Oral Health Disparities and Psychosocial Correlates of Self-Rated Oral Health in the National Survey of American Life

Tracy L. Finlayson, PhD, David R. Williams, PhD, Kristine Siefert, PhD, MPH, James S. Jackson, PhD, and Ruth Nowjack-Raymer, PhD, MPH

Objectives. We sought to better understand the determinants of oral health disparities by examining individual-level psychosocial stressors and resources and self-rated oral health in nationally representative samples of Black American, Caribbean Black, and non-Hispanic White adults.

Methods. We conducted logistic regression analyses on fair or poor versus better oral health using data from the National Survey of American Life (n=6082).

Results. There were no significant racial differences. Overall, 28% of adults reported having fair or poor oral health. Adults with lower income and less than a high school education were each about 1.5 times as likely as other adults to report fair or poor oral health. Higher levels of chronic stress, depressive symptoms, and material hardship were associated with fair or poor oral health. Adults living near more neighborhood resources were less likely to report fair or poor oral health. Higher levels of self-esteem and mastery were protective, and more-religious adults were also less likely to report fair or poor oral health.

Conclusions. Social gradients in self-rated oral health were found, and they have implications for developing interventions to address oral health disparities. (*Am J Public Health.* 2010;100:S246–S255. doi:10.2105/AJPH.2009.167783)

Oral health disparities are most pronounced among socioeconomically disadvantaged and racial-minority groups in the United States.[1] A social gradient in adult self-reported oral health has been documented in this country and others,[2,3] illustrating that poor oral health is attenuated by higher levels of income and education. Similar social gradient patterns have been found using more-objective indicators of oral health as well, including periodontal disease, gingival bleeding, and loss of attachment of tissue supporting teeth, after sociodemographics were controlled.[2,4–6] Studies have also shown that Black adults have worse oral health when compared with Whites across several dimensions of oral health.[6–12] Although research supports that lower socioeconomic status (SES) adults disproportionately bear the burden of oral disease,[13] it is unclear how social stratification contributes to poor oral health, especially among racial minorities. Income and education do not fully explain racial disparities in oral health, and research on disparities in general health suggests that there are additional likely causes.[6]

Most prior oral health research has focused primarily on biological and behavioral health risk factors. Recently, researchers have been exploring the psychosocial determinants of oral health in an effort to better understand and address the processes underlying documented inequities.[14–16] A small but growing body of research has explored the associations between oral health and select psychosocial factors that may influence biological processes and health behavior, such as depressive symptoms,[17–20] different types of stress,[21,22] and various neighborhood characteristics.[12,23,24] Few studies have explored any positive psychosocial resources, like self-esteem.[25] Collectively, these studies have shown that experiencing depressive symptoms, higher levels of stress, and living in disadvantaged neighborhoods are each positively associated with worse oral health outcomes. However, many of these studies are limited by small, nonrepresentative samples. An additional gap in the literature is the failure to explore several possible types of both positive and negative psychosocial factors. For instance, no studies have examined how mastery (extent to which individuals believe they have control over aspects of their life) or religiosity might relate to oral health. Therefore, we sought to determine whether multiple individual psychosocial stressors and resources are associated with self-rated oral health in a large national sample of Black American, Caribbean Black, and non-Hispanic White adults.

The conceptual framework for this analysis was derived from epidemiological theories of the social production of disease, which posit that individuals' relative economic and social positioning—that is, their race/ethnicity, gender, and SES—determine their exposure to health-damaging stressors as well as their access to resources that can help them avoid risks or minimize the impact of disease.[26–28] Risk factors and resources can be either ongoing or acute and can occur at both the individual and neighborhood levels. All of these factors should be considered as providing the context of an individual's life circumstances, and exposures can vary by SES. Low SES often exposes individuals to more stressors (such as material hardships, financial worries, discrimination, an unsafe neighborhood, unemployment, housing and transportation problems) and access to fewer resources (such as money for goods and services, community and institutional supports) with which to cope.[29]

Given past research findings, we hypothesized that there may be associations between self-rated oral health perceptions and psychosocial stressors and resources: (1) adults with lower levels of both income and education and who are racial minorities regardless of income and education levels will be more likely than their higher-income and more-educated counterparts to report fair or poor oral health status; (2) adults exposed to each potential stressor will be more likely to report fair or poor oral health status; and (3) adults with access to each potential resource will be less likely to report fair or poor oral health status. We further hypothesized that access to psychosocial resources would help attenuate the negative effects of exposure to stressors.

TABLE 1—Distribution of Background Characteristics, Psychosocial Stressors, and Psychosocial Resources: National Survey of American Life (n = 5493), February 2001 to March 2003

	Unweighted No. (Weighted % ±SE)	Mean ±SE (Range)
Self-rated oral health		
Fair or poor	1537 (28.08 ±1.57)	
Good, very good, or excellent (ref)	3956 (71.92 ±1.57)	
Model 1: background		
Age, y		
18–29	1302 (23.29 ±1.77)	
30–44	1969 (34.75 ±1.21)	
45–59	1314 (24.96 ±1.21)	
>59	908 (17.00 ±1.16)	
Education		
Less than high school	1218 (19.41 ±1.5)	
High school diploma or more (ref)	4275 (80.59 ±1.5)	
Gender		
Men	2107 (46.29 ±1.2)	
Women (ref)	3386 (53.71 ±1.2)	
Income, $		
≤12 000	1048 (15.5 ±0.89)	
12 001–19 999	1084 (15.8 ±1.1)	
22 000–34 999	1106 (18.4 ±1.2)	
35 000–53 999	1116 (22.4 ±1.1)	
>54 000 (ref)	1139 (27.9 ±2.5)	
Household size		2.65 ±0.05 (1–7)
Race/ethnicity		
Black American (ref)	3247 (46.44 ±3.1)	
Caribbean Black	1427 (3.4 ±0.3)	
Non-Hispanic White	819 (50.16 ±3.3)	
Model 2: psychosocial stressors		
Depression		
During past 12 mo	309 (6.72 ±0.47)	
No depression (ref)	5184 (93.28 ±0.47)	
No. material hardships		0.82 ±0.03 (0–8)
Employment status		
Unemployed	511 (7.4 ±0.73)	
Employed/not in labor force (ref)	4982 (92.62 ±0.73)	
Everyday Discrimination Scale score		4.92 ±0.03 (1–6)
Chronic Stress score		1.56 ±0.04 (0–6)
Financial Stress score		3.84 ±0.06 (2–9)
Neighborhood crime		
Frequent	1006 (15.66 ±1.13)	
Infrequent (ref)	4487 (84.34 ±1.13)	
Neighborhood drug problems		
Drug problems exist	2068 (32.25 ±1.8)	
Few drug problems (ref)	3425 (67.75 ±1.8)	

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METHODS

Data for this analysis came from the National Survey of American Life (NSAL), which was conducted by the Program for Research on Black Americans at the University of Michigan's Institute for Social Research. The NSAL builds upon the Program for Research on Black Americans' National Survey of Black Americans—a national probability study of 2107 self-identified Black participants aged 18 years and older interviewed in 1979 to 1980. The National Survey of Black Americans respondents were recontacted 3 times, at 8, 9, and 12 years after initial interview, forming the 4-wave National Panel Survey of Black Americans.[30] No other study has assessed rates of psychological distress and serious mental problems along with a wide range of social, political, and economic factors in a large, representative longitudinal national sample of Blacks.

The goal of the NSAL was to investigate the physical, emotional, mental, structural and economic conditions of self-identified Blacks in the United States at the beginning of the 21st century. Special emphasis was given to measuring race and ethnicity among Blacks to capture the group's heterogeneity.[31,32] Blacks from the Caribbean were the largest subgroup of Black immigrants in this country around the turn of the century, warranting attention[33]; their inclusion was unique to this study. Participants self-identified their race/ethnicity, and here we present health information based on those racial categories. Williams and Fenton[34] noted that research needs to be attentive to the heterogeneity within racial categories and there are conceptual and methodological complexities associated with presenting health statistics by race. Racial categories in this country traditionally reflect a history of inequality, and race is an important marker of that inequality and differential access to health.

The NSAL was a detailed study of mental disorders among large, nationally representative samples of Black (3570 Black Americans and 1621 Caribbean Blacks) and non-Hispanic White (n=891) adults. There were 6082 adult participants total and a 72.3% response rate overall. The sample of Black participants was the primary core sampling base for the whole study, and a 4-stage national area probability

TABLE 1—*Continued*

Model 3: psychosocial resources		
Self-Esteem Scale score		16.07 ±0.04 (4-24)
Mastery Scale score		18.49 ±0.09 (7-28)
Church attendance		
Regular	2101 (34.38 ±1.34)	
Less than once per week (ref)	3392 (65.62 ±1.34)	
Importance of religion scale score		3.53 ±0.04 (1-4)
No. neighborhood resources		4.7 ±0.11 (0-7)

Note. Higher scores on the Everyday Discrimination, Chronic Stress, and Financial Stress scales reflect higher levels of perceived discrimination and stress. Higher scores on the Self-Esteem, Mastery, and Importance of Religion scales reflect higher levels of each respective variable.

sample frame design with a special supplement for Caribbean Black adults was used.[31,35] The non-Hispanic White sample was a representative sample of Whites that lived in census tracks with 10% or greater Black population (representing about 14% of the total White population).[36] Data were collected between February 2001 and March 2003, with 86% of interviews conducted face-to-face (computer assisted) and 14% conducted entirely or partially via telephone.[31] Interviewers were race matched with participants for data collection.[31,32] Additional details about the study sample and methodology are available elsewhere.[31,32,35,37,38]

The NSAL collected information about multiple types and sources of individual-level psychosocial stressors and resources, thus providing a unique opportunity to explore the relationships of these factors on adults' oral health perceptions.

Measures

The dependent variable was adults' self-rated oral health status. A single global question about perceived oral health was included in the NSAL: "How would you rate the overall condition of your teeth, mouth, and gums at the present time?" The responses were dichotomized into those who perceived their oral health to be fair or poor versus good, very good, or excellent (reference). Typically, this variable has been defined as a dichotomy,[2,5,12,21,25,39] although we examined alternate definitions before using the dichotomy in our study.

Self-rated oral health is used frequently in many national health surveys when clinical evaluations are too costly and has been shown to be a valid and useful summary indicator of overall oral health status.[40] Most adult validation studies have been conducted with samples of older adults, and findings indicate this measure is fairly stable over time[41] and positively associated with clinical assessments of dental status and other measures of perceived oral health functioning and quality of life.[39,42–46]

Consistent with hypothesized relationships to oral health, 3 models of independent variables were examined: sociodemographic background characteristics, psychosocial stressors, and psychosocial resources.

Background characteristics. Sociodemographic information included: age, gender, education, income, household size, and race/ethnicity. Age was a continuous variable. Women were the reference group for gender. Education was dichotomized as less than a high school education completed or high school graduate or more (reference group). Annual family income was grouped into quintiles: less than or equal to $12 000, $12 001 to 19 999, $20 000 to 34 999, $35 000 to $53 999, and $54 000 and greater (reference group). Household size was included as a continuous variable to adjust for per capita material resources. Participants self-identified their race/ethnicity, which included Black Americans (reference group), Caribbean Blacks, and non-Hispanic Whites.

Psychosocial stressors. Major depressive disorder in the last 12 months was defined by the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition*, criteria and was assessed with the slightly modified World Mental Health Composite International Diagnostic Interview (CIDI).[47,48] The CIDI is a comprehensive instrument developed for use in research by trained lay interviewers to measure the prevalence and severity of mental disorders.

Respondents answered whether they experienced 8 specific material hardships in the last 12 months.[49] Sample items include "couldn't meet basic expenses," "couldn't afford day care or babysitting," and "had telephone disconnected." Affirmative answers were counted to create a continuous measure, with higher scores reflecting more hardships experienced in the past year. The Cronbach α for this scale was 0.79.

Employment status was dichotomized into those who were working for pay or not in the labor force (reference group) versus those who were unemployed but wanted to work.

The Everyday Discrimination Scale[50] was used to measure the frequency of chronic, routine experiences of unfair treatment. The original scale includes 9 items, such as "I am treated with less courtesy than other people," "I sometimes receive poorer service than other people," and "I am called names or insulted," with a 6-point response scale (6=almost every day, 5=at least once a week, 4=a few times a month, 3=a few times a year, 2=less than once a year, and 1=never). A 10th item, being followed around in stores, was added, and the 10 items were averaged so that higher average scores reflected greater frequency of experiences of discrimination in the past year. Other studies have included this 10th item previously,[51] and including it in this study improved the Cronbach α slightly. The Cronbach α was 0.89 in this sample.

Respondents reported whether they had experienced any of 10 different chronic stressors in the last month.[52] Sample stressors included problems with health, money, job, police, or family. Affirmative answers were counted to create a continuous measure, with higher scores reflecting a greater number of stressors experienced in the past month.

Two survey questions were combined to reflect the impact of economic stress on the individual.[52] One item assessed the difficulty in meeting monthly payments for bills (responses ranged from 1, extremely difficult, to 5, not difficult at all). The other item assessed the extent to which the individual worried that their total income would not be enough to meet the family's expenses and bills (responses were 1, a great deal, to 4, not at all). Items were reverse coded and summed so that higher scores reflected a greater negative impact of financial stress.

TABLE 2—Distribution of Sample Background Characteristics, Psychosocial Stressors, and Psychosocial Resources, by Self-Rated Oral Health Status: National Survey of American Life, February 2001 to March 2003

	Fair or Poor Oral Health (n = 1537)		Good, Very Good, or Excellent Oral Health (n = 3956)		
	Unweighted No. (Weighted %)	Mean (SE)	Unweighted No. (Weighted %)	Mean (SE)	*P*
Model 1: background					
Age, y					<.001
18–29	235 (14.41)		1067 (26.75)		
30–44	480 (31.77)		1489 (35.91)		
45–59	460 (31.66)		854 (22.34)		
>59	362 (22.17)		546 (14.99)		
Education					<.001
Less than high school	519 (31.05)		699 (14.87)		
High school diploma or more (ref)	1018 (68.95)		3257 (85.13)		
Gender					NS
Men	583 (50.73)		1524 (44.56)		
Women (ref)	954 (49.27)		2432 (55.44)		
Income, $					<.001
≤12 000	406 (22.24)		642 (12.8)		
12 001–19 999	387 (21.62)		697 (13.48)		
22 000–34 999	296 (19.19)		810 (18.14)		
35 000–53 999	264 (20.39)		852 (23.21)		
>54 000 (ref)	184 (16.56)		955 (32.37)		
Household size		2.55 (0.08)		2.69 (0.05)	NS
Race/ethnicity					NS
Black American (ref)	1000 (48.73)		2247 (45.55)		
Caribbean Black	316 (2.85)		1111 (3.62)		
Non-Hispanic White	221 (48.42)		598 (50.84)		
Model 2: psychosocial stressors					
Depression					<.001
During past 12 mo	133 (12.76)		176 (4.37)		
No depression (ref)	1404 (87.24)		3780 (95.63)		
No. material hardships		1.3 (0.1)		0.63 (0.03)	<.001
Employment status					.003
Unemployed	180 (11.63)		331 (5.71)		
Employed/not in labor force (ref)	1357 (88.36)		3625 (94.29)		
Everyday Discrimination Scale score		4.84 (0.03)		4.95 (0.03)	<.001
Chronic Stress score		2.02 (0.06)		1.38 (0.04)	<.001
Financial Stress score		4.36 (0.12)		3.63 (0.06)	<.001
Neighborhood crime					<.001
Frequent	357 (23.38)		649 (12.65)		
Infrequent (ref)	1180 (76.62)		3307 (87.35)		
Neighborhood drug problems					<.001
Drug problems exist	700 (42.67)		1368 (28.18)		
Few drug problems (ref)	837 (57.33)		2588 (71.82)		
Model 3: psychosocial resources					
Self-Esteem Scale score		15.46 (0.09)		16.3 (0.04)	<.001
Mastery Scale score		17.31 (0.12)		18.96 (0.12)	<.001

Continued

TABLE 2—*Continued*

Church attendance					<.001
Regular	541 (27.49)		1560 (37.07)		
Less than once per wk (ref)	996 (72.51)		2396 (62.93)		
Importance of Religion Scale score		3.49 (0.04)		3.55 (0.04)	NS
No. neighborhood resources		4.45 (0.16)		4.8 (0.11)	.006

Note. NS = nonsignificant. Higher scores on the Everyday Discrimination, Chronic Stress, and Financial Stress scales reflect higher levels of perceived discrimination and stress. Higher scores on the Self-Esteem, Mastery, and Importance of Religion scales reflect higher levels of each respective variable.

Potential individual-perceived neighborhood characteristic stressors were captured in 2 survey questions concerned with aspects of safety of the living environment.

The individual's perceived frequency of problems with neighborhood safety (such as muggings, burglaries, or assaults) was assessed.[52] Possible response options included very often, fairly often, not too often, hardly ever, and never. The "very often" and "fairly often" responses were combined to create a dichotomous variable that indicated more frequent occurrence of neighborhood crime.

The second neighborhood safety item focused on the individual's perception of the sale and use of drugs as a potential problem.[52] The 4 possible response categories ranged from 1 (very serious) to 4 (not serious at all). Responses that drugs were a "very serious" or "fairly serious" problem were combined to create a dichotomous variable indicating whether drugs were problematic.

Psychosocial resources. Positive perceptions about one's self (high self-esteem, feelings of mastery) and a prominent role of religion in one's life may offer protective psychological resources to adults dealing with stressful life circumstances.

We used the Rosenberg Self-Esteem Scale,[53] a validated measure using 10 items assessed on a 4-point scale (1=strongly agree, 4=strongly disagree), to assess global self-worth. Sample items include "All in all, I feel that I am a failure" and "I feel that I have a number of good qualities." Appropriate reverse codings were done before summing items, with higher scores reflecting greater self-esteem. The Cronbach α was 0.48 in this sample.

We used Pearlin's Mastery Scale,[54] a validated 7-item scale with 4-point response options (1=strongly agree, 4=strongly disagree), to assess the degree to which individuals believed they had control over aspects of their life. Items were summed to create a scale score, with higher scores reflecting greater sense of mastery. Sample items include "There is really no way I can solve some of the problems I have" and "What happens to me in the future mostly depends on me." The Cronbach α was 0.59 in this sample.

We assessed the frequency of attendance at religious services.[52] Possible response categories included nearly every day (4 or more times a week), at least once a week (1–3 times), a few times a month (1-3 times), a few times a year, or less than once a year. A dichotomous variable was created to reflect regular church attendance, with regular attendance defined as once per week or more versus less frequently (reference).

The importance of religion scale[55] was constructed as the average across 5 items, with a 4-point scale (1=very important, 4=not important at all). Items were reverse coded so that higher scores reflected greater importance placed on religion. A sample item is "How important is religion in your life?" This scale had a Cronbach α of 0.80 in this sample.

We assessed neighborhood resources[56] by asking respondents to indicate whether they lived in proximity to 7 different neighborhood resources, such as public libraries, banks, parks, and medical services. Affirmative responses were counted to create a continuous variable, and higher scores reflected living near more resources. The Cronbach α was 0.79 in this sample.

Analyses

All analyses were conducted with SAS version 9 (SAS Institute Inc, Cary, NC) using statistical procedures that accounted for the complex sampling methods and weighting of the NSAL. Weighting was used to adjust for disproportionate sampling, nonresponse, and the sociodemographic characteristics of the sample. In particular, the Caribbean Black subsample was oversampled. The final sample size of those with no missing data was 5493. Most variables had very few missing data (less than 1% because of refusal to respond, and 3% or fewer were missing responses for any given variable), but there was a slightly higher proportion of missing data for the dependent variable.

Weighted frequency distributions and correlations for each variable were explored and descriptive statistics tabulated for the overall sample and by race. Bivariate relationships between each independent variable and self-rated oral health status were assessed with logistic regressions. Nested logistic regression models examined the effects of background sociodemographic characteristics, psychosocial stressors, and psychosocial resources. Each model of variables was entered successively to explore the extent to which exposure to additional stressors intensified likelihood of reporting fair or poor oral health and whether access to resources attenuated the effect of the potential stressors. Diagnostic statistics (tolerance) were examined for each of the models to test for potential multicollinearity issues, which were not found. All variables were recoded so that hypothesized stressors yielded an odds ratio (OR) greater than 1, to indicate an increased odds of fair or poor oral health, and an OR less than 1 for potential resources, to indicate a lower likelihood of fair or poor oral health.

RESULTS

Table 1 presents the characteristics of the final study sample used in this analysis and summarizes the distribution of psychosocial stressors and resources. A wide age range of

TABLE 3—Distribution of Sample Background Characteristics, Psychosocial Stressors, and Psychosocial Resources, by Race/Ethnicity: National Survey of American Life, February 2001 to March 2003

	Black American (n = 3247)		Caribbean Black (n = 1427)		Non-Hispanic Whites (n = 819)		
	Unweighted No. (Weighted %)	Mean (SE)	Unweighted No. (Weighted %)	Mean (SE)	Unweighted No. (Weighted %)	Mean (SE)	*P*
Self-rated oral health							NS
Fair or poor	1000 (29.47)		316 (23.52)		221 (27.11)		
Good, very good, excellent (ref)	2247 (70.53)		1111 (76.48)		598 (72.89)		
Model 1: background							
Age, y							NS
18–29	760 (25.25)		398 (32.27)		144 (20.86)		
30–44	1180 (35.74)		540 (34.46)		249 (33.86)		
45–59	771 (23.78)		309 (19.93)		234 (26.39)		
> 59	536 (15.23)		180 (13.34)		192 (18.90)		
Education							.002
Less than high school	824 (23.79)		257 (20.5)		137 (15.28)		
High school diploma or more (ref)	2423 (76.21)		1170 (79.5)		682 (84.71)		
Gender							NS
Men	1165 (44.52)		597 (53.18)		345 (47.46)		
Women (ref)	2082 (55.48)		830 (46.82)		474 (52.54)		
Income, $							<.001
≤ 12 000	760 (19.71)		182 (12.7)		106 (11.70)		
12 001–19 999	715 (18.97)		231 (13.96)		138 (12.93)		
22 000–34 999	627 (19.16)		320 (20.07)		159 (17.65)		
35 000–53 999	624 (20.94)		308 (20.78)		184 (23.90)		
> 54 000 (ref)	521 (21.22)		386 (32.49)		232 (33.82)		
Household size		2.86 (0.04)		2.90 (0.09)		2.45 (0.09)	<.001
Model 2: psychosocial stressors							
Depression							<.001
During past 12 mo	178 (5.30)		65 (7.78)		66 (7.96)		
No depression (ref)	3069 (94.69)		1362 (92.22)		753 (92.04)		
No. material hardships		0.94 (0.04)		0.87 (0.08)		0.7 (0.05)	<.001
Employment status							<.001
Unemployed	337 (10.22)		138 (8.58)		36 (4.66)		
Employed/not in labor force (ref)	2910 (89.78)		1289 (91.42)		783 (95.34)		
Everyday Discrimination Scale score		4.74 (0.03)		4.66 (0.07)		5.11 (0.03)	<.001
Chronic Stress score		1.76 (0.05)		1.69 (0.09)		1.35 (0.06)	<.001
Financial Stress score		3.95 (0.06)		4.19 (0.14)		3.71 (0.10)	.035
Neighborhood crime							<.001
Frequent	647 (19.90)		254 (18.03)		105 (11.58)		
Infrequent (ref)	2600 (80.10)		1173 (81.97)		714 (88.41)		
Neighborhood drug problems							<.001
Drug problems exist	1309 (40.16)		532 (38.01)		227 (24.54)		
Few drug problems (ref)	1938 (59.84)		895 (61.99)		592 (75.46)		
Model 3: psychosocial resources							
Self-Esteem Scale score		16.10 (0.06)		16.34 (0.06)		16.02 (0.06)	NS
Mastery Scale score		18.44 (0.09)		17.88 (0.39)		18.58 (0.16)	NS

Continued

TABLE 3—*Continued*

Church attendance					NS
Regular	1278 (36.86)	543 (32.16)	280 (32.24)		
Less than once per wk (ref)	1969 (63.14)	884 (67.84)	539 (67.76)		
Importance of Religion Scale score	3.75 (0.01)	3.68 (0.04)	3.32 (0.06)		<.001
No. neighborhood resources	4.92 (0.09)	5.69 (0.14)	4.43 (0.20)		.019

Note. NS = nonsignificant. Higher scores on the Everyday Discrimination, Chronic Stress, and Financial Stress scales reflect higher levels of perceived discrimination and stress. Higher scores on the Self-Esteem, Mastery, and Importance of Religion scales reflect higher levels of each respective variable.

adults (18–94 years; mean=43 years) of diverse SES were represented in the study. Overall, 28% of the study sample reported having fair or poor oral health. The distribution of background characteristics and psychosocial stressors and resources by oral health status is presented in Table 2, and the distribution by race is presented in Table 3.

Table 4 presents the estimates from the nested multivariate logistic regression analyses. Model 1 included all the sociodemographic background characteristics. There were no differences by race/ethnicity but gender differences were noted. Men were about 1.5 times more likely to report fair or poor oral health than were women (OR=1.48; 95% confidence interval [CI]=1.08, 2.02; $P<.05$). The social gradient was observed with income again, and individuals in the lowest income group (earning less than $12 000 annually) were more than 3 times as likely as the highest income group (earning over $55 000 annually) to report fair or poor oral health (OR=3.30; 95% CI=2.30, 4.73; $P<.001$). Adults in the next 3 higher income groups were all still more likely to report worse oral health than was the highest income group. Adults with less than a high school education were also over 1.5 times more likely to report fair or poor oral health than those with more education (OR=1.67; 95% CI=1.30, 2.16; $P<.001$), and increasing age also slightly increased the odds of fair or poor oral health.

In model 2, the same pattern of findings across the background characteristics remained, although the magnitude of the OR estimates for all income groups decreased. The income gradient was still present and significant for all income groups, but the lowest income group was now only about twice, rather than 3 times, more likely to report fair or poor oral health (OR=1.94; 95% CI=1.46, 2.58; $P<.001$). Four of the psychosocial stressors were significant in this model, and all increased the odds of reporting fair or poor oral health. Adults who met the criteria for depression during the previous 12 months were more than twice as likely to report fair or poor oral health (OR=2.25; 95% CI=1.33, 3.81; $P<.01$). Being unemployed also raised the odds of fair or poor oral health to almost twice the likelihood (OR=1.80; 95% CI=1.02, 3.19; $P<.05$). Respondents with exposure to more material hardships and with higher chronic-stress scores had slightly higher odds of reporting fair or poor oral health.

Psychosocial resources were added in model 3. The pattern of results and magnitude of OR estimates were similar to model 2 for the background characteristics and stressors, with the exception of unemployment no longer being significant. Each of the 5 psychosocial resources was significant in this final model and reduced the odds of fair or poor oral health being reported. The odds were reduced the most for those indicating regularly attending church (OR=0.76; 95% CI=0.59, 0.99; $P<.05$) and placing greater importance on religion (OR=0.76; 95% CI=0.62, 0.93; $P<.01$). Additionally, higher self-esteem and mastery scores and living nearby more neighborhood resources were also protective against worse self-rated oral health.

DISCUSSION

Although it is clear that less advantaged groups experience a greater disease burden; socioeconomic markers such as income, race, and education are often confounded, and understanding the effects of socioeconomic conditions on disease prevalence can be a challenge for health disparities research. When income and race are considered together, the poor, regardless of race, tend to have worse oral health than do their nonpoor counterparts.[57] However, most racial minorities in this country are disproportionately overrepresented among the lower socioeconomic strata. Although we did not find racial differences in self-rated oral health status in this study sample between non-Hispanic Whites, Black Americans, and Caribbean Blacks, there were significant differences in the distributions across racial groups for education and income. Consistent with other studies,[2,13,21] social gradients in self-rated oral health were found by income and education, with lower income groups being more likely to report fair or poor oral health. The Caribbean Blacks had the lowest crude rate of reporting fair or poor oral health (23.52%), followed by non-Hispanic Whites (27.11%), and Black Americans (29.47%; Table 3), but these racial differences were not statistically significant. Notably, those with less than a high school education and all the lower income categories in our study comprised significantly higher proportions of Blacks than of Whites.

Study Implications

Importantly, previous studies have not examined how multiple individual-level psychosocial stressors and resources might also contribute to poorer self-rated oral health status in adults. We found that 3 of our 8 hypothesized psychosocial stressors increased the odds of adults reporting fair or poor oral health, whereas all 5 psychosocial resources reduced the odds of fair or poor oral health. These findings have implications for prevention, intervention, and future research. There were some differences in access to psychosocial resources and exposure to stressors across racial groups as well. Additionally, adults with fair or poor oral health also reported higher levels of psychosocial stressors and lower levels of psychosocial resources compared with adults with better self-rated oral health (Table 2).

TABLE 4—Nested Logistic Regression Models for Adults' Self-Rated Fair or Poor Oral Health Status: National Survey of American Life, February 2001–March 2003

	Model 1, OR (95% CI)	Model 2, OR (95% CI)	Model 3, OR (95% CI)
	Background		
Age, y	1.02*** (1.01, 1.03)	1.03*** (1.02, 1.04)	1.04*** (1.03, 1.05)
Less than high school education	1.67*** (1.30, 2.16)	1.52*** (1.19, 1.94)	1.42** (1.11, 1.82)
Men	1.48* (1.08, 2.02)	1.65** (1.22, 2.24)	1.49** (1.12, 1.97)
Income, $			
≤12 000	3.30*** (2.30, 4.73)	1.94*** (1.46, 2.58)	1.80*** (1.37, 2.38)
12 001–19 999	2.89*** (2.14, 3.90)	2.03*** (1.46, 2.82)	1.92*** (1.37, 2.67)
22 000–34 999	2.08*** (1.56, 2.78)	1.61** (1.21, 2.16)	1.55** (1.17, 2.07)
35 000–53 999	1.73*** (1.30, 2.30)	1.54*** (1.20, 1.96)	1.53*** (1.23, 1.93)
Household size	1.07 (0.99, 1.16)	1.06 (0.98, 1.14)	1.07 (1.00, 1.16)
Race/ethnicity			
Caribbean Black	0.85 (0.63, 1.13)	0.80 (0.61, 1.04)	0.79 (0.62, 1.00)
Non-Hispanic Whites	1.03 (0.80, 1.33)	1.16 (0.88, 1.53)	0.97 (0.74, 1.26)
	Psychosocial stressors		
Depression during the past 12 mo		2.25** (1.33, 3.81)	1.90* (1.15, 3.14)
No. material hardships		1.21*** (1.11, 1.31)	1.21*** (1.10, 1.32)
Unemployed		1.80* (1.02, 3.19)	1.77 (1.00, 3.12)
Everyday Discrimination Scale score		0.93 (0.80, 1.07)	0.97 (0.83, 1.13)
Chronic Stress Scale score		1.19*** (1.08, 1.30)	1.15** (1.05, 1.26)
Financial Stress Scale score		1.04 (0.98, 1.10)	1.02 (0.96, 1.08)
Frequent Crime Scale score		1.28 (0.96, 1.71)	1.30 (0.96, 1.76)
Neighborhood Drug Problem Scale score		1.33 (1.00, 1.78)	1.33 (0.98, 1.80)
	Psychosocial resources		
Self-Esteem Scale score			0.94* (0.90, 0.99)
Mastery Scale score			0.94*** (0.92, 0.97)
Regular church attendance			0.76* (0.59, 0.99)
Importance of Religion Scale score			0.76** (0.62, 0.93)
No. neighborhood resources			0.95* (0.91, 0.99)

Note. Twenty-eight percent reported fair or poor oral health. For model 1, age and household size were continuous variables; high school education or more, women, annual family income over $54 999, and Black American race were the reference categories for their respective variables. For model 2, no depression during last year, employed or not in labor force, the Everyday Discrimination scale scores, and the Stress scale scores were continuous variables; infrequent neighborhood crime and no serious neighborhood drug problems were the reference categories for their respective variables. For model 3, self-esteem scale scores, mastery scale scores, importance of religion scale scores, and number of neighborhood resources were continuous variables; nonregular church attendance (less than once per week) was the reference category for its respective variable. Higher scores on the Everyday Discrimination, Chronic Stress, and Financial Stress scales reflect higher levels of perceived discrimination and stress. Higher scores on the Self-Esteem, Mastery, and Importance of Religion scales reflect higher levels of each respective variable.
*P < .05; **P < .01; ***P < .001

As noted, the psychosocial stressors that increased the odds of fair or poor oral health were exposure to more numerous material hardships and other chronic stressors and meeting the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition,* diagnostic criteria for depression during the previous 12 months. Poor adults and those with greater stress levels and less personal control are more likely to rate their oral health as poor.[21] In one study, adults with greater depressive symptoms rated their own oral health worse.[17] In studies of older adults, those with more depressive symptoms scored worse on oral-quality-of-life scales,[18] and among Blacks in North Carolina, tooth loss was associated with depressive symptoms.[9] Higher perceived stress levels among lower-income Blacks have been associated with worse oral health ratings,[58] and recent studies show that higher levels of stress had significant direct effects on depressive symptoms and self-rated health.[59] Primarily, stress has been positively correlated with periodontal disease in recent literature reviews.[60,61]

Stress and depression can be moderated to some extent by psychological resources. Some community-based research has found that involvement in religious activities is an important way social support is enhanced for Blacks, and this source of support yields health benefits.[62] However, most oral health studies typically do not include resource measures that assess possible support or coping mechanisms for stressors. One study explored active coping, stress, and self-rated oral and general health among adults and found that coping style was associated with oral health.[63] However, our study is among the first to document the protective associations between self-esteem, mastery, religiosity, and self-rated oral health.

Living environments may provide additional exposure to stressors and supports, so neighborhood characteristics are important to consider. Although no stressors related to aspects of the individual's neighborhood were associated with self-reported oral health, respondents who reported living near more neighborhood resources were less likely to report fair or poor oral health. Some recent research has found that Blacks in poor neighborhoods were more likely than were their nonpoor counterparts to rate their general and oral health as fair or poor.[12] In another study, adults living in more-disadvantaged neighborhoods were more likely to rate their oral health as fair or poor, report greater tooth loss, and poorer quality of life.[24] Future oral health studies should continue to address neighborhood conditions assessed either by the individual or observed directly (such as at the census-track level) then analyzed at a higher-order level. Only individual-level information was available in the NSAL, and the associations found here represent a starting point for exploring how many new psychosocial factors correlate with one aspect of adult oral health for some racial groups in the United States. Additional research is needed to explore whether these relationships persist among other racial groups and age groups and over time. Future studies could also investigate the nature of these relationships in more depth, possibly using different analytic statistical approaches, such as structural

equation modeling, to assess mediation and indirect effects.

There are some limitations to consider. Surprisingly, we did not find significant racial differences in self-rated oral health, a finding that is inconsistent with other research on oral health using nationally representative samples.[6] Supplemental analyses (not shown) exploring racial differences by age and across all levels of oral health did not yield significant findings. Additionally, all measures in this analysis were based on perceptions and self-report, which are subject to recall and social desirability biases. Further, given the NSAL sampling methodology, the results for the Black American and Caribbean Black samples are nationally representative and generalizeable, whereas the non-Hispanic White sample estimates are not optimal for describing all Whites in the country.[35,38] Also, a few of the α reliabilities were borderline to moderate, and this should be considered when interpreting the results.

Nevertheless, if confirmed by future research, these results have important implications for developing interventions to address oral health disparities. Specifically, our findings suggest the need to address stressful but remediable conditions such as chronic stress, material hardship, and depression, as well the need to build on the protection conferred by factors such as religious participation and access to neighborhood resources. Oral health is an important but often neglected component of overall health, and many oral diseases are largely preventable. Socioeconomic disparities should not persist. The surgeon general has set goals to eliminate oral health disparities, improve quality of life, and promote oral health nationwide.[64] These goals echo those established by *Healthy People 2010*.[65,66] Effective oral health promotion requires addressing multiple health determinants, including ensuring access to regular dental services. Lower-income populations report worse oral health, lower dental service use, and experience more access barriers.[67] Systemic policy changes are needed to promote access, such as including dental in all programs and benefit packages. Policy changes addressing socioeconomic inequities that shape our exposure to resources and risk factors will help improve our nation's oral health and eliminate disparities.[68]

Conclusions

Research has yet to fully explore the potential relationships between many psychosocial factors and aspects of oral health. Future interventions to reduce oral health disparities should address not only individual biological and behavioral risk and protective factors, but psychosocial factors as well. More prospective research is needed to better elucidate the role of various psychosocial factors and oral health outcomes for all adults, including objective, clinical measures.

The findings of this study partially support the hypothesis that adults with lower levels of both income and education, and who are racial minorities will be more likely to report fair or poor oral health status. No racial differences in self-reported fair or poor oral health were found, but there were significant differences by income level and education. The hypothesis that adults exposed to each potential stressor would be more likely to report fair or poor oral health was supported for depression, material hardships, and chronic stress. The hypothesis that adults with access to each potential resource would be less likely to report fair or poor oral health and that access to those resources would help attenuate the negative effects of exposure to stressors was supported. All 5 resources were protective, although they did not dramatically diminish the effects of most stressors, with the exception of being unemployed. ■

About the Authors

Tracy L. Finlayson is with the Division of Health Management and Policy, Graduate School of Public Health, San Diego State University, San Diego, CA. David R. Williams is with the Department of Society, Human Development and Health, Harvard School of Public Health, Boston, MA. Kristine Siefert is with the School of Social Work, University of Michigan, Ann Arbor. James S. Jackson is with the Institute for Social Research, University of Michigan, Ann Arbor. Ruth Nowjack-Raymer is with the National Institute of Dental and Craniofacial Research, National Institutes of Health, Bethesda, MD.

Correspondence should be sent to Tracy L. Finlayson, Health Management and Policy, Graduate School of Public Health, San Diego State University, 5500 Campanile Dr, San Diego, CA 92182-4162 (e-mail: tfinlays@mail.sdsu.edu). Reprints can be ordered at http://www.ajph.org by clicking the "Reprints/Eprints" link.

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Contributors

T.L. Finlayson conducted the analysis and led the writing of the article. D.R. Williams and K. Siefert guided the study design and assisted with analysis, interpretation, and writing. J.S. Jackson was the primary investigator of the National Survey of American Life and wrote and reviewed drafts of the article. R. Nowjack-Raymer wrote and reviewed drafts.

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Human Participant Protection

Data collection for the NSAL was approved by the University of Michigan institutional review board. Informed consent was obtained from all participants.

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