Published in final edited form as:

Intellect Dev Disabil. 2014 June ; 52(3): 193–204. doi:10.1352/1934-9556-52.3.193.

U.S. Emergency Department Admissions for Non-Traumatic Dental Conditions for Individuals with Intellectual and Developmental Disabilities

Donald Leslie Chi

Abstract

We hypothesized that individuals with intellectual and developmental disabilities (IDDs) are more likely to have an emergency department (ED) admission for non-traumatic dental conditions (NTDCs). We analyzed 2009 U.S. National Emergency Department Sample data and ran logistic regression models for children ages 3-17 years and adults ages 18+ years. The prevalence of NTDC-related ED admissions was 0.8% for children and 2.0% for adults. Children with IDDs were at increased odds of NTDC-related ED admission, but this difference was not statistically significant (pOR=1.06; 95% CI=0.91,1.23). Adults with IDDs had significantly lower odds of an ED admission for NTDCs (pOR=0.49;95% CI=0.44,0.54). Children with IDDs are not at increased odds of NTDC-related ED admissions whereas adults with IDDs are at significantly reduced odds.

Use of the emergency department (ED) for management of non-traumatic dental conditions (NTDCs) is a growing problem in the U.S. (Wall, 2012; Lee, Lewis, Saltzman, & Starks, 2012), especially among vulnerable population subgroups such as individuals without health insurance, Medicaid enrollees, and minorities (Lewis, Lynch, & Johnston, 2003; Nalliah, Allareddy, Elangovan, Karimbux, & Allareddy, 2010; Hong et al., 2011; McCormick, Abubaker, Laskin, Gonzales, & Garland, 2013; Okunseri, Okunseri, Chilmaza, Harunani, Xiang, & Szabo, 2013). It is common for State legislatures to eliminate Medicaid dental benefits to balance budgets, which leads to greater unmet dental care needs and subsequent ED admissions (Cohen, Manski, & Hooper, 1996; Wallace, Carlson, Mosen, Snyder, & Wright, 2011). Individuals with poor access to office-based dental care services commonly use the ED for management of dental pain and infection (Dorfman, Kastner, & Vinci, 2001; Patel, Miner, & Miner, 2012). Most studies report individual-level risk factors associated with ED admission for NTDCs (e.g., age, gender, race/ethnicity, income, health insurance status and type) (Wall, 2012; Lee, Lewis, Saltzman, & Starks, 2012; Lewis, Lynch, & Johnston, 2003; Nalliah, Allareddy, Elangovan, Karimbux, & Allareddy, 2010; Hong et al., 2011; McCormick, Abubaker, Laskin, Gonzales, & Garland, 2013; Okunseri, Okunseri, Chilmaza, Harunani, Xiang, & Szabo, 2013; Cohen, Manski, & Hooper, 1996; Wallace, Carlson, Mosen, Snyder, & Wright, 2011). Despite evidence suggesting that individuals with intellectual and developmental disabilities (IDDs) are at risk for dental disease and poor access to timely dental care (Authors, 2011a; Morgan et al., 2012), no published studies to date have examined NTDC-related ED admissions for individuals with IDDs.

It is important to understand NTDC-related ED admissions for individuals with IDD for three main reasons. First, individuals with IDDs are a vulnerable population subgroup whose dental needs are more efficiently managed within office-based dental homes. For instance, NTDC-related ED admissions are costly with per patient charges ranging from \$381 to \$526 (Nalliah, Allareddy, Elangovan, Karimbux, & Allareddy, 2010; Nagarkar, Kumar, & Moss, 2012). Second, most NTDCs in the ED are managed non-definitively with analgesics or antibiotics, which do not address the underlying cause of dental disease and lead to repeat ED visits (McCormick, Abubaker, Laskin, Gonzales, & Garland, 2013; Davis, Deinard, & Maïga, 2010; Pajewski & Okunseri, 2012). Thus, management of NTDCs in the ED is an inefficient use of scarce health care resources. Third, there is a dearth of studies on ED use for patients with IDD and no data on NTDC-related ED admission rates.

Although there are limitations associated with adopting diagnosis-based approaches to identify individuals with IDDs in secondary datasets (e.g., underrepresentation of individuals with IDDs), the availability of such datasets enable researchers to begin addressing critical knowledge gaps that limit progress in the field. The knowledge generated is a starting point that will make it possible to design future population-based studies that address limitations with existing datasets, develop evidence-based policies and interventions, evaluate outcomes associated with efforts aimed at reducing NTDC-related ED admissions, and improve the oral and systemic health of individuals with IDD. The goal of this study is to analyze a nationally representative dataset to test the hypothesis that among ED utilizers in the U.S., individuals with IDDs are more likely to be admitted to the ED for a non-traumatic dental condition than individuals without IDDs.

Materials and Methods

Study Design, Participants, and Data

This study was a cross-sectional analysis of 2009 National Emergency Department Sample (NEDS) data. NEDS, a publicly available dataset, is the largest all-payer ED dataset in the U.S. and contains information on over 29 million ED admissions from 29 States (HCUP, 2009). Our analyses focused on individuals ages 3 years and older, all of whom were admitted to a hospital ED in 2009. We excluded participants under age 3 years because intellectual and developmental disabilities, our main predictor variable, are typically diagnosed after a child's third birthday (Pinto-Martin, Dunkle, Earls, Fliedner, & Landes, 2005). The final study sample consisted of 26,791,871 individuals ages 3 years and older who were admitted to an ED in 2009 (n=4,325,309 children ages 3-17 years and n=22,466,562 adults ages 18 years and older). This study was exempted from human subjects approval by the University of Washington Institutional Review Board.

Outcome Variable

The outcome was whether the ED admission was for a non-traumatic dental condition (NTDC) (no/yes). The etiology of NTDCs is preventable and includes diseases such as dental caries (tooth decay) and periodontitis (gum disease). We defined NTDCs using International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) codes from any of the 15 diagnosis fields in the NEDS. The specific ICD-9-CM codes,

which have been published previously (Okunseri et al., 2008), included 521 (diseases of hard tissues of teeth), 522 (diseases of pulp and periapical tissues), 523 (gingival and periodontal diseases), 525.3 (retained dental root), 525.9 (unspecified disorder of the teeth and supporting structures), and 873.63 (internal structures of the mouth, without broken tooth).

Main Predictor Variable

The main predictor variable was intellectual and developmental disability (IDD) status (no/yes). We adopted a diagnosis-based approach of identifying IDDs developed previously by a team of physicians, clinical psychologists, and dentists based on relevant ICD-9-CM codes present in any of the 15 NEDS diagnosis fields (Authors, 2010; Authors, 2011b; Authors, 2012a). IDDs are associated with life-long, non-acquired cognitive deficits or impairments. The codes included 299 (autism), 317-319 (mental retardation), 343 (cerebral palsy), 741 (spina bifida), 758 (Down syndrome), 759.5 (Tuberous sclerosis and Bourneville's diseases), 759.83 (Fragile X syndrome), and 760.71 (fetal alcohol syndrome).

Model Covariates

We used the Behavioral Model for Vulnerable Population (Gelberg, Andersen, & Leake, 2000) to select relevant covariates for our explanatory model. There were two predisposing variables: age (modeled as a categorical variable) and sex (male/female). The three enabling variables were health insurance type (private or health maintenance organization/Medicaid or Medicare/self-pay/no charge/other), median community income (quartiles), and size of community (a six-level categorical variable ranging from large central metro to non-core). The two need variables were IDD status (defined previously) and number of chronic conditions (0/1/2 or more, measured by aggregating the total number of chronic health conditions as indicated in the 15 NEDS chronic condition indicators).

Data Analyses

After generating descriptive statistics separately for children and adults, we evaluated the bivariate relationships between model covariates and our outcome measure using unadjusted prevalence odds ratios (pORs) ($\alpha=0.05$). We generated two multiple variable logistic regression models to test the hypotheses that among ED admissions children and adults with IDDs would be more likely to be admitted to the ED for an NTDC than those without IDDs. All analyses were adjusted for hospital clusters and strata and weighted by patient discharge weights to derive nationally-representative pORs. All statistical analyses were completed using SAS Version 9.3 for Windows and the SURVEYLOGISTIC procedure (SAS Institute Inc., Cary, NC).

Results

Characteristics of Study Participants

About 0.7% of children and 0.4% of adults with an ED admission had an intellectual or developmental disability (IDD) (Table 1). Nearly one-in-five children (18.4%) had one or more chronic conditions. In terms of health insurance, 45.5% were publicly-insured (Medicaid or Medicare), 41.6% were privately-insured, and 8.5% were self-pay (uninsured).

For adults, 20.7% had one chronic condition and 35.8% had two or more chronic conditions. In terms of health insurance, 43.5% were publicly-insured (Medicaid or Medicare), 31.2% were privately-insured, and 18.8% were self-pay (uninsured). The prevalence of NTDC-related ED admissions was 0.8% for children and 2.0% for adults (Table 1). There was a bimodal distribution with an initial peak prevalence at age 6 years (0.9%) and a second peak at age 27 years (4.4%) (Figure 1).

Unadjusted Regression Models

In the bivariate analyses, having an intellectual or developmental disability (IDD), for both children and adults, was associated with significantly lower odds of NTDC-related ED admission (Table 2). Older children (ages 6 to 17 years) had significantly greater odds of an NTDC-related ED admission compared to younger children (ages 3 to 5 years) use whereas older adults (ages 50 years and older) had significantly lower odds of an NTDC-related ED admission compared to adults ages 18 to 49 years. Publicly-insured, self-pay, and uninsured individuals had a significantly greater odds of an ED admission related to NTDCs compared to those with private insurance. There was also an income gradient present with individuals living in lower-income communities at greater odds of ED admission for NTDCs. Children and adults with chronic health conditions had a significantly lower odds of NTDC-related ED admission

Covariate-Adjusted Regression Models

In the covariate-adjusted logistic regression models, having an intellectual and developmental disability was associated with NTDC-related ED admissions for children and adults, but the relationship was statistically significant only for adults ($pOR=0.49$; 95% confidence interval $[CI]=0.44, 0.54$; $P<.0001$) and not for children ($pOR=1.06$; 95% $CI=0.91, 1.23$; $P>.05$) (Table 3). While an income-related gradient was present for children in the odds of an NTDC-related ED admission there no gradient for adults. The other findings were consistent with results from the unadjusted regression models.

Discussion

This is the first known study that examined non-traumatic dental condition (NTDC)-related emergency department (ED) admissions for individuals with intellectual and developmental disabilities (IDDs). We hypothesized that among U.S. patients admitted to the ED, those with IDDs would be more likely to have a NTDC-related ED admission than those without IDDs. Based on data from the 2009 National Emergency Department Sample (NEDS), we found that there was no significant difference in ED admissions for NTDCs by IDD status for children. Adults with IDDs were significantly less likely to use the ED for NTDCs than adults without IDDs. In addition, other factors from our conceptual model (e.g., male sex, not having private health insurance, living in a lower-income or rural community, and not having a chronic health condition) were associated with significantly greater odds of having a NTDC-related ED admission.

Our first finding was that children with IDDs were not significantly more likely to be admitted to the ED for NTDCs than children without IDDs. Previous work indicates that

children with developmental disabilities are two to three times as likely to have an ED visit as children without developmental disabilities (Boulet, Boyle, & Schieve, 2009). There are no comparable studies from the literature, but we have two plausible explanations for our findings that should be evaluated through additional research. First, while young children with IDD have difficulties with initiating use of preventive dental care (Authors, 2011a) and establishing a dental home, they may not have greater difficulties than children without IDD in obtaining subsequent preventive dental care (Authors, 2010; Authors, 2012a). Although patients with IDD are at greater risk for tooth decay (Morgan, Minihan, & Stark, 2012), no difference in NTDC-related ED admissions may mean that children with IDD have a regular place to go for treatment of NTDCs. This underscores the importance of ensuring routine preventive dental care for all children with IDD (Authors, 2012b). Second, children with IDD may have impaired peripheral nociceptors (Symons, 2011) or difficulties communicating dental pain (Breau & Burkitt, 2009), which could lead to reduced NTDC-related ED admissions even though underlying symptoms are present. Future research should examine the extent to which underreporting of dental pain that could lead to reduced ED admissions is a problem for children with IDD.

Our second finding was that adults with IDD were significantly less likely to be admitted to the ED for NTDCs than adults without IDD. There are no studies from the dental literature to which we can directly compare our findings. However, two studies suggest that general ED use is higher in adults with IDD (Lunsky et al., 2011; Rasch, Gulley, & Chan, 2013) and two studies have focused on ED use in adults with IDD (Lunsky & Elserafi, 2011; Venkat, Pastin, Hedge, Shea, Cook, & Culig, 2011). There are three main explanations for our finding. First, a large proportion of adults with IDD live in group homes (Morgan et al., 2012) and may have access to palliative dental care that helps prevent NTDCs. However, this explanation is unlikely given previous work that has identified dental care as a notable gap among adults with IDD (Parish, Moss, & Richman, 2008). A more important factor in lower odds of NTDC-related ED visits for adults with IDD may be having a health care advocate who can reinforce positive oral health behaviors. Second, lower NTDC-related ED use for adults with IDD may actually indicate barriers to dental care that stem from an inability to express pain or discomfort, transportation problems, or general neglect. Previous work has identified neglect and poor care as common forms of mistreatment of individuals with IDD (Oktay & Tompkins, 2004). Third, compared to national edentulism (i.e., total tooth loss) rates (Dye et al., 2007), nearly three times as many adults with IDD are edentulous (Morgan et al., 2012), which may reduce the odds of NTDCs and concomitant NTDC-related ED admissions. This latter explanation is consistent with NTDC-related ED admissions rates presented in Figure 2 in which adult rates peak in the late 20s and trend downward with older age. Despite this trend, it is important to note that NTDC-related ED admissions rates for older adults are not zero. We ran post-hoc interaction models between IDD status and age and found that compared to adults without IDD ages 18 to 21 years, adults with IDD age 65 to 75 years had significantly greater odds of NTDC-related ED admissions ($pOR=1.91$; $P=.02$).

Collectively, these findings suggest that despite overall lower odds of NTDC-related ED admissions for adults with IDD, there are subgroups of adults with IDD at increased risk for ED admissions. Future research should continue to identify these subgroups with the

ultimate goal of developing interventions that reduce ED admissions by promotion oral health behaviors such as regular toothbrushing with fluoride toothpaste, decreased frequency of carbohydrate intake, and regular dental examinations and treatment when necessary.

Covariates from all three domains (e.g., predisposing, enabling, and need) of the Behavioral Model for Vulnerable Population were significantly associated with NTDC-related ED admissions. In terms of predisposing factors, male sex was associated with significantly greater odds of an ED admission for children and adults. This is consistent with a previous study on inpatient hospitalization (Authors, 2013), but inconsistent with results presented from an ED utilization study based on data from the National Hospital Ambulatory Medical Care Survey (NHAMCS) (Lee, Lewis, Saltzman, & Starks, 2012). Older children had greater odds whereas older adults had significantly lower odds of NTDC-related ED admissions. The reasons for these trends for children are unknown. Future work should further clarify the types of teeth (primary versus permanent) that are implicated in pediatric NTDCs, which has implications for the development of training programs for ED health providers on how to diagnosis and manage NTDCs in children.

In terms of enabling factors from our model, not having private health insurance and living in a lower-income community were significantly associated with greater odds of NTDC-related ED use for both children and adults. These findings are not surprising given that socioeconomic vulnerability is one of the most consistent correlates of ED use for NTDCs (Lewis, Lynch, & Johnston, 2003; Nalliah, Allareddy, Elangovan, Karimbux, & Allareddy, 2010; Hong et al., 2011; McCormick, Abubaker, Laskin, Gonzales, & Garland, 2013; Okunseri, Okunseri, Chilmaza, Haurani, Xiang, & Szabo, 2013). In addition, while community size was not significantly associated with ED use for children, adults in smaller communities had significantly greater odds of ED use than adults living in metropolitan areas. These findings suggest heterogeneity in how community-level enabling factors influence NTDC-related ED admissions. Community-based interventions in rural areas might focus on reducing ED admissions among adults whereas intervention targeting socioeconomically vulnerable individuals should focus on both children and adults.

In terms of the other need factor in our model, we found that for both children and adults, having a chronic condition was associated with significantly lower odds of NTDC-related ED admission. This finding was inconsistent with our original hypothesis but runs parallel to a study from Canada on factors related ED use (Moineddin, Meaney, Agha, Zagorski, & Glazier, 2011). Future investigations should identify subgroups of individuals with chronic conditions at increased risk for NTDC-related admissions.

Beyond the predisposing, enabling, and need variables that we examined in this study, there is a need to identify the behavioral and social factors related to ED use for individuals with IDD. This could be accomplished through primary data collection methods, which would lead to information needed to develop strategies that prevent ED use for NTDCs.

There are four main study limitations. First, because the NEDS data were cross-sectional our findings are associations rather than causal relationships. Our hypotheses should be investigated further other national ED datasets (Owens, Barrett, Gibson, Andrews, Weinick,

& Mutter, 2010) and with prospective studies. Second, our measure of intellectual and development disability (IDD) was diagnosis-based. If the ED staff missed diagnoses, conditions were miscoded, or there was underreporting by caregivers, there is a possibility of classification bias for our main predictor variable. The prevalence of IDD in our study (0.4% to 0.7%) is lower than rates reported in previous studies (Authors, 2010; Murphy, Yeargin-Allsopp, Decouflé, & Drews, 1995; Maulik, Mascarenhas, Mathers, Dua, & Saxena, 2011), which suggest that a strictly diagnosis-based IDD case finding protocol under-identifies IDD. Future investigations should adopt diagnosis-based and non-categorical protocols whenever possible to identify IDDs. Third, we assume coding accuracy of NTDCs, but as with our IDD measure there is a possibility of under-identification. Validation studies could be conducted to evaluate the extent to which IDDs are under-coded during ED visits. Fourth, our models did not include behavioral and social factors that may be important mediators or moderators of the relationship between IDD and NTDC-related ED admissions. For instance, oral health-related behaviors such as access to preventive dental care use, topical fluoride exposure, and diet may be important factors to consider when modeling ED admissions related to NTDCs. Future research should further clarify the role of behaviors and social context as the next step in developing interventions and policies aimed at reducing NTDC-related ED admissions. In particular, there is a need for mixed methods research, with an emphasis on qualitative research, on NTDC-related ED admissions to understand the complex factors that contribute to ED use.

Despite these limitations, our study has clinical, policy, and research significance. In terms of clinical significance, our findings support efforts to ensure that publicly-insured and uninsured patients have access to regular preventive and restorative dental care provided in an office-based setting. Private practice dental offices and community health centers should be urged to have after-hours policies that do not simply refer patients to the ED in cases of dental emergencies. In addition, ED physicians, nurses, and staff must be adequately trained to manage patients with NTDCs. Patient management includes appropriate referral networks to ensure that patients receive definitive treatment and do not return to the ED with the same problems. In terms of policy significance, private health insurance plans, including state Medicaid programs, could implement pay-for-performance measures that incentivize dentists for managing all NTDCs within a non-ED setting. There is also the need to reinstate dental coverage for adults within state Medicaid programs that have eliminated dental benefits, which would help reduce ED admissions for NTDCs and ED crowding (Wallace, Carlson, Mosen, Synder, Wright, 2011; IOM, 2007; Sun et al., 2013), and provide dental benefits for all Medicare beneficiaries (Manski et al., 2010). More broadly, federal health care reform that incorporate dental care would help to address the limitations associated with Medicaid and the dental safety net (Bailit & D'Adamo, 2012). In terms of research significance, this is only the first study to examine NTDC-related ED admissions with an emphasis on individuals with IDDs. Additional research is needed to assess the behavioral and social determinants of ED use, the underlying mechanisms that help prevent ED admissions for patients with IDDs, and the extent to which repeat ED admissions are a problem for this vulnerable population. Qualitative methods should be used in conjunction with quantitative studies to uncover important factors related to NTDC-related ED admissions.

In conclusion, we found that children with intellectual and developmental disabilities (IDDs) were not more likely to be admitted to the ED than children without IDDs whereas adults with IDDs were significantly less likely to have an ED admission for non-traumatic dental condition (NTDCs). Other factors were associated with significantly greater odds of NTDCs for both children and adults, including male sex, non-private health insurance, living in a lower-income community, and not having a chronic health condition. ED use for NTDCs has become a major public health problem. Management of NTDCs within ED settings is costly, inefficient, and contributes to ED crowding. Because most NTDCs are preventable, new strategies are needed that focus on improving oral health-related behaviors and ensuring proper access to timely and appropriate dental care services in high-risk individuals. Such strategies are likely to reduce NTDC-related ED admissions and improve the oral health of all vulnerable individuals.

References

2010. Author citation
- 2011a. Author citation
- 2011b. Author citation
- 2012a. Author citation
- 2012b. Author citation
2013. Author citation
- Bailit H, D'Adamo J. State case studies: improving access to dental care for the underserved. *Journal of Public Health Dentistry*. 2012; 72:221–34. [PubMed: 22747649]
- Boulet SL, Boyle CA, Schieve LA. Health care use and health and functional impact of developmental disabilities among US children, 1997-2005. *Archives of Pediatric and Adolescent Medicine*. 2009; 163:19–26.
- Breau LM, Burkitt C. Assessing pain in children with intellectual disabilities. *Pain Research and Management*. 2009; 14:116–20. [PubMed: 19532853]
- Cohen LA, Manski RJ, Hooper FJ. Does the elimination of Medicaid reimbursement affect the frequency of emergency department dental visits? *Journal of the American Dental Association*. 1996; 127:605–9. [PubMed: 8642140]
- Davis EE, Deinard AS, Maïga EW. Doctor, my tooth hurts: the costs of incomplete dental care in the emergency room. *Journal of Public Health Dentistry*. 2010; 70:205–10. [PubMed: 20337900]
- Dorfman DH, Kastner B, Vinci RJ. Dental concerns unrelated to trauma in the pediatric emergency department: barriers to care. *Archives of Pediatric and Adolescent Medicine*. 2001; 155:699–703.
- Dye BA, Tan S, Smith V, Lewis BG, Barker LK, Thornton-Evans G, et al. Trends in oral health status: United States, 1988-1994 and 1999-2004. *Vital Health Statistics*. 2007; 11:248, 1–92.
- Gelberg L, Andersen RM, Leake BD. The Behavioral Model for Vulnerable Populations: application to medical care use and outcomes for homeless people. *Health Services Research*. 2000; 34:1273–302. [PubMed: 10654830]
- Healthcare Cost and Utilization Project (HCUP). Introduction to the HCUP National Emergency Department Sample (NEDS). 2009. Available at: http://www.hcupus.ahrq.gov/db/nation/neds/NEDS_Introduction_2009.jsp#whatis. Accessed on July 21, 2013
- Hong L, Ahmed A, McCuniff M, Liu Y, Cai J, Hoff G. Secular trends in hospital emergency department visits for dental care in Kansas City, Missouri, 2001-2006. *Public Health Reports*. 2011; 126:210–9. [PubMed: 21387951]
- Institute of Medicine (IOM). *Hospital-Based Emergency Care: At the Breaking Point*. National Academies Press; Washington, DC: 2007.
- Lee HH, Lewis CW, Saltzman B, Starks H. Visiting the emergency department for dental problems: trends in utilization, 2001 to 2008. *American Journal of Public Health*. 2012; 102:e77–83. [PubMed: 22994252]

- Lewis C, Lynch H, Johnston B. Dental complaints in emergency departments: a national perspective. *Annals of Emergency Medicine*. 2003; 42:93–9. [PubMed: 12827128]
- Lunsky Y, Elserafi J. Life events and emergency department visits in response to crisis in individuals with intellectual disabilities. *Journal of Intellectual Disability Research*. 2011; 55:714–8. [PubMed: 21492291]
- Lunsky Y, Lin E, Balogh R, Klein-Geltink J, Bennie J, Wilton AS, et al. Are adults with developmental disabilities more likely to visit EDs? *American Journal of Emergency Medicine*. 2011; 29:463–5. [PubMed: 21316180]
- Manski RJ, Moeller J, Schimmel J, St Clair PA, Schimmel J, Magder L, et al. Dental care coverage and retirement. *Journal of Public Health Dentistry*. 2010; 70:1–12. [PubMed: 19694939]
- Maulik PK, Mascarenhas MN, Mathers CD, Dua T, Saxena S. Prevalence of intellectual disability: a meta-analysis of population-based studies. *Research in Developmental Disabilities*. 2011; 32:419–36. Erratum in: *Research in Developmental Disabilities*, 34, 729 (2013). [PubMed: 21236634]
- McCormick AP, Abubaker AO, Laskin DM, Gonzales MS, Garland S. Reducing the burden of dental patients on the busy hospital emergency department. *Journal of Oral and Maxillofacial Surgery*. 2013; 71:475–8. [PubMed: 23265850]
- Moineddin R, Meaney C, Agha M, Zagorski B, Glazier RH. Modeling factors influencing the demand for emergency department services in Ontario: a comparison of methods. *BMC Emergency Medicine*. 2011; 11:13. [PubMed: 21854606]
- Morgan JP, Minihan PM, Stark PC, Finkelman MD, Yantsides KE, Park A, et al. The oral health status of 4,732 adults with intellectual and developmental disabilities. *Journal of the American Dental Association*. 2012; 143:838–46. [PubMed: 22855898]
- Murphy CC, Yeargin-Allsopp M, Decoufle P, Drews CD. The administrative prevalence of mental retardation in 10-year-old children in metropolitan Atlanta, 1985 through 1987. *American Journal of Public Health*. 1995; 85:319–23. [PubMed: 7892912]
- Nagarkar SR, Kumar JV, Moss ME. Early childhood caries related visits to emergency departments and ambulatory surgery facilities and associated charges in New York state. *Journal of the American Dental Association*. 2012; 143:59–65. [PubMed: 22207670]
- Nalliah RP, Allareddy V, Elangovan S, Karimbux N, Allareddy V. Hospital based emergency department visits attributed to dental caries in the United States in 2006. *Journal of Evidence-Based Dental Practice*. 2010; 10:212–22. [PubMed: 21093802]
- Oktay JS, Tompkins CJ. Personal assistance providers' mistreatment of disabled adults. *Health & Social Work*. 2004; 29:177–88. [PubMed: 15453056]
- Okunseri C, Okunseri E, Chilmaza CA, Harunani S, Xiang Q, Szabo A. Racial and ethnic variations in waiting times for emergency department visits related to nontraumatic dental conditions in the United States. *Journal of the American Dental Association*. 2013; 144:828–36. [PubMed: 23813265]
- Okunseri C, Pajewski NM, Brousseau DC, Tomany-Korman S, Snyder A, Flores G. Racial and ethnic disparities in nontraumatic dental-condition visits to emergency departments and physician offices: a study of the Wisconsin Medicaid program. *Journal of the American Dental Association*. 2008; 139:1657–66. [PubMed: 19047672]
- Owens PL, Barrett ML, Gibson TB, Andrews RM, Weinick RM, Mutter RL. Emergency department care in the United States: a profile of national data sources. *Annals of Emergency Medicine*. 2010; 56:150–65. [PubMed: 20074834]
- Pajewski NM, Okunseri C. Patterns of dental service utilization following nontraumatic dental condition visits to the emergency department in Wisconsin Medicaid. *Journal of Public Health Dentistry*. 2012 Epub 2012 Aug 8.
- Parish SL, Moss K, Richman EL. Perspectives on health care of adults with developmental disabilities. *Intellectual and Developmental Disabilities*. 2008; 46:411–26. [PubMed: 19006428]
- Patel R, Miner JR, Miner SL. The need for dental care among adults presenting to an urban ED. *American Journal of Emergency Medicine*. 2012; 30:18–25. [PubMed: 21030190]
- Pinto-Martin JA, Dunkle M, Earls M, Fliedner D, Landes C. Developmental stages of developmental screening: steps to implementation of a successful program. *American Journal of Public Health*. 2005; 95:1928–1932. [PubMed: 16195523]

- Rasch EK, Gulley SP, Chan L. Use of Emergency Departments among working age adults with disabilities: a problem of access and service needs. *Health Services Research*. 2013; 48:1334–58. [PubMed: 23278461]
- Sun BC, Hsia RY, Weiss RE, Zingmond D, Liang LJ, Han W, et al. Effect of emergency department crowding on outcomes of admitted patients. *Annals of Emergency Medicine*. 2013; 61:605–611. [PubMed: 23218508]
- Symons FJ. Self-injurious behavior in neurodevelopmental disorders: relevance of nociceptive and immune mechanisms. *Neuroscience and Biobehavioral Reviews*. 2011; 35:1266–74. [PubMed: 21237197]
- Venkat A, Pastin RB, Hegde GG, Shea JM, Cook JT, Culig C. An analysis of ED utilization by adults with intellectual disability. *American Journal of Emergency Medicine*. 2011; 29:401–11. [PubMed: 20825812]
- Wall T. Recent trends in dental emergency department visits in the United States:1997/1998 to 2007/2008. *Journal of Public Health Dentistry*. 2012; 72:216–20. [PubMed: 22536892]
- Wallace NT, Carlson MJ, Mosen DM, Snyder JJ, Wright BJ. The individual and program impacts of eliminating Medicaid dental benefits in the Oregon Health Plan. *American Journal of Public Health*. 2011; 101:2144–50. [PubMed: 21680938]

Figure 1. Prevalence peaks of NTDC-related ED admissions.

Figure 1.
Prevalence peaks of NTDC-related ED admissions.

TABLE 1

Descriptive Characteristics of Children (n=4,325,309) and Adults (n=22,466,562) in the 2009 U.S. National Emergency Department Sample (NEDS)

Measure	Children Ages 3 to 17 Years (n=4,325,309) n (%)	Adults Ages 18 Years and Older (n=22,466,562) n (%)
Outcome Variable		
Emergency Department Admission for a Non-Traumatic Dental Condition (NTDC)	32,498 (0.8)	453,549 (2.0)
Main Predictor Variable		
Intellectual and Developmental Disability (IDD)		
No	4,295,385 (99.3)	22,381,683 (99.6)
Yes	29,924 (0.7)	84,879 (0.4)
Model Covariates		
<i>Predisposing Variables</i>		
Age Category (years)		
3-5	1,097,801 (25.4)	n/a
6-12	1,706,146 (39.5)	n/a
13-17	1,521,362 (35.2)	n/a
18-21	n/a	1,995,267 (8.9)
22-49	n/a	11,373,494 (50.6)
50-64	n/a	4,279,226 (19.1)
65-75	n/a	2,103,508 (9.4)
76+	n/a	2,715,067 (12.1)
Sex		
Male	2,249,140 (52.0)	9,527,777 (42.4)
Female	2,070,436 (47.9)	12,916,556 (57.5)
Missing	5,733 (0.1)	22,229 (0.1)
<i>Enabling Variables</i>		
Health Insurance Type		
Private or health maintenance organization	1,797,199 (41.6)	7,009,662 (31.2)
Medicaid or Medicare	1,968,864 (45.5)	9,782,520 (43.5)
Self-pay	368,824 (8.5)	4,229,025 (18.8)
No charge	10,436 (0.2)	245,988 (1.1)
Other	168,479 (3.9)	1,098,586 (4.9)
Missing	11,507 (0.3)	100,781 (0.5)
Median Community Income Quartile		
Q4 – highest income quartile	726,492 (16.8)	3,685,151 (16.4)
Q3	921,261 (21.3)	4,892,787 (21.8)
Q2	1,247,995 (28.9)	6,324,581 (28.2)
Q1 – lowest income quartile	1,351,847 (31.3)	6,970,196 (31.02)
Missing	77,714 (1.8)	593,847 (2.7)
Size of Community		
Large central metropolitan	1,204,864 (27.9)	6,194,877 (27.6)

Measure		Children Ages 3 to 17 Years (n=4,325,309) n (%)	Adults Ages 18 Years and Older (n=22,466,562) n (%)
Large fringe metropolitan		1,028,659 (23.8)	4,988,240 (22.2)
Medium metropolitan	Small metropolitan	886,789 (20.5) 364,005 (8.4)	4,760,042 (21.2) 2,069,332 (9.2)
Micropolitan		473,920 (11.0)	2,555,418 (11.4)
Noncore		344,057 (8.0)	1,695,938 (7.6)
Missing		23,015 (0.5)	202,715 (0.9)
Need Variable			
Number of Chronic Health Conditions			
0		3,531,028 (81.6)	9,764,722 (43.5)
1		628,507 (14.5)	4,653,535 (20.7)
2 or more		165,774 (3.8)	8,048,305 (35.8)

TABLE 2

Bivariate Statistics from Unadjusted Logistic Regression Models¹ Indicating Factors Associated with Non-Traumatic Dental Condition-Related Emergency Department Admissions for U.S. Children and Adults

Measure	Children Ages 3 to 17 Years Unadjusted Odds Ratio ² and 95% Confidence Interval	Adults Ages 18 Years and Older Unadjusted Odds Ratio ² and 95% Confidence Interval
Main Predictor Variable		
Intellectual and Developmental Disability (IDD)		
No (reference)	1.00	1.00
Yes	0.84 (0.72, 0.98)*	0.34 (0.30, 0.37)***
Model Covariates		
<i>Predisposing Variables</i>		
Age Category (years)		
3-5 (reference for children)	1.00	n/a
6-12	1.17 (1.13, 1.20)***	n/a
13-17	1.24 (1.18, 1.30)***	n/a
18-21 (reference for adults)	n/a	1.00
22-49	n/a	1.31 (1.29, 1.34)***
50-64	n/a	0.40 (0.39, 0.41)***
65-75	n/a	0.13 (0.12, 0.14)***
76+	n/a	0.07 (0.07, 0.07)***
Sex		
Male (reference)	1.00	1.00
Female	0.94 (0.91, 0.96)***	0.82 (0.80, 0.83)***
<i>Enabling Variables</i>		
Health Insurance Type		
Private or health maintenance organization (reference)	1.00	1.00
Medicaid or Medicare	1.53 (1.44, 1.63)***	1.49 (1.40, 1.59)***
Self-pay	2.02 (1.92, 2.14)***	3.88 (3.66, 4.12)***
No charge	1.95 (1.54, 2.47)***	2.34 (1.64, 3.34)***
Other	1.09 (0.97, 1.22)	1.23 (1.03, 1.48)*
Median Community Income Quartile		
Q4 – highest income quartile (reference)	1.00	1.00
Q3	1.17 (1.05, 1.32)**	1.53 (1.34, 1.74)***
Q2	1.30 (1.14, 1.47)***	2.02 (1.76, 2.32)***
Q1 – lowest income quartile	1.38 (1.22, 1.57)***	2.10 (1.82, 2.42)***
Size of Community		
Large central metropolitan (reference)	1.00	1.00
Large fringe metropolitan	0.99 (0.88, 1.12)	1.20 (1.04, 1.38)*
Medium metropolitan	1.07 (0.94, 1.21)	1.54 (1.34, 1.76)***

Measure	Children Ages 3 to 17 Years Unadjusted Odds Ratio ² and 95% Confidence Interval	Adults Ages 18 Years and Older Unadjusted Odds Ratio ² and 95% Confidence Interval
Small metropolitan	1.11 (0.98, 1.25)	1.64 (1.42, 1.89) ***
Metropolitan	1.11 (0.99, 1.24)	1.73 (1.51, 1.98) ***
Noncore	0.98 (0.87, 1.09)	1.52 (1.34, 1.73) ***
<i>Need Variable</i>		
Number of Chronic Health Conditions		
0 (reference)	1.00	1.00
1	0.92 (0.87, 0.97) **	0.78 (0.74, 0.82) ***
2 or more	0.69 (0.62, 0.77) ***	0.23 (0.22, 0.24) ***

Regression models adjusted for hospital clustering and strata and patient discharge-level weights Nationally representative estimates

* P 0.01 to P<0.05

** P 0.001 to P<0.01

*** P<0.001

TABLE 3

Covariate-Adjusted Logistic Regression Models¹ for Non-Traumatic Dental Condition-Related Emergency Department Admissions for U.S. Children and Adults

Measure	Children Ages 3 to 17 Years (n=4,235,188) Adjusted Odds Ratio (OR) ² and 95% Confidence Interval	Adults Ages 18 Years and Older (n=21,766,997) Odds Ratio (OR) ² and 95% Confidence Interval
Main Predictor Variable		
Intellectual and Developmental Disability (IDD)		
No (reference)	1.00	1.00
Yes	1.06 (0.91, 1.23)	0.49 (0.44, 0.54) ***
Model Covariates		
<i>Predisposing Variables</i>		
Age Category (years)		
3-5 (reference for children)	1.00	n/a
6-12	1.20 (1.16, 1.24) ***	n/a
13-17	1.32 (1.25, 1.39) ***	n/a
18-21 (reference for adults)	n/a	1.00
22-49	n/a	1.48 (1.45, 1.51) ***
50-64	n/a	0.63 (0.61, 0.66) ***
65-75	n/a	0.19 (0.18, 0.20) ***
76+	n/a	0.11 (0.10, 0.12) ***
Sex		
Male (reference)	1.00	1.00
Female	0.91 (0.89, 0.94) ***	0.80 (0.78, 0.81) ***
<i>Enabling Variables</i>		
Health Insurance Type		
Private or health maintenance organization (reference)	1.00	1.00
Medicaid or Medicare	1.53 (1.44, 1.62) ***	2.50 (2.36, 2.64) ***
Self-pay	1.98 (1.87, 2.09) ***	3.08 (2.92, 3.25) ***
No charge	1.86 (1.44, 2.40) ***	2.28 (1.79, 2.90) ***
Other	1.08 (0.97, 1.21)	1.07 (0.89, 1.28)
Median Community Income Quartile		
Q4 – highest income quartile (reference)	1.00	1.00
Q3	1.08 (0.97, 1.20)	1.22 (1.09, 1.36) ***
Q2	1.15 (1.03, 1.29) *	2.38 (1.24, 1.55) ***
Q1 – lowest income quartile	1.20 (1.08, 1.34) **	1.35 (1.20, 1.51) ***
Size of Community		
Large central metropolitan (reference)	1.00	1.00
Large fringe metropolitan	1.07 (0.96, 1.19)	1.40 (1.24, 1.58) ***

Measure	Children Ages 3 to 17 Years (n=4,235,188) Adjusted Odds Ratio (OR) ² and 95% Confidence Interval	Adults Ages 18 Years and Older (n=21,766,997) Odds Ratio (OR) ² and 95% Confidence Interval
Medium metropolitan	1.06 (0.94, 1.19)	1.55 (1.37, 1.75) ***
Small metropolitan	1.07 (0.95, 1.21)	1.64 (1.43, 1.88) ***
Micropolitan	1.08 (0.97, 1.20)	1.74 (1.55, 1.95) ***
Noncore	0.91 (0.82, 1.02)	1.48 (1.32, 1.67) ***
<i>Need Variable</i>		
Number of Chronic Health Conditions		
0 (reference)	1.00	1.00
1	0.89 (0.84, 0.94) ***	0.80 (0.76, 0.84) ***
2 or more	0.64 (0.57, 0.72) ***	0.37 (0.35, 0.39) ***

Regression models adjusted for hospital clustering and strata and patient discharge-level weights Nationally representative estimates

* P 0.01 to P<0.05

** P 0.001 to P<0.01

*** P<0.001