Research

Oral Health of Older Adults in Washington State

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Abstract

Purpose: An aging population, combined with increasing tooth retention, could significantly impact the dental care delivery system. The purpose of this study was to assess self-reported oral health and the factors associated with oral health outcomes among a random sample of older adults in Washington State.

Methods: A telephone survey of adults 55+ years was used to collect information on factors associated with oral health, plus four outcome variables; substantial tooth loss (6+ teeth lost), oral problems, oral pain, and poor health of teeth. Data were weighted to reflect the state's age and gender statistics.

Results: A total of 2,988 older adults completed the survey during 2017. Substantial tooth loss (18%), oral problems (17%) and oral pain (13%) were the most frequently reported issues. Of the adults with teeth, 17% reported fair/poor health of teeth. Compared to adults with an income of $75,000 or more, adults with an income less than $25,000 were twice as likely to have substantial tooth loss and oral problems (OR=2.1 and 2.2, respectively) and were three times more likely to report oral pain and poor health of teeth (OR=3.1 and 3.3, respectively). The oldest old (adults 75+ years), as compared to those 55-64 years, were significantly more likely to have substantial tooth loss (OR=2.6) but were less likely to report oral problems (OR=0.6), pain (OR=0.3), or poor health of teeth (OR=0.5).

Conclusions: Although the majority of Washington's older adults report having good oral health, a small subgroup has oral problems which may have a negative impact on quality of life.

Keywords: oral health, older adults, oral pain, tooth loss, dental disease, quality of life

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Introduction

Following World War II, the United States (U.S.) experienced a dramatic increase in birth rates. The population born between 1946 and 1964, commonly referred to as the Baby Boom generation, is now considered to be the largest generation in US history. The aging of the Baby Boom generation in combination with increasing life expectancy is shifting the nation's demographic profile; about 12% of the population was 65 years or older in 2000 but is expected to increase to 20% by 2029.[1] The 85 and older population is projected to triple from 6.3 million in 2015 to 14.6 million in 2040.[2]

The oral health profile of older adults is also changing with an ongoing decrease in the prevalence of complete edentulism nationally among adults 65+ years; dropping to 34% in 1988-1994, 27% in 1999-2004 and 23% in 2005-2008.[3-4] This trend is likely to continue as only 14% of older adults reported being edentulous in the 2016 Behavioral Risk Factor Surveillance System (BRFSS).[5] As older adults retire, many lose employer paid dental benefits coverage and regular dental care is not a covered service under Medicare. Even without the coverage of dental services by Medicare, dental care utilization among older adults has been rising, in spite of higher out of pocket expenses.[6,7] This increase in dental care utilization may be partially due to the changing demographic profile of older Americans; compared to previous generations, a higher percent of today's older adults have college degrees and a higher median income. Even with increasing incomes, 9% of older adults live in poverty while 14% are considered poor.[2]

The aging of America, combined with increasing tooth retention, could significantly impact the dental care delivery system, as more older adults will be at risk for both dental caries and periodontal disease. In the United States, the dental care

delivery system is dominated by stand alone, in-office, fee-for-service private and corporate practices with dentists and dental hygienists as the primary care providers. While this delivery system works well for community-dwelling individuals with dental insurance or the financial means to pay for care, it is problematic for those that live in poverty, have difficulty with ambulation, have low health literacy, or are institutionalized. To improve the oral health of older adults, the Association of State and Territorial Dental Directors (ASTDD) recommends seven public health strategies: 1) assess and monitor the oral health of older adults, 2) enhance dental care infrastructure and build partnerships, 3) educate older adults and their caregivers to improve their oral health and empower them to advocate for the services they need, 4) prepare all members of the dental workforce to better serve older adults, including frail elders, 5) promote expanded private and public insurance coverage for dental services needed by older adults and frail elders, 6) integrate dental and medical into comprehensive health homes, and 7) collaborate with State and Federal organizations involved with regulation of long-term care facilities to assure that oral health requirements are being addressed.[8]

As outlined by ASTDD, the first step in the process of developing plans for oral disease prevention and intervention programs targeted toward older adults, is to identify state-level data which can be used for identifying high-risk populations, program planning and evaluation. While BRFSS provides data on the prevalence of tooth loss and dental visits, there is limited data on oral health status or dental insurance coverage among older adults. The data that do exist are generally for specific sub-groups, such as senior center and congregate meal site participants, nursing facility residents, dental clinic users, or a combination of these groups.[9-11] These sub-groups, however, are not representative of the general older adult population.

The purpose of this paper is to present information on self-reported oral health status, dental benefits coverage, time since last dental visit, and factors associated with oral health among a representative sample of older adults throughout Washington State and in addition, the authors outline ways in which dental hygienists could impact the oral health of older adults.

Methods

Arcora Foundation, a non-profit organization, contracted with a market research firm to conduct a survey of adults age 55 and older in Washington State in 2017. The sample was selected by targeting an equal representation from seven geographic regions; 384 surveys per region. The regions were based on Washington's classification for Accountable Communities of Health (ACH), regional coalitions of stakeholders, collaborating to address health issues through community and healthcare transformation. Although there are nine ACH regions in Washington, several are very rural. These very rural ACHs were merged resulting in a total of seven geographic regions covering the entire state. Washingtonians aged 55 and older were surveyed by phone using random digit dialing on landline phone numbers with a wireless augment (30% of the surveys). Quotas were placed by geographic region, age and gender to follow U.S. Census data for Washington State. In addition, certain demographic groups were intentionally over-sampled in order to ensure enough data to evaluate the oral health of African Americans and Hispanics. To reflect the state's population demographics, sample weights were derived based upon respondents' age, gender and race to bring the survey data back in alignment with the most recent U.S. Census projections for Washington.

The survey collected information on age, gender, race, ethnicity, education, income, usual frequency of dental care, time since last dental visit, reasons for not visiting a dentist, dental insurance coverage, self-perceived oral health status, and self-reported oral health outcomes. Questions were adapted from those previously used and validated in the National Health and Nutrition Examination Survey (NHANES), BRFSS, the Pregnancy Risk Assessment Monitoring System (PRAMS) and the employed adult survey conducted by the National Institute of Dental Research (NIDR), now known as the National Institute of Dental and Craniofacial Research.

This manuscript focuses on four self-rated oral health outcomes: substantial tooth loss, oral problems, oral pain, and poor health of teeth (dentate participants only). Information on tooth loss was obtained using the tooth loss question from BRFSS with substantial tooth loss defined as having lost six or more teeth including those reporting having lost all their teeth. Those that responded yes to the modified NIDR question "Do you have any dental problems that need to be addressed in the next month?" were classified as having oral problems. Responding very often or occasionally to the NHANES question "How often during the last year have you had painful aching anywhere in your mouth?" was used to classify oral pain. Self-rated health of teeth was based on the NHANES question "How would you describe the condition of your teeth?" Those who responded fair or poor were classified as having poor health of teeth while those who responded excellent, very good, or good were grouped into the good health category. Self-rated health of teeth was only obtained from dentate participants.

All analyses were completed using SAS version 9.3 (SAS; Cary, NC, USA) and the appropriate sampling weights. Unweighted frequencies and weighted percentages are presented for the categorical variables. Logistic regression models were used to assess the association between the oral health outcomes and the demographic and individual characteristics of the population. Respondents with missing values for one or more explanatory variables were excluded. Because of the large number of missing values for household income, respondents who either refused to provide information or indicated that they did not know were classi-fied into a fifth 'unknown' income category. A *p-value* of < 0.05 was considered statistically significant and only statistically significant associations are noted in the presentation of the logistic regression results.

An Institutional Review Board (IRB) exemption to con-duct the phone interviews and compile the data was obtained from Western Institutional Review Board (WIRB), an independent IRB firm, under Regulatory Opinion 45 CFR §46.101(b)(2) criteria.

Results

A total of 2,988 adults participated. Nearly one-half of the respondents (47%) were 55-64 years of age, 53% were female, 83% were non-Hispanic white, 47% had a college degree, and 32% had a household income of $75,000 or more. Most of the respondents (83%) reported having a dental visit in the past year and 61% had insurance coverage that pays for some or all of their routine dental care. Of those who had not been to a dentist in the past year (n=521), the primary reasons for not going were "no reason to go" (n=179) and "cost" (n=142). The percent of adults with household incomes above $75,000 decreased with age as did the percent with dental insurance coverage. Thirty-seven percent of those 55-64 years reported an annual household income of $75,000 or more and 69% reported dental insurance coverage compared to 19% and 45%, respectively, for those 75 years or older. Socio-demographic information by age group is shown in Table I.

Table I. Socio-demographic characteristics of participating adults by age group (n=2,988)

Characteristic	55-64 Years n=1,482		65-74 Years n=731		75+ Years n=775		Overall 55+ Years n=2,988	
	# with data	%	# with data	%	# with data	%	# with data	%
Sex								
Male	680	48.9	355	48.3	338	43.2	1,373	47.5
Female	802	51.1	376	51.7	437	56.8	1,615	52.5
Race/Ethnicity								
Non-Hispanic White	1,115	80.3	575	83.8	650	86.0	2,340	82.6
Hispanic or Minority	320	16.4	138	14.4	100	10.1	558	14.5
Unknown/refused	47	3.3	18	1.8	25	3.8	90	2.9
Education								
High school or less	338	21.0	136	15.9	248	30.0	722	21.3
Some college	502	33.9	219	29.0	220	28.0	941	31.1
College graduate	628	44.2	366	54.0	294	40.5	1,288	46.5
Unknown/refused	14	0.9	10	1.1	13	1.4	37	1.1
Household income								
< $25,000	237	14.6	113	13.6	132	17.2	482	14.9
$25,000-$49,999	279	18.1	128	17.0	175	22.6	582	18.7
$50,000-$74,999	260	18.1	154	21.4	119	15.2	533	18.5
>=$75,000	529	37.4	226	33.7	140	18.9	895	32.3
Unknown/refused	177	11.8	110	14.2	209	26.1	496	15.6
Dental insurance								
Yes	1,012	68.6	429	59.1	348	44.8	1,789	60.5
No	447	29.8	295	40.1	414	53.1	1,156	38.1
Unknown/refused	23	1.6	7	0.8	13	2.1	43	1.5
Dental visit in last year								
Yes	1,235	83.8	603	83.4	611	79.2	2,449	82.7
No	243	15.9	126	16.3	152	19.0	521	16.7
Unknown/refused	4	0.2	2	0.3	12	1.8	18	0.6
Usual visit to dentist								
At least once a year	1,150	77.9	546	75.9	72.1	72.1	2,246	76.1
Less than yearly	317	21.1	172	22.5	26.4	26.4	700	22.7
Unknown/refused	15	1.0	13	1.6	1.5	1.5	42	1.3

A large portion of the adults surveyed (53%) had lost at least one permanent tooth due to dental caries or periodontal disease. The prevalence of substantial tooth loss was 17%. Only 6% reported having lost all their teeth. Seventeen percent reported an oral problem that required care within the next month, 13% reported oral pain, and 15% reported avoiding foods because of problems with their mouth. Of the 2,685 dentate participants, 17% self-rated the health of their teeth as fair or poor, 12% think they may have gum disease and 15% think they may have tooth decay. The prevalence of tooth loss increased with age while the prevalence of self-reported oral health problems and oral pain decreased with age (Table II).

The percentage of participants with substantial tooth loss, oral health problems, oral pain and poor health of teeth by selected characteristics is presented in Table III. In the bivariate analyses, race/ethnicity, income, education, and dental visit in the last year, were significantly associated with all the oral health outcome variables. Racial/ethnic minorities, compared to non-Hispanic whites, were more likely to report substantial tooth loss (23% vs.17%), oral problems (22% vs.16%), oral pain (16% vs.12%) and poor health of teeth (31% vs.14%).

Adults with an income < $25,000 compared to their peers with an annual income > $75,000, were significantly more likely to report substantial tooth loss (36% vs. 9%), oral problems (31% vs. 13%), oral pain (26% vs. 8%) and poor health of teeth (37% vs. 8%). Similar trends were seen when adults with a high school education or less, were compared to those with a college degree; and when those without a dental visit in the last year, were compared to those with a dental visit in the last year (Table III). There was a positive association between age and substantial tooth loss, however associations between age and oral health problems and oral pain were negative. Adults without dental insurance coverage as compared to those with coverage, were more likely to have substantial tooth loss (21% vs. 15%), oral health problems (19% vs. 16%) and poor health of teeth (19% vs. 15%).

It should be noted that many of the risk factors are highly correlated, for example adults with a college degree were more likely to have a higher annual income and younger adults were more likely to have dental insurance than their older peers. In order to determine the independent contribution of each of the risk factors to the oral health outcomes, multivariable analyses were performed, and the results are presented in Table IV. Age and income were significantly associated with all the outcome variables. When compared to adults 55-64 years of age, adults 75+ years of age were more than twice as likely to have substantial tooth loss (OR=2.6) but were significantly less likely to report oral health problems (OR=0.6), oral pain (OR=0.3), and poor health of teeth (OR=0.5). Adults with an income less than $25,000, compared to those with an income of $75,000 or more, were twice as likely to have substantial tooth loss (OR=2.1) and oral problems (OR= 2.2), and were three times more likely to report oral pain (OR=3.1) and poor health of teeth (OR= 3.3). Compared to individuals with a full dentition, adults who had lost some but not all their teeth, were more likely to report poor outcomes. Edentulous adults, on the other hand, were less likely to report oral problems. Race/ethnicity, education and dental visit within the last year were associated with some but not all the outcome variables. Sex and dental insurance coverage were not associated with any of the outcomes.

Discussion

This is the first published survey of self-reported oral health for a statewide sample of older adults. The survey findings indicate a high prevalence of tooth loss (53%) but a relatively low prevalence (6%) of edentulism, which is slightly better than the 2016 Washington State BRFSS results for adults 55+ years (56% and 8%, respectively).[12] The adults sampled in the current survey were more likely than those in the BRFSS sample to report a dental visit in the last year (83% vs. 71%), to have dental insurance (61% vs. 56%) and to have an income of $50,000 or more (51% vs. 44%).[12] There was no difference in the percent with painful aching in the mouth between this sample and BRFSS (13% vs. 13% respectively).[12] Given that the current sample findings were slightly better than those obtained by the Washington State BRFSS, it is possible that higher income adults with teeth, were more likely to participate in the telephone survey. In addition, the survey has other limitations. First, it relied on self-reported data which has inherent problems including recall bias and potential over-reporting of behaviors considered desirable (regular dental visits). Second, the survey excluded institutionalized adults, the most vulnerable older adult population group.

Regardless of these limitations, the results provide important information on the oral health of older adults. Most older adults in Washington State have regular dental visits, report no oral pain and have good, self-reported oral health. Compared to the overall older adult U.S. population, a substantially higher proportion of Washington's older adults report having visited the dentist in the past year. It should be noted that, due to differences in data collection methods, the percent of older Americans (> 65) reporting a dental visit in the last year varies by data source; 55% for NHANES 1999-2004,[3] 47% for the 2015 Medical Expenditure Panel Survey

Table II. Self-reported oral health status of participating adults by age group (n=2,988)

Oral Health Variable	55-64 Years n=1,482		65-74 Years n=731		75+ Years n=775		Overall 55+ Years n=2,988	
	# with data	Percent	# with data	Percent	# with data	Percent	# with data	Percent
Number of teeth lost								
None	741	51.0	306	43.0	204	28.6	1,251	43.7
1 to 5	502	33.5	273	38.3	287	36.0	1,062	35.6
6 or more but not all	146	9.7	86	10.0	140	17.7	372	11.5
All	64	4.0	41	5.2	88	10.3	193	5.7
Unknown/refused	29	1.7	25	3.4	56	7.4	110	3.5
Health of teeth (dentate only*)								
Excellent/very good/good	1,121	81.1	559	84.9	537	85.1	2,217	83.1
Fair/poor	264	18.6	105	14.9	90	14.6	459	16.6
Unknown/refused	4	0.3	1	0.2	4	0.3	9	0.3
Health of gums								
Excellent/very good/good	1,222	82.6	626	85.7	681	87.4	2,529	84.6
Fair/poor	251	16.9	101	13.7	85	11.1	437	14.7
Unknown/refused	9	0.6	4	0.6	9	1.5	22	0.8
Dental problems								
Yes	297	19.1	123	15.7	112	13.6	532	16.8
No	1,161	79.2	588	81.7	650	84.6	2,399	81.2
Unknown/refused	24	1.7	20	2.6	13	1.8	57	2.0
Think has gum disease (dentate only*)								
Yes	188	13.5	90	13.2	49	8.2	327	12.4
No	1,151	82.8	550	82.4	563	88.5	2,264	83.8
Unknown/refused	50	3.7	25	4.4	19	3.2	94	3.8
Think has tooth decay (dentate only*)								
Yes	271	19.1	95	13.3	66	8.9	432	15.3
No	1,064	76.8	537	81.0	542	87.2	2,143	80.2
Unknown/refused	54	4.0	33	5.8	23	3.8	110	4.5
Avoids foods								
Never/hardly ever	1,212	81.8	629	86.1	677	88.3	2,518	84.6
Very often/occasionally	265	17.9	96	13.2	86	10.3	447	14.8
Unknown/refused	5	0.2	6	0.7	12	1.4	23	0.6
Oral pain								
Never/hardly ever	1,237	84.0	630	87.5	698	91.0	2,565	86.6
Very often/occasionally	243	15.8	96	11.9	73	8.6	412	13.0
Unknown/refused	2	0.1	5	0.6	4	0.4	11	0.4

* Limited to the respondents with at least one tooth (n=2,685)

Table III. Prevalence of substantial tooth loss, oral health problems and oral pain for all participants plus prevalence of poor health of teeth for dentate participates by selected characteristics

	Substantial Tooth Loss			Oral Health Problems			Oral Pain			Poor Health of Teeth (Dentate Only)		
	# with data	% Yes	*p-value* chi-square	# with data	% Yes	*p-value* chi-square	# with data	% Yes	*p-value* chi-square	# with data	% Yes	*p-value* chi-square
All respondents	2,878	17.9	NA	2,931	17.2		2,977	13.1		2,676	16.7	
Age group (years)												
55 to 64	1,453	14.0		1,458	19.4		1,480	15.8		1,385	18.6	
65 to 74	706	15.7		711	16.1		726	11.9		664	14.9	
75 or older	719	30.3	<0.001	762	13.9	0.011	771	8.6	<0.001	627	14.7	NS
Sex												
Male	1,322	16.8		1,343	16.5		1,367	12.3		1,238	17.3	
Female	1,556	18.8	NS	1,588	17.8	NS	1,610	13.7	NS	1,438	16.2	NS
Race/Ethnicity												
Non-Hispanic White	2,258	16.7		2,296	16.1		2,331	12.2		2,113	14.0	
Hispanic or Minority	535	23.2	0.005	548	22.3	0.007	556	16.0	0.047	486	30.5	<0.001
Education												
High school or less	686	33.4		710	22.3		720	18.5		577	27.5	
Some college	902	19.6		923	19.4		933	13.7		846	18.2	
College graduate	1256	9.7	<0.001	1,261	13.3	<0.001	1,287	10.1	<0.001	1,226	11.4	<0.001
Income												
< $25,000	469	36.3		470	31.4		480	26.3		388	36.8	
$25,000-$49,999	560	20.2		571	18.6		579	11.8		523	20.3	
$50,000-$74,999	508	14.9		521	17.8		532	11.6		490	16.0	
>=$75,000	879	9.1		882	12.9		892	8.3		859	8.1	
Unknown/refused	462	19.3	<0.001	487	10.3	<0.001	496	13.6	<0.001	416	15.0	<0.001
Dental insurance												
Yes	1,727	15.1		1,760	15.8		1,781	12.0		1,629	14.8	
No	1,114	21.0	<0.001	1,131	19.2	0.023	1,154	14.2	NS	1,016	18.8	0.016
Dental visit in last year												
Yes	2,370	12.6		2,410	15.4		2,440	11.2		2,301	11.8	
No	492	43.3	<0.001	494	26.6	<0.001	510	22.5	<0.001	363	47.8	<0.001
Number of teeth lost												
None	NA	NA		1,235	12.0		1,251	6.9		1,247	7.3	
1 to 5	NA	NA		1,041	19.6		1,062	14.2		1,059	18.7	
6 or more but not all	NA	NA		358	32.0		372	28.2		370	46.1	
All	NA	NA	NA	192	10.9	<0.001	193	21.0	<0.001	NA	NA	<0.001

NA=not applicable, NS=not significant (p≥0.05, Pearson chi-square)

(MEPS),[13] and 67% for 2016 national BRFSS.[5] Higher utilization in Washington State may be partially explained by socioeconomic factors. The percent of residents with a college degree and median household income are higher in Washington State than for the nation.[14]

Although the majority of Washington's older adults report having good oral health, low-income older adults have oral problems which impact quality of life. More than 1 in 4 of Washington's low-income seniors reported oral pain. To improve the oral health of low-income adults, public health policies must address the ability of older adults to afford dental care or access lower cost preventive and restorative services. Unfortunately, Medicare is not a source of comprehensive dental coverage; it only provides coverage for limited hospital-based oral surgeries required in conjunction with other medical treatments. Yet oral health status is closely connected to overall health and wellbeing. Academic research and medical studies have identified a link between periodontal disease and a number of chronic health conditions, including coronary artery disease (heart disease), cerebrovascular disease (stroke) and diabetes. Additionally, researchers have found a link between gum inflammation and a decline in cognitive function among Alzheimer's disease patients.[15-16] Treating older adults' oral disease could yield financial benefits in addition to overall health improvements. A 2016 study found that providing periodontal treatment for all Medicare beneficiaries with heart disease, stroke or diabetes, is estimated to cost approximately $7.2 billion. However, it would produce a savings of $63.5 billion over a 9-year period, largely as a result of a decline in hospitalizations and emergency room visits.[17]

While state Medicaid programs are required to cover comprehensive dental services for children, coverage for adult dental services is optional. Because of this, states often decide to offer adults no Medicaid dental coverage or a very limited set of covered services, especially during difficult financial times. As of January 2018, three states offered no dental benefits for adults, 14 had emergency only (relief of pain), 17 had limited benefits (fewer than 100 procedures, annual per person expenditure <$1,000), while 17 offered comprehensive benefits (100+ procedures, annual per person expenditure > $1,000). At the time this survey was conducted, Washington's Medicaid program offered extensive dental benefits for eligible adults.[18]

Federally Qualified Health Centers (FQHC) and other non-profit community health centers may be a source of lower-cost dental care for older adults without Medicaid or private dental benefits. In 2017, more than 6.1 million Americans received dental services at FQHCs which represents 23% of all patients served by FQHCs.[19] In Washington State, 36% of FQHC patients received a dental service in 2017. Unfortunately, older adults are underrepresented within the population served by FQHCs. Sixteen percent of the U.S. population was 65 years or older in 2017, but only 9% of the patients seen by FQHCs in 2017 were 65+ years.[19-20] In Washington State, 14% of the population was 65 years or older in 2017, but only 8% of patients seen by Washington's FQHCs in 2017 were 65+ years. Informing older adults about the lower cost dental services provided by FQHCs may raise awareness and increase use of this valuable service by older Americans.

Allowing dental hygienists to provide preventive dental services at community-based locations such as senior centers, congregate meal sites and long-term care facilities through either direct access or teledentistry would also improve access to affordable care. According to the American Dental Hygienists' Association, direct access to dental hygienists for the provision of preventive dental care to vulnerable populations in some form, is now part of the practice act in 42 states, although not all states identify older adults as a vulnerable population.[21] The use of teledentistry to improve access to oral health services is emerging as a practical solution, especially for treatment planning and specialty consultations. Under both systems, dental hygienists could provide a wide range of services including screening, referral, patient education, topical fluorides (including silver diamine fluoride), interim therapeutic restorations, and prophylaxis. For these models to be sustainable, however, Medicaid and private insurance providers must allow dental hygienists to bill for services provided in non-traditional settings.

Developing and implementing strategies to improve the oral health of older adults will require coordination with health care providers, pharmacists and the social service system. In 2016, approximately 95% of older adults reported visiting a physician or other health care professional within the last year.[22] However, 70% of our respondents stated that their physician did not address oral health during these encounters. This is a missed opportunity to address oral health issues with older adults. Many practical aspects of preventive care can be reinforced or initiated in the medical office. In addition, given the increasing prevalence of diabetes and the association between periodontal disease and elevated hemoglobin A1c's, a closer working relationship between medicine and dentistry will evolve.[23-24] As ongoing medical research continues to establish associations between periodontal disease and heart disease, and the risk of systemic infections, the need to

Table IV. Logistic regression results for substantial tooth loss, oral health problems, oral pain, and poor health of teeth

	Substantial Tooth Loss				Oral Health Problems				Oral Pain				Poor Health of Teeth (Dentate Only)			
	Odds Ratio	Lower 95% CL	Upper 95% CL	*p-value* chi-square	Odds Ratio	Lower 95% CL	Upper 95% CL	*p-value* chi-square	Odds Ratio	Lower 95% CL	Upper 95% CL	*p-value* chi-square	Odds Ratio	Lower 95% CL	Upper 95% CL	*p-value* chi-square
Age group (years)																
65- 74 vs. 55-64	1.3	1.0	1.7	NS	0.8	0.6	1.1	NS	0.7	0.5	0.9	0.010	0.7	0.5	1.0	NS
75+ vs. 55-64	2.6	2.0	3.5	<0.001	0.6	0.4	0.8	0.001	0.3	0.2	0.5	<0.001	0.5	0.4	0.8	0.001
Sex																
Female vs. male	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Race/Ethnicity																
Minority vs. White	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	2.4	1.6	3.5	<0.001
Education																
Some college vs. college grad.	2.0	1.4	2.6	<0.001	1.3	1.0	1.7	0.040	NS	NS	NS	NS	NS	NS	NS	NS
High school or less vs. college grad.	3.0	2.2	4.1	<0.001	1.5	1.1	2.1	0.021	NS	NS	NS	NS	NS	NS	NS	NS
Income																
$50,000-$74,999 vs. $75,000+	1.3	0.9	1.8	NS	1.2	0.9	1.8	NS	1.5	1.0	2.2	NS	1.8	1.2	2.8	0.005
$25,000-$49,999 vs. $75,000+	1.3	0.9	1.9	NS	1.2	0.8	1.7	NS	1.3	0.9	1.9	NS	1.9	1.2	2.9	0.003
< $25,000 vs. $75,000+	2.1	1.4	3.1	<0.001	2.2	1.6	3.2	<0.001	3.1	2.2	4.5	<0.001	3.3	2.2	5.1	<0.001
Missing vs. $75,000+	1.3	0.9	2.0	NS	0.6	0.4	1.0	0.037	1.8	1.1	2.8	0.018	1.8	1.1	2.9	0.026
Dental insurance																
No vs. yes	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Dental visit in last year																
No vs. yes	3.6	2.8	4.8	3.6	1.5	1.1	2.1	0.012	NS	NS	NS	NS	4.2	3.0	5.8	<0.001
Number of teeth lost																
1 to 5 vs. none	NA	NA	NA	NA	1.7	1.3	2.2	<0.001	2.3	1.7	3.2	<0.001	2.9	2.1	4.0	<0.001
6 or more but not all vs. none	NA	NA	NA	NA	2.7	1.9	3.9	<0.001	5.4	3.7	7.8	<0.001	9.2	6.2	13.6	<0.001
All vs. none	NA	NA	NA	NA	0.5	0.3	1.0	NS	3.1	1.8	5.1	<0.001	NA	NA	NA	NA

CL=confidence limit, NS=not significant (p≥0.05, Wald chi-square), NA=not applicable

include oral health assessment in routine primary care grows more compelling. Engaging pharmacists to address the oral health impacts of drug-induced xerostomia may also benefit the population that reports having symptoms of dry mouth.

One approach for improving oral health would be to train and incentivize medical professionals to conduct oral health screenings, deliver oral health services such as education and fluoride varnish, and refer for treatment of oral disease, especially for their medically compromised patients. For this strategy to work effectively for low-income older adults, financial and logistical barriers to accessing dental care must be reduced or eliminated. Reducing financial barriers may be accomplished through expansion of Medicaid dental benefits, the delivery of preventive services by dental hygienists at senior centers and increased use of FQHCs.

Reducing logistical barriers and improve care transition and case management, will require engagement with the social service agencies that provide services to older Americans,

often referred to as the national aging network. The Older Americans Act (OAA) was signed into law in 1965, creating the Administration on Aging (AoA). Eight years later, the comprehensive services amendment to the OAA, established Area Agencies on Aging (AAA) to develop and administer comprehensive and coordinated systems of aging services at the local level. Services provided by AAAs include, but are not limited to, nutrition, transportation, case management, and in-home services. In Washington, select AAA's have taken the steps to prevent oral disease among their clients. These interventions include providing oral health education during care transition meetings and oral health questions as part of their care assessment protocol. Any initiative focused on improving the oral health of older Americans should include representatives from the aging network.

Given the changing demographics in the older adult population along with increasing tooth retention, state and federal dental public health programs must expand beyond the oral health services provided to children and begin to focus on the preventive oral health needs of high-risk older adults. A comprehensive Medicare dental benefit would improve overall health and wellbeing for older adults, and has the potential to substantially reduce medical costs over time for beneficiaries with periodontal disease and other chronic conditions. National health reform offers a unique opportunity to reconsider a delivery system that separates oral health care from primary medical care services. Developing a model that integrates the evaluation and treatment of all health care needs, including oral, is a worthwhile goal, and has the potential to control costs, enhance the patient experience of care, and measurably improve population health.

Conclusion

Most older adults in Washington report having good oral health and regular dental care. However, a subgroup, older adults with low-incomes, are at increased risk of oral problems. Improving the oral health of this high-risk population will require continued collection of oral health status data; development and implemention of strategies to reduce financial barriers for dental care; and coordination of treatment with oral health care providers and the aging network.

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