches for "low birthweight", "preterm birth" or "gestation" either alone or in combination with dental health search terms. (Results not yet available.)

Providing Medicaid dental benefits could also have supply side impacts. According to mixed economy model with private and public payers (Sloan et al., 1978), dentists would increase acceptance of Medicaid patients but reduce the quantity of services supplied in response to Medicaid dental benefits. The latter prediction is based on lower payment rates to dentists in Medicaid relative to private plans. Research examining dentist responses to Medicaid dental coverage expansions found increased employment of dental hygienists to accommodate additional demand resulting in minimal disruption to provided services.

In terms of impacts on birth outcomes, there are several possible pathways. First, poor oral health during pregnancy may increase inflammation, worsening systemic health and negatively affecting the fetal environment. Furthermore, periodontal pathogens have been identified in the placenta and amniotic fluid, allowing for the possibility of direct impacts of maternal oral infection on infant health. While rigorous studies supporting links to birth outcomes are limited, retrospective cohort studies using linked medical and dental claims suggest that treatment for periodontal disease at baseline precedes lower total medical spending for atypical pregnancy care. Further, evidence from randomized controlled trials, while mixed, provides some evidence that periodontal intervention during pregnancy may reduce preterm birth and low birthweight. While we are limited in our ability to examine this pathway in the PRAMS, recent research suggests that dental benefits for non-pregnant adults are associated with improvements in general reported health status. We also confirm this finding among reproductive-aged women using data from the Behavioral Risk Factor Surveillance System (results available on request).

In addition to possible impacts on maternal systemic health and the fetal environment, pregnancy dental benefits could have indirect impacts on infant health by inducing changes to maternal health behaviors. Other types of prenatal care use could increase if dentists counsel pregnant patients on current guidelines for obstetric visits. Conversely, dental visits may crowd out other prenatal care use given time and work constraints. We examine the effects of pregnancy dental benefits on the Kotelchuk index, a measure of prenatal care adequacy, and find no evidence of an effect. Pregnancy dental benefits could also affect other types of health behaviors if dentists counsel pregnant women on dietary or smoking habits, via an income effect, or moral hazard. Given the adverse consequences of smoking during pregnancy, we assess whether pregnancy dental visits affect smoking prevalence and also find no evidence of an impact.

3 Data

The data for this study is drawn from the Pregnancy Risk Assessment Monitoring System (PRAMS), a state-based surveillance system managed by the Centers for Disease

Control and Prevention (CDC) in collaboration with state health departments. PRAMS collects comprehensive, population-based data on maternal experiences before, during, and shortly after pregnancy, with an emphasis on maternal health behaviors and access to care. The survey samples a state-representative subset of women who have recently given birth, sampling between 1,000 and 3,000 individuals annually from each participating site (typically a state). The dataset includes self-reported measures of dental care access during pregnancy and linked birth certificate information on birth outcomes.

ADD PARA explaining data availibity - only available if meets response rate threshold for year and some states even if they meet threshold are only available on data request. Explain that we obtained data through site-specific requests and name states where we are using restricted data.

Our analysis uses PRAMS data from 2012 to 2019. We begin our analysis in 2012 because this is the first year when the question about dental cleanings during pregnancy is included in the survey. Previous surveys include questions about dental care use before pregnancy in addition to other questions related to dental care access, but only the question about dental cleanings is consistently available over time during recent years. We end our analysis in 2019 to avoid confounding due to the COVID-19 pandemic given evidence of depressed healthcare utilization, interruptions to prenatal care, and infant health impacts. However we include data through 2021 in a sensitivity analysis.

We focus on individuals aged 21 and older who were enrolled in Medicaid during pregnancy. This restriction allows us to target populations most likely to be affected by Medicaid dental policy changes since all Medicaid enrollees up to age 20 receive dental coverage under the Early and Periodic, Screening, Diagnostic, and Treatment benefit. We have access to information on the month and year of birth, allowing us to estimate the timing of conception. We match these dates with the month and year of policy implementation to define our primary policy indicator, which is equal to one if the respondent had any exposure to pregnancy dental benefits and zero otherwise.

Our primary outcome for dental care utilization is an indicator of having received a dental cleaning at any time during the most recent pregnancy. Furthermore, we investigate four main birth outcomes, including small for gestational age (at 10^{th} percentile), preterm birth, low birth weight, and very low birth weight. The PRAMS also provides a rich set of individual and socioeconomic characteristics at the individual level, allowing us to control for potential factors that may influence dental care access and utilization. We supplement the PRAMS data with a comprehensive set of state-by-year-specific variables to account for potential confounding factors related to state-level socioeconomic and policy changes.

(Table 2 here)

Table 2 provides descriptive statistics offering a snapshot of the study population. In

total, we obtain 71,442 individual observations. Regarding dental care utilization, 44% of respondents reported receiving a dental cleaning during pregnancy. For birth outcomes, approximately 10% of births are classified as low birth weight, 11% as preterm, and 11% as small for gestational age (10th percentile). The demographics of the sample reveal that the average maternal age is 28 years, with 56% of respondents having less than a college education. The sample is racially and ethnically diverse, with 42% identifying as non-Hispanic White, 30% as non-Hispanic Black, and 22% as Hispanic. Additionally, 40% of respondents are married, and 80% reside in urban areas.

4 Empirical Strategy

4.1 Stacked Difference-in-differences Approach

This study employs a stacked difference-in-differences (DID) design, following recent methodological advancements outlined by Wing et al. (2024). In this approach, we create multiple "sub-experiments," each representing a distinct policy adoption event. Each sub-experiment is defined by an event window that includes observations before and after a given policy adoption date. The sub-experiment's treatment group includes one or more treatment states that implemented the policy on that precise date and control states that did not implement the policy within the event window. This approach allows us to decompose the staggered adoption setting into multiple two-by-two difference-in-differences estimation problems, circumventing bias that can arise in the standard two-way-fixed effects model. While there are several methods to recover unbiased DiD estimates, we selected a stacked DiD approach for several reasons. First, our setting involves a moderate number of treatment and control states, making sub-experiments straightforward to define. Second, while dental benefits can be added and dropped, states only added benefits during our study period so there is no reversible treatment. Finally, the stacked approach is also suitable for repeated cross-sectional survey data and can accommodate survey weights.

As Figure 1 shows, five PRAMS states including Colorado, Illinois, South Carolina, Utah, and Virginia began offering pregnancy dental benefits during the study period (shown in green). Twenty-six PRAMS states maintained pre-existing benefits (shown in blue) and nine states did not offer pregnancy dental benefits throughout our entire study period (shown in red). Two states that had not adopted pregnancy dental benefits by 2019 did so after 2019 (West Virginia and Delaware). States shown in gray did not consistently contribute to the PRAMS during our period of analysis and are therefore excluded. We also exclude the 26 states pre-existing benefits to avoid any potential confounding due to continually evolving trends in these '"already treated" states.

Table 1 summarizes the states included in each sub-experiment used in our primary

analysis. For example, Utah's policy adoption in October 2013 forms one sub-experiment, with the nine states that did not offer pregnancy dental benefits during the study period serving as controls. Each sub-experiment uses symmetric event windows of approximately 4 to 6 years, depending on the implementation date and data availaibility. Since 2012 was the first year the dental cleaning question was asked, some sub-experiments have shorter pre-implementation windows relative to post-implementation windows. For example, Utah's event window includes January 2012 through October 2016.

(Figure 1 here)

(Table 1 here)

4.2 Estimation

We estimate aggregated average treatment effects (ATEs) and event study models that include the leads and lags of the policy adoption date. To generate ATEs we estimate the following model:

$$Y_{istd} = \mu_{sd} + \omega_1 \text{PregDental}_{istd} + \mathbf{X}_{istd}\boldsymbol{\beta} + \lambda_t + \epsilon_{istd} \tag{1}$$

Where Y_{istd} denotes the outcome of interest for individual i (e.g., dental cleaning utilization or birth outcomes) in state s, time t, and sub-experiment d. $PregDental_{istd}$ is a binary indicator equal to one if a respondent is imputed to have any exposure to pregnancy dental benefits during their pregnancy and zero otherwise. X_{istd} is a vector of individual and state-by-year control variables, μ_{sd} represents state-by-sub-experiment fixed effects, and λ_t represents month-by-year-of-birth fixed effects. Individual controls included in X_{istd} include LIST ALL. State-by-year controls included in X_{istd} include LIST ALL.

*EXPLAIN HOW STACKED MODEL CREATES ESTIMATES WITHIN EACH SUB-EXPERIMENT AND HOW THEY ARE AGGREGATED, INCLUDING WEIGHTING - BOTH STACKED WEIGHTS AND SURVEY WEIGHTS.

Our event study model is specified as follows:

$$Y_{istd} = \mu_{sd} + \sum_{\tau=-\kappa_a}^{-2} \alpha_\tau \cdot 1(TSE_{td} = \tau) + \sum_{\sigma=0}^{\kappa_b} \delta_\sigma \cdot 1(TSE_{td} = \sigma) + \mathbf{X}_{istd}\boldsymbol{\beta} + \lambda_t + \epsilon_{istd} \tag{2}$$

In Equation (2), Y_{istd} denotes the outcome of interest for individual i (e.g., dental cleaning utilization or birth outcomes) in state s, time t, and sub-experiment d. The variable TSE_{td} represents the number of months since policy implementation, with α_τ and δ_σ capturing pre-policy and post-policy event-time effects, respectively. Specifically, our

event study specification aligns birth year and month with the timing of Medicaid dental benefit implementation and groups the pre- and post-treatment periods into three-month intervals. This structure allows for a detailed examination of how outcomes, such as dental care utilization and birth outcomes, evolve over time. The model differentiates between partial policy exposure, observed in the initial post-policy intervals, and full policy exposure, captured in later periods. By aligning events temporally, this approach provides a clearer understanding of the timing, stabilization, and persistence of policy impacts, offering insights into both short-term effects and longer-term trends.

The control variable vector $\mathbf{X}_{istd}$ includes individual-level characteristics (e.g., maternal age, education, marital status, race/ethnicity, and urban/rural residence), state-level policy variables (e.g., Medicaid eligibility thresholds and managed care penetration rates), and time-varying contextual factors (e.g., unemployment rates and dentist density). These controls account for time-varying observable differences that could be associated with outcomes. State-by-sub-experiment fixed effects, μ_{sd}, account for time-invariant characteristics at the state level, while λ_t represents time fixed effects to control for common time shocks. The error term, ϵ_{istd}, captures unobserved variation. Standard errors are clustered at the state level to account for serial correlation and within-state dependencies in outcomes.

Equation (2) tests for pre-trends by estimating the pre-policy coefficients α_τ, ensuring that treated and control groups exhibit parallel trends before policy implementation. The post-policy coefficients δ_σ capture the dynamic effects of the policy. To obtain the aggregated average treatment effect, we estimate the following model:

Together, the stacked DID and event study methods offer a comprehensive framework for evaluating the staggered adoption of Medicaid pregnancy dental benefits. By capturing effects in three-month intervals, this approach is well-suited to identifying nuanced temporal trends, which are essential for understanding both the granular and overall impact of Medicaid dental benefit expansions on both dental care utilization and birth outcomes. Our empirical strategy enhances the robustness and interpretability of the results, providing valuable insights for policymakers and stakeholders seeking to optimize Medicaid dental benefits for pregnant individuals.

*INTEGRATE ABOVE when talking about model Each sub-experiment is analyzed within a pre-defined event window, spanning a period before and after the policy implementation date. Symmetric event windows of approximately 4 to 5 years were used in this study to capture both pre-policy trends and post-policy effects. For instance, the event window for Utah spans from January 2012 to October 2016, providing sufficient observations to evaluate changes in outcomes before and after the policy adoption month. The event study version of the stacked DID framework not only captures dynamic treatment effects in both the short and long term but also assesses whether the parallel

trends assumption holds during the pre-treatment period.

5 Results

This section presents the findings on the impact of Medicaid pregnancy dental benefits on dental care utilization and birth outcomes. The analysis evaluates how these benefits influence the likelihood of receiving prenatal dental cleaning and their subsequent effects on key birth outcomes, including small for gestational age (at 10^{th} percentile), preterm birth, low birth weight, and very low birth weight. Additionally, event study models are employed to examine the dynamic treatment effects over time and test the parallel trends assumption. Heterogeneous treatment effects are explored across demographic and socioeconomic subgroups, shedding light on disparities in policy impacts and highlighting potential areas for targeted interventions.

5.1 Effects of Medicaid Pregnancy Dental Benefits on Dental Cleaning and Birth Outcomes

We first estimate the effect of Medicaid dental benefits for pregnant women on the probability of having received dental cleaning during the pregnancy period for the current birth, as a first-stage outcome. Column (1) in Table 3 shows a 7.16 percentage point increase in dental cleaning rates among Medicaid recipients, from a baseline mean of 24.6%. This improvement represents a 29.1% relative increase from baseline rates of prenatal dental cleaning and demonstrates the effectiveness of policy expansions in promoting the use of preventive dental care among pregnant women. These findings underscore Medicaid's potential as a lever to address gaps in healthcare access during pregnancy.

(Table 3 here)

Figure 2 provides event study estimates of the impact of Medicaid pregnancy dental benefits on prenatal dental cleaning rates. The temporal dynamics suggest that while there is no pre-existing trend in prenatal dental cleaning rates before policy implementation, the effect of Medicaid pregnancy dental benefits gradually intensifies in the months afterwards, with significant increases becoming evident between 7 and 9 months post-adoption. This upward trajectory suggests that the early post-policy period represents a phase of partial policy exposure, during which the full impact of expanded benefits may not be immediately realized. As time progresses, the observed effect grows stronger, reflecting full policy exposure and a sustained improvement in dental care utilization. By the later post-policy months, the effect plateaus at a consistently higher

rate of dental cleaning compared to pre-policy levels, indicating a long-lasting shift in healthcare-seeking behavior among Medicaid-eligible pregnant individuals.

(Figure 2 here)

We estimate the effects of prenatal exposure to Medicaid dental benefits on four primary birth outcomes: small for gestational age (SGA) at the 10th percentile, preterm birth, low birth weight, and very low birth weight. Table 3 presents these findings in Columns (2) to (5). Notably, Medicaid dental benefits significantly reduce the likelihood of a newborn being small for gestational age by 1.19 percentage points, representing a 9.52% decrease relative to the baseline mean of 12.5%. Additionally, we observe a statistically significant reduction in very low birth weight by 0.47 percentage points. However, the estimated impacts on preterm birth (-0.99 percentage points) and low birth weight are not statistically significant.

Figure 3 illustrates event study plots for each birth outcome. Before policy implementation, estimates for most outcomes largely hover near zero with overlapping confidence intervals, suggesting parallel trends between treated and control states. However, the estimates for low birth weight deviate from zero prior to policy adoption, indicating potential violations of the parallel trends assumption for this outcome. Post-policy implementation, we consistently observe negative effects for small for gestational age, preterm birth, and very low birth weight. These effects are especially pronounced for small for gestational age and very low birth weight. While the table estimates for preterm birth are imprecise, the event study plots reveal consistent post-policy reductions, suggesting a potential impact not captured in the average effect estimates. In contrast, there is no consistent evidence of impact on low birth weight.

(Figure 3 here)

Our main results underscore the effectiveness of Medicaid dental benefits in addressing barriers to prenatal dental care access, with policy impacts that extend over the course of pregnancy and contribute to sustained improvements in maternal healthcare utilization. Furthermore, we find suggestive evidence that providing dental care benefits to pregnant women may have intergenerational health impacts on their newborns. This highlights the need for further research to better understand the underlying mechanisms driving these effects and to identify additional factors that could enhance policy effectiveness.

5.2 Heterogeneous Treatment Effects Across Subgroups

The analysis of subgroup-specific treatment effects on prenatal dental cleaning reveals broadly consistent improvements across different racial and ethnic groups in response to

the Medicaid pregnancy dental benefit expansions (Figure 4). Non-Hispanic Black and non-Hispanic White individuals experienced statistically significant increases in prenatal dental cleaning rates. While Hispanic individuals also exhibited positive point estimates, the effects for this group are statistically imprecise. These findings suggest that the Medicaid expansions may have contributed to narrowing disparities in access to preventive dental care across racial and ethnic groups, although further research is needed to confirm the impact among Hispanic populations due to the lack of statistical precision.

(Figure 4 here)

Geographic differences also emerged, with rural residents showing not significant increase in utilizing prenatal dental cleaning compared to their urban counterparts. This pattern might reflect ongoing disparities in healthcare access between rural and urban areas, possibly driven by factors such as limited availability of dental providers or the increased travel distance required to access care in rural settings. Age-specific effects reveal that individuals aged 26 to 34 experienced the largest improvements in dental cleaning utilization among all age groups, suggesting that this segment of the population may have been particularly well-positioned to benefit from the policy. Furthermore, individuals without pre-pregnancy health risks exhibited stronger effects, indicating that those without underlying health conditions might respond more favorably to the expansion of dental benefits. These variations highlight the differential impacts of Medicaid expansions across population subgroups, with distinct responses based on demographic, geographic, and health-related factors.

We further demonstrate heterogeneous treatment effects of Medicaid pregnancy dental expansions on birth outcomes across subgroups, with pronounced disparities observed across geographic, racial, and age categories (Figure 5).

For the impact on small for gestational age, rural residents experienced a more statistically significant and substantial negative effect than urban counterparts, suggesting that the policy may contribute to improved fetal growth in these areas. Compared with women with other marital statuses, married individuals experience a statistically significant reduction in the rate of small for gestational age.

Notably, mothers aged 21-25 experienced significant improvements in preterm birth rates, suggesting that this group, often facing heightened risks, benefited substantially from improved access to prenatal dental care. Similarly, among rural residents, the coefficient for preterm birth was also negative, indicating a promising effect on improving this birth outcome in rural areas.

Rural residents also experienced a statistically significant reduction in low birth weight, with a negative estimated coefficient and a confidence interval that did not cross zero. This suggests that the expansion of dental benefits may be particularly effective in mitigating adverse birth outcomes in these underserved communities.

(Figure 5 here)

Further examination of the effects on very low birth weight reveals similar patterns for younger mothers and rural populations. Mothers aged 21-25 experienced a statistically significant reduction in very low birth weight, reinforcing the positive impact of the policy on this demographic. Rural areas also exhibited a likely negative effect on very low birth weight. These findings suggest that more data or a larger sample size can be used to confirm this effect conclusively.

The benefits observed on birth outcomes underscore the potential of targeted healthcare policies to address specific vulnerabilities faced by younger mothers and rural communities. It suggests that younger mothers, who often face heightened risks due to limited financial stability and inconsistent healthcare access, were among the primary beneficiaries of improved prenatal care. The findings emphasize that expanding dental care access during pregnancy may play a key role in mitigating preterm birth risks and very low birth weight for younger populations. In contrast, older mothers did not exhibit significant improvements, indicating that the policy's effects might be less effective for this group. For all four adverse birth outcomes, rural residents substantially benefit from Medicaid dental benefits for pregnant women. This further suggests that rural areas—where individuals typically face greater barriers to accessing healthcare services than their urban counterparts—are a key target population for Medicaid dental care coverage.

In summary, the analysis of heterogeneous treatment effects demonstrates that the Medicaid pregnancy dental benefit expansion yielded meaningful improvements in preventive dental care utilization and birth outcomes, particularly for rural residents, younger mothers, and non-Hispanic Black individuals. However, the variability in effects across subgroups, including mixed or insignificant results for certain populations, underscores the complexity of addressing adverse birth outcomes through single-policy interventions. These findings highlight the importance of considering demographic and geographic disparities when evaluating policy effectiveness.

5.3 Robustness Checks and Mechanisms

To ensure the validity and robustness of our main findings and to better understand the underlying mechanisms driving observed effects, we conduct additional analyses through a series of robustness checks and mechanism explorations. Table 4 presents estimates examining the effects of Medicaid pregnancy dental benefits across different education and income groups. These analyses are conducted on the full sample, which includes individuals with Medicaid, private insurance, and other forms of coverage. The purpose of this stratification is to assess whether the policy's impact varies by socioeconomic

status and to identify which subgroups benefit the most from the expansion of dental benefits.

Results show consistent and statistically significant improvements in prenatal dental cleaning rates across all subgroups, with the strongest effects observed among individuals with lower education and those with incomes less than $25,000 and $50,000. These patterns suggest that the policy may be particularly effective in expanding access to dental care among historically underserved populations. In terms of birth outcomes, the overall estimates are generally imprecise. However, we find a statistically significant reduction in low birth weight among the low-education subgroup, indicating a potential health benefit of the dental policy among individuals facing greater structural barriers to care. These findings reinforce the importance of Medicaid dental expansions in improving preventive care access, particularly for socially and economically disadvantaged groups.

(Table 4 here)

Table 5 further examines the joint effects of Medicaid pregnancy dental benefits and broader adult Medicaid expansions on prenatal dental cleaning and birth outcomes. This analysis serves to isolate the specific contribution of pregnancy-targeted dental coverage relative to general Medicaid eligibility expansions for adults. The results confirm that improvements in prenatal dental cleaning and reductions in very low birth weight are consistent even when controlling for non-pregnancy adult Medicaid expansions. In contrast, the estimated effects for other birth outcomes are sensitive to the inclusion of adult expansions. Notably, adult (non-pregnancy) Medicaid expansions are associated with modest improvements—statistically significant at the 10% level—for small-for-gestational-age births and low birth weight. These findings underscore the unique value of pregnancy-specific dental coverage in driving improvements in maternal oral health, while also suggesting that broader Medicaid expansions may offer complementary, albeit limited, benefits for certain birth outcomes.

(Table 5 here)

Table 6 presents estimates of the effect of Medicaid pregnancy dental benefits on dental cleaning and birth outcomes after excluding individuals classified as low-income. This analysis is intended to test whether the observed effects persist among higher-income populations. The results indicate that even after excluding low-income individuals, Medicaid pregnancy dental benefits are associated with a statistically significant increase in prenatal dental cleaning (8.99 percentage points) and significant reductions in small-for-gestational-age births, low birth weight, and very low birth weight. The effect on preterm birth remains negative but is not statistically significant. These findings suggest that while low-income populations may benefit most strongly from the policy,

meaningful improvements are also observed among higher-income individuals, indicating broader relevance of the dental benefit expansion across income levels.

(Figure 6 here)

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(Figure 7 here)

Table 7 explores potential mechanisms through which Medicaid pregnancy dental benefits may influence birth outcomes by examining prenatal care utilization and maternal smoking behaviors. The results indicate no statistically significant effects on receiving adequate prenatal care, as measured by the Kotelchuck Index, or on maternal smoking behaviors before, during, or after pregnancy. These findings suggest that the improvements in birth outcomes associated with dental benefit expansions are unlikely to be driven by changes in these particular behavioral mechanisms. Instead, the effects may operate through other pathways, such as direct improvements in maternal oral health or reduced systemic inflammation associated with periodontal treatment.

In summary, the robustness checks and supplemental analyses provide strong support for the main findings. The consistent improvements in prenatal dental cleaning across diverse subgroups, along with significant reductions in certain adverse birth outcomes, underscore the effectiveness of Medicaid pregnancy dental benefit expansions. While we find limited evidence for behavioral mechanisms such as prenatal care utilization or smoking cessation, the persistence of effects across income levels and policy combinations suggests that improved access to dental care itself plays a critical role in shaping maternal and neonatal health outcomes.

6 Discussion

This study provides compelling evidence on the effectiveness of Medicaid pregnancy dental benefits in increasing access to prenatal dental care and its varying impacts on birth

outcomes. Our results indicate that expanding Medicaid dental coverage significantly increased the likelihood of pregnant individuals receiving preventive dental cleanings, with particularly strong improvements observed among non-Hispanic Black and Hispanic individuals, as well as among individuals aged 26–34. These findings are consistent with previous research showing the importance of insurance coverage in addressing unmet healthcare needs during pregnancy. However, the benefits of expanded coverage were not uniformly distributed, as rural residents experienced smaller gains in dental care utilization but larger relative improvements in birth outcomes, including significant reductions in low birth weight and preterm birth. This discrepancy underscores the complex relationship between healthcare access and birth outcomes, particularly for populations facing structural barriers to care.

The heterogeneous treatment effects reveal that while Medicaid expansions helped reduce some disparities, particularly those based on geographic location and income, challenges remain in addressing disparities related to race and ethnicity. The lack of significant and consistent improvements in preterm birth and very low birth weight outcomes highlights the multifaceted nature of these outcomes, which are influenced by a range of factors beyond oral healthcare access. The findings suggest that Medicaid dental benefits alone are insufficient to comprehensively improve birth outcomes across all populations, emphasizing the need for a more holistic approach that considers social, medical, and environmental factors affecting maternal and child health.

The robustness of our results is supported by placebo tests, which show no significant changes in birth outcomes or dental cleaning rates among privately insured individuals who were not eligible for Medicaid pregnancy dental benefits. Additionally, we found no policy-related effects on unrelated health conditions, such as pre-pregnancy diabetes and hypertension, further confirming that the observed effects are specific to Medicaid recipients and not driven by external confounding factors. These findings strengthen the causal interpretation of our results, highlighting the role of Medicaid coverage expansions in improving maternal healthcare utilization and, to some extent, birth outcomes.

The findings from this study carry important policy implications for improving maternal and child health outcomes. Expanding Medicaid dental benefits has proven to be an effective strategy for increasing access to dental care among low-income pregnant individuals, particularly those from historically underserved groups. Given the significant improvements observed, further expansion of these benefits could help bridge income-based disparities in dental care use during pregnancy. However, the mixed results on birth outcomes suggest that coverage alone may not be sufficient to address disparities related to race and ethnicity. Complementary strategies, such as targeted outreach, culturally tailored health education, and coordination between dental and prenatal care providers, are necessary to ensure that minority populations fully benefit from expanded

coverage.

Moreover, extending Medicaid and Children's Health Insurance Program (CHIP) coverage to 12 months postpartum could further support maternal and child health by sustaining the oral health improvements achieved during pregnancy. Postpartum coverage would provide opportunities for continued preventive care, reducing the risk of long-term oral health issues that could negatively affect both the mother and her child. Integrating oral health services into routine prenatal care could also enhance the impact of Medicaid dental benefits. Encouraging collaboration between dental and prenatal care providers would allow for early detection and treatment of oral health issues, while implementing routine dental screenings during prenatal visits could address oral health concerns before they lead to adverse outcomes.

Targeted programs are needed to address the specific barriers faced by vulnerable populations, particularly rural and Hispanic mothers. The significant gains observed in rural areas in terms of birth outcomes suggest that targeted interventions, such as mobile dental clinics and telehealth services, could further improve access to care. Additionally, bilingual health education and culturally sensitive prenatal programs could help overcome barriers faced by Hispanic mothers, ensuring that they also benefit from expanded dental coverage. To ensure the ongoing effectiveness of these policies, robust monitoring and evaluation systems should be established to track both short-term and long-term impacts. Data-driven approaches would allow policymakers to identify gaps, assess program performance, and continuously improve the design and implementation of Medicaid dental benefits.

7 Conclusion

In conclusion, Medicaid pregnancy dental benefits have demonstrated their potential to improve maternal healthcare utilization and reduce some adverse birth outcomes, particularly among rural residents, younger mothers, and non-Hispanic Black individuals. However, the variability in policy impacts highlights the need for a comprehensive approach that integrates expanded coverage with targeted programs and complementary interventions. Addressing persistent disparities requires not only financial access through expanded benefits but also tailored outreach and education programs designed to meet the unique needs of diverse populations.

By incorporating continuous monitoring and evaluation systems, policymakers can ensure that programs remain effective and equitable. Expanding postpartum coverage and integrating oral health services into prenatal care could further enhance the impact of Medicaid dental benefits. As policymakers seek to optimize maternal and child health outcomes, this study underscores the importance of leveraging Medicaid's potential as a

powerful tool to reduce barriers to care, while recognizing the complexity of addressing disparities in health outcomes through policy interventions alone.

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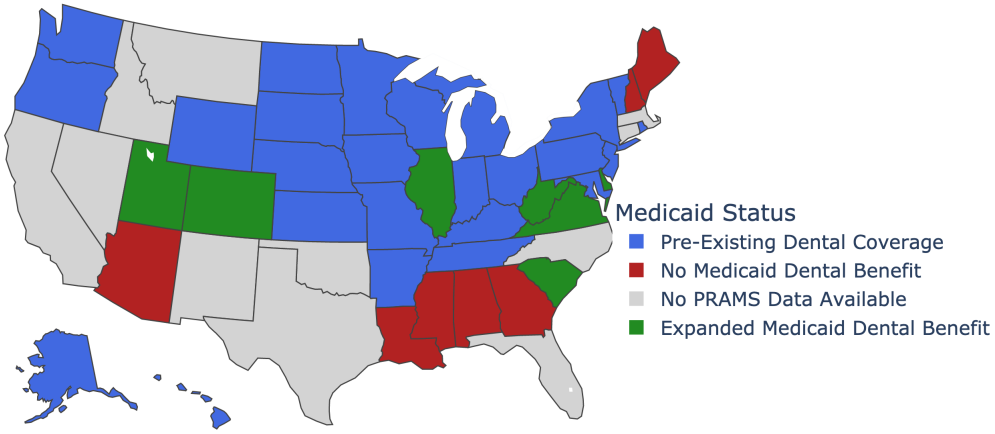
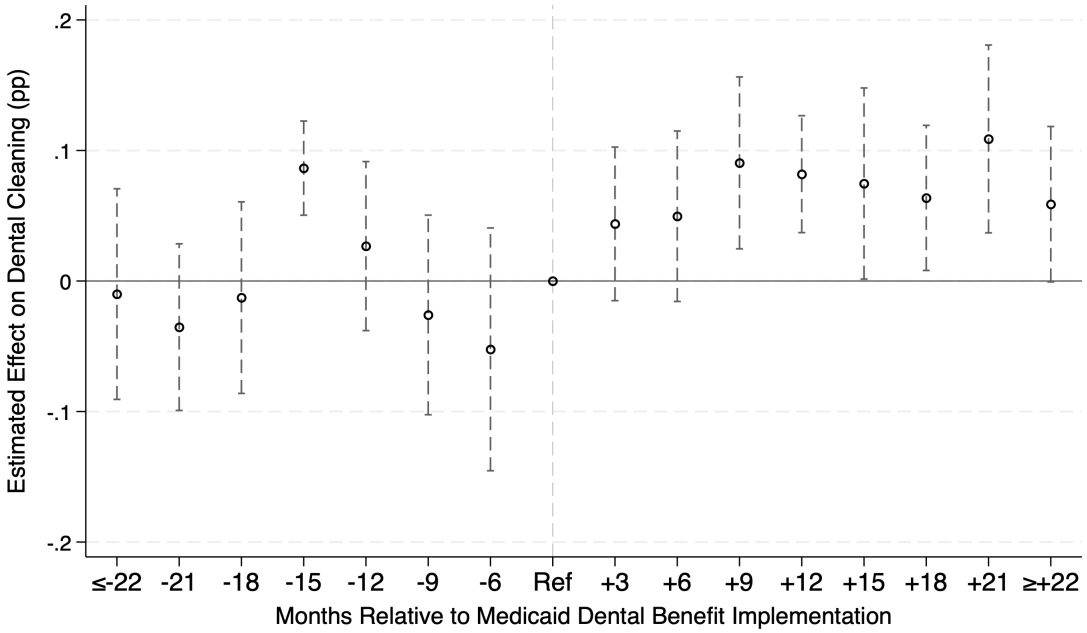
Figure 1: State Variation in Medicaid Pregnancy Dental Benefits, 2012–2022



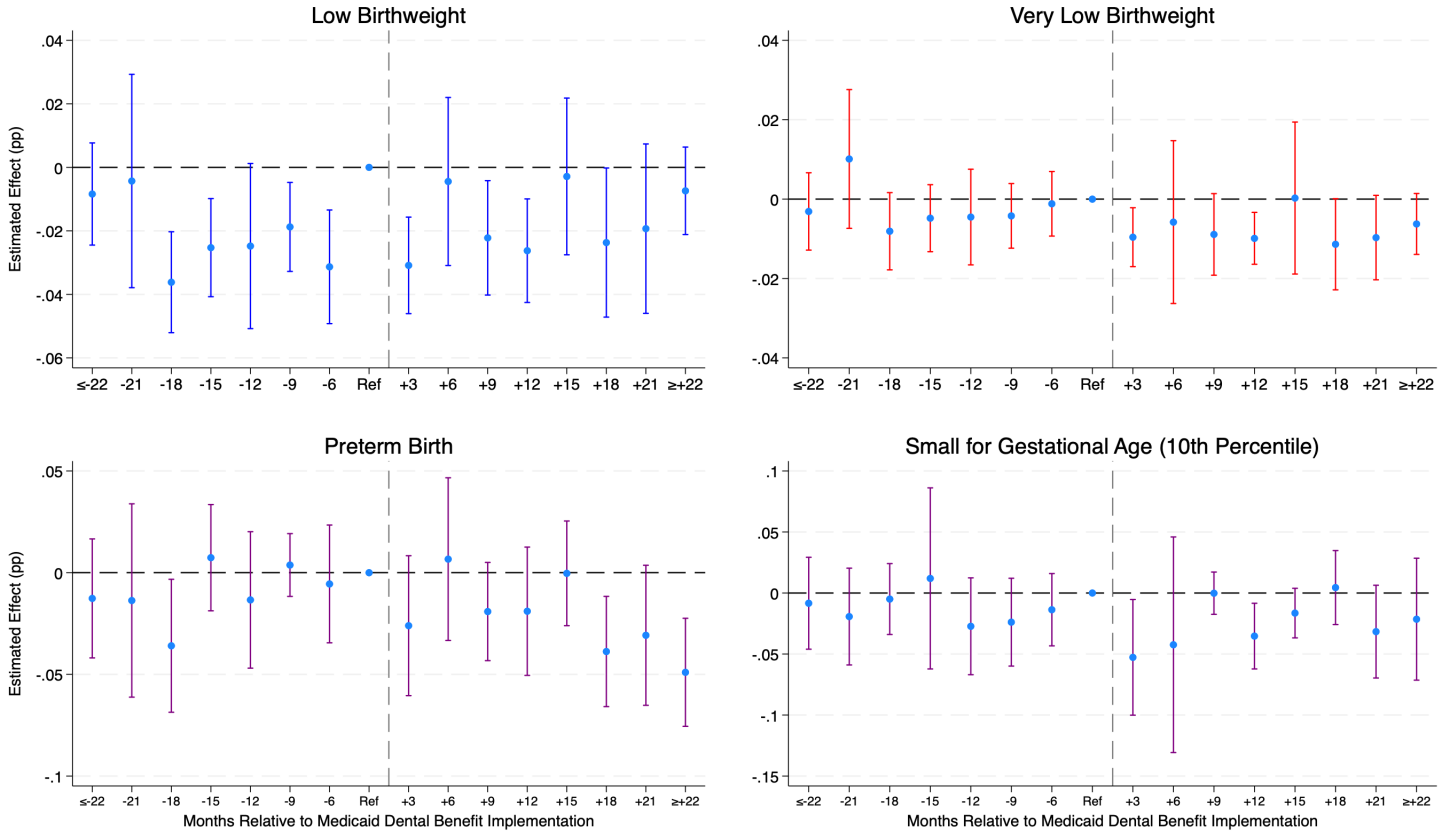
Notes: Data are from the Pregnancy Risk Assessment Monitoring System (PRAMS) and state-level Medicaid policy reports. The figure depicts the Medicaid pregnancy dental benefit status for each state during the study period.

Figure 2: Effect of Medicaid Pregnancy Dental Benefits on Dental Cleaning: Event Study Estimates



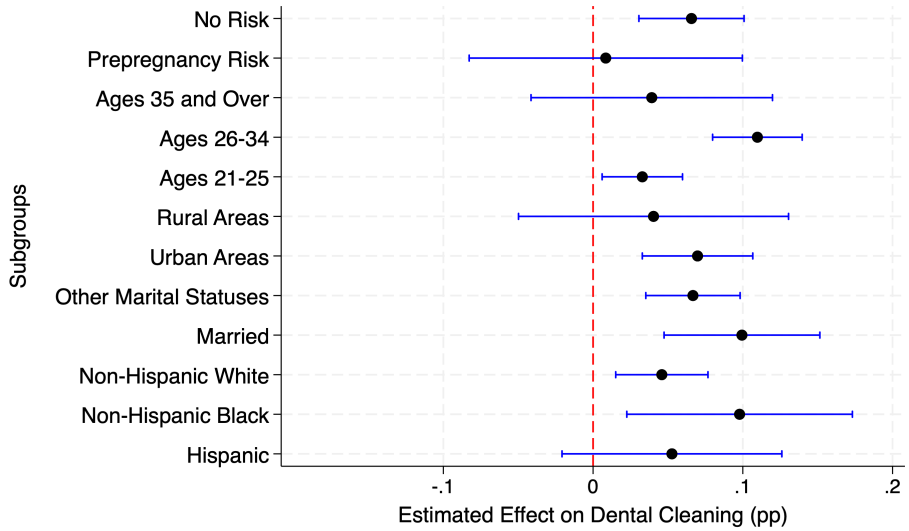
Notes: The figure displays event study estimates of the effect of Medicaid pregnancy dental benefit expansions on prenatal dental cleaning rates, using a stacked difference-in-differences approach. The x-axis represents time in months before and after policy adoption, and the y-axis shows the estimated coefficients. Confidence intervals are indicated by the vertical lines around the point estimates. The reference group is set to 0–3 months before policy implementation, and the estimates test the parallel trends assumption while capturing dynamic treatment effects.

Figure 3: Event Study Estimates: Effect of Medicaid Pregnancy Dental Benefits on Birth Outcomes



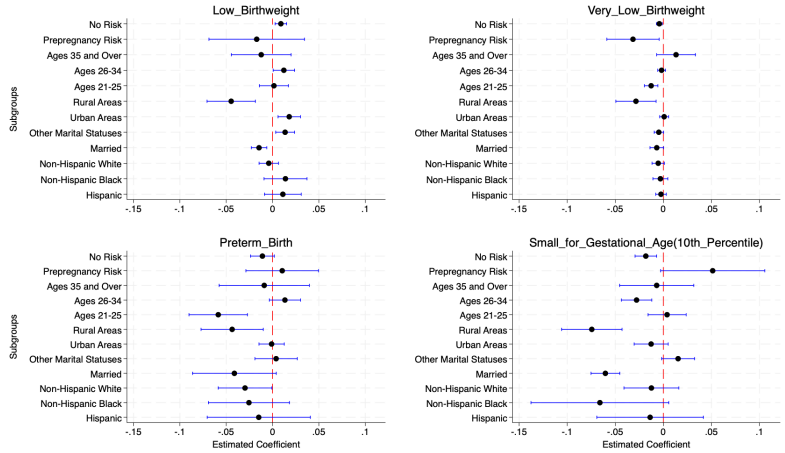
Notes: The figure presents event study estimates of the effect of Medicaid pregnancy dental benefits on key birth outcomes, including low birth weight, very low birth weight, preterm birth, and small for gestational age (10th percentile). Each panel corresponds to a separate outcome variable, with the x-axis representing time in months before and after policy implementation. The y-axis indicates the estimated coefficients, and vertical bars represent 95% confidence intervals. The reference group is set to 0–3 months before policy implementation. These estimates test the parallel trends assumption and provide dynamic treatment effects.

Figure 4: Heterogeneous Effects of Medicaid Pregnancy Dental Benefits on Dental Cleaning by Subgroup



Notes: The figure displays heterogeneous effects of Medicaid pregnancy dental benefits on prenatal dental cleaning rates across key subgroups, including racial/ethnic groups, age groups, marital statuses, and geographic locations. The estimated coefficients are plotted along with 95% confidence intervals. Subgroups with significant positive effects indicate populations that benefit most from the policy, while the vertical red line at zero denotes no effect.

Figure 5: Heterogeneous Effects of Medicaid Pregnancy Dental Benefits on Birth Outcomes by Subgroup



Notes: The figure displays the heterogeneous effects of Medicaid pregnancy dental benefits on key birth outcomes across subgroups, including demographic (age, race/ethnicity), geographic (urban vs. rural), and risk-based categories. Estimated coefficients for low birthweight, very low birthweight, preterm birth, and small for gestational age (10th percentile) are presented with 95% confidence intervals. Subgroups showing significant reductions or no changes provide insights into differential impacts. The vertical red line at zero represents no effect.

Table 1: Sub-experiments of Medicaid dental benefit expansions for pregnant individuals

Sub-experiment Date	Event Window	Treatment States	Control States
10/2013	01/2012–10/2016	UT	DE, GA, ME, TN, WV, NH, AL, LA, MS
04/2014	01/2012–04/2017	CO	DE, GA, ME, TN, WV, NH, AL, LA, MS
07/2014	01/2012–07/2017	IL	DE, GA, ME, TN, WV, NH, AL, LA, MS
12/2014	01/2012–12/2017	SC	DE, GA, ME, TN, WV, NH, AL, LA, MS
03/2015	01/2012–03/2028	VA	DE, GA, ME, TN, WV, NH, AL, LA, MS

Notes: The table lists sub-experiments comparing treatment states with expanded benefits to control states without policy changes during the event window. The design captures pre- and post-policy effects.

Table 2: Summary Statistics

Variable	Mean	Std. Dev
Dental Care Utilization		
Received Dental Cleaning	0.443	0.497
Birth Outcomes		
Low Birthweight	0.077	0.267
Very Low Birthweight	0.013	0.114
Preterm Birth	0.093	0.290
Small for Gestational Age (10th Percentile)	0.109	0.312
Demographics		
Birth Order	1.009	0.098
Age of Mother	29.384	5.151
Lower than College Education	0.338	0.473
Non-Hispanic White	0.586	0.493
Non-Hispanic Black	0.176	0.381
Hispanic	0.145	0.353
Married	0.658	0.474
Urban Areas	0.797	0.402

Note: Summary statistics are based on PRAMS data from 2012 to 2019 for Medicaid-enrolled pregnant individuals aged 21 and older. The table provides means and standard deviations for birth outcomes, dental care utilization, and demographic characteristics.

Table 3: Effect of Medicaid Pregnancy Dental Benefits on Dental Cleaning and Birth Outcomes

	Dental Cleaning	Small for Gestational Age (P10)	Preterm Birth	Low Birth Weight	Very Low Birth Weight
Pregnancy Dental Benefit	0.0716***	-0.0119**	-0.00900	0.00503	-0.00470***
	(0.0138)	(0.00518)	(0.00633)	(0.00321)	(0.00147)
Baseline Mean	0.246	0.125	0.112	0.103	0.017
Observations	67068	61317	64282	67132	67132
R-squared	0.038	0.015	0.025	0.023	0.010

Notes: The table presents estimates of the effect of Medicaid pregnancy dental benefits on dental cleaning during pregnancy and key birth outcomes. Each column corresponds to results from a separate regression, with robust standard errors clustered at the state level shown in parentheses. The baseline mean is the average rate of each outcome in states without Medicaid pregnancy dental benefits. Covariates include maternal age, race/ethnicity, education, marital status, urban/rural residence, and pre-pregnancy risk factors, along with state-level controls such as Medicaid eligibility limits, managed care penetration, and broader contextual factors. State and year-by-month fixed effects account for unobserved heterogeneity across states and over time. Statistical significance is denoted as *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 4: Stratified Estimates: Effect of Medicaid Pregnancy Dental Benefits

	All Sample	Low Education ($\leq$ Associate)	High Education ($\geq$ Bachelor's)	Income $<$ \$25k	Income $\geq$ \$75k	Income $\leq$ \$50k	Income $\geq$ \$90k
Panel A: Dental Cleaning							
Pregnancy Dental Benefit	0.0420***	0.0572***	0.0362**	0.0355*	0.0262	0.0423**	0.0301
	(0.0110)	(0.0124)	(0.0117)	(0.0184)	(0.0194)	(0.0151)	(0.0199)
Observations	148811	54838	93973	56406	35374	84565	31430
R-squared	0.161	0.050	0.135	0.021	0.043	0.042	0.040
Panel B: Small for Gestational Age (P10)							
Pregnancy Dental Benefit	-0.00113	0.00442	-0.00342	0.00548	-0.00280	-0.00421	0.00339
	(0.00539)	(0.0107)	(0.00822)	(0.0109)	(0.0137)	(0.00766)	(0.0136)
Observations	135413	50555	84858	51836	31858	77389	28324
R-squared	0.013	0.013	0.009	0.011	0.012	0.013	0.012
Panel C: Preterm Birth							
Pregnancy Dental Benefit	0.00116	-0.00853	0.00640	-0.0104	0.00439	-0.00497	0.00532
	(0.00817)	(0.00984)	(0.00986)	(0.00922)	(0.00585)	(0.00739)	(0.00675)
Observations	143090	52829	90261	54203	34210	81203	30520
R-squared	0.018	0.021	0.015	0.024	0.013	0.020	0.012
Panel D: Low Birth Weight							
Pregnancy Dental Benefit	-0.00180	-0.0121**	0.00387	-0.00819	-0.00282	-0.00510*	-0.00188
	(0.00248)	(0.00394)	(0.00362)	(0.00495)	(0.00466)	(0.00250)	(0.00490)
Observations	148846	54871	93975	56400	35367	84553	31423
R-squared	0.020	0.017	0.019	0.020	0.010	0.018	0.008
Panel E: Very Low Birth Weight							
Pregnancy Dental Benefit	0.000368	-0.00189	0.00178	-0.00229	0.00276	-0.000717	0.00311*
	(0.00160)	(0.00138)	(0.00213)	(0.00267)	(0.00179)	(0.00262)	(0.00163)
Observations	148846	54871	93975	56400	35367	84553	31423
R-squared	0.007	0.008	0.007	0.009	0.008	0.007	0.005

Notes: The table presents stratified estimates of the effect of Medicaid pregnancy dental benefits on prenatal dental cleaning and birth outcomes. Each column represents a subgroup defined by education or income. Low education includes those with an associate degree or less; high education includes those with a bachelor's degree or more. Income categories are based on midpoint estimates of income brackets. All models control for demographics, state-level covariates, and year fixed effects. Standard errors are clustered at the state level. Statistical significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 5: Effect of Medicaid Pregnancy Dental Benefits and Adult Medicaid Expansions on Dental Cleaning and Birth Outcomes

	Dental Cleaning	Small for Gestational Age (P10)	Preterm Birth	Low Birth Weight	Very Low Birth Weight
Pregnancy Dental Benefit	0.0734***	-0.00347	-0.000311	0.00301	-0.00422**
	(0.0269)	(0.00817)	(0.00559)	(0.00430)	(0.00187)
Non-Pregnant Medicaid Expansion	-0.00308	-0.0147*	-0.0151*	0.00349	-0.000819
	(0.0271)	(0.00858)	(0.00803)	(0.00492)	(0.00260)
Observations	67068	61317	64282	67132	67132
R-squared	0.038	0.015	0.025	0.023	0.010

Notes: This table presents estimates of the effects of (i) Medicaid pregnancy dental benefit adoption and (ii) non-pregnancy adult Medicaid expansions on prenatal dental cleaning and selected birth outcomes. Each column reports results from a separate regression controlling for maternal demographics, state-level economic and healthcare characteristics, and COVID-19 related measures. All regressions include state and year fixed effects and are weighted using survey weights. Standard errors clustered at the state level are shown in parentheses. Statistical significance is denoted as *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 6: Effect of Medicaid Pregnancy Dental Benefits on Dental Cleaning and Birth Outcomes (Excluding Low-Income)

	Dental Cleaning	Small for Gestational Age (P10)	Preterm Birth	Low Birth Weight	Very Low Birth Weight
Pregnancy Dental Benefit	0.0899***	-0.0218**	-0.00809	-0.00828**	-0.00528**
	(0.0199)	(0.00825)	(0.0103)	(0.00399)	(0.00222)
Baseline Mean	0.282	0.109	0.101	0.086	0.014
Observations	31638	29276	30773	31693	31693
R-squared	0.057	0.019	0.030	0.021	0.011

Notes: This table presents estimates of the effect of Medicaid pregnancy dental benefits on prenatal dental cleaning and key birth outcomes, excluding individuals classified as **low income**. Each column corresponds to results from a separate regression, with robust standard errors clustered at the state level shown in parentheses. Covariates include maternal age, race/ethnicity, education, marital status, urban/rural residence, and pre-pregnancy risk factors, along with state-level controls such as Medicaid eligibility limits, managed care penetration, and broader contextual factors. State and year-by-month fixed effects account for unobserved heterogeneity across states and over time. Statistical significance is denoted as *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

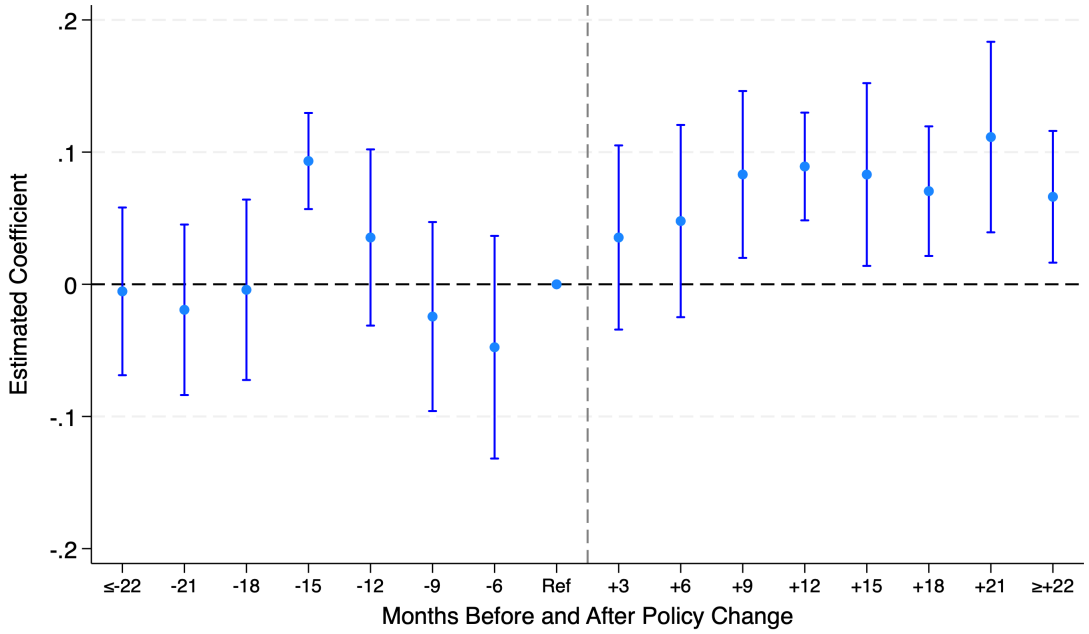
Table 7: Effect of Medicaid Pregnancy Dental Benefits on Prenatal Care and Smoking Behaviors

	Adequate Prenatal Care (Kotelchuck)	Maternal Smoking (Any)	Smoking 3 Months Before	Smoking Last 3 Months of Pregnancy	Non-Smoking After Pregnancy
Pregnancy Dental Benefit	-0.000125	0.0130	0.00921	0.0147	0.00275
	(0.0169)	(0.0148)	(0.0132)	(0.0146)	(0.0115)
Observations	62819	66003	66451	66507	66479
R-squared	0.038	0.171	0.195	0.174	0.170

Notes: The table presents estimates of the effect of Medicaid pregnancy dental benefits on prenatal care utilization and maternal smoking behaviors. The first column measures the probability of receiving adequate prenatal care based on the Kotelchuck Index (coded as a binary variable). The other columns reflect smoking status before, during, and after pregnancy. Each estimate is from a separate regression controlling for maternal demographics, state characteristics, and health service availability. All models include state and year fixed effects. Standard errors are clustered at the state level and reported in parentheses. Statistical significance is denoted by *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

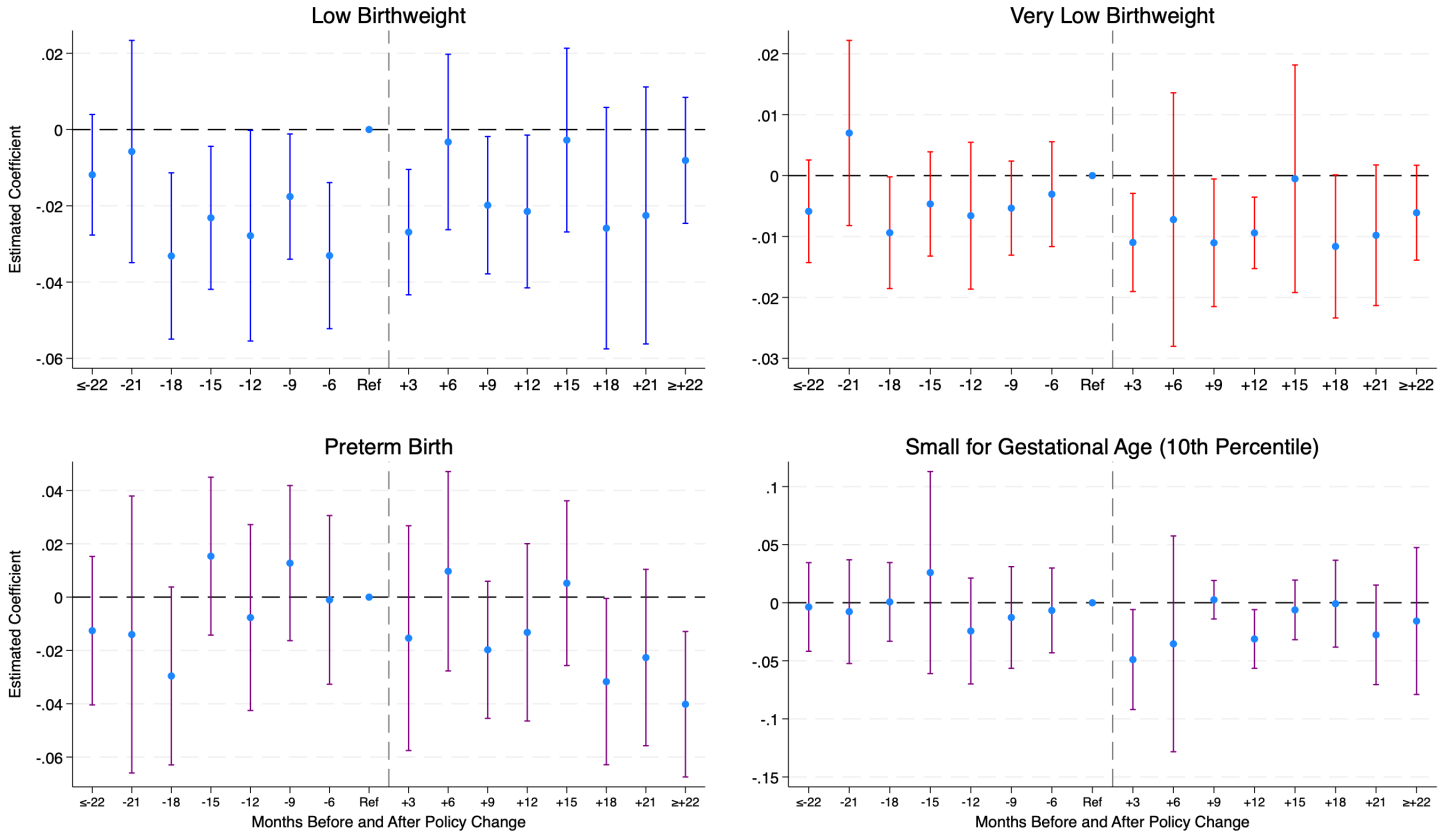
Appendix

Figure A.1: Effect of Medicaid Pregnancy Dental Benefits on Dental Cleaning: Event Study Estimates (Including Post-COVID-19 Period)



Notes: The figure displays event study estimates of the effect of Medicaid pregnancy dental benefit expansions on prenatal dental cleaning rates, using a stacked difference-in-differences approach with data including the post-COVID-19 period. The x-axis represents time in months before and after policy adoption, and the y-axis shows the estimated coefficients. Confidence intervals are indicated by the vertical lines around the point estimates. The reference group is set to 0–3 months before policy implementation. These estimates test the parallel trends assumption and provide dynamic treatment effects over time.

Figure A.2: Event Study Estimates: Effect of Medicaid Pregnancy Dental Benefits on Birth Outcomes (Including Post-COVID-19 Period)



Notes: The figure presents event study estimates of the effect of Medicaid pregnancy dental benefits on key birth outcomes, including low birth weight, very low birth weight, preterm birth, and small for gestational age (10th percentile), using data that includes the post-COVID-19 period. Each panel corresponds to a separate outcome, with the x-axis representing months before and after policy implementation. The y-axis shows the estimated coefficients, and vertical bars indicate 95% confidence intervals. The reference group is set to 0–3 months before policy implementation. These estimates assess the parallel trends assumption and capture dynamic treatment effects.

Table A.1: Effect of Medicaid Pregnancy Dental Benefits on Dental Cleaning (Stacked DID)

	(1)	(2)	(3)	(4)
Pregnancy Dental Benefit	0.0658***	0.0806***	0.0737***	0.0716***
	(0.0160)	(0.0127)	(0.0148)	(0.0138)
State	YES	YES	YES	YES
Year	YES	YES	YES	YES
Demographics		YES	YES	YES
Contextual Factors			YES	YES
Health Resources				YES
Observations	68840	67068	67068	67068
R-squared	0.016	0.037	0.038	0.038

Notes: The table reports estimates of the effect of Medicaid pregnancy dental benefits on prenatal dental cleaning using a stacked difference-in-differences (SDID) design. Each column corresponds to a separate regression, sequentially adding control variables: demographics, contextual factors, and health resources. All models include state and year fixed effects and are weighted by survey weights. Robust standard errors clustered at the state level are reported in parentheses. Statistical significance is denoted as *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A.2: Effect of Medicaid Pregnancy Dental Benefits on Dental Cleaning (TWFE)

	(1)	(2)	(3)	(4)
Pregnancy Dental Benefit	0.0757***	0.105***	0.0974***	0.0776***
	(0.0233)	(0.0168)	(0.0173)	(0.0160)
State	YES	YES	YES	YES
Year	YES	YES	YES	YES
Demographics		YES	YES	YES
Contextual Factors			YES	YES
Health Resources				YES
Observations	30437	28758	28758	28758
R-squared	0.016	0.032	0.032	0.033

Notes: The table reports estimates of the effect of Medicaid pregnancy dental benefits on prenatal dental cleaning using a traditional two-way fixed effects (TWFE) design. Each column adds further controls: demographics, contextual factors, and health resources. Models are weighted and include state and year fixed effects. Standard errors are clustered at the state level. Statistical significance is denoted as *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A.3: Effect of Medicaid Pregnancy Dental Benefits on Prenatal Dental Cleaning and Birth Outcomes (Including Post-COVID-19 Period)

	Dental Cleaning	Small for Gestational Age (P10)	Preterm Birth	Low Birth Weight	Very Low Birth Weight
Pregnancy Dental Benefit	0.0663***	-0.0149***	-0.00758	0.00693**	-0.00427**
	(0.0151)	(0.00506)	(0.00551)	(0.00304)	(0.00164)
Baseline Mean	0.242	0.123	0.114	0.105	0.017
Observations	95582	87430	91572	95653	95653
R-squared	0.039	0.014	0.026	0.023	0.010

Notes: The table presents estimates of the effect of Medicaid pregnancy dental benefits on dental cleaning during pregnancy and key birth outcomes using data that includes the post-COVID-19 period. Each column corresponds to results from a separate regression, with robust standard errors clustered at the state level shown in parentheses. The baseline mean is the average rate of each outcome in states without Medicaid pregnancy dental benefits. Covariates include maternal age, race/ethnicity, education, marital status, urban/rural residence, and pre-pregnancy risk factors, along with state-level controls such as Medicaid eligibility limits, managed care penetration, and broader contextual factors. State and year fixed effects account for unobserved heterogeneity across states and over time. Statistical significance is denoted as *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A.4: Intent-to-Treat Estimates: Effect of Medicaid Pregnancy Dental Benefits on Dental Cleaning and Birth Outcomes (Full Insurance Sample)

	Dental Cleaning	Small for Gestational Age (P10)	Preterm Birth	Low Birth Weight	Very Low Birth Weight
Pregnancy Dental Benefit	0.0350***	0.000495	0.00330	0.00670**	-0.000273
	(0.00807)	(0.00433)	(0.00289)	(0.00252)	(0.00104)
Baseline Mean	0.422	0.101	0.093	0.079	0.013
Observations	148811	135413	143090	148846	148846
R-squared	0.163	0.014	0.019	0.020	0.007

Notes: The table presents intent-to-treat (ITT) estimates of the effect of Medicaid pregnancy dental benefit expansions on prenatal dental cleaning and birth outcomes using the full insurance sample, which includes individuals with Medicaid, private, or other forms of insurance. Each column reports results from a separate regression of the outcome on the dental benefit policy indicator. All models adjust for maternal demographics (age, education, marital status, race/ethnicity, urban/rural residence, pre-pregnancy health risk), state-level characteristics (fertility rate, managed care penetration, dental provider supply, unemployment rate) and health service factors (ACA expansion, dentist availability). State and year fixed effects are included. Robust standard errors are clustered at the state level and reported in parentheses. Baseline means represent average outcomes in states without pregnancy dental benefits. Statistical significance is denoted as *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A.5: Effect of Medicaid Pregnancy Dental Benefits on Dental Cleaning and Birth Outcomes (Self-Reported + Birth Certificate Medicaid)

	Dental Cleaning	Small for Gestational Age (P10)	Preterm Birth	Low Birth Weight	Very Low Birth Weight
Pregnancy Dental Benefit	0.0673***	0.000789	-0.00350	0.00880**	-0.00325*
	(0.0133)	(0.00439)	(0.00664)	(0.00426)	(0.00165)
Baseline Mean	0.253	0.122	0.111	0.101	0.016
Observations	74233	67809	71136	74292	74292
R-squared	0.036	0.014	0.022	0.021	0.009

Notes: This table presents estimates of the effect of Medicaid pregnancy dental benefits on dental cleaning during pregnancy and key birth outcomes, using a sample that includes both self-reported Medicaid coverage and birth certificate Medicaid coverage. Each column corresponds to results from a separate regression, with robust standard errors clustered at the state level shown in parentheses. The baseline mean is the average rate of each outcome in states without Medicaid pregnancy dental benefits. Covariates include maternal age, race/ethnicity, education, marital status, urban/rural residence, and pre-pregnancy risk factors, along with state-level controls such as Medicaid eligibility limits, managed care penetration, and broader contextual factors. State and year fixed effects account for unobserved heterogeneity across states and over time. Statistical significance is denoted as *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A.6: Leave-One-Out Estimates: Effect of Medicaid Pregnancy Dental Benefits

	Full Sample	Excl. UT	Excl. IL	Excl. CO	Excl. VA	Excl. SC
Panel A: Dental Cleaning						
Pregnancy Dental Benefit	0.0716***	0.0812***	0.0437*	0.0654***	0.0764***	0.0716***
	(0.0138)	(0.00959)	(0.0231)	(0.0173)	(0.0161)	(0.0138)
Observations	67068	65470	64822	65030	66180	67068
R-squared	0.038	0.035	0.043	0.039	0.038	0.038
Panel B: Small for Gestational Age (P10)						
Pregnancy Dental Benefit	-0.0119**	-0.0148***	-0.00295	-0.0108	-0.0162***	-0.0119**
	(0.00518)	(0.00522)	(0.00728)	(0.00677)	(0.00572)	(0.00518)
Observations	61317	59778	59168	59391	60476	61317
R-squared	0.015	0.015	0.015	0.015	0.014	0.015
Panel C: Preterm Birth						
Pregnancy Dental Benefit	-0.00900	-0.00937	-0.0178*	-0.0104*	-0.0169***	-0.00900
	(0.00633)	(0.00736)	(0.00927)	(0.00602)	(0.00464)	(0.00633)
Observations	64282	62684	62039	62246	63393	64282
R-squared	0.025	0.025	0.026	0.026	0.023	0.025
Panel D: Low Birth Weight						
Pregnancy Dental Benefit	0.00503	0.00443	0.00470	0.00606*	0.00604	0.00503
	(0.00321)	(0.00327)	(0.00450)	(0.00357)	(0.00393)	(0.00321)
Observations	67132	65534	64886	65097	66241	67132
R-squared	0.023	0.023	0.022	0.023	0.023	0.023
Panel E: Very Low Birth Weight						
Pregnancy Dental Benefit	-0.00470***	-0.00559***	-0.00609**	-0.00337**	-0.00397**	-0.00470***
	(0.00147)	(0.00147)	(0.00252)	(0.00145)	(0.00157)	(0.00147)
Observations	67132	65534	64886	65097	66241	67132
R-squared	0.010	0.010	0.010	0.010	0.010	0.010

Notes: This table presents leave-one-out stacked difference-in-differences (SDID) estimates of the effect of Medicaid pregnancy dental benefits on various maternal and birth outcomes. Each column excludes one treated state at a time. Standard errors are clustered at the state level and shown in parentheses. Statistical significance is denoted as *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A.7: Placebo Test: Effect of Medicaid Pregnancy Dental Benefits on Dental Cleaning and Birth Outcomes (Private Insurance Sample)

	Dental Cleaning	Small for Gestational Age (P10)	Preterm Birth	Low Birth Weight	Very Low Birth Weight
Pregnancy Dental Benefit	0.00625	0.00447	0.00306	0.00963***	0.00397***
	(0.0224)	(0.00566)	(0.00737)	(0.00332)	(0.00133)
Baseline Mean	0.611	0.079	0.073	0.056	0.010
Observations	58626	53232	56654	58614	58614
R-squared	0.094	0.013	0.016	0.010	0.008

Notes: This table presents placebo test estimates of the effect of Medicaid pregnancy dental benefits on dental cleaning during pregnancy and key birth outcomes using the private insurance sample. Because private insurance enrollees are not subject to Medicaid dental expansions, significant estimates would suggest potential confounding or broader trends. Each column corresponds to results from a separate regression, with robust standard errors clustered at the state level shown in parentheses. Covariates include maternal age, race/ethnicity, education, marital status, urban/rural residence, and pre-pregnancy risk factors, along with state-level controls such as Medicaid eligibility limits, managed care penetration, COVID-19 contextual factors, and broader socioeconomic indicators. State and year fixed effects are included. Statistical significance is denoted as *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A.8: Balance Test: Covariate Differences by Medicaid Pregnancy Dental Benefit Status

	Hispanic	Non-Hispanic Black	Non-Hispanic White	Non-Hispanic Other	Ages 21–25	Ages 26–34	Ages 35 and Over	Married	Other Marital Status	Urban Areas	Rural Areas
Pregnancy Dental Benefit	-0.0404**	-0.00877	0.0227	0.0264	0.0661***	-0.0801***	0.0141*	-0.0174	0.0174	-0.0250*	0.0250*
	(0.0197)	(0.00721)	(0.0488)	(0.0565)	(0.0230)	(0.0211)	(0.00790)	(0.0124)	(0.0124)	(0.0146)	(0.0146)
Observations	67141	67141	67141	67141	67141	67141	67141	67141	67141	67141	67141
R-squared	0.099	0.118	0.130	0.415	0.015	0.009	0.012	0.030	0.030	0.113	0.113
	Low Education	High Education	Low Income	Low Middle Income	Middle Income	Upper Income	High Income	Other Income	Prepregnancy Risk	No Risk	Missing Risk Info
Pregnancy Dental Benefit	0.0280	-0.0280	-0.00710	0.0312**	-0.0330*	0.0291***	-0.000825	0.0291***	-0.0177	0.00323	0.0144
	(0.0332)	(0.0332)	(0.0167)	(0.0126)	(0.0176)	(0.00728)	(0.00285)	(0.00728)	(0.0137)	(0.00552)	(0.0123)
Observations	67141	67141	67141	67141	67141	67141	67141	67141	67141	67141	67141
R-squared	0.011	0.011	0.074	0.017	0.040	0.034	0.006	0.034	0.450	0.018	0.832

Notes: The table reports results from balance tests assessing differences in baseline characteristics between states with and without Medicaid pregnancy dental benefits. Each cell presents the estimated coefficient from a separate regression of the specified characteristic on the Medicaid dental benefit indicator, controlling for time-varying state-level covariates. All models include state and year fixed effects. Standard errors clustered at the state level are shown in parentheses. Statistical significance is denoted by *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.