



HHS Public Access

Author manuscript

J Public Health Dent. Author manuscript; available in PMC 2021 March 31.

Published in final edited form as:

J Public Health Dent. 2017 March ; 77(2): 105–114. doi:10.1111/jphd.12180.

Prevalence of past-year dental visit among US adults, 1999–2010: comparison of trends and estimates between the Behavioral Risk Factor Surveillance System and three national surveys

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Abstract

Objectives: To compare estimated prevalence of past-year dental visit (PPYDV) among US adults aged 18 years from the Behavioral Risk Factor Surveillance System (BRFSS) to estimates from the Medical Expenditure Panel Survey (MEPS), National Health Interview Survey (NHIS), and National Health and Nutrition Examination Survey (NHANES).

Methods: We estimated PPYDV adjusted for covariates (age, race/ethnicity, education level, poverty status, edentulism) using BRFSS, MEPS, and NHIS 1999–2010, and NHANES 1999–2004. We tested trend in overall PPYDV for BRFSS, MEPS, and NHIS from 1999–2010. For 2002 and 2010, we calculated absolute differences (AD) and 95% confidence intervals (CI) in PPYDV between BRFSS and each of the other surveys overall and among subpopulations defined by covariates. We pooled NHANES 1999–2004 data for comparison with BRFSS 2002.

Results: From 1999 to 2010, BRFSS (68.5% vs. 67.5%), MEPS (43.5% vs. 39.7%), and NHIS (63.3% vs. 59.7%) showed small but significant decreases in overall PPYDV. In 2002, estimates for overall PPYDV were highest for BRFSS (70.0%) and lowest for MEPS (43.9%) with estimates for NHIS (61.5%) and NHANES (1999–2004: 58.1%) in between; the largest AD (26.2%, 95% CI: 25.0%–27.3%) was between BRFSS and MEPS. ADs were consistent in 2002 and 2010,

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overall and by covariates, except among edentate persons, where PPYDV estimates from BRFSS and NHIS were similar.

Conclusions: Estimates of PPYDV from BRFSS were notably higher than estimates from MEPS, NHIS, or NHANES except among the edentate. Trends in PPYDV over time, however, were consistent across all surveys.

Keywords

dental care use; health surveys; population surveillance; adults

Introduction

Since 1999, the prevalence of past-year dental visit (PPYDV) among adults has been a National Oral Health Surveillance System (NOHSS) indicator, with the Behavioral Risk Factor Surveillance System (BRFSS) as the official data source (1). This NOHSS indicator aligns with the national Healthy People (HP) 2020 objective to increase the proportion of the US population using the oral health care system in the past year, with the Medical Expenditure Panel Survey (MEPS) as the official data source (2). In practice, state progress in PPYDV has been monitored by comparing state-level estimates from BRFSS to HP targets based on MEPS, or previously, the National Health Interview Survey (NHIS) (3,4). An inherent assumption behind this approach is that estimates from BRFSS are similar to those from MEPS and NHIS, which may not hold for PPYDV.

National PPYDV estimates can also be obtained from the National Health and Nutrition Examination Survey (NHANES) (5). Stakeholders at the national, state, and local levels use PPYDV estimates from all four of these data sources to assess trends over time, evaluate impacts of programs and policies, and track progress toward targets for national objectives. The different emphases and designs of these surveys make them unique and complementary to one another, however, estimates of PPYDV from these surveys may not be directly comparable due to differences in survey design (6).

A comparison of PPYDV estimates in adults aged 25–59 years among MEPS, NHIS, and NHANES during 1971–1996 found that the lowest estimates were from MEPS and that trends over time in overall PPYDV estimates from these surveys were inconsistent (6). More recently, PPYDV estimates from BRFSS (e.g., 70.8% among ages 18 years, 2004 US median) (7) appear higher than estimates from MEPS (e.g., 43.0% among ages 21–64 years, 2004) (8), NHIS (e.g., 65.9% among ages 21–64 years, 2003) (9), and NHANES (e.g., 59.9% among ages 20–64 years, 1999–2004) (5). However, the practice of comparing BRFSS estimates to HP targets for PPYDV has continued, perhaps due in part to the lack of an accepted, comparable benchmark for estimates from BRFSS.

MEPS, NHIS, and NHANES are primarily used to monitor health at the national level. They are not designed to provide state-level estimates, although direct estimates may be obtained from MEPS and NHIS for some states with larger sample sizes, or through pooling multiple years of data (10–12). Although BRFSS is primarily used to provide state-level estimates, nationwide estimates can be obtained by pooling data for all states (13,14). Although each

survey uses a different sampling design, all are limited to civilian, noninstitutionalized US residents.

BRFSS, an annual telephone survey of adults, was established in 1984 specifically to provide state-level data for chronic diseases, health-related behaviors, and health care use. By 1993, all 50 states and DC participated in the core questionnaire, supporting nationwide estimates from pooled data (15). To address the lack of comparable state-level oral health data, the questionnaires for 1999, and even-numbered years since 2002 have included a question about time since last dental visit (1).

MEPS has been conducted and its data released annually since 1996. MEPS provides national estimates of health care use and expenditures (16). MEPS is the only survey of these four to use a panel design that includes five rounds of in-person interviews over 2 years (16).

NHIS, an in-person household survey conducted continuously since 1957 has provided the longest time series of national data on a wide range of health indicators and supports annual estimates within many subpopulations (12). NHIS has a central role in the design of federal household surveys, such as providing the sampling frame for MEPS (12).

NHANES, first established in the early 1960s and conducted continuously since 1999, combines in-person interviews with laboratory tests and standardized physical examinations, including an oral health examination (17). Released every two years, it is a uniquely rich data source for monitoring oral health status within the overall health context. Because of the intensive nature of NHANES, a much smaller sample size than NHIS and MEPS is used.

To our knowledge, no studies have provided comparisons of PPYDV estimates from BRFSS with those from MEPS, NHIS, and NHANES, overall and within subpopulations, in one report. Because BRFSS is the only survey of these four to support direct PPYDV estimates for all states, we compare national trends and estimates from BRFSS with those from MEPS, NHIS, and NHANES during 1999–2010. Findings may inform development and use of aligned state and national oral health indicators.

Methods

Data sources

Our analysis of publicly released, de-identified data sets was exempt from IRB and human subjects research review; however, data collection for all four surveys was reviewed by the appropriate institutional or ethics review boards and either approved or found to be exempt from review.

BRFSS

We pooled BRFSS data for all states and DC to create nationwide estimates for PPYDV for 1999, 2002, 2004, 2006, 2008, and 2010 (1). We did not include data after 2010 because BRFSS changed the sampling frame and weighting methods from 2011 and forward (18).

MEPS

We estimated PPYDV for each year during 1999–2010 from the MEPS-household component (MEPS-HC) (16). The MEPS-HC sample is drawn from the previous year's NHIS sample households; participants in each panel are asked about dental visits in five rounds of in-person interviews over 2 years (16).

NHIS

We estimated PPYDV for each year during 1999–2010 from the NHIS Sample Adult data. NHIS Household and Family components collect demographic and limited health data on all members of each NHIS household and family. From each NHIS family, a sample adult is randomly selected to complete the Sample Adult core questionnaires, on which the question on time since last dental visit is included (12). We obtained covariates from the NHIS Household and Family components.

NHANES

In 1999–2010, the comparable time period with BRFSS, the NHANES oral health questionnaire included a dental visit question in 1999–2004, but not in 2005–2010 (17). We pooled NHANES data from the 1999–2000, 2001–2002, and 2003–2004 cycles to estimate PPYDV during 1999–2004 (17) for comparison with the BRFSS 2002 estimates. The NHANES analytic guidelines recommend pooling four or more years of data to produce stable estimates for subpopulations (10). Pooling 1999–2004 data placed 2002 closer to the midpoint than pooling 4 years of data (1999–2002 or 2001–2004).

Study population

We limited our analyses to adults aged ≥ 18 years with information on PPYDV. Because the NOHSS indicator and HP2020 objective for PPYDV (1,2) are not limited to the dentate population, our study population included dentate and edentulous adults.

Outcome

The outcome was PPYDV based on self-reported visit to any type of dental care provider. For each survey, we reviewed questions and responses representing PPYDV, along with interview mode, which could affect the response or dictate the questionnaire structure (Table 1). BRFSS, NHIS, and NHANES participants were asked how long it had been since their last dental visit. The questions and response choices for each survey did not change from 1999–2010 except for minor changes in response options for BRFSS since 2002. BRFSS used a telephone interview; the other three surveys used in-person interviews. MEPS participants were asked about dental visits in each of the five interview rounds conducted over two years: since January 1 for the first round; since the previous round for the second through fourth rounds; and between the fourth round and December 31 for the fifth round. From MEPS, we estimated the prevalence of having ≥ 1 dental visit during each calendar year, using data from all panels with interview rounds during the calendar year (16).

Covariates

We selected socio-demographic factors for which disparities in dental care use have been reported (6,19–21). We also included dentate status because difference in PPYDV between socio-demographic groups may be due in part to differences in prevalence of edentulism (21).

Socio-demographic factors included age group (18–44, 45–64, and 65+ years), race/ethnicity (non-Hispanic White (NHW), non-Hispanic Black (NHB), Hispanic), education level (less than high school, high school graduate, greater than high school), and poverty status (Poor: <100% Federal Poverty Level (FPL), Near-poor: 100–199% FPL, Non-poor: 200% FPL). Adults reporting multiple races or race/ethnicities other than NHW, NHB or Hispanic were included in the analyses, however, we do not report separate estimates for these groups. The NHANES 1999–2004 estimates for the Hispanic population are representative only of the Mexican American population (10).

Edentulism (yes, no) was based on self-report of having lost all natural teeth for BRFSS, MEPS, and NHIS. For NHANES, edentulism was defined as having no natural teeth recorded in any of the 32 tooth spaces from the oral health examination. Adults lacking examination data were coded as dentate status unknown and retained in the denominator for the analyses.

Statistical analyses

We estimated crude and adjusted PPYDV overall for BRFSS, MEPS, and NHIS from 1999–2010 and for NHANES 1999–2004. To estimate adjusted PPYDV, we used predicted marginal probabilities from binomial multiple regression models that simultaneously adjusted for all covariates (22).

We tested linear trend over time in overall PPYDV from 1999–2010 for BRFSS, MEPS, and NHIS through binomial regression models, controlling for other covariates. Linear trend was present if the β coefficient of the survey year variable was not equal to zero (increasing trend if $\beta > 0$; decreasing trend if $\beta < 0$); statistical significance of the trend was assessed with a *t*-test.

Analyses stratified by the covariates were conducted for BRFSS, MEPS, and NHIS using data from 2002 and 2010 and for NHANES using data from 1999–2004. PPYDV estimates among subpopulations were adjusted for all other covariates.

We calculated absolute differences (AD) in adjusted PPYDV between BRFSS and each of other three surveys. We provided 95% confidence intervals (CI) for AD using the *Z* distribution. *Z*-tests were used to test hypotheses of AD greater than zero.

We describe statistically significant results at the *P* 0.05 level, unless otherwise stated. All analyses were conducted using SAS-callable SUDAAN version 11 (23), accounted for the complex, multistage sampling designs, and were weighted for disproportionate sampling, nonresponse and post-stratification to the US adult population. For NHANES estimates, we used the interview weights because adults who did not participate in the examination were

retained in the denominators. Trend analyses incorporated the variance structures described in the NHIS and MEPS analysis guidelines to account for statistical dependence between samples drawn within the same design period (e.g., 1995–2005, 2006–2010) and geographic area (16,24).

Results

The sample size for each year was largest for BRFSS (range: 153,669–441,607), followed by NHIS (range: 21,361–32,792), MEPS (range: 16,748–24,925), and NHANES 1999–2004 (16,997).

Trends in overall adjusted PPYDV from BRFSS, MEPS, and NHIS during 1999–2010 were generally parallel with small declines ($P<0.001$) (Figure 1 and Table 2).

Crude and adjusted PPYDV were similar overall and within most subpopulations, except among older adults aged ≥ 65 years, Hispanics, adults with less than high-school education, and poor adults. For example, the crude estimates were lower than adjusted estimates among older adults from BRFSS (2002: 64.6% vs. 72.7%), MEPS (2002: 42.3% vs. 50.9%), NHIS (2002: 54.8% vs. 66.3%), and NHANES (1999–2004: 53.5% vs. 62.9%). We present only adjusted estimates to reduce the chance that differences between estimates were due to confounding (Tables 3 and 4).

In 2002, the highest overall adjusted PPYDV estimate was from BRFSS (70.0%), followed by NHIS (61.5%), NHANES 1999–2004 (58.1%), and MEPS (43.9%) (Table 3). Among most subpopulations, with the exception of edentulous adults, the highest estimates were from BRFSS and the lowest from MEPS. The 2010 overall adjusted estimates were ordered similarly: BRFSS (67.5%), NHIS (59.7%), and MEPS (39.7%) (Table 4). The AD in overall adjusted PPYDV between BRFSS and the other three surveys was largest for MEPS (2002: AD = 26.2%, 95% CI: 25.0%–27.3%), followed by NHANES (1999–2004: AD = 12.0%, 95% CI: 10.3%–13.6%) and NHIS (2002: AD = 8.5%, 95% CI: 7.8%–9.3%) (Table 5). ADs in 2010 were similar to those in 2002 among most subpopulations (Table 5).

In the edentate subpopulation, the BRFSS estimate (27.5%, 2002) was higher than those from MEPS (19.8%, 2002) and NHANES (19.8%, 1999–2004). However, we did not find differences in adjusted PPYDV between the BRFSS and NHIS estimates (26.7%, 2002) (AD = 0.9%, 95% CI: –1.5%–3.2%) (Tables 3 and 5).

Discussion

We found that MEPS yielded the lowest PPYDV estimate among adults relative to estimates from NHIS and NHANES, consistent with Macek et al.'s finding (6). However, we found generally parallel trends in adjusted overall estimates of PPYDV during 1999–2010 for BRFSS, MEPS, and NHIS, in contrast to Macek et al. (6), who found inconsistent trends in overall PPYDV estimates among adults aged 25–59 years among MEPS and its precursors (1977 National Medical Care Expenditure Survey, 1987 National Medical Expenditure Survey, 1996 MEPS), NHIS (1986, 1989, 1993) and NHANES (1971–1975, 1988–1994). These inconsistencies perhaps were due in part to differing and limited number of time

periods with available data at the time of their study. Our trend analyses were based on 12 years of NHIS and MEPS data and 6 years of BRFSS data, included older adults and controlled for multiple socio-demographic factors and edentulism.

We found that BRFSS produced substantially higher PPYDV estimates than MEPS, NHIS, and NHANES for the time periods and most subpopulations we examined. Overall, BRFSS estimates differed from NHIS, NHANES, and MEPS by about 8, 12, and 26 percentage points, respectively (Figure 1). One exception was among the edentate, for whom PPYDV estimates from BRFSS were higher than from MEPS and NHANES, but not different from NHIS. There is no clear explanation for these differences among edentate persons.

To our knowledge, no previous studies included BRFSS in such comparisons. The differences in survey design, interview mode (telephone vs. in-person) and question (Table 1) may explain the relative order of PPYDV estimates among the surveys. For example, our finding of the highest PPYDV estimate among adults from BRFSS versus the lowest estimate from MEPS parallels Romaine et al.'s finding of the highest PPYDV estimate among children from the National Survey of Children's Health (NSCH) versus the lowest estimate from MEPS (20). Like BRFSS, NSCH is a telephone survey designed to provide state and national data, although for children through parent interviews.

Although all four surveys collect only self-reported dental visit data, Macek et al. and Romaine et al. (6,20) speculated that MEPS might provide a more accurate estimate of PPYDV than NHIS, NHANES, and NSCH because the shorter recall period of the MEPS panel design may improve recall accuracy. This feature affirms the rationale for use of MEPS as the official data source for the HP objective on dental care use (6). BRFSS, NHIS, and NHANES – each with recall time of a year or longer – could be subject to greater recall error than MEPS. However, it isn't clear whether recall error from a longer recall period would lead to systematic overestimation or underestimation of PPYDV (6,20,25).

The inclusion in MEPS of detailed follow-up questions on each dental visit could protect against overestimation of PPYDV due to social desirability bias (6), and lead to underestimation of PPYDV, if participants underreport visits, because they know that additional follow-up questions regarding that visit will be asked (6,26).

Different modes of data collection might also explain the difference in PPYDV estimates. During this time period, BRFSS used a landline-based telephone interview whereas MEPS, NHIS, and NHANES used an in-person interview (25,27). Landline-based telephone interview surveys may have a bias toward higher-income, older, non-minority respondents due to telephone noncoverage than in-person household interviews, although BRFSS minimized the impact of noncoverage with special weights (27). Congruent with our findings, Romaine et al. (20) reported much higher PPYDV estimates from NSCH, also a landline-based telephone interview survey, than from the face-to-face interview surveys, MEPS, NHIS, and NHANES. However, the difference in estimates between these telephone and face-to-face interview surveys can vary by indicator. Previous studies reported that BRFSS, NHIS, and NHANES provided similar estimates for several measures, such as smoking and diabetes (13,14).

A few limitations of our study should be noted. Our study used self-reported time since last dental visit. One study examined the accuracy of self-reported dental visit in 6 months against dental record among adults aged 45 years in north Florida and agreement ranged from 84 to 91% (28). No studies of internal validity were available to confirm which of the four surveys produced more accurate PPYDV estimates, although MEPS estimates may be subject to fewer sources of bias than BRFSS, NHANES, or NHIS. The relative order and size of PPYDV estimates between BRFSS and the other surveys may not apply to other indicators. Data for categorizing subpopulations by Hispanic ethnicity and edentate status differed by survey, thus between-survey PPYDV comparisons for these groups should be interpreted with caution.

It is perhaps most important to note that BRFSS has made major methodological changes since 2011, including adding cell phone interviews and adopting an advanced weighting method to improve the survey's representativeness(18). However, three recent reports of PPYDV among adults aged 65+ years in 2012 indicate that estimates from BRFSS (66.0%) (1) remained higher than estimates from NHIS (61.8%) (29) and substantially higher than estimates from MEPS (42%) (30). When three or more years of data are available from BRFSS (e.g., 2012, 2014, and 2016), a study is needed to determine if trends from the surveys remain approximately parallel and the magnitude of differences in PPYDV estimates between BRFSS and the other surveys changes over time, especially among young adults and minority groups who were more likely to be cell phone only users than their counterparts (18). Despite the limitations, our study highlights differences that existed among these surveys in the last decade, establishes a good point of reference for future study, and highlights the need for a comparable benchmark for state estimates of PPYDV.

Our study findings indicated that it may not be appropriate to compare state estimates for PPYDV from BRFSS to national estimates from MEPS, NHIS, or NHANES, such as targets for HP2020 objectives derived from MEPS – due to substantial differences in PPYDV estimates from BRFSS as compared to MEPS, NHIS, and NHANES. For example, if compared with the HP2020 target of 49% on use of dental care in the past year developed from MEPS (2), 1999–2010 BRFSS estimates (Figure 1) were far beyond the target, giving a falsely optimistic view of dental care use at the state level during that time period, in which MEPS estimates (Figure 1) fell short of the target.

Recognizing these challenges, we suggest some practical strategies on how BRFSS could be used to monitor state-level data of dental care use in alignment with the HP2020 objective rather than compared directly (and inappropriately) to the national target. HP objectives reflect issues of national importance. HP provides priority areas, objectives and measurable indicators that states, as well as local areas and communities, can use to guide their efforts in improving the health of their populations. However, states do not necessarily monitor their progress against national targets such as a HP2020 target or other estimates from the official HP data source, especially when the official data source was not designed to support state-level estimates.

Although PPYDV estimates from BRFSS were higher than those from the other three surveys, the direction and size of the differences was relatively constant during 1999–2010

and the trends over time were consistent from the four surveys. Thus, BRFSS could be used to monitor trends over time and sociodemographic disparities in PPYDV.

Rather than monitoring progress relative to national estimates or targets developed from MEPS, NHANES, or NHIS, states may consider using BRFSS to monitor trends in and set state targets for PPYDV. State developed targets could better reflect the impact of state-specific public health program and policy efforts on dental care utilization. Availability of both US and state-level estimates from BRFSS allows comparisons among state estimates and between a state and the US estimate from BRFSS (7). It would also support ongoing comparison of PPYDV estimates from BRFSS to estimates from other national surveys, which contain more detailed data to explore main drivers of trends and provide context for more careful interpretation of the BRFSS estimates.

In conclusion, our study found substantially higher PPYDV estimates among adults from the state-based BRFSS than from national surveys, MEPS, NHIS, and NHANES, even after adjustment for socio-demographic factors and edentulism. The lowest estimates were from MEPS, which were more than 20 percentage points below BRFSS estimates. Despite these differences, BRFSS, MEPS, and NHIS all displayed small decreasing trends in overall PPYDV estimates from 1999–2010. Between-survey comparisons in PPYDV estimates for 2002 and 2010 were similar overall and in most subpopulations. Given the magnitude of the differences in PPYDV estimates between BRFSS and these three national surveys, it may not be appropriate to compare BRFSS estimates of PPYDV with estimates or targets derived from MEPS, NHIS, or NHANES. However, BRFSS could be used to monitor trends in PPYDV over time, and state-level targets for PPYDV could be established using state or nationwide estimates from BRFSS.

Acknowledgment

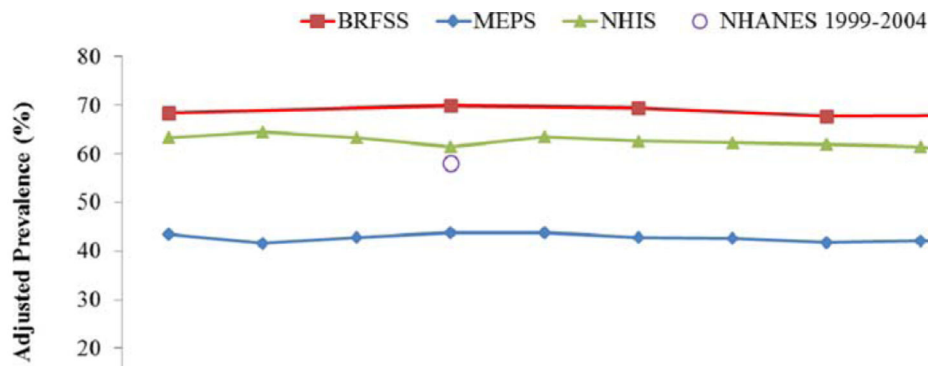
We acknowledge excellent suggestions provided by Drs. Susan Griffin, Valerie Robison, and Barbara Gooch with the Division of Oral Health at the Centers for Disease Control and Prevention.

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	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
BRFSS	68.5			70.0		69.4		67.8		68.0		67.5
MEPS	43.5	41.6	42.8	43.9	43.7	42.8	42.6	41.7	42.1	41.6	41.1	39.7
NHIS	63.3	64.4	63.3	61.5	63.5	62.6	62.3	62.0	61.5	59.3	60.8	59.7
NHANES 1999-2004				58.1								

Figure 1.

Adjusted prevalence (%)^a of having a past-year dental visit (PPYDV) among adults aged 18 years and older, 1999–2010 BRFSS^b, MEPS and NHIS and NHANES 1999–2004^c.

^aPrevalence adjusted for age, race/ethnicity, education level, poverty status, and edentulism except for adjusted prevalence from MEPS 1999, which did not adjust for edentulism due to edentulism not available for MEPS 1999.

^bDental visit question was included in the BRFSS emerging core questionnaire in 1999 and rotating core questionnaire in even years since 2002.

^cNHANES 1999–2004 was used for comparison with BRFSS 2002; dental visit question not available from NHANES 2005–2010.

BRFSS, Behavioral Risk Factor Surveillance System; MEPS, Medical Expenditure Panel Survey; NHIS, National Health Interview Survey; NHANES, National Health and Nutrition Examination Survey. [Color figure can be viewed at wileyonlinelibrary.com]

Table 1
Questions Used to Estimate Prevalence of Past-Year Dental Visit, BRFSS, MEPS, NHIS, and NHANES 1999–2010

BRFSS*	MEPS[†]	NHIS	NHANES[‡]
Telephone interview	In-person interview, 5 rounds	In-person interview	In-person interview
1999, 2002, 2004, 2006, 2008, 2010	1999–2010	1999–2010	1999–2004
Single question used	Multiple questions used	Single question used	Single question used
How long has it been since you last visited a dentist or a dental clinic for any reason? Include visits to dental specialists, such as orthodontists	{Since (START DATE)/ Between (START DATE) and (END DATE)}, did (PERSON) see or talk to any type of dental care provider, such as the types listed on this card, for dental care or a dental check-up? {Since (START DATE)/ Between (START DATE) and (END DATE)}, did (PERSON) see or talk to any other type of dental care provider, such as the types listed on this card (other than what you've already told me about)? What type of dental care provider did (PERSON) see during this visit? What did (PERSON) have done during this visit?	About how long has it been since you last saw or talked to a dentist? Include all types of dentists, such as orthodontists, oral surgeons, and all other dental specialists, as well as dental hygienists.	About how long has it been since (you/SP) last visited a dentist? Include all types of dentists, such as orthodontists, oral surgeons, and all other dental specialists, as well as dental hygienists.
		<i>Survey</i> <u>Interview mode</u> <u>Years question(s) asked</u> <u>Single or multiple questions used</u> <u>Question wording</u>	
Within the past year (anytime less than 12 months ago) (2002, 2004, 2006, 2008, 2010)	Reported dental visit at any round of interview during the calendar year	6 months or less, or more than 6 months, but not more than 1 year ago	6 months or less, or more than 6 months, but not more than 1 year ago
Within the past year (1 to 12 months ago) (1999)			

* Dental visit question was included in the BRFSS emerging core questionnaire in 1999 and rotating core questionnaire in even years since 2002

[†] Dental care providers in the MEPS question refer to general dentist, dental hygienist, dental technician, dental surgeon, orthodontist, periodontist, or other dental specialist

[‡] Question and response listed were for NHANES 1999–2004; Dental visit question was not available in NHANES 2005–2010

BRFSS, Behavioral Risk Factor Surveillance System; MEPS, Medical Expenditure Panel Survey; NHIS, National Health Interview Survey; NHANES, National Health and Nutrition Examination Survey

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Table 2

Trends* in Prevalence (%) of Having a Past-Year Dental Visit (PPYDV) Among Adults Aged 18 Years and Older, from 1999 to 2010 BRFSS, MEPS, and NHIS

Trend	Years	β coefficient of survey year [†]	P-value [‡]
BRFSS	1999–2010	–0.00235	<0.001
MEPS [‡]	2000–2010	–0.00620	<0.001
MEPS [‡]	1999–2010	–0.00477	<0.001
NHIS	1999–2010	–0.00597	<0.001

BRFSS, Behavioral Risk Factor Surveillance System; MEPS, Medical Expenditure Panel Survey; NHIS, National Health Interview Survey.

* Trends in PPYDV adjusted for age, race/ethnicity, education level, poverty status, and edentulism.

[†] Linear trend was present if the β coefficient of the survey year variable was not equal to zero (increasing trend if $\beta > 0$; decreasing trend if $\beta < 0$); statistical significance of the trend was assessed with a *t*-test.

[‡] Because edentulism was not available in MEPS 1999, trend in PPYDV from MEPS 2000–2010 adjusted for all the covariates including edentulism, and trend in PPYDV from MEPS 1999–2010 adjusted for all the covariates excluding edentulism.

Table 3

Adjusted Prevalence (%)^{*} and 95% Confidence Interval (CI) of Having a Past-Year Dental Visit Among Adults Aged 18 Years and Older, 2002 BRFSS, MEPS and NHIS, and NHANES 1999–2004

	BRFSS 2002			MEPS 2002			NHIS 2002			NHANES 1999–2004		
	Sample size	Adjusted prevalence AI (%) [†] (95% CI)	Adjusted prevalence BI (%) [†] (95% CI)	Sample size	Adjusted prevalence B1 (%) [†] (95% CI)	Adjusted prevalence CI (%) [†] (95% CI)	Sample size	Adjusted prevalence CI (%) [†] (95% CI)	Adjusted prevalence DI (%) [†] (95% CI)	Sample size	Adjusted prevalence DI (%) [†] (95% CI)	
Total	236,457	70.0 (69.7, 70.4)	43.9 (42.8, 44.9)	26,364	43.9 (42.8, 44.9)	61.5 (60.8, 62.2)	30,502	61.5 (60.8, 62.2)	58.1 (56.5, 59.8)	16,997	58.1 (56.5, 59.8)	
Age (years)												
18–44	104,421	67.9 (67.4, 68.4)	39.5 (38.1, 40.9)	13,772	39.5 (38.1, 40.9)	59.0 (58.1, 60.0)	15,483	59.0 (58.1, 60.0)	56.8 (54.8, 58.8)	8,393	56.8 (54.8, 58.8)	
45–64	83,353	70.7 (70.1, 71.3)	45.9 (44.5, 47.3)	8,268	45.9 (44.5, 47.3)	63.0 (61.9, 64.1)	9,308	63.0 (61.9, 64.1)	61.1 (58.6, 63.7)	4,295	61.1 (58.6, 63.7)	
65+	48,683	72.7 (71.8, 73.5)	50.9 (48.8, 53.1)	4,324	50.9 (48.8, 53.1)	66.3 (64.8, 67.7)	5,711	66.3 (64.8, 67.7)	62.9 (59.7, 66.2)	4,309	62.9 (59.7, 66.2)	
Race/ethnicity												
NHW [‡]	188,866	70.9 (70.6, 71.3)	47.5 (46.2, 48.9)	15,447	47.5 (46.2, 48.9)	63.0 (62.1, 63.8)	20,144	63.0 (62.1, 63.8)	61.1 (58.8, 63.4)	8,283	61.1 (58.8, 63.4)	
NHB [‡]	17,260	65.2 (64.0, 66.5)	28.9 (26.9, 31.1)	3,630	28.9 (26.9, 31.1)	54.8 (53.1, 56.7)	4,068	54.8 (53.1, 56.7)	53.3 (50.7, 56.1)	3,443	53.3 (50.7, 56.1)	
Hispanic [‡]	13,340	65.9 (64.2, 67.6)	30.0 (28.1, 32.1)	5,789	30.0 (28.1, 32.1)	57.9 (56.0, 59.8)	5,183	57.9 (56.0, 59.8)	48.5 (44.0, 53.6)	3,997	48.5 (44.0, 53.6)	
Education level												
Less than high school	25,167	54.0 (52.5, 55.5)	30.5 (28.7, 32.4)	6,934	30.5 (28.7, 32.4)	43.7 (42.1, 45.4)	5,815	43.7 (42.1, 45.4)	44.5 (41.1, 48.1)	5,854	44.5 (41.1, 48.1)	
High school graduate	74,764	67.2 (66.5, 67.8)	40.9 (39.6, 42.2)	12,719	40.9 (39.6, 42.2)	56.4 (55.2, 57.5)	8,705	56.4 (55.2, 57.5)	54.4 (52.1, 56.9)	4,169	54.4 (52.1, 56.9)	
More than high school	136,037	73.4 (72.9, 73.9)	52.6 (51.3, 54.0)	6,595	52.6 (51.3, 54.0)	68.2 (67.4, 69.1)	15,697	68.2 (67.4, 69.1)	66.1 (64.1, 68.1)	6,934	66.1 (64.1, 68.1)	
Poverty status												
Poor [‡]	18,839	57.8 (56.2, 59.6)	31.1 (29.0, 33.3)	3,837	31.1 (29.0, 33.3)	51.9 (49.7, 54.3)	4,718	51.9 (49.7, 54.3)	51.3 (48.0, 54.8)	3,147	51.3 (48.0, 54.8)	
Near-poor [‡]	48,481	61.9 (61.1, 62.7)	33.6 (31.7, 35.6)	5,517	33.6 (31.7, 35.6)	52.5 (50.9, 54.0)	6,051	52.5 (50.9, 54.0)	48.6 (46.1, 51.3)	4,092	48.6 (46.1, 51.3)	
Non-poor [‡]	135,635	73.5 (73.0, 73.9)	46.4 (45.1, 47.7)	17,010	46.4 (45.1, 47.7)	65.1 (64.3, 65.9)	19,733	65.1 (64.3, 65.9)	63.0 (61.0, 65.1)	8,098	63.0 (61.0, 65.1)	
Edentulism												
Yes	19,517	27.5 (26.3, 28.8)	19.8 (18.0, 21.9)	2,591	19.8 (18.0, 21.9)	26.7 (24.7, 28.8)	2,858	26.7 (24.7, 28.8)	19.8 (17.3, 22.7)	1,331	19.8 (17.3, 22.7)	
No	213,528	72.1 (71.7, 72.5)	46.1 (44.9, 47.2)	23,362	46.1 (44.9, 47.2)	64.6 (63.9, 65.4)	27,613	64.6 (63.9, 65.4)	62.0 (60.3, 63.8)	13,283	62.0 (60.3, 63.8)	

BRFSS, Behavioral Risk Factor Surveillance System; MEPS, Medical Expenditure Panel Survey; NHIS, National Health Interview Survey; NHANES, National Health and Nutrition Examination Survey.

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* Prevalence adjusted for age, race/ethnicity, education level, poverty status, and edentulism.

[†] A1, B1, C1, and D1: adjusted prevalence from 2002 BRFSS, 2002 NHIS, and NHANES 1999–2004, respectively; NHW: Non-Hispanic White; NHB: Non-Hispanic Black; Hispanic: Mexican-American only for NHANES 1999–2004; Poor: <100% Federal Poverty Level (FPL); Near-poor: 100–199% FPL; Non-poor: 200% FPL.

Table 4

Adjusted Prevalence (%)^{*} and 95% Confidence Interval (CI) of Having a Past-Year Dental Visit Among Adults Aged 18 Years and Older, 2010 BRFSS, MEPS, and NHIS

	BRFSS 2010		MEPS 2010		NHIS 2010	
	Sample size	Adjusted prevalence A2(%) [†] (95% CI)	Sample size	Adjusted prevalence B2(%) [†] (95% CI)	Sample size	Adjusted prevalence C2(%) [†] (95% CI)
Total	441,607	67.5 (67.3, 67.8)	22,559	39.7 (38.5, 40.8)	26,725	59.7 (58.9, 60.5)
Age (years)						
18-44	103,857	66.4(65.9, 66.9)	11,144	35.9 (34.2, 37.6)	12,402	57.4 (56.4, 58.5)
45-64	189,437	68.6 (68.3, 69.0)	7,695	42.1 (40.4, 43.8)	8,972	61.1 (59.9, 62.3)
65+	148,313	72.2 (71.8, 72.6)	3,720	48.0 (45.7, 50.4)	5,351	64.4 (62.7, 66.1)
Race/ethnicity						
NHW [‡]	349,294	69.4 (69.1, 69.8)	10,641	43.6 (42.1, 45.1)	15,356	61.4 (60.4, 62.4)
NHB [‡]	34,634	63.8 (62.8, 64.9)	4,257	31.6 (29.5, 33.9)	4,419	55.8 (54.0, 57.6)
Hispanic	27,875	66.0 (64.8, 67.3)	5,462	29.3 (26.8, 32.1)	5,073	55.4 (53.6, 57.2)
Education level						
Less than high school	40,905	53.8 (52.5, 55.1)	5,011	28.6 (26.4, 30.9)	4,565	44.7 (42.7, 46.9)
High school graduate	131,358	63.1 (62.5, 63.7)	10,790	35.2 (33.7, 36.8)	7,050	53.1 (51.7, 54.5)
More than high school	267,854	71.9 (71.6, 72.3)	6,567	49.4 (47.9, 50.8)	15,000	65.7 (64.7, 66.7)
Poverty status						
Poor [‡]	43,025	49.6 (48.5, 50.7)	4,020	28.6 (26.1, 31.3)	4,780	45.8 (43.9, 47.8)
Near-Poor [‡]	78,537	58.0 (57.2, 58.8)	4,895	31.0 (29.1, 33.0)	5,704	48.4 (46.8, 50.1)
Non-Poor [‡]	257,968	74.7 (74.3, 75.1)	13,644	43.6 (42.1, 45.1)	16,241	66.1 (65.1, 67.0)
Edentulism						
Yes	38,172	28.2 (27.3, 29.2)	1,676	20.6 (16.8, 25.2)	2,294	30.1 (27.8, 32.5)
No	395,296	70.0 (69.7, 70.3)	20,412	42.2 (40.9, 43.6)	24,423	62.6 (61.7, 63.5)

BRFSS, Behavioral Risk Factor Surveillance System; MEPS, Medical Expenditure Panel Survey; NHIS, National Health Interview Survey.

^{*} Prevalence adjusted for age, race/ethnicity, education level, poverty status, and edentulism; the dental visit question was not available in NHANES 2005-2010.

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A2, B2, and C2: adjusted prevalence from 2010 BRFSS, MEPS, and NHIS, respectively; NHW: Non-Hispanic White; NHB: Non-Hispanic Black; Poor: <100% Federal Poverty Level (FPL); Near-poor: 100–199% FPL; Non-poor: 200% FPL.[†]

Table 5

Absolute Difference (AD) (%) and 95% Confidence Interval (CI) in Adjusted Prevalence of Having a Past-Year Dental Visit Among Adults Aged 18 Years and Older, Between BRFSS and MEPS, NHIS and NHANES*

	2002 BRFSS-2002 MEPS	2002 BRFSS-2002 NHIS	2002 BRFSS-1999-2004 NHANES	2010 BRFSS-2010 MEPS	2010 BRFSS-2010 NHIS
	AD (95% CI) AD = A1-B1 [†]	AD (95% CI) AD = A1-C1 [†]	AD (95% CI) AD = A1-D1 [†]	AD (95% CI) AD = A2-B2 [†]	AD (95% CI) AD = A2-C2 [†]
Total	26.2 (25.0, 27.3)	8.5 (7.8, 9.3)	12.0 (10.3, 13.6)	27.9 (26.7, 29.1)	7.8 (7.0, 8.7)
Age (years)					
18-44	28.4 (26.9, 29.9)	8.9 (7.8, 9.9)	11.1 (9.1, 13.1)	30.5 (28.8, 32.3)	8.9 (7.7, 10.1)
45-64	24.8 (23.3, 26.3)	7.7 (6.5, 8.9)	9.6 (7.0, 12.1)	26.6 (24.9, 28.3)	7.5 (6.3, 8.8)
65+	21.8 (19.4, 24.1)	6.4 (4.7, 8.1)	9.8 (6.5, 13.1)	24.2 (21.8, 26.6)	7.8 (6.1, 9.6)
Race/ethnicity					
NHW [‡]	23.4 (22.0, 24.8)	8.0 (7.0, 8.9)	9.9 (7.6, 12.2)	25.9 (24.3, 27.4)	8.1 (7.0, 9.1)
NHB [‡]	36.3 (33.9, 38.7)	10.4 (8.2, 12.5)	11.9 (9.0, 14.8)	32.2 (29.8, 34.7)	8.1 (6.0, 10.2)
Hispanic [‡]	35.9 (33.2, 38.5)	8.0 (5.4, 10.5)	17.4 (12.4, 22.3)	36.7 (33.8, 39.6)	10.6 (8.4, 12.8)
Education level					
Less than high school	23.5 (21.1, 25.8)	10.3 (8.1, 12.4)	9.5 (5.8, 13.2)	25.2 (22.6, 27.8)	9.0 (6.5, 11.5)
High school graduate	26.3 (24.8, 27.7)	10.8 (9.5, 12.1)	12.7 (10.3, 15.2)	27.9 (26.3, 29.5)	10.0 (8.5, 11.6)
More than high school	20.8 (19.3, 22.2)	5.2 (4.2, 6.1)	7.3 (5.3, 9.3)	22.6 (21.1, 24.0)	6.2 (5.2, 7.3)
Poverty status					
Poor [‡]	26.8 (24.0, 29.5)	5.9 (3.1, 8.8)	6.6 (2.9, 10.3)	21.0 (18.2, 23.9)	3.8 (1.6, 6.0)
Near-poor [‡]	28.3 (26.2, 30.4)	9.4 (7.7, 11.2)	13.3 (10.6, 15.9)	27.0 (24.9, 29.1)	9.6 (7.7, 11.4)
Non-poor [‡]	27.1 (25.7, 28.5)	8.4 (7.4, 9.3)	10.5 (8.4, 12.5)	31.1 (29.6, 32.7)	8.6 (7.6, 9.7)
Edentulism					
Yes	7.7 (5.4, 10.0)	0.9 (-1.5, 3.2)	7.7 (4.8, 10.6)	7.6 (3.4, 11.9)	-1.9 (-4.4, 0.7)
No	26.0 (24.8, 27.3)	7.5 (6.7, 8.3)	10.1 (8.3, 11.8)	27.8 (26.5, 29.2)	7.4 (6.5, 8.4)

BRFSS, Behavioral Risk Factor Surveillance System; MEPS, Medical Expenditure Panel Survey; NHIS, National Health Interview Survey; NHANES, National Health and Nutrition Examination Survey.

* Prevalence adjusted for age, race/ethnicity, education level, poverty status, and edentulism; the dental visit question was not available in NHANES 2005-2010; all ADs in adjusted prevalence between BRFSS and each of other three surveys MEPS, NHIS, and NHANES were statistically significant ($P < 0.05$) except for AD between BRFSS and NHIS among edentate adults.

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A1, B1, C1, and D1: adjusted prevalence from 2002 BRFSS, 2002 MEPS, 2002 NHIS, and NHANES 1999–2004 respectively; A2, B2, and C2: adjusted prevalence from 2010 BRFSS, MEPS, and NHIS, respectively; NHW: Non-Hispanic White; NHB: Non-Hispanic Black; Hispanic: Mexican-American only for NHANES 1999–2004; Poor: <100% Federal Poverty Level (FPL); Near-poor: 100–199% FPL; Non-poor: 200% FPL.