Socioeconomic and Demographic Disparities in Symptoms of Orofacial Pain

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Abstract

Objectives: *The purpose of this study was to document the association between socioeconomic status (SES) and the prevalence and impact of orofacial pain by anatomical location. In addition, differential effects of SES on orofacial pain across levels of sex, race, and age were documented.* ***Methods:*** *The subjects were 724 participants in the Florida Dental Care Study, a study of oral health among dentate adults, aged 45 years and older at baseline. Pain prevalence and subjective ratings were assessed for a range of orofacial pain sites using a standardized telephone interview.* ***Results:*** *Lower SES was associated with reporting pain and pain impact at many, but not all, of the orofacial sites. Some sex, race, and age cohort differences in orofacial pain were found when adjusting for differences in socioeconomic position. The most consistent result, as evidenced by similar findings across orofacial pain sites, was that the effects of SES on orofacial pain appear to have a sex-differentiated effect.* ***Conclusion:*** *Consistent with findings for other subjective measures of oral health, persons of lower SES are at increased risk for orofacial pain and pain-related behavioral impact. [J Public Health Dent 2003;63(3):166-73]*

Key Words: orofacial pain, behavioral impact, race/ethnicity, sex differences, socioeconomic status, pain epidemiology.

Studies have demonstrated that socioeconomic status (SES) is associated with a variety of health outcomes (1-3), and that these differentials exist in many societies (4) and income levels (5). These inequalities in health are thought to occur as the result of interactions among environmental, psychosocial, and biological factors (4,6,7). Because oral health is a component of overall health, one would expect an association between SES and objective measures of oral health, as well. Miller and Locker (8) demonstrated that household income was predictive of tooth loss in a sample of 500 dentate subjects. Educational attainment was found to be an indicator of the number of decayed and filled teeth in a sample of Swedish adults (9). In a review of epidemiologic studies, Caplan and Weintraub (10) concluded that the 25 percent of children with the most dental caries are typically minority, rural children, and those from less educated or poorer families.

Studies have also reported a relationship between SES and subjective measures of oral health. Gift et al. (11) found that those of lower income and educational attainment reported the most days of restricted activity and lost work hours as the result of poor oral health. Atchison et al. (12) demonstrated an association between socioeconomic variables and composite measures of subjective oral health even among disadvantaged Hispanic and African-American adults. However, other studies have not found differences. Gilbert et al. (13) reported that poor persons, blacks, and irregular dental care users reported the greatest oral disadvantage, as defined by avoidance of certain activities because of decrements in oral health. However, in multivariable analyses that accounted for a number of signs and symptoms of oral disease and several demographic variables (i.e., race, sex, age), differences were not found for SES. Tickle et al. (14) reported that a group from a lower SES municipality in the United Kingdom was more likely to report difficulty chewing than those from an affluent area (41% to 23%), but no difference was found in the percentages with oral pain (36% and 34%). In a multivariable model, Tickle found that psychosocial impacts (eating, communications, activities of daily living, etc.) were predicted by pain and chewing problems, whereas place of residence, educational attainment, dentate status, and patterns of dental care were not significant. The authors suggested that an individual's socioeconomic circumstances were of secondary importance to pain and functional problems in determining the effects of oral conditions.

Although the impact and prevalence of orofacial pain has been documented (15-18), there are very few studies that have examined the effects of low SES on the prevalence and severity of orofacial pain. Oral pain is a common symptom for many of the conditions affecting the oral and facial structures, and is estimated to occur in 22 percent of adults 18 years of age and older in the US population in a six-month period (18). One large epidemiologic study has indicated that lower SES is a risk factor for toothache pain (19). Among persons 20–64 years old living below the poverty level, the six-month prevalence of toothache pain was 22.6 percent, compared to 13.8 percent for those at or above the poverty level. In multivariable models, poverty status, not having dental insurance, and fewer years of formal education were risk factors for the group 20–64 years of age, whereas for the 65+ group, reporting race/ethnicity as non-Hispanic black

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was the only significant predictor. However, a population-based study of residents of Sweden did not find associations between having a toothache in the past year and several SES-related indicators (9).

Disparate findings also have been reported for jaw pain. In an epidemiologic study of Canadian citizens, Goulet et al. (20) did not find an association between jaw pain and education or family income. However, Dworkin et al. (21) reported that among HMO members, those with jaw pain were more likely to have an annual family income of under $35,000, and not to have graduated from college, compared to those without jaw pain. Consequently, there is conflicting evidence whether lower SES is associated with the development or maintenance of orofacial pain.

The purpose of this study was to test whether socioeconomic variables are associated with reporting orofacial pain or pain impact by anatomical location, in the participants of the Florida Dental Care Study (13). Secondly, we tested whether the effects of SES on orofacial pain can account for the reported association between demographic factors and oral disease (11-13), including orofacial pain (18,19). Further, we tested whether the effects of SES on orofacial pain differ across levels of sex, race, and age.

Methods

Sampling Methods. Data were taken from the Florida Dental Care Study (FDCS), a prospective longitudinal study of oral health and dental care of adults aged 45 years old and older at baseline. The goal of the sampling design was to ensure that a large number of persons at a hypothesized increased risk for dental health decrements would be included (namely, blacks, residents of rural areas, persons who were aged 45 years or older, and the poor). Four counties in north Florida were selected because they provided an urban/rural contrast, had large percentages of blacks, older adults, and poor individuals because they were geographically proximate and near the administrative base for the project. A telephone screening methodology was used to identify a random sample of subjects in households with telephones who: (1) resided in one of the four counties of interest; (2) spoke English; (3) were capable of engaging in a cogent telephone conversation; (4) resided in a household, in contrast to a congregate facility; (5) reported race as African American or non-Hispanic white; (6) had at least one remaining natural tooth; and (7) were 45 years of age or older. Details of sampling methodology and selection procedures are provided in an earlier publication (22).

The 873 subjects who participated at baseline had a dental care recency that was similar to 1989 NHIS data, and conclusions drawn from the FDCS and the NHIS regarding sociodemographic determinants of dental care recency were the same (22). Additionally, 77 percent of the sample had one or more dental visits in the first two years of the study (22). This rate is also very similar to the 75 percent of the comparable group of 1989 NHIS respondents who reported having had one or more dental visits within a two-year period (23).

Although the study began at baseline in August of 1993 to April 1994 with 873 participants, by 42 months, 724 participants (unweighted) remained in the study and participated in the telephone interview. Demographic information for the 724 participants is presented in Table 1. Of the 149 persons who did not participate for the 42-month telephone interview, 52 were deceased, 40 refused, 16 were medically unable to participate, and 41 were unreachable. To evaluate the potential for bias as a result of subject attrition, characteristics of those who participated at 42 months in the interview were compared with those who did not. Persons who participated were more likely to have graduated from high school [χ^2 (1)=6.775; P=.009], received regular dental care [χ^2 (1)=7.93.5; P=.005], reported an income in excess of $20,000 per year [$\chi^2$ (1)=7.817; P=.005], had the ability to pay an unexpected $500 dental bill [$\chi^2$ (2)=6.602, P=.037], and reported better self-rated general health [t=4.203; P<.001]. No differences were observed with respect to race, age group, sex, area of residency, or present financial situation.

Interview Methods. An in-person interview was conducted at baseline, which was immediately followed by a clinical dental examination. The baseline interview and clinical examination were followed by telephone interviews at 6, 12, 18, 30, 36, and 42 months following the baseline. The 42-month interview included items related to orofacial pain symptoms experienced over the previous six months, and these results are described in the current paper. Several items were

TABLE 1
Demographic Variables Across Sex, Age Group, and Race

Demographic Variables	Sample Size	Rural Residence (%)	High School Graduate (%)	Income >$20,000 (%)	Have Dental Insurance (%)	Percent Female	Over 65 Years Old (%)
Sex							
Males	321	51	83	70	36	—	38
Females	429	49	79	45	34		42
Age (years)							
45–64	447	48	85	62	41	56	
65+	302	53	73	46	25	59	—
Race							
Black	194	63	56	31	296	60	41
White	552	45	89	64	36	56	40

adapted from the orofacial pain supplement of the 1989 NHIS (18). Other items were those periodically asked during the FDCS. Questionnaires can be viewed at the FDCS Internet site noted in the Acknowledgments section.

Measures. The following questions assessed six-month symptom prevalence:

Jaw Joint Pain. In the past six months, did you have pain in the jaw joint or in front of the ear?

Face Pain. In the past six months, did you have a dull aching pain across your face or cheek?

Painful Oral Sores. In the past six months, did you have painful sores or irritations around the lips or in your mouth?

Temperature Sensitivity. In the past six months, have you had teeth that are sensitive to hot or cold fluids?

Pain When Chewing. In the past six months, have you had tooth pain while chewing?

Toothache. In the past six months, did you have toothache pain?

Burning Mouth. During the past six months, have you had a burning sensation in your tongue or any other part of your mouth?

Present Financial Status. The ordinal response choices were: Can't make ends meet, I manage to get by, I have enough to manage plus some extra, Money is not much of a problem ... I can buy whatever I want.

Ability to Pay an Unexpected $500 Dental Bill. The ordinal response choices were: Able to pay comfortably, Able to pay but with difficulty, Not able to pay the bill.

Educational Achievement. What was the highest level of formal school you completed? The data were divided into the following ordinal categories: Eighth grade or less, Some high school, High school graduate, Some college, College graduate.

Dental Insurance. Some people have dental insurance that pays for part of their dental bills, such as from an employer, Medicaid, or the VA. Are you covered by any such dental insurance program?

TABLE 2
Socioeconomic Indicators for FDCS Sample

Variable	Response %	Response *n*
Educational attainment		
8th grade or less	10.4	78
Some high school	9.1	68
High school graduate	27.2	204
Some college	29.1	217
College graduate	24.3	182
Missing	<1.0	1
Unexpected dental bill		
Able to pay comfortably	48	365
Able to pay, but with difficulty	39	292
Not able to pay the bill	13	95
Missing	<1.0	2
Present financial status		
Money is not much of a problem, I can buy about whatever I want	16	122
I have enough to manage, plus some extra	36	271
I manage to get by	43	321
Can't make ends meet	4	28
Missing	<1.0	8
Dental insurance		
Yes	35	259
No	65	490
Missing	<1.0	1

TABLE 3
Correlation Coefficient Between Measures of SES and Orofacial Pain Prevalence and Behavioral Impact from Pain

	Toothache Pain	Temperature Sensitivity	Pain when Chewing	Painful Oral Sores	Jaw Joint Pain
Prevalence					
Financial status	0.13*	0.05	0.08†	0.15*	0.03
Education	0.11*	0.02	0.07	0.07	-0.09†
Dental insurance	0.02	0.02	0.04	0.08†	0.02
Pain impact					
Financial status	0.25†	0.30*	0.31†	0.23†	0.29*
Education	0.24†	0.17†	0.23	0.07	0.07
Dental insurance	0.08	0.15†	0.07	0.13	0.08

*$P<.01$.

† $P<.05$.

The financial status and education variables were coded such that higher numbers reflect lower financial status and educaitonal attainment and the pain variables are coded 0=no pain or impact and 1=pain or pain impact.

TABLE 4
Estimates of Odd Ratios for Orofacial Pain Risk Factors by Symptom Education

Model of Prevalence		Model for Pain Impact	
Risk Factors	Coeffients	Risk Factors	Coefficients
Toothache pain			
Financial status	1.2 (1.1, 1.5)*	Sex	2.1 (1.5, 5.8)*
Education	1.8 (1.2, 3.5)*	Sex x financial	
		Males	7.9 (1.3, 14.2)†
		Females	NS
Temperature sensitivity			
Age group	0.6 (0.4, 0.8)†	Financial status	6.8 (2.2, 14.7)†
		Sex	1.4 (1.1, 2.2)†
		Race	2.2 (1.1, 4.8)†
		Sex x financial	
		Males	2.5 (1.4, 4.4)†
		Females	NS
Pain when chewing			
Sex	0.3 (0.1, 0.5)*	Financial status	1.6 (1.1, 2.8)†
Age group	0.5 (0.3, 0.9)†	Race	3.0 (1.3, 8.8)†
Sex x financial			
Males	NS		
Females	1.5 (1.1, 2.4)		
Painful oral sores			
Financial status	1.2 (1.1, 1.5)†	Sex	3.0 (1.2, 7.4)†
Race	0.3 (0.1, 0.4)*	Age group	2.0 (1.1, 5.6)†
Sex x financial		Sex x financial	
Males	NS	Males	1.4 (1.1, 10.2)†
Females	1.4 (1.1, 2.3)†	Females	NS
Jaw joint pain			
Sex x financial		Financial status	1.5 (0.1, 0.9)†
Males	NS	Sex	2.1 (1.3, 4.1)†
Females	1.4 (1.1, 1.8)†	Sex x financial	
		Males	NS
		Females	4.4 (1.3, 12.0)†
Pain at multiple sites		**Any pain-related behavioral impact**	
Financial	4.6 (1.8, 11.6)*	Financial status	2.9 (1.5, 3.3)*
Sex	1.8 (1.1, 3.0)†	Sex	2.0 (1.2, 3.3)*
Age	2.4 (1.1, 5.8)†	Race	1.8 (1.1, 3.3)*
Age x financial		Sex x financial	
45–64 years old	1.5 (1.2, 2.1)*	Males	1.4 (1.1, 2.0)†
65+ years old	NS	Females	NS
Sex x financial			
Males	NS		
Females	1.5 (1.2, 2.0)*		

*$P<.01$
†$P<.05$.
Estimates for interaction terms were calculated at each level of the demographic variable. Males, whites, 45–64-year-old age group, and having dental insurance were reference categories. The financial status and education variables were coded such that an estimate of odds ratio of greater than one would be associated with a one unit increase in the odds of pain for each one unit decrease in financial status or educational attainment.

This question was asked for all reported symptoms:

Pain Rating: In the past six months, how bad has your (symptom) been? The ordinal response choices were: So painful that I can't do what I normally do; It's been painful, but I manage to get by; It's really more annoying than painful.

We refer to prevalence estimates as "six-month prevalence" instead of "prevalence" or "incidence" because of the nature of the questionnaire wording. Not only do we identify all those persons who reported pain at the time of the interview (a typical "prevalence" estimate), but we also include all those who had an incident pain event in the previous six-month interval, but who may no longer be in pain.

Statistical Analysis. All results were weighted estimates that reflect the population of interest in the counties studied, using a method that minimized the variance inflation resulting from sample design effects (22). Weights were developed using special tabulations provided by the US Census Bureau that detailed the distribution of target populations provided by age, sex, race, and poverty status (24). When the data were examined for violation of the assumptions of the planned statistical tests, it was found that the expected frequency in more than 20 percent of the contingency table cells in analyses involving the pain rating variable was less than five. Consequently, the adjacent ordinal response categories of "So painful that I can't do what I normally do" and "It's been painful but I manage to get by" were collapsed into a single category labeled "Sufficiently intense to impact behavior" for all analyses.

Our measure of SES included measures of income (present financial status and difficulty paying for services), social status (educational attainment), and access to care (dental insurance). The income-related variables, ratings of present financial status and difficulty paying an unexpected $500 dental bill, were highly correlated (r=0.68). Consequently, they were summed into a single ordinal variable that we labeled financial status. The financial status and education variables were coded such that an estimate of odds ratio of greater than one would

be associated with a one-unit decrease in financial status or educational attainment. For the dichotomous variables males, whites, 45–64 age group, and having dental insurance were coded 0 and used as reference categories. Bivariate associations between measures of SES and orofacial pain prevalence and behavioral impact from pain are reported using the Spearman rank correlation coefficient or phi coefficient as appropriate.

Using a series of stepwise logistic regression models for each pain symptom, an SES variable model was tested in step 1, followed by an SES + demographic model in step 2. Race, sex, and age by SES status interaction effects were then tested separately in a third step, testing for a significant improvement with the overall model fit from step 2 to step 3. If an interaction term was found to be significant, separate logistic models were tested for each level of the demographic variable, while controlling for all other variables in the model, to determine the nature of the interaction.

Because of the low numbers of FDCS participants reporting burning mouth (n= 12) and face pain (n=23) in the previous six-month time period, inferential statistics were not performed for these orofacial sites. However, these symptoms were included in the analyses collapsing across pain site.

Results

Characteristics of the Sample. Seven of the participants in the 42-month interview did not respond to any of the questions about orofacial pain symptoms because these interviews were done by proxy. An additional 22 did not respond to questions regarding toothache pain, temperature sensitivity, or pain when chewing because by the 24-month clinical examination, they had no remaining teeth. Therefore, the weighted sample size for each symptom was as follows: jaw joint pain, $n_{weighted}$ = 744; face pain, $n_{weighted}$ = 743; toothache pain, $n_{weighted}$ = 726; temperature sensitivity, $n_{weighted}$ = 728; pain when chewing, $n_{weighted}$ = 728; painful oral sores, $n_{weighted}$ = 743; and burning mouth $n_{weighted}$ = 728. The distributions of the socioeconomic indicators are displayed in Table 2.

Prediction Models for Reporting Orofacial Pain and Behavioral Impact. Table 3 shows the bivariate associations between the SES variables and reporting orofacial pain and behavioral impact. Estimates of odds ratio for significant SES variables, demographic variables, and interaction terms where appropriate are displayed in Table 4 for each of the orofacial pain symptoms.

Toothache Pain. Eighty-seven of the FDCS participants (12.0%) reported toothache pain. The prediction model for reporting toothache pain was significant for the SES variable model [χ^2 (3)=8.248, P=.041]. The model did not improve significantly with the addition of the demographic variables or demographic by SES interaction variables. In the final model, lower financial status (odds ratio [OR]=1.2) and less education (OR=1.8) were significant risk factors for toothache pain.

Among those with toothache pain, the SES variable model did not significantly predict reporting toothache pain intense enough to impact behavior. The model improved significantly when the demographic variables [$\Delta\chi^2$ (1)=7.927; P=.045] and the sex by financial status interaction term were added [$\Delta\chi^2$ (1)=15.005; P<.001]. In the final model, female sex (OR=2.1) was also a significant risk factor. When the significant interaction term was decomposed into separate models for males and females, financial status was significant for males (OR=7.9), but not females, suggesting that only for males does lower financial status increase the risk for toothache pain-related behavioral impact.

Temperature Sensitivity. One hundred seventy-three of the FDCS participants (24.8%) reported temperature sensitivity. The prediction model for reporting temperature sensitivity was not significant for the SES or SES + demographic variable models. The model fit did not improve significantly with the addition of any of the demographic by SES interaction variables. However, in the final model, membership in the 45–64-year-old age group (OR=0.6) was a significant risk factor.

Among those with temperature sensitivity, the SES variable model significantly predicted reporting temperature sensitivity as sufficiently intense to impact behavior [χ^2 (3)=12.353; P=.006]. The model did not improve with the addition of the demographic variables. However, the model improved with the addition of the sex by financial status interaction term [$\Delta\chi^2$ (1)=10.999; P=.001]. In the final model, lower financial status (OR=1.3), female sex (OR=1.4), and black race (OR=2.2) were also significant predictors. When a separate model was tested for each sex, financial status was significant for males (OR=2.5), but not females, suggesting that only for males is lower financial status a risk factor for temperature sensitivity-related behavioral impact.

Pain when Chewing. Sixty-seven of the FDCS participants (9.2%) reported pain when chewing. The prediction model for reporting pain when chewing was not significant for the SES variable model. However, the model improved significantly with the addition of the demographic variables [$\Delta\chi^2$ (3)=9.760; P=.021] and the sex by financial status interaction term [$\Delta\chi^2$ (1) =3.879; P=.047]. In the final model, male sex (OR=0.3) and membership in the 45–64-year-old age group (OR=0.5) were also significant risk factors. When a separate model was tested for each sex, financial status was significant for females (OR=1.5), but not males, suggesting that only females with lower financial status were at increased risk for pain when chewing.

The SES variable model was significant [χ^2 (3)=7.998; P=.046] for behavioral impact from pain when chewing. The model did not improve with the addition of the demographic or demographic by socioeconomic interaction variables. In the final model, lower financial status (OR=1.6) and black race (OR=3.0) were significant risk factors.

Painful Oral Sores. One hundred sixteen of the FDCS participants (15.6%) reported painful oral sores. The prediction model for reporting painful oral sores was significant for the SES variable model [χ^2 (3)=10.240; P=.017]. The model improved significantly with the addition of the demographic variables [$\Delta\chi^2$ (3)=25.799; P<.001] and the sex by financial status interaction term [$\Delta\chi^2$ (1)=3.667; P=.045]. In the final model, white race (OR=0.3) and lower financial status (OR=1.2) were significant risk factors. When a separate model was tested for each sex, financial status was significant only for females (OR=1.4) suggesting that lower financial status as-

sociated with increased risk for painful oral sores for females.

The SES or SES + demographic variable models were not significant predictors of reporting painful oral sores as sufficiently intense to impact behavior. However, the model improved with the addition of the sex by financial status [$\Delta\chi^2$ (1)=9.758; P=.002]. In the final model, female sex (OR=3.0) and membership and age of 65+ years (OR=2.0) were also significant risk factors. When the model was tested separately for each sex, financial status was significant for males (OR=1.4), but not females, suggesting that only males with lower financial status were at increased risk for behavioral impact from painful oral sores.

Jaw Joint Pain. Sixty-two of the FDCS participants (8.3%) reported jaw joint pain. The prediction model for reporting jaw joint pain was not significant for the SES or SES + demographic models. The model improved significantly when the sex by financial status interaction term was added [$\Delta\chi^2$ (1)=5.097; P=.024]. When a separate model was tested for each sex, financial status was significant for both females (OR=1.4) and males (OR=0.6), suggesting that females with lower financial status and males with higher financial status are at increased risk for painful oral sores.

The SES variable model was significant for jaw joint pain-related behavioral pact behavior [χ^2 (3)=12.440; P=.006], but did not improve with the addition of the demographic variables. However, the model improved with the addition of the sex by financial status [$\Delta\chi^2$ (1)=7.825; P=.0051] interaction term. In the final model, female sex (OR=2.1) and financial status (OR=1.5) were also risk factors for behavioral impact from jaw joint pain. When the model was tested separately for each sex, financial status (OR=4.4) was significant only for females, suggesting that only for females is lower financial status associated with reporting jaw joint pain-related behavioral impact.

Orofacial Pain at Multiple Sites. Of the 302 FDCS participants who reported orofacial pain, 111 (36.7%) reported pain at more than one of the targeted sites. The prediction model for orofacial at multiple sites was significant using only SES variables [χ^2 (3)=9.177; P<.027], but did not improve with the addition of the demographic variables. The model improved significantly when the age by financial status [$\Delta\chi^2$ (1)=5.097; P=.024] and sex by financial status interaction terms were added. In the final model, lower financial status (OR=4.6), female sex (OR=1.8), age of 65+ years (OR=2.4) were also significant risk factors for reporting orofacial pain at multiple sites. When separate models were tested for each level of the demographic categories involved in the interaction, lower financial status was only a risk factor for the 45–64-year-old age group (OR=1.5) and female sex (OR=1.5).

Pain Impact at Any Site. One hundred thirty-four of those reporting pain (44.4% of those with pain), indicated that it was sufficiently intense to impact behavior. The prediction model for pain impact was significant using only the SES variables [χ^2 (3)=11.094; P=.011]. The model improved with the addition of the demographic variables [$\Delta\chi^2$ (3)=12.027; P=.007] and the sex by financial status interaction term [χ^2 (1)=3.667; P=.045]. In the final model, lower financial status (OR=2.9), female sex (OR=2.0), and black race (OR=1.8) were also significant risk factors for having orofacial pain at multiple sites. When a separate model was tested for each sex, financial status was a significant risk factor for males (OR=1.4), but not females, suggesting that only males with lower financial status were at increased risk for orofacial pain-related behavioral impact in at least one site.

Discussion

This study documented the association between SES and the six-month prevalence and impact of orofacial pain by anatomical location among participants of the FDCS. The results suggest that lower SES is predictive of reporting pain and pain impact at some, but not all, of the orofacial sites. We also found that when accounting for differences in SES in multivariable models, certain orofacial pain symptoms remained associated with specific demographic groups. A consistent finding was the effects of SES on reporting orofacial pain or pain impact differed across sex of the respondent. We were unable to find another study that reported interactions between SES and sex or race as predictors of orofacial pain.

Orofacial Pain Prevalence. Consistent with a variety of studies linking SES and other disease states (1-5), we found that SES was associated with increased risk of reporting orofacial pain. FDCS respondents with lower SES were more likely to report toothache pain, painful oral sores, and orofacial pain at one or more of the target sites. Similar findings have been reported by Andersson et al. (25), who found that the prevalence of pain across multiple sites was highest in the lower SES group; however, they did not report differences by pain site. For three of the symptoms (pain when chewing, painful oral sores, and jaw joint pain) we found that the effects of financial status on the probability of reporting orofacial pain differed as a function of sex. In each case, females with lower financial status were at greater risk, whereas financial status was not a significant risk factor for males.

Our findings are consistent with those of Vargas et al. (19), who reported that education and income below the poverty level were predictive of tooth pain. Vargas and colleagues only found these relationships in the 20–64-year-old group and not among those 65 years and older. It should be kept in mind that at the time of the 42-month interview, the youngest participants in the FDCS would have been 48 years old. Consequently, our findings may reflect this effect attenuated by our older age cohort.

In combination, lower indicators of SES were associated with the increased probability of suffering from painful oral sores. The oral sores item from the FDCS 42-month interview originated with the NHIS (18), and assesses painful sores or irritations around the lips and on the tongue, gingival, or other soft tissues. Their causes may range from minor irritation, which result from trauma and infections, to malignancies or systemic diseases. Few studies have examined the specific physical signs associated with self-reported painful oral lesions.

Behavioral Impact from Pain. Socioeconomic variables also were associated with increased risk of pain sufficiently intense to impact behavior for temperature sensitivity, pain when chewing, and jaw joint pain. Similar to our findings for pain prevalence, the association between financial status

and reporting pain impact differed by sex. Male respondents with higher financial status were at reduced risk for pain impact, whereas the risk did not differ for females. The pain impact variable may be considered a proxy for disease severity. However, the pain literature has documented that oral pain frequently correlates poorly with organic findings (26,27).

The impact of orofacial pain has been documented in several studies and is severe. Orofacial pain, as a symptom of untreated dental and oral problems, and as a condition in and of itself, is a major source of diminished quality of life with multiple adverse psychosocial outcomes (28). For example, Locker and Grushka (16) assessed the impacts associated with suffering from oral pain in the past month. Of respondents with oral pain, 70 percent worried about their oral health, 44 percent consulted a doctor, 30 percent avoided eating certain foods, 29 percent took medications, and 14 percent experienced sleep difficulty. The variable most associated with impact was pain intensity. Murray et al. (29) reported that dental patients with facial pain reported a greater impact on daily life, a fourfold increase in functional problems such as difficulty chewing foods, and a ninefold increase in reports of depression, compared to pain-free controls. A person's perception of current need for care is an important predictor of dental care attendance, and evidence suggests that when reporting perceived need, people respond to specific oral signs and symptoms, and their effects. Gilbert et al. (30) found that adults were more likely to report they needed to see a dentist in the next couple of weeks if they were experiencing a toothache or other dental pain (92%) than those who reported having cavities (66%), a broken tooth (56%), or a loose tooth (77%). In a multivariable model, having oral pain increased the probability of perceiving a need for dental care by more than 14 times.

Socioeconomic Indicators. Our measure of SES included measures of income (financial status and difficulty paying for services), social status (educational attainment), and access to care (dental insurance). Still undetermined is how best to conceptualize and measure socioeconomic position in general (31), and particularly across sociodemographic groups. Whereas European research typically uses social class as an indicator of SES, studies in the United States rely more on education and income (32). Our measures of SES were selected because they represent a range of SES indicators and because they have demonstrated predictive validity in several FDCS studies as predictors of dental care (33,34) and diverse measures of oral health (35-37).

A review of studies of education level (as a proxy for SES) with back pain suggest that associations are stronger with longer duration and/or higher recurrence than with onset (38). Many reports of an association of lower education with adverse consequences of back pain also suggest that the course of a back pain episode is less favorable among persons with low educational attainment. However, lower education was generally not associated with the outcomes of intervention (38). The literature addressing SES and health suggests that SES influences health through specific risk factors. Some indicate a direct effect through differences in access to health care (6). For example, Newman and Gift (39) found that those with a regular pattern of dental care were more likely to be white, younger, have dental insurance, have no cost barriers, and have more than 12 years of education. Others postulate that certain risk factors are associated with, not the consequence, of lower SES. These include behaviors such as smoking, alcohol consumption, poor nutrition, and poorer adaptation to stress (5,40).

Groups at Increased Risk. In our multivariable models that accounted for differences in SES, we found that certain sociodemographic groups remain at increased risk for particular orofacial pain symptoms. Our findings for racial differences in behavioral impact from orofacial pain are consistent with findings reported by Hunt, Slade, and Strauss (41). They found that older blacks reported more frequent impact than did older white participants. In the United States, race, socioeconomic position, and health are related in complex ways. Although socioeconomic position is a frequent explanation for race differences in health through the mechanisms discussed above, factors such as discrimination and residential segregation may also account for some of the effects of race on health (32). Clark et al. (42) have proposed a biopsychosocial model through which high levels of stress related to racism and discrimination could influence oral health.

However, the most consistent finding was that adjustments for SES failed to account for the increased risk for orofacial pain by females. Adjusting for differences in socioeconomic position, twice as many females as males rated pain as sufficiently intense to impact behavior. Similar findings are generally reported for measures of pain intensity among those with orofacial pain in several studies (20,43), but not others (16,44).

Limitations. There are several methodologic issues to consider when interpreting the results. The FDCS sample does not include younger adults, and whether these associations occur for individuals younger than 45 years of age is undetermined. No clinical examinations were performed at the 42-month time point and six-month prevalence is based on self-report and subject to an individual's interpretation. Consequently, there was no control for the severity of pathology across respondents. There is also potential for bias in the FDCS sample at the 42-month follow-up as dropouts differed from participants on some, but not all, measures of SES used in this study. When interpreting analysis involving the pain rating (sufficiently intense to impact behavior), it is important to consider that higher ratings on this item may reflect higher subjective ratings of pain, lower threshold for interference with activities, or both. Analyses involving pain at multiple sites are influenced by the more common symptoms.

Conclusions

This study is the first to document the association between SES and the six-month prevalence and impact of orofacial pain by anatomical location. We found that lower SES was predictive of increased pain and pain impact at many, but not all, of the orofacial sites. The findings also suggest orofacial pain symptoms are more common among certain demographic groups, when accounting for differences in SES in our multivariable models. The most consistent result, as evidenced by similar findings across orofacial pain sites, was that females are at increased risk for orofacial pain impact, and that financial status appears

to have a sex-differentiated effect.

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