Adult Medicaid Benefit Generosity and Receipt of Recommended Health Services among Low-income Children: The Spillover Effects of Medicaid Adult Dental Coverage Expansions*

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Abstract

Low-income children are less likely to receive recommended health services than their high-income counterparts. This paper examines whether the design of parental Medicaid benefit packages could serve as a mechanism for reducing income-based disparities in unmet health care needs, considering dental benefits as a case study. Leveraging state-level changes to adult dental benefits over time, I find that coverage is associated with increases of 14 and 5 percentage points, respectively, in the likelihood of a recent dental visit among parents and children directly exposed to the policy. Child effects appear to be concentrated among younger children under age 12.

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1. INTRODUCTION

Low-income children are significantly less likely to receive recommended health care services compared to their higher income counterparts (Berdahl et al. 2013). This observation holds true even among children who are insured (Case & Paxson 2002). In fact, nearly all children with family income below the federal poverty level are eligible for public health insurance in the United States, yet stark disparities in the receipt of health care and health outcomes persist. For example, Medicaid-eligible children are more likely to have tooth decay but less likely to visit the dentist compared to children from higher income families despite the fact that all state Medicaid programs cover dental services for children (Berdahl et al. 2016; Edelstein & Chinn 2009). These disparities may have effects that extend beyond health. For example, research has shown that poor oral health may affect a child's school attendance and academic performance (Agaku et al. 2015; Jackson et al. 2011).

This paper poses the question of whether the design of parental Medicaid benefit packages could serve as a new mechanism for reducing unmet health care needs among low-income, insured children. I use state-level variation in Medicaid benefit generosity for adults to examine whether there is a plausibly causal link between parental and child health behaviors among low-income families, considering dental benefits as a case study. While most states cover emergency dental services for adult enrollees, only about half have provided coverage of preventive and/or restorative dental services in the recent past (Decker & Lipton, 2015). Further, states have added and dropped these benefits over time. Prior research has shown that providing coverage of preventive dental care significantly increases the likelihood that an adult visits the dentist (Abdus & Decker 2019; Decker & Lipton 2015; Choi 2011).

Medicaid adult dental coverage could affect child dental care use in several ways. First, fixed costs such as finding a provider and learning about the health and other benefits of having a dental visit could be applied to both parent and child.[1] Past research finds that participation in Medicaid increases with family size, providing support for the notion that fixed costs play a role in a related decision-making process (Currie 2000). Second, where the standard economic model posits that people are perfectly aware of the costs and benefits of a given decision, this assumption is often not met in practice, particularly when the decision is complex as is often the case in health care related choices (Baicker et al. 2012). Gaining dental insurance through Medicaid may help a parent to better understand the costs and benefits of taking a child to the dentist by bringing awareness or salience to dental benefits available to publicly insured children or through resulting provider contact. Finally, gaining Medicaid adult dental coverage may incentivize parents to develop the habit of regular dental visits, which may have downstream effects on their children (e.g., reference dependence) (Kahneman & Tversky 1979).

This paper uses a difference-in-differences regression design and 2000-2013 National Health Interview Survey (NHIS) data to assess the effects of Medicaid adult dental coverage on both parents and children. The main samples consist of parents with at least one minor co-residing child who report Medicaid enrollment and children with at least one parent enrolled in Medicaid as these groups are expected to be directly affected by changes to Medicaid benefit coverage policies. Estimates for these samples may be biased if dental benefits increase enrollment in Medicaid among eligible adults, inducing systematic correlation between dental benefits and sample composition. To account for this possibility, I also provide estimates for samples more likely to be treated but not defined based on parental Medicaid enrollment, including parents and

[1] Past research finds that most general dentists (91%) treat children as well as adults (Seale & Casamassimo 2003).

children in low-income families, and alternatively, low-educated families. The results of these analyses are generally qualitatively consistent with the findings from the main analysis and confirm that results are concentrated among groups more likely to be treated.

I find that dental coverage is associated with a 13.8 percentage point increase in the likelihood that a parent had a dental visit in the past year, which is similar to the finding in Decker and Lipton (2015). The effect size is larger in magnitude for mothers than fathers (15.4 vs. 8.2 percentage points, $p<0.10$ for the difference) and also appears to decline with the number of co-residing children under age 18, but increases in dental visits do not appear to differ substantially with age (under vs. over 35) or marital status.

Among children with at least one parent on Medicaid, adult dental coverage is associated with a 5.1 percentage point increase in the likelihood of a recent dental visit. A rough calculation based on the estimates for parents and children suggests that approximately 20% of parents who had a visit because of the availability of dental coverage also took their children to the dentist. These effects appear to be concentrated among children under age 12, with little evidence of an effect among children ages 12 and over. There were no statistically significant differences by child sex, number of siblings, or mother's marital status. I estimate effects in the expected direction for other outcomes plausibly related to increased child access to dental care, including emergency department visits and missed school days, however none of these estimates are statistically significant at conventional levels.

An exploratory analysis of potential mechanisms suggests that changes in the perception of cost-related barriers to child dental care use are unlikely to provide a complete explanation for the results. I also find little evidence that improvements in family financial resources, either through reductions in parental out-of-pocket expenses for dental care or improvements in a

parent's employment prospects, play a major role. Effects among children are concentrated among those residing with a mother who had a recent dental visit, suggesting that an information channel may be a more likely explanation.

Event study estimates do not suggest violations of the parallel trends assumption. The results are also robust to a number of sensitivity tests, including controlling for state-year variables plausibly related to Medicaid benefit generosity, inclusion of state-specific trends, and using triple difference models to estimate effects for treated children and adults relative to a within-state control group.

This work is related to the literature examining the spillover effects of public health insurance expansions, and how these policies impact the entire family. A growing literature has focused on the household-level financial implications of gaining public health insurance eligibility (Levy et al. 2019; Hu et al. 2018; Miller et al. 2018; Dillender 2017; Mazumder & Miller 2016; Wherry et al. 2016; Saloner 2013; Leininger et al. 2010). Several recent articles examining data from a major credit reporting agency find that increasing health insurance coverage among low-income adults substantially reduces unpaid medical bills and the amount of debt sent to third-party collection agencies (Hu et al. 2018; Miller et al. 2018; Mazmuder & Miller 2016). Among studies examining self-reported expenditures, some find substantial reductions in health expenses among adults that switch from private to public coverage after becoming eligible for Medicaid (Dillender 2017; Leininger et al. 2010) while another study finds a relatively modest reduction (Levy et al. 2019). Findings from Leininger et al. (2010) suggest that the money saved on health care expenses is used to pay for transportation costs and to contribute to retirement savings.

More closely related to the present work are studies examining how extending public health insurance eligibility to one family member affects health-care related decisions for other members of the family. Past research has shown that increases in health insurance coverage among parents are associated with an increased likelihood of coverage among already eligible children (Hamersma et al. 2018; Hudson & Moriya, 2017; Sommers et al. 2016; Devoe et al. 2015; Devoe et al. 2008; Sommers 2006; Aizer & Grogger 2003; Dubay & Kenney 2003). Several studies using state-level variation in Medicaid eligibility rules for parents to examine this connection find evidence of spillover effects among children (Hamersma et al. 2018; Devoe et al. 2015; Sommers 2006; Aizer & Grogger 2003). One national study (Hudson & Moriya 2017) and one study of California (Sommers et al. 2016) assess the 'welcome mat' effects of the Affordable Care Act's Medicaid expansion to low-income adults and find a substantial increase in child enrollment in public health insurance coverage. A few studies address the related question of the spillover effects of public health insurance expansions to children on adults and also find evidence of effects (Koch 2015; Monheit & Vistnes, 2015; Cutler & Gruber 1996).

Fewer studies with rigorous identification strategies have examined the association between parental and child *health behaviors*, such has having a provider visit. One recent article examining past adult Medicaid eligibility expansions found substantial spillover effects to receipt of well-child visits among low-income children (Venkataramani et al. 2017). Other related studies have produced findings in line with this work, though most cannot establish causality. For example, Devoe et al. (2009) find that insured children with uninsured parents are more likely to have unmet health care needs. Similarly, Davidoff et al. (2003) find that having an uninsured parent is associated with a lower likelihood of having a medical provider visit. However, neither of these studies have a plausibly causal research design.

Moreover, there is little research, causal or correlational, to shed light on the influence parental dental insurance or visits have on a child's likelihood of a dental visit. To my knowledge, only one nationally representative US study has examined the association between parent and child dental visits, finding a positive correlation (Isong et al. 2010). Another study found evidence of a positive association between caregiver and child dental visits among Hispanic agricultural worker families in California (Finlayson et al. 2014). While this research is suggestive that parent dental visits may play an important role in the decision to take a child to the dentist, it is difficult to disentangle common, pre-existing familial factors from any potential causal relationship.

This paper complements and builds on existing literature by providing evidence of a plausibly causal connection between parental and child health behaviors for a specific health service. In comparison with the majority of studies that use public health insurance eligibility expansions to examine related research questions, the present research has the advantage that all states provided comprehensive dental benefits to publicly insured children during the study period. Further, changes in eligibility affect access to a bundle of health care services, whereas changes to dental benefits only affect access to a single service. While improved access to dental care may have indirect effects on use of other types of health care and health, the main anticipated effect is an increase in dental visits. This research question and study design therefore may make other confounding factors easier to identify as large effects on more general health-care related outcomes would indicate that dental benefits were not entirely responsible for observed effects.

By establishing a direct connection between parental and child health behaviors, these results could inform policies that affect low-income children and their families. Because some benefits,

such as dental coverage, are mandatory for children enrolled in public health insurance but optional for parents, this research could also help to build the case for states to provide these benefits to parents with one objective being to increase the use of related services among children.

The outline for this paper is as follows. The remainder of Section 1 provides additional background on the literature examining adult dental benefits as well as child tooth development and disparities in child use of dental care. Section 2 describes the data and methods. Section 3 presents results, and Section 4 concludes.

1.1 Previous Evidence on the Effect of Medicaid Dental Benefits on Adult Outcomes

Research has found that Medicaid adult dental benefits are associated with increased use of dental care (Abdus & Decker 2019; Decker & Lipton 2015; Choi 2011), reduced out-of-pocket dental care spending (Abdus & Decker 2019), and improved oral health (Decker & Lipton 2015). Estimates of the effects of dental coverage on any past year dental visit from national studies range from about 9 to 13 percentage points (Abdus & Decker 2019; Decker & Lipton 2015; Choi 2011). One study of California found evidence that dropping adult dental benefits increased emergency department visits for dental conditions, increasing average yearly costs associated with these visits by 68% (Singhal et al. 2015).

Studies of the impact of health care reform on use of dental care have come to somewhat mixed conclusions, but generally find evidence of positive effects. Studies of the 2006 Massachusetts health care reform (Nasseh & Vujicic 2013) and 2008 Oregon Health Insurance Experiment Medicaid expansion by lottery (Baicker et al. 2018) suggest increases in dental care use. However, Oregon's Health Plan Standard available to lottery winners only covered

emergency dental services, and correspondingly, the increase observed was for dental emergency department visits (Baicker et al. 2018). By contrast, the Massachusetts reform included comprehensive dental coverage for all adults under poverty and was associated with an 11 percentage point increase in preventive dental visits for poor relative to nonpoor adults (Nasseh & Vujicic 2013).

The results of one analysis of the Affordable Care Act's (ACA) Medicaid expansion suggest increases in past year dental use between 2 and 6 percentage points in states that expanded Medicaid and offered adult dental coverage, but these estimates were not statistically significant (Nasseh & Vujicic 2017a). However, in a follow-up study including additional years of data, the authors found significant increases of a similar magnitude (Nasseh & Vujicic 2017b). Another study found a significant increase in dental visits among childless adults, but a reduction among parents (Singhal et al. 2017). An analysis of Kentucky's Medicaid expansion found that reform was associated with an increase in emergency department visits for dental conditions, a finding likely explained by the fact that Kentucky's Medicaid program only covers emergency dental care for adult Medicaid enrollees (Chalmers et al. 2016).

This research expands on the literature examining how Medicaid adult dental benefits affect adult dental care use by studying downstream effects on children in families likely to be affected by these policies.

1.2 Child Tooth Development, Disparities in Child Use of Dental Care, and the Role of Policy

Appendix Figure A.1 illustrates the timing of tooth eruption and shedding for most children. Primary teeth typically erupt between the ages of 8 and 33 months and are shed between ages 6 and 12 years. Permanent teeth typically erupt between ages 6 and 13 years, with the exception of

wisdom teeth, which erupt in late childhood or early adulthood. The American Dental Association (ADA) and the American Academy of Pediatric Dentistry (AAPD) recommend that a child have his first dental visit within 6 months of the eruption of the first tooth and no later than his first birthday (AAPD 2013).

Untreated caries is one of the most common unmet health care needs among children with about 23% of US children ages 2-5 having had at least one cavity, and about 10% having untreated tooth decay (Dye et al. 2015). While permanent teeth do not begin to erupt until age 6 in most children, early receipt of dental care may be important for several reasons. First, early use of dental care is associated with a higher likelihood of using preventive dental care at other times during childhood, an association which is strongest among the highest risk children (Savage et al. 2004). Second, dental visits during early childhood may provide an opportunity for counseling on healthy habits such as twice daily tooth brushing that reduce exposure to cariogenic bacteria (Wan et al. 2003). Finally, primary tooth decay may increase the risk of oral health problems later in life by affecting permanent tooth placement (ADA 2019).

Research has found substantial disparities in dental visit rates and oral health problems among children by socioeconomic status (Slade & Sanders 2018; Berdhal et al. 2016; Dye et al. 2015). Figure 1 provides the percentage of children with a recent dental visit for 2000-2013 by family income (Panel A) and child insurance status (Panel B) from the National Health Interview Survey. As can be seen in the figure, the rate of past 6-month dental visits increased over time across income and insurance status groups, but substantial gaps remained at the end of the period. For example, the visit rate increased from 42 to 58% among the lowest income children between 2000 and 2013 (Panel A). However the rate among the highest income children in 2013 remained 15 percentage points higher than for the lowest income children. Despite the fact that

all state Medicaid programs cover preventive dental care for children, the dental visit rate for publicly insured children remained below that for privately insured children throughout the period.[2] In 2013, the gap between publicly and privately insured children remained about 8 percentage points.

Past studies have found that policies targeted at children and young adults have had positive effects on dental insurance coverage and use of recommended dental care. One recent study found that inclusion of pediatric dental care as an essential health benefit under the ACA increased private dental insurance coverage among children (Kranz & Dick 2018). Other work examining the ACA's dependent coverage expansion to young adults ages 19-25 has found increased private dental insurance coverage (Shane & Ayyargari 2015) and use of dental care (Shane & Wehby 2017; Vujicic et al. 2014). Studies of past Medicaid and CHIP eligibility expansions to children have also found positive effects on child use of dental care (Howell & Kenney 2012), and one study found that these expansions were associated with long-run reductions in tooth loss among adults likely to gain eligibility as children (Lipton et al. 2016).

This research contributes to the literature examining how public policy can affect dental care use among youth, but is unique in focusing on a policy targeted at adults rather than children. Since Medicaid policies mostly affect low-income families, the finding of a positive effect on child dental visits may contribute to reducing income-based disparities in unmet needs for dental care.

2. DATA AND METHODS

2.1. The National Health Interview Survey

[2] Private insurance status refers to medical insurance and may not include dental coverage.

The National Health Interview Survey (NHIS) is a nationally representative, repeated cross-sectional household survey of the civilian non-institutionalized United States population. Each member of the household completes an interview, and within each household, one adult and one child are sampled to provide more in-depth information. Sampled adults and children are asked how long it has been since their most recent dental visit, and parents can be linked with co-residing children. This study uses a restricted version of the survey linked with Medicaid adult dental coverage policies for 2000-2013.

The main outcome of interest is whether a child has seen a dentist in the past 6 months. An adult family member provides information about the length of time since the last dental visit for sampled children ages 1-17. Possible response options are categorical and include "never," "6 months or less," "more than 6 months, but not more than 1 year ago," "more than 1 year, but not more than 2 years ago," "more than 2 years, but not more than 5 years ago," and "more than 5 years ago." Past 6 month dental visits were selected as the primary outcome based on recommendations from both the American Dental Association (ADA) and the American Academy of Pediatric Dentistry (ADA 2013; AAPD 2013).

To place estimates of changes in child dental care use in perspective, I also present estimates of changes in parent dental care use. While past work estimates the effects of Medicaid adult dental coverage on adult dental care use, this paper provides estimates for NHIS parents, and also shows subgroup analyses by parent gender, age, marital status, and by the number of children under age 18 present in the household. Past year dental visits are used in the main analysis as recommendations for adults vary depending on oral health status. Once yearly visits are considered adequate for adults free of gum disease and associated risk factors (Giannobile et al. 2013).

The NHIS also asks whether children ages 2-17 needed but did not receive dental care in the past year because the family could not afford it. Analysis of responses to this question is included to inform potential pathways through which Medicaid adult dental coverage policies affect child dental care use. This paper also analyzes child outcomes that could plausibly be affected by improved access to dental care (i.e., school absences, emergency department visits, and general self-reported health status) as well as select general indicators of access to health care and health that are not expected to respond directly to improvements in access to dental care (i.e., usual source of care, past-year well-child visit, and three or more ear infections in the past year).[3] While increased use of dental care may create spillovers to other types of care, these indirect effects are expected to be modest relative to changes in dental care use and therefore inclusion of these latter measures also serves as a placebo check. (For example, when a child visits the dentist, she may be less likely to see another type of provider because of time or other constraints, or more likely because of increased awareness of the child's health care needs.)

2.2. State Dental Coverage Policies

As described in Decker and Lipton (2015), the Kaiser Family Foundation serves as the main source of information for Medicaid adult dental coverage policies. Kaiser Family Foundation biannual reports were supplemented with internet research and contact with state health departments to resolve uncertainties. Similar to past research (Abdus & Decker 2019; Decker & Lipton 2015), dental coverage was operationalized as a binary indicator equal to one in states that provide coverage of at least one preventive or restorative service beyond emergency care for adults. Since most states that cover more than emergency services cover regular dental visits, this

[3] There is some evidence to suggest an association between oral health and respiratory conditions (see for example Gomes-Filho et al. 2010), however this has been debated in the literature and this link has not been shown to be causal to my knowledge.

measure seems most appropriate to assess changes to dental visits.[4] Coverage policies can differ for adults who are eligible for Medicaid because they are pregnant or disabled. This analysis uses policies for non-pregnant and non-disabled adults who are eligible for Medicaid based on their income. NHIS respondents who resided in a state where dental coverage was provided for at least 6 months of the year prior to their interview date were classified as being covered since the main outcomes are retrospective (i.e., past 6 month and past year dental visits).

While there is no requirement that states provide any level of dental coverage to adult Medicaid enrollees, almost all states covered emergency dental services during the study period and many offered coverage of a preventive or restorative service. Between 23 and 28 states offered dental coverage according to the definition used in this paper during 2000-2013, with 17 states changing their dental coverage policies (Table 1). Overall, about 61.6% of Medicaid-enrolled parents had dental coverage during the study period, with the percentage declining from 74.6% in 2000 to 44.2% in 2013. Similarly, the percentage of children exposed to Medicaid adult dental coverage through a Medicaid-enrolled parent declined substantially over the study period (Appendix Figure A.2). While the main empirical model assumes that adding and dropping coverage have symmetric effects, states that dropped coverage contribute more to identification of these estimates.

Unlike adults, all state Medicaid programs are required to provide a comprehensive set of dental benefits to children through the Early and Periodic Screening, Diagnostic and Treatment

[4] Illinois was not considered a coverage state in Decker and Lipton (2015), but was recoded as a dropper state for this analysis based on updated information. Illinois only offered coverage of restorative services and not of preventive exams until July 2012, when coverage for restorative services was also dropped. However, this state is considered a coverage state prior to July 2012 for consistency with the definition of dental coverage applied to other states. All other state definitions in Table 1 are consistent with Decker and Lipton (2015), except for one state (KS) that restored dental coverage after the end of that study's analysis period.

(EPSDT) benefit (CMS n.d.), which must include regular dental exams, restoration of teeth and treatment of pain and infections. Additionally, any treatment considered medically necessary for conditions discovered during an exam must be covered by Medicaid. Children in slightly higher income families that receive coverage through the Children's Health Insurance Program (CHIP) have access to the same coverage under the EPSDT benefit if they reside in a state that has a combined Medicaid and CHIP program. For children enrolled in CHIP in states with separate programs, dental coverage must include coverage for those services "necessary to prevent disease and promote oral health, restore oral health and function, and treat emergency conditions."

2.3. Sample Selection

The sample for the child analysis includes children ages 1-17 with at least one co-residing parent enrolled in Medicaid and complete demographic and dental visit information. Children residing in families who report receipt of supplemental security income in the past year are excluded from the sample since their parents are more likely to be eligible for Medicaid due to a disability. The final sample consists of 17,274 children. As expected given more generous eligibility rules for children relative to parents, nearly all (94%) of children in the sample are enrolled in Medicaid and CHIP.

The sample for the parent analysis includes Medicaid-enrolled adults ages 22-64 who can be linked with at least one co-residing child under age 18. Adults under 22 years old are excluded because adults up to age 20 are eligible for dental coverage through the EPSDT benefit in all state Medicaid programs, and the dental visit variables are retrospective. Similar to the child analysis, adults that report receipt of supplemental security income in the past year are excluded from the sample. The final sample consists of 12,167 parents.

To account for the possibility of systematic correlation between dental coverage and parent participation in Medicaid, I also consider three additional samples including all parents and children, parents and children with family incomes up to 400% of the federal poverty level (FPL), and parents and children in low-educated households where the parent has a high school diploma or GED or less education.

Appendix Table A.1 provides the means of all control variables for the main child and parent samples. Among the child sample, about 51% are male, 37% are non-Hispanic white, 96% are US citizens, and 16% are the only child in the household. On average, 48% reported a dental visit in the past 6 months, and 7% reported needing but not receiving dental care due to cost. Among the parent sample, about 22% are male, 45% are non-Hispanic white, 84% are US citizens, and 32% have only one child present in the household. On average, 51% reported a dental visit in the past year, and 22% reported needing but not receiving dental care due to cost.

2.4. Empirical Approach

The preferred approach is a difference-in-differences model that regresses each outcome on the Medicaid adult dental coverage indicator, demographic characteristics, and state and year fixed effects. State fixed effects account for time-invariant characteristics that may be correlated with both the propensity to offer dental benefits and outcomes, while year fixed effects account for national trends over time. This method uses within-state changes in dental coverage policies over time to identify the effects of adult dental coverage. Intuitively, this model compares outcomes in states with and without adult dental benefits at any given time (first difference), and before and after changes to dental coverage in states that added or dropped these benefits (second difference).

Because NHIS contains dental visit information for both parents and children, a second possible estimation strategy is an instrumental variables approach with the first stage predicting adult dental visits and the second the impact of an adult visit on child dental visits. There are some disadvantages of this approach relative to the preferred difference-in-differences model. First, instrumental variables estimates would assume that the only mechanism for an effect of Medicaid adult dental coverage on child dental visits is a parent dental visit, which may be inappropriate. Second, the difference-in-differences approach provides a direct estimate of the effect of the policy lever on child outcomes, while an instrumental variables approach would estimate the effect of a parent dental visit on child dental visits. While both of these estimates are of potential interest, the former is arguably more policy relevant. Third, because only one sampled adult and child in each household are asked about recent dental visits, some children included in the difference-in-differences regressions would have to be excluded from the instrumental variables analysis. For these reasons, the difference-in-differences approach is preferred.

The regression model for the child and parent analysis takes the following form:

$$Y_{ist} = \beta_1 AdultDental_{st} + \beta_2 X_{ist} + \gamma_s + \tau_t + \varepsilon_{ist} \quad (1)$$

Where Y_{ist} represents the outcome of interest for individual *i* residing in state *s* and interviewed at time *t*, $Dental_{st}$ is the binary Medicaid adult dental coverage indicator, X_{ist} includes demographic characteristics, γ_s represents state fixed effects, τ_t represents year fixed effects, and ε_{ist} is an error term. For the child analysis, X_{ist} includes child sex, age, race/ethnicity, citizenship status, an urban area indicator, dummy variables for the number of children under 18 residing in the home (2-4, and 5 or more, with the reference category being 1 child), and maternal characteristics including mother's citizenship status, education, employment

status, and marital status.[5] For the parent analysis, X_{ist} includes sex, age, race/ethnicity, citizenship status, education, marital status, an urban area indicator, and indicators for the number of children under 18 residing in the home. Errors are clustered by state in all analyses to account for serial correlation in the policy variable – adult dental coverage. All regressions are weighted using sampling weights available from the National Center for Health Statistics to produce nationally representative estimates.

Results that include time-varying state level controls and state-specific linear yearly trends are also shown for comparison. Time-varying state-level characteristics included in both the child and parent analysis include the maximum temporary assistance for needy families benefit for a family of four, the maximum supplemental nutrition assistance program benefit for a family of four, the state earned income tax credit as a proportion of the federal benefit, the number of dentists per 10,000 population, and the annual unemployment rate. Most state controls were obtained from the University of Kentucky Center for Poverty Research, except for the number of dentists per capita and unemployment rate, which were obtained from the Area Health Resources File.

The main identifying assumption is that outcome trends in states that changed their dental coverage policies would have remained parallel to those in other states in the absence of a policy change. While this assumption is fundamentally not testable, I assess its validity in several ways. First, I estimate event study models that regress the dental visit outcomes against leads and lags

[5] A small number of children meeting the other criteria for inclusion in the sample do not reside with a biological or adoptive mother and are excluded from the analysis. Including these children and excluding the maternal characteristics controls does not have a substantial impact on the results.

of the policy change to assess both pre-trends and the timing and evolution of post-policy effects. These models are of the following form:

$$Y_{ist} = \sum_{k=-2}^{2} \varphi_k \cdot 1(t - T_s = k) + \beta_1 X_{ist} + \gamma_s + \tau_t + \varepsilon_{ist} \qquad (2)$$

Where T_s is the year in which state s changes its dental coverage policy and all other variables are as defined in Eq. (1). The coefficients φ_k estimate the evolution of the effects of dental coverage over time relative to three or more years prior to a coverage change. Effects in the post-policy period are measured by φ_1 and φ_2, which provide estimates of effects in the first year and two or more years following a coverage change, respectively. To be consistent with the main analysis, the post-effect variable φ_1 "turns on" with a 6-month lag. By using a reference period well before the policy change, I allow for an earlier effect in the year the policy change actually occurs, as measured by φ_0. States both dropped and added dental coverage, and some states changed their policy multiple times during the study period. This analysis incorporates as much identifying variation as possible by including all states with a single change for the full period,[6] and states with multiple changes until their second policy change. States with no coverage change were included in the control group.

Second, I test the robustness of the results to inclusion of an indicator for Medicaid adult vision coverage, another optional Medicaid benefit plausibly correlated with dental coverage adoption. Third, I present results of triple difference models that incorporate a within-state control group of children without a parent on Medicaid. These models may account for state-by-

[6] To include both adder and dropper states, adder state indicators were coded with a -1 and dropper states were coded with a +1. Therefore, the results for this analysis are presented in terms of a coverage drop.

year factors that affect other children within a state similarly. These models are of the following form:

$$Y_{ist} = \beta_1 Medicaid_{it} + \beta_2 AdultDental_{st} \times Medicaid_{it} + \beta_3 X_{ist} + \gamma_s + \tau_t + \gamma_s \times Medicaid_{it} + \tau_t \times Medicaid_{it} + \tau_t \times \gamma_s + \varepsilon_{ist} \quad (3)$$

Where $Medicaid_{it}$ is a binary indicator for being enrolled in Medicaid (parent analysis) or for having at least one parent enrolled in Medicaid (child analysis), and all other variables are as defined above. Models include state and year fixed effects as well as the two-way interactions between treatment group status and these controls ($\gamma_s \times Medicaid_{it}$ and $\tau_t \times Medicaid_{it}$). These terms provide flexible control for differences in trends across states and over time, respectively, for the treatment and control groups. The results of models that include the full set of state-by-year interactions ($\tau_t \times \gamma_s$) to account for time-varying state-level variables that do not vary by Medicaid status are also presented.

The results of the event study analysis are presented in section 3.2. Other sensitivity analyses are discussed in section 3.4.

2.5. Dental Benefits and Sample Composition

Since the main empirical approach uses a sample of children with a parent enrolled in Medicaid, one potential concern is that the sample's composition may change systematically with changes to adult dental benefits. Prior cross-sectional evidence suggests that when a state provides Medicaid adult dental coverage, eligible adults may be more likely to participate in the program (Sommers et al. 2012). This may be because dental benefits make program participation more valuable, or because of other concurrent policy changes that affect enrollment. If the marginal person that enrolls due to a change in dental coverage policy has a different propensity

to seek dental care for herself and her children compared to the average enrollee, then results may be biased.

To gauge the extent of potential bias, I directly test the association between dental benefits and sample inclusion among parents and children and also test for compositional changes in observable characteristics. Table 2 presents the results of a regression of a binary indicator for parent Medicaid and CHIP enrollment (Panel A) and of an indicator for inclusion in the child sample (Panel B) against the dental coverage indicator and all other controls included in the main analysis. Results are shown for all parents and children and also for low-income and low education samples. Dental coverage is not significantly associated with inclusion in the child sample and point estimates are generally modest, ranging from -0.1 to 0.4 percentage points in the base model, depending on the sample (first column, Panel B). Dental coverage is not significantly associated with parent sample inclusion among all adults, but it is associated with a statistically significant but modest increase of about 1.8 percentage points for the low-income and low education samples, respectively, in the base model (first column, Panel A). This estimate is only significant at the 10% level among low-income adults. This increase in parent participation may be less likely to affect child sample inclusion if the increase is concentrated among dual parent households where one parent is already participating in Medicaid. In fact, I find that the increase in parent participation is concentrated among married adults and multiple adult households (results available upon request).

To test for compositional changes in observable characteristics, each individual-level explanatory variable used in the main analysis is regressed against the adult dental coverage indicator and state and year fixed effects. Appendix Table A.2 presents results for both parents and children. None of the observable characteristics are significantly correlated with adult dental

benefits among the child sample and estimated coefficients are generally small in magnitude, with the exception of citizenship status (both own and maternal) and being non-Hispanic black. Dental coverage is associated with declines of about 1.7 and 2.4 percentage points in the likelihood that a child in the sample is a citizen and non-Hispanic black, respectively, though the latter estimate is only significant at the 10% level. Further, neither of these estimates remain statistically significant in models that include the time-varying state level controls. On average, citizens and non-citizens included in the sample are similarly likely to use dental care. Non-Hispanic black children tend to be less likely to use dental care compared to other racial and ethnic groups, however, given the modest size of the estimated association and differences in mean use, it is unlikely that compositional effects contribute substantially to the main findings. Among the parent sample, dental coverage is associated with an increase in the likelihood of being male and a reduction in the likelihood of residing in an urban area, however these estimates are only significant at the 10% level and also modest relative to estimated effects on dental visits among adults.

Taken together, it is unlikely that compositional changes to the adult and child samples concurrent with changes to adult dental benefits could explain the main findings. However, results of intent-to-treat estimates for low-income and low-education households that do not suffer this potential selection bias are also provided for comparison.

3. RESULTS

3.1 Main Difference-in-difference Results

Table 3 presents the main regression results for parents (first column). Dental benefits are associated with an increase of about 13.8 percentage points ($p<0.001$) in the likelihood that an

adult had a visit in the past year. This increase represents a 27% effect relative to the mean visit rate (51.5%). Results are similar when controlling for the set of time-varying state-level variables (column 2), and only slightly attenuated when adding state-specific linear trends (column 3). Table 3 also shows results for various subgroups. Point estimates are larger in magnitude for women than men (15.4 vs. 8.2 percentage points) and for parents with fewer compared to more children, though these differences are only significant at the 10% level.

Table 4 shows the main regression results for children (first column). Dental benefits are associated with an increase of about 5.1 percentage points ($p<0.01$) in the likelihood that a child had a visit in the past 6 months. This increase represents an 11% effect relative to the mean visit rate (48.2%). Assuming that an adult dental visit is the only mechanism through which dental benefits affect child dental care use, and given the average ratio of parents to children in the sample, this estimate would suggest that roughly 20% of parents who responded to receipt of dental coverage by visiting the dentist themselves also took their children to the dentist. Results are similar when controlling for the set of time-varying state-level variables (column 2). Inclusion of state-specific trends reduces the point estimate moderately, but the estimate remains significant at the 10% level (column 3).

Effects appear to be concentrated among younger children ages 1-11 (7.2 percentage point effect), with no evidence of a significant effect among children ages 12-17 ($p<0.10$ for the difference). Estimates for single children are moderately smaller than for households with more children, but this difference is not statistically significant at conventional levels. Effect

magnitudes are similar for male and female children and for those with married and unmarried mothers.[7]

Table 5 provides estimates for all parents and children as well as the alternative income- and education-based samples. Consistent with the main results for parents and children directly affected by Medicaid adult dental coverage policies, estimates for all, low-income, and low-educated parents and children are positive and statistically significant. Table 5 also shows results for samples less likely to be affected by the policy – individuals from higher income and education families. While some of these families may be eligible for Medicaid and CHIP, possibly for part of the year, estimates for these groups are expected to be substantially smaller. To the extent that Medicaid adult dental benefits improve oral health knowledge among parents, there is potential for spillover effects to untreated individuals who have substantial interaction with treated adults. However, again, it is expected that lower income and lower education adults would be more likely to interact with publicly insured adults (e.g., they are more likely to reside in the same neighborhoods).

Point estimates are extremely modest and not statistically significant for parents and children with incomes over 400% FPL. This is unsurprising as it is unlikely that these individuals were exposed to the policy through parent Medicaid enrollment. Estimates for parents with a high school diploma or GED or more education are substantially smaller than for their lower educated counterparts (1.9 vs. 4.8 percentage points in the base model, first column), but are statistically significant. More parents in this group report Medicaid enrollment (7%) than in the higher income group (<1%), which likely explains this finding. Point estimates for children with at least

[7] Results also did not differ significantly by race and ethnicity for parents or children. Results are available upon request.

one highly educated parent are also much smaller than for those with low educated parents and not statistically significant (third column). However, corresponding with the larger estimates for parents, estimates for the high educated child sample are larger in magnitude than for the high income sample.

3.2 Event Study Results

Figure 2 presents event study estimates for parents and children in panels A and B, respectively (Equation 2). Since most variation is from states dropping coverage, results are framed in terms of a coverage drop. Reassuringly, estimates of pre-effects are relatively small in magnitude and not statistically significant for parents or children. There is a statistically significant 4.6 percentage point reduction in dental visits for parents in the year of policy implementation ($p<0.10$), but the point estimate for children is small and not statistically significant. This suggests that on average, parents respond to dental coverage changes by first adjusting their own use of dental care. Estimates for the first year and two or more years after a coverage change are negative for both parents and children and indicate that the effect of dental coverage increases over time. Among parents, estimates suggest statistically significant decreases of 9.6 ($p<0.10$) and 14.0 percentage points ($p<0.01$) in the first year and two or more years after a coverage change, respectively. Among children, estimates suggest reductions of 3.1 ($p=0.26$) and 6.4 percentage points ($p<0.01$) in the first year and two or more years after a coverage change, respectively, though only the latter is statistically significant. Results were qualitatively similar when the year before policy implementation was used as the reference period, only changer sates were included, states with multiple policy changes were excluded, as well as when including additional controls for time-varying state-level variables (results available upon request).

3.3 Effects on Related Outcomes and Potential Mechanisms

Table 6 presents the results of the main regression analysis (Equation 1) for other child outcomes, including outcomes plausibly related to access to dental care (i.e., unmet need for dental care due to cost, past year emergency department visit, missed school days, and self-reported general health status) and those without an obvious connection (usual source of medical care, past year check-up, and three or more ear infections in the past year). If a state's provision of adult dental coverage increases awareness of benefits available to children, then reports of needing but not being able to afford dental care should decline when adult dental coverage is offered. While the point estimate for this outcome is negative, it is not statistically significant at conventional levels (Table 6, Panel A). The baseline specification suggests a decline of about 2.3 percentage points (p=0.15), less than half the size of the estimate for the increase in dental visits, suggesting that perceived cost is likely not the only mechanism driving the results for children (first column). This estimate is further attenuated in models that include time-varying state controls (1.4 percentage points) and state-specific trends (-0.6 percentage points). On the contrary, dental coverage is associated with large and statistically significant reductions in unmet dental care needs due to cost among parents (see Decker and Lipton (2015), and also Table 8), suggesting that cost-related barriers may be a larger factor in the increase in parent dental visits. Point estimates for other plausibly related child outcomes are generally of the expected sign but none are statistically significant at conventional levels.

Among other general outcomes that are not expected to be directly related to improved access to dental care (Table 6, Panel B), I do not find any evidence of significant effects. Increasing dental visits could crowd out other types of care or may reinforce other health related behaviors. Further reductions in out-of-pocket costs for adult dental care could have an income

effect (Abdus & Decker 2019). The baseline specification suggests a small decline in past year check-ups, but this estimate is not statistically significant and the sign is not stable across models. The estimated association between dental coverage and frequent ear infections is also very modest and not statistically significant. While dental coverage could plausibly have small effects on these outcomes, more substantial and significant effects would imply the presence other factors correlated with both dental coverage and child health care outcomes. The fact that these estimates are modest in size and not statistically significant is reassuring.

Where perceived cost alone does not seem to explain the child dental visit results, increased awareness of child oral health needs, a provider's recommendation, and habit formation through a parent dental visit are also strong possible mechanisms. To investigate the importance of a parent dental visit, Appendix Table A.3 presents the correlation between Medicaid adult dental coverage and child dental visits among children residing with a mother who did and did not have a recent visit. This information is only available when a mother is also the NHIS sampled adult, and therefore results in a reduced child sample size of 9,971. Clearly parent dental visits are endogenous to adult dental coverage policies, so these estimates cannot be interpreted as causal. However, these results may indicate the relative importance of a parent dental visit in explaining the main child visit results. Because results for children are highly concentrated among those under age 12, results are also presented separately for this group.

Among all children and those under age 12, increases in child dental visits appear to be concentrated among those with a recent mother dental visit. For example, adult dental benefits are associated with increases of 6.1 percentage points ($p<0.05$) and 1.7 percentage points ($p=0.71$) among children with and without a recent mother dental visit, respectively, in the

baseline model (first column, Appendix Table A.3). A similar pattern holds for children under 12.

While information received during a parent dental visit provides a plausible explanation for the concentration of results among children residing with a mother who had a recent visit, there are other possibilities. For example, adult dental coverage may improve family resources by reducing out-of-pocket costs for adult dental care (Abdus & Decker 2019), or by improving a parent's employment prospects. These mechanisms could lead to observed parent and child dental visits without any information transmission during a parent's visit.

Table 7 explores the effects of dental coverage on employment outcomes and health care cost burdens among parents. Point estimates for the employment outcome are positive and moderate in size across model specifications, but also noisy and not statistically significant. Among employed parents, dental coverage is associated with a positive but modest increase in working full time compared to part time that is not statistically significant in the baseline model (first column, Table 7), and is also not consistent in sign across models.

If improvements in family resources explain the increase in child dental visits, I would also expect dental benefits to be associated with reduced cost burdens and increased use of other types of medical care among parents and children. Dental coverage is associated with a 1.7 percentage point reduction in the likelihood that a parent reports delaying medical care due to cost (first column, Table 7). However, this estimate is only significant in the baseline model. Further, I do not find significant effects on reports that a parent did not get medical care due to cost. By contrast, dental coverage is associated with a significant 11 percentage point decline in the likelihood that a parent reports needing but not receiving dental care due to cost, a result that is consistent with prior work (Decker & Lipton 2015). Overall, evidence that dental coverage

enhances family resources by improving employment prospects among parents, or that any possible increase is applied toward other types of parent medical care is weak. Further, I do not find evidence of an increase in the use of other types of medical care among children (Table 6).

Another possible mechanism to explain the main findings is a reduction in the per family member fixed costs of dental care receipt. When a state offers adult dental coverage reducing cost barriers to a parent dental visit, costs such as finding a provider and taking time off from work may be applied toward both parent and child dental visits. The importance of this channel is difficult to test empirically with the present data, however, analysis of effects by family structure and size may provide some insight.

While the total potential benefits of family dental visits are likely to increase with family size, on the margin, the change in benefits only depends on the number of adults that gain dental coverage. However, certain costs may increase with family size. For example, a parent may more easily schedule two appointments (i.e., a parent and single child visit) with the same provider on the same day than appointments for multiple children. Parents with larger families may also have greater time commitments, making it more difficult to use medical and dental benefits. Findings indicate that parents with one child compared to three or more children were more likely to use dental care in response to the availability of dental benefits, and this difference was statistically significant at the 10% level (Table 3). The opposite pattern was observed among children, though differences between the effects on child visits did not differ significantly by family size. Estimated effects by parent marital status do not differ significantly among parents or children.[8]

[8] Alternative estimates by single versus multiple adult households were also not statistically significantly different for parents or children.

Overall, I find little evidence that improvements in family resources or increased parental awareness without provider contact can explain the main results. Changes in perceptions of cost-related barriers to child dental care may provide some, but not a complete explanation as the point estimate for this outcome is less than half the size of the estimated increase in child dental visits in the baseline model and also not statistically significant at conventional levels. The fact that parent results vary by the number of co-residing children might indicate that fixed costs are a component the results, but this observed effect may also stem from other factors such as time availability.

I find that child effects are concentrated among those residing with a mother who had a recent dental visit, indicating that the parent dental visit may play an important role in the results. While not possible to assess empirically, information transmission from provider to parent during the dental visit provides a plausible explanation for these findings.

3.4 Sensitivity Analysis

This section explores several sensitivity analyses to examine the robustness of the main findings. First, Appendix Table A.4 presents triple difference estimates including a within-state control group for both parents and children (Equation 3). Estimates are presented for all children and children under age 12. These estimates may account for time-varying state-level factors that affect the main analysis samples and other residents of a state similarly. However, if there are spillover effects to other families not directly targeted by Medicaid adult dental policies, these estimates may understate effects on the treated sample. For example, if information transmission is an important factor in the main child results, it is possible that Medicaid-enrolled parents could relay this information to other low-income parents, producing an effect on children in other low-income families.

Effects among children of all ages are similar to the main results when considering a control group of all children without a Medicaid-enrolled parent in a state, but somewhat attenuated when low-income control groups are used. (Estimates referenced throughout the text are for the model that does not include the full set of state-by-year interactions, but results including these controls are generally extremely similar, as shown in Appendix Table A.4.) For example, I estimate that, relative to all other children, dental benefits are associated with a significant 4 percentage point increase in the likelihood that a child with a Medicaid-enrolled parent had a recent dental visit (first column). When comparing to children with family incomes up to 400% FPL, I estimate an effect of 3.2 percentage points that is significant at the 10% level (third column). Estimates are further attenuated (2.1 percentage points) and no longer statistically significant when considering a control group of children with family incomes up to 250% FPL (fifth column). While these estimates suggest that low-income children without a Medicaid-enrolled parent may experience an increase in dental visits, I do not estimate significant effects among these groups.

Among children under age 12, results are more consistent across control groups, though also slightly attenuated when considering the lower income control groups. In particular I estimate that dental benefits are associated with significant increases of 6.7, 6.1, and 5.5 percentage points in the likelihood of a recent dental visit among treated children relative to all other children, children with family incomes up to 400% FPL, and children with family incomes up to 250% FPL, respectively.

Among parents, results are statistically significant and similar in magnitude across control groups, though slightly attenuated relative to the difference-in-differences estimates. In particular, I estimate that dental benefits are associated with significant increases of 12.4, 11.6,

and 12.0 percentage points in the likelihood of a recent dental visit among treated parents relative to all other parents, parents with incomes up to 400% FPL, and parents with incomes up to 250% FPL, respectively. These results are in line with, but slightly smaller than, the main difference-in-difference estimate of 13.8 percentage points (Table 3).

Second, while the triple difference results discussed above may account for certain time-varying state-level factors and generally support the main results for parents and children, these estimates cannot account for changes to Medicaid program features that may co-occur with changes to adult dental benefits. For example, coverage of other optional benefits such as prescription drugs, physical and occupational therapy, or vision care may be correlated with dental benefits. Vision benefits are arguably most similar to dental benefits among this list and are also among the more likely to change within states over time.[9]

Results that control for adult vision coverage are shown in Appendix Table A.5. Generally, these results are similar, but slightly attenuated relative to the main estimates that do not include this control. In the baseline model, I estimate that dental benefits are associated with significant increases of 4.3 and 13.3 percentage points in the likelihood of a recent child and parent dental visit, respectively. Results for parents are positive and significant across models, though more significantly attenuated in models that also include state-specific trends (third column, Appendix Table A.5). Results for children remain positive and significant at the 10% level when other time-varying state-level controls are included (second column), but are no longer statistically significant when state-specific trends are added to the model (third column).

[9] Based on the author's analysis of Kaiser Family Foundation reports.

Finally, to explore the relative importance of larger compared to smaller states, unweighted estimates are presented in Appendix Table A.6. Relative to the main parent results, unweighted estimates are generally similar and statistically significant across models. Point estimates for children are moderately attenuated relative to the main results. For example, unweighted estimates from the baseline model suggest that dental benefits are associated with a 3.3 percentage point increase in dental visits among children, compared to a weighted estimate of 5.1 percentage points (first column). Results for children remain statistically significant in the baseline model (first column) and also when controls for time-varying state-level variables are included (second column), but are no longer significant when controlling for state-specific trends (third column). Taken together, these results suggest that while the effect of dental benefits on parent use of dental care are not driven by larger states, the downstream effects on child dental visits may be larger in more populous states. However, even unweighted results generally suggest a significant and positive impact on child dental care use.

4. CONCLUSIONS

Past research has established that Medicaid adult dental benefits are associated with substantial increases in dental visits among adults (Abdus & Decker 2019; Decker & Lipton 2015; Choi 2011). This analysis suggests that not only do adult dental benefits increase use of dental care among parents, but coverage is also associated with a 5 percentage point increase in past 6-month dental visits among children. Analysis of child subgroups revealed that effects were concentrated among younger children under age 12. Effects may vary between subgroups because of differences in the prevalence of oral health problems, family oral health knowledge, or a parent's decision-making process and authority. For example, parents may either feel a greater responsibility to make health investments in younger children, or they may be better able

to coordinate a younger child's schedule to ensure that a provider visit occurs. Point estimates in the baseline model were also modestly larger for females compared to males, for children with siblings compared to single children, and among those with unmarried mothers, however none of these differences were statistically significant at conventional levels.

Point estimates for the association between dental benefits and plausibly related child outcomes including emergency department visits and school absences were of the expected sign, but not statistically significant at conventional levels. While improved access to preventive dental care may be expected to reduce emergency department visits for dental conditions, the measure available in the NHIS does not distinguish dental-related visits from visits for other conditions. Analysis of a more refined measure may have produced different results.

Prior research has found an association between child oral health and academic outcomes, including absences (Agaku et al. 2015; Jackson et al. 2011). However, to my knowledge, there are no national studies with rigorous designs to assess this question. Given that the effects of adult dental benefits on dental visits were concentrated among younger children, effects on other outcomes among 12-17 year-olds would not be expected. Research using larger sample sizes for younger school-aged children and exploration of other outcomes beyond absences warrants further study.

While estimates implied an 11 percentage point reduction in unmet needs for dental care due to cost among parents, the corresponding estimate for children was relatively modest (2 percentage point reduction) and not statistically significant. Provision of adult dental benefits could change parents' perceptions of the costs of taking a child to the dentist if awareness of their own benefits prompts them to investigate related benefits available to their children, or if they learn this information through a provider visit. Because dental benefits are associated with

reduced out-of-pocket costs (Abdus & Decker 2019), a family with adult dental coverage may also have more resources for child health care services, but these effects are likely to be modest.

The potential for dental benefits to improve employment prospects among parents could translate to a larger gain in family resources, but evidence for such an effect is scarce. One study found that exposure to fluoridated water during childhood was associated with improved adult oral health and an increase in earnings among women (Glied & Niedell 2010). Other related studies suffer from small samples and study design limitations, but generally suggest that the effects of access to dental care on employment-related outcomes are positive (Singhal et al. 2013). Estimates of changes in employment from the present study were positive, but not statistically significant. I also did not find evidence of an increase in full-time vs. part-time work among the employed. This analysis differs from Glied and Neidell's 2010 study because it examines the short-term association between changes in access to oral health care and labor market outcomes. Further, while Medicaid adult dental coverage has been found to be associated with a reduction in untreated caries among adults, coverage (as defined) was not associated with a reduction in tooth loss in a study using similar methods as the present work (Decker & Lipton 2015). By contrast, Glied and Neidell found that exposure to fluoridated water was significantly associated with later life tooth loss. These are important differences that may explain why the present study did not find evidence of an association.

While difficult to assess empirically, information gained through the parent provider visit may be an important channel for observed effects on children. Unfortunately, there is little data available to assess oral health knowledge at the national level. The only data source I am aware of is the American Dental Association's Oral Health and Well-Being in the United States Survey, which is only available in a single year (2015), and public-use data are at the state level.

Further, this survey assesses adult oral health knowledge and does not directly examine an adult's knowledge of child oral health needs. The finding that effects among children are concentrated among those with a recent mother dental visit suggests that the parent's dental visit likely plays an important role in the results. However it is not possible to distinguish whether an adult dental visit provides information about child oral health needs, awareness of public health insurance benefits among children, or if there is an alternative explanation (e.g., the reduction in fixed costs per family member) that results in both parent and child visits.

The results of this study suggest that providing dental benefits to parents may have a positive impact on receipt of recommended care among children. These findings may have important policy implications. For example, many state Medicaid programs do not provide basic preventive dental care to adult enrollees, including some states that expanded Medicaid under the ACA. While increases in adult dental care use after the ACA's Medicaid expansion appear to be more modest than those resulting from historical changes to Medicaid dental benefits studied here and in other work, the most recent analysis suggests a significant increase in those states that expanded and also provided dental coverage (Nasseh & Vujicic 2017b). Offering dental benefits in states that currently do not may encourage increased receipt of dental care among low-income adults and children. Further, the ACA required pediatric but not adult dental care to be covered as an essential health benefit in private ACA-compliant plans. While it is not possible to extrapolate the results of this research to privately insured families, it is plausible that some of the mechanisms that might explain the link between parent and child dental care receipt observed in this study could also apply to other populations.

Overall, the gap in receipt of a recent dental visit between the lowest and highest income children during the analysis period was about 23 percentage points in states that did not offer

adult dental coverage.[10] If all of these children were exposed to Medicaid adult dental coverage, a rough calculation based on this analysis suggests that this disparity could be reduced by more than 20%. Research suggests that measures taken to improve access to oral health care during childhood may have persistent effects on adult oral health (Lipton et al. 2016; Neidell et al. 2011; Glied & Neidell 2010). Given evidence of associations between oral health and pain, systemic health, social and economic outcomes (Singhal et al. 2013; de Oliveira et al. 2010; Glied & Neidell 2010; Willis et al. 2008; Naito et al. 2006), improving access to dental care among children could have important effects that extend well into adulthood.

[10] Author's calculation from the 2000-2013 NHIS.

REFERENCES

Abdus, S., & Decker, S. L. (2019) Association between Medicaid adult dental nonemergency dental benefits and dental services use and expenditures. *Journal of the American Dental Association*, 150(1), 24-33.

Agaku, I. T., Olutola, B. G., Adisa, A. O., Obadan, E. M., & Vardavas, C. I. (2015). Association between unmet dental needs and school absenteeism because of illness or injury among US school children and adolescents aged 6-17 years, 2011-2012. *Preventive Medicine*, 72, 83-88.

Aizer, A., & Grogger, J. (2003). Parental Medicaid expansions and health insurance coverage. NBER Working Paper No. 9907.

American Academy of Pediatric Dentistry. *Guideline on Periodicity of Examination, Preventive Dental Services, Anticipatory Guidance/Counseling, and Oral Treatment for Infants, Children, and Adolescents*. Chicago, IL: AAPD, 2013. Available at: http://www.aapd.org/media/policies_guidelines/g_periodicity.pdf. Accessed April 9, 2019.

American Dental Association. *American Dental Association Statement on Regular Dental Visits*. Chicago, IL: ADA, June 2013.

American Dental Association. *Mouth Healthy: Baby Teeth*. Chicago, IL: ADA, 2019. Available at: https://www.mouthhealthy.org/en/az-topics/b/baby-teeth. Accessed April 9, 2019.

Baicker, K., Allen, H. L., Wright, B. J., Taubman, S. L., & Finkelstein, A. N. (2018). The effect of Medicaid on dental care of poor adults: evidence from the Oregon Health Insurance Experiment. *Health Services Research*, 53(4), 2147-2164.

Baicker, K., Congdon, W. J., & Mullainathan, S. (2012). Health insurance coverage and take-up: Lessons from behavioral economics. *The Millbank Quarterly*, 90(1): 107-134.

Berdahl, T. A., Friedman, B. S., McCormick, M. C., & Simpson, L. (2013). Annual report on health care for children and youth in the United States: Trends in racial/ethnic, income, and insurance disparities over time, 2002-2009. *Academic Pediatrics*, 13(3), 191-203.

Berdahl, T. A., Hudson, J., Simpson, L., & McCormick, M. C. (2016). Annual report on children's health care: Dental and orthodontic utilization and expenditures for children, 2010-2012. *Academic Pediatrics*, 16(4), 314-326.

Case, A., & Paxson, C. (2002). Parental behavior and child health. *Health Affairs*, 21(2), 164-178.

Centers for Medicare and Medicaid Services. *Medicaid Benefits, Dental Care.* Baltimore, MD: CMS (n.d.). Available at: https://www.medicaid.gov/medicaid/benefits/dental/index.html. Accessed April 9, 2019.

Chalmers, N., Grover, J., & Compton, R. (2016). After Medicaid expansion in Kentucky, use of hospital emergency departments for dental conditions increased. *Health Affairs*, 35(12), 2268-2276.

Choi, M. K. (2011). The impact of Medicaid insurance coverage on dental service use. *Journal of Health Economics*, 30(5), 1020-1031.

Currie J. (2000). Do children of immigrants make differential use of public health insurance? In: Borjas G., editor. Issues in the economics of immigration. Chicago: University of Chicago Press, 271-308.

Cutler, D. M., & Gruber, J. (1996). Does public insurance crowd out private insurance? *Quarterly Journal of Economics*, 111(2), 391-430.

Davidoff, A., Dubay, L., Kenney, G., & Yemane, A. (2003). The effect of parents' insurance coverage on access to care for low-income children. *Inquiry*, 40(3), 254-268.

de Oliveira, C., Watt, R., & Hamer, B. (2010). Toothbrushing, inflammation, and risk of cardiovascular disease: results from Scottish Health Survey. *BMJ: British Medical Journal*, 340, c2451.

Decker, S. L., & Lipton, B. J. (2015). Do Medicaid benefit expansions have teeth? The effect of Medicaid adult dental coverage on the use of dental services and oral health. *Journal of Health Economics*, 44, 212-225.

DeVoe, J. E., Krois, L., Edlund, T., Smith, J., & Carlson, N. E. (2008). Uninsurance among children whose parents are losing Medicaid coverage: results from a statewide survey of Oregon families. *Health Services Research*, 43(1), 401-418.

DeVoe, J. E., Marino, M., Angier, H., O'Malley, J. P., Crawford, C., Nelson, C.,…& Gold, R. (2015). Effect of expanding Medicaid for parents on children's health insurance coverage: lessons from the Oregon experiment. *JAMA Pediatrics*, 169(1), e143-e145.

DeVoe, J. E., Tillotson, C. J., & Wallace, L. S. (2009). Children's receipt of health care services and family health insurance patterns. *The Annals of Family Medicine*, 7(5), 406-413.

Dillender, M. (2017). Medicaid, family spending, and the financial implications of crowd-out. *Journal of Health Economics*, 53, 1-16.

Dubay, L., & Kenney, G. (2003). Expanding public health insurance to parents: effects on children's coverage under Medicaid. *Health Services Research*, 38(5), 1283-1302.

Dye, B. A., Thornton-Evans, G., Li, X., & Iafolloa, T. J. (2015). Dental caries and sealant prevalence in children and adolescents in the United States, 2011-2012. *NCHS data brief* 191, 1-8.

Edelstein, B. L., & Chinn, C. H. (2009). Update on disparities in oral health and access to dental care for America's children. *Academic Pediatrics*, 9(6), 415-419.

Finlayson, T. L., Gansky, S. A., Shain, S. G., & Weintraub, J. A. (2014). Dental utilization by children in Hispanic agricultural worker families in California. *Journal of Dental, Oral and Cranofacial Epidemiology*, 2(1-2), 15.

Glied, S., & Neidell, M. (2010). The economic value of teeth. *Journal of Human Resources*, 45(2), 468-496.

Giannobile, W. V., Braun, T. M., Caplis, A. K., Doucette-Stamm, L., Duff, G. W., & Kornman, K. S. (2013). Patient stratification for preventive care in dentistry. *Journal of Public Health Dentistry*, 92(8), 694-701.

Gomes-Filho, I. S., Passos, J. S., & Seixas da Cruz, Simone. (2010). Respiratory disease and the role of oral bacteria. *Journal of Oral Microbiology*, doi:10.3402/jom.v2i0.5811.

Hamersma, S., Kim, M., & Timpe, B. (2018). The effect of parental Medicaid expansions on children's health insurance coverage. *Contemporary Economic Policy*, Advance online publication. doi: 10.1111/coep.12392.

Howell, E. M., & Kenney, G. M. (2012). The impact of the Medicaid/CHIP expansions on children: a synthesis of the evidence. *Medical Care Research and Review*, 69(4), 372-396.

Hu, L., Kaestner, R., Mazumder, B., Miller, S., & Wong, A. (2018). The effect of the Affordable Care Act Medicaid expansions on financial wellbeing. *Journal of Public Economics*, 163, 99-112.

Hudson, J. L., & Moriya, A. S. (2017). Medicaid expansion for adults had measurable 'Welcome Mat' effects on their children. *Health Affairs*, 36(9), 1643-1651.

Isong, I. A., Zuckerman, K. E., Rao, S. R., Kuhlthau, K. A., Winickoff, J. P, & Perrin, J. M. (2010). Association between parents' and children's use of oral health services. *Pediatrics*, 125(3), 502-508.

Jackson, S. L., Vann Jr, W. F., Kotch, J. B., Pahel, B. T., & Lee, J. Y. (2011). Impact of poor oral health on children's school attendance and performance. *American Journal of Public Health*, 101(10), 1900-1906.

Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica*, 47(2), 263-291.

Koch, T. G. (2015). All internal in the family? Measuring spillovers from public health insurance? *Journal of Human Resources*, 50(4), 959-979.

Kranz, A.M., & Dick, A.W. (2018). Changes in pediatric dental coverage and visits following the implementation of the Affordable Care Act. *Health Services Research*, Advance online publication, doi: 10.1111/1475-6773.13093.

Leininger, L., Levy, H., & Schanzenbach, D. (2010). Consequences of SCHIP expansions for household well-being. In: *Forum for Health Economics & Policy*, 13(1), 1-32.

Levy, H., Buchmueller, T., & Nikpay, S. (2019). The impact of Medicaid expansion on household consumption. *Eastern Economic Journal*, 45(1), 34-57.

Lipton, B. J., Wherry, L. R., Miller, S., Kenney, G. M., & Decker, S. (2016) Previous Medicaid expansion may have had lasting positive effects on oral health among non-Hispanic black children. *Health Affairs*, 35(12), 2249-2258.

Mazumder, B., & Miller, S. (2016). The effect of the Massachusetts health reform on household financial distress. *American Economic Journal: Economic Policy*, 8(3), 284-313.

Miller, S., Hu, L., Kaestner, R., Mazumder, B., & Wong, A. (2018). The ACA Medicaid expansion in Michigan and financial health. NBER Working Paper No. 25053.

Monheit, A. C., & Vistnes, J. (2015). Does public health insurance for children improve single mothers' health care use? *Journal of Family and Economic Issues*, 36(4), 581-592.

Naito, M., Yuasa, H., Nomura, Y., Nakayama, T., Hamajima, N., & Hanada, N. (2006). Oral health status and health-related quality of life: a systematic review. *Journal of Oral Science*, 48(1), 1-7.

Nasseh, K., & Vujicic, M. (2013). Health reform in Massachusetts increased adult dental care use, particularly among the poor. *Health Affairs*, 32(9), 1639-1645.

Nasseh, K., & Vujicic, M. (2017a). Early impact of the Affordable Care Act's Medicaid expansion on dental care use. *Health Services Research*, 52(6), 2256-2268.

Nasseh, K., & Vujicic, M. (2017b). The impact of the Affordable Care Act's Medicaid expansion on dental care use through 2016. *Journal of Public Health Dentistry*, 77(4), 290-294.

Neidell, M., Herzog, K., & Glied, S. (2010). The association between community water fluoridation and adult tooth loss. *American Journal of Public Health*, 100(10), 1980-1985.

Saloner, B. (2013). Does expanding public insurance prevent material hardship for families with children? *Medical Care Research and Review*, 70(3), 267-286.

Savage, M. F., Lee, J. Y., Kotch, J. B., & Vann, W. F., (2004). Early preventive dental visits: effects on subsequent utilization and costs. *Pediatrics*, 114(4), e418-423.

Seale, N. S., & Casamassimo, P. S. (2003). Access to dental care for children in the United States: a survey of general practitioners. *Journal of the American Dental Association*, 134(12), 1630-1640.

Shane, D. M, & Ayyagari, P. (2015). Spillover effects of the Affordable Care Act? Exploring the impact on young adult dental insurance coverage. *Health Services Research*, 50(4), 1109-1124.

Shane, D. M., & Wehby, G. L. (2017). The impact of the Affordable Care Act's dependent coverage mandate on use of dental treatments and preventive services. *Medical Care*, 55(9), 841-847.

Singhal, A., Caplan, D. J., Jones, M. P., Momany, E. T., Kuthy, R. A., Buresh, C. T., …& Daminano, P. C. (2015). Eliminating Medicaid adult dental coverage in California led to increased dental emergency visits and associated costs. *Health Affairs*, 34(5), 749-756.

Singhal, A., Damiano, P., & Sabik, L. (2017). Medicaid adult dental benefits increase use of dental care, but impact of expansion on dental services use was mixed. *Health Affairs*, 36(4), 723-732.

Singhal, S., Correa, R., & Quinonez, C. (2013). The impact of dental treatment on employment outcomes: a systematic review. *Health Policy*, 109(1), 88-96.

Slade, G. D., & Sander, A. E. (2018). Two decades of persisting income-disparities in dental caries among US children and adolescents. *Journal of public health dentistry*, 78(3), 187-191.

Sommers, B. D. (2006). Insuring children or insuring families: Do parental and sibling coverage lead to improved retention of children in Medicaid and CHIP? *Journal of Health Economics*, 25(6), 1154-1169.

Sommers, B. D., Tomasi, M. R., Swartz, K., & Epstein, A. M. (2012). Reasons for the wide variation in Medicaid participation rates among states hold lessons for coverage expansion in 2014. *Health Affairs*, 31(5), 909-919.

Sommers, B. D., Chua, K. P., Kenney, G. M., Long, S. K., & McMorrow, S. (2016). California's early coverage expansion under the Affordable Care Act: a county-level analysis. *Health Services Research*, 51(3), 825-845.

Venkataramani, M., Pollack, C. E., & Roberts, E. T. (2017). Spillover effects of adult Medicaid expansions on children's use of preventive services. *Pediatrics*, 140(6), e20170953.

Vujicic, M., Yarbrough, C., & Nasseh, K. (2014). The effect of the Affordable Care Act's expanded coverage policy on access to dental care. *Medical Care*, 52(8), 715-719.

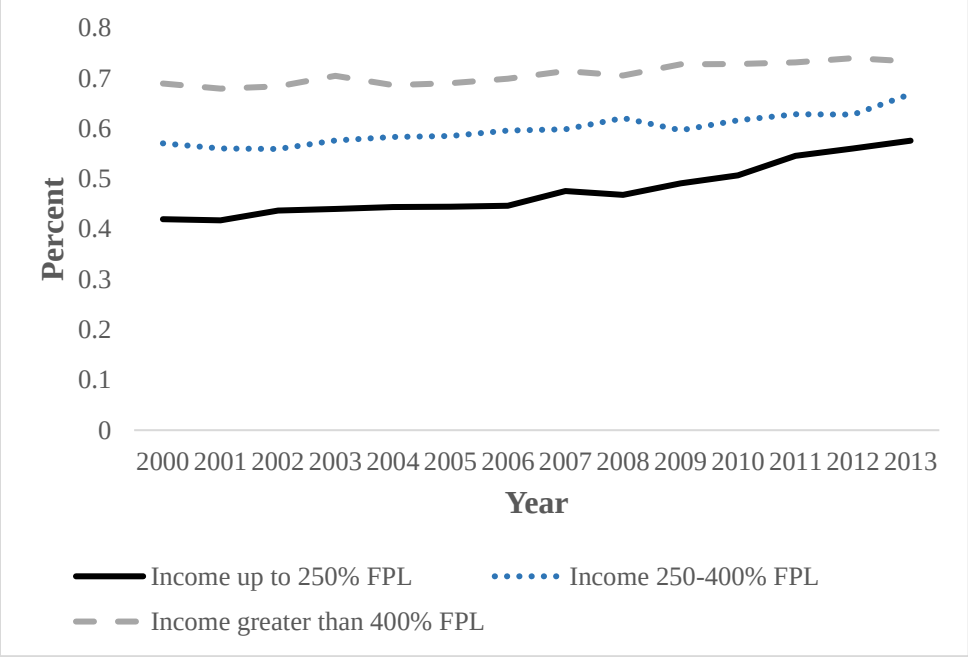
Wan, A. K. Seow, W. K., Purdie, D. M., Bird, P. S., Walsh, L. J., & Tudehope, D. I. (2003). A longitudinal study of Streptococcus mutans colonization in infants after tooth eruption. *Journal of Dental Research*, 82(7): 504-508.

Willis, M. S., Esqueda, C. W., & Schacht, R. N., 2008. Social perceptions of individuals missing upper front teeth. *Perceptual and Motor Skills*, 106(2), 423-435.

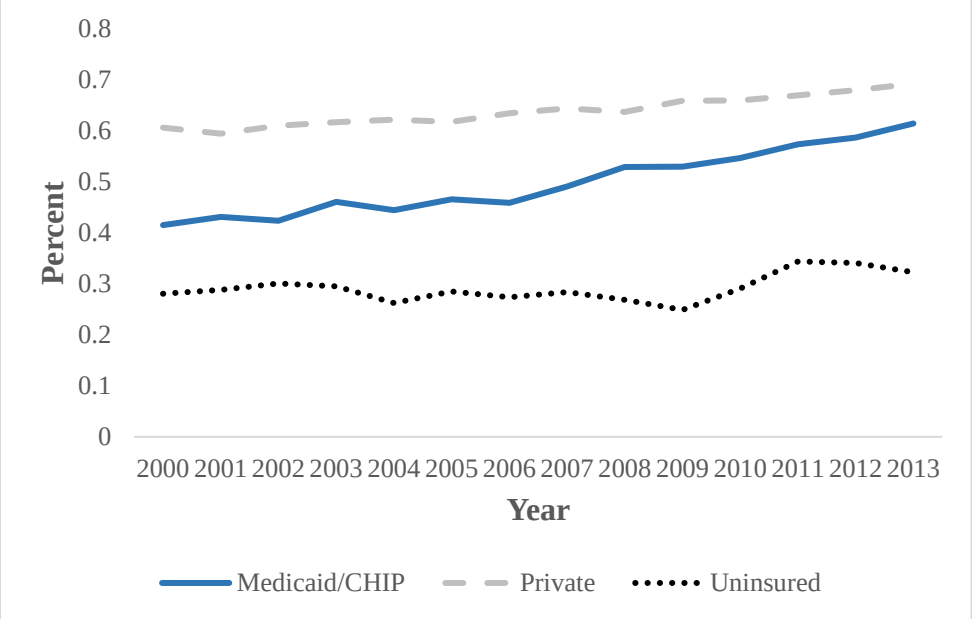
FIGURES

Figure 1. Disparities in children's past 6-month dental visits by family income and child insurance status, NHIS 2000-2013

Panel A. By income category



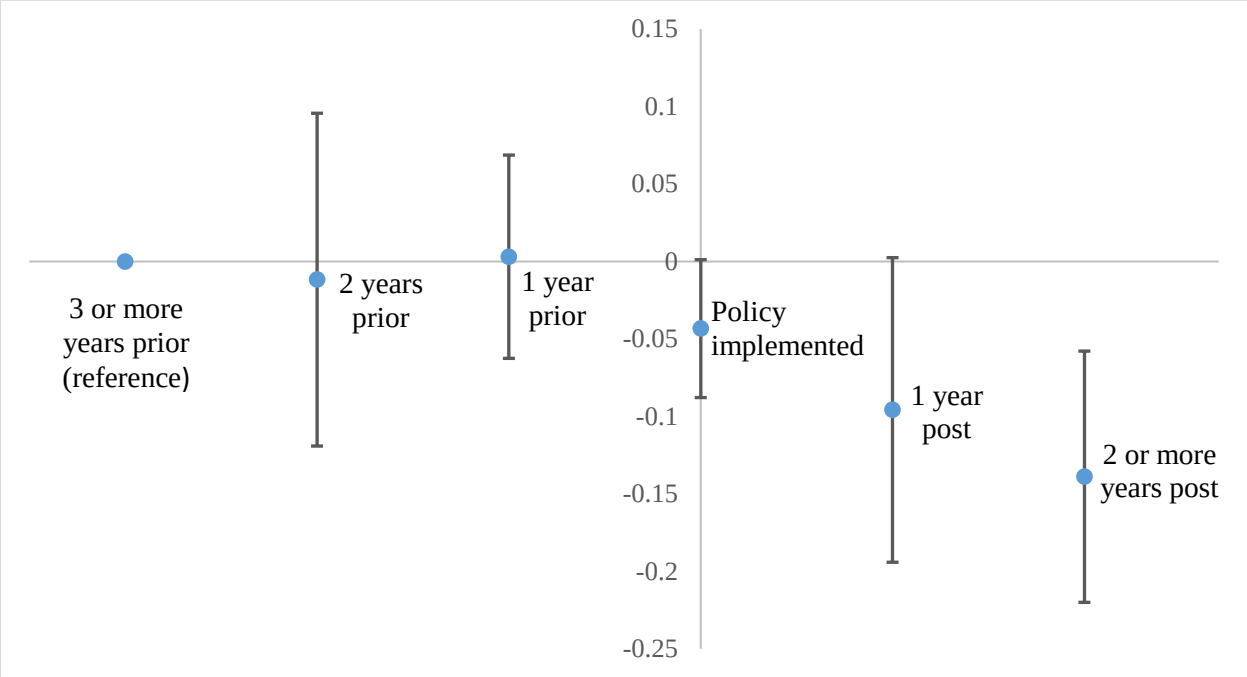
Panel B. By child insurance category



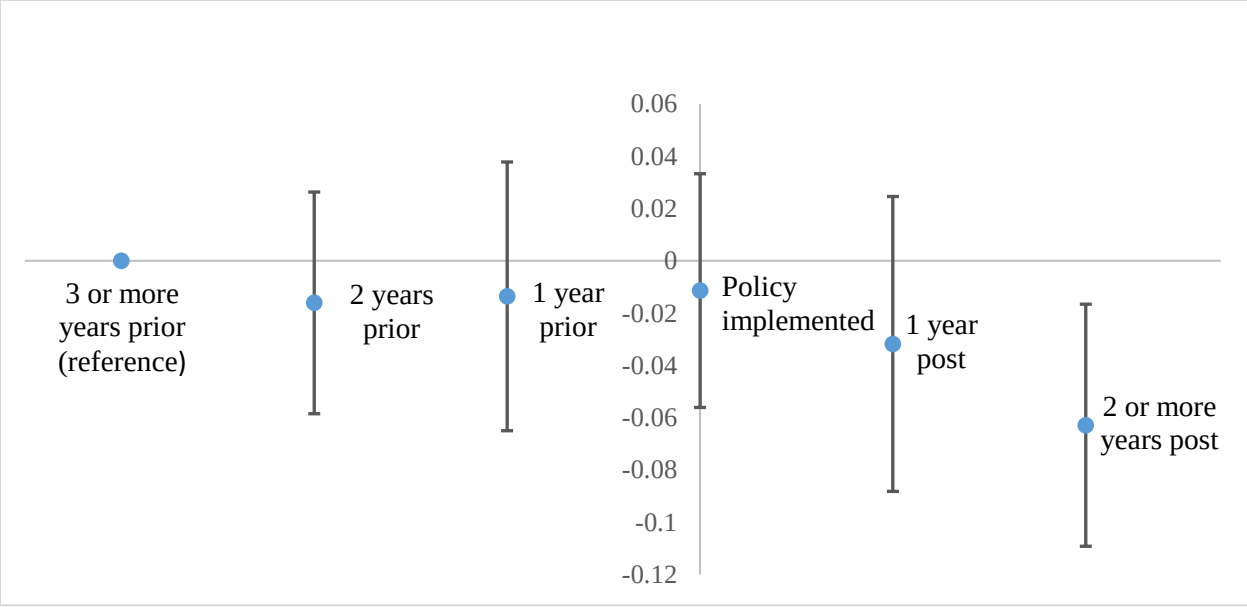
Notes. Estimates represent the weighted percentage of children ages 1-17 who had a dental visit in the past 6 months from the 2000-2013 National Health Interview Survey.

Figure 2. Event study estimates of the effect of dental benefits on dental visits among parents and children, NHIS 2000-2013

Panel A. Parents



Panel B. Children



Notes. Each graph contains point estimates from event study (3 or more years prior to policy change is normalized to zero) and 95% confidence intervals which are adjusted for within-state clustering. Estimates are in terms of a drop in coverage. All states are included in the analysis sample. States with multiple policy changes during the study period are dropped from the sample prior to the second change. The one-year policy implementation period is

centered around the date of change. The post variables are aligned with the timing of the dental coverage variable in the main analysis.

TABLES

Table 1. Summary of dental coverage policy changes, 2000-2013

Never covered dental (17 states)
AL, AZ, CO, DE, GA, LA, ME, MD, MS, MT, NH, NV, SC, TN, TX, VA, WV
Always covered dental (17 states)
CT, IN, IA, KY, MN, NE, NJ, NM, NY, NC, ND, OH, OR, PA, RI, VT, WI
Added dental (6 states)
AK (3/29/2007), AR (7/1/2009), DC (10/1/2006), KS (1/1/2013), SD (1/1/2002), WY (7/1/2007)
Dropped dental (6 states)
CA (7/1/2009), FL (7/1/2002), ID (7/1/2011), OK (7/1/2002), WA (7/1/2011), IL (7/1/2012)
Dropped and added dental (5 states)
HI (added 7/1/2006, dropped 7/1/2009), MA (dropped 7/1/2002, added 7/1/2006), MI (dropped 10/1/2003, added 10/1/2005, dropped 4/1/2009, added 10/1/2010), MO (added 7/1/2003, dropped 7/1/2005), UT (dropped 7/1/2002, added 7/1/2005, dropped 7/1/2006)

Notes. Author's analysis of Kaiser Family Foundation reports and various other sources.

Table 2. Regression estimates of the association between dental benefits and sample inclusion, parents and children, NHIS 2000-2013

Panel A. Dental coverage and participation in Medicaid/CHIP among parents, by sample

	Coefficient (SE)			
Sample	**Model 1**	**Model 2**	**Model 3**	**N**
All parents	0.0060	0.0053	0.0088	112,653
	(0.0047)	(0.0046)	(0.0058)	
Low-income parents	0.0184	0.0153	0.0210	56,818
	(0.0092)	(0.0089)	(0.0089)	
Low-educated parents	0.0175	0.0127	0.0235	49,110
	(0.0082)	(0.0073)	(0.0103)	
Time-varying state variables	No	Yes	Yes	
State-specific trends	No	No	Yes	

Panel B. Dental coverage and the likelihood of having at least one parent enrolled in Medicaid/CHIP among children, by sample

	Coefficient (SE)			
Sample	**Model 1**	**Model 2**	**Model 3**	**N**
All children	-0.0008	-0.0023	-0.0032	142,895
	(0.0047)	(0.0048)	(0.0066)	
Low-income household	0.0030	0.0000	-0.0077	72,629
	(0.0085)	(0.0087)	(0.0102)	
Low-educated household	0.0043	0.0006	0.0043	75,046
	(0.0080)	(0.0068)	(0.0098)	
Time-varying state variables	No	Yes	Yes	
State-specific trends	No	No	Yes	

Notes. Panel A reports estimates from a linear regression of Medicaid and CHIP enrollment on the adult dental coverage indicator, parent demographic characteristics, state and year fixed effects, and additional controls as indicated in the table. Panel B reports estimates from a linear regression of child sample inclusion on the adult dental coverage indicator, child demographic characteristics, maternal characteristics, state and year fixed effects, and additional controls as indicated in the table. Standard errors are reported below estimates in parentheses. All estimates are weighted and errors are clustered at the state level. N represents the unweighted sample size for each parent and child sample. Low-income households include those with incomes up to 250% FPL. Low educated households include those with a parent with a high school diploma or GED or less education.

Table 3. Difference-in-differences estimates of the effect of dental benefits on one-year dental visits among parents, by subgroup, NHIS 2000-2013

	Coefficient (SE)			
Sample	**Model 1**	**Model 2**	**Model 3**	**N**
All	0.1384	0.1389	0.1135	12,167
	(0.0203)	(0.0244)	(0.0314)	
Gender				
Male	0.0816	0.0967	0.0535	1,931
	(0.0307)	(0.0425)	(0.0604)	
Female	0.1541	0.1531	0.1329	10,236
	(0.0249)	(0.0294)	(0.0390)	
Age				
Under 35	0.1361	0.1474	0.1151	7,029
	(0.0272)	(0.0334)	(0.0475)	
At least 35	0.1367	0.1221	0.1095	5,138
	(0.0268)	(0.0307)	(0.0425)	
Number of children				
One	0.1711	0.1634	0.1527	3,819
	(0.0384)	(0.0406)	(0.0432)	
Two	0.1508	0.1434	0.1718	4,025
	(0.0273)	(0.0415)	(0.0468)	
Three or more	0.0914	0.1170	0.0402	4,323
	(0.0400)	(0.0435)	(0.0623)	
Marital Status				
Married	0.1425	0.1433	0.1755	3,984
	(0.0262)	(0.0350)	(0.0362)	
Unmarried	0.1307	0.1288	0.0567	8,183
	(0.0338)	(0.0335)	(0.0347)	
Time-varying state variables	No	Yes	Yes	
State-specific trends	No	No	Yes	

Note. This table presents estimates from a linear regression of past year dental visits on the adult dental coverage indicator, parent demographic characteristics, state and year fixed effects, and other controls as shown in the table. Time-varying state variables include the maximum temporary assistance for needy families benefit for a family of four, the maximum supplemental nutrition assistance program benefit for a family of four, the state earned income tax credit as a proportion of the federal benefit, the number of dentists per 10,000 population, and the annual

unemployment rate. Estimates shown represent the coefficient for the dental coverage indicator. All estimates are weighted and errors are clustered at the state level. Standard errors are shown below estimates in parentheses. N represents the unweighted sample size for each group.

Table 4. Difference-in-differences estimates of the effect of dental benefits on six-month dental visits among children, by subgroup, NHIS 2000-2013

	Coefficient (SE)			
Sample	**Model 1**	**Model 2**	**Model 3**	**N**
All	0.0510	0.0468	0.0380	17,274
	(0.0149)	(0.0161)	(0.0221)	
Age				
Ages 1-11	0.0720	0.0692	0.0680	12,083
	(0.0162)	(0.0163)	(0.0214)	
Ages 12 -17	0.0073	-0.0075	-0.0325	5,191
	(0.0282)	(0.0347)	(0.0424)	
Gender				
Male	0.0454	0.0427	0.0337	8,763
	(0.0251)	(0.0286)	(0.0362)	
Female	0.0572	0.0542	0.0498	8,511
	(0.0164)	(0.0177)	(0.0263)	
Number of children				
One	0.0320	0.0394	0.0295	5,748
	(0.0175)	(0.0202)	(0.0184)	
Two	0.0608	0.0547	0.0775	5,665
	(0.0157)	(0.0243)	(0.0305)	
Three or more	0.0579	0.0467	0.0194	5,861
	(0.0260)	(0.0295)	(0.0393)	
Mother's Marital Status				
Married	0.0431	0.0456	0.0197	6,410
	(0.0235)	(0.0252)	(0.0265)	
Unmarried	0.0613	0.0520	0.0540	10,864
	(0.0259)	(0.0275)	(0.0321)	
Time-varying state variables	No	Yes	Yes	
State-specific trends	No	No	Yes	

Note. This table presents estimates from a linear regression of past year dental visits on the adult dental coverage indicator, child and maternal demographic characteristics, state and year fixed effects, and other controls as shown in the table. Time-varying state variables include the maximum temporary assistance for needy families benefit for a family of four, the maximum supplemental nutrition assistance program benefit for a family of four, the state earned income tax credit as a proportion of the federal benefit, the number of dentists per 10,000 population, and the annual unemployment rate. Estimates shown represent the coefficient for the dental coverage indicator. All estimates are weighted and errors are clustered at the state level. Standard errors are shown below estimates in parentheses. N represents the unweighted sample size for each group.

Table 5. Difference-in-differences estimates of the effect of dental benefits on recent dental visits among parents and children, by income and education, NHIS 2000-2013

	Coefficient (SE)			
Sample	**Parents**		**Children**	
Panel A: All	0.0312	0.0278	0.0167	0.0140
	(0.0044)	(0.0049)	(0.0069)	(0.0064)
Panel B: By Income				
Family income up to 400% FPL	0.0427	0.0421	0.0230	0.0179
	(0.0063)	(0.0070)	(0.0090)	(0.0076)
Family income greater than 400% FPL	-0.0049	-0.0086	-0.0028	0.0032
	(0.0085)	(0.0081)	(0.0101)	(0.0084)
Panel C: By Education				
Low educated parent	0.0466	0.0458	0.0244	0.0198
	(0.0069)	(0.0078)	(0.0105)	(0.0104)
High educated parent	0.0191	0.0140	0.0107	0.0086
	(0.0050)	(0.0061)	(0.0074)	(0.0079)
State-year variables	No	Yes	No	Yes

Note. This table presents estimates from a linear regression of having a recent dental visit on the adult dental coverage indicator, demographic characteristics, state and year fixed effects, and other controls as shown in the table. Time-varying state variables include the maximum temporary assistance for needy families benefit for a family of four, the maximum supplemental nutrition assistance program benefit for a family of four, the state earned income tax credit as a proportion of the federal benefit, the number of dentists per 10,000 population, and the annual unemployment rate. Estimates shown represent the coefficient for the dental coverage indicator. All estimates are weighted and errors are clustered at the state level. Standard errors are shown below estimates in parentheses. Low educated parent indicates attainment of a high school diploma or GED or less education. High educated parent indicates attainment of some college of more education.

Table 6. Difference-in-differences estimates of the effect of dental benefits on other outcomes among children, NHIS 2000-2013

	Coefficient (SE)		
Outcome	**Model 1**	**Model 2**	**Model 3**
Panel A: Related Outcomes			
Needed but could not afford dental care, past year[a]	-0.0229	-0.0140	-0.0060
	(0.0151)	(0.0128)	(0.0156)
Emergency department visit, past year	-0.0263	-0.0222	-0.0357
	(0.0162)	(0.0174)	(0.0215)
No missed School[b]	0.0103	0.0062	0.0083
	(0.0208)	(0.0270)	(0.0421)
Missed school 4 or more days[b]	-0.0177	-0.0059	-0.0282
	(0.0153)	(0.0212)	(0.0272)
Excellent or very good health	-0.0030	0.0017	-0.0004
	(0.0113)	(0.0156)	(0.0232)
Panel B: Unrelated Outcomes			
Usual source of care	0.0012	0.0088	0.0067
	(0.0050)	(0.0088)	(0.0100)
Had check-up, past year	-0.0202	-0.0101	0.0112
	(0.0189)	(0.0254)	(0.0309)
Three or more ear infections, past year	-0.0038	-0.0052	-0.0118
	(0.0079)	(0.0088)	(0.0100)
Time-varying state variables	No	Yes	Yes
State-specific trends	No	No	Yes

Note. This table presents estimates from linear regressions that control for the adult dental coverage indicator, demographic characteristics, state and year fixed effects, and other controls as shown in the table. Time-varying state variables include the maximum temporary assistance for needy families benefit for a family of four, the maximum supplemental nutrition assistance program benefit for a family of four, the state earned income tax credit as a proportion of the federal benefit, the number of dentists per 10,000 population, and the annual unemployment rate. Estimates shown represent the coefficient for the dental coverage indicator. All estimates are weighted and errors are clustered at the state level. Standard errors are shown below estimates in parentheses.

[a] Outcome is assessed for children ages 2-17.

[b] Outcomes are assessed for children ages 5-17.

Table 7. Difference-in-differences estimates of the effect of dental benefits on employment and medical care cost burden among parents, NHIS 2000-2013

	Coefficient (SE)		
Outcome	**Model 1**	**Model 2**	**Model 3**
Employment outcomes			
Employed[a]	0.0357	0.0264	0.0449
	(0.0278)	(0.0318)	(0.0480)
Work full time[a]	0.0142	-0.0212	-0.0134
	(0.0359)	(0.0331)	(0.0445)
Medical care cost burden			
Delayed care due to cost	-0.0168	-0.0167	-0.0167
	(0.0082)	(0.0104)	(0.0162)
Did not get care due to cost	-0.0170	-0.0157	-0.0118
	(0.0118)	(0.0134)	(0.0167)
Did not get dental care due to cost	-0.1084	-0.0859	-0.0617
	(0.0325)	(0.0234)	(0.0188)
Time-varying state variables	No	Yes	Yes
State-specific trends	No	No	Yes

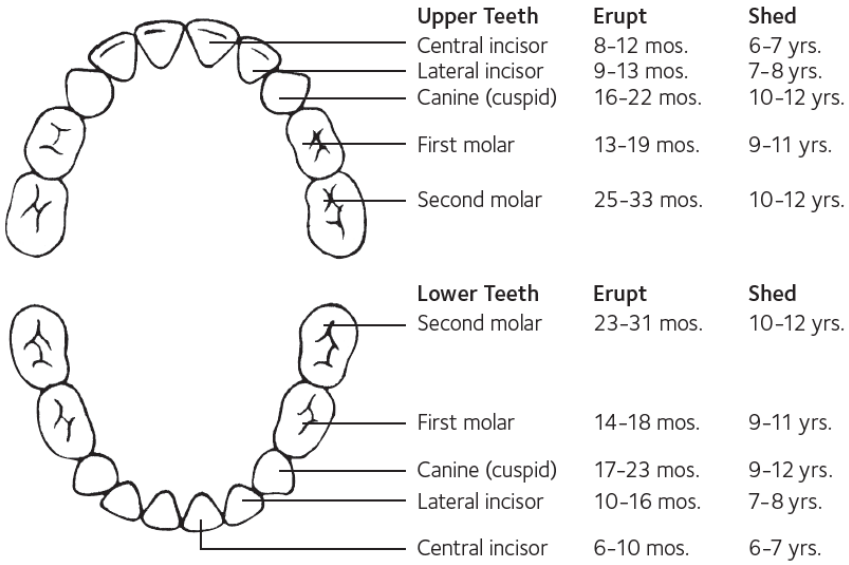
Note. This table presents estimates from linear regressions that control for the adult dental coverage indicator, parent demographic characteristics, state and year fixed effects, and other controls as shown in the table. Time-varying state variables include the maximum temporary assistance for needy families benefit for a family of four, the maximum supplemental nutrition assistance program benefit for a family of four, the state earned income tax credit as a proportion of the federal benefit, the number of dentists per 10,000 population, and the annual unemployment rate. Estimates shown represent the coefficient for the dental coverage indicator. All estimates are weighted and errors are clustered at the state level. Standard errors are shown below estimates in parentheses.

[a] "Employed" is a binary variable equal to one if the respondent reported any employment in the past year. "Work full time" is an indicator for reporting working 35 or more hours during the past week.

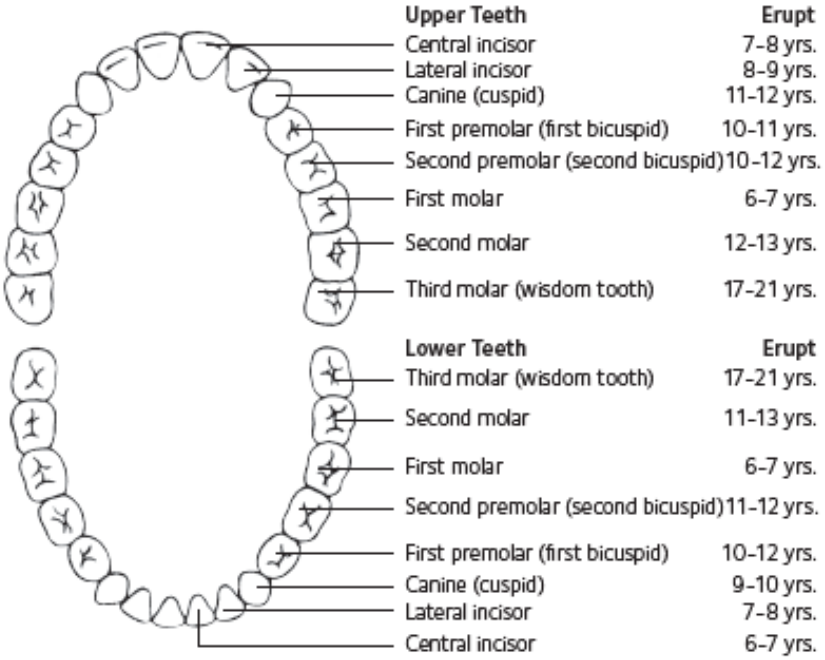
APPENDIX FIGURES AND TABLES

Figure A.1: Primary and permanent tooth development in children

Panel A. Primary tooth development

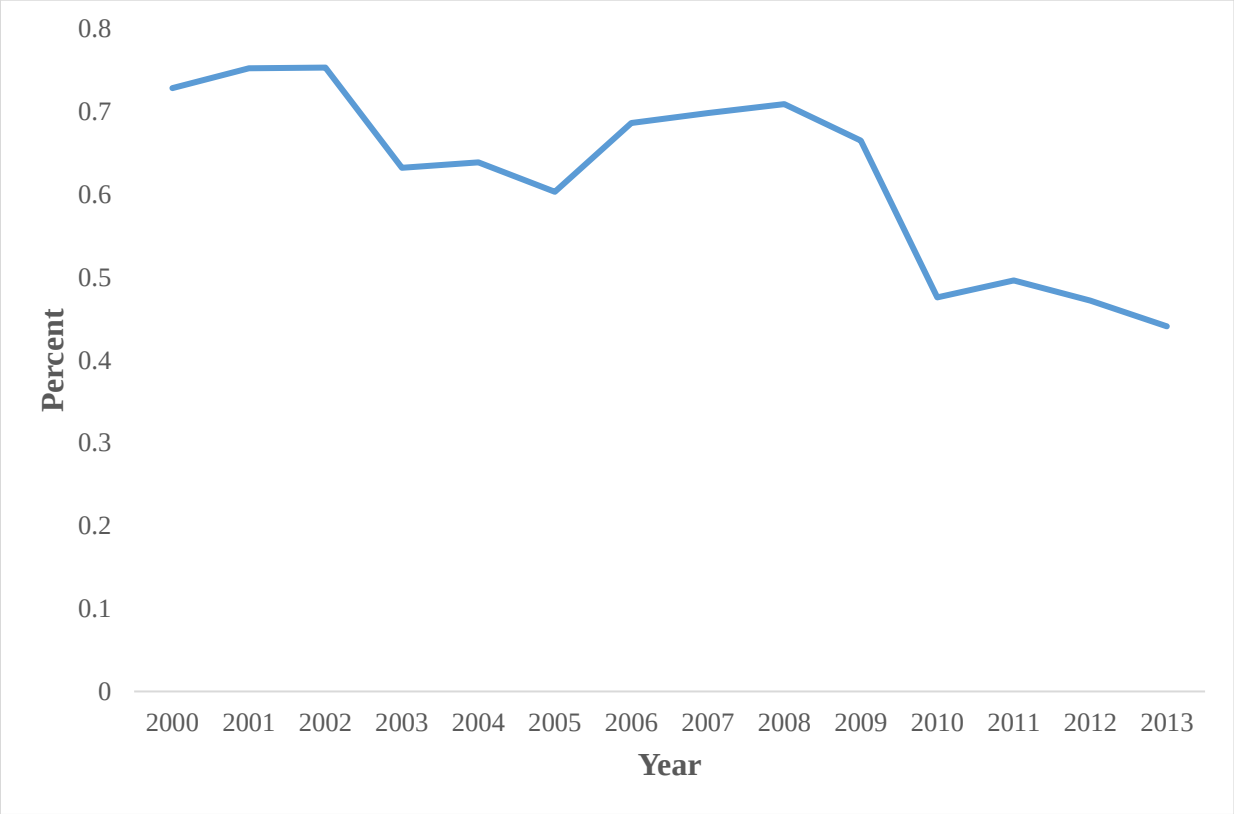


Panel B. Permanent tooth development



Notes. Figures are reproduced from the American Dental Association and are available here: https://www.mouthhealthy.org/en/az-topics/e/eruption-charts

Figure A.2. Percent of children exposed to Medicaid adult dental coverage policies, NHIS 2000-2013



Notes. Estimates represent the weighted percentage of children ages 1-17 with at least one parent enrolled in Medicaid who reside in a state that offered adult dental coverage from the 2000-2013 National Health Interview Survey.

Table A.1. Sample descriptive statistics, NHIS 2000-2013

Variable/Sample	Mean (SE)	
	Parents on Medicaid	**Children with at least one parent on Medicaid**
Male	0.2223	0.5062
	(0.0146)	(0.0054)
Age	33.8898	8.1726
	(0.3778)	(0.0964)
Non-Hispanic white	0.4480	0.3735
	(0.0556)	(0.0451)
Non-Hispanic black	0.2352	0.2880
	(0.0312)	(0.0371)
Hispanic	0.2653	0.2896
	(0.0725)	(0.0684)
Non-Hispanic other race	0.0514	0.0488
	(0.0084)	(0.0089)
U.S. citizen	0.8410	0.9632
	(0.0508)	(0.0075)
Resides in urban area	0.8137	0.8296
	(0.0301)	(0.0267)
Less than high school diploma or GED	0.3142	---
	(0.0347)	
High school diploma or GED	0.3427	---
	(0.0213)	
Some college	0.2875	---
	(0.0213)	
College or more education	0.0556	---
	(0.0049)	
Married	0.4331	---
	(0.0279)	
Number of children in household		
1	0.3194	0.1631
	(0.0124)	(0.0070)

Table A.1., Continued

2-4	0.6283	0.7224
	(0.0104)	(0.0055)
5 or more	0.0523	0.1145
	(0.0032)	(0.0046)
Mother's characteristics		
U.S. citizen	---	0.8536
		(0.0454)
Employed	---	0.5440
		(0.0146)
Married	---	0.389
		(0.0257)
Less than high school diploma or GED	---	0.3362
		(0.0313)
High school diploma or GED	---	0.3345
		(0.0199)
Some college	---	0.2833
		(0.0138)
College or more education	---	0.0459
		(0.0036)
Dental coverage and visits		
Medicaid adult dental coverage	0.6161	0.6103
	(0.0724)	(0.0722)
Dental visit past 6 months	0.3072	0.4820
	(0.0184)	(0.0085)
Dental visit past year	0.5147	0.6857
	(0.0226)	(0.0094)
Needed but could not afford dental coverage, past year	0.2181	0.0725
	(0.0199)	(0.0055)
N	**12,167**	**17,274**

Note. All estimates are weighted means for the main parent and child samples. Standard errors are shown below estimates in parentheses.

Table A.2. Regression estimates of the association between dental benefits and sample composition, parents and children, NHIS 2000-2013

Coefficient (SE)			
Variable/Sample	**Children**	**Variable/Sample**	**Parents**
Male	-0.0013	Male	0.0326
	(0.0160)		(0.0176)
Age	0.0518	Age	0.1660
	(0.0944)		(0.2827)
Non-Hispanic white	0.0169	Non-Hispanic white	0.0039
	(0.0154)		(0.0159)
Non-Hispanic black	-0.0236	Non-Hispanic black	-0.0233
	(0.0297)		(0.0197)
Hispanic	-0.0028	Hispanic	0.0154
	(0.0110)		(0.0106)
Non-Hispanic other race	0.0095	Non-Hispanic other race	0.0040
	(0.0081)		(0.0071)
U.S. citizen	-0.0170	U.S. citizen	-0.0288
	(0.0071)		(0.0196)
Resides in urban area	-0.0013	Resides in urban area	-0.0382
	(0.0138)		(0.0202)
Number of children		**Number of children**	
1	0.0097	1	0.0274
	(0.0075)		(0.0102)
2-4	-0.0059	2-4	-0.0249
	(0.0183)		(0.0120)
5 or more	-0.0038	5 or more	-0.0025
	(0.0211)		(0.0078)
Mother's characteristics		**Other parent characteristics**	
U.S. citizen	-0.0340	Married	0.0179
	(0.0116)		(0.0228)
Employed	0.0287	Less than high school diploma or GED	0.0240
	(0.0255)		(0.0199)
Married	0.0053	High school diploma or GED	0.0010
	(0.0222)		(0.0145)
Less than high school diploma or GED	-0.0022	Some college	-0.0126
	(0.0223)		(0.0125)
High school diploma or GED	0.0062	College or more education	-0.0124
	(0.0221)		(0.0076)

Some college	-0.0028
	(0.0105)
College or more education	-0.0012
	(0.0078)

Note. This table presents estimates from linear regressions of each model control on the adult dental coverage indicator and state and year fixed effects. Estimates shown represent the coefficient for the dental coverage indicator. All estimates are weighted and errors are clustered at the state level. Standard errors are shown below estimates in parentheses.

Table A.3. Difference-in-differences estimates of the effect of dental benefits on 6-month dental visits among children, by mother's past year dental visit status, NHIS 2000-2013

	Coefficient (SE)					
Sample	**All Ages**		**N**	**Under 12**		**N**
Mom had dental visit past year						
Yes	0.0612	0.0479	5,413	0.0817	0.0726	3,826
	(0.0281)	(0.0341)		(0.0303)	(0.0397)	
No	0.0167	0.0055	4,558	0.0395	0.0139	3,225
	(0.0453)	(0.0385)		(0.0580)	(0.0466)	
Time-varying state variables	No	Yes		No	Yes	

Note. This table presents estimates from linear regressions of past 6-month dental visits on the adult dental coverage indicator, demographic characteristics, state and year fixed effects, and other controls as shown in the table. The sample is stratified by whether the child's mother reported a dental visit in the past year. This information is only available when the child's mother is also the sampled adult, and the resulting sample consists of 9,971 child observations. Time-varying state variables include the maximum temporary assistance for needy families benefit for a family of four, the maximum supplemental nutrition assistance program benefit for a family of four, the state earned income tax credit as a proportion of the federal benefit, the number of dentists per 10,000 population, and the annual unemployment rate. Estimates shown represent the coefficient for the dental coverage indicator. All estimates are weighted and errors are clustered at the state level. Standard errors are shown below estimates in parentheses.

Table A.4. Triple difference estimates of the effect of dental benefits on recent dental visits among children and parents, by control group, NHIS 2000-2013

	Coefficient (SE)					
Control Group	All others		Up to 400% FPL		Up to 250% FPL	
Children						
All children	0.0402	0.0376	0.0318	0.0318	0.0213	0.0200
	(0.0172)	(0.0186)	(0.0165)	(0.0183)	(0.0194)	(0.0211)
Under 12	0.0672	0.0682	0.0610	0.0653	0.0550	0.0602
	(0.0185)	(0.0204)	(0.0184)	(0.0206)	(0.0200)	(0.0207)
Parents						
All parents	0.1240	0.1267	0.1155	0.1148	0.1195	0.1177
	(0.0275)	(0.0277)	(0.0291)	(0.0283)	(0.0276)	(0.0282)
Full set of state-by-year interactions	No	Yes	No	Yes	No	Yes

Note. This table presents estimates from a linear regression of having a recent dental visit on the adult dental coverage indicator, demographic characteristics, state and year fixed effects, and other controls as shown in the table. Samples include the main child and parent analysis samples as well as within-state control groups as indicated in the table. The control groups include "all others," which consists of all children or parents in a state that do not meet the sample inclusion criteria, and two income-based groups that do not meet the sample inclusion criteria and have family incomes up to 400% FPL and up to 250% FPL, respectively. Estimates shown represent the coefficient for the interaction between treatment group status and the dental coverage indicator. All estimates are weighted and errors are clustered at the state level. Standard errors are shown below estimates in parentheses.

Table A.5. Difference-in-differences estimates of the effect of adult dental benefits on recent dental visits including an adult vision coverage control, children and parents, NHIS 2000-2013

	Coefficient (SE)		
Sample	**Model 1**	**Model 2**	**Model 3**
Children			
No vision coverage control	0.0517	0.0471	0.0379
	(0.0150)	(0.0163)	(0.0225)
Vision coverage control	0.0432	0.0370	0.0219
	(0.0187)	(0.0202)	(0.0262)
Parents			
No vision coverage control	0.1386	0.1389	0.1125
	(0.0205)	(0.0245)	(0.0314)
Vision coverage control	0.1334	0.1349	0.0890
	(0.0271)	(0.0287)	(0.0342)
Time-varying state variables	No	Yes	Yes
State-specific trends	No	No	Yes

Note. This table presents estimates from a linear regression of having a recent dental visit on the adult dental coverage indicator, demographic characteristics, state and year fixed effects, and other controls as shown in the table. The vision coverage control is a binary variable indicating state coverage of regular eye exams and glasses for correction of refractive error for Medicaid-enrolled adults. Other time-varying state variables include the maximum temporary assistance for needy families benefit for a family of four, the maximum supplemental nutrition assistance program benefit for a family of four, the state earned income tax credit as a proportion of the federal benefit, the number of dentists per 10,000 population, and the annual unemployment rate. Estimates shown represent the coefficient for the dental coverage indicator. All estimates are weighted and errors are clustered at the state level. Standard errors are shown below estimates in parentheses.

Table A.6. Difference-in-differences estimates of the effect of adult dental benefits on recent dental visits with and without sampling weights, children and parents, NHIS 2000-2013

	Coefficient (SE)		
Sample	**Model 1**	**Model 2**	**Model 3**
Children			
Sampling weights	0.0510	0.0468	0.0380
	(0.0149)	(0.0161)	(0.0221)
No sampling weights	0.0328	0.0285	0.0212
	(0.0107)	(0.0112)	(0.0128)
Parents			
Sampling weights	0.1384	0.1389	0.1135
	(0.0203)	(0.0244)	(0.0314)
No sampling weights	0.1327	0.1269	0.1005
	(0.0255)	(0.0263)	(0.0289)
Time-varying state variables	No	Yes	Yes
State-specific trends	No	No	Yes

Note. This table presents estimates from a linear regression of having a recent dental visit on the adult dental coverage indicator, demographic characteristics, state and year fixed effects, and other controls as shown in the table. Time-varying state variables include the maximum temporary assistance for needy families benefit for a family of four, the maximum supplemental nutrition assistance program benefit for a family of four, the state earned income tax credit as a proportion of the federal benefit, the number of dentists per 10,000 population, and the annual unemployment rate. Estimates shown represent the coefficient for the dental coverage indicator. Errors are clustered at the state level. Standard errors are shown below estimates in parentheses.