# Dental and Other Health Care Visits Among U.S. Adults With Diabetes

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OBJECTIVE — This study compared yearly dental visits of diabetic adults with those of nondiabetic adults. For adults with diabetes, we compared the frequency of past-year dental visits with past-year visits for diabetes care, dilated eye examinations, and foot examinations.

RESEARCH DESIGN AND METHODS — We conducted a cross-sectional study using a sample of 105,718 dentate individuals aged ≥25 years, including 4,605 individuals with diabetes who participated in the 1995–1998 Behavioral Risk Factor Surveillance System in 38 states.

RESULTS — Dentate adults (i.e., those with at least some natural teeth) with diabetes were less likely than those without diabetes to have seen a dentist within the preceding 12 months (65.8 vs. 73.1%, $P = 0.0000$). Adults with diabetes were less likely to have seen a dentist than to have seen a health care provider for diabetes care (86.3%); the percentage who saw a dentist was comparable with the percentage who had their feet examined (67.7%) or had a dilated eye examination (62.3%). The disparity in dental visits among racial or ethnic groups and among socioeconomic groups was greater than that for any other type of health care visit for subjects with diabetes.

CONCLUSIONS — Promotion of oral health among diabetic patients may be necessary, particularly in Hispanic and African-American communities. Information on oral health complications should be included in clinical training programs. Oral and diabetes control programs in state health departments should collaborate to promote preventive dental services, and the oral examination should be listed as a component of continuous care in the American Diabetes Association's standards of medical care for diabetic patients.

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Currently, the diabetic population in the U.S. is ~16 million people. Within this population, a disproportionate number of ethnic minorities and older Americans are affected by the disease (1). Because these subpopulations will rapidly increase in size over the next few decades, increases in human suffering, economic costs, and public health challenges associated with diabetes and its complications will occur.

Oral health complications of diabetes include severe periodontitis (bacterial-mediated destruction of the tooth-supporting bone and soft tissue) and subsequent tooth loss, gingivitis (inflammation of the gums), and dental abscesses (2–5). In addition, diabetes increases the risk of xerostomia (dry mouth) and soft tissue lesions of the tongue and oral mucosa, such as candidiasis. Prolonged hyperglycemia and the accumulation of advanced glycation end products in gingival tissue of individuals with diabetes are thought to be primarily responsible for oral and other complications of diabetes (6–8).

It is generally accepted that diabetes increases the prevalence and severity of periodontitis (9). More recent evidence, however, suggests a two-way association between chronic periodontal inflammation and diabetes. Chronic gram-negative bacterial infections of periodontal tissues may decrease insulin-mediated glucose uptake by skeletal muscle and may produce whole-body insulin resistance (10). In one longitudinal study (11), chronic gram-negative bacterial infection of the periodontal tissues was associated with poor glycemic control. This association suggests that periodontal infection may contribute to hyperglycemia and complicate diabetes control. In a study to assess the effects of treatment of periodontal disease on the level of metabolic control of diabetes, researchers concluded that effective treatment was associated with a reduction in the level of glycated hemoglobin and that control of periodontal infections may be an important part of the overall management of diabetic patients (12).

The interrelationship between diabetes and periodontal inflammation suggests that routine preventive dental care (e.g., dental prophylaxis or "cleaning") may be important in preventing complications of both diseases. Treatment guidelines issued by the Centers for Disease Control and Prevention (CDC) recommend that diabetic patients see a dentist at least once every 6 months, and more frequent dental visits are recommended for those with periodontal disease (13). The CDC's guidelines recommend that all individuals with type 2 diabetes and those with type 1 diabetes of at least 5 years duration have a dilated eye examination at least annually. The CDC also recommends that diabetic patients have their feet examined at least four times per year. The American Diabetes Association's (ADA) standards for treating diabetic patients (14) include examination of the oral cavity as part of the patient's initial visit; however, unlike examinations of the eyes and feet, periodic oral examinations are not included as a standard of continuing care.

To assess whether adults with diabetes are receiving regular dental care, this study compared yearly dental visits of individuals with diabetes and individuals without dia-

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Abbreviations: ADA, American Diabetes Association; BRFSS, Behavioral Risk Factor Surveillance System; CDC, Centers for Disease Control and Prevention; DDT, Division of Diabetes Translation; OR, odds ratio.

A table elsewhere in this issue shows conventional and Système International (SI) units and conversion factors for many substances.

Table 1—*Data for individuals aged ≥25 years who had diagnosed diabetes*

| | Sample size* (*n*) | Subjects with diabetes (%) | ±95% CI |
|---|---|---|---|
| Sex | | | |
| Male | 52,057 | 5.3 | 0.3 |
| Female | 73,922 | 5.6 | 0.3 |
| Age (years) | | | |
| 25–44 | 58,913 | 1.7 | 0.2 |
| 45–64 | 39,263 | 7.2 | 0.5 |
| 65–74 | 16,327 | 12.2 | 0.8 |
| ≥75 | 11,476 | 11.1 | 1.0 |
| Ethnicity | | | |
| Non-Hispanic Caucasian | 105,300 | 5.0 | 0.2 |
| Non-Hispanic African-American | 8,648 | 8.7 | 1.2 |
| Hispanic | 7,783 | 6.2 | 0.8 |
| Other | 3,847 | 5.7 | 1.4 |
| Education | | | |
| Less than high school | 16,799 | 10.3 | 0.7 |
| High school | 40,913 | 5.8 | 0.4 |
| More than high school | 68,007 | 3.9 | 0.3 |
| Yearly income | | | |
| <$20,000 | 25,457 | 9.6 | 0.6 |
| $20,000–34,999 | 33,649 | 5.5 | 0.4 |
| $35,000–49,999 | 22,322 | 3.8 | 0.5 |
| ≥$50,000 | 29,128 | 3.1 | 0.3 |
| Total | 125,979 | 5.4 | 0.2 |

*Because of missing data, the sum of the variables in each category may not equal the total sample size. Percentages were weighted to adjust for the probability of selection of each respondent and poststratified to the age-sex-race distribution for each state for the year of the survey.

betes in representative samples. In addition, we compared the frequency of past-year dental visits by adults with diabetes with past-year visits for diabetes care, dilated eye examinations, and foot examinations.

## RESEARCH DESIGN AND METHODS

### Data source and study variables

Data for this study were from the Behavioral Risk Factor Surveillance System (BRFSS). The BRFSS is a state-based system that uses telephone surveys of adults aged ≥18 years to collect information on a wide variety of behaviors associated with chronic diseases and injury (15). Funded by the CDC, the BRFSS currently operates in all 50 states and the District of Columbia. Details on the design and conduct of the BRFSS have been published previously (16).

The BRFSS questionnaire has three components: *1*) a set of core questions prepared by the CDC and administered by all participating states; *2*) a series of optional modules developed by the CDC, including an oral health module and a diabetes module; and *3*) optional questions designed and administered by individual states to address issues of local concern.

The BRFSS core component includes sociodemographic characteristics and a number of key behavioral and health indicators, including diabetes status. In this study, we defined people with diabetes as individuals who responded "yes" to the question, "Have you ever been told by a doctor that you have diabetes?" This question has been found to have excellent reliability and validity (17,18). We did not attempt to differentiate between type 1 and type 2 diabetes in this study, and women who reported having had diabetes only during pregnancy were not included in the analysis. In states that administered the eight-question optional diabetes module, subjects with diabetes were asked how many times they had seen a doctor or other health professional in the past year for their diabetes. They also were asked how many times in the past year a health professional had checked their feet for sores or irritations and when was the last time they had an eye examination in which the pupils were dilated. The full text of the BRFSS diabetes module has been published previously (19).

The BRFSS oral health module included the following 4 questions: *1*) "How long has it been since you last visited the dentist or a dental clinic?" Subjects who reported that they had not visited a dentist during the preceding 12 months were asked, *2*) "What is the main reason you have not visited the dentist in the past year?" *3*) "How many of your permanent teeth have been removed because of tooth decay or gum disease?" and *4*) "Are you covered by any kind of insurance coverage that pays for some or all of your dental care, including dental insurance, prepaid plans such as HMOs, or government plans such as Medicaid?" These questions were generally asked as open-ended questions; trained telephone interviewers keyed the responses based on pre-established response categories.

During a 4-year period from 1995 to 1998, 38 states (see APPENDIX) included both the oral health module and the diabetes module in their BRFSS surveys in at least one of those years. In these 38 states, 126,151 people aged ≥25 years responded to the survey; complete data on diabetes status were available for 125,979 respondents (99.9%). For comparisons of dental visits between individuals with diabetes and those without diabetes, we included in our analysis 107,247 adults aged ≥25 years who had at least some natural teeth (i.e., dentate individuals). Of these adults, 105,718 (98.6%) had complete information on dental visits and self-reported diabetes status. We limited the analysis to dentate individuals because edentate individuals are no longer at risk for periodontal problems and because their use of dental services is very low, regardless of diabetic status. We compared dental visits and other health care visits among the 4,605 dentate individuals aged ≥25 years who reported that a health care professional had told them that they had diabetes. Of these subjects, 4,206 (91.3%) provided complete data on dental visits, physician visits for diabetes care, foot examinations, and dilated eye examinations.

### Data analysis

The data were weighted to be representative of the state populations and were analyzed using SUDAAN software (20). For most comparisons, we used the direct method to age-adjust the estimated prevalence of past-year dental visits to the age distribution of the 2000 U.S. population, as estimated by the U.S. Bureau of the Census (21). We calculated 95% CIs for prevalence estimates and compared dental visits

Table 2—*Data for dentate individuals aged ≥25 years who saw a dentist within the preceding 12 months*

| | Subjects with diagnosed diabetes | | | Subjects without diagnosed diabetes | | | |
|---|---|---|---|---|---|---|---|
| | Sample size* (*n*) | Subjects who saw a dentist (%) | ±95% CI | Sample size (*n*) | Subjects who saw a dentist (%) | ±95% CI | *P*† |
| Sex | | | | | | | |
| Male | 2,019 | 64.2 | 4.2 | 42,992 | 70.5 | 0.7 | 0.0043 |
| Female | 2,551 | 67.3 | 3.7 | 58,156 | 75.6 | 0.6 | 0.0000 |
| Age (years) | | | | | | | |
| 25–44 | 859 | 64.0 | 5.3 | 53,747 | 69.5 | 0.7 | 0.0426 |
| 45–64 | 1,918 | 67.8 | 3.7 | 30,925 | 76.3 | 0.8 | 0.0000 |
| 65–74 | 1,153 | 68.4 | 4.1 | 10,116 | 76.2 | 1.3 | 0.0004 |
| ≥75 | 640 | 64.7 | 6.3 | 6,360 | 75.6 | 1.7 | 0.0011 |
| Race-ethnicity | | | | | | | |
| Non-Hispanic Caucasian | 3,522 | 70.4 | 3.1 | 84,846 | 75.5 | 0.5 | 0.0015 |
| Non-Hispanic African-American | 502 | 58.9 | 8.2 | 6,435 | 61.8 | 1.9 | 0.4944 |
| Hispanic | 376 | 50.0 | 7.6 | 6,411 | 62.6 | 2.1 | 0.0018 |
| Other | 155 | 69.4 | 12.4 | 3,153 | 70.8 | 3.2 | 0.8307 |
| Education | | | | | | | |
| Less than high school | 934 | 48.4 | 7.1 | 9,718 | 53.3 | 1.7 | 0.1820 |
| High school | 1,522 | 67.0 | 4.5 | 32,024 | 71.0 | 0.8 | 0.0892 |
| More than high school | 2,105 | 73.4 | 3.8 | 59,287 | 78.5 | 0.6 | 0.0103 |
| Yearly income | | | | | | | |
| <$20,000 | 1,417 | 46.8 | 5.7 | 17,123 | 54.7 | 1.4 | 0.0077 |
| $20,000–34,999 | 1,229 | 65.6 | 5.4 | 27,194 | 69.0 | 1.0 | 0.2239 |
| $35,000–49,999 | 615 | 77.1 | 5.9 | 19,656 | 78.0 | 1.0 | 0.7797 |
| ≥$50,000 | 696 | 82.1 | 5.3 | 26,331 | 84.4 | 0.8 | 0.3901 |
| Total | 4,570 | 65.8 | 2.8 | 101,148 | 73.1 | 0.5 | 0.0000 |

Percentages were weighted to adjust for the probability of selection of each respondent and poststratified to the age-sex-race distribution for each state for the year of the survey. Data were then adjusted to the age distribution of the 2000 U.S. standard population. *Because of missing data, the sum of the variables in each category may not equal the total sample size; †probability that the proportion of individuals who saw a dentist differed between those with diabetes and those without diabetes according to the null hypothesis of no difference.

among individuals with self-reported diabetes and those without diabetes by using pairwise Student's *t* tests. We used multiple logistic regression analysis to examine the association between diabetic status and dental care use while simultaneously controlling for possible confounders and other correlates, including sex, age, race or ethnicity, educational attainment, income, and dental insurance coverage. For individuals who reported that they had not visited a dentist within the preceding 12 months, we examined the reasons for not going.

## RESULTS

### Prevalence of diabetes

Overall, 5.4% (95% CI ±0.2%) of individuals aged ≥25 years in the study population had diabetes (Table 1). Diabetes was more common among individuals aged 65–74 years (12.2%) or aged ≥75 years (11.1%) than among those aged 25–44 years (1.7%) or 45–64 years (7.2%). The prevalence of diabetes was higher among non-Hispanic African-Americans (8.7%) and Hispanics (6.2%) than among non-Hispanic Caucasians (5.0%). Subjects with less than a high school education were more likely to have diabetes (10.3%) than high school graduates (5.8%) or those with at least some post–high school education (3.9%). Diabetes prevalence was inversely associated with household income, ranging from 9.6% among those with annual incomes <$20,000 to 3.1% of those with incomes ≥$50,000.

### Dental visits and diabetes status

Adults with diabetes were less likely than those without diabetes to have seen a dentist within the preceding 12 months (65.8 vs. 73.1%, respectively, $P = 0.0000$) (Table 2). This pattern was true for both men and women and persisted across all age-groups. Hispanics with diabetes were substantially less likely than those who did not have diabetes to have seen a dentist (50.0 vs. 62.6%, respectively), as were non-Hispanic Caucasians with diabetes (70.4%) compared with those without diabetes (75.5%). At all education and income levels, individuals with diabetes were consistently less likely than those who did not have diabetes to have seen a dentist, although most of these differences were not statistically significant. Among diabetic patients, there was no significant difference in past-year dental visits between those taking insulin and those not taking insulin (66.3 vs. 64.9%, $P = 0.66$).

Because of probable confounding factors affecting the association between diabetic status and dental visits, we used multiple logistic regression to adjust for these factors. After controlling for age, race or ethnicity, educational attainment, household income, and dental insurance coverage, dentate individuals with diabetes were significantly less likely than those who did not have diabetes to have seen a dentist within the preceding year (odds ratio [OR] 0.82, 95% CI 0.73–0.93). The strength of association between diabetic status and use of dental services did not differ appreciably from the unadjusted OR estimate (OR 0.76, 95% CI 0.69–0.85). Multivariate modeling revealed that the association between race

Table 3—*Data for individuals aged ≥25 years with diagnosed diabetes who saw a physician for diabetes care, had a foot examination, had a dilated eye examination, or saw a dentist within the preceding 12 months*

| | Subjects who saw a physician for diabetes care | Subjects who had a foot examination | Subjects who had a dilated eye examination | Subjects who saw a dentist |
|---|---|---|---|---|
| Sex | | | | |
| Male | 86.3 (2.9) | 70.2 (3.8) | 62.7 (4.3) | 63.5 (4.5) |
| Female | 86.5 (2.8) | 65.5 (4.0) | 61.9 (4.1) | 67.3 (3.9) |
| Age (years) | | | | |
| 25–44 | 85.1 (3.8) | 66.4 (5.1) | 53.6 (5.6) | 63.2 (5.5) |
| 45–64 | 86.4 (2.8) | 67.7 (3.9) | 64.8 (3.9) | 67.4 (3.9) |
| 65–74 | 89.7 (2.7) | 70.7 (4.2) | 74.8 (4.1) | 68.8 (4.3) |
| ≥75 | 88.4 (3.8) | 71.1 (5.7) | 82.3 (5.5) | 65.6 (6.7) |
| Race-Ethnicity | | | | |
| Non-Hispanic Caucasian | 85.6 (2.5) | 67.0 (3.3) | 62.4 (3.4) | 69.9 (3.3) |
| Non-Hispanic African-American | 87.6 (5.3) | 73.0 (7.2) | 69.8 (7.7) | 58.1 (9.0) |
| Hispanic | 87.9 (5.1) | 65.7 (7.6) | 55.9 (8.2) | 49.7 (7.9) |
| Other | 90.1 (6.3) | 75.8 (9.6) | 70.4 (12.8) | 71.4 (12.4) |
| Education | | | | |
| Less than high school | 86.9 (5.4) | 64.2 (7.2) | 50.5 (6.7) | 48.1 (7.4) |
| High school | 85.9 (3.5) | 64.7 (4.8) | 62.1 (4.9) | 66.1 (4.7) |
| More than high school | 86.0 (2.8) | 70.7 (3.7) | 67.4 (4.0) | 73.3 (4.0) |
| Yearly income | | | | |
| <$10,000 | 86.4 (6.9) | 64.9 (9.3) | 56.4 (9.4) | 41.2 (9.4) |
| $10,000–14,999 | 84.5 (7.9) | 63.8 (11.5) | 59.9 (11.9) | 44.7 (11.9) |
| $15,000–19,999 | 87.9 (5.1) | 69.3 (7.3) | 60.4 (10.0) | 55.1 (10.0) |
| $20,000–24,999 | 89.3 (4.0) | 70.1 (7.8) | 65.2 (7.9) | 60.7 (7.9) |
| $25,000–34,999 | 81.8 (6.7) | 63.5 (7.5) | 56.7 (7.5) | 67.7 (7.5) |
| $35,000–49,999 | 87.3 (4.3) | 68.7 (6.6) | 65.1 (6.5) | 76.9 (6.5) |
| ≥$50,000 | 86.0 (4.1) | 68.3 (5.8) | 68.5 (5.9) | 81.6 (5.9) |
| Total | 86.3 (2.0) | 67.7 (2.8) | 62.3 (3.0) | 65.4 (3.0) |

Data are % (±95% CI) and are age-adjusted to the 2000 U.S. standard population.

or ethnicity and dental visits were largely attenuated, although not eliminated completely, after adjusting for other factors.

Among dentate individuals aged ≥25 years who did not see a dentist within the preceding 12 months, the primary reason given was that there was no perceived need to visit a dentist (37.2%, 95% CI ±1.0%), followed by cost (28.6%, 95% CI ±0.9%), fear or anxiety (10.5%, 95% CI ±0.6%), and other reasons (23.7%, 95% CI ±1.0%). This pattern did not differ between subjects with diabetes and those without diabetes.

Overall, people with diagnosed diabetes were less likely to have seen a dentist within the preceding 12 months (65.4%) than to have seen a physician or other health care provider for diabetes care (86.3%) (Table 3). Overall, the percentage who saw a dentist was comparable with the percentage who had their feet examined at least once in the preceding year (67.7%) or had a dilated eye examination (62.3%). However, the disparity in dental visits among racial or ethnic groups and among socioeconomic groups was greater than that for any other type of health care visit for individuals with diabetes. For example, among diabetic subjects, there was a >20% difference in the prevalence of past-year dental visits between Hispanics (49.7%) and non-Hispanic Caucasians (69.9%). There was a nearly twofold difference in dental visits between people with diabetes whose annual household income was <$10,000 (41.2%) and those who earned ≥$50,000 (81.6%). In contrast, there were no significant differences in the prevalence of past-year physician visits or foot examinations among groups defined by race or ethnicity, educational attainment, or income. The only significant disparity in dilated eye examinations was found among individuals with less than a high school education (50.5%) compared with those who finished high school (62.1%) and those with at least some college or other post–high school education (67.4%).

CONCLUSIONS — Findings from this study suggest that dentate individuals with diabetes are less likely than individuals without diabetes to visit a dentist; this pattern persisted even after adjusting for age, income, education, race or ethnicity, and dental insurance coverage. This finding is a cause for concern because people with diabetes are generally at an increased risk for periodontal diseases and other oral conditions (22). Indeed, diabetic individuals were more likely than those without diabetes to have been excluded from the analysis because they had lost all of their natural teeth (data not shown), which is usually the end result of extensive advanced dental or periodontal diseases. The lower use of dental services among people with diabetes suggests a need for promotion of appropriate dental preventive and treatment services in that group. However, the finding that the leading reason for not seeing a dentist within the preceding 12 months was a lack of a perceived need, regardless of diabetic status, suggests the need for the general promotion of regular preventive dental visits. Adults may not yet

appreciate the interrelationship between oral health and general health.

We also found that, overall, subjects with diabetes were about as likely to have seen a dentist as they were to have had their feet or eyes examined, but they didn't receive any of these services as frequently as recommended by the CDC's guidelines. In addition, Hispanics were substantially less likely than non-Hispanic Caucasians to have seen a dentist, but they were no less likely than other ethnic minorities with diabetes to have received general diabetes care, a foot examination, or a dilated eye examination. Unfortunately, Hispanics, particularly Mexican-Americans, are more likely than non-Hispanic Caucasians in the U.S. to have diabetes (23) or to experience destructive periodontitis (24). Generalized health promotion activities related to dental care are needed for people with diabetes. Physicians, dentists, and other primary health care providers working in Hispanic communities may also be particularly important audiences to target educational messages on the importance of regular dental care for diabetic patients.

The substantial variation in dental visits among dentate subjects with diabetes by income level contrasted sharply with the pattern of general diabetes care, foot examinations, and dilated eye examinations. This pattern of dental care use may be partly attributable to a higher sensitivity of dental services to income level compared with most other health care services (25), because a much larger proportion of dental services (48%) compared with physician services (16%) are paid out-of-pocket by consumers (26). Although several recent federal initiatives are designed to increase Medicare coverage for preventing diabetic complications (27) and improving the quality of medical care (28), dental services, unlike dilated eye examinations or foot care, receive virtually no coverage under Medicare. In addition, Medicaid provides only very limited coverage for dental services for adults in most states (29).

In accord with other study findings, we found that people with diabetes reported using dental care services less often than people without diabetes. For example, a study in Sweden examined dental care knowledge and practices among adults aged 20–70 years, including subjects with type 1 diabetes (30). This study found that subjects with type 1 diabetes of a long duration (mean 29 years) or a short duration (mean 5 years) were less likely to have seen a dentist within the preceding 2 years (89 and 83%, respectively) than those without diabetes (97%). In another study, people with diabetes in a population served by the Indian Health Service showed relatively low levels of compliance with recommended regular dental visits (31).

Disparities in health status, preventive health practices, and access to health care services among minority populations compared with nonminority populations are well documented (32). Elimination by 2010 of chronic disease health disparities in minority populations, including the disparity in diabetes prevalence, is one of the primary goals of the U.S. Department of Health and Human Services (33). The President's Initiative on Race also focuses on elimination of such long-standing health disparities, with emphasis on access to culturally competent health care services and improved quality of care (34). African-Americans with diabetes, a community that we suggest would benefit from enhanced oral health education and promotion activities, participated in a study to determine the effect of health education on the rate of opthalmic examinations (35). The randomized controlled trial demonstrated that patient-targeted educational interventions can substantially increase examination rates.

Several recent federal initiatives are attempting to increase awareness of the interrelationships between oral health and diabetes. Objective 5.15 of the *Healthy People 2010* objectives is to increase the proportion of people with diabetes who have at least an annual dental examination (33). The National Diabetes Education Program, a collaborative project sponsored by the CDC and the National Institutes of Health, included dental professionals along with representatives of other health care professions in a recently established work group whose mission is to heighten awareness of diabetic complications. The Bureau of Primary Health Care, a unit of the Health Resources and Services Administration, is including oral health in its Diabetes Collaborative, an innovative program to raise awareness and improve health outcomes for people diagnosed with diabetes in 100 health centers nationwide. The CDC's Division of Diabetes Translation (DDT) has begun formative research to assist with design and planning of appropriate and effective health communications messages on the relationship between diabetes and oral health. DDT is also developing questions for inclusion in the BRFSS diabetes module to better understand why people with diabetes seek dental care.

The are a number of limitations that should be considered in interpreting the findings from this study. First, the analytic sample included adults in the 38 states that included both the oral health and diabetes modules during at least one year between 1995 and 1998. Therefore, the sample may not be representative of the entire U.S. population.

Telephone-based surveys, such as the BRFSS, are a cost-effective method for obtaining population-based data (36). However, certain groups, in particular people who do not have a telephone in the household, people who are difficult to contact because of the hours they are at home, and people who simply refuse to participate, are excluded from or are under-represented in telephone surveys (37). The BRFSS weighting procedures are intended to partially compensate for this differential nonresponse, but they cannot totally eliminate potential selection bias.

The validity of survey results depends on the accuracy of self-reported data, which may be affected by the respondent's honesty, accuracy in interpreting questions, and ability to recall past behavior. To minimize this problem, the BRFSS incorporated, whenever possible, questions that have been used successfully in past surveys. There is evidence that self-reported diabetes status, health care use, and sociodemographic factors in the BRFSS have good-to-excellent reliability and validity (18,38,39).

Despite an increased risk for other health problems compared with the general population and the possible impact of periodontal inflammation on glycemic control, dentate adults with diabetes are less likely than other people to have seen a dentist within the preceding year. We recommend that the ADA include examination of the oral cavity in its guidelines for continuous care of patients with diabetes. In addition, we recommend that state health departments' oral health and diabetes programs work together to include oral health information in diabetes educational materials and promote periodic dental visits. Greater promotional efforts appear to be needed within African-American and Hispanic communities.

APPENDIX — The following states included both the oral health module and the diabetes module in their BRFSS surveys: Alabama, Alaska, Arizona, Arkansas,

California, Colorado, Delaware, Florida, Georgia, Idaho, Illinois, Indiana, Kansas, Kentucky, Maine, Massachusetts, Michigan, Mississippi, Missouri, Montana, Nebraska, Nevada, New Hampshire, New Jersey, New Mexico, New York, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, Texas, Utah, Virginia, West Virginia, Wisconsin, and Wyoming.

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