Predicting Periodontitis at State and Local Levels in the United States

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Appendix

The National Health and Nutrition Examination Survey (NHANES) is a stratified, multistage probability sample of the civilian noninstitutionalized population in the United States. The technical details of the survey, including sampling design, periodontal data collection protocols, and data availability, can be accessed online (www.cdc.gov/nchs/nhanes.htm). The periodontal protocol for NHANES 2009–2012 was restricted to adults aged 30 to 79 y who had at least 1 natural tooth and no health condition requiring antibiotic prophylaxis before periodontal probing. For the first time in NHANES, the full-mouth gold-standard periodontal surveillance protocol was used (2009–2014). Periodontitis was defined as having combined mild, moderate, or severe periodontitis, as categorized by the Centers for Disease Control and Prevention (CDC)/American Academy of Periodontology (AAP) case definitions (Page and Eke 2007; Eke et al. 2012).

By using NHANES, individual age groups were categorized as 30 to 44, 45 to 54, 55 to 64, and 65 to 79 y. Race or ethnicity was categorized as the following 4 groups: non-Hispanic white, non-Hispanic black, non-Hispanic other Hispanic (i.e., anyone who self-identified as Hispanic, which is a combination of Mexican Americans and other Hispanics), and other race or ethnicity, including multiracial. Smoking status was constructed from responses to 2 questions: 1) *Have you smoked at least 100 cigarettes in your life?* and 2) *Do you now smoke cigarettes?* Respondents who reported smoking every day or some days and had smoked at least 100 cigarettes were categorized as *current smokers*, respondents who reported currently not smoking but having smoked more than 100 cigarettes in the past were categorized as *former smokers*, and respondents who reported having ever smoked fewer than 100 cigarettes were categorized as *nonsmokers*. Poverty status was categorized into 2 groups: the family income to federal poverty threshold ratio (poverty income ratio [PIR]) less than 1.5 (family in poverty) and PIR equal to or greater than 1.5 (family not in poverty).

The Behavioral Risk Factor Surveillance System (BRFSS) is a state-based telephone survey of noninstitutionalized US adults aged 18 y or older and is conducted annually to monitor state-level prevalence of behavioral risks associated with morbidity and mortality. The BRFSS is administered by states with support and assistance provided by the CDC. A similar smoking question was used in the BRFSS as was used in the NHANES program. Details of this survey can be obtained from www.cdc.gov/brfss.

The Americal Community Survey (ACS) 2008–2012 is a 5-y estimate of county surveys. The ACS data and the work of the Missouri Census Data Center are publicly available (http://www.ofm.wa.gov/pop/acs/userguide/ofm_acs_user_guide.pdf). Currently, the BRFSS method includes the use of control totals derived from the ACS. BRFSS uses age, race, ethnicity, gender, education, marital status, home ownership, and phone ownership as raking weight margins within each substate region. With the exception of phone ownership, which is weighted based on estimates from the National Health Interview Survey (NHIS), control totals for all BRFSS weighting variables are taken from the ACS.

In addition to the 1-, 3-, and 5-y estimates for single substate jurisdictions, the ACS data provide a large sample of substate population information through the release of the Public Use Microdata Sample (PUMS). Each individual in the ACS PUMS is assigned a person weight (PWGTP) by the Census Bureau. The ACS PUMS contains a state identifier (ST) and a substate geographic identifier, Public Use Microdata Area (PUMA). The Missouri Census Data Center has produced a series of geographic equivalency files—one for each state—that shows how PUMAs line up with other census geographies, including counties and census blocks. The Data Center has provided a variable, GEOCORR, that provides a general correlation between PUMAs and counties that can be used to interpret locations of persons within ACS data sets. Also, the GEOCORR variable allows for a crosswalk of the PUMA to the county, thus allowing for the merger of the BRFSS data set with the ACS data, making use of both data sets and adjusting

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Appendix Table 1. Selected Characteristics of Populations Aged 30 to 79 y in 3 Data Sets.

Characteristic	NHANES 2009–2012 (N = 169,567,648), % (95% CI)[a]	BRFSS 2012 (N = 176,929,762), % (95% CI)[a]	2010 US Census (N = 171,553,374), %
Gender			
Men	48.3 (47.0, 49.5)	48.3 (48.0, 48.7)	48.6
Women	51.7 (50.5, 53.0)	51.7 (51.3, 52.0)	51.4
Age group (y)			
30–44	35.9 (33.6-38.3)	34.8 (34.5, 35.1)	35.6
45–54	25.2 (23.8-26.7)	24.8 (24.5, 25.1)	26.2
55–64	21.7 (20.5-23.0)	21.5 (21.2, 21.7)	21.3
65–79	17.2 (16.0-18.4)	18.9 (18.7, 19.1)	16.9
Age groups (y)			
30–34		12.1 (11.9, 12.3)	11.6
35–39		10.5 (10.2, 10.7)	11.8
40–44		12.2 (12.0, 12.5)	12.2
45–49		11.1 (10.9, 11.3)	13.2
50–54		13.7 (13.5, 13.9)	13.0
55–59		11.0 (10.8, 11.1)	11.5
60–64		10.5 (10.3, 10.7)	9.8
65–69		8.0 (7.8, 8.1)	7.2
70–74		6.0 (5.9, 6.1)	5.4
75–79		4.9 (4.8, 5.0)	4.3
Race or ethnicity			
Non-Hispanic white	68.6 (63.4, 73.4)	66.6 (66.2, 66.9)	68.7
Non-Hispanic black	11.3 (9.1, 14.1)	11.4 (11.2, 11.6)	11.3
Hispanic	13.1 (9.8, 17.2)	14.0 (13.7, 14.3)	13.0
Non-Hispanic other	7.0 (5.6, 8.6)	8.0 (7.8, 8.3)	6.9
Race or ethnicity			
Non-Hispanic white		67.1 (66.8, 67.5)	68.7
Non-Hispanic black		11.5 (11.3, 11.7)	11.3
American Indian/Alaska Native		1.1 (1.0, 1.1)	0.7
Asian		4.2 (4.0, 4.5)	4.8
Hawaii Native/other Pacific Islander		0.2 (0.2, 0.2)	0.1
Other single race, non-Hispanic		0.5 (0.4, 0.5)	0.1
Multiracial, non-Hispanic		1.3 (1.3, 1.4)	1.2
Hispanic		14.1 (13.8, 14.4)	13.0
Below poverty index			
Yes	12.2 (10.8, 13.9)		15.1
Other responses	87.8 (86.1, 89.2)		84.9
Smoking status			
Never smoked	53.9 (52.0, 55.7)	53.0 (52.7, 53.3)	
Former smoker	26.3 (24.4, 28.3)	28.0 (27.7, 28.3)	
Current smoker	19.8 (18.4, 21.3)	19.0 (18.7, 19.3)	

BRFSS, Behavioral Risk Factor Surveillance System; CI, confidence interval; NHANES, National Health and Nutrition Examination Survey.
[a]Weighted percentages obtained with SAS-SUDAAN.

Appendix Table 2. Model-Based Estimates of Total and Severe Periodontitis Prevalence by State or District, 2009 to 2012.

State or District	Total, % (95% CI)	Severe, % (95% CI)
Alabama	47.39 (47.26, 47.52)	9.80 (9.75, 9.85)
Alaska	43.60 (43.32, 43.89)	8.72 (8.60, 8.83)
Arizona	47.73 (47.62, 47.84)	9.46 (9.41, 9.50)
Arkansas	47.23 (47.05, 47.41)	9.57 (9.50, 9.63)
California	47.80 (47.75, 47.84)	9.42 (9.40, 9.43)
Colorado	43.29 (43.17, 43.40)	8.26 (8.22, 8.30)
Connecticut	43.35 (43.22, 43.47)	8.18 (8.14, 8.23)
Delaware	45.86 (45.60, 46.11)	9.03 (8.93, 9.14)
District of Columbia	50.08 (49.79, 50.37)	11.18 (11.04, 11.33)
Florida	49.47 (49.41, 49.55)	10.00 (9.97, 10.03)
Georgia	46.41 (46.31, 46.51)	9.51 (9.47, 9.54)
Hawaii	51.10 (50.88, 51.32)	10.56 (10.45, 10.66)
Idaho	42.72 (42.44, 43.01)	7.87 (7.77, 7.97)
Illinois	44.87 (44.80, 44.94)	8.79 (8.76, 8.81)
Indiana	44.18 (44.07, 44.30)	8.58 (8.54, 8.63)
Iowa	42.10 (41.95, 42.25)	7.66 (7.61, 7.71)
Kansas	43.28 (43.13, 43.42)	8.17 (8.11, 8.22)
Kentucky	45.17 (45.03, 45.32)	8.89 (8.84, 8.94)
Louisiana	48.21 (48.08, 48.33)	10.26 (10.2, 10.31)
Maine	42.90 (42.63, 43.16)	7.90 (7.80, 7.99)
Maryland	45.25 (45.15, 45.35)	8.97 (8.93, 9.01)
Massachusetts	42.80 (42.70, 42.89)	8.01 (7.98, 8.05)
Michigan	45.13 (45.05, 45.21)	8.95 (8.91, 8.98)
Minnesota	41.66 (41.55, 41.77)	7.68 (7.64, 7.72)
Mississippi	49.22 (49.04, 49.42)	10.58 (10.5, 10.65)
Missouri	45.12 (45.00, 45.24)	8.88 (8.83, 8.93)
Montana	44.29 (43.98, 44.57)	8.41 (8.30, 8.52)
Nebraska	42.85 (42.65, 43.02)	8.00 (7.93, 8.07)
Nevada	47.84 (47.69, 47.98)	9.68 (9.63, 9.74)
New Hampshire	40.51 (40.28, 40.73)	7.27 (7.18, 7.36)
New Jersey	45.26 (45.18, 45.33)	8.82 (8.79, 8.86)
New Mexico	52.79 (52.60, 52.97)	11.32 (11.23, 11.41)
New York	46.59 (46.54, 46.65)	9.28 (9.26, 9.30)
North Carolina	46.53 (46.44, 46.62)	9.47 (9.43, 9.50)
North Dakota	42.42 (42.11, 42.76)	7.85 (7.73, 7.98)
Ohio	44.45 (44.37, 44.54)	8.70 (8.66, 8.73)
Oklahoma	46.98 (46.85, 47.12)	9.49 (9.44, 9.54)
Oregon	43.63 (43.48, 43.78)	8.12 (8.07, 8.18)
Pennsylvania	44.41 (44.34, 44.49)	8.56 (8.54, 8.59)
Rhode Island	43.63 (43.38, 43.88)	8.26 (8.17, 8.35)
South Carolina	47.78 (47.67, 47.90)	9.91 (9.86, 9.96)
South Dakota	43.55 (43.26, 43.87)	8.25 (8.15, 8.37)
Tennessee	46.18 (46.07, 46.30)	9.30 (9.25, 9.35)
Texas	48.25 (48.19, 48.31)	9.86 (9.84, 9.89)
Utah	37.69 (37.51, 37.86)	6.36 (6.31, 6.41)
Vermont	41.43 (41.09, 41.77)	7.47 (7.35, 7.59)
Virginia	44.29 (44.21, 44.36)	8.65 (8.62, 8.69)
Washington	42.92 (42.81, 43.02)	8.01 (7.98, 8.05)
West Virginia	45.69 (45.46, 45.92)	8.88 (8.79, 8.97)
Wisconsin	42.71 (42.59, 42.83)	8.02 (7.98, 8.06)
Wyoming	42.85 (42.51, 43.24)	8.01 (7.89, 8.15)

to the population totals for the counties represented by the PUMAs.

Decennial 2010 US census block-level population counts were downloaded from the US Census Bureau (www.census.gov).

Appendix References

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