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Visits to US Emergency Departments by 20 to 29 Year-olds with Chief Complaint of Toothache during 2001–2010

Charlotte W. Lewis, MD, MPH,

Department of Pediatrics, Division of General Pediatrics, School of Dentistry, University of Washington, Box 354920, Seattle, WA, 98195. cwlewis@u.washington.edu

Christy M. McKinney, PhD, MPH,

Department of Oral Health Sciences, School of Dentistry, University of Washington, Seattle, WA.

Helen H. Lee, MD, MPH,

Department of Pediatric Anesthesiology and Pain Medicine, Seattle Children's Hospital. Seattle, WA

Molly L. Melbye, DDS, MPH, and

Department of Oral Health Sciences, School of Dentistry, University of Washington, Seattle, WA

Neighborcare Health. Seattle, WA

Tessa C. Rue, MS

Department of Biostatistics, University of Washington, Seattle, WA.

Abstract

Background—Visits to emergency departments (EDs) for dental complaints are on the rise, yet reliance on EDs for dental care is far from ideal. ED toothache visits represent opportunities to improve access to professional dental care.

Methods—This research focuses on 20–29 year-olds, who account for more ED toothache visits than other age groups. We analyzed publicly available ED visits data from the National Hospital Ambulatory Medical Care Survey (NHAMCS). We assessed trends in ED toothache visit rates compared with back pain and all-cause ED visits during the past decade. We used 2009–2010 NHAMCS to characterize the more recent magnitude, relative frequency, and independent risk factors for ED toothache visits. Statistical analyses accounted for the complex sampling design.

Results—The average annual increase in ED visit rates among 20–29 year-olds during 2001–2010 was 6.1% for toothache; 0.3% for back pain; and 0.8% for all-causes ED visits. In 2009–2010, 20–29 year-olds made an estimated 1.27 million ED visits for toothaches and accounted for

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Correspondence to: Charlotte W. Lewis.

Dr. Lee now at Department of Anesthesiology, College of Medicine, University of Illinois at Chicago, Chicago, IL.

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42% of all ED toothache visits. Toothache was the fifth most common reason for any ED visit and third most common for uninsured ED visits in 20–29 year-olds. Independent risk factors for ED toothache visits were being uninsured or Medicaid-insured.

Conclusions—Younger adults increasingly rely on EDs for toothaches—likely because of barriers to accessing professional dental care. Expanding dental coverage and access to affordable dental care could increase options for timely dental care and decrease ED use for dental complaints.

Keywords

Access to care; emergency services; emergency treatment; toothache

The emergency department (ED) is a well-known safety net for those who face barriers to other sources of health care. However, reliance on the ED as a dental care safety net is problematic for many reasons. EDs usually are not staffed or equipped to deliver dental care. Most treatment rendered in the EDs for toothache is only temporizing,^{1–3} which means that the symptom is likely to recur in the absence of subsequent professional dental care.⁴ Moreover, because ED visits for dental complaints are disproportionately made by the uninsured,^{1–3,5–7} the cost of such care is more likely to be shifted to insured patients and absorbed by individual EDs and hospitals⁴ rather than more widely distributed among dental and public health care systems

ED toothache visits are usually classified as nonurgent, potentially contributing to ED inefficiency. Yet, advocates point out that the uninsured seek ED care for nonurgent problems not because they want to, but because they have no other option.⁸ If pain from toothache interferes with ability to sleep, eat, or work; and dental care is not affordable or accessible, then individuals will seek care where ever they can get it, including in the ED. There are few upfront financial barriers to ED care. Unlike dental offices, hospitals must legally provide emergency care to anyone who needs it, regardless of ability to pay.⁹ Additionally, tax exempt hospitals (and their EDs) are obligated by the IRS to provide charity care, often in the form of discounted care for low-income patients^{10,11}; such financial assistance may not be as readily available in private dental practices.

In 2012, we reported that ED dental visits had increased between 2001 and 2008, particularly among adults.⁶ Other investigators have documented similar findings.^{12–15} As a next step in our research agenda, we then asked whether certain age groups were disproportionately represented among ED visits for dental complaints, specifically toothache, and found that 20–29 year-olds (“younger adults”) had substantially more ED visits for toothaches than other age groups. Understanding national trends in ED toothache visits and the magnitude and characteristics of more recent ED toothache visits, particularly in this high-utilizer age group, is important because these visits reflect opportunities to improve access and utilization of professional dental care through patient education, health policy, and expansion of dental public health infrastructure.

Methods

Research goals

We relied on the National Hospital Ambulatory Medical Care Survey (NHAMCS),¹⁶ a nationally-representative sample of US ED visits, to address 3 research goals as they pertain to 20–29 year-olds:

- Compare average annual change in ED visit rates for toothache relative to back pain and all-cause ED visits during years 2001 through 2010. We chose back pain as a comparator because, like toothache, it is subjective and often perceived as a nonurgent reason for seeking ED care.¹⁷ We were interested in whether a rise in ED toothache visits was the result of secular increases in ED use overall or for nonurgent reasons. If so, we would expect similar changes in toothache ED visit rates as in all-cause ED and/or back pain visit rates during this period.
- Rank the frequency of ED toothache visits relative to other common reasons for seeking ED care in 2009–2010.
- Characterize patient-, hospital- and visit-level variables associated with ED toothache visits in 2009–2010. Based on review of the literature about racial, income, insurance and geographic-based disparities in dental care access and oral health,^{18–24} we hypothesized *a priori* that an ED toothache visit would be more likely on adjusted multivariable analysis: in non-whites than whites, when Medicaid or uninsured was listed as payer compared with private insurance, in EDs in non-MSA (i.e., rural and micropolitan statistical areas—relative to MSA (metropolitan statistical area),²⁵ and during-business-hours compared with after-business-hours.

Data

NHAMCS is a national probability sample of hospital ED visits conducted annually by the US National Center for Health Statistics (NCHS).¹⁶ The multistaged sample design includes geographic primary sampling units, hospitals within primary sampling units; and patient visits within emergency service areas. Sampled EDs are located in general and short-stay hospitals—exclusive of federal, military, and Veterans Affairs hospitals—in the 50 US states and District of Columbia. Within an ED, visits are systematically selected during a randomly assigned 4-week reporting period. Hospital or US Census Bureau staff complete a patient record form for each sampled visit by reviewing the medical record. Sampled data are extrapolated to population estimates using assigned patient visit weights, which account for probability of visit selection, nonresponse, and ratio of sampled hospitals to all hospitals in the US.¹⁶

For the first research goal, we used 2001 through 2010 NHAMCS data and the corresponding year of US Census Bureau population estimate²⁶ to calculate the rate of ED visits in the US population for each of the 10 years. We characterized recent ED toothache visits—the focus of the second and third research goals—using the 2 most recently released years of NHAMCS data (2009 and 2010), which we combined in order to improve reliability of our estimates—a strategy recommended by the NCHS.²⁷ To ensure validity of our results,

all reported estimates are based on at least 30 unweighted records and relative standard errors (RSE) less than 30%.

The University of Washington considers that research using certain publicly available datasets, including NHAMCS, does not involve “human subjects” as defined by federal regulations. Thus, no IRB approval was required (<http://www.washington.edu/research/hsd/docs/1125>).

ED visits

From NHAMCS, we selected ED visits made by 20–29 year-olds during 2001 through 2010. These were compared with ED toothache visits in other age groups in descriptive analysis.

Measures

Outcomes—The outcomes for this study were derived from the variable: “reason for the visit,” which is coded according to a NCHS classification system.²⁸ The primary outcome variable was an ED visit for toothache (reason-for-visit code=1500.1) as chief complaint.²⁸ We were interested in the chief complaint rather than discharge diagnoses because our focus is on toothache as a potentially preventable reason for an ED visit. In addition, investigators have noted that chief complaint of toothache is more reliably present in ED records than dental diagnoses, and that assigned dental diagnoses tend to be nonspecific.^{2,29} For comparison with ED toothache visit trends, we extracted ED visits for chief complaints of back pain (comprised of “back pain, ache, soreness, discomfort,” code=1905.1 and “low back pain, ache, soreness, discomfort,” code=1910.1). We generated the most frequent chief complaint for ED visits in younger adults in order to rank these relative to toothache in 2009–2010.

Covariates—For the third research goal, we extracted 3 categories of covariates from 2009–2010 NHAMCS: patient-related, hospital-related and visit-related. Patient-related covariates included: patient gender, race (White, Black, and other—as imputed or recoded by NHAMCS), and medical payer (private, Medicaid, uninsured, other/unknown). (NHAMCS identifies only medical payer and not dental benefit status. To aid in interpretation of results, we estimated the degree that medical insurance status reflected having dental coverage among US 20–29 year-olds, by analyzing 2009–2010 Medical Expenditure Panel Survey (MEPS) data (see Supplemental Materials for additional details). We found that being uninsured for medical care was almost always accompanied by lack of dental benefits (99.5% were insured for both medical and dental care). The converse however is not true: only 56% of 20–29 year-olds with private medical insurance for the entire calendar year had coverage for dental care during the year. Patients with private medical insurance making visits to the ED may or may not have dental benefits; thus, we could be underestimating the protective effect of having private dental coverage on ED toothache visits.) Among hospital variables, we included: US region where the ED was located (Northeast, South, Midwest and West), and MSA status of the ED (MSA and non-MSA). The visit-related variable was time/day of visit (during business hours—Monday through Friday 0800–1700 vs. nights/weekends).

Statistical analysis

We used the survey capabilities in Stata 12.0 to conduct all analyses. To describe and compare relative trends—our first research goal, we calculated population-based ED visit rates for toothache, back pain, and all-causes for each year 2001–2010, by dividing the annual weighted number of ED visits made by 20–29 year-olds for toothache, back pain, and all-causes in a given year by the estimated annual US Census Bureau’s population of 20–29 year-olds in the corresponding year (ED visits/1000 US population of 20–29 year-olds).²⁶ We then assessed average percent annual change in the rates of population-based ED visits during 2001–2010 using weighted linear regression analysis for each of the 3 ED visit types.

For Research Goal 2, we determined the weighted proportion of each leading reason for the ED visit in 20–29 year-olds in 2009–2010. We ranked the top reasons-for-visit among all payers and then stratified by payer. For Research Goal 3, we generated weighted proportions and corresponding 95% confidence intervals (CIs) to describe variables related to patients, hospitals, and visits among 20–29 year-olds with and without a chief complaint of toothache. We conducted multivariable logistic regression to test hypotheses, and we generated weighted adjusted odds ratios and 95% CIs. Based on literature review, we specified *a priori* that the model would include gender, race, payer, hospital region, MSA status, and whether the ED visit occurred during business hours or not. We did not impute any values or take special measures for missing values because these were minimal among our selected covariates.

RESULTS

Relative to 2001, yearly population-based ED visit rates among 20–29 year-olds increased at a significantly higher rate for toothaches compared with back pain and all-causes (Figure 1): 6.1% (95% CI: 4.2, 7.9%) for toothache, 0.3% (95% CI: –2.1, 2.6%) for back pain, and 0.8% (95% CI: 0.1, 1.4%) for all-causes ED visits (census and weighted ED visit estimates for each year are tabulated in the Supplemental Materials). In 2009–2010, there were an estimated 3.02 million total visits made nationally to EDs for chief complaint of toothache (sample N=783), and 42% of these were made by 20–29 year-olds (sample N=317). In this age group, 2.8% of ED visits were for toothache—with lower odds for all other age categories (Figure 2). ED toothache visits by younger adults accounted for an estimated 1,271,000 visits nationally during 2009–2010 (95% CI: 1,039,000 & 1,504,000)—602,000 in 2009 and 669,000 visits in 2010. In 2009–2010, toothache was the fifth most common leading reason for an ED visit among all 20–29 year-olds. Toothache was ranked ninth for privately insured visits and fifth for Medicaid-insured visits, but, for uninsured ED visits, toothache was the third most common reason for an ED visit in this age group (Table 1).

In multivariable analysis, we found that being uninsured or being Medicaid-insured, relative to privately insured, was independently and positively associated with an ED visit for toothache compared with all other reasons for ED visits among 20–29 year-olds in 2009–2010 (Table 2)—confirming 1 out of 4 of our hypotheses. We did not find a statistically significant association with black race (N of sampled visits by non-white races was too small to include in the analysis), ED MSA status, or timing of visit on risk of ED toothache visit relative to another reason for an ED visit.

DISCUSSION

Among 20–29 year-olds, ED toothache visits rose, on average, 6.1% each year between 2001 and 2010, far outpacing yearly increases in back pain and all-cause ED visits. There are a number of possible explanations for why ED toothache rates grew to such a degree over 10 years, although the relatively stable rates of all-cause and ED back pain visits suggest that there are influences besides simple secular shifts that underlie this increase. It is likely that income- and employment-related factors, combined with economic stressors and decreasing public health resources for adult dental care in this decade, contributed to this trend. During the recent recession (December 2007–September 2010), higher unemployment rates meant fewer opportunities for employer-based dental benefits and less disposable income to pay for dental care.³⁰ Under these influences, professional dental care visits made by adults declined substantially between 2001 and 2010, and to the greatest degree among poor adults.³¹ With more barriers to professional dental care, dental disease could advance unchecked until it manifests as a toothache or other complication. Toothache is similar to ambulatory care sensitive conditions³² (asthma is an example), in that lack of preventive care results in greater morbidity, cost, and societal burden.

Faced with budget shortfalls during the last decade, US states reduced public health funding for safety net dental clinics and eliminated or drastically reduced preventive and restorative dental benefits under adult Medicaid.³³ Unlike the case for children, dental care is an optional state-level benefit for adults insured by Medicaid. Only 7 states maintained comprehensive dental benefits for adult Medicaid beneficiaries for all years between 2002 and 2010.³⁴ There is precedent to support the association between decreased adult Medicaid dental funding and increased ED dental visits. In 1993, when the state of Maryland eliminated Medicaid reimbursement to dentists for treatment of adults with dental emergencies, the rate of dental visits to EDs by Medicaid recipients rose by 22%—an increase that occurred while ED visits by Medicaid recipients were otherwise decreasing.³⁵ Similarly, after Massachusetts reduced Medicaid adult dental benefits in 2010, dental-related visits at a Boston safety net ED increased 14% by 2012.³⁶

We also found that, in 2009–2010, the largest proportion of ED visits for toothache was made by 20–29 year-olds, accounting for 42% of such visits. Similar to our results, Jasek and coinvestigators reported that ED dental visits in New York during 2009–2011 were highest among 18–29 year-olds.²⁹ Our research is the first to document that toothache is among the top reasons for younger adults to seek care in EDs. Specifically, toothache was the fifth most common chief complaint in EDs among 20–29 year-olds and the third most common for uninsured younger adults.

We posit a variety of reasons why younger adults disproportionately rely on the ED for toothache. Relative to adults 30 years and older, younger adults are poorer and less likely to have dental coverage. (In our analyses of 2009–2010 MEPS(see Supplemental Materials), 20–29 year-olds had the lowest proportion of all of the age categories with at least 1 dental visit (32.1%) and the second lowest proportion with dental benefits (33.7%) after 50+ year-olds. Second only to children, 18.3% of 20–29 year-olds were poor—defined as at/below 100% of the Federal Poverty Guideline or an annual income of less than or equal to \$10,830

for a single adult in 2010 .) Our results indicate that, in this age group, being uninsured or Medicaid-insured were independent risk factors for ED toothache utilization, which supports the precept that financial barriers play a role in younger adults using the ED for toothache. Among 20–29 year-olds, being uninsured for medical care is essentially equivalent to being uninsured for dental care (see Supplemental Materials). Dental benefits under Medicaid are more variable, depending on state of residence. To qualify for adult Medicaid benefits during 2009–2010, the period for this study, typically required an income below the Federal Poverty Guideline and eligibility often was restricted to special groups, such as pregnant women or parents of dependent children.) Regardless of dental coverage, dental care can be costly. Nationally, 42% of dental expenses are paid out-of-pocket by consumers.³³ Cost-sharing combined with a weak dental care safety net, in which demand outweighs supply,³⁷ may pose insurmountable barriers to dental care for many young Americans,^{18, 19} regardless of the value they place on preventive dental care. Although EDs cannot turn away patients with emergency conditions (including pain and/or infection from toothache) for inability to pay,⁹ they are inadequately prepared to deliver dental care. On the other hand, dentists and other dental practitioners are uniquely able to provide preventive and restorative dental care needed to prevent toothache, but financial and other barriers may impede access. This is a conundrum deserving additional attention.

The ED toothache visit surge in the third decade of life may also result from missed opportunities for dental care during later adolescence. Only 30% of 16–18 year-old Medicaid enrollees received dental care in the previous year compared with 45% of children 6–11, and 38% 12–15 years old, according a 2008 US Government Accountability Office report.³⁸ Untreated dental decay in later adolescence may become symptomatic—in the form of a toothache—a few years later, just at the point that younger adults have many fewer options for dental care because they have “aged out” of more generous pediatric dental coverage and resources. Dental care is a mandated benefit for low-income children on Medicaid under EPSDT³⁹ (Early and Periodic Screening, Diagnosis, and Treatment legislation passed in 1967) and more recently, CHIPRA (the Children’s Health Insurance Program Reauthorization Act).⁴⁰ However, in adulthood, dental care is an optional benefit under Medicaid, with most states substantially restricting eligibility criteria as well as limiting the scope of covered dental services.³³

We did not find an association between time/day of the ED visit and the risk of an ED toothache visit. This implies that reasons behind ED toothache visits have less to do with finding a dentist who is open when a toothache occurs. ED MSA status and Black race were also not associated with higher risk of ED toothache visits in younger adults. Few studies have addressed ED MSA status as a predictor of ED dental visits. Okunseri and colleagues identified that Wisconsin Medicaid enrollees who lived in dental health professional shortage areas—a more specific variable than MSA—had a higher adjusted risk of an ED dental visit.⁴¹ With regards to race, prior studies have reported conflicting results about racial disparities in ED dental visits,^{2,6,13,41,42} but these studies did not generally focus on a specific age group and were often limited to smaller regions.

Certain limitations to this study bear mention. The quality of NHAMCS data may vary because it is abstracted on the hospital level.^{27,43} Some variables in NHAMCS contain

missing values, were not recorded, or were imputed. However, the main conclusions drawn in this paper were based on variables with few or no missing values. Another limitation to NHAMCS is that data are collected at the visit level; and thus, we do not know if individual patients were represented more than once within a 4-week data collection period in an ED. Also inherent to secondary analysis is the limited number of available variables; this leaves some unanswered questions about ED visits for toothaches among young adults but generates hypotheses for future research.

Conclusions

Results of this research suggest the need to reconsider how a dental care delivery and payment model can better meet the oral health needs of adults, particularly in the 20- to 29-year-old range. Toothaches are among the top reasons for younger adults to seek care in EDs, which essentially forces integration of dental care into medical care, albeit in a less than optimal way. The time has come to view dental disease in the same way that we do other preventable medical problems—deserving of equitable funding, accessible care, and monitoring to ensure disparities are being addressed and are diminishing. To that end, ED toothache visits represents a potential quality indicator for system-level barriers to dental care access or utilization within a region or population.²⁹

Finding solutions to the increasingly common nature of ED toothache visits will be complicated and require short and long term considerations. Redirecting ED patients with toothaches to a source of definitive dental care does not address the underlying missed opportunities for preventive and restorative dental care, but it is an essential step to alleviate ongoing reliance on EDs. Strengthening the dental care safety net is also imperative, and ideally, will be facilitated by expanded funding under the Affordable Care Act (ACA) for community health centers beginning in 2014.⁴⁴ Borrowing from the medical insurance provisions under the ACA, maintaining dental coverage from childhood through younger adulthood, either from one's parents or Medicaid, could provide a bridge to employment-based dental coverage. Likewise, encouraging regular preventive dental care and oral hygiene throughout adolescence may help maintain these practices and a relationship with a dental home into young adulthood as well.

Finally, although expansion of Medicaid under the ACA has increased the number of adults who are eligible for Medicaid, there remains no requirement that states cover dental care for adults enrolled in Medicaid. Furthermore, under the original ACA legislation, oral health care was designated an "essential health benefit" only for children.⁴⁵ It is unclear why dental care would be considered essential during childhood but not adulthood. Dental disease, like other chronic diseases, has its substantive origins in childhood, but caries and periodontal disease continue to occur and advance during adulthood, ultimately affecting more than 90% of adults.⁴⁶ Regular preventive dental care and timely restorative care are important throughout the lifespan, not just during the first 18 years.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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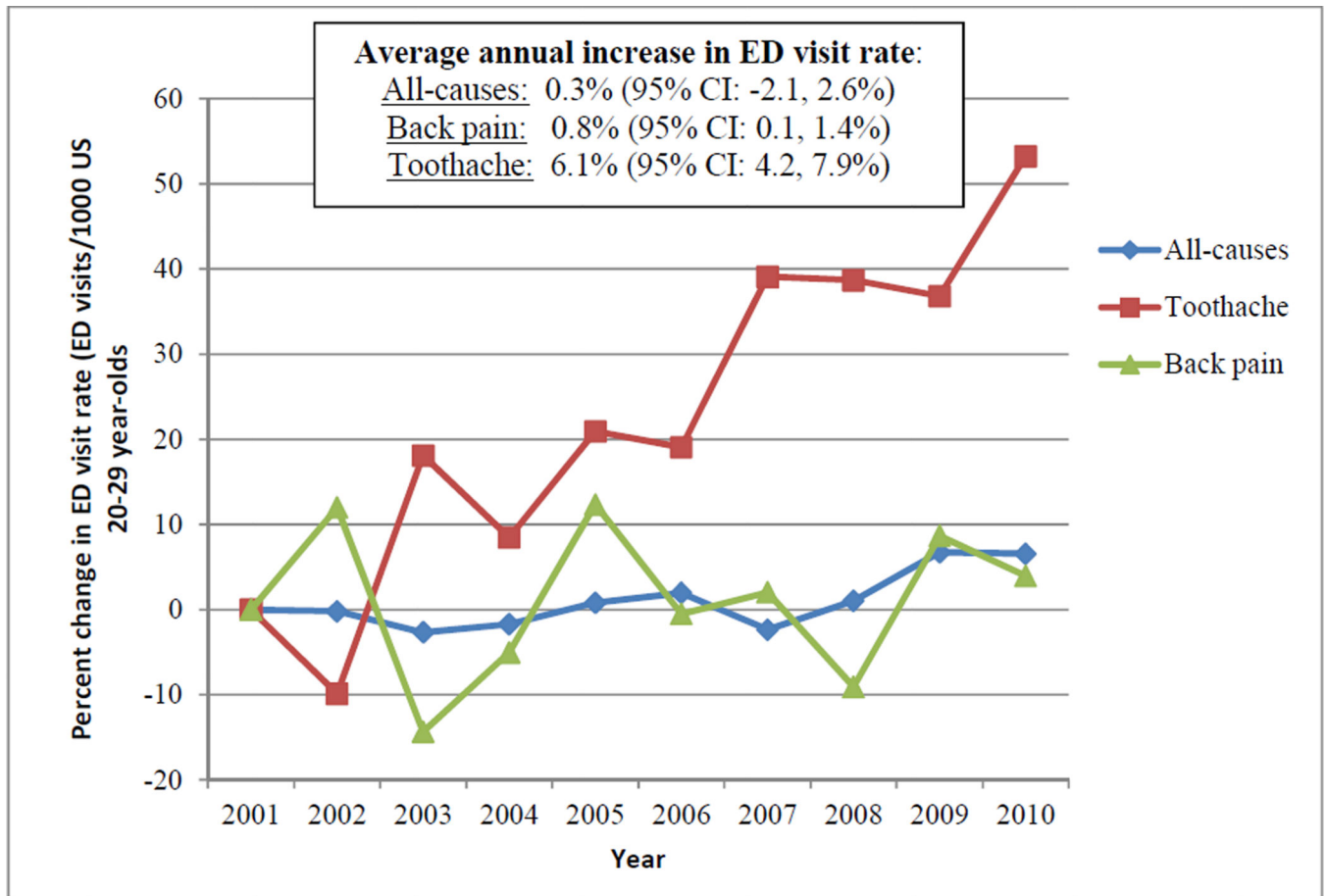


Figure 1. Percent change in rate of emergency department (ED) visit rates for toothache compared with all-causes and back pain among 20–29 year-olds from 2001 through 2010. NHAMCS, US. Between 2000 and 2010, ED toothache visits increased at a substantially higher rate than either all-cause or back pain ED visit among 20–29 year-olds.

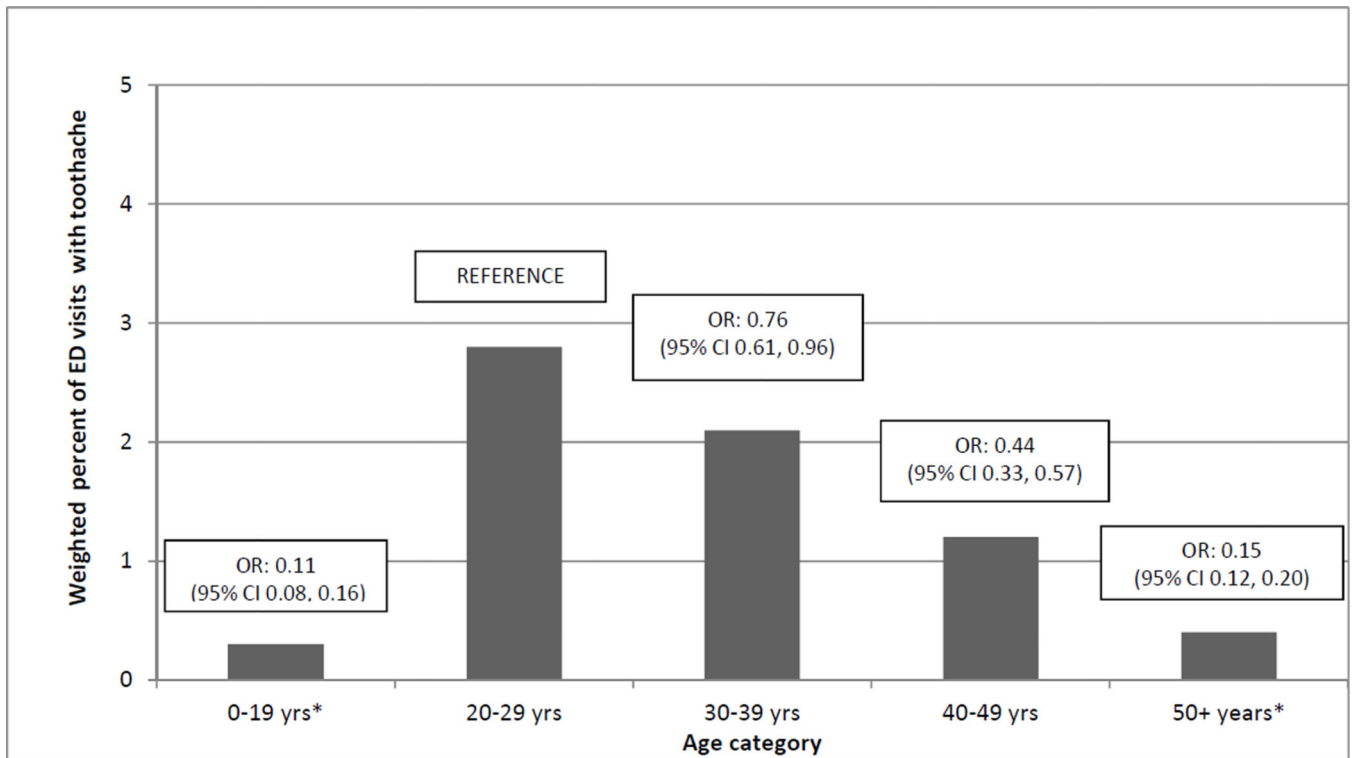


Figure 2.

Weighted percentage of emergency department (ED) visits with toothache as leading reason-for-visit, by age category. Weighted odds ratio (OR) and 95% confidence interval (CI) of ED toothache visit by age category (20–29 year-olds are reference category). NHAMCS, US, 2009–2010. In 2009–2010, 20–29 year-olds had a statistically significantly higher odds of an ED toothache visit relative to other age groups.

Table 1

Ranking of the Most Common Leading Reasons for ED Visits among 20–29 Year-olds: all ED visits and by payer. Weighted percentage and 95% confidence interval. NHAMCS, US, 2009–2010.

ALL VISITS	PRIVATE INSURANCE (28.5%)	UNINSURED (29.0%)	MEDICAID (27.9%)
1. Abdominal Pain 7.7% (7.0, 8.3)	1. Abdominal pain 7.9% (6.6, 9.1)	1. Abdominal n 6.8% (5.9, 7.8)	1. Abdominal pain 8.6% (7.2, 9.9)
2. Back pain 4.6 (4.2, 5.0)	2. Back pain 4.9 (4.1, 5.6)	2. Back pain 5.2 (4.3, 6.1)	2. Back pain 4.5 (3.3, 5.7)
3. Headache 3.6 (3.1, 4.1)	3. Chest pain 4.1 (3.0, 5.3)	3. Toothache 3.9 (3.1, 4.7)	3. Headache 3.7 (2.7, 4.6)
4. Chest pain 3.3 (2.8, 3.8)	4. Headache 3.1 (2.4, 3.9)	4. Throat pain 3.3 (2.3, 4.3)	4. Chest pain 3.6 (2.8, 4.3)
5. Toothache 2.8 (2.4, 3.2)	5. Flank pain 2.0 (1.4, 2.7)	5. Headache 3.2 (2.5, 3.9)	5. Toothache 3.1 (2.3, 3.9)
6. Throat pain 2.5 (2.1, 2.9)	6. Fever... 1.9 (1.3, 2.3)	6. Chest Pain 2.6 (1.9, 3.3)	6. Throat pain 2.3 (1.7, 3.0)
	9. Toothache 1.4 (0.7, 2.1)		

Table 2
Select Characteristics of ED Visits by 20–29 Year-olds for ED visits without and with toothache as leading complaint

Weighted percentage, weighted adjusted odds ratio for toothache visit vs. another reason for ED visit, and 95% confidence intervals. NHAMCS, US, 2009–2010.

	ED VISITS FOR 20–29 YEAR-OLDS W/O TOOTHACHE	ED VISITS FOR 20–29 YEAR-OLDS WITH TOOTHACHE	WEIGHTED ADJUSTED ODDS RATIO
PATIENT CHARACTERISTICS			
<u>GENDER</u>			
Female	61.2% (95% CI 60.0, 62.4)	59.6% (95% CI 52.4, 66.7)	1.02 (95% CI 0.75, 1.38) vs. male
<u>RACE</u>			
White	71.1% (67.3, 74.8)	74.0% (CI 67.8, 80.2)	Reference
Black	25.0 (21.4, 28.7)	24.2 (18.1, 30.2)	0.89 (0.64, 1.24)
Other	3.8 (2.7, 5.1)	N/A a	N/A a
<u>PRIMARY PAYER</u>			
Private	28.9% (27.1, 30.8)	14.5% (8.5, 20.4)	Reference
Medicaid	26.8 (24.9, 28.7)	29.7 (22.5, 36.8)	2.21 (1.30, 3.77)
Uninsured	28.7 (26.4, 31.0)	40.3 (33.8, 46.9)	2.83 (1.73, 4.64)
Other/Unknown	15.6 (13.6, 17.6)	15.5 (9.9, 21.1)	2.02 (1.04, 3.92)
<u>HOSPITAL CHARACTERISTICS</u>			
<u>MSA STATUS OF ED</u>			
Non-MSA	16.9% (7.8, 26.0)	20.3% (8.6, 31.9)	1.20 (0.82, 1.77) (vs. MSA)
<u>US REGION OF ED</u>			
Northeast	17.8% (15.1, 20.5)	18.6% (12.3, 24.9)	Reference
Midwest	22.8 (17.4, 28.2)	24.7 (16.0, 33.4)	0.98 (0.46, 1.60)
South	41.4 (36.0, 46.8)	39.9 (31.1, 48.7)	0.90 (0.58, 1.39)
West	17.1 (14.5, 21.3)	16.7 (9.5, 23.8)	1.00 (0.60, 1.66)
<u>VISIT CHARACTERISTICS</u>			
<u>DAY/TIME OF VISIT</u>			
During business hours (0800–1700, Monday-Friday)	37.2% (35.9, 38.6)	35.7% (29.3, 42.2)	0.96 (0.70, 1.31) vs. after business hours