

WISCONSIN DEPARTMENT OF HEALTH SERVICES



Wisconsin Healthy Smiles Survey The Oral Health of Wisconsin's Older Adults



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The Wisconsin Healthy Smiles Survey collected data during calendar year 2016 on the oral health status of adults aged 65 and older in Wisconsin nursing homes. The Healthy Smiles Survey included a representative sample of nursing homes throughout Wisconsin with at least 30 beds. Complete data for 1,197 participants from 27 nursing homes are included in this report. The data were weighted for survey design and non-response.

The findings indicate that older adults in Wisconsin experience a significant burden of oral disease. When left untreated, these conditions can cause pain and infection and affect quality of life. The overall key findings are listed below. However, disparities in oral health status exist among nursing home residents. Residents with dementia are more likely to have untreated decay, need dental treatment, and have poor periodontal health. In addition, non-Hispanic White nursing home residents are more likely to have poor periodontal health, while non-Hispanic Black nursing home residents are more likely to be missing all of their teeth and have no functional occlusal contacts. In general, long-term care residents were more likely to have poor oral health compared to rehabilitation residents and were significantly more likely to have gingival inflammation and no functional occlusal contacts.

Key findings are:

- One out of three nursing home residents had no natural teeth.
- One out of three nursing home residents had no functional occlusal contacts.
- Forty-six percent of nursing home residents had untreated decay.
- One out of two nursing home residents with natural teeth had treatment needs.
- One out of three nursing home residents had at least one untreated root fragment.
- Twenty-seven percent of nursing home residents had substantial oral debris.
- Two out of five nursing home residents needed periodontal care.

The burden of oral disease among adults aged 65 and older is significant. Efforts to address the needs of this growing population will require system-level changes to improve access to oral health services and a multipronged approach, with changes implemented by the state and federal government, nursing homes, and dental providers.



Oral health is recognized as an essential component of general health and a fundamental aspect of well-being for all Americans (U.S. Department of Health and Human Services, 2000). However, many Americans continue to experience needless pain and suffering due to oral disease, resulting in reduced quality of life. Vulnerable populations, such as older adults aged 65 and older, experience an increased burden of oral disease. Untreated decay and periodontal disease can lead to pain, swelling, abscesses, and infection, as well as tooth loss. Poor oral health can affect self-esteem, physical appearance, and basic daily activities such as sleeping, eating, and talking. Poor oral health complicates the treatment of diabetes and has also been linked with heart disease, bacterial pneumonia, and stroke (U.S. Department of Health and Human Services, 2000).

Older adults face many barriers to accessing dental care. Private dental insurance benefits are often lost at retirement, and there is essentially no dental coverage through Medicare. This results in high out-of-pocket costs for older adults, who are more likely to be on a fixed income. Approximately 35 percent of adults aged 65 and older in Wisconsin live below 200 percent of the federal poverty level according to the Kaiser Family Foundation supplemental poverty measure (Cubanski et al., 2018). In addition, older adults are more likely to face transportation issues in accessing dental care and are also more likely to have mobility issues, such as being bedridden, or needing to use a wheelchair, cane, or walker.

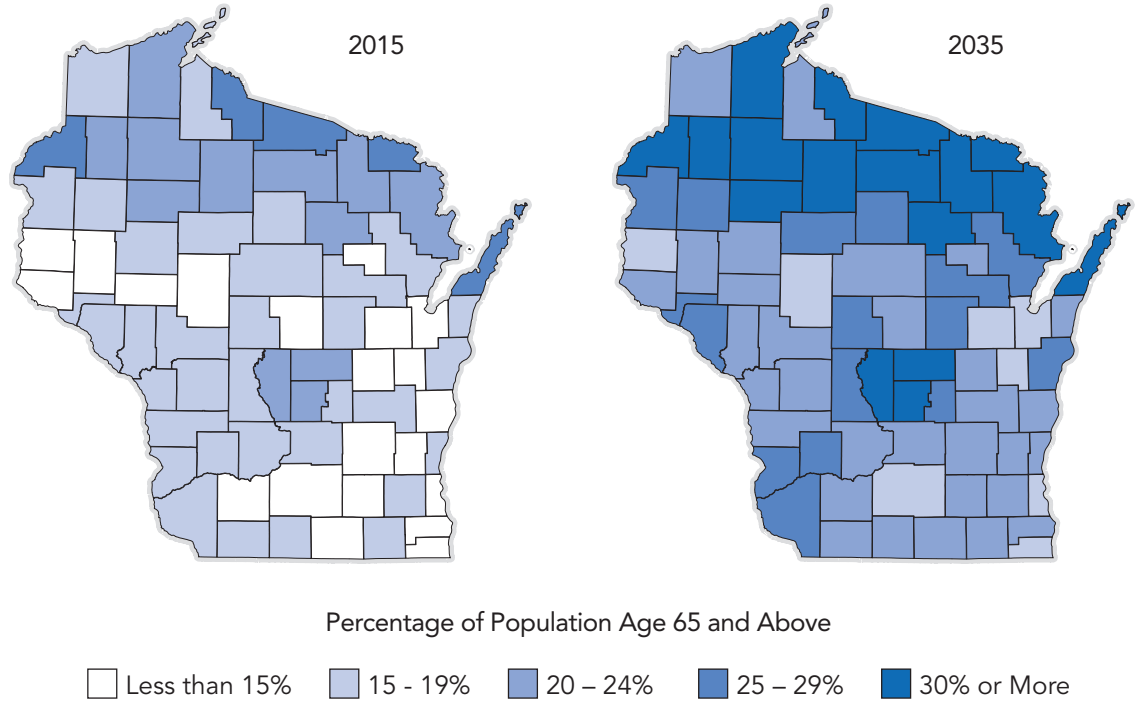
Furthermore, some older adults grew up without the protective benefits of community water fluoridation, other fluoride products, and dental sealants.

The population aged 65 and older in Wisconsin and throughout the U.S. has been increasing with the aging of the baby boomers. In 2010, there were 777,500 adults aged 65 and older in Wisconsin (13.7% of the total population) and 40,229,000 in the U.S. (13.0% of the total population) (U.S. Department of Commerce, 2010). By 2040, the older adult population in Wisconsin is expected to double in size to 1,535,500, with similar changes expected nationally (to 81,238,000) (Wisconsin Department of Administration, 2013).

While many older adults continue to live independently at home, it is estimated that of adults reaching age 65, nearly 70 percent will need some form of long-term care in their lifetime. This includes nursing homes, assisted living facilities, adult day care, and home care (U.S. Department of Health and Human Services, 2014). In Wisconsin, there are nearly 400 nursing homes throughout the state, ranging in size from six beds to 240 beds. Nursing home facilities in Wisconsin are required by federal regulation (42 CFR 483.55) and state regulation (Wis. Admin. Code § DHS 132.67) to assist residents in obtaining routine and 24-hour emergency dental care. A facility can either have a dentist on staff or contract with a dentist to provide dental services. Nursing homes are also required to assist residents with activities of daily living, including oral hygiene, when residents are unable to perform these activities independently. Wisconsin regulations include the requirement that all nursing homes have an advisory dentist and that all new residents receive a dental exam within six months of admission.



Figure 1: Projected Increase in Older Adult Population in Wisconsin, by County, 2015 to 2035



Source: County Population Projections Through 2035 Population Age 65+, Division of Public Health, Wisconsin Department of Health Services



METHODS



The *Healthy Smiles Survey* conducted in 2016 included a representative sample of nursing homes throughout Wisconsin. The sampling frame for the survey consisted of all nursing homes in Wisconsin with at least 30 beds. Each nursing home was identified as urban, suburban, or rural based on the county of location and the National Center for Health Statistics' urban-rural classification. The sampling frame was stratified by urban status and each stratum was ordered by bed size. Probability proportional to size sampling was used to randomly select nursing homes within each stratum. Each nursing home had one back-up site, which was the next nursing home on the list within the same strata and of similar size.

Dental hygienists completed the screenings using flashlights, and disposable mouth mirrors. Screeners used the diagnostic criteria and infection control procedures outlined in the Association of State and Territorial Dental Directors 2010 publication *Basic Screening Surveys: An Approach to Monitoring Community Oral Health, Older Adults*. Screeners attended a required webinar training session, which included a review of the diagnostic criteria. In addition, all screeners were required to attend a hands-on calibration session at the first nursing home participating in the survey.

The Basic Screening Survey (BSS) protocol for older adults includes seven recommended indicators and five optional indicators. The Wisconsin Oral Health Program chose to include all 12 indicators in the *Healthy Smiles Survey*. Some modifications were made based on findings from the 2012 older adult survey in order to improve the quality of data collected. Table 1 lists all indicators and definitions.

Table 1: Older Adult Basic Screening Survey Indicators and Definitions

	Indicator	Definition
1	Dentures and denture use	Participants were asked "Do you have a removable upper denture?" and if yes, "Do you usually wear your denture when you eat?" The same questions and data were collected for lower dentures.
2	Number of natural teeth present	Natural teeth were counted in each arch, including third molars, retained primary teeth, and root fragments. The values range from 0 to 16 for each arch. Overdentures were classified as no natural teeth.
3	Untreated decay	Untreated decay was present when the screener could readily observe breakdown of the enamel or cementum. Only cavitated lesions were counted. Root fragments, unless otherwise restored, were considered to be untreated decay.
4	Root fragments	Presence of visible root fragments or teeth where the crown fractured off at the gum line. Counts of restored and unrestored root fragments were recorded.
5	Need for periodontal care	Participants who needed to have their teeth cleaned before their next regularly scheduled dental appointment or needed more advanced periodontal treatment.
6	Suspicious soft tissue lesion	Presence of soft tissue lesion that needed to be evaluated by a health professional, including red and white lesions and conditions or infections such as candidiasis.
7	Urgency of need for dental care	Participants with untreated decay with accompanying signs or symptoms of pain, infection, or swelling or soft tissue lesions were classified as having urgent need for dental care within the next week. Participants with untreated decay without signs or symptoms of pain, infection, or swelling, or other conditions such as a broken filling, were classified as needing early dental care (should be seen in the next several weeks). Participants with no untreated decay or other problems were categorized as having no obvious problems and needing to see their dental provider for their next regularly scheduled checkup. Participants with need for periodontal care but no other problems were classified as no obvious problems.
8	Functional posterior occlusal contacts	This indicator was assessed with dentures or partials in place if the participant indicated that they wear their dentures or partials while eating. While the participant was closing together normally on the back teeth or dentures the screener looked to see if there were contacts (teeth opposing each other) in the premolar and molar teeth. Participants were classified as having none, one side, or both sides.

Table 1: Older Adult Basic Screening Survey Indicators and Definitions

	Indicator	Definition
9	Substantial oral debris	Substantial oral debris was based on the oral hygiene index. Participants with hard or soft matter covering more than two-thirds of any tooth surface were considered to have substantial oral debris.
10	Severe gingival inflammation	Based on the gingival index, participants with marked redness and edema, ulceration, or a tendency to spontaneous bleeding were classified as having severe gingival inflammation. Participants with redness, edema, and glazing had moderate inflammation and those with slight change in color or slight edema were coded as normal to mild inflammation. Participants were coded based on the worst area in their mouth.
11	Obvious tooth mobility	Coded as yes for participants with at least one tooth that was obviously mobile. A gloved finger could be used to confirm suspected mobility.
12	Severe dry mouth	Participants with dry cracked lips, a dry cracked or fissured tongue, or tissue that stuck to the teeth because of lack of saliva were classified as having severe dry mouth.

In addition to the BSS, demographic indicators, including sex, date of birth, race/ethnicity, dementia status, and resident type, were collected from the nursing home.

Complete data are available for 1,197 participants from 27 nursing homes. The data were weighted for survey design and non-response. Electronic data collection was used through a Qualtrics survey on iPads to reduce data entry errors and improve efficiency. The data were then cleaned and analyzed using SAS version 9.3. SurveyFreq procedures were used with 95 percent confidence intervals and chi-square tests for significance.

Survey Limitations

The BSS protocol is a visual screening with a mirror and flashlight and does not include the use of dental explorers, magnification devices, or radiographs, which results in an underestimate of untreated decay. The percentage of older adults with urgent needs is also underestimated because some of the participants were unable to answer when questioned about pain. In addition, because a full periodontal exam (using probes to measure pocket depth) was not conducted, periodontal disease is underestimated as well. The level of disease is also underestimated for other indicators such as oral debris and dry mouth, because the survey only captured the most severe cases.

In addition, nursing homes had the ability to decline participation in the survey. Nursing homes may not have participated if they felt their residents had poor oral health or if they felt there would be negative consequences based on the findings. All residents of participating nursing homes were eligible to participate; however, at some of the sites, screeners were not allowed access to all residents on the day of the screening. Residents that screeners were not allowed to screen were often the most ill or cognitively impaired residents, which may have skewed the results toward healthier residents.

Despite these limitations, the BSS protocol provides valuable estimates of oral disease among older adults in Wisconsin. This national protocol is commonly used by states to assess the oral health status of older adults and monitor progress towards objectives.



RESULTS

Older adults were screened at 27 nursing homes between April and December 2016. There were a total of 1,197 participants with complete data. The mean age of participants was 84.4 years old. In addition, they were more likely to be female, non-Hispanic White, and live in rural nursing homes.

Table 2: Number and Percent of Survey Participants by Site Type and Demographics

Indicator	Number	Percent*
Total	1,197	100
Age Groups		
65-74	169	14.1
75-84	338	28.2
85-94	557	46.5
95+	133	11.1
Race/Ethnicity		
Non-Hispanic White	1,043	87.1
Non-Hispanic African American	78	6.5
Other/Missing	76	6.4
Gender		
Female	782	65.3
Male	415	34.7
Location		
Urban	357	29.8
Suburban	315	26.3
Rural	525	43.9
Dementia Status		
Yes	470	39.3
No	604	50.5
Missing	123	10.3
Resident Type		
Long Term Care	966	80.7
Rehabilitation	128	10.7
Missing	103	8.6

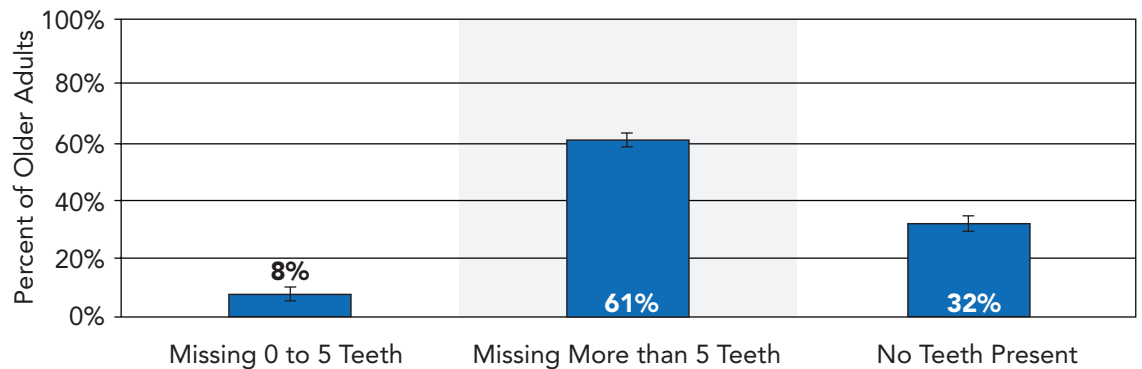
*Percentages may not add up due to rounding.

Tooth Loss

Tooth loss is common among older adults, and is typically the result of tooth decay and/or periodontal disease. The absence of teeth can affect quality of life, including the ability to chew food and speak clearly. Tooth loss can influence food choices, with those affected typically opting for softer, easier-to-chew foods (U.S. Department of Health and Human Services, 2000). In addition to the physical effects of tooth loss, there can be psychological and social effects. The absence of teeth can reduce self-esteem and negatively affect social interactions and physical appearance. Adults missing all natural teeth are referred to as edentulous, while those with at least one natural tooth are referred to as dentate.

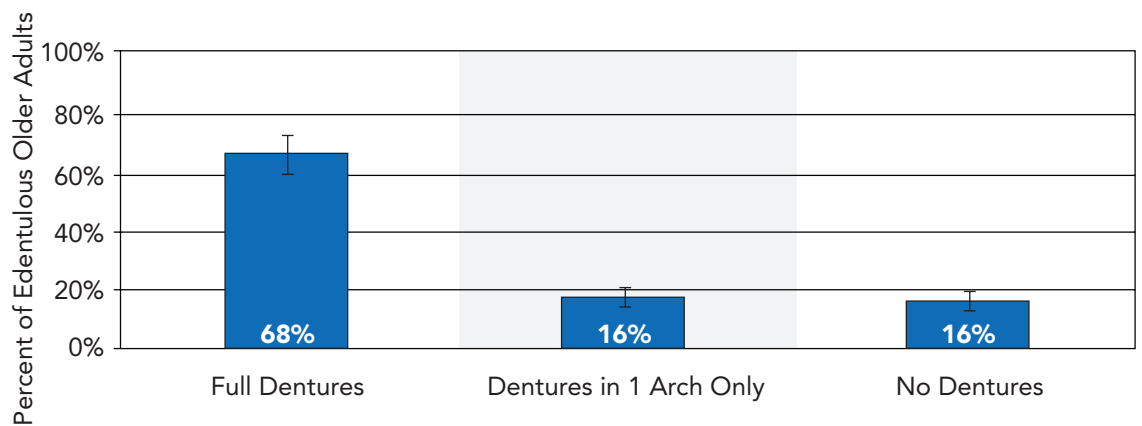
Among Wisconsin nursing home residents, about 61 percent were missing more than five teeth but not all (so were defined as dentate or "having teeth") and 32 percent were missing all natural teeth (edentulous or "without teeth") (Figure 2). The average number of natural teeth per resident was 11.8. Non-Hispanic Black residents were more likely to be edentulous compared to non-Hispanic White residents and residents of other races or ethnicities (Appendix A, Table 9)

Figure 2. Percent of Older Adults with Tooth Loss.



Among edentulous older adults at nursing homes, about 68 percent had full dentures for both arches (Figure 3); however, only about 59 percent of those with dentures reported wearing them for meals (Appendix A, Table 5). This means a significant portion of the Wisconsin nursing home population may not be able to eat a regular diet. They may avoid certain foods, favoring foods that are softer and easier to chew, which may also be less nutrient dense, resulting in poorer nutrition.

Figure 3. Percent of Edentulous Older Adults with Dentures

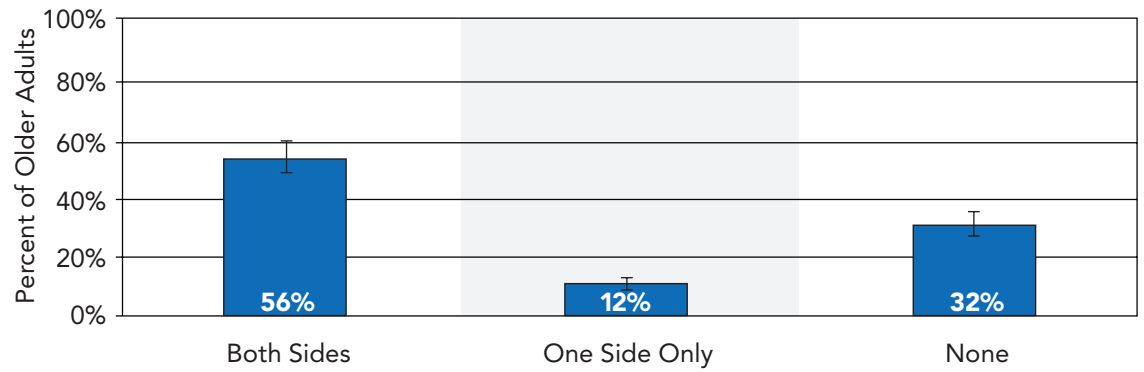


Functional occlusal contacts were assessed with dentures and partials in place. While the participant was closing together normally on the back teeth or dentures, the screener looked to see if there were teeth opposing each other in the premolar and molar teeth.

Among nursing home residents, 32 percent did not have functional occlusal contacts on either side (Figure 4). The purpose of this indicator is to determine the presence of teeth that oppose each other and can function properly for eating. People without functional occlusal contacts may have dietary limitations and may eat softer, less nutrient-dense foods, affecting their nutritional intake and quality of life.

Non-Hispanic Black nursing home residents were significantly more likely to have no functional occlusal contacts (48%) compared to non-Hispanic White nursing home residents (32%) and nursing home residents of other races and ethnicities (30%) (Appendix A, Table 9). In addition, long-term care residents were 2-1/2 times as likely to have no functional occlusal contacts compared to rehabilitation residents (Appendix A, Table 11).

Figure 4: Percent of Older Adults with Functional Occlusal Contacts



Untreated Decay and Root Fragments

Tooth decay is a chronic disease that results in the destruction of tooth enamel. A sticky white film of bacteria (plaque) forms on teeth. The bacteria use sugars from food and drink to produce acids that damage the outer layer of the tooth. Tooth decay can affect anyone with natural teeth present, but can be prevented with regular dental visits, use of fluorides, drinking fluoridated water, eating healthy foods, and practicing good oral hygiene.

Older adults can be more susceptible to tooth decay because of dry mouth associated with many common prescription medications. In addition, older adults can have gingival recession, making root surfaces susceptible to decay. They can also have dexterity issues resulting in the inability to effectively remove plaque. Older adults with systemic health conditions or a compromised immune system may be at increased risk for tooth decay. When left untreated, tooth decay can continue to worsen, and treatment for the condition becomes more complex and costly. Root fragments are the result of teeth that have decayed or fractured down to the gum line and are an indicator of lack of access to dental care over an extended period of time.

About 46 percent of dentate nursing home residents had any untreated decay (Figure 5). About 25 percent had untreated coronal caries and 38 percent had untreated root caries. Nursing home residents with dementia were more likely to have any untreated decay, untreated coronal decay, and untreated root decay compared to residents without dementia (Appendix A, Table 12). In addition, 33 percent of dentate nursing home residents had at least one untreated root fragment. However, many residents had multiple untreated root fragments, with 17 percent having three or more (Figure 6).

Figure 5: Percent of Dentate Older Adults with Untreated Decay by Type

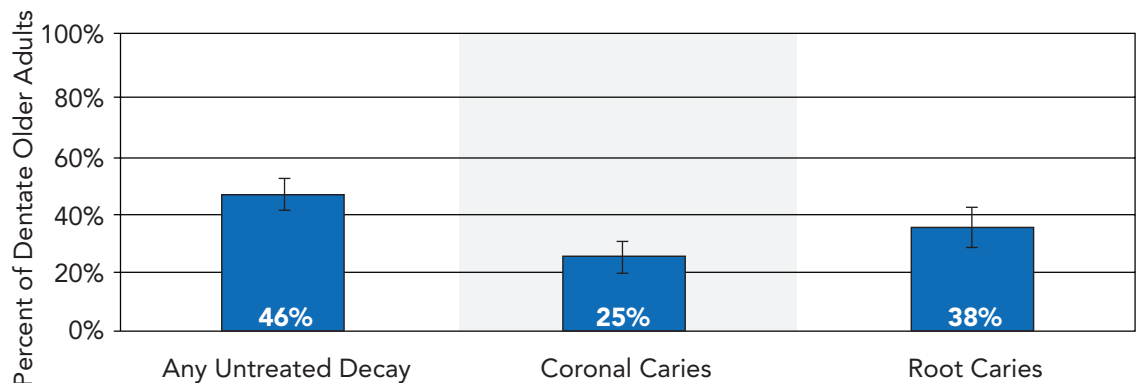
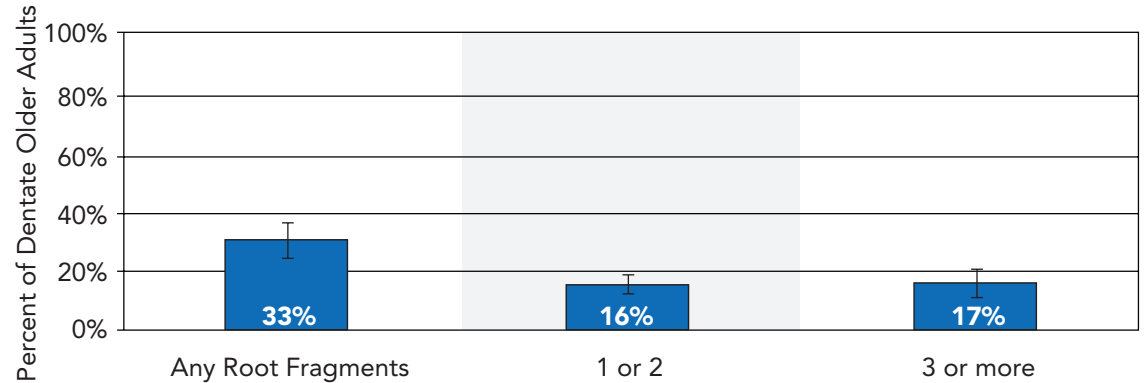


Figure 6: Percent of Dentate Older Adults with Untreated Root Fragments by Type



Suspicious Soft Tissue Lesions

Soft tissue lesions in the oral cavity vary in color, size, texture, and etiology. They can be present at birth or can develop as a result of factors such as tobacco use, alcohol use, infection, or injury (HHS, 2000). Soft tissue lesions can be detected through an intraoral examination. The BSS protocol for suspicious soft tissue lesions includes both white and red lesions. The indicator also includes conditions or infections such as candidiasis (thrush), which is a fungal infection. Any lesions that screeners felt should be evaluated by a health professional were considered suspicious soft tissue lesions.

Soft tissue lesions are typically benign, but in some cases they are oral cancer. Every year, nearly 52,000 new cases of oral and pharyngeal (throat) cancers are diagnosed in the U.S., and about 10,000 deaths occur annually from oral and pharyngeal cancers (American Cancer Society [ACS], 2018a). In Wisconsin, there are about 900 new cases annually and about 190 deaths (Wisconsin Department of Health Services [DHS], 2018). Five-year survival rates for oral and pharyngeal cancers are low compared to other cancer sites, but improve when diagnosed at the earliest stage. Survival rates also vary greatly based on where the cancer is located (lip, tongue, floor of mouth, oropharynx, tonsils, and gums) (ACS, 2018b). Overall, for oral and pharyngeal cancer diagnosed at the earliest stage, about 84 percent of people are living five years after first diagnosis (ACS, 2018a). However, only 39 percent of those diagnosed at the latest stage are living five years after first diagnosis (ACS, 2018a). Unfortunately, the stage at diagnosis trend is going in the wrong direction in Wisconsin, with more cases being diagnosed at later stages. Only about 35 percent of new cases of oral and pharyngeal cancers in Wisconsin are diagnosed at the earliest stage (Simó & Olson, 2017). The main risk factors for oral and pharyngeal cancers include tobacco use in any form (smoked and smokeless), heavy alcohol consumption, and human papillomavirus (HPV) infection (ACS, 2014).

About 3 percent of nursing home residents had suspicious soft tissue lesions.

Treatment Urgency

The dental treatment needs of participants were determined based on two indicators: untreated decay and suspicious soft tissue lesions. Treatment urgency was coded as no obvious problems, early, or urgent. The classification of urgent needs is typically used for participants with accompanying signs or symptoms that include pain, infection (abscess), or swelling. Urgent needs also include candidiasis or a suspicious soft tissue lesion. People with urgent treatment needs should receive dental care within a week.

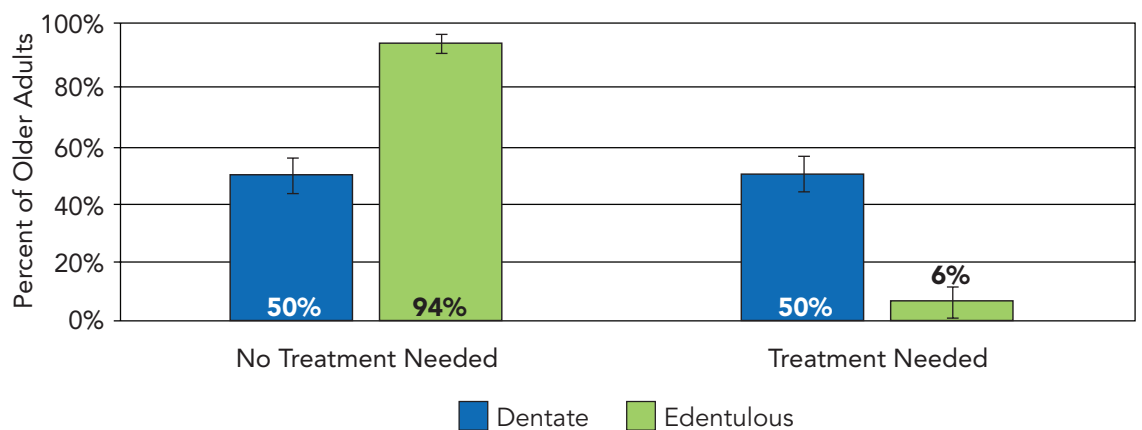
Participants with untreated decay without accompanying signs or symptoms are classified as having early needs. This also includes broken or missing fillings. These people should see a dentist within the next several weeks or before their next regular visit.

People with no untreated decay and no suspicious soft tissue lesions are considered to have no obvious problems. It is recommended that these people see their dentist for their next regular visit.

Figure 7 shows the percent of older adults with treatment needs stratified by the presence of natural teeth. About 50 percent of dentate nursing home residents had treatment needs. The majority of participants had early treatment needs, but about 4 percent had urgent treatment needs. Residents with dementia were significantly more likely to have treatment needs (58%) compared to those without dementia (45%) (Appendix A, Table 12).

Participants with no natural teeth had fewer treatment needs because they can no longer experience untreated decay. However, some did have treatment needs due to suspicious soft tissue lesions. Six percent of edentulous nursing home residents had early or urgent treatment needs.

Figure 7: Percent of Older Adults with Treatment Needs by Presence of Natural Teeth

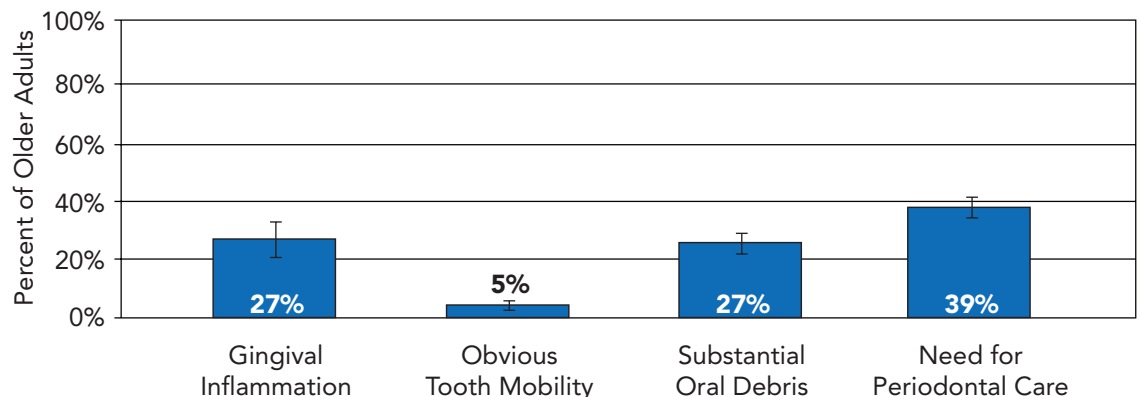


Periodontal Health

Gingivitis is characterized by localized inflammation, swelling, and bleeding gums without a loss of the bone that supports the teeth (U.S. Department of Health and Human Services [HHS], 2000). Gingivitis is usually reversible with good oral hygiene, which means the removal of dental plaque on a daily basis. However, without good oral hygiene, it can progress to destructive periodontal disease. Periodontitis is characterized by the loss of tissue and bone that support the teeth (HHS, 2000). Adults with periodontitis can suffer from bleeding, pain, infection, tooth mobility, and tooth loss. Uncontrolled periodontal disease can increase the risk for other systemic diseases, such as, bacterial pneumonia, heart disease, diabetes, and stroke (HHS, 2000). For example, periodontal disease can make it more difficult to control blood sugar levels for people with diabetes, and people with diabetes are more likely to develop periodontal disease than are people without diabetes (HHS, 2000). The 2009-2012 National Health and Nutrition Examination Survey (NHANES) conducted a full periodontal exam and found that about 66 percent of adults ages 65 and older in the U.S. have mild, moderate, or severe periodontitis (Eke, Zhang, Lu, Wei, Thornton-Evans, Greenlund, Holt, & Croft, 2016).

The indicator for severe gingival inflammation is based on the gingival index. The indicator was modified from a yes no format for severe inflammation to a categorical format that captured normal to mild, moderate, and severe. The normal to mild category captures normal gingiva to slight change in color and slight edema. Moderate includes redness, edema, and glazing of the gingiva,

Figure 8: Percent of Dentate Older Adults with Periodontal Indicators by Setting



while severe includes marked redness and edema, ulceration, or a tendency to spontaneous bleeding. Moderate and severe were combined for reporting. About 27 percent of nursing home residents had moderate to severe gingival inflammation (Figure 8). Long-term care residents and residents with dementia were significantly more likely to have gingival inflammation (Appendix A, Tables 11 & 12).

Obvious tooth mobility was noted if participants had one or more teeth that were clearly loose. The screener could confirm suspected mobility by placing a gloved finger on the occlusal or incisal surface to gently touch the tooth. Approximately 5 percent of nursing home residents had obvious tooth mobility.

Substantial oral debris is an indicator of a participant's oral hygiene and is based on the oral hygiene index. Participants with soft matter or hard matter (calculus) covering more than two-thirds of any tooth surface had substantial oral debris. In addition to being an indicator of poor oral hygiene, calculus can be an indicator of lack of access to dental care. Among nursing home residents, about 27 percent had substantial oral debris. Non-Hispanic White residents were significantly more likely to have substantial oral debris along with residents with dementia (Appendix A, Tables 9 & 12).

Need for periodontal care was noted for participants if they needed to have their teeth cleaned before their next regularly scheduled dental appointment or if they needed more advanced periodontal treatment. About 39 percent of nursing home residents needed periodontal care, with significantly higher rates among non-Hispanic White residents and residents with dementia (Appendix A, Tables 9 & 12).

Dry Mouth

Saliva is needed to moisten and cleanse the mouth and help digest food. Saliva can also provide protective benefits by bathing the teeth in fluoride. If not enough saliva is present, dry mouth can occur, resulting in discomfort and increased risk for oral disease. Dry mouth is a side effect of many common prescription and over-the-counter drugs. In addition, dry mouth can result from several medical conditions such as diabetes and Sjögren's Syndrome. Certain medical treatments, including radiation and chemotherapy, can damage salivary glands, resulting in dry mouth.

Dry mouth can range from mild to severe. However, the BSS protocol only measured severe dry mouth, defined as having dry cracked lips; a dry, cracked or fissured tongue; or tissue that sticks to the teeth because of lack of saliva. About 7 percent of nursing home residents had severe dry mouth.

Healthy People 2020

Healthy People 2020 (HP 2020) provides 10-year national objectives for improving the health of Americans. These objectives provide targets toward which states and communities can work. HP 2020 contains three objectives that are related to the oral health of older adults. However, the objectives and targets are not specific to older adults in nursing homes. Therefore, we used the HP 2020 target setting methodology to develop Wisconsin-specific targets based on these data and modified the objective language to specify older adults in nursing homes. The targets reflect a 10 percent reduction for each objective from baseline. Table 3 below lists the objectives, baselines, and targets, which will be used to monitor progress as these data continue to be collected in the future.



Table 3: Wisconsin Objectives, Baselines, and Targets

Objective	Baseline	Target
Reduce the proportion of adults in nursing homes aged 65 to 74 with untreated coronal caries.	31.5%	28.4%
Reduce the proportion of adults in nursing homes aged 75 years and older with untreated root surface caries.	38.4%	34.7%
Reduce the proportion of adults in nursing homes aged 65 to 74 who have lost all of their natural teeth.	30.4%	27.4%

CONCLUSIONS

The *Wisconsin Healthy Smiles Survey* allowed the Oral Health Program to monitor the oral health status of older adults in Wisconsin. The findings indicate that older adults experience a significant burden of oral disease. When left untreated, these conditions can cause pain and infection and affect quality of life. The overall key findings are listed below. In addition, the data indicate that some groups within nursing homes experience a disparate burden of oral disease. Nursing home residents with dementia were more likely to have untreated decay, need dental treatment, and have poor periodontal health.

- One out of three nursing home residents had no natural teeth.
- One out of three nursing home residents had no functional occlusal contacts.
- Forty-six percent of nursing home residents had untreated decay.
- One out of two nursing home residents with natural teeth had treatment needs.
- One out of three nursing home residents had at least one untreated root fragment.
- Twenty-seven percent of nursing home residents had substantial oral debris.
- Two out of five nursing home residents needed periodontal care.

As the population of adults age 65 and older continues to increase over the next 20 years, these results will allow the Oral Health Program and partners to appropriately target resources to provide programs and services for this population. A multipronged approach is needed, including changes at the nursing home and dental provider levels, such as implementing training for staff on providing care to frail elderly. Changes are also needed at the state and federal levels, such as maintaining an adult Medicaid dental benefit and adding dental coverage to Medicare. In 2017, Wisconsin Act 20 allowed dental hygienists to perform their full scope of practice in nursing homes without the supervision of a dentist. In addition, silver diamine fluoride can be effective in arresting decay in the frail elderly. As these and other strategies are implemented, it is essential to continue the collection of data to evaluate the impact of these initiatives.

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Table 4: Percent and 95 Percent Confidence Interval of Participants with Tooth Loss

Tooth Loss	2012		2016	
	Percent	95% CI	Percent	95% CI
Missing 0 to 5	7.4	5.2, 9.7	7.6	5.4, 9.8
Missing More than 5, Not All	59.5	54.1, 65.0	60.7	58.6, 62.8
Missing All (Edentulous)	33.0	26.8, 39.2	31.7	28.5, 35.0

Table 5: Percent and 95 Percent Confidence Interval of Participants with Dentures/Partials by Tooth Loss Status

Dentures or Partials	2012		2016	
	Percent	95% CI	Percent	95% CI
Edentulous				
Full Dentures, Both Arches	73.4	64.2, 82.7	68.0	60.4, 75.7
Have Dentures for One Arch	11.0	5.7, 16.2	16.2	11.5, 20.9
No Dentures	15.6	10.0, 21.2	15.8	10.6, 21.0
Wear Dentures, Both Arches	58.3	49.9, 66.7	59.1	50.9, 67.2
Edentulous with Full Dentures Both Arches				
Wear Dentures	79.4	74.3, 84.5	86.8	81.0, 92.7
Dentate				
Have a Lower Denture/Partial	11.6	8.1, 15.1	10.6	8.3, 13.0
Have an Upper Denture/Partial	25.2	21.0, 29.5	28.4	23.1, 33.6
Dentate w/ Denture/Partial				
Wear Lower Denture/Partial	80.7	70.7, 90.7	87.9	81.5, 94.3
Wear Denture/Partial	93.1	89.2, 97.0	91.1	84.8, 97.4

Table 6: Percent and 95 Percent Confidence Interval of Participants with Functional Occlusal Contacts

Functional Occlusal Contacts	2012		2016	
	Percent	95% CI	Percent	95% CI
Both Sides	56.1	43.2, 57.8	56.1	49.9, 62.3
One Side Only	11.3	7.3, 15.2	11.7	8.9, 14.5
None	38.7	32.5, 43.9	32.2	27.8, 36.6

Table 7: Percent and 95 Percent Confidence Interval of Participants with Oral Conditions by Year

Variable	2012		2016	
	Percent	95% CI	Percent	95% CI
Any Untreated Decay	42.4	35.0, 49.8	46.3	39.9, 52.8
Untreated Coronal Decay	–	–	25.2	19.0, 31.5
Untreated Root Decay	–	–	38.2	30.8, 45.6
Any Untreated Root Fragments	31.2	26.3, 36.1	32.9	26.6, 39.2
1-2 Root Fragments	–	–	16.4	12.5, 20.2
3 or More Root Fragments	–	–	16.5	11.5, 21.6
Suspicious Soft Tissue Lesion	4.2	2.2, 6.2	2.8	1.8, 3.8
Treatment Needs (Early & Urgent)				
Dentate	49.8	42.9, 56.8	50.4	43.6, 57.2
Edentulous	6.5	1.5, 11.4	5.8	3.5, 8.0
Gingival Inflammation*	22.2	12.5, 31.9	27.2	21.3, 33.2
Obvious Tooth Mobility	5.7	2.6, 8.8	4.9	3.0, 6.9
Substantial Oral Debris	35.2	24.3, 46.1	26.6	23.3, 29.8
Need for Periodontal Care	27.3	18.5, 36.1	39.0	35.4, 42.6
Severe Dry Mouth	7.2	3.0, 11.5	7.0	4.5, 9.5

* Gingival inflammation for 2012 only captured severe, while 2016 captured both severe and moderate.

Table 8: Percent and 95 Percent Confidence Interval of Nursing Home Participants with Oral Conditions by Sex

Variable	Female (n=782)		Male (n=415)	
	Percent	95% CI	Percent	95% CI
Edentulous	31.9	28.0, 35.7	31.5	24.3, 38.8
No Functional Occlusal Contacts	32.5	27.5, 37.5	31.7	26.3, 37.2
Any Untreated Decay	45.2	37.0, 53.3	48.2	39.7, 56.7
Untreated Coronal Decay	25.1	17.0, 33.3	25.4	18.3, 32.4
Untreated Root Decay	36.6	28.2, 45.0	40.7	29.0, 52.4
Root Fragments	30.2	23.0, 37.6	37.0	27.4, 46.6
Treatment Needs (Early & Urgent)*	49.7	41.2, 58.3	51.5	43.0, 60.0
Gingival Inflammation	26.9	20.8, 33.1	27.7	19.1, 36.4
Substantial Oral Debris	26.1	21.0, 31.2	27.3	23.5, 31.1
Need for Periodontal Care	38.4	33.2, 43.6	39.9	33.6, 46.2

* Dentate participants only

Note: Numbers in bold indicate difference is significant at the p<0.05 level.

Table 9: Percent and 95 Percent Confidence Interval of Nursing Home Participants with Oral Conditions by Race/Ethnicity

Variable	Non-Hispanic White (n=1043)		Non-Hispanic Black (n=78)		Other/Missing (n=76)	
	Percent	95% CI	Percent	95% CI	Percent	95% CI
Edentulous	31.5	28.0, 35.0	41.2	30.2, 52.2	28.5	24.1, 32.9
No Functional Occlusal Contacts	31.6	27.0, 36.2	48.2	33.2, 63.5	30.4	21.6, 39.1
Untreated Decay	46.3	39.4, 53.2	49.0	24.1, 73.8	45.5	40.0, 51.1
Root Fragments	32.5	25.6, 39.5	30.3	16.6, 44.1	38.8	31.6, 45.9
Treatment Needs (Early & Urgent)*	50.4	43.1, 57.8	52.0	29.2, 74.8	49.4	43.9, 54.8
Gingival Inflammation	27.9	21.3, 34.5	22.0	14.2, 29.8	21.5	12.8, 30.3
Substantial Oral Debris	27.6	24.1, 31.1	18.4	4.3, 32.5	17.4	11.0, 23.8
Need for Periodontal Care	40.1	36.2, 44.2	29.0	17.8, 40.2	29.4	19.7, 39.1

* Dentate participants only

Note: Numbers in bold indicate difference is significant at the p<0.05 level.

Table 10: Percent and 95 Percent Confidence Interval of Nursing Home Participants with Oral Conditions by Urban Classification

Variable	Urban (n=357)		Suburban (n=315)		Rural (n=525)	
	Percent	95% CI	Percent	95% CI	Percent	95% CI
Edentulous	23.8	15.4, 32.1	31.4	26.6, 36.1	34.5	31.0, 38.0
No Functional Occlusal Contacts	34.2	24.6, 43.8	26.2	20.3, 32.2	36.9	30.9, 43.0
Untreated Decay	43.7	35.7, 51.8	46.4	35.5, 57.3	47.2	37.8, 56.6
Root Fragments	32.1	25.1, 39.1	33.2	24.4, 42.0	32.9	21.9, 43.9
Treatment Needs (Early & Urgent)*	49.0	41.4, 56.6	49.7	36.8, 62.6	51.6	43.7, 59.5
Gingival Inflammation	21.4	18.2, 24.7	26.4	17.3, 35.4	30.2	20.1, 40.2
Substantial Oral Debris	27.7	16.7, 38.7	25.0	21.8, 28.3	27.7	22.4, 32.9
Need for Periodontal Care	35.8	29.0, 42.7	35.9	31.3, 40.6	43.1	35.8, 50.4

* Dentate participants only

Note: Numbers in bold indicate difference is significant at the p<0.05 level

Table 11: Percent and 95 Percent Confidence Interval of Nursing Home Participants with Oral Conditions by Resident Type

Variable	Long Term Care (n=966)		Rehabilitation (n=128)	
	Percent	95% CI	Percent	95% CI
Edentulous	31.4	27.8, 35.0	32.4	21.9, 42.8
No Functional Occlusal Contacts	33.8	27.9, 39.6	13.6	3.5, 23.8
Any Untreated Decay	46.5	38.5, 54.6	41.2	25.7, 56.7
Untreated Coronal Decay	24.9	17.8, 31.9	29.2	15.6, 41.9
Untreated Root Decay	38.1	28.8, 47.5	27.3	15.1, 39.4
Root Fragments	32.4	25.4, 39.3	21.1	9.2, 33.0
Treatment Needs (Early & Urgent)*	50.9	42.5, 59.2	46.2	28.8, 63.7
Gingival Inflammation	28.4	21.4, 35.3	10.6	3.2, 17.9
Substantial Oral Debris	–	–	–	–
Need for Periodontal Care	40.4	35.4, 45.4	26.2	12.1, 40.3

* Dentate participants only

Note: Numbers in bold indicate difference is significant at the p<0.05 level.

Table 12: Percent and 95 Percent Confidence Interval of Nursing Home Residents with Oral Conditions by Dementia Status

Variable	Dementia (n=470)		No Dementia (n=604)	
	Percent	95% CI	Percent	95% CI
Edentulous	24.6	20.7, 28.5	35.5	32.2, 38.7
No Functional Occlusal Contacts	33.9	26.9, 41.0	29.8	25.2, 34.3
Any Untreated Decay	53.8	44.5, 63.0	40.1	30.9, 49.3
Untreated Coronal Decay	31.2	20.9, 41.4	21.0	14.6, 27.4
Untreated Root Decay	45.5	37.5, 53.4	30.6	19.4, 41.8
Root Fragments	37.2	31.6, 42.9	26.6	16.3, 37.0
Treatment Needs (Early & Urgent)*	57.9	47.7, 68.0	44.7	33.8, 55.6
Gingival Inflammation	33.2	24.5, 41.9	21.6	14.4, 28.7
Substantial Oral Debris	34.8	30.5, 39.2	20.6	17.2, 23.9
Need for Periodontal Care	48.6	43.8, 53.3	32.0	27.9, 36.0

* Dentate participants only

Note: Numbers in bold indicate difference is significant at the p<0.05 level.



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