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Joseph Whitesides  
*Marquette University*

Nicholas M. Pajewski  
*University of Alabama - Birmingham*

T. Gerard Bradley  
*Marquette University*, [thomas.bradley@marquette.edu](mailto:thomas.bradley@marquette.edu)

Anthony Iacopino  
*University of Manitoba*

Christopher Okunseri  
*Marquette University*, [christopher.okunseri@marquette.edu](mailto:christopher.okunseri@marquette.edu)

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### Recommended Citation

Whitesides, Joseph; Pajewski, Nicholas M.; Bradley, T. Gerard; Iacopino, Anthony; and Okunseri, Christopher, "Socio-demographics of Adult Orthodontic Visits in the United States" (2008). *School of Dentistry Faculty Research and Publications*. 99.  
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*American Journal of Orthodontics and Dentofacial Orthopedics*, Vol. 133, No. 4 (April 2008): 489.e9-489.e14. [DOI](#). This article is © Elsevier and permission has been granted for this version to appear in [e-Publications@Marquette](#). Elsevier does not grant permission for this article to be further copied/distributed or hosted elsewhere without the express permission from Elsevier.

# Socio-demographics of adult orthodontic visits in the United States

**Joseph Whitesides**

Orthodontic resident, Department of Developmental Sciences, School of Dentistry, Marquette University, Milwaukee, Wis.

**Nicholas M. Pajewski**

Doctoral candidate, Division of Biostatistics, Department of Population Health, Medical College of Wisconsin, Milwaukee, Wis.

**T. Gerard Bradley**

Associate professor, Department of General Dental Sciences, School of Dentistry, Marquette University, Milwaukee, Wis.

**Anthony M. Iacopino**

Professor, Faculty of Dentistry, University of Manitoba, Winnipeg, Manitoba, Canada.

**Christopher Okunseri**

Assistant professor, Department of Clinical Services, School of Dentistry, Marquette University, Milwaukee, Wis.

## Abstract

**Introduction:** Population-based studies in orthodontics have focused on differences between normative and perceived needs. However, information from national data on the prevalence of orthodontic visits and their associated factors in adults in the United States is scarce. We examined the demographic profile of likely adult users of orthodontic services and whether there is racial and ethnic disparity in orthodontic visits. **Methods:** We analyzed data from the Medical Expenditure Panel Survey, 2000-2004. **Results:** Overall, about 1% of the population reported an orthodontic visit. Subjects who made a general dental visit during the current year were significantly more likely to also have an orthodontic visit. Single adults, women, people between 18 and 30 years of age, and those from high-income families were more likely to report an orthodontic visit. There were no indications of racial and ethnic disparity for either black or Hispanic adults compared with white adults after adjusting for other covariates. **Conclusions:** Substantial racial and ethnic disparity in adult orthodontic usage was not identified. Adults (ages 18-30 years), women, those with higher incomes, and single adults had significantly higher odds of reporting an orthodontic visit. However, additional studies specifically evaluating the association of treatment need among low-income families are required to evaluate whether these adults face significant barriers in accessing orthodontic care.

The prevalence of malocclusion in adults is equal to or greater than what is documented in children.<sup>1</sup> Studies in Sweden and Holland reported that the prevalence of malocclusion ranged between 40% and 76% in adults.<sup>2,3</sup> Another study of US Army recruits reported that 77% had some malocclusion and required orthodontic treatment, and 16% had a malocclusion that was rated as severe or handicapping.<sup>4</sup> Additionally, the Third National Health and Nutrition Examination Survey (NHANES III), which included a measure of occlusal relationships in its oral-health component, showed that up to two thirds of adults had some type of malocclusion.<sup>5,6</sup> NHANES III also showed that as many as 15% of white children and 40% of Mexican-American children between the ages of 12 and 17 might reach adulthood with moderate to definite treatment needs (measured by the index of orthodontic treatment need) that go untreated.

Okunseri et al,<sup>7</sup> in a study of pediatric orthodontic use, documented a disparity<sup>8</sup> for black and Hispanic children in the United States. These minority groups reported fewer orthodontic visits compared with what would be expected for their population size and the usage of white children. Both minority groups were significantly less likely to report an orthodontic visit compared with whites even after adjusting for socioeconomic differences. This disparity was observed in spite of public programs such as Medicaid that cover orthodontic expenses for low-income children. Since public programs do not cover orthodontic expenses for adults, adult users of orthodontic care might also be subject to this same disparity. When this is considered in conjunction with reports of more adults seeking orthodontic care,<sup>9, 10, 11, 12, 13, 14</sup> it suggests a need for pertinent national data to characterize those most likely to receive orthodontic services. Additionally, from a public-health perspective, it is also important to investigate whether this usage profile appropriately coincides with the population subgroups that are known to have higher rates of orthodontic treatment need as measured by the person (perceived need) or the expert (normative need).

Few studies have included information on orthodontic usage patterns in adults in the United States. Manski et al,<sup>15</sup> using the 1987 National Medical Expenditure Survey and the 1996 Medical Expenditure Panel Survey (MEPS), reported a racial and ethnic disparity between white and nonwhite people in the general US population. Although the results of this study were generalized to the entire US population (including children), it was not based on adjusted comparisons between population subgroups.

The goals of this study were to specifically examine the orthodontic visit patterns of adults in the United States and to determine whether the racial and ethnic disparities reported by Manski et al<sup>15</sup> and Okunseri et al<sup>7</sup> exist

among adult users of orthodontic care. We hypothesized that adult orthodontic visits would reflect racial or ethnic disparities, as well as sex and income differences.

## Material and methods

We analyzed data from alternating years of the MEPS household component to determine overall orthodontic usage and associated factors among adults in the United States, 2000-2004. Conducted by the Agency for Healthcare Research and Quality, MEPS is a national survey of health care use and expenditures that represents the civilian noninstitutionalized population of the United States.<sup>16</sup> Oversampling techniques are used to gather more accurate information for underrepresented subsets of the population. Person-level data in the MEPS sample were weighted to provide national population-based estimates.

Each calendar year of MEPS data consists of the incoming participants from the previous year and the incoming participants of the current year (eg, 2000 contains panel 1 participants who entered MEPS in 2000, and panel 2 contains participants who entered MEPS in 1999). Because of this 2-year panel structure, data were analyzed from alternating years (2000, 2002, and 2004) to prevent double counting of participants in cross-sectional years. Adults 19 years of age or older when they entered MEPS were considered eligible for this study. Adults who were not within the study scope—ie, part of the noninstitutionalized population for the entire year—were excluded from all analyses.<sup>17</sup> In addition to the variables provided by the MEPS survey, 1 variable (current smoking status) was also included from the Adult Self-Administered Questionnaire. This mail-back supplemental survey, first conducted in 2000, collected information about MEPS respondents' ( $\geq 18$  years) personal feelings about their health, health care, and medical provider interactions.

Orthodontic use was defined as the weighted percentage of adults who reported at least 1 orthodontic visit during the current year of their participation in MEPS (2000-2004). We examined demographic characteristics of age, categorized as 19 to 30 years, 31 to 50 years, 51 to 70 years, and older than 70 years. Other demographic factors included were sex and race or ethnicity (white, black, Hispanic, Asian or Pacific Islander, and other). We also examined socioeconomic factors, including health insurance (private, public only, and uninsured), household income, employment status (yes or no), and education level. Income levels were categorized as poor, near poor, or low income ( $< 200\%$  of the poverty line), middle income (200%-400%), and high income ( $> 400\%$ ). Education level was defined as high school or less, more than high school but less than 4 years of college, and 4 or more years of college.

Respondents were also asked whether they had dental coverage at 3 times during the year. They were classified as having dental insurance if they had no lapses in coverage during the year. We also included information about general dental visits, categorized as none in the current year and at least 1 in the current year. Based on a report from Dye et al,<sup>18</sup> we also investigated the effect of smoking on orthodontic usage. Although smoking should not impact a person's normative need for orthodontic care, those authors reported an interaction between race and being a current smoker in terms of perceived need for orthodontic or cosmetic care. Current Hispanic smokers were reported to be more likely to perceive a need for orthodontic or cosmetic treatment. We believe this result represents a higher demand among minority smokers for purely cosmetic procedures, such as teeth cleaning, and should not increase an adult's likelihood of visiting an orthodontist.

## Statistical analysis

All analyses account for the complex survey design of MEPS by using appropriate survey weights to produce national-level estimates from the person-level data.<sup>19</sup> Descriptive and logistic regression analyses were performed to examine the effect of demographic and socioeconomic variables on the outcome of at least 1 orthodontic visit in a year. For multiple regression analyses, the cross-sectional data were pooled (and appropriately reweighted) because of the small number of adults who reported an orthodontic visit. The

descriptive analysis did not show differential usage patterns for Asians and Pacific Islanders and other racial groups; those categories were defined as white in subsequent regression analyses.

Because of multicollinearity between income, insurance, education, and employment statuses, only income and insurance were used as covariates in the regression models. Dental and health insurance were combined to form a single variable, categorized as uninsured, public coverage, private health without dental, and private health with dental. All survey-weighted analyses were performed using the svy package in STATA (version 9; StataCorp, College Station, Tex). A significance level of 0.05 was used throughout to denote statistical significance. This study was approved by the Marquette University Institutional Review Board.

## Results

The eligible sample size consisted of 64,968 adults weighted to represent the noninstitutionalized adult population in the United States of approximately 205 million people. Table I gives weighted estimates of the prevalence of orthodontic visits by demographic characteristics. Overall, the prevalence of at least 1 visit was 1.0% (95% CI, 0.9%-1.1%). This corresponds to approximately 2.05 million adults visiting an orthodontist during the 5-year study span. The highest prevalences of visits occurred between the ages of 19 and 30 (1.7%) and for single adults (1.6%).

Table I. Overall US population weighted estimates by demographic characteristics

|                           | Percentage | 95% CI  | People with visit (estimated, n) |
|---------------------------|------------|---------|----------------------------------|
| Total adult population    | 1.0        | 0.9-1.1 | 2,050,870                        |
| Age (y)                   |            |         |                                  |
| 19-30                     | 1.7        | 1.5-2.0 | 781,908                          |
| 31-50                     | 1.1        | 0.9-1.2 | 888,231                          |
| 51-70                     | 0.6        | 0.4-0.7 | 294,895                          |
| >70                       | 0.4        | 0.2-0.6 | 85,836                           |
| Sex                       |            |         |                                  |
| Male                      | 0.7        | 0.6-0.8 | 704,375                          |
| Female                    | 1.3        | 1.1-1.4 | 1,346,495                        |
| Race or ethnicity         |            |         |                                  |
| White                     | 1.0        | 0.9-1.1 | 1,431,525                        |
| Black                     | 1.0        | 0.8-1.3 | 239,442                          |
| Hispanic                  | 0.9        | 0.7-1.1 | 211,283                          |
| Asian or Pacific Islander | 1.5        | 1.0-2.2 | 126,016                          |
| Other                     | 1.5        | 0.7-3.2 | 42,604                           |
| Health insurance          |            |         |                                  |
| Private insurance         | 1.1        | 1.0-1.2 | 1,696,401                        |
| Public coverage           | 0.6        | 0.4-0.9 | 159,797                          |
| Uninsured                 | 0.7        | 0.5-1.0 | 194,672                          |
| Dental insurance          |            |         |                                  |
| Full-year coverage        | 1.3        | 1.1-1.5 | 1,052,640                        |
| Partial or no coverage    | 0.8        | 0.7-0.9 | 998,230                          |
| Family income             |            |         |                                  |
| Poor                      | 0.7        | 0.6-0.9 | 395,840                          |
| Middle                    | 0.9        | 0.8-1.1 | 595,331                          |
| High                      | 1.2        | 1.1-1.4 | 1,059,699                        |

|                                        |     |         |           |
|----------------------------------------|-----|---------|-----------|
| Education                              |     |         |           |
| High school or less                    | 0.8 | 0.7-1.0 | 872,921   |
| > high school but < 4 years of college | 1.3 | 1.1-1.5 | 591,437   |
| 4 years of college or more             | 1.1 | 0.9-1.3 | 586,512   |
| Employment status                      |     |         |           |
| Employed for full year                 | 1.1 | 1.0-1.2 | 1,363,660 |
| Unemployed for at least part of year   | 0.9 | 0.7-1.0 | 684,413   |
| Marital status                         |     |         |           |
| Single, never married                  | 1.6 | 1.3-1.8 | 733,227   |
| Married                                | 0.9 | 0.8-1.0 | 1,049,250 |
| Separated, divorced, or widowed        | 0.7 | 0.5-0.8 | 268,393   |
| Current smoker                         |     |         |           |
| Yes                                    | 0.6 | 0.5-0.8 | 260,255   |
| No                                     | 1.1 | 1.0-1.2 | 1,623,928 |

Table II compares the demographic and socioeconomic distribution of people who made a visit against the distribution of these factors in the overall US adult population. Only 34.4% of orthodontic visits were reported by men; this is much lower than their overall percentage of 47.9%. Adults between 19 and 30 years (22.2% of the population) accounted for 38.1% of all adult orthodontic visits reported between 2000 and 2004. An interesting finding from Table II is that the percentage of adults in each racial group who reported an orthodontic visit was similar to their overall percentage in the sample population. Single adults accounted for a much higher percentage of orthodontic visits (35.8%, 2000-2004) compared with their overall sample percentage (23.0%, 2000-2004).

Table II. US population weighted characteristics of adults with at least 1 orthodontic visit

|                                        | <b>With visit*</b> | <b>Overall</b>    |
|----------------------------------------|--------------------|-------------------|
|                                        | <b>% (95% CI)</b>  | <b>% (95% CI)</b> |
| Sex                                    |                    |                   |
| Male                                   | 34.4 (30.0-39.0)   | 47.9 (47.6-48.2)  |
| Age (y)                                |                    |                   |
| 19-30                                  | 38.1 (33.4-43.1)   | 22.2 (21.7-22.8)  |
| 31-50                                  | 43.3 (38.6-48.2)   | 40.8 (40.2-41.4)  |
| 51-70                                  | 14.4 (11.6-17.7)   | 26.1 (25.6-26.6)  |
| <70                                    | 4.2 (2.6-6.6)      | 10.9 (10.4-11.3)  |
| Race or ethnicity                      |                    |                   |
| White                                  | 69.8 (65.4-73.9)   | 71.6 (70.3-72.8)  |
| Black                                  | 11.7 (9.3-14.6)    | 11.2 (10.3-21.2)  |
| Hispanic                               | 10.3 (8.2-12.8)    | 11.7 (10.8-12.7)  |
| Asian or Pacific Islander              | 6.1 (4.2-9.0)      | 4.1 (3.8-4.6)     |
| Other                                  | 2.1 (0.9-4.5)      | 1.4 (1.2-1.6)     |
| Education                              |                    |                   |
| High school or less                    | 42.6 (37.7-47.6)   | 51.7 (50.8-52.6)  |
| > high school but < 4 years of college | 28.8 (24.7-33.4)   | 22.6 (22.1-23.1)  |
| 4 years or more of college             | 28.6 (24.5-33.0)   | 25.7 (24.9-26.5)  |
| Marital status                         |                    |                   |

|                              |                  |                  |
|------------------------------|------------------|------------------|
| Single, never married        | 35.8 (30.8-41.0) | 23.0 (22.4-23.6) |
| Married                      | 51.2 (46.3-56.0) | 56.9 (56.1-7.6)  |
| Divorced, widowed, separated | 13.1 (10.2-16.6) | 20.1 (19.6-20.7) |
| Employment status            |                  |                  |
| Employed for full year       | 66.6 (61.4-71.4) | 60.9 (60.3-61.6) |
| Insurance                    |                  |                  |
| Any private                  | 82.7 (78.7-86.1) | 73.6 (72.8-74.3) |
| Public                       | 7.8 (5.3-11.3)   | 13.4 (12.9-13.9) |
| Uninsured                    | 9.5 (7.2-12.5)   | 13.1 (12.6-13.6) |
| Dental insurance             |                  |                  |
| Yes                          | 40.8 (39.9-41.6) | 51.3 (46.2-56.4) |
| Household income             |                  |                  |
| Poor or low income           | 19.3 (15.8-23.3) | 27.0 (26.2-27.9) |
| Middle income                | 29.0 (25.1-33.4) | 31.5 (30.8-32.1) |
| High income                  | 51.7 (46.8-56.5) | 41.5 (40.6-42.4) |
| Current smoker               |                  |                  |
| Yes                          | 13.8 (10.9-17.4) | 22.2 (21.7-22.7) |

\*Adults with at least 1 orthodontic visit.

Table III shows the results of a weighted multiple logistic regression analysis for factors associated with orthodontic visits. Women were more likely to have had a visit than men (odds ratio [OR], 1.61; 95% CI, 1.30-2.00). We also saw a decreasing trend in usage as people got older, with those 30 years of age or younger the most likely users of orthodontic services. Married subjects were less likely to have had a visit compared with single people (OR, 0.71; 95% CI, 0.55-0.93). Subjects who made a general dental visit in the current year were significantly more likely to also have an orthodontic visit (OR, 2.40; 95% CI, 1.92-3.02).

Table III. US population weighted estimates from logistic multiple regression for factors associated with adult orthodontic visits

| Factor                       | OR   | 95% CI    |
|------------------------------|------|-----------|
| Sex (male)                   |      |           |
| Female                       | 1.61 | 1.30-2.00 |
| Age (19-30 y)                |      |           |
| 31-50                        | 0.59 | 0.46-0.75 |
| 51-70                        | 0.31 | 0.22-0.42 |
| >70                          | 0.25 | 0.15-0.41 |
| Race or ethnicity (white)    |      |           |
| Black                        | 1.18 | 0.88-1.59 |
| Hispanic                     | 0.99 | 0.74-1.32 |
| Income (poor or low)         |      |           |
| Middle                       | 1.1  | 0.83-1.46 |
| High                         | 1.39 | 1.05-1.85 |
| Insurance (uninsured)        |      |           |
| Public coverage              | 0.95 | 0.57-1.59 |
| Private health, no dental    | 1.15 | 0.77-1.72 |
| Private health, with dental  | 1.19 | 0.82-1.72 |
| General dental visits (none) |      |           |

|                              |      |           |
|------------------------------|------|-----------|
| 1 or more in year            | 2.4  | 1.92-3.02 |
| Marital status (single)      |      |           |
| Married                      | 0.71 | 0.55-0.92 |
| Separated, divorced, widowed | 0.74 | 0.51-1.08 |
| Current smoker (no)          |      |           |
| Yes                          | 0.63 | 0.46-0.85 |

Compared with adults from poor to low-income families, adults from middle-income families were not significantly more likely to have an orthodontic visit. Those from high-income families, however, were more likely to have a visit (OR, 1.39; 95% CI, 1.05-1.85). Neither black nor Hispanic adults were significantly different from white adults (OR, 1.18; 95% CI, 0.88-1.59 and OR, 0.99; 95% CI, 0.74-1.32), respectively.

After adjusting for income, the effect of insurance on orthodontic usage disappeared. We did not find a higher probability of making an orthodontic visit for adults with public coverage and for those with private health insurance (with or without dental coverage) compared with the uninsured. This might be attributable to the low level of insurance reimbursement for orthodontic coverage. Finally, current smokers were actually less likely to have had a visit (OR, 0.61; 95% CI, 0.45-0.83). We also investigated whether there were any interactions between race and smoking status, but we found no significant effects for black or Hispanic smokers (results not shown).

## Discussion

This study demonstrates that several factors, outside treatment need, influence whether an American adult visits an orthodontist. It was not surprising that adults reporting regular dental visits were more likely to visit an orthodontist, since most visits occur through dental referrals. Patients who visit a dentist regularly are concerned about their oral health and are more likely to be introduced to and accept the concept of orthodontic care.<sup>20</sup> However, this result implies that, for the orthodontic community to adequately meet the treatment needs of US adults, this goal should invariably be connected with increasing regular dental visits.

We did not find a racial disparity for either Hispanic or black adults. This result, however, implies only that these minority groups seek orthodontic services at a rate relative to their overall population size that is similar to white adults. From a planning perspective, however, the more relevant comparison is whether these minority groups use orthodontic services at a rate commensurate with their level of treatment need. Unfortunately, due to the lack of current information on orthodontic treatment need among US adults, we cannot accurately predict what the most likely outcome would be. Earlier studies, such as those by Proffit et al<sup>6</sup> and Tickle et al<sup>21</sup> (which examined children's orthodontic treatment needs) reported higher rates of conditions requiring orthodontic treatment among black, Hispanic, and socioeconomically deprived people.

Although adults from high-income families were more likely to visit an orthodontist, approximately 48% of the visits were made by adults in the poor to middle-income categories. This appears to suggest that some adults decide to undergo orthodontic treatment despite the economic impact. Fashion and esthetics play major roles in society today, and how someone's smile looks influences self-esteem and image more today than ever before.<sup>9, 20, 22</sup> In addition, unlike children, when the treatment decision is driven by parental attitudes, adults are more likely to see orthodontic care as a personal priority compared with providing it for their children. This study also shows that women were more likely to have an orthodontic visit, a finding that is supported by other studies that reported that women are generally more likely to have routine dental care.<sup>7</sup>



Our study results should be considered in light of some limitations. First, the orthodontic-visit data were self-reported, and no attempt was made to cross-check the responses with actual provider data or treatment records. Second, the MEPS database does not contain an assessment of orthodontic treatment need or the reasons that an adult decided to visit an orthodontist. These 2 pieces of information would provide the most conclusive evidence of whether adults most in need are actually receiving orthodontic care. Third, because racial and ethnic minority children have high prevalences of orthodontic treatment need, it seems reasonable to believe that, if their treatment needs were truly being met, they would be overrepresented among adults who seek orthodontic care; we did not find this to be true.

This study is an important first step for future research that could delineate the link between treatment need, economics, personal oral-health beliefs, and eventual orthodontic usage. Although Caban-Martinez et al<sup>23</sup> and Mueller et al<sup>24</sup> documented that large percentages of American adults have unmet dental care needs and barriers to receiving care, other reports from private practice surveys also indicated that more adults are seeking orthodontic care.<sup>9, 14</sup> It is therefore unclear whether this growth is due to improved access, population growth, or increased orthodontic productivity. Additional studies specifically evaluating the association of treatment need among low-income families and whether they face significant barriers in accessing orthodontic care are required. Furthermore, other possible studies could include the role of orthodontic marketing efforts on usage, especially efforts that might target population groups with the greatest needs.

## Conclusions

We did not identify a racial or an ethnic disparity in adult orthodontic usage after adjusting for other factors such as sex and income. Younger adults (ages 19-30 years), women, and single adults had significantly higher odds of reporting an orthodontic visit. Because orthodontic care often is an out-of-pocket expense, it could be that adults are placing greater priority on their esthetics.

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