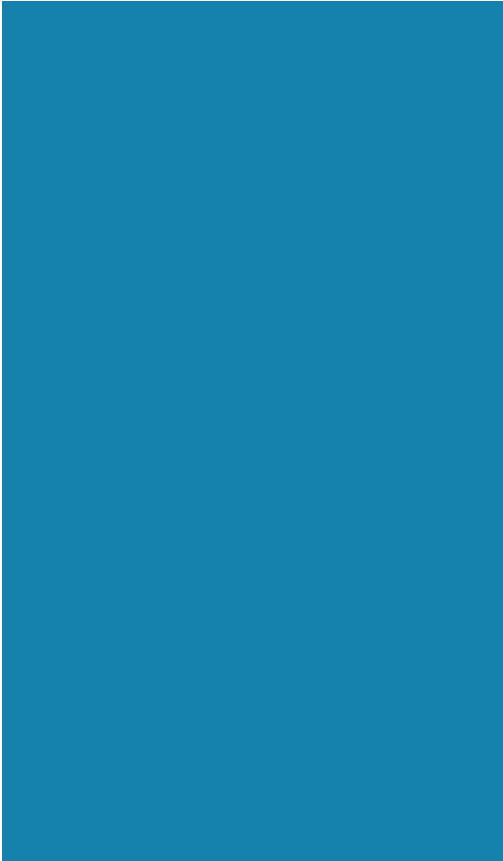


Wisconsin Healthy Smiles Survey

Kindergarten and Third Grade Children



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Find additional information about oral health on the [Wisconsin Oral Health Program website](#).

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Executive Summary

During the 2022–23 school year, the Wisconsin Department of Health Services completed Healthy Smiles, a statewide survey on the oral health status of Wisconsin’s kindergarten and third-grade children. More than 2,600 kindergarten and 2,700 third-grade children in public schools participated in the survey. Dental screenings were completed by dental professionals following the Basic Screening Survey protocol developed by the Association of State and Territorial Dental Directors. Results among third-grade children were compared to similar surveys conducted in 2001–02, 2007–08, 2012–13, and the 2017–18 school years. Overall, it was found that in the 2022–23 school year, tooth decay remained a problem for Wisconsin’s children. Further, data suggests that the oral health status of third grade children has regressed in the last five years.



69

Wisconsin schools participated.



2,682

Kindergarteners

2,754

Third graders



Key Findings

Tooth decay is a significant problem among children. Approximately 22.1% and 25.4% of kindergarten (KG) and third grade students had untreated tooth decay, respectively. Additionally, 15% of children in each grade had multiple teeth with untreated decay.

Unmet dental needs remain a considerable issue. Approximately, 1 in 5 kindergarteners and 1 in 4 third graders were determined to have early or urgent dental needs. The prevalence among both kindergarteners and third graders of urgent dental needs was 2%.

The oral health status among third grade children has regressed in the past five years.

Health disparities exist by race, ethnicity, and income-level. Students of color in KG had nearly two times the prevalence of untreated decay and unmet dental needs when compared to non-Hispanic white children. Regardless of grade, schools with 75% or more of children eligible for free and reduced lunch (FRL) had significantly higher oral disease and unmet dental needs when compared to schools with less than 25% of children eligible for FRL.

Access to dental sealants was similar across income-level.



22% of kindergarteners and **25%** of third graders had untreated decay on at least one tooth.



15% of children in each grade had multiple teeth with untreated decay.



700+ students in both kindergarten and third grade had urgent dental needs.



Students of color in KG were nearly **2x** as likely to have untreated decay compared to non-Hispanic white children.

Introduction

Oral health is an important factor in overall health, and as such, good oral hygiene across the lifespan can help to promote a healthy lifestyle. Children are often at risk of poor oral health outcomes as tooth decay is the most common chronic disease experienced during childhood.^[1] In the United States, 23% of children ages 2-to-5 years-old and 52% of children 6-to-8 years-old have had tooth decay on at least one of their primary teeth.^[2] This is concerning because poor oral health outcomes, such as tooth decay, can have a considerable impact on a child's ability to eat, speak, and learn. In fact, children with a poor oral health status are three times more likely to miss school due to dental pain when compared to those with a better oral health status.^[3] It is estimated that on average, the need for unplanned dental care results in 34 million school hours lost each year.^[4,5] These additional hours of missed school can result in poorer school performance.^[3,6] Furthermore, untreated oral disease has a significant economic impact; an estimated \$45 billion in lost productivity per year is attributable to untreated oral disease.^[7]

Poor oral health not only has immediate impacts, but there are also long-term consequences of poor oral health on an individual's general health. For example, research suggests that poor oral health is linked with other chronic conditions such as diabetes and heart disease.^[8] Therefore, promoting good oral hygiene habits early in life can be an effective preventive measure for the onset of other chronic conditions. In general, oral health in the U.S. has improved significantly over the last several decades; however, oral health disparities persist by socioeconomic status, race, and ethnicity. Nationally, data from 2011-2016 showed that 33% of Mexican American and 28% of non-Hispanic Black children ages 2-to-5 years-old have had a cavity on at least one of their primary teeth, compared to 18% of non-Hispanic white children.^[9] Furthermore, children from low-income households are disproportionately burdened by oral disease. Children ages 2-to-5 years-old from low-income households were three times more likely to have untreated decay on at least one of their primary teeth when compared to children from high-income households.^[9] Moreover, children ages 12-to-19 years-old from low-income households were two times more likely to have untreated decay on at least one of their permanent teeth when compared to children from high-income households.^[9] These disparities can be exacerbated by a lack of access to routine dental care or disease prevention programs, such as school-based sealant programs and community water fluoridation (CWF).

Access to routine dental care and disease prevention programs plays a pivotal role in improving oral health. For example, the application of dental sealants on molars has proven to be an effective measure for preventing tooth decay. In fact, it is estimated that over the course of the first 2-years after a tooth is sealed, dental sealants prevent 80% of cavities.^[10,11] Despite this evidence, there is still a significant unmet need as data show that only 42% of children ages 6-to-11 years-old in the U.S. have a dental sealant on one of their permanent teeth.^[2] In Wisconsin, sealant placement rates have gradually improved since the introduction of its school-based sealant program, Seal-A-Smile (SAS). The mission of the program is to improve access to dental sealants throughout the state by providing services within a school-based setting. For nearly two decades, the program has been paramount in leading efforts to address the unmet oral health needs of children and adolescents

throughout Wisconsin. During the 2022–2023 school year, SAS programs provided services to more than 75,000 students in over 850 schools.

For more than 75-years, CWF has played a significant role in helping prevent tooth decay. The practice of CWF involves adjusting the fluoride level of drinking water to a level recommended for preventing tooth decay. As levels are maintained, all community members served by the water system receive the dental health benefits of fluoride, thus providing equitable access to preventive services. The public health benefit of the practice has been so substantial that the Centers for Disease Control and Prevention recognized CWF as one of the ten great public health achievements of the 20th century.^[12] In fact, it is estimated that CWF can reduce tooth decay by 25% in children and adults.^[13] In addition to the dental health benefits, CWF offers significant cost saving to communities.^[14] Communities of 1,000 or more people save an average of \$20 per dollar invested, while community members save an average of \$32 per person by avoiding the dental care required for the treatment of cavities.^[14] However, despite the evidence of the safety and effectiveness of CWF, there is some opposition to the practice. Data sourced from the Wisconsin Department of Natural Resources show an increase in the number of the communities discontinuing the practice since 2020, and the current trajectory observed this decade outpaces the previous three decades by a considerable margin.^[15] These trends are concerning, and if maintained could significantly impact childhood oral health throughout Wisconsin.

Considering the public health significance of oral health, it is important to routinely conduct public health surveillance activities to accurately track oral health status. The insights gained from these surveillance activities will help inform public health programs that seek to create equitable access to oral health care. As such, the Wisconsin Oral Health Program (OHP) carried out the *Wisconsin Healthy Smiles Survey* during the 2022–2023 school year. The *Wisconsin Healthy Smiles Survey* provided the opportunity for a deeper understanding of childhood oral health status by capturing data on a key set of oral health measures among kindergarten and third grade students. These measures encompass topics of disease burden, need for dental care, and disease prevention.



Tooth decay is the most common chronic disease of childhood.

34 million hours of school lost per year in the United States.

Methodology

Basic screening survey background

The *Wisconsin Healthy Smiles Survey* follows a framework developed by the Association of State and Territorial Dental Directors, known as the Basic Screening Survey (BSS).^[16] The BSS allows for a standardized community-level assessment of oral health status. At baseline, most states conduct a third grade BSS. This standardized methodology allows for states to assess oral health trends over time and compare their data with other states. The 2022–2023 *Wisconsin Healthy Smiles Survey*, formerly known as the *Healthy Smiles Healthy Growth* survey, marks the fifth assessment of third grade students' oral health in Wisconsin, and the first assessment of the kindergarten (KG) grade level.

The Basic Screening Survey was designed to assess four core oral health status indicators for grade school children (that is, KG to 12th grade). Untreated decay (active and potentially arrested), treated decay, dental sealants on permanent first and/or second molars, and the urgency of need for dental care. The protocol offers numerous variations in the diagnostic criteria for the untreated decay, treated decay, and sealant indicators that differ by level of complexity. For the purposes of the *Wisconsin Healthy Smiles Survey*, the OHP opted to use the complex diagnostic criteria, which consisted of dental professionals counting the number of teeth for each indicator. Further, there are two additional indicators used in the assessment: caries experience and the need for dental sealants. All measures and their diagnostic criteria are outlined in Table 1.

Oral health measure	Diagnostic criteria
Untreated decay	<p>A readily observable breakdown in the tooth enamel upon visual inspection only:</p> <ul style="list-style-type: none"> • Cavitated lesions coded as untreated decay • Arrested decay (lesion is black and dark with a hard, glossy appearance) coded as untreated decay <p>Stained pits or fissures without readily observable breakdown of the enamel are not considered untreated decay, nor are white spot lesions.</p>
Treated decay	<ul style="list-style-type: none"> • Any tooth with the presence of any type of filling, such as a preventive resin restoration, crown, or a temporary filling • Any tooth extracted due to untreated decay
Caries experience	Presence of untreated decay or treated decay upon visual inspection
Dental sealants on permanent molars	Presence of a dental sealant on a permanent first and/or second molar; includes sealants covering part of the pits or fissures, or a partially lost sealant

Need for sealants	Presence of a permanent molar that is free of decay, restorations, and dental sealants
Urgency of need for dental care	<p>No obvious problems: No presence of untreated decay or any other dental problem. Children with the presence of untreated decay exclusive to primary teeth that are ready for exfoliation are classified as having no obvious problems.</p> <p>Early dental care needed: Dental caries without any accompanying signs or symptoms that include pain, infection, or swelling. Any dental problem requiring care before the next routine dental visit is designated as early dental care needed.</p> <p>Urgent need for dental care: Designated to those that are determined to need dental care within 24 to 48 hours due to signs or symptoms that include pain, infection, or swelling.</p>

Table 1: Oral health measure diagnostic criteria

Sampling

The *Wisconsin Healthy Smiles Survey* included a representative sample of KG and third grade students in Wisconsin public schools. The sampling design followed a probability proportional to size methodology, which ensures that larger schools have a higher probability of being selected. Considering KG enrollment mirrors third grade enrollment, sampling design was based on third grade enrollment only. Data sourced from the Wisconsin Department of Public Instruction (DPI) was used to produce a sampling frame that included all non-virtual public schools with at least 15 children enrolled in third grade during the 2021–2022 school year (n=1,016 schools). Additionally, implicit stratification was used to ensure that the sample included a diverse set of schools. As such, the sampling frame was first stratified by Wisconsin’s five public health regions, and ascendingly ordered by school-level National School Lunch Program (NSLP) eligibility (that is, 0% to 100%).

After finalizing the sampling frame, schools were then randomly sampled at a consent interval for each public health region until 90 sampling intervals, or strata, were derived. If a school did not have a KG grade level, its appropriate feeder school(s) was added to the sample. After accounting for feeder schools, the original sample included 100 schools with a total enrollment of 6,164 KG and 6,143 third grade students. Approximately 8% of schools in each public health region were sampled, except the Northern region which was oversampled at 16%, due to its lower population density. If a school declined to participate, a backup school was selected as a replacement. If the replacement school also declined to participate, no additional replacements were selected.

Training and calibration

Dental professionals (or screeners) completed screenings in all participating schools. Screenings consisted of a brief visual inspection of the child’s gums and teeth using gloves, a headlamp, and a disposable mouth mirror. Prior to the commencement of field work, all screeners had to participate in two mandatory trainings. The first of these trainings consisted of a three hour didactic session. The intent of this didactic session was to acclimate screeners

to the BSS protocol and the diagnostic criteria for each oral health indicator. Following the completion of the didactic session, screeners participated in a calibration day. The purpose of this session was to ensure the standardization of the protocol across all screeners. The calibration session was held at a participating school and lasted an entire school day.

Data collection and analysis

Demographic data including age (in years), sex, race, and ethnicity were obtained from school records. School-level NSLP eligibility data was sourced from DPI and served as a proxy for socio-economic status. All data were entered into a secure database using an electronic data collection tool. Data were weighted and analyzed using PROC SURVEYFREQ (SAS 9.4) procedures to adjust for the complex sampling design. One sampling interval needed to account for 4-year-old kindergarten (K4) enrollment when weighting the data, as K4 students were mistakenly included in the screening event. However, the impact of this was minimal as less than 20 K4 children were screened. Due to data limitations, students identifying as Native Hawaiian/Pacific Islander, American Indian/Alaska Native (AIAN), or multiple races were combined for the purposes of data analysis.

Results

Participation

A total of 69 schools representing 62 sampling intervals participated in the *Wisconsin Healthy Smiles Survey*. This translates to roughly a 68.9% school-level participation rate. There were 3,440 kindergarten and 3,594 third grade students enrolled at participating schools. Among these enrolled students, a total of 2,682 KG and 2,754 third grade students were screened. The overall response rate, calculated by taking the total number of students screened and dividing it by the total enrollment, was 77.3%. Response rates varied by consent method: Among passive consent schools, the response rate was 82.8%, while the response rate was considerably lower among active consent schools, at 30.4% participation.

Decay and caries experience

The results of the *Wisconsin Healthy Smiles Survey* demonstrate unmet needs among both KG and third grade children. In Wisconsin, 1 in 5 (22.1%) KG children and 1 in 4 (25.4%) third grade children had the presence of untreated decay on at least one tooth. The prevalence of untreated decay is more than double the Healthy People 2030 (HP 2030) target of 10% and suggest that more than 8,000 kindergarteners and 9,000 third graders statewide currently have untreated decay. Furthermore, the proportion of students with two or more teeth with untreated decay was 15.1% and 15.5% among KG and third grade children, respectively.

Caries experience, a combination of untreated or treated decay, was also high in both grade levels. Survey results show that 43.3% KG and 59.5% third grade students were determined to have some form of caries experience. The prevalence of caries experience in third grade far outpaces the HP 2030 target of 42.9%, while the prevalence among KG children is slightly above this threshold. The high prevalence of untreated decay and caries experience demonstrate a need for delivering preventive care to children earlier in childhood.

Results of the survey also highlight noticeable disparities in oral disease by income-level, race, and ethnicity. Regardless of grade, as the proportion of NSLP eligible students increases, so did the prevalence of untreated decay. In fact, while some variation was observed among KG children, lower-income schools (that is, $\geq 75\%$ NSLP) had nearly two times the prevalence of untreated decay compared to higher-income schools (that is, $< 25\%$ NSLP) (Table 8). Additionally, 57.1% of children in lower-income schools had some form of caries experience. This was the only group of schools to outpace the HP 2030 objective of 42.9%. These data suggest that while the statewide average caries experience among KG students (43.3%) does not cross the HP 2030 threshold, children in lower-income schools are disproportionately affected by oral disease. These associations were mirrored among third grade children. The prevalence of untreated decay in lower-income schools was 34.4%, which was 15% higher than what was observed in higher-income schools. Caries experience in low-income schools was profound, as 70.9% of all third-grade children had some form of caries experience, roughly 20% greater than caries experience detected in higher-income schools.

Regardless of the grade, students of color were disproportionately burdened by oral disease. In the KG population, the presence of untreated decay among non-Hispanic Black (34.7%) children, Asian (36.2%) children, and Hispanic (32.1%) children was nearly double that of non-Hispanic White (17.3%) children (Figure 1A). The burden of untreated decay among students of color in third grade was also significant, as the highest prevalence of untreated decay were observed among non-Hispanic Black (34.2%) children, Hispanic (30.4%) children, and Asian (26.5%) children (Figure 1C). Moreover, caries experience among Hispanic (70.8%) children were roughly 11% higher than the statewide average of 59.5% and was far greater than the prevalence detected among their non-Hispanic white counterparts (Figure 1D).

FIGURE 1A: KG - UNTREATED DECAY

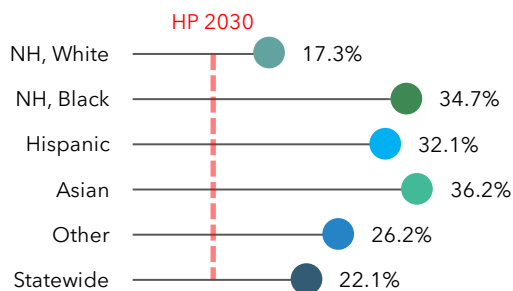


FIGURE 1B: KG - CARIES EXPERIENCE

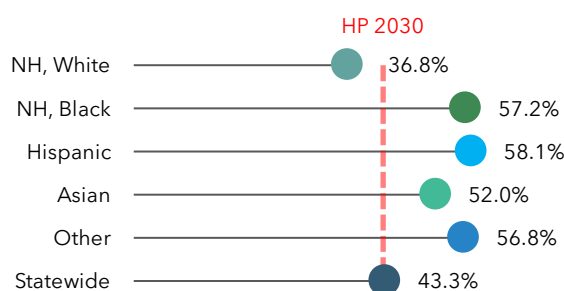


FIGURE 1C: THIRD GRADE - UNTREATED DECAY

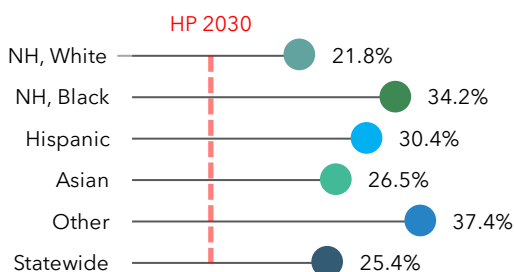
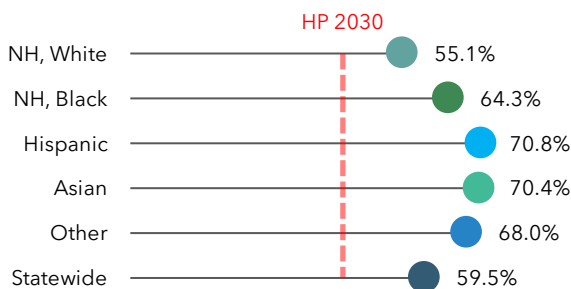


FIGURE 1D: THIRD GRADE - CARIES EXPERIENCE



Dental care needs

One in five KG children (21.6%) and roughly one in four third grade children (24.6%) were determined to have unmet dental needs, mirroring the prevalence of untreated decay. Overall, 2.0% of all KG and third grade students screened were identified as having urgent dental needs. As with oral disease, the presence of early and urgent dental needs was significantly higher among lower-income schools and students of color. Among KG children, lower-income schools had two times the prevalence of early or urgent dental needs when compared to higher-income schools (Figure 2C). This disparity was also reflected among third-grade children, as early or urgent dental needs was highest among lower-income schools (32.3%) (Figure 2D).

In both KG and third grade, early or urgent dental needs were considerably higher among students of color. In kindergarten, prevalence of dental care needs was highest among Asian (37.6%) children, non-Hispanic Black (34.7%) children, and Hispanic (30.0%) children (Figure 2A). These rates significantly outpaced the dental care needs among non-Hispanic white children (16.9%). Among third grade children, dental care needs were highest among non-Hispanic Black (32.2%) and Hispanic (29.2%) children, and those identifying as another race (34.3%) (Figure 2B).

FIGURE 2A: KG - DENTAL CARE NEEDS BY RACE AND ETHNICITY

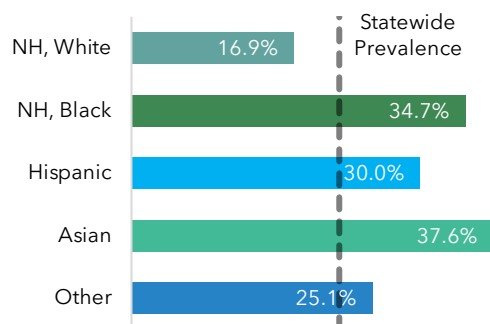


FIGURE 2B: THIRD GRADE - DENTAL CARE NEEDS BY RACE AND ETHNICITY

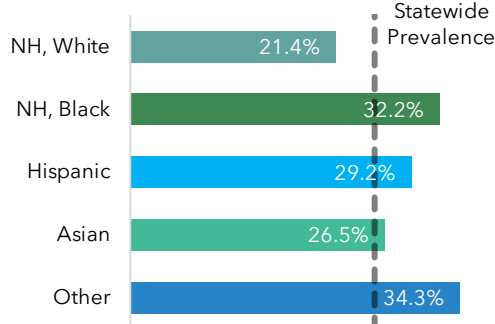


FIGURE 2C: KG - DENTAL CARE NEEDS BY NSLP STATUS

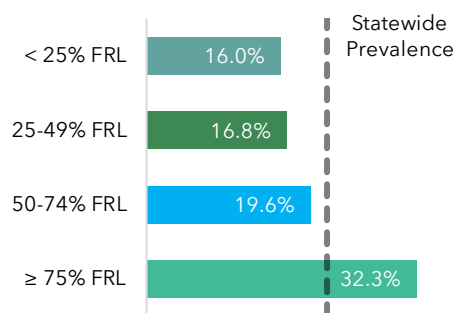
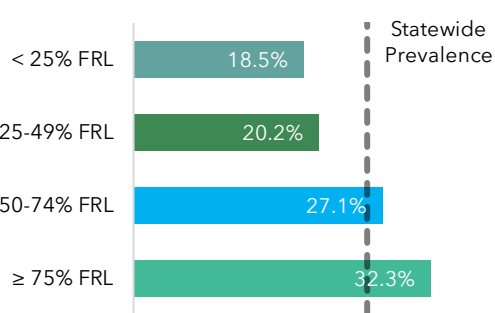


FIGURE 2D: THIRD GRADE - DENTAL CARE NEEDS BY NSLP STATUS



Sealant placement rates and sealant needs

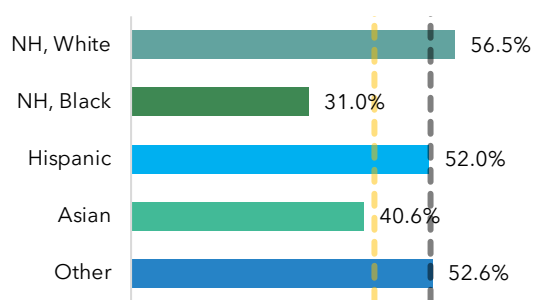
Dental sealants are an effective prevention measure against the development of tooth decay. As such, it is essential that children are delivered sealants early in childhood to reduce the

burden of oral disease. Wisconsin SAS has played a considerable role in expanding access to sealants, and this has been reflected in previous surveys, as sealant placement rates have increased over time. Sealant placement rates are still reasonably strong among third grade children: half (52.3%) of all third graders had a sealant on at least one of their permanent molars, which outpaces the HP 2030 target by approximately 10%.

Despite the strong sealant placement rates, 59.9% of children in third grade still have at least one permanent molar that could be sealed but was not. Sealant placement among KG children was much lower, at just 9.1%. This low sealant rate among KG children was expected, given most children don't develop their permanent first molars until 6-years-old. However, 38.5% of KG children were determined to have at least one permanent molar that could be sealed but was not. This highlights an unmet need for preventive dental services among KG children, as these data suggest that more than 14,000 KG children throughout Wisconsin require at least one sealant on a permanent molar. Additionally, addressing the sealant needs of these children could potentially lead to a reduction in prevalence of decay observed among the third-grade population.

There was no statistically significant difference detected in sealant placement rates or sealant needs across income-level. This finding is encouraging, as it suggests that children have access to sealants regardless of family income-level. This result held for both KG and third grade children. Additionally, sealant placement rates across all income-levels (third grade only) surpassed the HP 2030 target of 42.5% (Table 8). While data suggest children have access to sealants regardless of income-level, there were differences by race and ethnicity. Non-Hispanic Black children in third grade were significantly less likely to have a sealant despite having the greatest need for sealants (Figures 3A-B). These rates were well below the rate observed among non-Hispanic white (56.5%) children and the statewide average of 51.2% (Table 9). Furthermore, sealant placement rates among Asian and non-Hispanic Black children fall short of the HP 2030 target of 42.5%.

FIGURE 3A: THIRD GRADE SEALANT PLACEMENT RATES BY RACE AND ETHNICITY



*Yellow dashed line indicates Healthy People 2030 target. Black dashed line indicates the statewide prevalence of sealant placement.

FIGURE 2B: THIRD GRADE SEALANT NEEDS BY RACE AND ETHNICITY



*Black dashed line indicates the statewide prevalence of sealant needs.

Statewide trends with third grade children

There have been four previous survey cycles to include third grade students, which allows for comparisons over time. The first assessment of third grade students was carried out during the 2000–2001 school year and serves as baseline data for the purpose of monitoring trends. In our most recent analysis, caries experience among third grade children remained unchanged from the 2017–2018 survey cycle, as 59.5% of children have some form of caries (Figure 4B). There was a slight decrease in the prevalence of treated decay (46.9%) compared to the 2017–2018 survey (52.0%).

The prevalence of untreated decay, however, increased from 18.4% in 2017–2018 to 25.4% in 2022–2023 (Figure 4A). Additionally, dental treatment needs increased from 20.5% to 24.6% (Figure 4C). The estimates observed in the 2022–2023 survey mark the highest prevalence of decay and dental care needs since the 2000–2001 survey. Furthermore, while Wisconsin is above the HP 2030 sealant placement target, there was nearly an 18% decrease in sealant placement rates when compared to the 2017–2018 survey (Figure 4D).

The BSS methodology does not allow for direct causation to be determined, but the pandemic likely played some role, given the considerable shift in oral health status between the 2017–2018 and 2022–2023 survey periods. Access to dental care in Wisconsin is governed by insurance type and geography. Access that may have normally been available was restricted during the early-to-mid-pandemic period, as dental offices either closed or were limited to providing emergency services and schools moved to virtual learning. Barriers continued to persist even after dental offices began reopening and schools moved to in-person instruction. The shift to a virtual learning environment resulted in school-based sealant

FIGURE 4A: UNTREATED DECAY

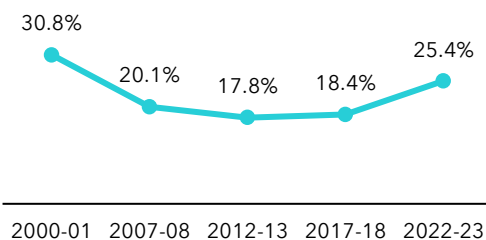


FIGURE 4B: CARIES EXPERIENCE

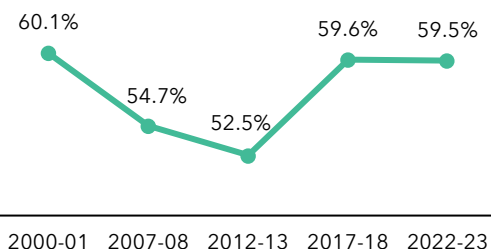


FIGURE 4C: DENTAL TREATMENT NEEDS

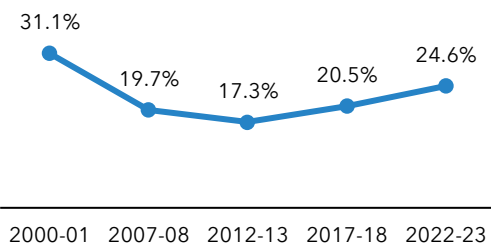
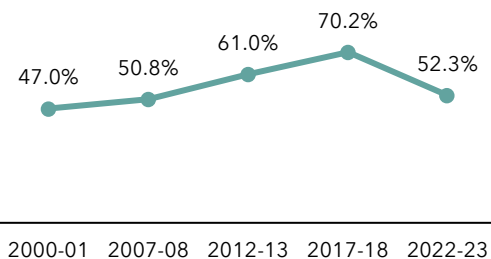


FIGURE 4D: SEALANT PLACEMENT



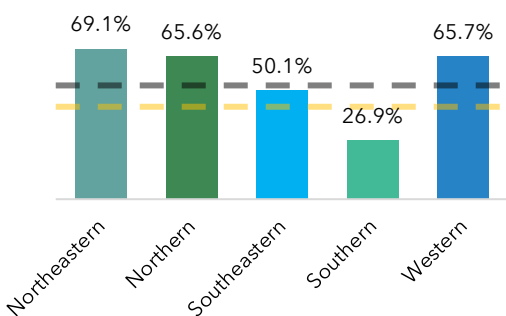
programs being unable to provide care, and programs continued to operate at a fraction of their normal capacity for more than a year. Data sourced from Wisconsin’s dental sealant registry, DentaSeal, demonstrates this sustained impact to programming. In the school year preceding the pandemic, Seal-A-Smile programs served more than 73,000 students; only 18,000 children were served during the 2020-2021 school year. Even after in-person instruction resumed, schools may have been hesitant to allow sealant programs back, both to avoid potential COVID-19 transmission and to prevent additional losses to instruction time. Once dental offices opened back up for regular service, many experienced staffing shortages, and additional safety precautions increased time between patients. These issues may have contributed to increased patient waitlists. As such, many children now in KG or third grade likely experienced disruptions in their routine dental care.

Oral health by region

Regional analyses revealed differences in the burden of oral disease and sealant placement rates. Among kindergarteners, the Northern and Southeastern regions had the highest prevalence of treated decay and caries experience (Table 10). The prevalence of caries experience in the Northern (51.1%) and Southeastern (48.8%) regions outpace the statewide average and the HP 2030 target of 42.9%. Regional level data among third grade students paint a similar picture, as the treated decay and overall caries experience were the only measures in which there were statistically significant differences across regions. Again, the Northern and Southeastern regions had the highest prevalence of both treated decay and overall caries experience (Table 10). However, all regions surpassed the HP 2030 caries experience targets, so improvements need to be prioritized statewide.

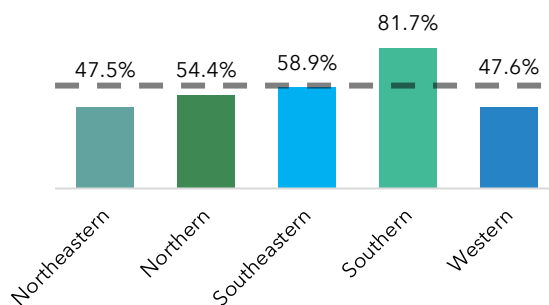
Overall, sealant placement rates remain strong across most regions. The Northeastern, Northern, and Western regions all had sealant placement rates above 65%, which approaches the statewide sealant placement rate observed during the 2017-2018 survey cycle. The only region to fall short of the HP 2030 target was the Southern region (Figure 5A). In fact, only 26.9% of third grade children in this area of the state had a sealant, despite 81.7% of children needing a sealant on at least one of their permanent molars (Figure 5B). From a geographic perspective, the unmet sealant needs in the Southern region could be a significant contributor to the 18% overall decline in sealant placement rates between survey cycles.

FIGURE 5A: THIRD GRADE SEALANT PLACEMENT RATES BY REGION



*Yellow dashed line indicates Healthy People 2030 target. Black dashed line indicates the statewide prevalence of sealant placement.

FIGURE 5B: THIRD GRADE SEALANT NEEDS BY REGION



*Black dashed line indicates the statewide prevalence of sealant needs.

Convenience sample focused on American Indian/Alaska Native students

In Wisconsin, there are 11 federally recognized Tribes, and American Indian and Alaska Natives make up roughly 1.2% of the total population. In the past, the random sample methodology has resulted in very few AIAN children participating in the survey. This lack of data has made it difficult to draw inferences about childhood oral health status among AIAN communities in Wisconsin. To address this gap, the OHP worked with the Great Lakes Inter-Tribal Epidemiology Center (GLITEC) on a supplemental convenience sample during the 2022-2023 school year.

The basis of the convenience sample included the following:

1. Any school located on Tribal lands.
2. Any public school with an enrollment of 15 or more third grade students that identify as AIAN.

Sixteen schools met these criteria, and all were contacted for participation. Of these sixteen schools, four agreed to participate. To ensure consistency of screenings, the BSS protocol was carried out by the same dental professionals and utilized the same equipment as screenings carried out at schools sampled through the random sample methodology. Due to the different sampling methodologies, the results of these screenings are presented separately.

Oral Health Status by Race and Ethnicity and Grade: Convenience Sample						
	% untreated decay	% treated decay	% caries experience	% Sealants	% sealants needed	% need for care
Kindergarten (n=107)						
Non-Hispanic, white	32.7	34.7	51.0	6.1	53.1	32.7
AIAN	44.4	53.3*	77.8*	11.1	40.0	42.2
Other	38.5	15.4	46.2	0.0	38.5	38.5
Third grade (n=113)						
Non-Hispanic, white	31.0	48.3	58.6	41.4	62.1	31.0
AIAN	48.7*	60.8	82.4*	44.6	68.9	48.7
Other	0.0	80.0	80.0	80.0	40.0	0.0

Table 2 Grade level specific oral health status stratified by race and ethnicity. Due to the limited sample size of the convenience sample, race and ethnicity was collapsed into three categories.

*Indicates a statistically significant difference between groups based on an alpha level of 0.05. Unadjusted chi-square tests were used to determine significance. Fisher's exact tests were incorporated into analysis as needed to account for small cell sizes.

Oral Health Status of AIAN Children in Wisconsin: Random Sample vs Convenience Sample

	% untreated decay	% treated decay	% caries experience	% sealants	% sealants needed	% need for care
Kindergarten						
Random Sample (n=37)	**	45.2 (31.1, 59.2)	57.8 (36.4, 79.3)	**	46.5 (36.4, 56.7)	**
Convenience Sample (n=45)	44.4	53.3	77.8	11.1	40.0	42.2
Third grade						
Random Sample (n=48)	**	66.1 (51.2, 80.8)	78.8 (58.3, 99.3)	43.7 (24.3, 63.1)	71.5 (51.3, 91.7)	**
Convenience Sample (n=74)	48.7	60.8	82.4	44.6	68.9	48.7

Table 3 Random sample data are included for comparison purposes.

**Data suppressed due to imprecise estimates.

Overall, the convenience and the random samples analyses yielded similar results, which strengthens the findings observed through the convenience sampling scheme (Table 3). Based on the random sample analyses, third grade screenings revealed that roughly three out of four AIAN children have some form of caries experience, and the convenience sample showed a slightly higher percentage. Less than half of children in both the random and convenience samples had at least one permanent molar sealed. These results among AIAN students are concerning: the prevalence of caries experience among AIAN children is more than 15% higher than the statewide average (59.5%), while sealant placement rates are roughly 10% lower than the statewide average (52.3%). These trends were also reflected in the KG data, as caries experience among AIAN children was roughly 15% higher than the statewide average of 43.3%. Dental sealants are an effective preventive measure against the development of dental caries. Based on the data herein, there is a clear need for sealant delivery, as a considerable proportion of children in both grades had at least one permanent molar that could be sealed (Table 3).

Convenience sample analyses highlight oral health disparities, as AIAN children were disproportionately impacted by oral disease when compared to non-Hispanic white children. In fact, when compared to non-Hispanic white children, the prevalence of caries experience was roughly 18% and 23% higher among AIAN children in KG and third grade, respectively. Furthermore, the prevalence of untreated decay and early or urgent dental needs among AIAN in third grade was more than 18% higher than non-Hispanic white children. However, due to data limitations, the prevalence of untreated decay and the need for dental care among AIAN children could not be replicated using random sample analyses. Therefore, the untreated decay and need for dental care estimates should be interpreted with a degree of caution given that the convenience sample methodology impacts the generalizability of the

survey results, so these estimates may not be reflective of KG or third grade AIAN students in Wisconsin.

Limitations

The basic screening survey offers valuable insights into oral health status, but there are several limitations that should be considered. To begin, BSS oral health screenings are not a clinical assessment and do not incorporate the use of dental explorers, magnification, or radiographs. Therefore, the prevalence of untreated decay detected through survey methods is likely an underestimation of disease. Additionally, while the goal of the screener calibration session is to ensure consistency in the implementation of the BSS protocol, it is possible, and expected, that some variation between screeners exists. Furthermore, the survey follows a cross-sectional study design, which only captures information at a single point in time, and as such, cannot be used to determine causation.

While the sampling methodology is designed to be representative of the entire population, there was a slightly higher percentage of non-Hispanic white children that participated in the survey compared to statewide demographics. The average percentage of students eligible for free and reduced lunch was also slightly higher among participating schools than the statewide average (Table 4). These differences may have been due to the moderate level of school participation (62 of the intended 90 samples intervals), or the use of active consent methods in two large school districts, which resulted in significantly lower student level participation rates, or both. Both the moderate school-level participation and the use of active consent impacted the sample size of the survey.

Discussion

Great strides need to be made in Wisconsin to ensure the oral health needs of children throughout the state are met. Currently, the prevalence of untreated decay and caries experience is high compared to the objectives set by Healthy People 2030. Additionally, a significant proportion of children were found to require early or urgent dental care. These patterns are present regardless of grade, which suggest that Wisconsin's oral health care system must prioritize delivering preventive services earlier in childhood. Further expanding access to dental sealants is a logical step for addressing the high prevalence of untreated decay. However, despite sealant placement rates among third grade children remaining strong, and access to sealants being consistent across income-level, there is still a significant need for improvement in sealant placement rates. Data herein suggest an estimated 14,000 KG and 21,000 third grade children have at least one permanent molar that could be sealed.

Overall, the oral health status among third grade children has regressed over the past five years. More specifically, the prevalence of untreated decay and early or urgent dental needs are the highest observed since the 2000–2001 survey cycle. Many areas of Wisconsin are designated as dental health professional shortage areas, a considerable number of which encompass entire counties. Additionally, there is low provider enrollment in the Medicaid/BadgerCare+ (MC/BC+) program, which results in a lack of access to routine dental

care for MC/BC+ recipients. To contextualize the degree of this impact, there were approximately 1.3 million Wisconsinites enrolled in the MC/BC+ program and approximately 7 out of 10 recipients did not receive dental care in 2022. The pandemic further exacerbated these conditions through dental office shutdowns, workforce shortages, and limiting services provided by school-based sealant programs. As such, the dental health care delivery system was severely impacted during the early-to-mid pandemic, which fostered an environment where access to dental care was more restrictive than in prior years. These results demonstrate the need for a dental health care delivery system that is better prepared for future public health emergencies, so that the impact to care is minimized.

Disparities in oral health status remain an issue throughout Wisconsin. There were noticeable differences in oral disease and unmet dental needs observed across income-level, race, and ethnicity. The prevalence of untreated decay and unmet dental needs was roughly two times higher among children in lower-income schools when compared to higher-income schools. Moreover, the burden of oral disease and unmet dental care needs disproportionately impacted students of color. Furthermore, both the random sample and convenience sample indicate a significant burden of caries experience among AIAN children. To address these gaps, dental professionals and public health programs alike must center the principal of health equity at the core of their work.

The results of these assessments present an opportunity to reflect on the current landscape of childhood oral health and serve as a basis for informing policy makers and public health initiatives going forward. At minimum, equitable access to dental care must be a core principle of the dental health care delivery system. This includes increasing the diversity of Wisconsin's oral health workforce; educating providers and parents on the importance of a dental visit within the first year of life, and at least annually thereafter; improving MC/BC+ provider enrollment; increasing the number of providers practicing in rural and health professional shortage areas; prioritizing medical-dental integration; and encouraging communities to continue the practice of CWF. These data provide a glimpse into the ramifications of a lack of access to dental care as the pandemic period saw a gradual regression of childhood oral health status among third grade children. It is likely the pandemic's impact on private practices and school-based sealant programs played a major role in the trends observed during this survey cycle. Considering school-based sealant programs serve many families that are uninsured or underinsured, these may be the only routine dental care opportunities a child receives on a yearly basis. Furthermore, the survey demonstrates a need for delivering care earlier in childhood as a considerable proportion of KG children had untreated decay and required at least one sealant. Wisconsin's dental health care delivery system must prioritize equitable and flexible care to ensure that all children have the opportunity for good oral health.

References

1. Division of Oral Health, National Center for Chronic Disease Prevention and Health Promotion. (2022, April 6). *Children's Oral Health*. <https://www.cdc.gov/oralhealth/basics/childrens-oral-health/index.html>
2. Centers for Disease Control and Prevention. (2019). Oral Health Surveillance Report: Trends in Dental Caries and Sealants, Tooth Retention, and Edentulism, United States, 1999–2004 to 2011–2016. Atlanta, GA: Centers for Disease Control and Prevention, US Dept of Health and Human Services. <https://www.cdc.gov/oralhealth/publications/OHSR-2019-dental-sealants.html>
3. Jackson, S. L., Vann, W. F., Jr, Kotch, J. B., Pahel, B. T., & Lee, J. Y. (2011). Impact of poor oral health on children's school attendance and performance. *American journal of public health*, 101(10), 1900–1906. <https://doi.org/10.2105/AJPH.2010.200915>
4. Division of Oral Health, National Center for Chronic Disease Prevention and Health Promotion. (2021, January 25). *Oral Health Fast Facts*. <https://www.cdc.gov/oralhealth/fast-facts/index.html>
5. Shillpa, N., & Uma, K. (2018). School Hours Lost Due to Acute/Unplanned Dental Care. *Health Behavior and Policy Review*, 5(2), 66-73(8). <https://doi.org/10.14485/HBPR.5.2.7>
6. Rebelo, M.A.B., Vieira, J.M.R., Pereira, J.V., Quandros, L.N., Vettore, M.V. (2018). Does oral health influence school performance and school attendance? A systematic review and meta-analysis. *International Journal of Paediatric Dentistry*, 29(2), 138-148. <https://doi.org/10.1111/ipd.12441>
7. Division of Oral Health, National Center for Chronic Disease Prevention and Health Promotion. (2023, June 12). *The High Cost of Oral Disease*. <https://www.cdc.gov/oralhealth/publications/features/the-high-cost-of-oral-dis.html>
8. Division of Oral Health, National Center for Chronic Disease Prevention and Health Promotion. (2023, September 20). *Oral Health Conditions*. <https://www.cdc.gov/oralhealth/conditions/index.html>
9. Division of Oral Health, National Center for Chronic Disease Prevention and Health Promotion. (2021, February 5). *Disparities in Oral Health*. https://www.cdc.gov/oralhealth/oral_health_disparities/index.htm
10. Division of Oral Health, National Center for Chronic Disease Prevention and Health Promotion. (2021, March 29). *Dental Sealants*. <https://www.cdc.gov/oralhealth/fast-facts/dental-sealants/index.html>
11. Community Preventive Services Task Force. (2016). *Preventing Dental Caries: School-based Dental Sealant Delivery Programs*. Atlanta, GA: US Department of Health and Human Services, Community Preventive Services Task Force.

https://www.thecommunityguide.org/sites/default/files/assets/Oral-Health-Caries-School-based-Sealants_0.pdf

12. Morbidity and Mortality Weekly Report. (1999, October 21). *Achievements in Public Health, 1900-1999: Fluoridation of Drinking Water to Prevent Dental Caries*. <https://www.cdc.gov/mmwr/preview/mmwrhtml/mm4841a1.htm>
13. Griffen, S.O., Regnier, E., Huntley, V. (2007). Effectiveness of Fluoride in Preventing Caries in Adults. *Journal of Dental Research*, 86(5), 410-415. <https://doi.org/10.1177/154405910708600>
14. O'Connell, J., Rockell, J., Ouellet, J., Tomar, S. L., & Maas, W. (2016). Costs And Savings Associated With Community Water Fluoridation In The United States. *Health affairs* (Project Hope), 35(12), 2224-2232. <https://doi.org/10.1377/hlthaff.2016.0881>
15. DNR SDWA. (2022). *Drinking Water System Portal*. [Public Drinking Water System Data]. Wisconsin Department of Natural Resources. <https://apps.dnr.wi.gov/dwsportalpub>
16. Association of State and Territorial Dental Directors. (2022). Basic Screening Survey: An Approach to Monitoring Community Oral Health. <https://www.astdd.org/basic-screening-survey-tool/#children>

Appendix A

Sample Demographics by Grade		
	Kindergarten	Third grade
Total number of students	2,682	2,754
Age (in years) n(%)		
4	16 (0.60)	--
5	984 (36.81)	--
6	1,655 (61.92)	--
7	17 (0.64)	5 (0.18)
8	1 (0.04)	1,013 (36.84)
9	--	1,693 (61.56)
10	--	38 (1.38)
11	--	1 (0.04)
Unknown	9	4
Sex n(%)		
Female	1,352 (50.41)	1,317 (47.82)
Male	1,330 (49.59)	1,437 (52.18)
Race and ethnicity n(%)		
non-Hispanic, White	1,956 (72.93)	1,987 (72.15)
non-Hispanic, Black	220 (8.20)	172 (6.25)
Hispanic or Latino/a/x	265 (9.88)	322 (11.69)
Asian	66 (2.46)	71 (2.58)
American Indian/Alaska Native	37 (1.38)	48 (1.74)
Native Hawaiian or Pacific Islander	3 (0.11)	2 (0.07)
People identifying as other or multiple races and/or ethnicities	77 (2.87)	93 (3.38)
Unknown	58 (2.16)	59 (2.14)

Table 4 Demographic characteristics of the statewide random sample. Due to a transcribing error, the race and ethnicity and age could not be determined for some records. When applicable, these records were excluded from multivariate analyses.

Kindergarten Demographics Statewide vs Sample									
	Number of kindergarten children	Total NSLP (%)	Non-Hispanic, White (%)	Non-Hispanic, Black (%)	Hispanic (%)	Asian (%)	AI/AN (%)	NH/PSI (%)	Other (%)
Kindergarten									
Statewide	53,767	48.8	65.7	9.3	13.7	4.2	1.0	0.1	6.1
Original sample	6,009	48.0	69.8	6.7	11.0	5.2	1.2	0.1	5.9
Participating schools	3,440	51.8	70.2	7.2	12.4	3.1	1.0	0.1	6.1
Participating children*	2,682	--	72.9	8.2	9.9	2.5	1.4	0.1	2.9
Third grade									
Statewide	55,767	--	66.3	8.6	13.6	4.7	1.0	0.1	5.8
Original sample	6,118	--	70.6	6.1	11.1	5.3	1.0	0.1	5.9
Participating schools	3,594	--	70.9	5.9	12.8	3.4	1.1	0.1	5.9
Participating children*	2,754	--	72.2	6.3	11.7	2.6	1.7	0.1	3.4

Table 5 Statewide demographics vs sample demographics. The random sample included a slightly higher proportion of non-Hispanic white children when compared to the statewide sample. An oversampling strategy was used for the Northern region due to its sample size, which could have resulted in this discrepancy. Additionally, the total percentage of student eligible for the National School Lunch Program was slightly higher among participating schools.

Oral Health Status by Grade			
Oral health measure	Kindergarten % (95% CI) n=2,682	Third grade % (95% CI) n=2,754	p-value
Untreated decay*	22.1 (18.5, 25.8)	25.4 (21.4, 29.4)	0.0335
Untreated category			0.0510
0 teeth with untreated decay	77.9 (74.2, 81.5)	74.6 (70.6, 78.6)	
1 tooth with untreated decay	7.0 (5.3, 8.8)	9.8 (7.9, 11.8)	
2 or more teeth with untreated decay	15.1 (11.9, 18.4)	15.5 (12.5, 18.6)	
Treated Decay*	28.0 (25.0, 31.0)	46.9 (43.4, 50.4)	<0.0001
Treated Category*			<0.0001
0 teeth with treated decay	72.0 (69.0, 75.0)	53.1 (49.6, 56.6)	
1 or 2 teeth with treated decay	10.9 (9.3, 12.6)	18.7 (16.3, 21.0)	
3 or 4 teeth with treated decay	5.4 (3.9, 6.8)	12.4 (10.5, 14.4)	
5 or more teeth with treated decay	11.7 (9.8, 13.6)	15.8 (13.7, 18.0)	
Caries experience*	43.3 (39.3, 47.4)	59.5 (55.5, 63.5)	<0.0001
Sealants present*	9.1 (7.3, 11.0)	52.3 (48.4, 56.1)	<0.0001
Sealants needed*	38.5 (34.8, 42.2)	59.9 (55.5, 64.3)	<0.0001
Urgency of care			0.0829
No obvious problems	78.4 (74.7, 82.1)	75.4 (71.5, 79.4)	
Early dental care needed	19.7 (16.3, 23.1)	22.6 (18.9, 26.3)	
Urgent dental care needed	2.0 (1.3, 2.6)	2.0 (1.3, 2.7)	
Dental care needed	21.6 (17.9, 25.3)	24.6 (20.6, 28.5)	0.0696

Table 6 Grade specific oral health status. All analyses were adjusted for complex sampling design and clustering effects.

*Indicates a statistically significant difference at an alpha-level of 0.05.

Oral Health Status by Sex and Grade			
Oral health measure	Female % (95% CI)	Male % (95% CI)	p-value
	KG n=1,352, 3rd n=1,317	KG n=1,330, 3rd n=1,437	
Kindergarten			
Untreated decay	24.4 (19.8 ,28.9)	19.8 (15.8, 23.9)	0.0513
Treated decay	26.6 (22.8 ,30.4)	29.5 (25.2, 33.8)	0.2753
Caries experience	44.3 (39.6 ,48.9)	42.4 (37.5, 47.2)	0.4521
Sealants present	10.1 (7.9 ,12.4)	8.1 (5.7, 10.5)	0.1576
Sealants needed*	41.5 (36.3 ,46.7)	35.4 (31.3, 39.4)	0.0318
Dental care needed	23.5 (18.9 ,28.1)	19.7 (15.6, 23.7)	0.0859
Third grade			
Untreated decay*	23.1 (19.4 ,26.9)	27.4 (22.3, 32.6)	0.0440
Treated decay	46.5 (42.7 ,50.2)	47.3 (42.9, 51.8)	0.6949
Caries experience*	57.4 (53.2 ,61.5)	61.4 (56.8, 66.1)	0.0389
Sealants present	53.4 (49.0 ,57.9)	51.2 (46.6, 55.9)	0.3661
Sealants needed	58.8 (54.0 ,63.6)	60.9 (56.1, 65.8)	0.2802
Dental care needed	22.4 (18.8, 25.9)	26.5 (21.3, 31.8)	0.0559

Table 7 Grade specific oral health status stratified by sex. All analyses were adjusted for complex sampling design and clustering effects.

*Indicates a statistically significant difference at an alpha-level of 0.05.

Oral Health Status by NSLP Status and Grade					
Oral health measure	< 25% NSLP Eligible % (95% CI)	25-49% NSLP Eligible % (95% CI)	50-74% NSLP Eligible % (95% CI)	≥ 75% NSLP Eligible % (95% CI)	p-value
	KG n=473, 3rd n=624	KG n=1,007, 3rd n=916	KG n=557, 3rd n=633	KG n=645, 3rd n=581	
Kindergarten					
Untreated decay*	17.2 (11.6, 22.9)	17.0 (13.6, 20.5)	19.9 (13.9, 26.0)	33.1 (24.9, 41.2)	<0.0001
Treated decay*	28.5 (21.6, 35.4)	23.5 (18.5, 28.4)	30.1 (25.1, 35.2)	32.8 (26.6, 39.1)	0.0358
Caries experience*	40.0 (34.8, 45.2)	35.8 (30.4, 41.3)	41.1 (34.8, 47.4)	57.1 (49.8, 64.3)	<0.0001
Sealants present	7.0 (4.7, 9.3)	8.9 (6.2, 11.6)	10.5 (6.3, 14.7)	9.5 (5.0, 13.9)	0.7225
Sealants needed	38.3 (29.3, 47.4)	39.5 (34.3, 44.7)	34.1 (23.7, 44.6)	40.3 (33.5, 47.1)	0.6934
Dental care needed*	16.0 (10.3, 21.7)	16.8 (13.1, 20.4)	19.6 (13.6, 25.6)	32.3 (23.8, 40.9)	0.0001
Third grade					
Untreated decay*	18.5 (12.0, 24.9)	20.9 (14.7, 27.0)	27.3 (21.2, 33.3)	34.4 (26.5, 42.3)	0.0018
Treated decay	38.9 (32.7, 45.0)	44.8 (38.7, 50.9)	48.7 (38.8, 58.6)	53.0 (48.0, 57.9)	0.0655
Caries experience*	49.0 (41.9, 56.0)	54.5 (48.2, 60.7)	61.8 (52.7, 71.0)	70.9 (65.9, 75.8)	<0.0001
Sealants present	52.5 (38.6, 66.5)	52.1 (44.0, 60.2)	62.0 (50.1, 73.9)	44.6 (36.0, 53.3)	0.1943
Sealants needed	59.0 (44.1, 73.9)	60.9 (53.6, 68.3)	50.6 (36.2, 65.0)	66.4 (59.1, 73.7)	0.2585
Dental care needed*	18.5 (11.9, 25.1)	20.2 (13.9, 26.4)	27.1 (21.0, 33.2)	32.3 (24.3, 40.4)	0.0094

Table 8 Grade specific oral health status stratified by school-level NSLP eligibility. Categories of NSLP status were determined by taking the number of students in the school eligible for free and reduced lunch and dividing it by the total number of children enrolled at the school.

*Indicates a statically significant difference between groups at an alpha-level of 0.05.

Oral Health Status by Race and Ethnicity and Grade						
Oral health measure	non-Hispanic, White % (95% CI) KG n=1,956, 3rd n=1,987	non-Hispanic, Black % (95% CI) KG n=220, 3rd n=172	Hispanic % (95% CI) KG n=265, 3rd n=322	Asian % (95% CI) KG n=66, 3rd n=71	Other % (95% CI) KG n=117, 3rd n=143	p-value
Kindergarten						
Untreated decay*	17.3 (14.3, 20.4)	34.7 (22.9, 46.5)	32.1 (23.7, 40.4)	36.2 (20.8, 51.5)	26.2 (15.4, 36.9)	<0.0001
Treated decay*	25.6 (22.5, 28.7)	29.4 (20.3, 38.5)	37.0 (26.5, 47.4)	**	38.6 (26.8, 50.4)	0.0327
Caries experience*	36.8 (33.5, 40.1)	57.2 (47.5, 66.9)	58.1 (48.1, 68.1)	52.0 (34.0, 70.1)	56.8 (44.7, 69.0)	<0.0001
Sealants present*	7.7 (6.0, 9.5)	11.9 (7.1, 16.7)	**	**	19.1 (8.1, 30.1)	0.0274
Sealants needed*	36.9 (32.3, 41.4)	49.0 (39.8, 58.2)	41.0 (34.2, 47.8)	**	47.8 (38.7, 57.0)	0.0063
Dental care needed*	16.9 (13.7, 20.1)	34.7 (22.9, 46.5)	30.0 (21.7, 38.3)	37.6 (22.4, 52.8)	25.1 (14.7, 35.4)	<0.0001
Third grade						
Untreated decay*	21.8 (17.8, 25.8)	34.2 (23.6, 44.8)	30.4 (21.3, 39.6)	26.5 (12.1, 40.8)	37.4 (25.3, 49.5)	0.0045
Treated decay*	44.6 (40.6, 48.7)	42.1 (34.2, 49.9)	55.3 (48.2, 62.4)	59.1 (41.5, 76.7)	49.0 (39.8, 58.2)	0.0221
Caries experience*	55.1 (50.7, 59.4)	64.3 (53.6, 74.9)	70.8 (65.1, 76.5)	70.4 (54.1, 86.6)	68.0 (56.2, 79.8)	0.0005
Sealants present*	56.5 (52.5, 60.5)	31.0 (19.7, 42.3)	52.0 (42.7, 61.3)	40.6 (24.5, 56.8)	52.6 (41.4, 63.9)	<0.0001
Sealants needed*	56.8 (51.9, 61.7)	77.1 (68.6, 85.7)	59.6 (50.9, 68.4)	67.8 (55.7, 79.9)	60.9 (48.9, 72.8)	0.0003
Dental care needed*	21.4 (17.4, 25.4)	32.2 (21.1, 43.3)	29.2 (19.9, 38.5)	26.5 (12.1, 40.8)	34.3 (22.0, 46.6)	0.0289

Table 9 Grade specific oral health status stratified by race and ethnicity. For the purposes of producing accurate estimates, some categories had to be combined. Other includes children that identify as American Indian/ Alaska Native, Native Hawaiian or other Pacific Islander, multiple races, or another race.

*Indicates a statistically significant difference between groups at an alpha-level of 0.05.

**Data suppressed due to imprecise estimates.

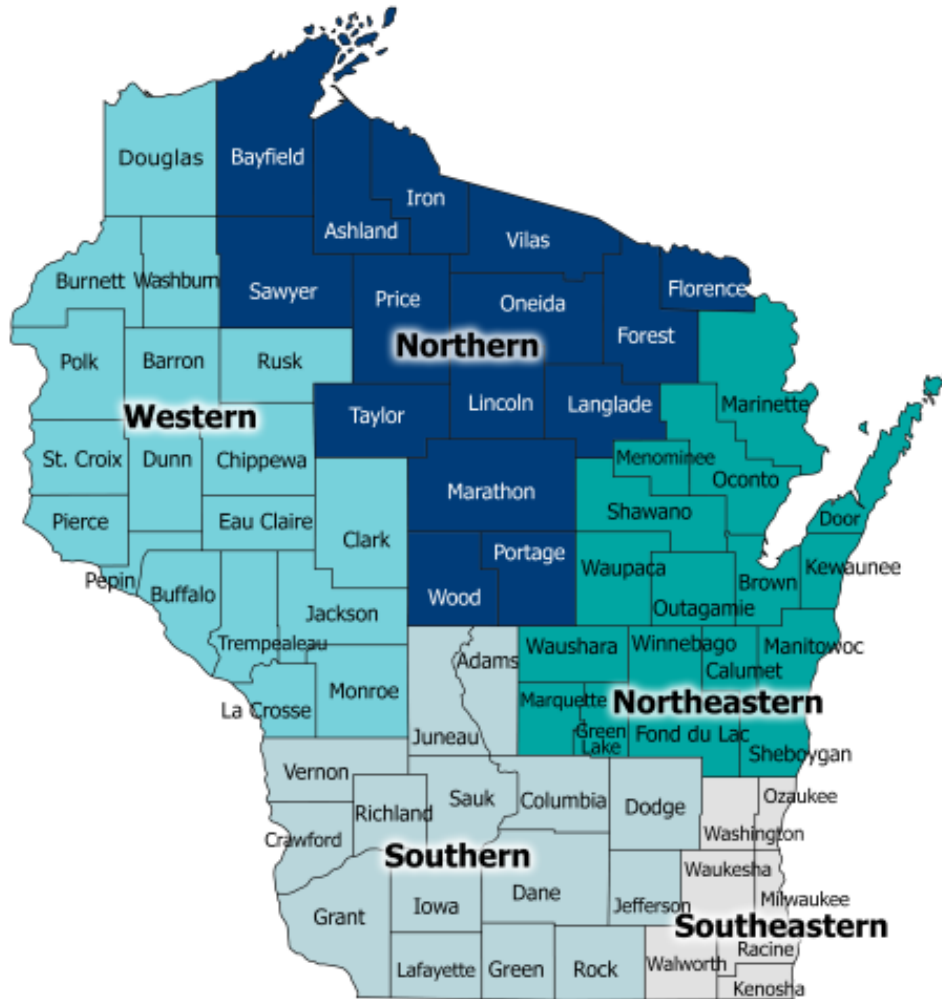
Oral Health Status by Public Health Region and Grade						
Oral health measure	Northeastern % (95% CI)	Northern % (95% CI)	Southeastern % (95% CI)	Southern % (95% CI)	Western % (95% CI)	p-value
	KG n=485, 3rd n=474	KG n=514, 3rd n=498	KG n=746, 3rd n=749	KG n=630, 3rd n=725	KG n=307, 3rd n=308	
Kindergarten						
Untreated decay	20.2 (9.7, 30.6)	29.0 (22.0, 36.0)	24.5 (17.8, 31.1)	18.9 (14.9, 22.9)	19.3 (13.3, 25.2)	0.3601
Treated decay*	26.4 (19.4, 33.5)	35.0 (28.2, 41.9)	31.8 (26.3, 37.4)	20.8 (16.1, 25.6)	27.5 (19.1, 35.9)	0.0180
Caries experience*	38.9 (28.7, 49.1)	51.1 (43.3, 58.9)	48.8 (41.2, 56.4)	37.9 (30.8, 45.0)	39.5 (33.6, 45.5)	0.0463
Sealants present*	10.3 (6.0, 14.6)	**	8.8 (5.3, 12.4)	6.1 (3.9, 8.3)	15.7 (9.7, 21.8)	0.0231
Sealants needed	30.9 (20.2, 41.6)	41.2 (34.7, 47.7)	41.8 (36.6, 46.9)	40.6 (33.4, 47.9)	37.4 (29.4, 45.4)	0.1740
Dental care needed	19.9 (9.4, 30.4)	27.6 (20.3, 34.9)	24.2 (17.2, 31.1)	18.0 (13.9, 22.2)	19.0 (13.2, 24.9)	0.4132
Third grade						
Untreated decay	22.3 (12.7, 31.9)	30.3 (24.0, 36.6)	24.8 (17.7, 31.9)	25.5 (17.3, 33.7)	28.1 (19.4, 36.7)	0.7803
Treated decay*	43.2 (35.0, 51.3)	58.8 (50.2, 67.3)	52.8 (46.8, 58.7)	35.3 (27.8, 42.8)	48.3 (42.1, 54.6)	<0.0001
Caries experience*	54.7 (44.9, 64.5)	69.5 (62.6, 76.4)	65.0 (58.5, 71.5)	50.6 (41.4, 59.8)	60.4 (52.9, 68.0)	0.0054
Sealants present*	69.1 (64.0, 74.2)	65.6 (56.9, 74.4)	50.1 (42.6, 57.5)	26.9 (17.9, 35.9)	65.7 (57.8, 73.7)	<0.0001
Sealants needed*	47.5 (37.1, 57.9)	54.4 (43.1, 65.8)	58.9 (51.9, 65.9)	81.7 (71.9, 91.5)	47.6 (39.5, 55.8)	<0.0001
Dental care needed	21.2 (12.0, 30.5)	30.2 (23.9, 36.4)	24.3 (17.1, 31.6)	23.6 (15.6, 31.6)	27.8 (19.5, 36.2)	0.6750

Table 10 Grade specific oral health status stratified by public health region.

*Indicates a statistically significant difference between groups at an alpha-level of 0.05.

**Data suppressed due to imprecise estimates.

Appendix B



Learn more about the DHS regions by reviewing [the online map](#).