Colorado Basic Screening Survey Report
Children's Oral Health Screening: 2022 - 2023

Prepared by the Colorado Department of Public Health and Environment Oral Health Unit and Center for Health and Environmental Data

COLORADO
Department of Public Health & Environment

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Executive Summary

The Colorado Department of Public Health and Environment (CDPHE) conducted the Basic Screening Survey (BSS), an intraoral screening of kindergarten and third-grade students, during the 2022-23 school year. The BSS is a surveillance tool used to assess the burden of childhood oral disease at two critical oral developmental stages. This surveillance was conducted by applying methods recommended by the Centers for Disease Control and Prevention (CDC), the Behavioral Risk Factor Surveillance System (BRFSS), and the Association of State and Territorial Dental Directors.

Previous BSS results indicated a general improvement in children's oral health in the 15 years between the first and third survey data collection. However, the most recent data collection does not suggest this positive trend has continued. Though direct statistical comparisons between the previous and current BSS surveys are not possible due to changes in sampling methodology, the findings of the current BSS indicate clear evidence of the significant magnitude of oral disease among children and the disparities among different demographic groups.

Methodology and Study Participation

A total of 2,773 students from 42 elementary schools participated in the screening. School selection was completed by a random, stratified process to ensure representative sampling across four key variables: Free and Reduced-price Lunch program participation (as a proxy for household income), race and ethnicity, rurality, and Colorado Department of Education state regions (Colorado Department of Education, 2022b). Additionally, screening data samples were weighted according to Colorado-wide proportions of these variables in the child population to further enhance the representativeness and generalizability of the findings of the screening.

Key Findings

Observed dental caries (tooth decay) experience is higher in third-grade (60.6%) when compared to kindergarten (46.2%). However, untreated decay and urgent need for treatment is similar in the two grade groups. As discussed in the report, this is an indication of the importance of early intervention to stem the progression of caries in young children. Caries experience was observed to be higher in children from schools with greater proportions of students receiving Free and Reduced-price Lunch benefits. This suggests that household income and/or related socio-demographic factors are important risk factors for oral disease, though the measure is an indirect indicator of household income.

The survey findings highlight racial disparities in oral disease burden among Colorado’s children. Black and Hispanic kindergarten students experience caries at a rate (59.0% and 60.9%, respectively) nearly twice that of their white peers (34.0%). Racial disparities were

smaller among third-grade students and remain statistically significant. Approximately one-quarter of students screened needed urgent or immediate dental care. Racial disparities persisted in these data where Black and Hispanic children more frequently required urgent follow-up than white children. Black children receive dental sealants about half as frequently as white children.

When comparing urban and rural populations, the findings indicate that urban third-graders had a 26.4% prevalence of untreated decay, compared to 17.0% of rural third-graders. This is similar to findings regarding dental sealant placement where 54.6% of urban students had sealants placed compared to 74.6% of rural students. All participating rural schools in this BSS were partnered with oral disease prevention initiatives, including school-based oral health programs and CDPHE-funded Regional Oral Health Specialists. The caries and sealant findings support a positive link between these prevention programs and oral health outcomes.

Funding Acknowledgement

The Department thanks the student participants and their parents or caregivers, whose involvement made this data collection possible. We also extend our gratitude to the members of the CDPHE's Oral Health Unit for coordinating the school screenings, overseeing the process, and supporting the screeners. Additionally, we are grateful to the dental hygienists, school administrators, nurses, and volunteers who took time out of their busy schedules to help improve our understanding of children's oral health needs across Colorado.

This report was made possible by grant number DP18-1810 from the U.S. Centers for Disease Control and Prevention (CDC). Most data from this report are available through the Colorado Basic Screening Survey Dashboard and the CDC’s National Oral Health Surveillance System, which allows comparisons of oral disease burden with other states.

Introduction

In the United States, people are more likely to have poor oral health if they are low-wage earning, uninsured, from a racial or ethnic minority, have immigrated recently, have disabilities, or live in a rural community (Northridge, *et al.*, 2020). The 2022-23 Colorado Basic Screening Survey (BSS) indicates similar conditions in Colorado’s children. The latest BSS findings strongly suggest that just under half of children in Colorado experience a cavity by kindergarten and more than 60% by third-grade. Consistent with findings in previous BSS reports, non-white children are impacted by cavities at a rate significantly higher than their white peers (Calanan, *et al.*, 2018).

Various factors, including economic stability, neighborhood, and built environment, education access and quality, social and community context, and health care access and quality, contribute to oral health disparities (Office of Disease Prevention and Health Promotion,

2020). Addressing the social determinants of health (the conditions in which people are born, develop, live, work, and age that shape health outcomes), along with improving access to oral health services and reducing costs, is essential to achieving oral health equity in Colorado (U.S. Department of Health and Human Services, 2021).

In 2023, the Oral Health Unit released "A Framework to Advance Oral Health Equity in Colorado." This document outlines a broad consensus among oral health partners from communities and organizations across Colorado regarding the current state of oral health and lays out a set of goals and strategies to achieve a shared vision among over 100 report contributors to eliminate oral health inequities in Colorado. The development of the Framework involved the engagement of focus groups with significant community representation, interviews with state and local partners, and engagement of other health partners in the Colorado oral health network. Lack of access to oral health care services emerged as one key concern. Participants also highlighted the need for reliable oral health data to inform preventive interventions and policies that are known to reduce oral health disparities and support everyone's oral health. The Framework guides the work of the Oral Health Unit, and involves collaborations with partners across the state to reverse the trends highlighted in this BSS report.

The BSS is an in-the-mouth oral health screening of kindergarten and third-grade children enrolled in Colorado's public elementary schools. The Oral Health Unit in CDPHE conducted this statewide BSS during the 2022-23 school year. A total of 2,773 children were screened in 42 participating schools. The sample was statistically weighted to be generalizable to the population of Colorado kindergarten and third-grade school children, and stratified by several relevant demographic characteristics such as school-level Free and Reduced-price Lunch participation (as a proxy for household income), race and ethnicity, Colorado Department of Education regions, and rurality.

The data presented in this report will inform the Oral Health Unit and its partners across the state in crafting programs and interventions that resource the most at-risk communities to protect and promote children's oral health. The findings in this report highlight the effects of one such program, the Regional Oral Health Specialist program, which is a project of the Oral Health Unit supported by both federal and state funding. The Regional Oral Health Specialists program was devised by the Oral Health Unit in 2010 expressly to address oral health disparities observed in children in rural communities. The program supports school-based sealant programs, community water fluoridation, early childhood oral health intervention programs, and oral health access programs. The Regional Oral Health Specialists program covers approximately 20 counties in rural Colorado and works with some of the state's most underserved communities with the fewest oral health care providers.

Though national oral health status data indicates rural populations have worse oral health outcomes than their urban counterparts, the findings from this BSS indicate a positive

divergent trend (Martin, *et al.*, 2023). Current findings reveal that third-grade children from rural communities experienced less untreated tooth decay than their peers in urban communities. We noted that all participating rural schools in this BSS were located in areas served by Federally Qualified Health Centers (FQHC) and the Oral Health Unit's Regional Oral Health Specialists program, which enables early identification of oral health concerns and access to preventive and restorative oral health care. These findings illustrate the importance of evidence-based public health practices and can inform how resources are distributed to create the greatest impact on oral health. The essential public health disease surveillance of the BSS will inform programs, policies, and practices across sectors that address oral health inequities and improve oral health outcomes for all Coloradans.

Methodology

Sample Selection

The 2022-23 BSS utilized a probability proportional to size (PPS) sampling method, as recommended by the Association of State and Territorial Dental Directors (2022), to identify 65 public elementary schools with at least 15 third-grade students enrolled during the 2021-22 school year. Schools were first stratified by eight Colorado Department of Education-defined regions (Metropolitan, North Central, Northwest, Northeast, Pikes Peak, Southeast, Southwest, and West Central), and by the percentage of students in each school who were eligible for the Free and Reduced-price Lunch program (Colorado Department of Education, 2022b). This structured list of schools created the sampling frame.

An initial sample of 65 schools was identified. If a school declined to participate in the BSS, a replacement school was selected utilizing the same PPS sampling method. This sampling method generated a higher likelihood that replacement school candidates would be in the same Colorado Department of Education region and that Free and Reduced-price Lunch eligibility rates among students would be similar. However, this methodological approach did not guarantee an equivalent replacement for both stratification variables in each instance. Due to difficulties with schools declining participation, a second sample of 65 schools was drawn, to attain a final sample size of 42 participating schools. In the two samples, 26 schools participated from the first sample and 16 schools from the second sample.

School Recruitment Methodology

Once data analysts identified candidate elementary schools for outreach, Oral Health Unit staff contacted school nurses and school principals via email to request participation in the BSS. Additional information was provided to the school contact about the BSS protocols and participation requirements, as well as the benefits of participation. The Oral Health Unit provided school representatives who expressed interest additional details in follow-up communications. School leaders who did not respond to the initial email request were

contacted in a follow-up email within two weeks of the initial email. Those who did not reply after a second attempt at contact were removed from the prospective school screening candidate pool.

If school leaders agreed to participate in the BSS, they were asked to complete a school participation agreement form. The form disclosed information regarding the responsibilities of the school, the responsibilities of the Oral Health Unit, and the desired screening dates identified by the school. Schools could also identify an oral health clinician or community dental program they preferred to perform the screenings. Each school was assigned a screener based on proximity and schedule availability for one or more of the preferred screening dates. The screener and the school independently negotiated screening logistics. If the school declined to participate after these initial intake processes, the data analyst was notified to identify a replacement school.

A total of 130 schools were identified in two samples. When schools declined to participate, a replacement school was selected, resulting in a total of 179 schools being invited to participate. Forty-two schools opted to participate. Of the 137 schools invited who did not participate (from the original sample and of replacement schools), 41 schools did not respond and 96 schools declined to participate.

Screening and Data Entry

The school screening coordinator obtained parental or guardian consent by either an active (op-in) or passive (opt-out) process with each participating school selecting its preferred consent model. Screeners used a paper screening data collection form, which detailed school information, the date of the screening event, student demographics, the grade screened, the oral health status of each student screened, and the treatment urgency when oral health concerns were identified (see Appendix A for sample BSS Screening Form). Registered Dental Hygienists, recruited by the Oral Health Unit through local public health agency partners, school-based health clinics, and the Colorado Dental Hygienists' Association, conducted the BSS screenings. These screeners attended a required, 90-minute live training delivered by the Oral Health Unit to calibrate observational scoring criteria defining the clinical manifestations of untreated decay, treated decay, status of permanent first molars, and treatment urgency. The training aligned with guidance provided by the Association of State and Territorial Dental Directors. This screener skills calibration assured data collection consistency and reporting across all participating screeners and collection dates.

Dental hygienists performed the BSS following procedures outlined in an oral health screening manual provided by the Association of State and Territorial Dental Directors. The screener and school nurse or other school staff arranged logistics and scheduling of screenings. The Oral Health Unit provided screening supplies to the screeners. Each screening event accommodated the needs of the school and screening protocol. For example, some screenings

were performed in a gymnasium while others were performed outside of classrooms, having students leave the classroom individually for their screening.

Screeners used gloves, flashlights, and disposable mouth mirrors to conduct the screening for caries experience (treated decay/fillings or untreated decay), untreated decay (number of teeth with untreated decay), treatment needs (urgency of care need), dental sealant presence, and permanent first molar status with the following status options: sound, sealant, filled/crown, decayed, extracted, or unerupted.

Oral health treatment needs were categorized as "urgent" if care was recommended within 24 to 48 hours for signs or symptoms such as pain, infection, or swelling; "early" if care was recommended within the next several weeks or before the next regularly scheduled dental appointment for cavities without accompanying symptoms or other oral health issues; or "no obvious problems" if care was not needed before the child's next regular dental appointment. After screening, each child received an oral hygiene kit (toothbrush, toothpaste, and floss), a notification of their current oral health status, and a timeline for any recommended dental treatment. For children with urgent dental needs, the screeners notified the school nurse so they could follow up with parents or guardians.

Following the screening event at each school, the screener sent the completed screening forms to the Oral Health Unit. Oral Health Unit staff digitized data submitted on paper using optical character recognition software called Remark Office OMR. Oral Health Unit staff stored data in an Excel spreadsheet. Oral Health Unit staff conducted two data quality reviews to ensure accurate data transformation between paper and digital formats and manually corrected translation errors.

Data Analysis

Data were weighted following the Behavioral Risk Factor Surveillance System (BRFSS) iterative proportional fitting or “raking” methodology (CDC, 2022). In this method, a base weight is created, where each child in the sample represents a portion of children in the known target population (Association of State and Territorial Dental Directors, 2022). The base weights were raked using categories of rural or urban county designation (according to the Office of Management and Budget Metropolitan Statistical Area model), sex, Free or Reduced-price Lunch program eligibility, and race/ethnicity. The weights were iterated until the sample proportions approached those of Colorado’s kindergarten and third-grade population. This statistical method mitigated the effects of non-response bias better than child and school self-selection probabilities alone. This technique was especially important given the difficult recruiting environment as described in the study limitations section of this report.

Previous iterations of the Colorado BSS applied different methods of school sampling, or different methods of data weighting, or both. The 2022-23 BSS used the same Association of

State and Territorial Dental Directors-prescribed school sampling methods as the 2003-04, 2006-07, and 2011-12 BSS. However, the 2016-17 BSS changed to an oversampling method to obtain region-level data. In 2011, BRFSS changed to raking methodology instead of traditional weighting, and CDPHE began transitioning all population-based surveillance to the Behavioral Risk Factor Surveillance System methodology. As a result, the 2016-17 BSS was the first to use raking methodology. These methodologic changes with school sampling and data weighting make longitudinal trend analysis comparing previous BSS reports to current findings unreliable. Future iterations of the BSS are expected to apply the same sampling and weighting methods as applied in the 2022-23 BSS, supporting trend analysis going forward.

Screening for the presence of dental sealants was only conducted on third-grade students as permanent molars generally have not erupted in kindergarten-aged students. The American Dental Association recommends the placement of dental sealants on permanent molars as an evidence-based preventive intervention (American Dental Association, 2021). Analysis in the following tables, therefore, exclude sealant observations in kindergarteners.

School-level Free and Reduced-price Lunch eligibility data from the Colorado Department of Education were added to the finalized dataset. Free and Reduced-price Lunch eligibility is applied as a proxy indicator of socioeconomic status (SES), estimating the overall SES of the school community. Free and Reduced-price Lunch data is not available to the BSS team at the student level. To be eligible for Free and Reduced-price Lunch during the 2022-23 school year, annual income for a family of four could be no higher than $51,338 (Colorado Department of Education, 2022a).

Stratification of schools in the study included two variables based on the percentage of school students participating in the Free and Reduced-price Lunch program. The first grouping sorted students into four categories: schools with less than 25.0% (highest socioeconomic status group of schools) of students receiving Free and Reduced-price Lunch, 25.0%-49.9%, 50.0%-74.9%, and 75.0% or more (the lowest socioeconomic status group of schools). The second grouping sorted students into two categories: less than 50.0% (higher socioeconomic status group of schools) and 50.0% or more (lower socioeconomic status group of schools).

The Office of Management and Budget (OMB) Metropolitan Statistical Area model guided urban and rural assignments of schools. According to the Office of Management and Budget, a Metropolitan Statistical Area includes one or more counties containing a core urban area of 50,000 or more people, together with any adjacent counties that have a high degree of social and economic integration (as measured by commuting to work) with the urban core. All counties outside metropolitan areas are considered rural (U.S. Department of Agriculture, 2022).

A Rao-Scott likelihood ratio chi-square test was used to test for statistical associations between oral health measures and demographic variables, which included race/ethnicity,

school-level Free and Reduced-price Lunch eligibility category, and county-level urban or rural designation. Appendix B includes P-values and 95% confidence intervals tables. A p-value of <0.05 was the selected threshold for statistical significance in this analysis. Statistically significant relationships were tested further through logistic regression models. These regression models helped determine prevalence ratios and also adjusted for demographics. Regression models were not performed if the numerator of a variable was below 10, due to high variability (Peduzzi, *et al.*, 1996).

Results

Sample Overview and Response Rates

A total of 42 schools participated in the 2022-23 BSS. Thirty-eight of the participating schools participated in a screening for both kindergarten and third-grade students. Two schools only screened kindergarten students and two schools only screened third-grade students. A total of 40 schools participated for each grade. Across all screening sites, 2,773 students were screened (1,375 kindergarteners and 1,398 third-graders). The overall student participation rate was 57.0% for kindergarteners and 56.6% for third-graders.

Sample Demographics

Table A.1, in Appendix B, details the student demographics of the weighted samples. The weighted sample of kindergarten students for race and ethnicity was 4.2% Black, 31.7% Hispanic, and 55.3% white. The weighted sample for third-grade students for race and ethnicity was 4.9% Black, 34.6% Hispanic, and 50.9% white. Any sub-population with fewer than 50 children in the sample was suppressed. For this reason, American Indian or Alaska Native, Asian, multirace, and Native Hawaiian or other Pacific Islander were combined together in the “other race,” Non-Hispanic category. The weighted population for that group was 8.7% for kindergarteners and 9.6% for third-graders. These weighted distributions were similar to the entire sample frame where 4.4% were Black, 32.6% were Hispanic, 53.4% were white, and 9.7% were “other race” and ethnicities.

The weighted sample was also similar to the entire sample frame for Free and Reduced-price Lunch eligibility, for both kindergarten and third-grade students. The distribution of Free and Reduced-price Lunch eligibility can be explored in Table A.1 in Appendix B.

The weighted sample of kindergarten students had a 90.2% urban and 9.8% rural distribution, while the weighted sample of third-grade students had a 87.5% urban and 12.5% rural distribution. This is similar to the entire sample where 88.9% were urban students and 11.1% were rural students.

Oral Health Measures

Figure 1 reports the 2022-23 prevalence of caries experience, untreated decay, and urgent need for dental treatment among kindergarten and third-grade students in the sample. The figure also reports 2022-23 prevalence of dental sealants observed in third-grade students. Table A.2 in Appendix B also reports the prevalence of dental sealants. The following four sections detail each of these four oral health measures.

Caries Experience

Figure 1: Oral Health Measures by Grade Level, Colorado, 2022-23

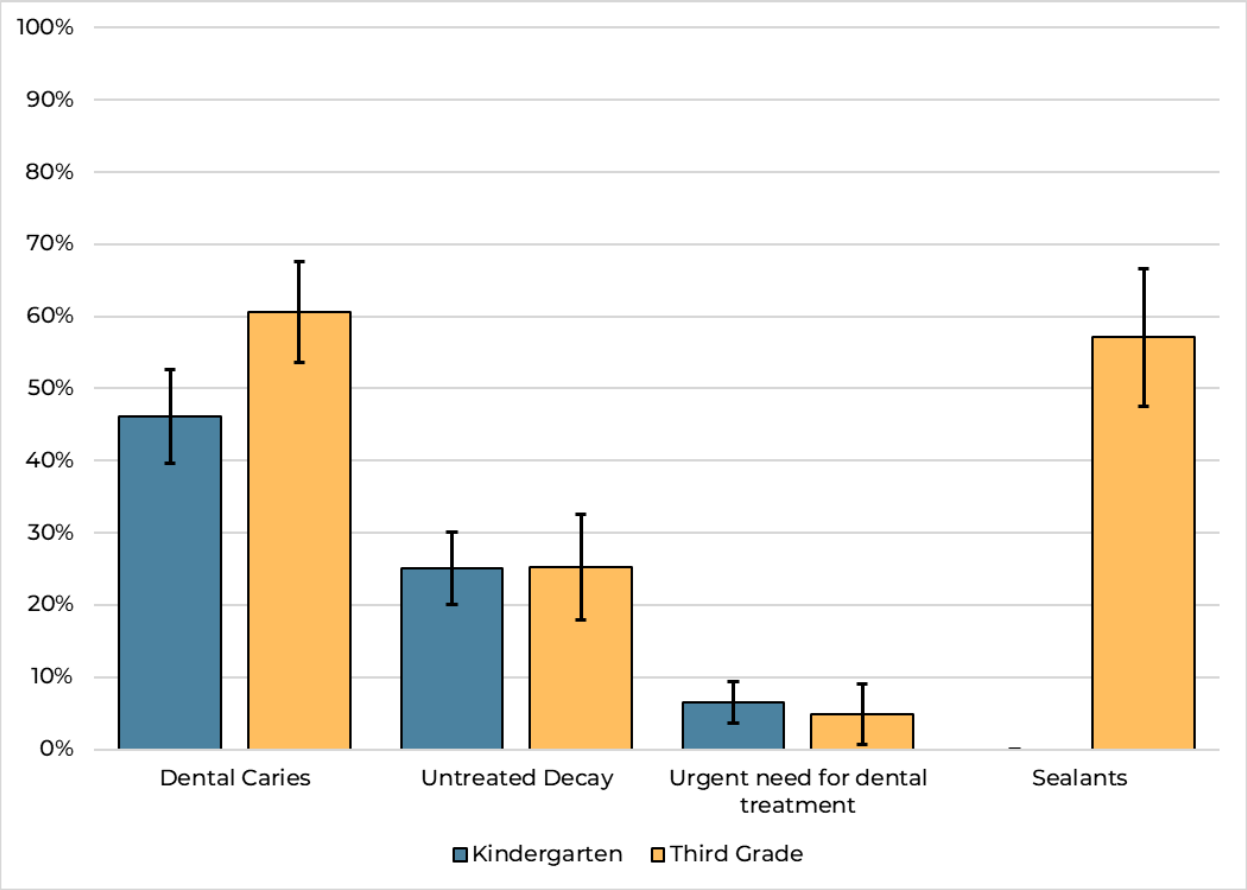


Figure 2: Percentage of Students with Caries Experience, Kindergarten, Colorado, 2022-23

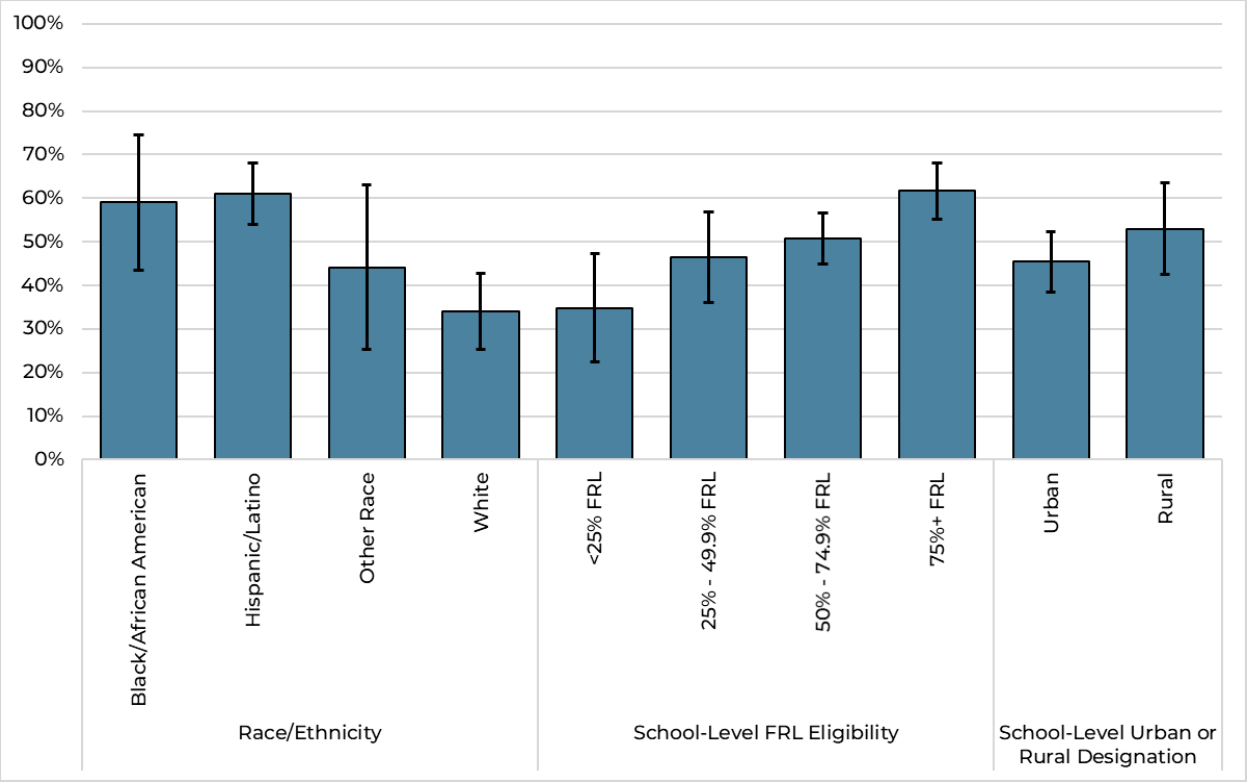
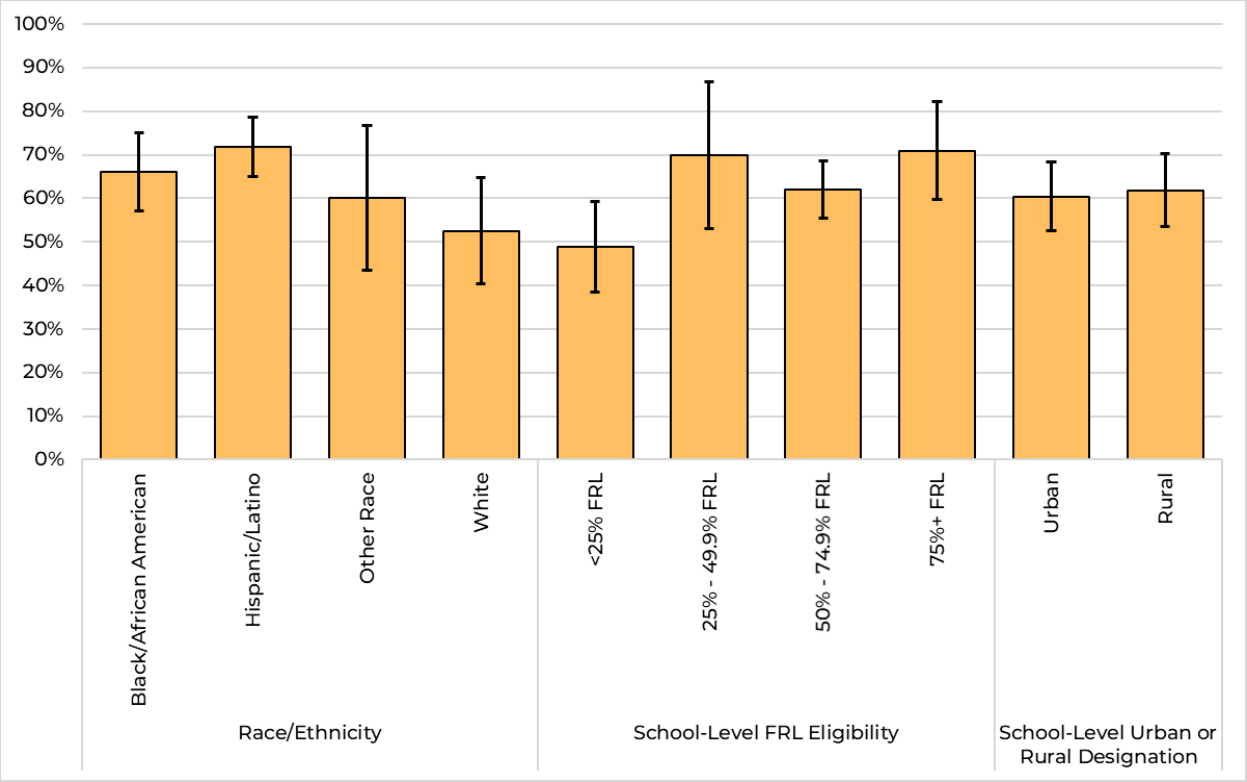


Figure 3: Percentage of Students with Caries Experience, third-grade, Colorado, 2022-23



The prevalence of caries experience was statistically significantly higher in third-grade as compared to kindergarten. This observation emphasizes the importance of early intervention. Nearly half (46.2%) of kindergarten students had a caries experience while nearly two-thirds (60.6%) of third-grade students had a caries experience (Figure 1). The caries prevalences in the sample are disaggregated by certain demographics in Figure 2 for kindergarten students and in Figure 3 for third-grade students.

When comparing observations among three demographic classifications, Black and Hispanic students were observed to have a higher prevalence of caries experience when compared to their white counterparts. This disparity was most apparent in kindergarten where Black and Hispanic students were observed to have nearly twice the prevalence of caries (59.0% and 60.9%, respectively) than white students (34.0%). The adjusted prevalence ratios indicated that Black and Hispanic kindergarten students are 1.73 and 1.80 times more likely than white students to have a caries experience, respectively. The prevalence for “other race” kindergarten students for all measures was not separately analyzed as the sample sizes for these groups were not sufficient to reach statistically valid conclusions. Although the difference in oral health measures decreased in third-grade, a statistically significant disparity persists. Black, Hispanic, and “other race” students had a prevalence of caries experience of 66.0%, 71.7%, and 60.1%, respectively. This compared to 51.5% of white

students. The only significant adjusted prevalence ratio for race and ethnicity between third-graders indicated Hispanic students were 1.37 times more likely to have a caries experience than white students.

The prevalence of caries experience generally increased as school-level Free and Reduced-price Lunch eligibility increased, for both kindergarten and third-grade students. Both the 50.0% to 74.9% Free and Reduced-price Lunch schools (1.31 times) and 75% or more Free and Reduced-price Lunch schools (1.56 times) had a significantly higher likelihood of having caries experience as compared to the less than 25.0% Free and Reduced-price Lunch schools.

Just as with race and ethnicity, the gap narrowed for third-graders, although there was still a significant difference in prevalence of caries experience between the lowest and highest Free and Reduced-price Lunch groups. Both the 25.0% to 49.9% Free and Reduced-price Lunch schools (1.53 times) and 75% or more Free and Reduced-price Lunch schools (1.34 times) had a significantly higher likelihood of having caries experience as compared to the less than 25.0% Free and Reduced-price Lunch schools. All Free and Reduced-price Lunch prevalences can be explored in tables A.4a, A.4b, A.8a and A.8b in appendix B.

There were no statistically significant differences observed between urban and rural students in the prevalence of caries experience. For kindergarten, 45.4% of urban students had caries experience compared to 53.0% of rural students. For third-grade, 60.4% of urban students had caries experience compared to 61.9% of rural students.

Untreated Decay

Figure 4: Percentage of Students with Untreated Decay, Kindergarten, Colorado, 2022-23

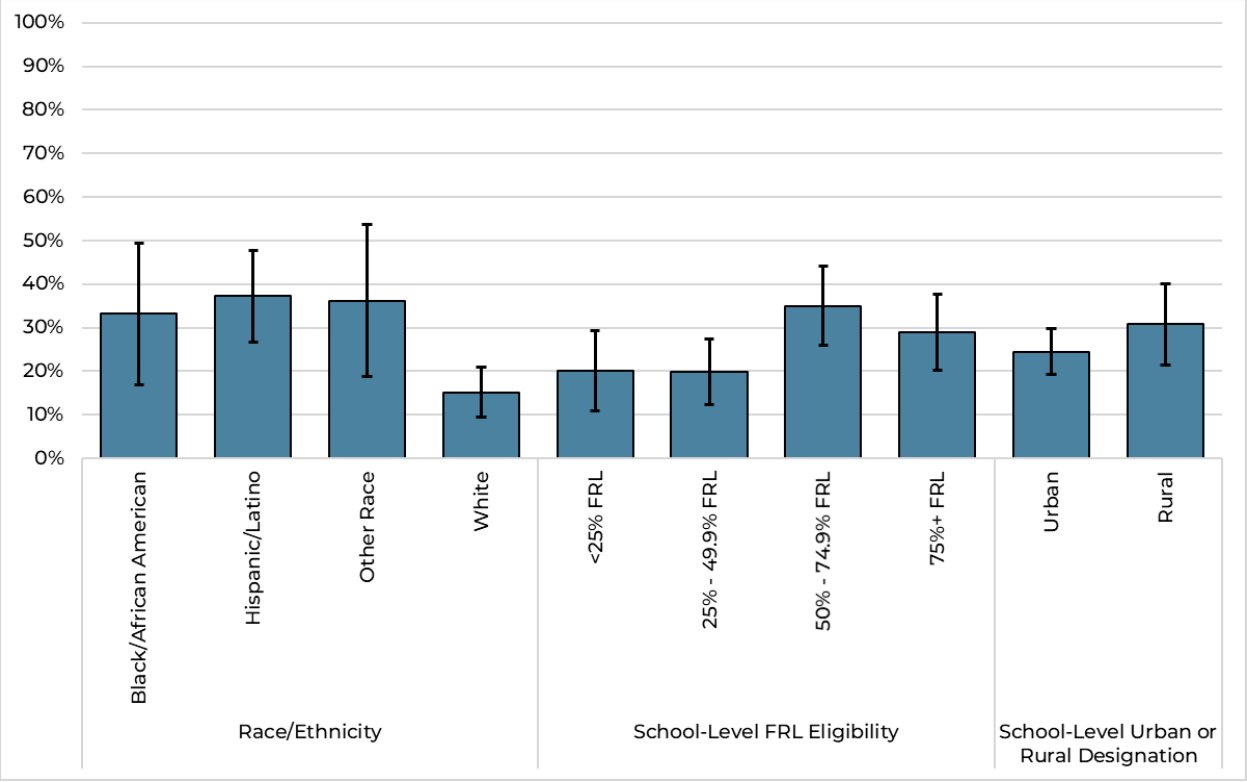
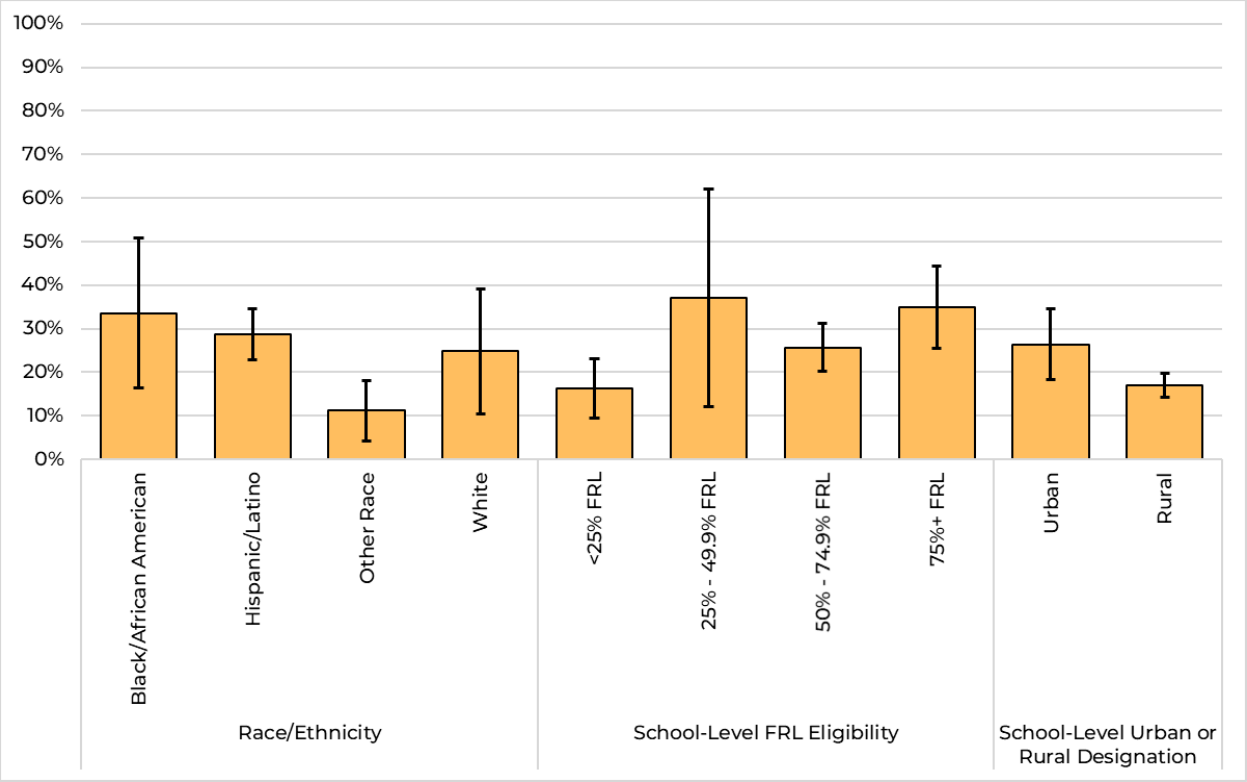


Figure 5: Percentage of students with Untreated Decay, third-grade, Colorado, 2022-23



The prevalence of untreated decay was similar for both kindergarten and third-grade students (25.1% and 25.2%, respectively), as reported in Figure 1. The prevalences are further disaggregated by demographics in Figure 4 for kindergarten students and Figure 5 for third-grade students.

The analysis of untreated decay for kindergarten students by race and ethnicity indicated a similar caries experience for Black (33.2%) and Hispanic (37.2%) students as compared to their white (15.2%) peers. The adjusted prevalence ratios for untreated decay in kindergarteners were more significant. In kindergarten, Black and Hispanic students were 2.25 and 2.37 times more likely than white students to have untreated decay. The prevalence of untreated decay in third-graders was 33.6% for Black students, 28.7% for Hispanic students, 11.2% for other race students, and 24.9% for white students.

Also similar to the prevalence of caries experience, the prevalence of untreated decay tended to increase with increased school-level Free and Reduced-price Lunch eligibility. The only significant regression for kindergarten students indicated students at 50.0% to 74.9% Free and Reduced-price Lunch schools had 1.52 times the amount of untreated decay as students at schools with less than 25.0% Free and Reduced-price Lunch. Third-grade students at all schools with more than 25% Free and Reduced-price Lunch had a higher likelihood of having untreated decay than students at schools with less than 25% Free and Reduced-price Lunch.

All Free and Reduced-price Lunch prevalences can be explored in tables A.4a, A.4b, A.8a and A.8b in appendix B.

Unlike the caries experience, there was a statistically significant difference observed in untreated decay prevalence between urban and rural students in third-grade. Urban third-graders had a 26.4% prevalence of untreated decay, compared to 17.0% of rural third-graders. There was no significant difference between kindergarten students in urban (24.5%) and rural (30.8%) geographies in untreated decay prevalence.

Treatment Urgency

Figure 6: Percentage of students with Dental Treatment Needs by Urgency of Need, Kindergarten, Colorado, 2022-23

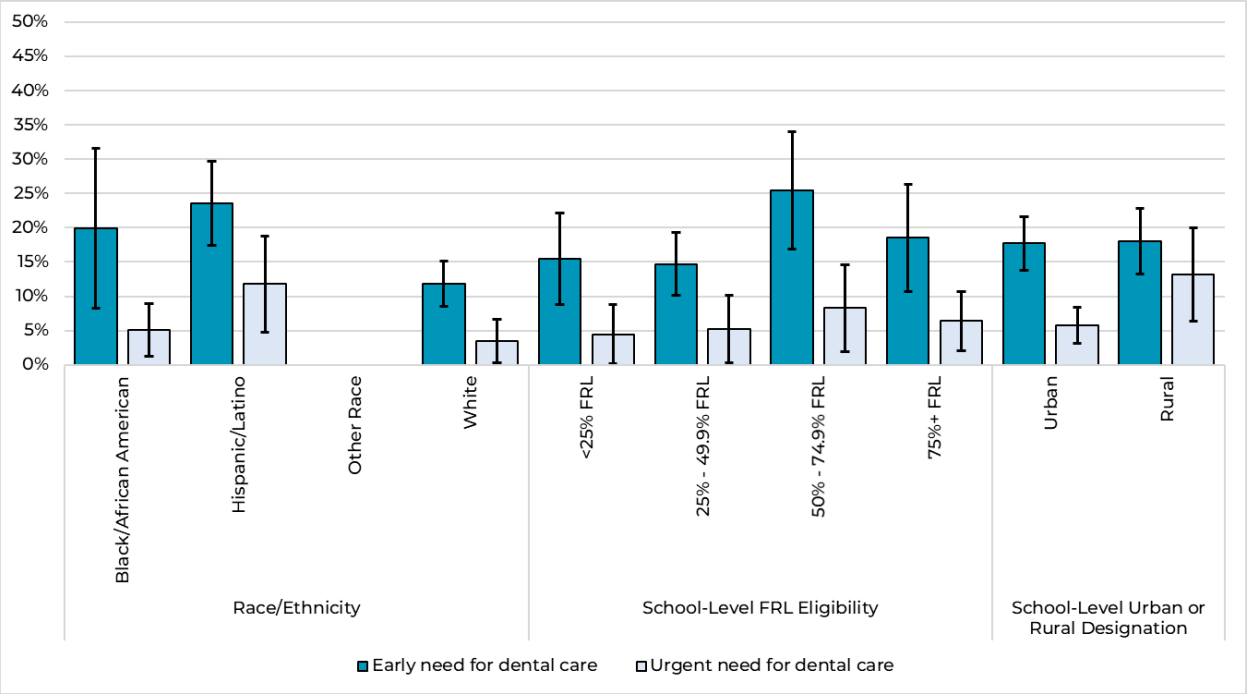
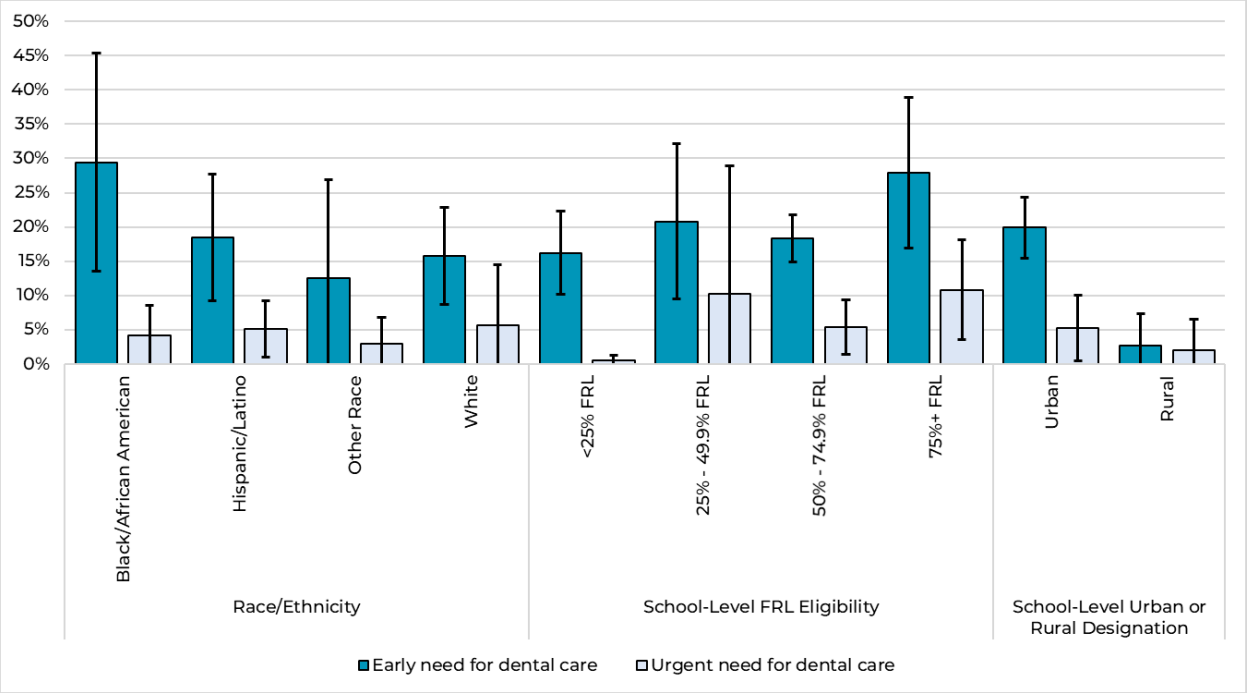


Figure 7: Percentage of students with Dental Treatment Needs by Urgency of Need, third-grade, Colorado, 2022-23



Nearly one-quarter of kindergarten students (24.2%) and third-grade students (22.6%) required either an early or urgent need for dental treatment. This data skewed toward more early need for dental treatment rather than urgent need. However, nearly one in 15 kindergarteners (6.5%), and one in 20 third-graders (4.9%) screened had an urgent need for dental care (Figure 1). The prevalences are further disaggregated by demographics in Figure 6 for kindergarten students and Figure 7 for third-grade students.

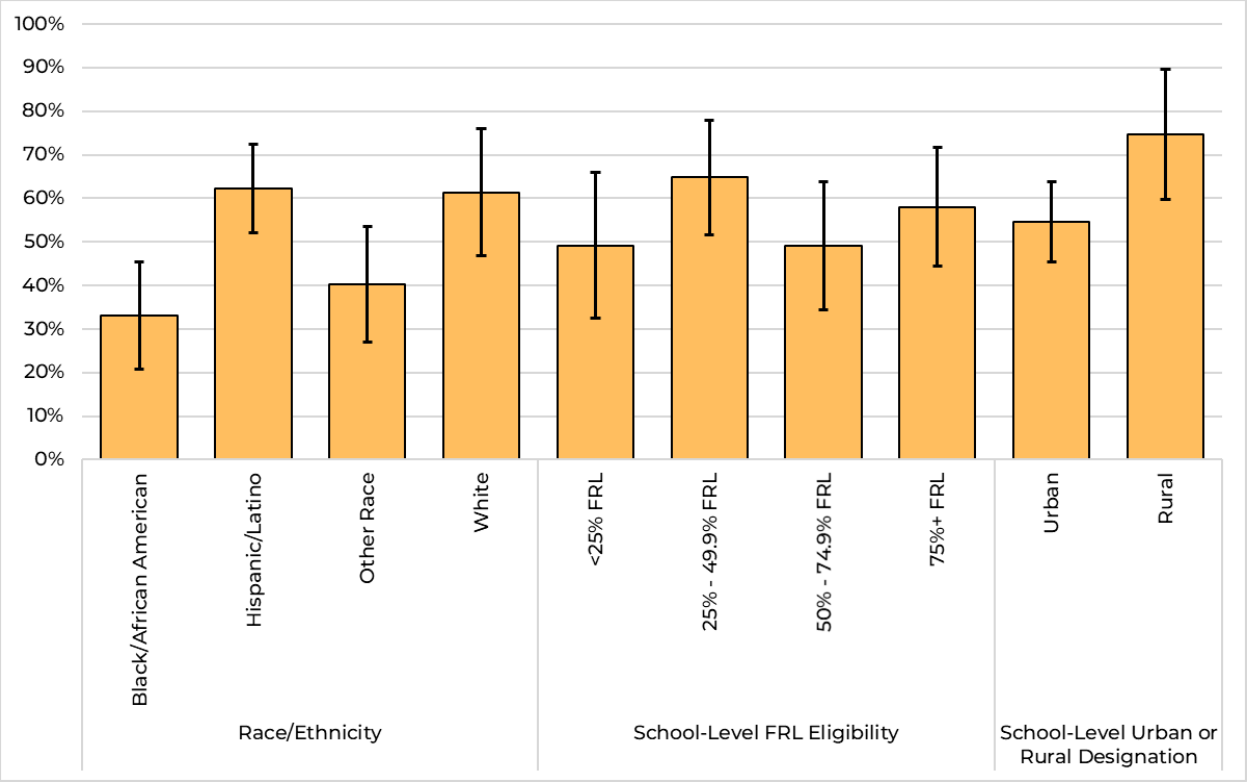
Race and ethnicity differences observed in previously described oral health measures were once again observed in urgency for treatment when analyzing data collected in kindergarteners. Black and Hispanic students had nearly double the prevalence of early need of dental treatment (20.0% and 23.5%, respectively) as their white counterparts (11.9%). Only Hispanic kindergarteners had a statistically significant prevalence ratio. Hispanic students were found to be 1.97 times as likely to have an early need for dental care when compared to white peers. For those in urgent need of dental care, Hispanic students had at least twice the prevalence (11.8%) than any other race or ethnicity group. The adjusted prevalence ratio indicated Hispanic students are 3.15 times as likely to have an urgent need for dental care when compared to white students. These differences were not observed in third-grade students, even when their prevalence changed for both early and urgent need for dental treatment.

When evaluating the need for dental care across the four school-level Free and Reduced-price Lunch eligibility groups, only urgent need for dental care among third-grade students was statistically significant. This was mostly due to a lack of urgent need for dental care (0.5%) among those from schools with under 25.0% Free and Reduced-price Lunch eligibility when compared to the other groups (25.0% - 49.9% = 10.2%, 50.0% - 74.9% = 5.4%, 75.0% or more = 10.8%). In contrast, the two school-level Free and Reduced-price Lunch eligibility groups only revealed a statistical significance for kindergarteners with an early need for dental care: 15.1% of kindergarten students from schools with less than 50.0% Free and Reduced-price Lunch eligibility had an early need for dental care, compared with 22.4% of kindergarten students from schools with 50.0% or more Free and Reduced-price Lunch eligibility.

Comparing geographies for need for dental care showed an inversion from kindergartners to third-graders. For kindergarteners, there was no significant difference between urban and rural early need for dental care, but rural students were more than twice as likely to have an urgent need for dental care (13.2%) compared to urban students (5.8%). In contrast, there was not a statistically significant difference between urban and rural third-graders with an urgent need for dental care. However, urban third-grade students were more likely to have an early need for dental care (19.9%) compared to rural third-grade students (2.7%). This was the only urban and rural relationship that remained significant when considering adjusted prevalence ratios. The prevalence ratios indicated that urban students were 7.04 times as likely to have an early need for dental care compared to rural students.

Sealants

Figure 8: Percentage of students with Dental Sealants, third-grade, Colorado, 2022-23



Fifty-seven percent (57.1%) of third-grade students had at least one dental sealant present on a permanent molar. This data is described in Figure 8.

Hispanic (62.2%) and white (61.4%) third-graders had a significantly higher prevalence of having at least one dental sealant on a permanent molar than Black (33.1%) or “other race” (40.3%) third-graders. Adjusted prevalence ratios indicated that Black students were about half (0.57 times) as likely as white students to have had sealants placed. The data did not indicate any statistical difference in sealant placement prevalence when analyzed by school Free and Reduced-price Lunch eligibility. There was, however, a significant difference in sealant placement between urban and rural students, with more than half (54.6%) of urban students having had sealants placed as compared to three out of four (74.6%) of rural students having had a sealant placed. These statistically significant differences were not found when analyzing the prevalence ratios of sealants placed.

Limitations

The analysis in this 2022-23 BSS report is subject to several limitations, primarily resulting from the difficulties in school participant recruitment. The initial target of 65 participating schools was not met. Though reasons were varied and may not have always been fully disclosed to the Oral Health Unit, school administrators cited the loss of classroom instruction time, the presence of oral health screening programs already available in their school, language translation requirements for the 12 most common languages spoken in Colorado elementary schools, and the inability to acquire all necessary authorizations in the time available for the BSS data collection as barriers to participation. This lower school participation rate resulted in a smaller sample size, which meant that analysis could not be conducted for a greater range of racial and ethnic categories and findings could only be reported with larger confidence intervals. A smaller sample size also prevented examining measures for more discrete geographies. The effects of lower school participation were exacerbated by schools that elected to use an active rather than passive consent model, further suppressing sample size at the individual student level. Although participation rates for active and passive consent schools were not documented in this study, the Colorado Department of Education recommended the active consent process, aligning with trends observed in other school health programs conducted by the state.

Because a high number of schools declined an invitation to participate and the active consent process chosen by some schools reduced the number of students who were screened at each school site where it was applied, it is possible that some selection bias influenced these findings. Though the presence and effect of selection bias were not evaluated within the scope of this analysis, further study may be necessary to evaluate the generalizability of findings across all schools.

A second limitation is associated with the analysis of race and ethnicity. Though sufficient data were collected to draw conclusions about variation in the burden of disease for Black, Hispanic, and white Colorado children, other less well-represented race and ethnic groups in the data could not be separately analyzed. Finally, there were multiple methods of determining rural and urban classifications of schools. For this report, a county-level designation was used for each school. More refined methods of distinguishing rural from urban areas for the purpose of health services access should be explored in future iterations of the BSS. Counties level base units sometimes obscure variation in population density within a county and may not represent relative access to oral health services by road travel distance to adjacent counties with high oral health clinician capacity.

Conclusions

Overall Implications

Findings from the 2022-23 Basic Screening Report in Colorado indicate that oral health status measures, such as caries experience, untreated decay, and treatment urgency, are at concerning prevalence levels for the state's kindergarteners and third-graders. Although these BSS findings suggest a decline in children's oral health status when compared to previous BSS reports, methodological changes in school sampling in this BSS to match current best practices prevent drawing statistically valid conclusions regarding trends in children's oral health. The findings of this BSS show that the prevalence of caries experience was statistically significantly higher in third-grade as compared to kindergarten. This emphasizes the importance of early intervention; children who do not receive preventive dental services may develop caries over time if risk factors are not addressed. The American Academy of Pediatric Dentistry highlights interventions for the prevention and management of caries that include fluoride and dietary recommendations and diagnostic and restorative protocols (American Academy of Pediatric Dentistry, 2022). The American Academy of Pediatric Dentistry recommends the prevention of early childhood caries by providing interventions to disrupt the cariogenic process that may lead to tooth decay over time (American Academy of Pediatric Dentistry, 2016).

This BSS shows encouraging signs regarding the application of dental sealants in children, with over half of Colorado third-graders having at least one sealant placed on their permanent molars. Several CDPHE-supported and partner sealant programs have contributed to this success. For example, CDPHE funds 22 school-based health centers to integrate oral health services, 10 of which provide dental sealants as part of their program. Oral Health Unit-funded Regional Oral Health Specialists within local public health agencies provide evidence-based preventive dental services and connect children to care. In addition, the Oral Health Unit has collected information from partners who implement school-based programs, including seven Federally Qualified Health Centers that are present in 156 schools, and independent programs in another 134 schools across the state. However, there is still work to be done considering the disparities in sealant prevalence between Black third-graders and their white counterparts illustrated in this report.

Implications Based on Race and Ethnicity

There are clear and significant disparities present among races and ethnicities regarding oral health status. These observed disparities are consistent for all examined oral health measures in kindergarten for both Black and Hispanic students. However, 2022-23 data indicate that these observed disparities in oral health status are not as wide among third-grade students. Caries experience was the only measure that was significantly different between different races and ethnicities in both grades. For third-graders, this difference was significant

between Hispanic and white students. A disparity was also evident in the presence of dental sealants where Black third-graders in Colorado were significantly less likely to have sealants placed than their white counterparts. These disparities are congruent with previous BSS reports and national trends (Calanan, *et al.*, 2018). A study published by the American Journal of Preventive Medicine found that non-Hispanic white children were more likely than non-Hispanic Black children to receive evidence-based preventive dental services, including dental sealants (Wei, Griffin, and Robison, 2018).

To reduce these disparities, it is necessary to explore the potential causes. A large body of peer-reviewed evidence indicates that oral health status disparities in racial and ethnic minorities are highly associated with certain social determinants of health (National Institutes of Health, 2021). The Healthy People 2030 initiative defines social determinants of health as economic stability, education access and quality, social and community context, health care access and quality, and the neighborhood and built environment (Office of Disease Prevention and Health Promotion, 2020).

Coloradans may experience additional barriers related to the ability to pay for care. In Colorado, 53.0% of Hispanic adults have dental insurance, compared to 75.4% of white adults (CDPHE, 2022). The Colorado Health Access Survey, administered by the Colorado Health Institute, found that 22.3% of Hispanic Coloradans did not get needed dental care due to cost. Only 15% of white Coloradans cited the same barrier (Colorado Health Institute, 2023). For those who are able to access affordable oral health care, there can be additional language barriers that could prevent some from seeking services, with as many as 315,000 Coloradans who speak English “less than very well (United States Census Bureau, 2020).”

Implications Based on Free and Reduced-price Lunch Eligibility

Students at schools with over 25.0% of students eligible for Free and Reduced-price Lunch were typically more likely to have more caries experience and untreated decay than students at schools with 25.0% or fewer students eligible for Free and Reduced-price Lunch, regardless of grade. Similar to race and ethnicity, these results are also congruent with previous BSS reports and national trends (Calanan, *et al.*, 2018). Vasireddy, *et al.* (2021) found that children living in households at or below the poverty level, another proxy for socioeconomic circumstances, were more likely to have tooth decay than those from high household income categories. The CDC has found that children from low-income households have a prevalence of untreated cavities that is three times higher than children from higher income households (CDC, 2019). In addition, children from lower income households aged 6 to 19 years are 15% less likely to receive preventive dental sealants as compared to those from higher income households (CDC, 2024). Conclusions from CDPHE’s Community and Partner Engagement Report found that though Coloradans believe dental care is important, necessities such as paying bills and feeding their families often were a higher priority (CDPHE, 2021).

Implications Based on Urbanicity

The 2022-23 BSS findings indicate that third-graders from rural communities experienced less untreated tooth decay and higher rates of sealant presence than their counterparts in urban settings. Urban third-graders had a 26.4% prevalence of untreated decay, compared to 17.0% of rural third-graders, observing that urban third-graders were significantly more likely to have an early need for dental care than their rural peers. This is not consistent with surveillance data of Colorado adults.

For adults, data show those from rural communities are more likely to have lost a tooth due to decay or periodontal disease than those in urban communities (CDPHE, 2022). This inequity could be due to regional disparities. Eighty percent of Colorado's rural counties are designated as federal Dental Health Professional Shortage Areas. Rural communities also have less access to optimally fluoridated drinking water. This is due to both the cost burden on rural water systems as well as a higher proportion of the population on private well water (Musleh, 2020).

There was also a significant difference in sealant placement between urban and rural students, with more than half (54.6%) of urban students having had sealants placed as compared to three out of four (74.6%) of rural students having had a sealant placed. This is an inversion of the typically observed trend for the general population. Oral health trends in the United States indicate that rural children are more likely to have poor overall health and less likely to receive evidence-based preventive dental services (Ignelzi, *et al.*, 2023). The 2022-23 BSS findings could be explained by the fact that all participating rural schools were located in areas served by either the Oral Health Unit-funded Regional Oral Health Specialist, who is specifically placed in communities with higher population-level indicators of oral health risk, or school-based oral health programs supported by Federally Qualified Health Centers in rural counties. Only 57% of the urban schools were served by an existing school-based oral health program. The findings outlined here show an association between school-based oral health programs and improvements in oral health, likely due to the increase in preventive dental services that these programs enable.

The 2022-23 BSS highlights the essential task of reducing the burden of disease in children through evidence-based prevention programs. Oral health is associated with academic performance, social and emotional development, and overall health. Promoting positive outcomes in each of these areas is necessarily linked to improving oral health through effective prevention programs such as community water fluoridation, school-based oral health programs, and improved access to oral health care for children. Colorado's oral health network–composed of community-based organizations, philanthropies, training programs, clinical systems, state programs, and other partners–works to improve access, integrate oral health into overall health, and address inequities. With these efforts, Colorado has made significant strides in decreasing the burden of oral disease; however, it is clear from the

2022-23 BSS data that Colorado communities still experience a high burden of oral disease. There is more work to be done to build a system of prevention and care in Colorado that ensures optimal oral health for all and includes specific strategies to address the barriers experienced by underserved communities.

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Appendix A

Basic Screening Survey Screening Form

Colorado Basic Screening Survey: 2022/23

School Code ☐☐☐☐☐☐
Date: ☐☐☐☐☐☐

Race/Ethnicity (check all that apply)

- ☐ American Indian/Alaska Native
- ☐ Asian
- ☐ Black/African American
- ☐ Hispanic/ Latino
- ☐ Native Hawaiian/Pacific Islander
- ☐ White
- ☐ Unknown or Missing

Grade:

- ☐ K (Kindergarten)
- ☐ 3 (3rd Grade)

Sex:

- ☐ Female
- ☐ Male
- ☐ Other

Comments (optional):

Number Teeth UNTREATED Decay

	0	1	2	3	4	5	6	7	8	9
0	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
1	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
2	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Number Teeth Treated Decay

	0	1	2	3	4	5	6	7	8	9
0	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
1	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
2	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Status of Permanent First Molars

	Sound	Sealant	Filled/ Crown	Decayed	Extracted	Unerupted
3	☐	☐	☐	☐	☐	☐
14	☐	☐	☐	☐	☐	☐
19	☐	☐	☐	☐	☐	☐
30	☐	☐	☐	☐	☐	☐

Treatment Urgency

- ☐ Routine
- ☐ Early
- ☐ Urgent

Appendix B

Table A.1: Sample Demographics for the Basic Screening Survey, Colorado, 2022-23

	Weighted Estimate	95% Confidence Interval
Kindergarten (Unweighted Frequency = 1375)		
Sex (Unweighted Frequency = 1372)		
Female	47.9%	43.7% - 52.1%
Male	52.1%	47.9% - 56.3%
Race/Ethnicity (Unweighted Frequency = 1176)		
Black/African American, Non-Hispanic	4.2%	2.1% - 6.3%
Hispanic/Latino	31.7%	22.4% - 41.1%
Other Race, Non-Hispanic	8.7%	4.4% - 13.1%
White, Non-Hispanic	55.3%	45.6% - 65%
School-Level Free and Reduced-Price Lunch Program Eligibility (Unweighted Frequency = 1370		
Less than 25.0%	38%	18.1% - 57.9%
25.0% - 49.9%	26.7%	7.9% - 45.5%
50.0% - 74.9%	19.7%	6.1% - 33.3%
75.0% or More	15.6%	5% - 26.3%
School-Level Urban or Rural Designation (Unweighted Frequency = 1375)		
Urban	90.2%	77.6% - 100%
Rural	9.8%	0% - 22.4%
Third Grade (Unweighted Frequency = 1398)		
Sex (Unweighted Frequency = 1387)		
Female	49.9%	44.6% - 55.1%
Male	50.1%	44.9% - 55.4%
Race/Ethnicity (Unweighted Frequency = 1163)		
Black/African American, Non-Hispanic	4.9%	2.1% - 7.6%
Hispanic/Latino	34.6%	23.6% - 45.6%
Other Race, Non-Hispanic	9.6%	3.5% - 15.8%
White, Non-Hispanic	50.9%	39.2% - 62.5%
School-Level Free and Reduced-Price Lunch Program Eligibility (Unweighted Frequency = 1392		
Less than 25.0%	40.1%	20% - 60.2%
25.0% - 49.9%	24.1%	6.9% - 41.3%
50.0% - 74.9%	19.8%	6.3% - 33.2%
75.0% or More	16.1%	5.5% - 26.7%
School-Level Urban or Rural Designation (Unweighted Frequency = 1398)		
Urban	87.5%	70.4% - 100%
Rural	12.5%	0% - 29.6%

Table A.2: Oral Health Measures by Grade Level, Colorado, 2022-23

	Weighted Estimate	95% Confidence Interval
Kindergarten		
Caries Experience (Unweighted Frequency = 1374)		
No caries experience	53.8%	47.3% - 60.4%
Caries experience	46.2%	39.6% - 52.7%
Untreated Decay (Unweighted Frequency = 1375)		
No untreated decay	74.9%	69.9% - 79.9%
Has untreated decay	25.1%	20.1% - 30.1%
Treatment Urgency (Unweighted Frequency = 1373)		
No obvious problem	75.8%	70.7% - 80.8%
Early dental care	17.7%	14.2% - 21.3%
Urgent dental care	6.5%	3.6% - 9.4%
Third Grade		
Caries Experience (Unweighted Frequency = 1397)		
No caries experience	39.4%	32.4% - 46.4%
Caries experience	60.6%	53.6% - 67.6%
Untreated Decay (Unweighted Frequency = 1398)		
No untreated decay	74.8%	67.5% - 82.1%
Has untreated decay	25.2%	17.9% - 32.5%
Treatment Urgency (Unweighted Frequency = 1393)		
No obvious problem	77.4%	70.7% - 84.1%
Early dental care	17.7%	12.5% - 22.9%
Urgent dental care	4.9%	0.6% - 9.1%
Sealants (Unweighted Frequency = 1386)		
No sealants	42.9%	33.4% - 52.4%
Sealant on at least one permanent molar	57.1%	47.6% - 66.6%

Table A.3: Oral Health Measures by Grade Level and Race/Ethnicity, Colorado, 2022-23

Kindergarten	Black/African American, Non-Hispanic	Hispanic/Latino	Other Race, Non-Hispanic	White, Non-Hispanic	Rao-Scott Chi-Square *(p)*
Caries Experience	59% (43.4% - 74.6%)	60.9% (53.9% - 68%)	*	34% (25.4% - 42.6%)	<0.0001
Untreated Decay	33.2% (17% - 49.4%)	37.2% (26.6% - 47.8%)	*	15.2% (9.5% - 20.9%)	<0.0001
Early need for dental care	20% (8.3% - 31.6%)	23.5% (17.4% - 29.6%)	*	11.9% (8.6% - 15.1%)	<.0001
Urgent need for dental care	5% (1.2% - 8.9%)	11.8% (4.8% - 18.8%)	*	3.5% (0.3% - 6.6%)	0.0141
Third Grade	**Black/African American, Non-Hispanic**	**Hispanic/Latino**	**Other Race, Non-Hispanic**	**White, Non-Hispanic**	**Rao-Scott Chi-Square *(p)***
Caries Experience	66% (57% - 75.1%)	71.7% (64.9% - 78.5%)	60.1% (43.5% - 76.7%)	52.5% (40.3% - 64.8%)	0.0021
Untreated Decay	33.6% (16.4% - 50.7%)	28.7% (22.8% - 34.7%)	11.2% (4.3% - 18.1%)	24.9% (10.5% - 39.2%)	0.1517
Early need for dental care	29.4% (13.5% - 45.3%)	18.5% (9.2% - 27.7%)	12.5% (0% - 26.9%)	15.8% (8.7% - 22.8%)	0.5284
Urgent need for dental care	4.2% (0% - 8.5%)	5.1% (1% - 9.3%)	2.9% (0% - 6.8%)	5.7% (0% - 14.5%)	0.9283
Sealants	33.1% (20.8% - 45.5%)	62.2% (52% - 72.4%)	40.3% (27.1% - 53.6%)	61.4% (46.9% - 75.9%)	0.002

*Data suppressed due to sample size

Table A.4a: Oral Health Measures by Grade Level and by School-Level Free and Reduced-Price Lunch Program Eligibility, Colorado, 2022-23

Kindergarten					
	Less than 25.0%	25.0% - 49.9%	50.0% - 74.9%	75.0% or More	Rao-Scott Chi-Square *(p)*
Caries Experience	34.8% (22.4% - 47.3%)	46.5% (36.1% - 56.9%)	50.7% (44.8% - 56.5%)	61.6% (55.2% - 68%)	0.0005
Untreated Decay	20% (10.8% - 29.2%)	19.8% (12.2% - 27.4%)	35% (26% - 44.1%)	29% (20.3% - 37.7%)	0.0344
Early need for dental care	15.4% (8.7% - 22.1%)	14.7% (10.1% - 19.3%)	25.4% (16.9% - 33.9%)	18.5% (10.7% - 26.3%)	0.1143
Urgent need for dental care	4.5% (0.2% - 8.8%)	5.2% (0.3% - 10.1%)	8.3% (1.9% - 14.7%)	6.4% (2% - 10.7%)	0.7202
Third Grade					
	Less than 25.0%	25.0% - 49.9%	50.0% - 74.9%	75.0% or More	Rao-Scott Chi-Square *(p)*
Caries Experience	48.8% (38.4% - 59.3%)	69.9% (53.1% - 86.8%)	61.9% (55.3% - 68.5%)	70.9% (59.7% - 82.1%)	0.0069
Untreated Decay	16.2% (9.4% - 23%)	37.1% (12.2% - 62%)	25.7% (20.2% - 31.2%)	34.8% (25.4% - 44.3%)	0.0242
Early need for dental care	16.2% (10.1% - 22.3%)	20.8% (9.5% - 32.1%)	18.3% (14.9% - 21.8%)	27.9% (16.9% - 39%)	0.2259
Urgent need for dental care	0.5% (0% - 1.3%)	10.2% (0% - 28.9%)	5.4% (1.5% - 9.3%)	10.8% (3.6% - 18.1%)	0.0306*
Sealants	49.2% (32.5% - 65.9%)	64.8% (51.6% - 78%)	49.1% (34.4% - 63.7%)	58% (44.5% - 71.6%)	0.2942

*Regression not run on significant relationship due to small numerator

Table A.4b: Oral Health Measures by Grade Level and by School-Level Free and Reduced-Price Lunch Program Eligibility, Colorado, 2022-23

Kindergarten			
	Less than 50.0%	50.0% or More	Rao-Scott Chi-Square *(p)*
Caries Experience	39.6% (30.4% - 48.8%)	55.5% (50.4% - 60.6%)	0.0009
Untreated Decay	19.9% (13.7% - 26.2%)	32.4% (25.9% - 38.8%)	0.1657
Early need for dental care	15.1% (10.7% - 19.5%)	22.4% (16.2% - 28.5%)	0.0387
Urgent need for dental care	4.8% (1.5% - 8%)	7.4% (3.4% - 11.5%)	0.3025
Third Grade			
	Less than 50.0%	50.0% or More	Rao-Scott Chi-Square *(p)*
Caries Experience	56.8% (45.8% - 67.7%)	65.9% (59.4% - 72.5%)	0.1266
Untreated Decay	24.1% (12.4% - 35.8%)	29.8% (24.2% - 35.5%)	0.9662
Early need for dental care	17.9% (12% - 23.7%)	22.6% (16.8% - 28.4%)	0.2497
Urgent need for dental care	4% (0% - 10.6%)	7.8% (3.8% - 11.9%)	0.4218
Sealants	55.1% (42.8% - 67.4%)	53% (42.6% - 63.4%)	0.7928

Table A.5: Oral Health Measures by Grade Level and by School-Level Urban or Rural Designation, Colorado, 2022-23

Kindergarten			
	Urban	Rural	Rao-Scott Chi-Square *(p)*
Caries Experience	45.4% (38.5% - 52.3%)	53% (42.4% - 63.5%)	0.1761
Untreated Decay	24.5% (19.2% - 29.7%)	30.8% (21.5% - 40%)	0.1748
Early need for dental care	17.7% (13.8% - 21.6%)	18% (13.2% - 22.8%)	0.934
Urgent need for dental care	5.8% (3.1% - 8.4%)	13.2% (6.4% - 19.9%)	0.0006
Third Grade			
	Urban	Rural	Rao-Scott Chi-Square *(p)*
Caries Experience	60.4% (52.6% - 68.3%)	61.9% (53.6% - 70.2%)	0.7951
Untreated Decay	26.4% (18.3% - 34.5%)	17% (14.2% - 19.9%)	0.0019
Early need for dental care	19.9% (15.4% - 24.4%)	2.7% (0% - 7.4%)	<.0001
Urgent need for dental care	5.3% (0.5% - 10%)	2.1% (0% - 6.5%)	0.3291
Sealants	54.6% (45.4% - 63.7%)	74.6% (59.7% - 89.5%)	0.0009

Table A.6 Race and Ethnicity Prevalence ratios for Oral Health Measures by Grade

Kindergarten				
Caries Experience	Unadjusted Prevalence	Unadjusted P Value	Adjusted Prevalence	Adjusted P Value
Black/African American, Non-Hispanic	1.74 (1.28 - 2.36)	0.0025	1.73 (1.27 - 2.35)	0.0030
Hispanic/Latino	1.79 (1.42 - 2.26)	<0.0001	1.80 (1.45 - 2.24)	<0.0001
Other Race, Non-Hispanic	*	*	*	*
White, Non-Hispanic	Ref	Ref	Ref	Ref
Untreated Decay	Unadjusted Prevalence	Unadjusted P Value	Adjusted Prevalence	Adjusted P Value
Black/African American, Non-Hispanic	2.18 (1.28 - 3.72)	0.0083	2.25 (1.33 - 3.81)	0.0059
Hispanic/Latino	2.44 (1.65 - 3.62)	<0.0001	2.37 (1.65 - 3.40)	<0.0001
Other Race, Non-Hispanic	*	*	*	*
White, Non-Hispanic	Ref	Ref	Ref	Ref
Early need for dental care	Unadjusted Prevalence	Unadjusted P Value	Adjusted Prevalence	Adjusted P Value
Black/African American, Non-Hispanic	1.68 (0.95 - 3.00)	0.0837	1.73 (0.95 - 3.13)	0.0803
Hispanic/Latino	1.98 (1.21 - 3.26)	0.0083	1.97 (1.28 - 3.03)	0.0026
Other Race, Non-Hispanic	*	*	*	*
White, Non-Hispanic	Ref	Ref	Ref	Ref
Urgent need for dental care	Unadjusted Prevalence	Unadjusted P Value	Adjusted Prevalence	Adjusted P Value
Black/African American, Non-Hispanic	1.45 (0.48 - 4.44)	0.5115	1.61 (0.50 - 5.19)	0.4267
Hispanic/Latino	3.40 (1.22 - 9.46)	0.0206	3.15 (1.27 - 7.85)	0.0180
Other Race, Non-Hispanic	*	*	*	*
White, Non-Hispanic	Ref	Ref	Ref	Ref

Third Grade				
Caries Experience	Unadjusted Prevalence	Unadjusted P Value	Adjusted Prevalence	Adjusted P Value
Black/African American, Non-Hispanic	1.26 (0.97 - 1.63)	0.0946	1.26 (0.98 - 1.62)	0.0863
Hispanic/Latino	1.37 (1.09 - 1.71)	0.0082	1.37 (1.10 - 1.71)	0.0051
Other Race, Non-Hispanic	1.14 (0.81 - 1.61)	0.4629	1.14 (0.81 - 1.61)	0.4652
White, Non-Hispanic	Ref	Ref	Ref	Ref
Sealants	Unadjusted Prevalence	Unadjusted P Value	Adjusted Prevalence	Adjusted P Value
Black/African American, Non-Hispanic	0.54 (0.36 - 0.80)	0.0004	0.57 (0.38 - 0.84)	0.0007
Hispanic/Latino	1.01 (0.82 - 1.25)	0.9078	0.99 (0.82 - 1.19)	0.8887
Other Race, Non-Hispanic	0.66 (0.42 - 1.03)	0.0336	0.69 (0.44 - 1.08)	0.0575
White, Non-Hispanic	Ref	Ref	Ref	Ref

Table A.7 Urban and Rural Prevalence ratios for Oral Health Measures by Grade

Kindergarten				
Urgent need for dental care	Unadjusted Prevalence Ratio	Unadjusted P Value	Adjusted Prevalence Ratio	Adjusted P Value
Urban	0.44 (0.08 - 2.42)	0.3649	0.41 (0.09 - 1.86)	0.2861
Rural	Ref	Ref	Ref	Ref
Third Grade				
Untreated Decay	Unadjusted Prevalence Ratio	Unadjusted P Value	Adjusted Prevalence Ratio	Adjusted P Value
Urban	1.55 (0.40 - 5.99)	0.5028	1.63 (0.44 - 6.03)	0.4366
Rural	Ref	Ref	Ref	Ref
Early need for dental care	Unadjusted Prevalence Ratio	Unadjusted P Value	Adjusted Prevalence Ratio	Adjusted P Value
Urban	7.32 (3.72 - 14.42)	<0.0001	7.04 (3.46 - 14.34)	<0.0001
Rural	Ref	Ref	Ref	Ref
Sealants	Unadjusted Prevalence Ratio	Unadjusted P Value	Adjusted Prevalence Ratio	Adjusted P Value
Urban	0.73 (0.53 - 1.01)	0.1571	0.76 (0.55 - 1.06)	0.2082
Rural	Ref	Ref	Ref	Ref

Table A.8a Four Level Free and Reduced-price Lunch Eligibility Prevalence Ratios for Oral Health Outcomes by Grade

Kindergarten				
Caries Experience	Unadjusted Prevalence Ratio	Unadjusted P Value	Adjusted Prevalence Ratio	Adjusted P Value
Less than 25.0%	Ref	Ref	Ref	Ref
25.0% - 49.9%	1.34 (1.02 - 1.76)	0.0406	1.31 (0.98 - 1.75)	0.0708
50.0% - 74.9%	1.45 (1.14 - 1.86)	0.0027	1.37 (1.03 - 1.83)	0.0274
75.0% or More	1.77 (1.37 - 2.29)	<0.0001	1.56 (1.10 - 2.22)	0.0161
Untreated Decay	Unadjusted Prevalence Ratio	Unadjusted P Value	Adjusted Prevalence Ratio	Adjusted P Value
Less than 25.0%	Ref	Ref	Ref	Ref
25.0% - 49.9%	0.99 (0.63 - 1.55)	0.9606	0.95 (0.58 - 1.57)	0.8517
50.0% - 74.9%	1.75 (1.20 - 2.55)	0.0032	1.52 (0.99 - 2.34)	0.0464
75.0% or More	1.45 (0.95 - 2.20)	0.0840	1.16 (0.68 - 1.98)	0.5852
Third Grade				
Caries Experience	Unadjusted Prevalence Ratio	Unadjusted P Value	Adjusted Prevalence Ratio	Adjusted P Value
Less than 25.0%	Ref	Ref	Ref	Ref
25.0% - 49.9%	1.43 (1.18 - 1.74)	0.0009	1.53 (1.25 - 1.88)	0.0001
50.0% - 74.9%	1.27 (1.05 - 1.53)	0.0147	1.15 (0.92 - 1.44)	0.2314
75.0% or More	1.45 (1.20 - 1.75)	0.0002	1.34 (1.04 - 1.72)	0.0301
Untreated Decay	Unadjusted Prevalence Ratio	Unadjusted P Value	Adjusted Prevalence Ratio	Adjusted P Value
Less than 25.0%	Ref	Ref	Ref	Ref
25.0% - 49.9%	2.29 (1.37 - 3.81)	0.0038	2.63 (1.52 - 4.57)	0.0014
50.0% - 74.9%	1.58 (1.09 - 2.29)	0.0149	1.75 (1.11 - 2.74)	0.0150
75.0% or More	2.15 (1.50 - 3.07)	<0.0001	2.66 (1.68 - 4.22)	<0.0001

Table A.8b Two Level Free and Reduced-price Lunch Eligibility Prevalence Ratios for Oral Health Measures by Grade (Kindergarten)

Kindergarten				
Caries Experience	Unadjusted Prevalence Ratio	Unadjusted P Value	Adjusted Prevalence Ratio	Adjusted P Value
Less than 50.0%	Ref	Ref	Ref	Ref
50.0% or More	1.40 (1.17 - 1.67)	0.0002	1.27 (1.02 - 1.59)	0.0299
Early need for dental care	Unadjusted Prevalence Ratio	Unadjusted P Value	Adjusted Prevalence Ratio	Adjusted P Value
Less than 50.0%	Ref	Ref	Ref	Ref
50.0% or More	1.48 (1.05 - 2.07)	0.0227	1.23 (0.81 - 1.87)	0.3192