

## Investigation

### Cover Story

# Changes in dental visits and oral health for children by race and ethnicity during the COVID-19 pandemic

Ashley M. Kranz, PhD; Linnea A. Evans, MPH, PhD; Kimberley H. Geissler, PhD

## ABSTRACT

**Background.** The COVID-19 pandemic created new barriers to oral health care, which may worsen oral health and exacerbate disparities. The authors quantified changes in children's dental care receipt and oral health outcomes during the pandemic and examined differences among racial and ethnic groups.

**Methods.** Using the National Survey of Children's Health (163,948 child observations from 2017-2021), the authors used weighted modified Poisson models to examine caregiver-reported receipt of a dental visit (for any reason and for preventive care) and adverse oral health outcomes (teeth in fair or poor condition; difficulty with toothaches, cavities, or bleeding gums) from 2017 through 2019 (prepandemic) compared with 2020 and 2021. The authors examined outcomes within and across racial and ethnic groups.

**Results.** Children from all racial and ethnic groups experienced declines in receipt of dental visits, but there were limited changes in adverse oral health outcomes during 2020 and 2021. Prepandemic disparities in receipt of dental visits persisted for Black children and Asian children compared with White children. Hispanic children experienced larger increases in risk of experiencing both adverse oral health outcomes compared with White children in 2020 and in having teeth in fair or poor condition in 2021.

**Conclusions.** The pandemic did not create new disparities in receipt of dental visits or oral health outcomes, but disparities in care persisted, and the oral health of Hispanic children was affected differentially.

**Practical Implications.** Continued monitoring of dental visits and adverse oral health outcomes by race and ethnicity is critical to ensuring all children have access to oral health care. This information can help develop targeted interventions to improve children's oral health, including for minoritized racial and ethnic groups.

**Key Words.** COVID-19; access to care; dental care for children; oral health; children; vulnerable populations; racial and ethnic disparities.

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Despite increasing attention to the topic in the United States, racial and ethnic disparities in children's oral health and use of dental care persist. Rates of untreated caries in primary teeth and permanent teeth are generally higher among Black and Mexican American children than White children. National Health and Nutrition Examination Survey data (2011-2016) show that rates of untreated caries in primary teeth were approximately 20% for Mexican American and Black children and approximately 10% for White children aged 2 through 11 years, with similar trends for adolescents' permanent teeth.<sup>1</sup> Disparate access to dental care likely contributes to oral health disparities.<sup>2</sup> Although racial and ethnic disparities in dental care use among children declined from 2001 through 2016, disparities endured.<sup>3</sup> In the 2016 Medical Expenditure Panel Survey, Black and Hispanic children were 15.7% and 9.1% less likely, respectively, to have visited a dentist than White children.<sup>3</sup> Differences in these measures across racial and ethnic groups

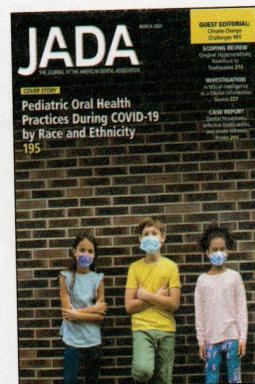
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vary by age, poverty status, and dentition type,<sup>1,3</sup> complicating the measurement of disparities and development of tailored strategies to prevent adverse oral health outcomes.

Studies have reported declines in dental visits due to the COVID-19 pandemic,<sup>4-7</sup> yet our understanding of the pandemic's impact on racial and ethnic disparities in children's oral health and dental visits remains limited. The pandemic directly disrupted the oral health care system through office closures, school closures (which paused school-based oral health care programs), and patients deferring care. As the pandemic emerged in the United States in March of 2020, the American Dental Association and the Centers for Medicare & Medicaid Services recommended delaying all nonessential health care procedures, including dental care.<sup>8,9</sup> Some children's access to dental care likely was disrupted further because of loss of household income and insurance changes due to pandemic-related unemployment.<sup>10</sup> These economic disruptions were experienced disproportionately by Black and Hispanic families,<sup>11,12</sup> highlighting a potential pathway for widening preexisting racial and ethnic gaps in receipt of dental care and oral health outcomes, as numerous studies have found an association between lower income and worse oral health outcomes.<sup>13</sup> In addition, children's oral health outcomes may be affected by receiving less preventive care, lack of timely acute care, and changing dietary and hygiene behaviors during lockdowns.<sup>14</sup> With continued disruptions over the course of the pandemic, the impact of these collective changes on children's dental care and outcomes are unknown.

To our knowledge, only 3 repeated cross-sectional analyses using nationally representative data have examined the pandemic's early effects on children's oral health and receipt of dental care.<sup>15-17</sup> Two studies found that children were less likely to receive dental care and more likely to have poor oral health in 2020 than in 2019,<sup>16,17</sup> with the third finding continuing declines in dental care and oral health outcomes in 2021.<sup>15</sup> Only the 2 articles by Lyu and Wehby<sup>15,16</sup> examined changes by race and ethnicity, finding that non-White children had greater risk of caregiver-reported teeth in poor condition in 2020 and 2021 than in 2019. Because these analyses grouped together all non-White children, it is unclear whether effects varied among this heterogeneous group.

Our study extends prior research by examining the immediate (2020) and longer-term (2021) effects of the COVID-19 pandemic on children's receipt of dental care and oral health among children from different racial and ethnic groups. Using the nationally representative National Survey of Children's Health (NSCH), we compared receipt of dental care and adverse oral health outcomes from 2017 through 2019 (pre-COVID) with 2020 and 2021. We compared outcomes over time within racial and ethnic groups, examined differences between racial and ethnic groups in each period, and examined whether groups were affected differentially by the pandemic. We hypothesized that any pre-pandemic differences persisted through the pandemic and may have increased.

## METHODS

This repeated cross-sectional observational study was approved by the RAND Corporation's institutional review board, and a waiver of informed consent was granted. This study followed the Strengthening the Reporting of Observational Studies in Epidemiology reporting guidelines.<sup>18</sup>

We used data from the 2017-2021 NSCH, which is a survey administered annually by the US Census Bureau on behalf of the Health Resources and Services Administration's Maternal and Child Health Bureau, with the objective of collecting information on the health outcomes, health care access, and well-being of children.<sup>19</sup> Surveys are available in both English and Spanish and can be completed online or on paper. We used 2017-2019 data to characterize the pre-COVID-19 period and 2020 and 2021 data to characterize the COVID-19 period. On March 13, 2020, the White House declared that COVID-19 was a national emergency.<sup>20</sup> The 3 years of survey data in the 2017-2019 period were collected from June and July of the survey year to January of the following year. The 2020 NSCH data were collected from July 2020 through January 2021, and 2021 NSCH data were collected from June 2021 through January 2022.<sup>21,22</sup> We examined children aged 1 through 17 years because teeth typically erupt at approximately age 6 months. After exclusion of children with missing information for the variables of interest (eFigure, available online at the end of this article), we examined data for 165,982 children from 2017 through 2021, corresponding to a weighted population of approximately 67.7 million children. Summary statistics are presented by period (pre-COVID [N = 77,352], 2020 [N = 40,614], and 2021 [N = 48,016]) and shown in eTable 1, available online at the end of this article.

## ABBREVIATION KEY

NSCH: National Survey of Children's Health.

Our dependent variables included 2 measures of receipt of a dental visit and 2 measures of adverse oral health outcomes. Two dichotomous measures of receipt of a dental visit indicated whether a child, in the past 12 months, saw a dentist for any kind of dental or oral health care and saw a dentist for preventive dental care. We combined 3 survey items asking whether a child had frequent or chronic difficulty in the past 12 months with bleeding gums, cavities or decayed teeth, or toothaches into a single dichotomous measure to identify whether a child had frequent or chronic difficulty in the past 12 months with any of these oral health problems (hereafter referred to as “any oral health problem”). Finally, the survey asked caregivers about the condition of each child’s teeth (response options: excellent, very good, good, fair, poor). On the basis of the distribution of responses, we constructed a dichotomous measure indicating whether the condition of the child’s teeth was described as fair or poor (“teeth in fair or poor condition”). Collectively, we refer to any oral health problem and teeth in fair or poor condition as “adverse oral health outcomes.” Although there are limitations to using caregiver-reported survey data, research suggests that a caregiver’s assessment of their child’s oral health is associated with actual need.<sup>23,24</sup>

Our key variables of interest were period (before and during COVID) and race and ethnicity. We constructed a 3-level categorical indicator of period to identify the period before COVID (2017-2019; pre-COVID) and compared this prepandemic period separately with each of the first 2 years of the pandemic (2020 and 2021). To examine outcomes across caregiver-reported racial and ethnic group of each child, we used 2 survey items to construct our measure of race and ethnicity. We view racial categories as socially produced categories shaped by systems of power and privilege (as opposed to an innate, biological trait).<sup>25,26</sup> We operationalize this widely accepted view via our interpretation of the combined variable of race and ethnicity as a proxy for exposures to racism. We categorized children as Hispanic, non-Hispanic White (White), non-Hispanic Black (Black), non-Hispanic Asian (Asian), and non-Hispanic other race groups. We grouped American Indian or Alaskan Native children, Native Hawaiian and other Pacific Islander children, and children with 2 or more races into the non-Hispanic other category due to small cell sizes.

We report proportions for each binary outcome by race and ethnicity and by period and changes in each outcome from pre-COVID to 2020 and pre-COVID to 2021 and compared these using Wald tests. We then estimated regression models

- Stratified by race and ethnicity to examine changes in outcomes over time for each group, comparing outcomes in 2020 and 2021 with pre-COVID.
- Stratified by period (pre-COVID, 2020, 2021) to examine differences in outcomes in each period for each racial and ethnic group compared with White children to determine whether differences existed pre-COVID and whether they persisted. We used White children as the reference group because they are the largest group and had the highest rates of dental visits and lowest rates of adverse oral health outcomes pre-COVID.
- Including an interaction of race and ethnicity and period to compare the size of the changes in outcomes over time experienced by each racial and ethnic group with White children (eg, comparing the change in dental visits for Black children from pre-COVID to 2020 with the change for White children from pre-COVID to 2020).

We estimated relative risk (RR) using modified Poisson models with SEs corrected for the sampling strategy.<sup>27</sup> We used these models because they allow us to compare changes in RR across outcomes with different baseline rates. All models controlled for child age, sex, health insurance type, special health care needs, household income, and total children in the household and included state fixed effects to account for time-invariant state characteristics.

The pandemic had differential effects on household income and insurance status by race and ethnicity,<sup>11,12,25</sup> and so controlling for them understates change across racial and ethnic groups. Therefore, we conducted a sensitivity analysis in which we excluded household income and insurance status from regression models to recapture the portion of the overall change in use and outcomes by race and ethnicity mediated through socioeconomic pathways.<sup>11,12,25</sup> All other controls mentioned above were included.

We used survey weights to generalize estimates to the national population of children. We used Stata/MP statistical software, Version 17.0 (StataCorp) for analyses. We used a conservative 2-sided significance threshold of *P* value below .01 due to multiple hypothesis testing.

**Table 1.** Unadjusted means for caregiver-reported outcomes over time and by race and ethnicity.\*

| OUTCOMES  | MEAN      |                    |                    | CHANGE FROM 2017-2019, % |       |
|---|-----------|--------------------|--------------------|--------------------------|-------|
|   | 2017-2019 | 2020               | 2021               | 2020                     | 2021  |
| <b>Child Saw a Dentist for Any Reason in Past 12 Mo</b>                                   |           |                    |                    |                          |       |
| White   | 0.818     | 0.790 <sup>†</sup> | 0.805              | -3.5                     | -1.6  |
| Hispanic  | 0.800     | 0.744 <sup>†</sup> | 0.760              | -7.5                     | -5.3  |
| Black   | 0.778     | 0.718 <sup>‡</sup> | 0.730              | -8.4                     | -6.6  |
| Asian   | 0.765     | 0.689 <sup>‡</sup> | 0.688              | -11.0                    | -11.2 |
| Other   | 0.808     | 0.737 <sup>†</sup> | 0.767              | -9.6                     | -5.3  |
| <b>Child Saw a Dentist for Preventive Care in Past 12 Mo</b>                              |           |                    |                    |                          |       |
| White   | 0.800     | 0.767 <sup>†</sup> | 0.717 <sup>†</sup> | -4.3                     | -11.6 |
| Hispanic  | 0.773     | 0.707 <sup>†</sup> | 0.694 <sup>†</sup> | -9.3                     | -11.4 |
| Black   | 0.748     | 0.672 <sup>†</sup> | 0.661 <sup>†</sup> | -11.3                    | -13.2 |
| Asian   | 0.739     | 0.669              | 0.620 <sup>†</sup> | -10.5                    | -19.2 |
| Other   | 0.787     | 0.717 <sup>†</sup> | 0.682 <sup>†</sup> | -9.8                     | -15.4 |
| <b>Condition of Child's Teeth Was Fair or Poor</b>  |           |                    |                    |                          |       |
| White   | 0.041     | 0.043              | 0.042              | 4.7                      | 2.4   |
| Hispanic  | 0.071     | 0.092              | 0.082              | 22.8                     | 13.4  |
| Black   | 0.072     | 0.076              | 0.069              | 5.3                      | -4.3  |
| Asian   | 0.070     | 0.053              | 0.066              | -32.1                    | -6.1  |
| Other   | 0.048     | 0.055              | 0.040              | 12.7                     | -20.0 |
| <b>Child Had Frequent or Chronic Difficulty With an Oral Health Problem in Past 12 Mo</b> |           |                    |                    |                          |       |
| White   | 0.119     | 0.122              | 0.128              | 2.5                      | 7.0   |
| Hispanic  | 0.164     | 0.188              | 0.163              | 12.8                     | -0.6  |
| Black   | 0.169     | 0.160              | 0.157              | -5.6                     | -7.6  |
| Asian   | 0.171     | 0.151              | 0.15               | -13.2                    | -14.0 |
| Other   | 0.132     | 0.150              | 0.133              | 12.0                     | 0.8   |

\* All outcomes were reported by caregivers. Means were generated using National Survey of Children's Health sampling weights to obtain nationally representative estimates. *P* values were obtained from Wald tests comparing outcomes prepandemic with 2020 and prepandemic with 2021 for each racial or ethnic group. † *P* < .001. ‡ *P* < .01.

## RESULTS

Pre-COVID, White children had the highest rates of caregiver-reported dental visits and preventive care and the lowest rates of teeth in fair or poor condition and any oral health problem (Table 1). Rates of dental visits ranged from 81.8% for White children through 76.5% for Asian children pre-COVID. Unlike caregiver-reported rates of dental visits, which began to rebound in 2021, rates of preventive care declined further in 2021. Racial and ethnic groups experienced declines of 11.4% through 19.2% in preventive care when comparing 2021 with pre-COVID years.

In adjusted models, all racial and ethnic groups experienced significant reductions in dental visits and preventive care during the pandemic compared with pre-COVID rates (Table 2). Larger changes were observed for receipt of preventive care than for dental visits for all groups. The largest change for preventive care was observed in 2021 compared with pre-COVID for Asian children (RR, 0.85; 95% CI, 0.79 to 0.91) and children categorized as non-Hispanic other (RR, 0.85; 95% CI, 0.81 to 0.90). No racial and ethnic groups had statistically significant changes in adverse oral health outcomes relative to pre-COVID.

**Table 2.** Results of modified Poisson regressions estimating the risk of caregiver-reported outcomes compared with pre-pandemic within each racial and ethnic group.\*

| OUTCOMES  | RELATIVE RISK (95% CI)           |                                  |
|---|----------------------------------|----------------------------------|
|   | 2020 (vs 2017-2019)              | 2021 (vs 2017-2019)              |
| <b>Child Saw a Dentist for Any Reason in Past 12 Mo</b>                                   |                                  |                                  |
| White   | 0.95 <sup>†</sup> (0.94 to 0.96) | 0.97 <sup>†</sup> (0.95 to 0.98) |
| Hispanic  | 0.93 <sup>†</sup> (0.89 to 0.96) | 0.95 <sup>†</sup> (0.92 to 0.99) |
| Black   | 0.91 <sup>†</sup> (0.87 to 0.95) | 0.93 <sup>‡</sup> (0.89 to 0.97) |
| Asian   | 0.90 <sup>†</sup> (0.84 to 0.96) | 0.91 <sup>‡</sup> (0.86 to 0.97) |
| Other   | 0.91 <sup>†</sup> (0.87 to 0.95) | 0.94 <sup>‡</sup> (0.90 to 0.98) |
| <b>Child Saw a Dentist for Preventive Care in Past 12 Mo</b>                              |                                  |                                  |
| White   | 0.94 <sup>†</sup> (0.93 to 0.96) | 0.88 <sup>†</sup> (0.87 to 0.89) |
| Hispanic  | 0.91 <sup>†</sup> (0.87 to 0.95) | 0.90 <sup>†</sup> (0.86 to 0.94) |
| Black   | 0.89 <sup>†</sup> (0.85 to 0.93) | 0.87 <sup>†</sup> (0.83 to 0.92) |
| Asian   | 0.90 <sup>‡</sup> (0.84 to 0.97) | 0.85 <sup>†</sup> (0.79 to 0.91) |
| Other   | 0.91 <sup>†</sup> (0.86 to 0.95) | 0.85 <sup>†</sup> (0.81 to 0.90) |
| <b>Condition of Child's Teeth Was Fair or Poor</b>  |                                  |                                  |
| White   | 0.91 (0.78 to 1.05)              | 0.88 (0.77 to 1.01)              |
| Hispanic  | 1.19 (0.92 to 1.53)              | 1.09 (0.84 to 1.41)              |
| Black   | 0.93 (0.71 to 1.21)              | 0.85 (0.64 to 1.11)              |
| Asian   | 0.72 (0.49 to 1.06)              | 0.90 (0.62 to 1.31)              |
| Other   | 0.96 (0.67 to 1.36)              | 0.74 (0.53 to 1.04)              |
| <b>Child Had Frequent or Chronic Difficulty With an Oral Health Problem in Past 12 Mo</b> |                                  |                                  |
| White   | 0.94 (0.87 to 1.02)              | 0.98 (0.92 to 1.06)              |
| Hispanic  | 1.11 (0.94 to 1.31)              | 0.97 (0.83 to 1.14)              |
| Black   | 0.90 (0.76 to 1.06)              | 0.88 (0.74 to 1.04)              |
| Asian   | 0.87 (0.68 to 1.10)              | 0.88 (0.68 to 1.14)              |
| Other   | 1.08 (0.88 to 1.33)              | 0.97 (0.81 to 1.18)              |

\* All outcomes were reported by caregivers. Models were stratified by race and ethnicity and controlled for time, age, sex, insurance type, special health care needs, household income, and total children in the household and included state fixed effects to account for time-invariant state characteristics. Models were estimated using National Survey of Children's Health sampling weights to obtain nationally representative estimates with standard errors correcting for complex sampling design. †  $P < .001$ . ‡  $P < .01$ .

Some differences in receipt of dental visits were observed for non-White children compared with White children in all periods (Table 3). Differences in receipt of dental visits and preventive care observed pre-COVID for Black children and for Asian children persisted compared with White children. Compared with a White child, a Black child's relative risk of receiving preventive care was 5% lower pre-COVID (95% CI, 0.92 to 0.97), 8% lower in 2020 (95% CI, 0.88 to 0.96), and 6% lower in 2021 (95% CI, 0.90 to 0.99). Compared with a White child, an Asian child's relative risk of receiving preventive care was 8% lower pre-COVID (95% CI, 0.88 to 0.95), 12% lower in 2020 (95% CI, 0.82 to 0.95), and 13% lower in 2021 (95% CI, 0.82 to 0.93). No significant differences in adverse oral health outcomes were observed for non-White children compared with White children in 2020 or 2021 (Table 3). Differences in adverse oral health outcomes for Asian children compared with White children pre-COVID were not significant in 2020 and 2021. Compared with a White child, an Asian child's relative risk of having teeth in fair or poor condition was 62% (RR, 1.62; 95% CI, 1.23 to 2.14) higher pre-COVID and not significantly different in 2020 and 2021.

We also examined whether racial and ethnic groups were affected differentially by the pandemic and found significant differences only for the trajectories of Hispanic children compared with White

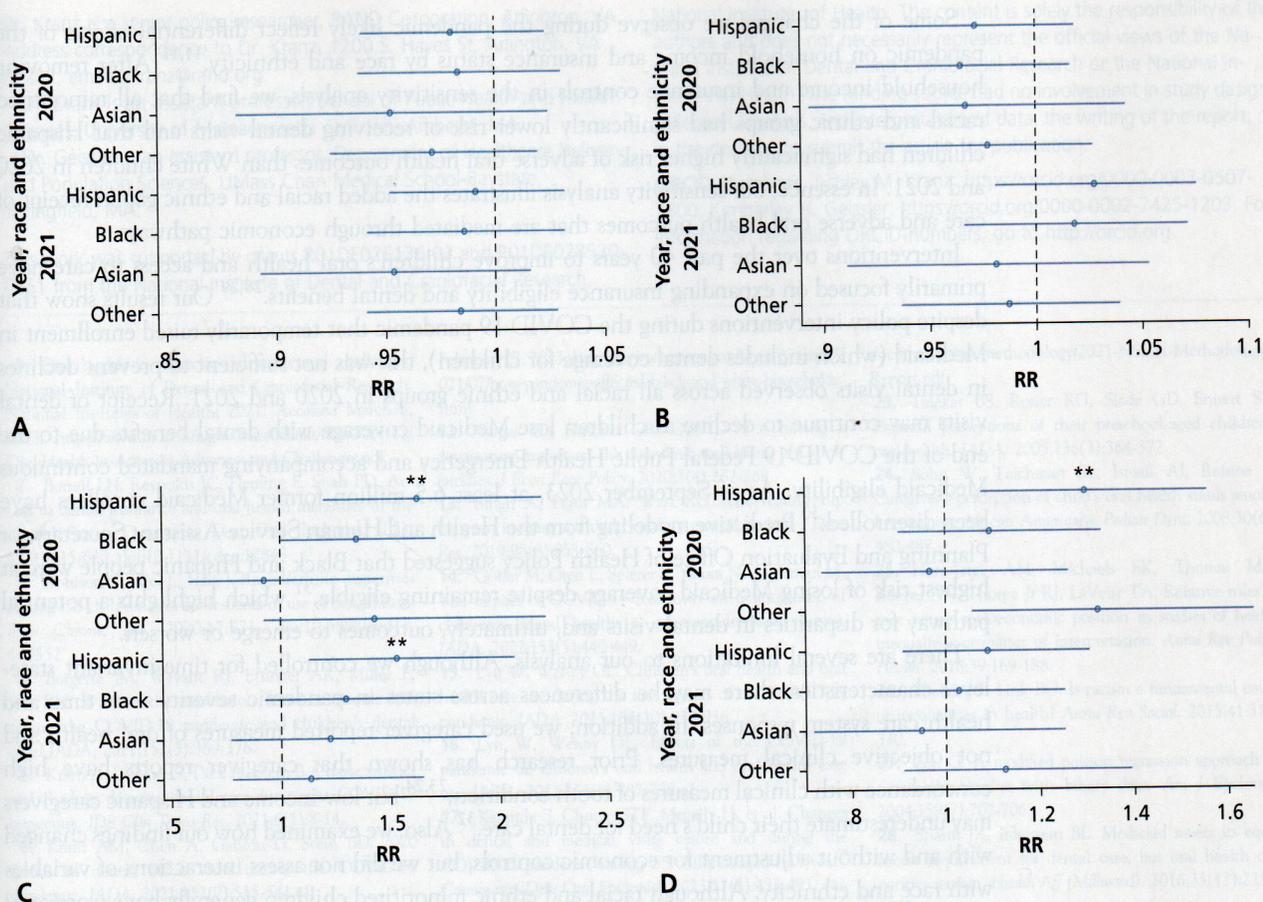
**Table 3.** Results of modified Poisson regressions estimating the risk of caregiver-reported outcomes compared with White children within each period.\*

| OUTCOMES   | RELATIVE RISK (95% CI)           |                                  |                                  |
|--|----------------------------------|----------------------------------|----------------------------------|
|  | 2017-2019                        | 2020                             | 2021                             |
| <b>Child Saw a Dentist for Any Reason in Past 12 Mo [Reference: White]</b>                                   |                                  |                                  |                                  |
| Hispanic   | 1.01 (0.99 to 1.03)              | 0.99 (0.96 to 1.03)              | 0.98 (0.94 to 1.01)              |
| Black  | 0.96 <sup>†</sup> (0.93 to 0.98) | 0.94 <sup>†</sup> (0.90 to 0.98) | 0.93 <sup>‡</sup> (0.89 to 0.97) |
| Asian  | 0.93 <sup>‡</sup> (0.90 to 0.97) | 0.88 <sup>‡</sup> (0.82 to 0.94) | 0.87 <sup>‡</sup> (0.82 to 0.92) |
| Other  | 1.00 (0.97 to 1.02)              | 0.96 (0.92 to 1.00)              | 0.96 (0.92 to 0.99)              |
| <b>Child Saw a Dentist for Preventive Care in Past 12 Mo [Reference: White]</b>                              |                                  |                                  |                                  |
| Hispanic   | 1.00 (0.98 to 1.02)              | 0.99 (0.95 to 1.03)              | 0.99 (0.95 to 1.03)              |
| Black  | 0.95 <sup>‡</sup> (0.92 to 0.97) | 0.92 <sup>‡</sup> (0.88 to 0.96) | 0.94 (0.90 to 0.99)              |
| Asian  | 0.92 <sup>‡</sup> (0.88 to 0.95) | 0.88 <sup>‡</sup> (0.82 to 0.95) | 0.87 <sup>‡</sup> (0.82 to 0.93) |
| Other  | 0.99 (0.97 to 1.02)              | 0.96 (0.92 to 1.01)              | 0.95 (0.90 to 0.99)              |
| <b>Condition of Child's Teeth Was Fair or Poor [Reference: White]</b>  |                                  |                                  |                                  |
| Hispanic   | 0.99 (0.83 to 1.17)              | 1.39 (1.08 to 1.80)              | 1.18 (0.93 to 1.50)              |
| Black  | 0.85 (0.70 to 1.03)              | 0.9 (0.70 to 1.14)               | 0.82 (0.62 to 1.07)              |
| Asian  | 1.62 <sup>‡</sup> (1.23 to 2.14) | 1.19 (0.80 to 1.77)              | 1.3 (0.87 to 1.96)               |
| Other  | 0.85 (0.67 to 1.08)              | 0.94 (0.65 to 1.37)              | 0.72 (0.53 to 0.97)              |
| <b>Child Had Frequent or Chronic Difficulty With an Oral Health Problem in Past 12 Mo [Reference: White]</b> |                                  |                                  |                                  |
| Hispanic   | 1.04 (0.93 to 1.15)              | 1.14 (0.98 to 1.32)              | 0.99 (0.86 to 1.15)              |
| Black  | 0.94 (0.83 to 1.06)              | 0.87 (0.73 to 1.03)              | 0.87 (0.74 to 1.02)              |
| Asian  | 1.42 <sup>‡</sup> (1.21 to 1.66) | 1.13 (0.90 to 1.43)              | 1.12 (0.88 to 1.42)              |
| Other  | 0.93 (0.81 to 1.06)              | 1.03 (0.86 to 1.24)              | 0.91 (0.77 to 1.08)              |

\* All outcomes were reported by caregivers. Models were stratified by time (2017-2019 [pre-COVID], 2020, 2021) and controlled for race and ethnicity, age, sex, insurance type, special health care needs, household income, and total children in the household and included state fixed effects to account for time-invariant state characteristics. Models were estimated using National Survey of Children's Health sampling weights to obtain nationally representative estimates with standard errors correcting for complex sampling design. †  $P < .01$ . ‡  $P < .001$ .

children. The estimated change since pre-COVID in the relative risk of having teeth in fair or poor condition was 63% higher in 2020 (95% CI, 1.20 to 2.20) and 53% higher in 2021 (95% CI, 1.13 to 2.07) for a Hispanic child than for a White child (Figure, C). The estimated change since pre-COVID in the relative risk of having any oral health problem was 30% higher (95% CI, 1.08 to 1.56) in 2020 for a Hispanic child compared with a White child (Figure, D) but not significant in 2021.

There were no changes in significance of our findings in race-stratified models excluding controls for income and insurance status. However, when we excluded these controls and examined models estimating differences across race and ethnic groups compared with White children, we found significant differences for Hispanic children compared with White children, both in receipt of care and adverse oral health outcomes (eTable 2, available online at the end of this article). The size of noted disparities in receipt of care compared with White children widened in the absence of these economic controls, including among children categorized as non-Hispanic other in 2020 and 2021. We also observed additional differential changes compared with White children in the trajectory of adverse oral health outcomes for Black children in 2021 and Asian children in 2020 (eTable 3, available online at the end of this article).



**Figure.** Results of Poisson regression estimating the comparative risk of dental outcomes. **A.** Child saw a dentist for any reason in past 12 months. **B.** Child saw a dentist for preventative care in past 12 months. **C.** Condition of child's teeth was fair or poor. **D.** Child had frequent or chronic difficulty with an oral health problem in the past 12 months. Relative risks (RRs) show the interaction between year and racial and ethnic group, allowing the comparison of the size of changes in outcomes over time experienced by each racial and ethnic group with White children (eg, comparing the change in rate of dental visits for Black children from 2017-2019 [pre-COVID] to 2020 with the change for White children from pre-COVID to 2020). All models controlled for period, race and ethnicity, an interaction between period and race and ethnicity, age, sex, insurance type, special health care needs, household income, and total children in the household and included state fixed effects to account for time-invariant state characteristics. Models were estimated using National Survey of Children's Health sampling weights to obtain nationally representative estimates and SEs correcting for complex sampling design.

## DISCUSSION

In our study, we found that children from all racial and ethnic groups experienced caregiver-reported declines in receipt of dental visits during the COVID-19 pandemic. Unlike caregiver-reported rates of dental visits, which began to rebound in 2021, caregiver-reported rates of preventative care declined further in 2021. This finding may reflect families seeking dental treatment for oral health issues rather than a return to routine dental visits, which are important for obtaining preventative care and addressing issues in a timely manner. We did not observe a significant change in 2020 and 2021 of caregiver reports of adverse oral health outcomes, measured as reporting their child's teeth in fair or poor condition or their child having frequent or chronic difficulty with toothaches, cavities, or bleeding gums. As oral health problems may take time to develop and may be a lagging indicator of reduced dental visits, children's oral health outcomes by race and ethnicity should continue to be monitored as postpandemic norms are established.

The gaps in dental visits reported by caregivers of Black and Asian children compared with White children observed before the pandemic persisted. The persistence of these gaps in care highlights the need for continued efforts to address disparities in access to dental visits. Attention to this is especially important because research had documented that the disparity in dental visits compared with White children had narrowed, with declines in this gap by 10% for Black children and by 14% for Asian children from 2001 through 2016.<sup>3</sup> Furthermore, Hispanic children experienced greater increases in adverse oral health outcomes during the COVID-19 pandemic than White children.

Some of the changes we observe during the pandemic likely reflect differential effects of the pandemic on household income and insurance status by race and ethnicity.<sup>11,12</sup> After removing household income and insurance controls in the sensitivity analysis, we find that all minoritized racial and ethnic groups had significantly lower risk of receiving dental visits and that Hispanic children had significantly higher risk of adverse oral health outcomes than White children in 2020 and 2021. In essence, our sensitivity analysis illustrates the added racial and ethnic gap in receipt of care and adverse oral health outcomes that are mediated through economic pathways.

Interventions over the past 40 years to improve children's oral health and access to care have primarily focused on expanding insurance eligibility and dental benefits.<sup>28,29</sup> Our results show that despite policy interventions during the COVID-19 pandemic that temporarily raised enrollment in Medicaid (which includes dental coverage for children), this was not sufficient to prevent declines in dental visits observed across all racial and ethnic groups in 2020 and 2021. Receipt of dental visits may continue to decline as children lose Medicaid coverage with dental benefits due to the end of the COVID-19 Federal Public Health Emergency and accompanying mandated continuous Medicaid eligibility. As of September 2023, at least 6.5 million former Medicaid enrollees have been disenrolled.<sup>30</sup> Predictive modeling from the Health and Human Service Assistant Secretary for Planning and Evaluation Office of Health Policy suggested that Black and Hispanic people were at highest risk of losing Medicaid coverage despite remaining eligible,<sup>31</sup> which highlights a potential pathway for disparities in dental visits and, ultimately, outcomes to emerge or worsen.

There are several limitations to our analysis. Although we controlled for time-invariant state-level characteristics, there may be differences across states in pandemic severity over time and health care system responses. In addition, we used caregiver-reported measures of oral health and not objective clinical measures. Prior research has shown that caregiver reports have high concordance with clinical measures of tooth condition,<sup>23,24</sup> but low-income and Hispanic caregivers may underestimate their child's need for dental care.<sup>32</sup> Also, we examined how our findings changed with and without adjustment for economic controls, but we did not assess interactions of variables with race and ethnicity. Although racial and ethnic minoritized children generally have worse oral health and are less likely to receive dental care than White children, outcomes vary across by age, poverty status, and dentition type.<sup>1,3</sup> Thus, further research is needed to examine pandemic changes by race and ethnicity across these characteristics. Our findings may not be generalizable to all children because we combined small population subgroups, which highlights the need for additional study of children from minoritized groups that we were not able to analyze separately. Finally, we include data from 2020 and 2021 but highlight a need for future studies to examine whether the low rates of use that we observed continue and whether outcomes subsequently may decline.

## CONCLUSIONS

We found reductions in caregiver-reported receipt of dental visits and preventive care for children in all racial and ethnic groups but limited changes in oral health outcomes during 2020 and 2021 compared with prepandemic. The COVID-19 pandemic did not appear to create new disparities in receipt of dental visits or oral health outcomes, but disparities in receipt of dental care persisted for Black and Asian children. Furthermore, Hispanic children experienced larger increases both in risk of experiencing adverse oral health outcomes than White children in 2020 and in having teeth in fair or poor condition in 2021. Continued monitoring of trends in dental visits and oral health outcomes by race and ethnicity is important to ensure all children have access to oral health care. This information can help to enact effective interventions to improve the oral health of children, particularly among those from minoritized racial and ethnic groups. ■

## DISCLOSURES

None of the authors reported any disclosures.

## SUPPLEMENTAL DATA

Supplemental data related to this article can be found at: <http://doi.org/10.1016/j.adaj.2023.11.005>.

Dr. Kranz is a senior policy researcher, RAND Corporation, Arlington, VA. Address correspondence to Dr. Kranz, 1200 S. Hayes St, Arlington, VA 22202, email akranz@rand.org.

Dr. Evans is an assistant professor, School of Public Health and Health Sciences, University of Massachusetts Amherst, Amherst, MA.

Dr. Geissler is an assistant professor, Department of Healthcare Delivery and Population Sciences, UMass Chan Medical School-Baystate, Springfield, MA.

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**ORCID Numbers.** Ashley M. Kranz: <https://orcid.org/0000-0003-0507-7800>; Kimberley H. Geissler: <https://orcid.org/0000-0002-7425-1203>. For information regarding ORCID numbers, go to <http://orcid.org>.

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