Dental caries and periodontal disease among U.S. pregnant women and nonpregnant women of reproductive age, National Health and Nutrition Examination Survey, 1999–2004

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Abstract

Objectives—This study assessed and compared the prevalence and severity of dental caries and the prevalence of periodontal disease among pregnant and nonpregnant women of reproductive age (15–44 years) using data from the National Health and Nutrition Examination Survey, NHANES (1999–2004).

Methods—Estimates were derived from a sample of 897 pregnant women and 3,971 nonpregnant women. Chi-square and two-sample *t*-tests were used to assess differences between groups stratified by age, race/ethnicity, education, and poverty. Bonferroni method was applied to adjust for multiple comparisons.

Results—In general, there were no statistically significant differences in the prevalence estimates of dental caries and periodontal disease between pregnant women and nonpregnant women. However, results showed significant differences when stratified by sociodemographic characteristics. For example, the prevalence of untreated dental caries among women aged 15–24 years was significantly higher in pregnant women than in nonpregnant women (41 percent versus 24 percent, *P*=0.001). Regardless of their pregnancy status, racial/ethnic minorities or women with less education or lower family income had higher prevalence of untreated dental caries, severity of

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dental caries, and periodontal disease compared to the respective reference groups of non-Hispanic whites or women with more education or higher family income.

Conclusion—Results of this study show few clinical differences in dental caries and periodontal disease between pregnant and nonpregnant women but persistent disparities by sociodemographic characteristics. In order to reduce oral health disparities in the United States, it is important to improve access to oral health care particularly among vulnerable groups. Integrating oral health into the overall health care could benefit and improve women's oral health outcomes.

Keywords

dental caries; periodontal disease; pregnancy; women; NHANES

Introduction

Oral diseases such as dental caries, gingivitis, and periodontal diseases can occur during pregnancy (1,2). Both dental caries and periodontal diseases may produce pain and complications and, if not treated promptly, may require more complicated interventions. Some studies have suggested an association between intraoral infections and adverse pregnancy outcomes (e.g., preeclampsia, preterm delivery, low birth weight) (2–7), but the evidence is still inconclusive (8,9).

A cohort study reported that approximately 40 percent of pregnant women in the United States had some form of periodontal infection, which may include gingivitis and periodontitis (10). The national prevalence of dental caries (including untreated and treated), untreated tooth decay, and periodontal disease among dentate women aged 20–64 years, as reported by the National Health and Nutrition Examination Survey (NHANES) 1999–2004, was 93 percent, 23 percent and 6 percent, respectively (11). A study using the same dataset compared the effect of tobacco smoke on the oral health of women of reproductive age between 15 and 44 years of age and reported estimates of the number of decayed, missing, and filled permanent surfaces and prevalence of periodontal disease. However, this study did not compare pregnant and nonpregnant women (12). The objective of this study is to assess and compare the national prevalence and severity of dental caries and the prevalence of periodontal disease among pregnant women and nonpregnant women of reproductive age (15–44 years) in the United States using data from NHANES (1999–2004).

Methods

We used data from NHANES, an ongoing, complex, multistage survey designed to provide estimates of nutrition and health status for the noninstitutionalized, civilian U.S. population. NHANES data are collected via household interviews, physical and clinical examinations at the Mobile Examination Center (MEC), and laboratory testing using biological samples taken at the MEC. Detailed information regarding NHANES is available on the NHANES website at http://www.cdc.gov/NCHS/NHANES.htm. NHANES oversampled pregnant women between 1999 and 2006. During 1999–2004, the NHANES oral health protocol included a face-to-face interview at home using a standardized questionnaire and a dental examination conducted by a trained dentist at the MEC. The oral health protocol in

NHANES changed in 2005, making it impossible to combine data from 2005 to 2006 with data from 1999 to 2004. More recent NHANES data for dental caries and periodontal status have been released to the public (2009–2012), but because of changes in the oral health protocol, we were also not able to combine these data with our data from 1999 to 2004.

We analyzed data on the prevalence of dental caries, prevalence of untreated dental caries, severity of dental caries, and prevalence of periodontitis among dentate pregnant women and nonpregnant women of reproductive age. The prevalence of dental caries (also known as caries experience) was defined as the percent of dentate participants with one or more untreated (decayed) or treated (filled) permanent teeth. The prevalence of untreated dental caries was defined as the percent of dentate participants with one or more untreated decayed teeth. Dental examiners detected untreated dental caries at the cavitated level (13). Severity of dental caries was measured by the number of decayed and filled permanent tooth surfaces (DFS), and the number of decayed surfaces (DS) and filled surfaces (FS) separately. We excluded missing permanent teeth from all computations to avoid including teeth that were missed due to reasons other than dental caries. The periodontal assessment in NHANES 1999–2004 included only two periodontal sites (mesial- and mid-buccal) on each fully erupted permanent tooth from two randomly selected quadrants (third molars were not included). Periodontal disease was defined as having at least one periodontal site with 3 mm or more of loss of attachment and 4 mm or more of pocket depth at the same periodontal site. This case definition has been used in prior NHANES publications (11). A third probing site (disto-buccal) was added in 2001; however, this additional site was not used in our analysis because we wanted to maximize six years of comparable data from 1999 to 2004. NHANES has published complete details of the dental examinations elsewhere (11,14).

Our study participants included pregnant women and nonpregnant women of reproductive age (15–44 years). To select pregnant women to be included in our analysis, we used the pregnancy variable provided by NHANES (RIDEX-PREG). According to NHANES, pregnancy status was ascertained through either the interview question "are you currently pregnant?" or a urine pregnancy test conducted at the MEC. Detailed information regarding how pregnancy status is determined in the survey is available at the NHANES website (Analytical Guidelines 1999–2010). Our sample included 897 pregnant women and 3,971 nonpregnant women of reproductive age. We had excluded 265 women because their pregnancy status could not be ascertained. We stratified our analysis by age, race/ethnicity, educational level, and poverty status. Age was categorized into three groups: 15–24, 25–34, and 35–44 years. We included three race/ethnicity groups: non-Hispanic white, non-Hispanic black, and Mexican American. Other race/ethnicity groups, such as other Hispanic and other race, which includes multi-racial, were not reported separately due to small sample size, but were included in the denominators in estimations of prevalence of other characteristics. We included three education categories provided by NHANES: <high school, high school diploma, and >high school. Poverty Status was defined by the ratio of family income to the federal poverty level (FPL), and we included three poverty categories: <100 percent of the FPL, 100–199 percent of the FPL, and 200 percent of the FPL.

Statistical analysis

To account for the complex sampling design, we used SAS version 9.3 (SAS Institute, Cary, NC) and SUDAAN version 10.0 (Research Triangle Institute, Research Triangle Park, NC) for our analysis. We used 6 years (1999–2004) of sample MEC weights to produce population estimates. Detailed information on the survey sample weights and the NHANES analytical guidelines are described on the NHANES website. Tabular distributions of sociodemographic characteristics are presented and contrasted by pregnancy status using chi-square tests at the α=0.05 level (Table 1). Percentages and mean estimates for clinical outcomes are presented and contrasted by pregnancy status using standard error (s.e.) and two-sample t-tests (Tables 2–4). We applied the Bonferroni method to adjust for multiple comparisons and only reported comparisons that remained significantly different after the Bonferroni adjustment. For the 16 pairwise tests between respondent characteristic, the differences were statistically significant if the Bonferroni P-value was less than 0.003; and for the 13 pairwise tests between pregnant and nonpregnant women, the differences were statistically significant if the Bonferroni P-value was less than 0.004.

Results

Sociodemographic characteristics

The sociodemographic characteristics of study participants by pregnancy status are shown in Table 1. Compared to nonpregnant women, a higher proportion of pregnant women were in the age group 25–34 years and a lower proportion in the age group 35–44 years ($P<0.001$). Compared to nonpregnant women, a lower proportion of pregnant women were non-Hispanic white and a higher proportion were Mexican American ($P<0.001$).

Prevalence of dental caries (DFS > 0)

Overall, there were no statistically significant differences between pregnant women and nonpregnant women in the prevalence of dental caries (Table 2). Nonetheless, the prevalence of dental caries among pregnant women was significantly higher than nonpregnant women among those with family income 200 percent of the FPL (94 percent versus 88 percent, P=0.002).

Among pregnant women, those aged 15–24 years or those with family income <100 percent of the FPL had a significantly lower prevalence of dental caries compared respectively to women aged 35–44 years (83 percent versus 97 percent; $P<0.001$) or those with family income 200 percent of the FPL (84 percent versus 94 percent; P=0.002). Among nonpregnant women, those aged 15–24 years or those with less than high school education had a significantly lower prevalence of dental caries compared respectively to women aged 35–44 years (75 percent versus 93 percent; $P<0.001$) or those with greater than high school education (77 percent versus 90 percent; $P<0.001$)

Prevalence of untreated dental caries (DS > 0)

Overall, there were no statistically significant differences between pregnant women and nonpregnant women in the prevalence of untreated dental caries (Table 2). Nonetheless, the

prevalence of untreated dental caries among women aged 15–24 years was significantly higher in pregnant women than in nonpregnant women (41 percent versus 24 percent, P=0.001).

In both pregnant and nonpregnant women, the prevalence of untreated dental caries was significantly higher (P 0.001, for all the results) among non-Hispanic blacks (45 percent and 39 percent, respectively) and Mexican Americans (42 percent and 35 percent, respectively) than among non-Hispanic whites (18 percent and 19 percent, respectively). It was also higher among women with less than high school education (46 percent and 37 percent, respectively) and with a high school education (45 percent and 33 percent, respectively) than among women with more than a high school education (17 percent and 15 percent, respectively). Furthermore, the prevalence of untreated dental caries was significantly higher among women with family income <100 percent of the FPL (53 percent and 41 percent, respectively) than among women with family income 200 percent of the FPL (16 percent and 14 percent, respectively). In addition, among nonpregnant women, those with family income between 100–199 percent of the FPL (34 percent) had a higher prevalence of untreated dental caries than those with family income 200 percent of the FPL (14 percent, P<0.001).

Severity of dental caries (mean number of DFS, DS, and FS)

There were no statistically significant differences between pregnant and nonpregnant women in the mean number of DFS, DS, and FS (Table 3).

Among pregnant women, there were no differences within sociodemographic characteristics in the mean number of DFS, and most differences within sociodemographic characteristics were in the mean number of FS. Those aged 15–24 years, those who are non-Hispanic black or Mexican American, or those with family income <100 percent of the FPL had a significantly lower mean number of FS compared respectively to women aged 35–44 years (8.21 versus 17.74, P=0.003), those who are non-Hispanic white (7.42 versus 12.05, P=0.002 and 7.47 versus 12.05, P<0.001, respectively), or those with family income 200 percent of the FPL (7.95 versus 12.81, P=0.002). In addition, pregnant women with family income <100 percent of the FPL had a higher mean number of DS compared to those with family income 200 percent of the FPL (3.1 versus 0.7, P=0.002).

Among nonpregnant women, those who were younger (15–24 years and 25–35 years), of minority racial/ethnic groups (Non-Hispanic black and Mexican American), with less education (<High School and High School Diploma), or with lower family income (<100 percent of the FPL and 100–199 percent of FPL) had significantly lower mean number of DFS and FS (P<0.001, for all the results) compared respectively to women aged 35–44 years, those who are non-Hispanic white, those with more than a high school education, or those with family income 200 percent of the FPL. Nonpregnant women who were non-Hispanic black (2.15), with less education (2.45 for<High School and 1.87 for High School Diploma), or with lower family income (2.76 for <100 percent of the FPL and 1.99 for 100–199 percent of FPL) had significantly higher mean number of DS compared respectively to nonpregnant women who were non-Hispanic white (1.19), with more than a high school

education (0.6), or with family income   200 percent of the FPL (0.58) (*P*<0.001, for all the results).

Prevalence of periodontal disease

In general, there were no statistically significant differences between pregnant women and nonpregnant women in the prevalence of periodontal disease (Table 4). However, the prevalence of periodontal disease among nonpregnant non-Hispanic black women was significantly higher than among pregnant non-Hispanic black women (10.9 percent versus 2.2 percent; *P*<0.001).

Mexican American pregnant women had a significantly higher prevalence of periodontal disease than non-Hispanic white pregnant women (9.3 percent versus 2.0 percent; *P*=0.003). Among nonpregnant women, those aged 15–24 years (1.7 percent) and 25–34 years (2.9 percent) had lower prevalence of periodontal disease than those aged 35–44 years (7.4 percent, *P*<0.001). Also among nonpregnant women, non-Hispanic blacks (10.9 percent), Mexican Americans (7.6 percent), those with less than high school (7.1 percent) or with high school education (6 percent), or those with family income of 100–199 percent of the FPL (7.5 percent) had significantly higher prevalence of periodontal disease than non-Hispanic whites (2 percent, *P*<0.001), those with more than high school education (2.1 percent, *P*<0.001 and *P*=0.002, respectively), or those with family income   200 percent of the FPL (2.1 percent, *P*<0.001).

Discussion

This is the first descriptive epidemiological study to provide national prevalence estimates of dental caries and periodontal disease among pregnant women and nonpregnant women of reproductive age (15–44 years), and the first to compare the differences in estimates between the two groups by sociodemographic characteristics. In general, there were no statistically significant differences between pregnant women and nonpregnant women in the prevalence estimates of dental caries and periodontal disease. Nonetheless, some exceptions included higher prevalence among pregnant women for dental caries (DFS>0) in the highest FPL level and untreated dental caries (DS>0) in the youngest age group (15–24 years). Regarding the prevalence of periodontal diseases, the only significant difference was among non-Hispanic blacks where the estimate of periodontal disease was higher among nonpregnant women.

We estimated a mean DFS of 12.1 among pregnant women and 13.1 among nonpregnant women of 15–44 years of age. These values are not directly comparable to those reported in Bruce et al. (DFS=19.8) (11) because the latter included a different population representation (women age 20–64 years) or those by Iida et al. (DMFS=19.1) (12) because it included the missing component in the DMFS index. Regarding periodontal disease, we estimated a prevalence of 3.1 percent among pregnant women and 4.2 percent among nonpregnant women. These estimates used a case definition constructed based on measuring two sites per tooth on two randomly selected quadrants. Such approach may underestimate the prevalence of periodontal disease (14) but were the only constructs of periodontal disease available in the data set. A more recent expansion in the number of sites and teeth in

NHANES have been available after 2009 (15) but because NHANES stopped oversampling pregnant women after 2006, more number of years of data will be needed to allow a comparison between pregnant and nonpregnant women. It is possible that more refined tools may show differences in periodontal status between pregnant and nonpregnant women.

The comparison of prevalence estimates of dental caries by sociodemographic characteristics show, in general, racial/ethnic minorities or women with less education or lower family income having a higher prevalence of untreated dental caries (DS>0) and lower mean number of FS compared respectively to non-Hispanic whites or women with more education or higher family income. Furthermore, a reciprocal pattern in treated-filled surfaces (FS) and untreated disease-decayed surfaces (DS) is observed in both pregnant and nonpregnant women (Table 3), where racial/ethnic minorities or women with less education or lower family income have the highest mean levels of decayed teeth surfaces (DS) and the lowest mean levels of filled teeth surfaces (FS). Regarding periodontal disease (Table 4), in general, our data show that racial/ethnic minorities or women with less education or lower family income have a higher prevalence of periodontal disease compared respectively to non-Hispanic whites or women with more education or higher family income.

Inequalities in both dental caries (including untreated dental caries and severity measures) and periodontal disease by race/ethnicity, education, and poverty status are of critical public health importance. Similar findings of disparities in oral health by sociodemographic factors among the U.S. population have been reported previously (11). One approach to reduce oral health disparities in the United States is improving access to preventive and curative oral care, particularly among the most vulnerable groups (16–18). Suggested strategies include integrating oral health care into overall health care for prompt oral disease detection, increasing coverage for underserved and vulnerable populations for dental services, and increasing reimbursement levels for providers in publicly funded programs so that all women have equal opportunities to access oral health services (17–19).

Overall, our findings suggest the need to improve oral health status among U.S. pregnant women, especially among younger women and disadvantaged populations (e.g., racial/ethnic minorities, those with lower education, or those with lower family income) in order to reduce the occurrence of dental caries, particularly untreated dental caries, and periodontal disease. Studies have reported that dental professionals and pregnant women may delay or postpone dental treatment until after delivery to avoid potential adverse pregnancy outcomes (6,20–22) despite the lack of evidence supporting harmful effects of dental preventive and treatment services during pregnancy (5,19,23–25). In addition, studies have examined knowledge, attitudes, and behaviors about oral health among pregnant women (6,20,26–29) and some have suggested that factors such as fear of dental treatment (6,20), perceptions of having no oral health problems during pregnancy (30), and socioeconomic barriers such as time and cost can be potential barriers to accessing dental care (29,31). Recently, a study reported national prevalence estimates on having dental visits in the same population included in the present study. This study found that pregnant women aged 15–24 years, those from minority race/ethnicity groups, or those with less than high school education reported a lower percentage of having a dental visit in the previous year compared with their nonpregnant women counterparts (32). As discussed in other studies, pregnancy does not

preclude dental visits, preventive care, or certain dental treatments (1,5,19,23). It would be helpful if dental and prenatal care professionals could increase collaboration to facilitate coordination and provision of oral health services for pregnant women (19). Targeted interventions such as providing counseling and oral health education during prenatal visits (19) to increase knowledge about maintaining good oral health and the safety of many dental treatments, and encouraging women to schedule regular dental visits may help improve use of dental services during pregnancy.

This study is subject to some limitations. First, the exclusion of missing permanent teeth in our analysis may underestimate the prevalence and severity of dental caries; however, we excluded them to avoid inclusion of missing teeth due to other causes than caries. Second, as mentioned before, the case definition used to characterize periodontal disease may produce underestimates of disease prevalence and severity (15). We did not include measures of gingival bleeding (a sign of inflammation) because of its transient characteristic and the possibility of overestimation of periodontal disease. Third, changes in the 2005 NHANES oral health protocol made it impossible to expand analysis with different data survey cycles. Fourth, our study did not propose the identification of risk factors or risk indicators for differences in disease status between pregnant and nonpregnant women of reproductive age, but to describe disease levels by sociodemographic characteristics. We understand that parity could be used to assess degree of change in disease level as a result of multiple pregnancies. However, the 2013 total fertility rate in the United States was only 1.86 per 1,000 women (33). We did not plan or execute multivariate models to assess or control for third variables because the objective was to describe disease level, as in other national surveillance reports (11). Furthermore, being that NHANES is a cross-sectional survey, those models would have limited epidemiological explanatory value. Strengths of our study include the use of a large, nationally representative sample of the U.S. population, and oversampling of pregnant women and population subgroups such as non-Hispanic blacks and all Hispanics (including Mexican Americans), which allowed us to make comparisons between pregnant and nonpregnant women and within racial/ethnic subgroups. The current selected sociodemographic characteristics in this study will enable researchers and public health officials to further compare data and monitor progress in both pregnant and nonpregnant women in the United States.

Our study reports few clinical differences in dental caries and periodontal disease between pregnant and nonpregnant women but persistent disparities by sociodemographic characteristics. In order to reduce oral health disparities in the United States, it is important to improve access to preventive and curative oral health care, particularly among the most vulnerable groups. It would also be helpful if obstetric care includes detecting oral health needs and making appropriate referral to dental services, and dental care includes providing appropriate preventive and treatment services in coordination with the obstetricians, especially in the younger group. As suggested by a national consensus statement developed by an expert workgroup, all women should be advised that "Preventive, diagnostic, restorative dental treatment is safe throughout pregnancy and is effective in improving and maintaining oral health" (19).

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Table 1

Sociodemographic Characteristics of Pregnant Women and Nonpregnant Women of Reproductive Age by Selected Characteristics –United States, 1999–2004

Selected characteristics	Pregnant women %	s.e.	Nonpregnant women %	s.e.	P-value[*]
Total	N=897		N=3971		
Age (years)					<0.001 [*]
15–24	34.0	2.46	30.4	0.98	
25–34	52.4	2.77	30.4	1.18	
35–44	13.6	2.26	39.2	1.31	
Race/Ethnicity [†]					<0.001 [*]
Non-Hispanic White	54.0	3.43	66.2	1.96	
Non-Hispanic Black	16.5	2.29	13.0	1.22	
Mexican American	14.4	1.85	9.2	1.02	
Education					0.126
< High School	22.9	2.36	24.0	0.88	
High School Diploma	19.1	2.33	23.0	1.03	
> High School	58.0	2.83	52.9	1.34	
Poverty status [‡]					0.144
<100% of the Federal Poverty Level (FPL)	23.4	2.85	20.3	1.14	
100%–199% of the FPL	18.2	2.32	22.1	0.93	
200% of the FPL	58.4	3.96	57.6	1.38	

Source: National Health and Nutrition Examination Survey, 1999–2004. s.e.=standard error.

[*]
Chi-square test was used to compare estimates between pregnant and nonpregnant women for the distribution of selected sociodemographic characteristics.

[†]
All race/ethnicity categories were included in the denominator but "other race/ethnicity" and "other Hispanic" were not included in the table.

[‡]
Poverty status is defined by the ratio of family income to the federal poverty level (FPL).

Table 2

Prevalence of Dental Caries and Untreated Tooth Decay Among Pregnant Women and Nonpregnant Women of Reproductive Age by Selected Characteristics – United States, 1999–2004

Selected characteristics	Prevalence of dental caries (DFS>0)					Prevalence of untreated dental caries (DS>0)				
	Pregnant women		Nonpregnant women			Pregnant women		Nonpregnant women		
	% (*P*-value)*	s.e.	% (*P*-value)*	s.e.	*P*-value†	% (*P*-value)*	s.e.	% (*P*-value)*	s.e.	*P*-value†
Total	*N*=847		*N*=3711			*N*=847		*N*=3711		
	87.2	2.1	86.6	0.8	0.770	28.3	3.1	24.2	1.2	0.245
Age (years)										
15–24	82.5 (<0.001)‡	2.7	75.4 (<0.001)‡	1.5	0.022	41.1 (0.071)	4.8	23.6 (0.593)	1.7	0.001¶
25–34	87.6 (0.016)	3.3	89.6 (0.050)	1.5	0.579	21.6 (0.917)	3.6	24.1 (0.773)	1.9	0.560
35–44	97.3 (ref)	1.5	93.2 (ref)	0.9	0.021	22.6 (ref)	8.9	24.7 (ref)	1.5	0.809
Race/Ethnicity§										
Non-Hispanic White	88.8 (ref)	2.9	87.1 (ref)	1.0	0.600	17.8 (ref)	3.9	18.9 (ref)	1.6	0.802
Non-Hispanic Black	82.1 (0.126)	3.4	85.9 (0.524)	1.3	0.295	45.3 (<0.001)‡	4.9	39.2 (<0.001)‡	2.1	0.247
Mexican American	76.2 (0.008)	4.3	82.6 (0.013)	1.5	0.122	42.2 (<0.001)‡	5.6	34.9 (<0.001)‡	2.4	0.195
Education										
< High School	81.2 (0.013)	3.1	76.7 (<0.001)‡	1.4	0.186	45.6 (<0.001)‡	4.8	36.5 (<0.001)‡	2.3	0.072
High School Diploma	81.2 (0.100)	6.0	88.1 (0.180)	1.4	0.264	44.9 (<0.001)‡	6.5	32.7 (<0.001)‡	2.1	0.078
> High School	91.3 (ref)	2.3	90.3 (ref)	1.1	0.690	16.7 (ref)	3.3	15.1 (ref)	1.2	0.654
Poverty status•										
<100% of the Federal Poverty Level (FPL)	83.6 (0.002)‡	2.5	85.0 (0.114)	1.5	0.628	53.0 (<0.001)‡	4.8	40.6 (<0.001)‡	2.9	0.013
100%–199% of the FPL	73.5 (0.007)	7.1	86.1 (0.279)	1.5	0.077	20.2 (0.323)	3.7	34.1 (<0.001)‡	2.1	0.005
200% of the FPL	93.6 (ref)	1.5	88.0 (ref)	1.1	0.002¶	15.7 (ref)	3.4	14.0 (ref)	1.3	0.665

Source: National Health and Nutrition Examination Survey, 1999–2004. s.e.=standard error. ref=reference group.

*
P-values in parenthesis correspond to comparisons against the reference group within each sociodemographic characteristic and pregnancy status.

†
P-values correspond to comparisons between pregnant and nonpregnant women for each level of the sociodemographic characteristic.

‡
P-value that remains statistically significant after Bonferroni adjustment. A total of 16 pairwise tests comparing levels of each sociodemographic characteristic require a Bonferroni corrected cut-off of 0.05/16, *P*<0.003125. Therefore, values exceeding this cut-off but lower than *P*<0.05 should be interpreted with caution because it may be an effect of chance. Values in a sociodemographic subgroup (e.g.,

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age groups) among either pregnant or nonpregnant women with a (‡) mean they are significantly different from the reference category (e.g., If the percentage of pregnant women aged 15 to 24 years has a (‡), it means that the percentage is significantly different from the percentage of pregnant women aged 35 to 44 years – *the reference group*).

¶*P*-value that remains statistically significant after the Bonferroni adjustment. A total of 13 pairwise tests between pregnant and nonpregnant women require a Bonferroni corrected cut-off of 0.05/13, *P*<0.00385. Therefore, values exceeding this cut-off but lower than *P*<0.05 should be interpreted with caution because it may be an effect of chance.

§All race/ethnicity categories are included in the total but not presented as separate race/ethnicity strata.

•Poverty status is defined by the ratio of family income to the federal poverty level (FPL).

Table 3

Mean Number of Decayed and Filled Permanent Tooth Surfaces (DFS), Decayed Surfaces (DS), and Filled Surfaces (FS) among Pregnant Women and Nonpregnant Women of Reproductive Age by Selected Characteristics – United States, 1999–2004

Selected characteristic	Pregnant women						Nonpregnant women						DFS P-value†	DS P-value†	FS P-value†
	DFS		DS		FS		DFS		DS		FS				
	μ (P-value)*	s.e.	μ (P-value)*	s.e.	μ (P-value)*	s.e.	μ (P-value)*	s.e.	μ (P-value)*	s.e.	μ (P-value)*	s.e.			
Total	12.08	0.71	1.4	0.23	10.69	0.7	13.11	0.33	1.33	0.13	11.78	0.34	0.149	0.771	0.117
Age															
15–24 years	10.01 (0.009)	1.26	1.8 (0.193)	0.36	8.21 (0.003)‡	1.19	7.02 (<0.001)‡	0.28	1.31 (0.597)	0.22	5.71 (<0.001)‡	0.24	0.029	0.270	0.060
25–34 years	11.65 (0.031)	0.87	1.27 (0.497)	0.34	10.38 (0.026)	0.85	11.81 (<0.001)‡	0.52	1.19 (0.288)	0.18	10.63 (<0.001)‡	0.51	0.873	0.840	0.8069
35–44 years	18.66 (ref)	2.83	0.92 (ref)	0.44	17.74 (ref)	2.85	18.98 (ref)	0.54	1.46 (ref)	0.2	17.53 (ref)	0.55	0.906	0.276	0.940
Race/Ethnicity‖															
Non-Hispanic White	13.13 (ref)	1.05	1.08 (ref)	0.31	12.05 (ref)	1.09	14.21 (ref)	0.45	1.19 (ref)	0.19	13.03 (ref)	0.46	0.287	0.733	0.334
Non-Hispanic Black	9.92 (0.019)	0.82	2.5 (0.024)	0.52	7.42 (0.002)‡	0.76	10.23 (<0.001)‡	0.4	2.15 (0.002)‡	0.23	8.08 (<0.001)‡	0.41	0.736	0.493	0.462
Mexican American	9.38 (0.007)	1.11	1.91 (0.24)	0.66	7.47 (<0.001)‡	0.83	10.86 (<0.001)‡	0.6	1.44 (0.335)	0.16	9.41 (<0.001)‡	0.63	0.153	0.474	0.027
Education															
<High School	10.11 (0.171)	1.69	2.43 (0.004)	0.55	7.68 (0.023)	1.66	9.27 (<0.001)‡	0.48	2.45 (<0.001)‡	0.4	6.82 (<0.001)‡	0.41	0.641	0.9742	0.622
High School Diploma	11.62 (0.412)	1.26	2.63 (0.009)	0.73	8.99 (0.026)	1.13	13.92 (0.516)	0.72	1.87 (<0.001)‡	0.28	12.05 (0.040)	0.72	0.089	0.2601	0.021
>High School	12.98 (ref)	0.99	0.64 (ref)	0.19	12.34 (ref)	0.96	14.49 (ref)	0.45	0.6 (ref)	0.07	13.88 (ref)	0.07	0.114	0.8703	0.094
Poverty status§															
<100% of the Federal Poverty Level (FPL)	11.05 (0.120)	1.2	3.1 (0.002)‡	0.72	7.95 (0.002)‡	1.11	10.96 (<0.001)‡	0.54	2.76 (<0.001)‡	0.4	8.2 (<0.001)‡	0.55	0.941	0.657	0.833
100%–199% of the FPL	9.84 (0.094)	2.06	1.21 (0.208)	0.36	8.63 (0.063)	2.06	12.01 (0.003)‡	0.71	1.99 (<0.001)‡	0.32	10.02 (<0.001)‡	0.68	0.333	0.125	0.528
200% of the FPL	13.51 (ref)	0.91	0.7 (ref)	0.21	12.81 (ref)	0.91	14.58 (ref)	0.45	0.58 (ref)	0.07	14 (ref)	0.45	0.24	0.575	0.184

Source: National Health and Nutrition Examination Survey, 1999–2004. μ=mean. s.e=standard error. ref=reference group.

*
P-values in parenthesis correspond to comparisons against the reference group within each sociodemographic characteristic and pregnancy status.

†
P-values correspond to comparisons between pregnant and nonpregnant women for each level of the sociodemographic characteristic.

‡
P-value that remains statistically significant after Bonferroni adjustment. A total of 16 pairwise tests comparing levels of each sociodemographic characteristic require a Bonferroni corrected cutoff of 0.05/16, *P*<0.003125. Therefore, values exceeding this cut-off but lower than *P*<0.05 should be interpreted with caution because it may be an effect of chance. Values in a sociodemographic subgroup (e.g.,

age groups) among either pregnant or nonpregnant women with a (‡) mean they are significantly different from the reference category (e.g., If the percentage of pregnant women aged 15 to 24 years has a (‡), it means that the percentage is significantly different from the percentage of pregnant women aged 35 to 44 years – *the reference group*).

¶All race/ethnicity categories are included in the total but not presented as separate race/ethnicity strata.

§Poverty status is defined by the ratio of family income to the federal poverty level (FPL).

Table 4

Prevalence of Periodontal Disease among Pregnant and Nonpregnant Women of Reproductive Age by Selected Characteristics – United States, 1999–2004

Selected characteristics	Pregnant women % (*P*-value)*	s.e	Nonpregnant women % (*P*-value)*	s.e	*P*-value[†]
Total	*N*=772		*N*=3457		
	3.1	0.8	4.2	0.5	0.177
Age (years)					
15–24	1.9 (0.39)	0.8	1.7 (<0.001)[‡]	0.61	0.838
25–34	2.8 (0.477)	0.4	2.9 (<0.001)[‡]	0.5	0.859
35–44	6.7 (ref)	5.4	7.4 (ref)	1.0	0.902
Race/Ethnicity‖					
Non-Hispanic White	2.0 (ref)	1.3	2.0 (ref)	0.4	0.966
Non-Hispanic Black	2.2 (0.902)	0.9	10.9 (<0.001)[‡]	1.6	<0.001§
Mexican American	9.3 (0.003)[‡]	1.8	7.6 (<0.001)[‡]	1.3	0.457
Education					
<High School	5.7 (0.112)	1.7	7.1 (<0.001)[‡]	1.1	0.439
High School Diploma	2.7 (0.762)	1.3	6.0 (0.002)[‡]	1.2	0.067
>High School	2.1 (ref)	1.3	2.1 (ref)	0.4	0.961
Poverty status•					
<100% of the Federal Poverty Level (FPL)	1.9 (0.626)	1.0	6.3 (0.006)	1.5	0.012
100%–199% of the FPL	5.5 (0.245)	1.6	7.5 (<0.001)[‡]	1.3	0.329
200% of the FPL	2.9 (ref)	1.5	2.1 (ref)	0.4	0.585

Source: National Health and Nutrition Examination Survey, 1999–2004. s.e.=standard error. ref=reference group.

Note: Periodontal disease is defined as having at least one periodontal site with 3 mm or more of loss of attachment and 4 mm or more of pocket depth.

*
P-values in parenthesis correspond to comparisons against the reference group within each sociodemographic characteristic and pregnancy status.

[†] *P*-values correspond to comparisons between pregnant and nonpregnant women for each level of the sociodemographic characteristic.

[‡] *P*-value that remains statistically significant after Bonferroni adjustment. A total of 16 pairwise tests comparing levels of each sociodemographic characteristic require a Bonferroni corrected cut-off of 0.05/16, *P*<0.003125. Therefore, values exceeding this cut-off but lower than *P*<0.05 should be interpreted with caution because it may be an effect of chance. Values in a sociodemographic subgroup (e.g.,

age groups) among either pregnant or nonpregnant women with a (‡) mean they are significantly different from the reference category (e.g., If the percentage of pregnant women aged 15 to 24 years has a (‡), it means that the percentage is significantly different from the percentage of pregnant women aged 35 to 44 years – the reference group).

¶All race/ethnicity categories are included in the total but not presented as separate race/ethnicity strata.

§P-value that remains statistically significant after the Bonferroni adjustment. A total of 13 pairwise tests between pregnant and nonpregnant women require a Bonferroni corrected cut-off of 0.05/13, P<0.00385. Therefore, values exceeding this cut-off but lower than P<0.05 should be interpreted with caution because it may be an effect of chance.

•Poverty status is defined by the ratio of family income to the federal poverty level (FPL).