Is Depressive Symptomatology Associated with Worse Oral Functioning and Well-being Among Older Adults?

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Abstract

Objectives: Although depression negatively affects individuals' physical functioning and well-being, its association with oral functioning and well-being has not been examined previously. The objective of this study was to examine the association between depressive symptomatology and oral quality of life. Methods: We utilized data from two samples of older adults: community-dwelling participants who used community primary care physicians in Los Angeles (n=1,653) and individuals who sought ambulatory care through four Department of Veterans Affairs facilities in the Boston metropolitan area (n=212). Depressive symptomatology was measured with the CES-D scale; Oral Quality of Life was measured with the Geriatric Oral Health Assessment Instrument and the Oral Health-related Quality of Life measure. We conducted hierarchical regression analyses to examine the effects of depression on oral quality of life, controlling for self-reported oral health, age, education, income, and marital status. **Results:** Individuals with more depressive symptoms reported worse oral quality of life, controlling for sociodemographic factors and self-reported oral health. This finding persisted across multiple samples and both sexes, and using two measures of oral quality of life. Conclusion: These findings further emphasize the importance of treating depression among older adults, and suggest that both dentists and physicians have a role in recognizing and referring patients for such treatment. [J Public Health Dent 2002;62(1):5-12]

Key Words: oral health, quality of life, depression.

The increased emphasis in medicine on improving patients' quality of life has recently extended to dentistry, where there is now recognition of the limitations of what clinical indices of oral health can reveal about how oral conditions affect individuals' daily lives (1,2). This is an especially important issue among older Americans who bear a particularly high burden of oral disease, a substantial cause of pain and functional disability (3-6). Nearly all dentate elders (99%) suffer from dental caries (4), and total tooth loss (edentulism) affects nearly onethird of adults aged 65-74 years and more than 40 percent of adults aged 75 years and older (7). Periodontal diseases also affect a majority of older Americans, with more than 86 percent having at least one tooth with evidence of periodontal disease (4).

The growing interest in the extent to which oral conditions affect individuals' daily lives, referred to as oral quality of life (OQOL), has fostered a growth in OQOL measures (8-14). However, little is known about how psychosocial factors such as mental health may affect individuals' scores on such measures. It is known that depression has a strong negative impact on individuals' physical functioning and emotional well-being, leading to decrements in daily activities, as well as lost work time (15,16). The effects of depression on physical functioning and well-being are comparable to or worse than decrements associated with eight major chronic medical conditions, including hypertension, diabetes, advanced coronary artery disease, angina, arthritis, back problems, lung problems, and gastrointestinal disorders (17). Further, among specific patient groups such as asthma patients, depressed individuals' health-related quality of life is worse (18).

Because depression clearly affects many dimensions of physical functioning and emotional well-being, it seems likely that depression also affects oral functioning and well-being. It is known that individuals with more depressive symptomatology rate their oral health worse (19); however, the association of depression with multidimensional evaluations of the impact of oral problems on functioning and well-being has not yet been examined. Such associations are particularly important to understand among older adults, because both the prevalence of depression (20) and the burden of oral disease (3,5,6,21) increase with age.

Perceived well-being may be viewed as an underlying dimension of the broad construct of quality of life. Insofar as quality of life is affected by mental well-being (among many other factors influencing this outcome, including social support, adequate income and housing, physical and oral health), and one component of mental well-being is depression, there would likely be an association between depression and quality of life. However, because the focus of the present analyses is on oral quality of life (how oral

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conditions affect one's functioning and well-being), which is distinct from health-related quality of life (10), and further still from general quality of life, one would expect associations between depression and oral quality of life to be small. It is also important to note that oral quality of life instruments focus respondents on describing how their oral conditions or problems with their teeth and gums affect their functioning and well-being. Accordingly, one would expect that any detected associations between depression and OQOL would be rather weak because of the distant relationship between the constructs.

Following Locker's conceptual model of oral health (22), we would expect that oral health problems would lead to depression and subsequently to worse OQOL, rather than vice versa. For example, individuals with chronic oral pain might become depressed, or those with difficulty chewing or speaking might experience a sense of loss or feelings of depression because of these functional limitations. Depression subsequent to discomfort or functional limitations could then lead to worse perceptions of oral quality of life, as has been documented in studies examining the association between depression and health-related quality of life (18).

Thus, the purpose of this study was to examine the association between depressive symptomatology and oral quality of life. We hypothesized that individuals with more symptoms of depression would report worse oral quality of life, particularly on dimensions of quality of life oriented more toward mental/emotional functioning than toward physical functioning. We drew on data from two different samples of older adults, including both men and women, and used two different measures of oral quality of life, reasoning that replication across different samples and measures would provide stronger support for any significant associations detected.

Methods

Samples. The first sample utilized in this study was the Medicare Screening and Health Promotion Trial (MSHPT), a study conducted in Los Angeles in 1989 for which communitydwelling participants were recruited through their primary care physicians. Individuals were eligible for the study if they were at least 65 years of age, participated in Medicare, spoke English, had no dementing or terminal illness, and had a telephone (23,24). A total of 1,911 individuals met the inclusion criteria and completed the first telephone survey, which included the measures included in this study. The present study includes data from the 913 women and 740 men in the final MSHPT sample who had complete data on the variables of interest. This study was approved by the Institutional Review Board of the University of California at Los Angeles.

The second sample was drawn from the Veterans Health Study (VHS), an ongoing longitudinal study of health and quality of life in 2,425 male ambulatory care patients, begun in 1993 (25). VHS participants, who have a median age of 65 years, were identified at four Department of Veterans Affairs (VA) outpatient clinic sites in the metropolitan Boston area, and they were eligible if they had been a patient in the clinic at any time in the prior year. This allmale sample is nearly representative of the sampling frame of all users of VA ambulatory care services. All VHS participants completed the depression measure as part of their study participation, and a subset of 538 completed the oral quality of life measures as part of an auxiliary study on oral health and quality of life. To facilitate comparisons with the MSHPT sample, we selected from the subsample of 538 only VHS participants aged 65 years and older for these analyses (n=271). We then selected individuals who had completed the depression measure in the year prior to completing the two different oral quality of life measures. Thus, we had data available on 212 and 206 VHS participants for the two oral quality of life instruments, respectively. This study was approved by the Human Studies Subcommittee of each of the four VA facilities from which participants were recruited.

Measures. The Geriatric Oral Health Assessment Instrument (GO-HAI) (8) is made up of 12 items reflecting three hypothesized dimensions, or domains of impact of oral disease: (1) physical function (e.g., ability to bite and chew); (2) psychosocial function (e.g., satisfaction with appearance, worries or concern about oral health, inhibition of social contacts due to such concerns); and (3) pain or discomfort (either with eating or with sensitivity to hot, cold, or sweets). The total GOHAI score is derived by summing the scores on each of the items, after reversing scores on three items. Thus, a higher total GOHAI score reflects better oral functioning and wellbeing. For respondents who answered 10 or 11 items, sample-specific item means were substituted for missing responses. Respondents missing more than two items were deleted from the analysis sample. Atchison and Dolan had originally reported results from the MSHPT with the GOHAI items that had been scored on a six-point scale (always, very often, often, sometimes, seldom, never). Because the VHS GOHAI responses were scored on a three-point scale (always, sometimes, never), for purposes of comparability the MSHPT results were recoded, as has been previously described (26). We utilized both the entire GOHAI scale and scores for three subscales based on the above dimensions as dependent variables for our analyses.

The Oral Health-related Quality of Life (OHQOL) measure is a brief global assessment of the impact of oral conditions on an individual's functioning and well-being (10,27), which was administered to the VHS sample only. The three items comprising the measure assess the extent to which problems with teeth or gums influenced an individual's daily activities, social interactions, or avoidance of conversations. Item response choices were all of the time, most of the time, some of the time, a little of the time, and none of the time. The scale score is the mean of the three items.

The measure of depression used in this study is the Center for Epidemiologic Studies Depression Scale (CES-D) (28). This well-validated instrument includes 20 symptoms assessing a depressive disorder, rated on a four-point scale from rarely or none of the time to most or all of the time. Scores for the four positively worded items were reversed, and a total score was derived by summing the item responses. Thus, higher scores indicate greater levels of depressive symptomatology. Following Radloff (28), we used a cutoff of 16 or greater as the criterion for a depressive disorder. We used both continuous and dichotomous scores from the CES-D, depending on the analysis.

Because previous research has

shown that self-reported oral health is associated with both depression (19) and oral quality of life (26), we controlled for it in our analyses. Self-reported oral health was measured in both samples using a single item with five response choices including excellent, very good, good, fair, or poor, with a higher score indicating worse oral health.

We also controlled for sociodemographic factors, including education (dichotomized to ≤ 12 years, or >12years), income (categories: <5,000, \$5,000-\$9,999, \$10,000-\$19,999, \$20,000-\$29,999, \$30,000-\$39,999, \$40,000-\$49,999, >\$50,000), age, and marital status (married or not).

Analyses. For each study sample (and by sex in the MSHPT), we calculated descriptive statistics for each variable, and Pearson Product Moment Correlations among all independent and dependent variables. Within each sample, we conducted Student's t-tests to examine differences in oral quality of life between individuals classified as depressed or not. Finally, we conducted ordinary least squares regression analyses to examine the association of depressive symptoms with oral quality of life, controlling for age, education, income, marital status, and self-reported oral health. These regressions were conducted in two steps: in the first we included only the control variables, and in the second we added depression, to determine its unique contribution to the variance in oral quality of life measures.

		scriptive ou				
S	ample	Ν	Mean*	SD	Minimum	Maximum
7	'HS	227	71.3 ^A	4.9	65	90
Ν	/ISHPT men	740	73.2 ^B	5.1	65	94
r	ASHPT women	913	74.0 ^C	5.7	65	94
on v	'HS	227	0.07 ^A	0.26	0	1
vears, $1=\geq 17$ years	ASHPT men	740	0.19 ^B	0.39	0	1
l	/ISHPT women	913	0.09 ^A	0.28	0	1
v	'HS	227	3.7 ^A	1.3	1	7
1	/ISHPT men	740	5.1 ^B	1.6	1	7
1	/ISHPT women	913	4.2 ^C	1.7	1	7
(1=yes, 0=no)	'HS	227	0.7 ^A	0.5	0	1
l	/ISHPT men	740	0.8^{B}	0.4	0	1
1	ASHPT women	913	0.4 ^C	0.5	0	1
orted oral healtht	/HS	227	3.2 ^A	0.9	1	5
1	ASHPT men	740	2.7 ^B	1.2	1	5
1	/ISHPT women	913	2.9 ^B	1.2	1	5
ive symptoms (CESD)†						
ing above cutoff: 15%	/HS	227	9.0 ^A	8.1	0	48
ing above cutoff: 7%	/ISHPT men	740	5.6 ^B	6.5	0	43
ing above cutoff: 16%	ASHPT women	913	8.2 ^C	8.2	0	47
4	/HS	212	4.6	0.7	2	5
ľ	/HS	206	31.8 ^A	3.9	19	36
I	ASHPT men	740	33.4 ^B	2.9	14	36
1	/ISHPT women	913	32.8 ^C	3.3	15.2	36
subscales						
al function	/HS	206	10.7 ^A	1.5	5	12
I	ASHPT men	740	11.3 ^B	1.2	4.4	12
J	ASHPT women	913	11.1 ^C	1.3	4	12
osocial function	/HS	206	13.3 ^A	2	6	15
]	ASHPT men	740	13.9 ^B	1.4	5	15
]	ASHPT women	913	13.6 ^C	1.6	5.4	15
r discomfort	/HS	206	7.8 ^A	1.1	3	9
]	ASHPT men	740	8.2 ^B	1	3	9
]	∕ISHPT women	913	8.1 ^B	1	4.2	9
]	ASHPT men ASHPT women	740 913	8.2 ^B 8.1 ^B	1 1	3 4.2	

TABLE 1 Descriptive Statistics

*Different superscript letters indicate samples are significantly different from one another.

tHigher scores in depression and self-reported oral health represent worse health.

‡OHQOL=Oral Health-related Quality of Life.

GOHAI=Geriatric Oral Health Assessement Instrument.

Results

To examine the representativeness of our analysis samples with respect to their parent studies, we conducted a series of t-tests contrasting the participants in our analyses to those excluded from the analyses because they did not have complete data. In the VHS, we first compared the 538 participants in the ancillary oral health study from which these data were drawn, to the other participants in the VHS with respect to age, education, income, and marital status, finding no significant differences. The present sample had fewer current smokers

(21% vs 28%). Because smoking is generally associated with poorer oral health, less tobacco use among participants in our sample may mean these individuals have better oral health than the rest of the VHS sample. Then we compared the participants in the present analyses to the other partici-

Correlations among Independent and Dependent Variables											
Sample	Age	Educ	Income	Married	S-R OHS*	Depress	GOHAI	Physt	Psych‡	Pain¶	
Education											
VHS	0.01										
MSHPT men	-0.04										
MSHPT women	0.04										
Income											
VHS	0.04	0.06									
MSHPT men	-0.11	0.23									
MSHPT women	-0.18	0.20									
Married?											
VHS	0.03	-0.13	0.28								
MSHPT men	-0.07	-0.03	0.31								
MSHPT women	-0.26	0.02	0.46								
S-R OHS*											
VHS	-0.01	-0.02	-0.14	-0.13							
MSHPT men	-0.01	-0.12	-0.16	-0.07							
MSHPT women	0.00	-0.08	-0.25	-0.06							
Depression											
VHS	-0.06	0.18	-0.13	-0.03	0.02						
MSHPT men	0.09	-0.04	-0.20	-0.22	0.14						
MSHPT women	0.01	-0.06	-0.23	0.16	0.23						
GOHAI											
VHS	-0.02	-0.05	0.09	0.10	-0.43	-0.38					
MSHPT men	0.01	0.11	0.24	0.14	-0.49	-0.30					
MSHPT women	-0.02	0.07	0.25	0.08	-0.49	0.37					
Physt											
VHS	-0.11	-0.02	0.04	0.13	-0.28	-0.35	0.83				
MSHPT men	0.02	0.12	0.25	0.15	-0.38	-0.26	0.85				
MSHPT women	-0.07	0.06	0.27	0.09	-0.41	0.30	0.86				
Psych‡											
VHS	0.04	0.09	0.09	0.05	-0.46	-0.29	0.90	0.61			
MSHPT men	0.01	0.08	0.16	0.09	-0.50	-0.24	0.87	0.61			
MSHPT women	0.02	0.05	0.20	0.07	-0.47	-0.32	0.90	0.65			
Pain¶											
VHS	0.02	0.01	0.09	0.07	-0.26	-0.30	0.70	0.40	0.48		
MSHPT men	-0.01	0.08	0.18	0.11	-0.30	-0.23	0.71	0.43	0.41		
MSHPT women	0.00	0.07	0.16	0.02	0.32	-0.32	0.72	0.47	0.48		
OHQOL											
VHS	0.01	0.02	0.03	0.02	-0.34	0.38	0.46	0.38	0.42	0.30	

TABLE 2

Significant correlations are shown in boldface type. Correlations among VHS men ≥ .13 are significant at P<.05. Correlations among PTH women \geq .07 are significant at P<.05. Correlations among PTH men \geq .07 are significant at P<.05.

*Self-reported oral health status.

tGOHAI physical function.

‡GOHAI psychosocial function.

¶GOHAI pain or discomfort.

pants in the ancillary oral health study who were 65 years of age and older who were missing some data, and found that they were also similar with respect to the same variables. In the MSHPT, we compared the 913 women in the present analyses to the other women in the parent study, and the 740 men in the present analyses to the other men in the parent study. The only significant difference we found was that the women in the analysis sample were slightly younger than those who were excluded (74 vs 75.6 vears, $P \leq .001$). Thus, our analysis samples were largely representative of the parent studies from which they were drawn.

As has been noted previously (26), there are numerous differences between the VHS and MSHPT samples; the VHS is all men, and they are on average younger, less educated, with lower income, worse self-reported oral health, and lower (worse) GOHAI scores. In this study we found that the VHS also has notably higher levels of depressive symptomatology, as shown in Table 1. The MSHPT men had the lowest scores on depressive symptomatology and the highest scores on the GOHAI and its subscales.

As shown in Table 2, in correlational analyses, we found that the continuous variable of depression was moderately correlated with the two oral quality of life measures used in this study (r's ranging from -.30 to -.38), as well as with the GOHAI subscales (r's ranged from -.23 to -.34). In comparison, the correlations between self-reported oral health and the oral quality of life measures were slightly higher (absolute values of r's between .34 and .49), as was the correlation between the two oral quality of life measures (r=.46).

We divided each sample into participants who did or did not exceed the cutoff for depression, then compared the mean oral quality of life scores between these two groups, using t-tests. As shown in Table 3, across both samples, the depressed individuals scored worse on each oral quality of life measure. When we examined the extent to which OQOL scores differed between depressed and nondepressed individuals, we found that depressed individuals had OQOL scores that ranged from 71 percent (GOHAI among MSHPT men) to 106 percent (GOHAI among VHS men) of a pooled standard deviation worse than nondepressed individuals. For example, for men in the VHS, the difference in OHQOL scores between depressed and nondepressed men was 93 percent of the pooled standard deviation for OHQOL.

We then conducted ordinary least squares regression analyses to examine the relationship between levels of depressive symptomatology and oral quality of life, controlling for age, education, marital status, income, and self-rated oral health. In each sample and with both oral quality of life measures, we found that depressive symptoms were consistently negatively associated with oral quality of life, explaining an additional 4-15 percent of the variance, beyond that contributed by the control variables. Again, we found that depressive symptoms explained the most variance in oral quality of life in the VHS sample, where mean levels of depression were highest, and the least among the MSHPT men, where mean levels of depression were lowest. When we examined the association of depression with the GO-HAI subscales in the MSHPT we found that among the women, depression was most strongly associated with the pain dimension, followed by the psychological dimension, and least with the physical functioning dimension, although among the men the amount of variance explained by depression was equal among the subscales. In the VHS, depressive symptoms accounted for slightly more variance in the OHQOL than in the GOHAI (Table 4). Among the GOHAI subscales, depression accounted for the most variance in the physical functioning scale, followed by the pain and then the psychological functioning scale.

Discussion

The purpose of this study was to examine the association of depressive symptomatology with oral quality of life among older adults, controlling for sociodemographic factors and selfperceived oral health. Drawing on data from three different samples in two studies, and using two oral quality of life measures, we found that individuals with more depressive symptoms consistently reported worse oral quality of life. Across all samples, the link between depressive symptoms and oral quality of life was strongest among the male VHS participants (with depression explaining more than twice the variance explained in the MSHPT), who had more depressive symptoms and worse oral quality of life. Veterans using VA care have substantially worse health status than non-VA populations (25), and this

			· · · - · ·							-			
		VHS OHQOL GOH. Phys Psych 4.04 28.31 9.40 11.88 4.69 32.43 10.92 13.54 93 106 101 83 204 204 204 204 3.83 4.89 5.36 4.49				MSHPT Women				MSHPT Men			
	OHQOL	GOH.	Phys	Psych	Pain	GOH.	Phys	Psych	Pain	GOH.	Phys	Psych	Pain
Depressed	4.04	28.31	9.40	11.88	7.03	30.52	10.34	12.65	7.52	31.45	10.73	13.04	7.68
Not de- pressed	4.69	32.43	10.92	13.54	7.98	33.31	11.24	13.83	8.25	33.51	11.34	13.98	8.20
Difference as % SD	93	106	101	83	86	85	69	74	73	71	51	67	52
DF	204	204	204	204	204	911	911	911	911	740	740	740	740
t	3.83	4.89	5.36	4.49	3.44	7.51	6.08	6.28	7.35	5.16	2.97	3.95	3.88
P-value	.0005	.0001	.0000	.0000	.0015	.0001	.0001	.0001	.0001	.0000	.0043	.0002	.0001

 TABLE 3

 Differences in Oral Quality of Life Scores Between Individuals Classified as Depressed or Not

Note: Higher OHQOL and GOHAI scores represent better oral quality of life.

			-										
		VHS											
	DV=OHQOL		DV=GOHAI		DV=Physical		DV=Psychosocial		DV=Pain				
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2			
S-R OHS	-0.26	-0.26	-1.78	-1.77	-0.45	-0.45	-1.01	-1.01	-0.31	-0.31			
Depression		-0.03	_	-0.18		0.07		-0.06	—	-0.04			
F	5.45	12.58	9.21	15.61	4.31	9.40	11.88	14.10	3.12	6.45			
DF	5, 206	6,205	5, 200	6, 199	5,200	6, 199	5,200	6, 199	5,200	6, 199			
Model R ²	0.12	0.27	0.19	0.32	0.10	0.22	0.23	0.30	0.07	0.16			
R ² change		0.15		0.13		0.12		0.07		0.09			

TABLE 4 Regressions of Independent and Control Variables on Oral Quality of Life Outcomes

		MSHPT Men								
	DV=C	OHAI	DV=P	hysical	DV=Psy	chosocial	DV=	=Pain		
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2		
Income	0.26	0.21	0.12	0.11	0.07		0.07	0.05		
Married?	0.51		0.23							
S-R OHS	-1.14	-1.09	-0.35	-0.33	-0.57	-0.55	-0.22	-0.21		
Depression		-0.09		-0.03		-0.03		-0.03		
F	55.68	56.04	33.89	33.8	50.26	47.15	18.03	19.31		
DF	5, 734	6,733	5,734	6, 733	5,734	6, 733	5,734	6, 733		
Model R ²	0.28	0.31	0.19	0.22	0.26	0.29	0.11	0.14		
R ² change		0.04		0.03		0.03		0.03		

	MSHPT Women										
	DV=GOHAI		DV=Physical		DV=Psy	chosocial	DV=Pain				
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2			
Income	0.28	0.20	0.14	0.12	0.09		0.06				
Married?											
S-R OHS	-1.22	-1.09	-0.39	-0.35	-0.60	-0.54	-0.23	-0.19			
Depression	_	0.11		-0.03		-0.04		-0.03			
F	64.58	72.59	45.34	45.88	55.17	57.66	22.78	31.84			
DF	5, 907	6,906	5,907	6,906	5, 907	6,906	5, 907	6,906			
Model R ²	0.26	0.32	0.20	0.23	0.23	0.28	0.11	0.17			
R ² change		0.06		0.03		0.05		0.06			

Age, education, income, marital status, self-reported oral health, and depression (Model 2 only) were forced into the model; only those significant at $P \le 0.05$ are shown. Shown are unstandardized parameter estimates. All changes in \mathbb{R}^2 are significant at P < .001. All models are significant at or beyond $P \le .01$.

greater morbidity likely also contributed to the stronger associations observed here. Similarly, within the MSHPT, depressive symptoms explained more variance in oral quality of life among the women, where there were more depressive symptoms and worse oral quality of life, than among the men.

The association of depression with the GOHAI subscales was constant and small among the MSHPT men, but was slightly larger and varied across the subscales for the women in the hypothesized directions. That is, depression was least associated with physical functioning and most strongly associated with the psychological functioning subscale, as we had expected. Conversely and surprisingly, in the VHS, depression was most strongly associated with the physical functioning and least with the psychological functioning subscales of the GOHAI. Perhaps this is due to worse oral health and different values on oral health in this sample.

The differential associations between depression and oral quality of life across the samples has potential implications for future research where samples with varying levels of depressive symptomatology might be used. Researchers will need to recognize that the link between these two constructs likely may vary according to the sample's level of depressive symptomatology, underlying oral health status and values on oral health.

The CESD scores for the VHS (mean=9.0) were significantly higher than those in either the MSHPT women (mean=8.2) or men (mean= 5.6); however, the VHS scores are largely consistent with those found in other community-dwelling samples (29). The fact that the MSHPT women had a higher mean score than the men is also consistent with other studies in the literature (30,31). Individuals hospitalized with clinical depression or other psychiatric diagnoses score in the low to mid-20s on the CES-D (32,33), and those with chronic diseases have worse CES-D scores, depending on the specific condition (34). The fact that a similar percentage of MSHPT women and men from the VHS scored above the CES-D cutoff is somewhat surprising, given the women's higher mean scores and the general increased tendency of women to receive diagnoses of depression (30,31). However, this sample may not be entirely representative of the general population, given that they were selected based on the fact that they had insurance coverage and used medical care.

To determine whether statistically significant differences in OQOL scores had any clinical relevance, we looked at GOHAI scores by levels of self-reported oral health. Self-reported oral health status is known to be associated with multiple dimensions of clinically assessed oral health status, including root and coronal caries, tooth mobility, number of teeth, and DMF scores (19,35,36). We found that GOHAI scores were similarly high (a mean of 32-35) among individuals reporting excellent, very good, and good oral health, but that they dropped by one or two points among individuals reporting fair oral health and dropped by another two to five points among individuals reporting poor oral health (results not shown). Thus, the observed differences in GOHAI scores between men and women in the MSHPT are probably not clinically significant, but the lower mean scores in the VHS represent the difference between excellent, very good, or good oral health and fair oral health, a clinically significant difference.

The correlational results (Table 2) showed that depression and self-rated

oral health were not correlated in the VHS as they were in the MSHPT women and men. This could reflect decreased salience of oral health on one's mental health in the VHS. Insofar as less socioeconomically advantaged individuals value oral health less than do more advantaged individuals (or those who have other more urgent needs to address), its impact on mental health and specifically depression could be attenuated.

The fact that the GOHAI and OHQOL measures were moderately correlated in the VHS provides some validation of the measures, supporting the notion that some similar underlying constructs are being assessed by each. This is consistent with our previous work, which has suggested that the two measures assess similar, but not identical, constructs (37).

The association between depression and the study covariates ranged from none (in two of three samples with age, and one sample each with education, marital status, and self-reported oral health) to small (range=.09–.23). The presence of these small but significant associations provides justification for our inclusion of these variables in the subsequent regression models.

The most variance due to depression was found in the OHQOL measure, the more global assessment of oral functioning and well-being, although the amount of variance explained by the GOHAI was only two percentage points lower. Because the OHQOL assesses more general aspects of oral quality of life, rather than the specific aspects measured by the GOHAI, one interpretation of this finding is that depression is more strongly associated with the more subjective outcome measure.

One question these results cannot fully resolve is whether depression is causing worse oral quality of life or whether it is simply influencing patients' reports of oral quality of life. To the extent that depression is more strongly associated with the more subjective OHQOL measure, the latter interpretation might be more correct, consistent with the "symptom perception hypothesis" (38), whereby individuals with depressed and negative views are more likely to perceive or complain about health concerns. However, regardless of the mechanism by which oral quality of life is worsened for individuals with more depressive symptomatology, the outcome remains the same: worse oral quality of life.

Although the MSHPT data were cross-sectional and therefore limited our ability to make causal inferences about the association of depressive symptoms with oral quality of life, the VHS data were temporally ordered (e.g., depression was measured before OQOL) and do support the notion that individuals with more depressive symptoms subsequently have worse oral quality of life. This finding minimizes the likelihood of other possible interpretations of the data, e.g., that worse oral quality of life may lead to increased depressive symptomatology; however, we did not have repeated measurements of either depression or OQOL with which to fully test this possibility. We were also limited by our reliance on self-report data, as there is likely a correlation between the independent and dependent measures due to common method variance. Although widely used in health services research, self-report measures are incomplete assessments of health.

This study was limited by its reliance on samples including only older adults who have access to medical care. The generalizability of these findings to younger individuals is thus not known. The study analyses also lacked information on use of antidepressant medication use, a potential influence on oral health status through xerostomia or other mechanisms. Future studies would benefit from the inclusion of such information.

The results from this study echo those found in the literature on physical functioning and well-being, which has documented that depressed individuals' functioning and well-being is compromised as much or more than that of individuals with chronic medical conditions (17,18,39). Thus, the present results indicate that depressive symptoms may also be an important risk factor for compromised oral health and well-being, suggesting that treatment for depression might have important ramifications for other domains of functioning and well-being, beyond those previously identified. These results lend further support to Locker's conceptual model of oral health (22). The present findings support the notion that depression, one element of psychological well-being,

is an important component of disability, and extend previous findings by documenting the association between disability and the ultimate outcome of handicap, or quality of life.

These results highlight the importance of identifying and treating depression among older adults, a goal that is well-recognized in the medical care system. These findings suggest that dentists might also have both a stake in and a role to play in identifying and referring depressed patients for treatment. To the extent that dentists become aware that depression is negatively associated with oral quality of life, they may be increasingly motivated to provide referrals for such treatment. Finally, regardless of the causal mechanisms of the association between depression and oral quality of life, it would be well for physicians, who identify and treat depressed patients, to ensure that they also receive necessary treatment for oral conditions.

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