Comparative Analysis of Insurance Use Among Dental and Trauma Patients Presenting for Care in Grady Memorial Hospital's Emergency Department

Comparative Analysis of Insurance Use Among Dental and Trauma Patients Presenting for Care in Grady Memorial Hospital's Emergency Department

By

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ABSTRACT

INTRODUCTION: Oral health is a worldwide concern that affects people of every age, socioeconomic status, and ethnicity. Having good oral health is vital to overall health and well-being. Dental caries and periodontal diseases are preventable, but disparities exist in access to preventive care. Proper oral hygiene includes brushing with fluoride toothpaste, flossing, and regular dental visits. Adults without dental insurance may have financial obstacles to proper oral hygiene. Due to lack of dental care, adults without dental insurance may seek acute dental treatment in inappropriate settings, such as an emergency department.

AIM: The purpose of this study was to examine if insurance status is associated with being dental and trauma patients presenting to Grady Memorial Hospital's emergency department for care.

METHODS: Data were obtained from Grady Memorial Hospital, Atlanta, GA for the years 2010-2013. Emergency department data for trauma and dental patients aged 20-64 years (n = 27,247) were extracted using ICD-9 codes and the age variable. Chi-square analyses were used to assess differences in insurance status between dental and trauma patients. Odds ratios from bivariate and multivariate analyses were used to determine associations between being a dental or trauma patient and selected independent variables. The model of best fit was determined using the stepwise logistic regression technique.

RESULTS: Insurance status was significantly different between trauma and dental patients ($p < .001$). Approximately 78% of dental patients were uninsured, while about 57% of trauma patients were uninsured. Controlling for cofounders, being uninsured was statistically significant. Being uninsured was significantly associated with an increased likelihood of being a dental patient (OR: 2.58, 95% CI: [2.17,3.07], $p < .001$).

DISCUSSION: The results from this study demonstrate that insurance status is a main reason why dental patients seek care in an emergency department. Dental patients are significantly more likely to be uninsured than trauma patients. This issue of lack of insurance coverage for dental patients must be addressed in order to decrease the current disparities in care. Further research is needed to determine if there are additional driving factors which contribute to the decision to visit an emergency department for dental care. Due to the disparities that exist in access to dental care, and the repercussions that occur from a lack of dental insurance, dental insurance coverage is a public health concern that needs to be given more attention.

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Chapter I
INTRODUCTION

1.1 Background

Oral health is a worldwide concern that affects people of every age, socioeconomic status and ethnicity. It is more than just having healthy teeth; it is vital to overall health and well-being (U.S. Department of Health and Human Services [HHS], 2000). Public health strides such as water fluoridation have improved oral health. Yet, untreated dental disease continues to be an important and often overlooked public health problem in the United States (Patel, Miner & Miner, 2010).

Dental caries and periodontal diseases are preventable health problems but these health issues are associated with health disparities in the United States (HHS, 2000). Due to the importance of oral health, it is included as one of the 42 Healthy People 2020 topic areas ("Oral Health", 2010). Of the over 1,200 objectives found in the Healthy People 2020 initiative, 33 pertain to oral health (Dye, Li, & Thornton-Evans, 2012). Access to preventive and curative dental care is among these objectives, and is a public health issue in the United States, including urban areas such as Atlanta, Georgia. According to the Centers for Disease Control and Prevention (CDC), 38.4% of adults ages 18-64 reported having no dental care in the year prior to 2012 (2014). The CDC also found that from 2005-2008, 23.7% of adults aged 20-64 had untreated dental caries (2014). Through regular dental visits and good oral hygiene, tooth decay is largely preventable. However, dental visits are expensive and economically burdensome to those who are uninsured.

Under both Medicaid and the State Children's Health Insurance Program (SCHIP), dental benefits are required for children. Additionally, the Patient Protection and Affordable Care Act (ACA) includes pediatric dental services. However, the ACA does not include adult dental

benefits in its essential health benefits requirements (Flynn, Call, Pintor, & Elmi, 2014). In 2012, U.S. census estimates showed that 15.4% of the population had no health insurance (Finegold, 2013). According to the National Association of Dental Plans/Delta Dental Plans Association (NADP/DDPA) Joint Dental Benefits Report on Enrollment, approximately 40% of Americans had no dental benefits in 2013 (NADP/DDPA, 2014). This means that there are approximately 126,652,000 Americans without dental coverage, 2.6 times more than the number of individuals without medical insurance (Berggren, 2012), yet no emphasis is currently being placed on expanding dental coverage for those in need.

According to the Ambulatory and Hospital Care Statistics Branch, there were 129.8 million emergency department (ED) visits in 2010 ("Table 1", 2010). Due to overcrowding and over utilization of EDs, 56% of these visits resulted in wait times between 15 minutes and two hours ("Table 4", 2010). Sixteen percent of all visits reported lack of insurance as the primary source of payment, 36.9% reported private insurance, and 49.1% reported Medicaid/CHIP or Medicare ("Table 6", 2010). According to a study funded by the National Institutes of Health, $1,233 is the median charge for the ten most common outpatient conditions presenting to the ED (Caldwell, Srebotnjak, Wang, & Hsia, 2013). The primary diagnoses in 2 million of the 129.8 million ED visits in 2010 were diseases of the teeth and their supporting structures ("Table 12", 2010). However, many hospitals do not have the capacity for dental treatment. Often the only available dental treatments in the ED are prescriptions for antibiotics or painkillers. The palliative care provided in the ED does not generally resolve the dental problem (Davis, Deinard, & Maïga, 2010). Therefore, if a lack of insurance is contributing to the utilization of EDs for dental care, then this information is vital to shaping and improving public health efforts.

1.2 Definition of Terminology

Payer- Payer is the expected primary entity (insurance or patient) providing payment for the hospital visit.

Self-pay – Self-pay is a patient paying out-of-pocket, without any portion of the cost paid by insurance, to cover any medical care received.

Lack of insurance – As a variable in this study, lack of insurance is considered self-pay.

1.3 Purpose of Study

The purpose of this study is to determine if adults seeking care in Grady Memorial Hospital's emergency department for dental reasons are different than those seeking care for trauma reasons, with respect to insurance status, in order to identify a factor that may contribute to dental patients seeking care in the emergency department. In order to address the study objectives, a comparative analysis of insurance use between dental and trauma patients presenting for care in Grady Memorial Hospital's emergency department was conducted. Because the use of emergency departments for dental issues may be considered a marker for disparities in dental care quality and access (Lee, Lewis, Saltzman, & Starks, 2012), determining if being uninsured is associated with presenting as a dental patient to the emergency department may shed light on what changes are essential for patients to receive appropriate oral care.

1.4 Research Question

Is lack of insurance associated with being a dental or trauma patient reporting to an ED?

Null Hypothesis: There is no difference in the rate of insurance between dental ED patients and trauma ED patients.

Alternate Hypothesis: There is a difference in the rate of insurance between dental ED patients and trauma ED patients.

Chapter II
REVIEW OF THE LITERATURE

In this chapter, support for this study's research questions is synthesized from the scientific literature. The literature review is focused on understanding the disparities in dental care quality and access, with special attention being paid to insurance. Additionally, the literature review is focused on the use of emergency departments for dental care. Studies that discuss the trends in emergency department use and associated costs are also noted.

2.1 The Role that Oral Health Plays in Overall Wellness

Oral health impacts parts of life other than just masticatory functions (Dahl, Wang, & Öhrn, 2012). Having poor oral health has been found to negatively impact individuals' overall well-being (Needleman, et al., 2013). Oral health can affect nearly every aspect of life, from academic performance (Seirawan, Faust, & Mulligan, 2012) to respiratory functions (Plančak & Puhar, 2012; Sharma & Shamsuddin, 2011; Scannapieco, Wang, & Shiau, 2001). Due to the ability of toxins from periodontal pathogens to reach and harm organs throughout the body, they represent a major infectious threat to the entire body (Plančak & Puhar, 2012). These systemic problems can compromise a person's quality of life and life expectancy (Texas Dental Association, 2008).

2.2 Obstacles to Preventive Oral Health

In 2013, A.J. Rugg-Gunn stated in his research that oral disease is the fourth most costly disease to treat (2013). Additionally, throughout the globe, those who are disadvantaged and poor carry the largest burden (Rugg-Gunn, 2013; Petersen, Bourgeois, Ogawa, Estupinan-Day, &

Ndiaye, 2005). Oral diseases are exacerbated by unhealthy diet and nutrition, poor oral hygiene, and limited availability and accessibility of regular oral health care services (Petersen et al., 2005). In 2004, the number of dental caries among 35-44 year olds was between 9.0 and 13.9 in the United States (Petersen et al., 2005). The cost of dental care and lack of insurance have been expressed as critical barriers to dental care for those who have no dental insurance (Schrimshaw, Siegel, Wolfson, Mitchell, & Kunzel, 2011). The obstacles found to be critical barriers to preventive and comprehensive oral health care are socioeconomic factors (Johnson, Turner, Novak, & Kaplan, 2005).

A study using data from the National Health and Nutrition Examination Survey found that utilization of regular dental care had declined among most adults (Dye et al., 2007). The same study discussed the belief that secular changes would correspond to decreased access to appropriate dental care and therefore increased use of EDs for dental services. The authors put forward that ED use for dental problems may serve as a marker for disparities in dental care quality and access (Dye et al., 2007). They conclude that this suggests the need for fundamental changes in delivery of preventive dental care to vulnerable populations. The authors offer several recommendations to improve access to dental care. These suggestions include expanding eligibility criteria of adult public programs and adding dental benefits, strengthening the safety net for dental health, and adopting innovative approaches to provider shortages (Dye et al., 2007).

2.3 Biological Manifestations of the Most Common Oral Health Issues

Periodontal diseases are bacterial infections (Bansal, Khatri, & Taneja, 2013). Among these diseases affecting the oral cavity are dental caries, which affect nearly 100% of the

population in the majority of countries worldwide (Petersen, Bourgeois, Ogawa, Estupinan-Day, & Ndiaye, 2005). Dental caries are also known as dental decay, a process in which the tooth enamel is being dissolved by the acid produced by bacteria in the process of digesting sugars (Rugg-Gunn, 2013). When sucrose is ingested regularly, bacterial pathogens known as *mutans streptococci* become the most prominent organisms in plaque (Loesche, 2007; Fitzgerald, Stevens, Fitzgerald, & Mandel, 1977). These bacterial pathogens are the aciduric bacterial species that dissolve teeth and contribute to tooth decay (Loesche, 2007). If left untreated, oral diseases do not resolve themselves, and can negatively impact a person's quality of life (S. Griffin, Jones, Brunson, P. Griffin, & Bailey, 2012). However, these dental caries, and other periodontal diseases, are in fact diagnosable chronic infections with proven treatments and effective prevention methods (Loesche, 2007). Fluorides in toothpastes, applied by dentists, and delivered through water, reduce incidence of caries in adults by approximately 25% (S. Griffin, Regnier, P. Griffin, & Huntley, 2007). Although restorative interventions of micro-restorative techniques using adhesive materials can preserve tooth structure and help prevent further decay, removal of the biofilm and application of fluoride or sealants to prevent early carious lesions is preferred and proven to successfully preserve tooth structure (Selwitz, Ismail, & Pitts, 2007).

2.4 Disparities in Dental Insurance (access and ability to utilize)

A study in New York found that many publicly insured and uninsured individuals cite a lack of faith that they were receiving the same level of healthcare that privately insured individuals enjoy (Schrimshaw, Siegel, Wolfson, Mitchell, & Kunzel, 2011). This feeling of below average care is consistent with the findings of several other studies (Kelly, Binkley, Neace, & Gale, 2005; Mofidi, Rozier, & King, 2002). Additionally, a large increase in unmet

dental need and dental-related emergency department use was found for those who lost dental benefits (Wallace, Carlson, Mosen, Snyder, & Wright, 2011). It is projected that the Affordable Care Act will not ease obstacles to dental care for adult Medicaid enrollees (Flynn, Call, Pintor, and Elmi, 2014). Therefore, access to and utilization of appropriate dental care is a pressing issue in the United States.

2.5 Using Emergency Departments for Secondary and Tertiary Oral Health (Including Trends over Time)

Due to the expense, limited insurance coverage, inability to find a provider that accepts their insurance, and quality of care, many individuals describe seeking only emergency dental care rather than preventive treatment (Schrimshaw et al., 2011). A 2012 study found a 4% annual rate of increase of non-traumatic dental conditions to emergency departments from 1997 to 2007 (Okunseri, Okunseri, Thorpe, Xiang, & Szabo, 2012). An article using data from the National Hospital Ambulatory Medical Care Survey (NHAMCS) revealed that from 2001 to 2008, the use of EDs for dental care increased disproportionately to the increase in all other causes of ED visits (Lee, Lewis, Saltzman, & Starks, 2012). In a time when dental caries are declining, it is perplexing that carious teeth are accounting for an increasing proportion of emergency department visits (Zeng, Sheller, & Milgrom, 1994).

2.6 Emergency Departments: Costs and Volumes (Including Trends over Time)

From 1993 to 2003, the number of hospitals in the United States decreased by 703 and the number of EDs decreased by 425 (Berger, 2006). This, in conjunction with the popularity of using the ED when in need of care and uninsured, has resulted in overcrowding of hospital EDs

(Berger, 2006). Difficulties accessing regular medical care are associated with increased ED use (Christakis, Mell, Koepsell, Zimmerman, & Connell, 2001; Lambrew, DeFriese, Carey, Ricketts, & Biddle, 1996; Baker, Stevens, & Brook, 1996). From 2008 through 2010, a total of 382,800,668 ED visits took place in the United States, with the year 2010 having 4,025,100 more ED visits than in the year 2008 (V. Allareddy, Rampa, Lee, V. Allareddy, & Nalliah, 2014).

2.7 Problems Arising from Utilizing Emergency Departments for Dental Care

A study in Minnesota found that for 10,325 dental-related visits, the hospitals charged $4,743,519, with an average charge per visit of $459 (Davis, Deinard, & Maïga, 2010). Due to the incomplete dental care received in EDs, return visits and the need for follow-up visits are not uncommon among patients seeking dental care in EDs. Using this average charge, Davis, Deinard, & Maïga estimated that for the 2,499 return visits that occurred, the total charges were approximately $1,147,000. The researchers found that the majority of the dental-related visits to the ED were charged to public programs, and that a substantial proportion of the visits were self-pay (Davis, Deinard, & Maïga, 2010). A study using the Nationwide Emergency Department Sample (NEDS) found an even higher mean hospital ED charge per visit of $760 (V. Allareddy, Rampa, Lee, V. Allareddy, & Nalliah, 2014), which suggests that the Minnesota study estimates costs incurred as less than the actual nationwide costs.

2.8 Rates of Insurance Coverage Among those Who Use Emergency Department for Dental Care

According to a study using nationally representative data, 40.5% of the 4,049,361 dental-care-related ED visits that occurred from 2008 to 2010 were made by individuals without health

insurance (V. Allareddy, Rampa, Lee, V. Allareddy, & Nalliah, 2014). Similar findings were published from a study in New Hampshire, where 44–51% of all dental care related ED visits from 2001-2007 were indicated as self-pay for the primary payer (Anderson, Cherala, Traore, & Martin, 2011). Other studies have also found that a substantial amount of dental visits to the ED were charged to public programs or self-pay (Davis, Deinard, & Maïga, 2010; Lewis, Lynch, & Johnston, 2003). From 2001 to 2008, the greatest overall increase in dental ED visits included those in uninsured subpopulations (Lee, Lewis, Saltzman, & Starks, 2012).

2.9 Variables associated with oral health and ED use

2.9.1 Smoking and smokeless tobacco

Those who smoke have been found to be four times as likely to have periodontitis as persons who have never smoked (Tomar, 2000). Suggestive evidence of an association between dental caries and smoking has also been published (Vellappally, Fiala, Smejkalova, Jacob, & Shriharsha, 2007; Axelsson, Paulander, & Lindhe, 1998). A study assessing the prevalence of smoking among ED patients found a rate of 48%, which is higher than the current national average (Lowenstein et al., 1998).

2.9.2 Age

According to the U.S. Department of Health and Human Services, in 2009, adults 18–64 years of age were more likely than children or older adults to report having unmet dental health care needs in the past 12 months because they could not afford care (2010). Between 1997 and 2000, 77% of ED visits for dental complaints were made by 19 to 50-year-olds (Lewis, Lynch, & Johnston, 2003).

2.9.3 Race/Ethnicity

In 2007, non-Hispanic black persons were found to be more likely to have had at least one ED visit in a year than those in other race groups (Garcia, Bernstein, & Bush, 2010). Additionally, in a study looking at ED visits in the preceding three months, black people were most likely to report two or more ED visits, although after adjusting for age, insurance coverage, barriers to health care, and regular source of care, the impact of race/ethnicity was no longer statistically significant (Baker, Stevens, & Brook, 1996).

2.9.4 Drug use

Drug use was found to be related to 4.6 million ED visits in 2009 (“Highlights”, 2010). Researchers also found that ED users were more likely to be greater than monthly illicit drug users as compared to non-ED users (Cheripetel & Ye, 2008). There is a paucity of data on describing the association between drug use and seeking dental care in the ED.

2.9.5 Insurance status

From 2008 to 2010, it was estimated that 1,639,991 of 4,049,361 dental-related ED visits in the United States were made by uninsured patients (V. Allareddy, Rampa, Lee, V. Allareddy, & Nalliah, 2014). Estimates from the National Access to Care Survey found that 22.6% of uninsured individuals stated that they had unmet dental needs, whereas only 5.9% of privately insured individuals reported unmet dental needs (Mueller, Schur, & Paramore, 1998). These findings were consistent with a study which found that being uninsured is an important factor determining the use of the ED for dental complaints (Lewis, Lynch, & Johnston, 2003).

2.9.6 Gender

Data showed underutilization of dental services and unmet dental needs in a range of 17.6% to 50.0% of female workers, compared with 18.9% to 57.8% percent of male workers

(Caban-Martinez et al., 2007). Another study found that in 2008, men were 1.8 times more likely to report to the ED for a dental reason than women (Quiñonez, 2011).

2.9.7 Employment Status

Unemployment has been associated with lower utilization of regular dental care (Chattopadhyay, 2008). In the absence of income data, employment status was used in this study as a proxy for income. It was also found that lower-income individuals are more likely to seek dental care from an ED as compared with higher income individuals, who were more likely to seek care from a dentist (Cohen et al., 2011).

2.9.8 Alcohol Use

Researchers Cherpitel and Ye found that ED users were more likely to be problem drinkers than non-ED users (2008). Alcohol use has been associated with decreased likelihood of using preventive dental services (Neff, Lynch, & Downs, 2010). Additionally, it has been found that higher drinking frequency is associated with a greater use of all types of emergency dental services (Neff, Lynch, & Downs, 2010).

2.9.9 Body Mass Index

Obesity, defined as having a BMI of 30 or greater, has been associated with dental disease, even after controlling for common risk factors (S. Griffin, Barker, P. Griffin, Cleveland, & Kohn, 2009). Additionally, compared with normal weight employees, a study found that obese employees across the United States had 26% higher emergency department visits (Goetzel, et al., 2010).

Chapter III

METHODS AND PROCEDURES

3.1 Sample and Study Design

Data from Grady Memorial Hospital, Atlanta, Georgia were used for this investigation. During emergency room visits, data were entered by medical providers and hospital staff into the inpatient and ambulatory electronic health records, admissions, patient tracking and billing software of Epic Systems Corp., Verona, WI. Data from 2010 to 2013 from all departments of the Grady Health System were extracted from the Epic system by Grady employees. Names and other identifiers were removed, and the cleaned data for only the emergency department (ED) were provided for this study. The Georgia State University Institutional Review Board approved the study protocols, with the understanding that the data set being used was secondary and could not be used to identify any patient.

Overall, 206,758 visits to the Grady ED were recorded between November 2010 and January 2013. However, only 20-64 year old adults who had values for payer and ICD-9 diagnosis codes were eligible for this study. Eligibility for this study was also restricted to participants with ICD-9 codes of 520-529 or 800-999. Payer was recorded by the hospital in reference to the mode of payment for the medical treatment being received during the current visit. The diagnostic description, which is associated with ICD-9 codes, was entered by the medical provider. Figure 3.1 depicts those who were included in the sample for this study.

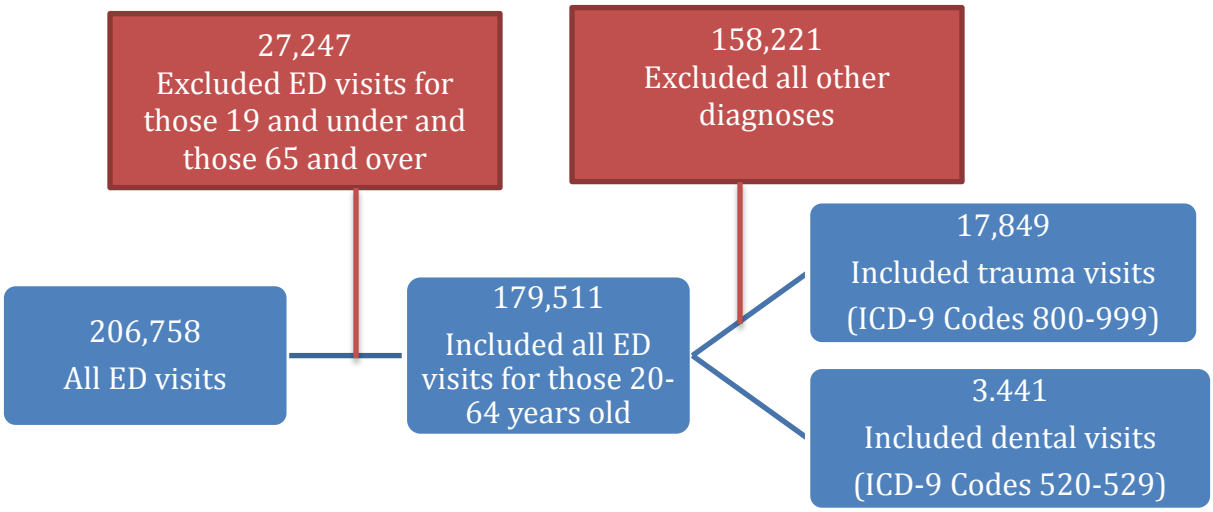

Figure 3.1. Diagram of sample selection.

3.2 Exclusions

This study was restricted to visits by individuals seeking care in the Grady ED. The 27,247 participants outside of the age range of 20-64 years were excluded from this analysis. Between Medicaid, the State Children's Health Insurance Program, and the newly established Health Insurance Marketplace, individuals 18 years of age and younger have many more opportunities for dental insurance coverage than adults. In addition, Grady Memorial Hospital's ED specializes in adult care and pediatric emergency care is available in an adjacent hospital. As for adults 65 years of age and older, they were excluded in this study because there was not a sufficient existing body of research to establish them as a population of interest, as evidenced in section 2.9.2. Participants who were excluded from this study were similar to those who were eligible in terms of gender and race/ethnicity, which was determined by analyzing the distribution of gender and race/ethnicity for the included and excluded groups.

3.3 Definitions of dependent and independent variables

3.3.1 Dependent variables

The main dependent variable in this study was seeking care in the Grady ED for dental or trauma reasons. During each ED visit, the hospital staff entered a reason for visit. These reasons for visit are each associated with a diagnosis description and finally a diagnosis code. The codes used are ICD-9-CM (International Classification of diseases, 9th edition, Clinical Modification) codes, which are used by physicians and hospitals to specify diagnoses for all patient encounters (Centers for Medicare & Medicaid Services, 2014). The category "Diseases of oral cavity, salivary glands, and jaws" was determined to be the most inclusive category for dental diagnoses, and therefore, the associated ICD-9 codes (520-529) were used to define patients seeking dental care. The category "Injury and poisoning" was determined to be the most inclusive for trauma and emergency-related visits, and therefore, the associated ICD-9 codes (800-999) were used to determine trauma patients. A dichotomous variable was created with trauma (ICD-9 codes 800-999) coded as 1 and dental (ICD-9 codes 520-529) coded as 2.

3.3.2 Independent variables

The main independent variable for this study was insurance status (insured versus uninsured). In the Epic system, the form of payment, or payer, is recorded. In this study, those with records listing "none" as payer were considered uninsured (n = 12,927). Patients with any other payer were considered insured (n = 8,363). Race/ethnicity was categorized into four groups consisting of White, Black, Hispanic, and Other. BMI was calculated automatically within the Epic system from the heights and weights measured and entered by hospital staff, and was categorized as obese or not obese on the basis of BMI less than 30 kg/m^2 or BMI greater than or equal to 30kg/m^2. Age was self-reported by the patients and entered by hospital staff. Categories

of ages 20-34, 35-49, and 50-64 were created from the age groups that were already created within the data set. Gender was self-reported by the patients. Employment status was reported as either “Yes” or “No”, in response to the question, “Are you currently employed?” Alcohol use was reported as either “Yes” or “No” from the response to the question, “Are you currently or have you ever used alcohol?” Chewing tobacco use was reported as either “Yes” or “No”, from the information received by asking the question, “Are you currently or have you ever used chewing tobacco?” Smoking status was reported as either “Yes” or “No”, from the information received by asking the question, “Do you currently, or have you ever smoked?” Drug use was reported as either “Yes” or “No”, from the information received by asking the question, “Are you currently or have you ever used drugs?”

3.4 Statistical analysis

Statistical programs available in IBM SPSS Statistics version 21 software were utilized in this analysis. Dental patients were compared with trauma patients using descriptive statistics. Pearson’s χ^2 tests were used to compare rates across dental and trauma patients. Bivariate and multivariable analyses were used to describe the associations between the dependent and selected independent variables. Binary logistic regression was used to calculate odds ratios, which were then used to determine associations. In all analyses, $P < 0.05$ and 95% confidence intervals were used to determine statistical significance.

CHAPTER IV
RESULTS

The following sections will describe the findings of this evaluation study and address the following research question:

Is there a difference between the rate of insurance use for dental ED patients and trauma ED patients?

4.1 Descriptive Analyses

Table 4.1 Descriptive statistics of demographic variables for patients presenting to Grady Memorial Hospital's Emergency Department (N =21290)

Demographic Characteristic	Total	Dental (n=3,441) % (n)	Trauma (n=17,849) % (n)	p-value
Age				<0.001
20-34	9,470	41.9 (1,443)	45.0 (8,027)	
35-49	6.743	35.4 (1,218)	31.0 (5,525)	
50-64	5,077	22.7 (780)	24.1 (4,297)	
Ethnicity				<0.001
White	3,782	6.6 (225)	20.4 (3,557)	
Black	15,894	91.7 (3,114)	73.4 (12,780)	
Hispanic	872	1.0 (34)	4.8 (838)	
Other	252	0.7 (23)	1.3 (229)	
Sex				<0.001
Female	6,570	42.2 (1,453)	28.7 (5,117)	
Male	14,703	57.8 (1,988)	71.3 (12,715)	
Employment Status				0.008
Employed	4,860	22.7 (765)	24.9 (4,095)	
Unemployed	14,961	77.3 (2,600)	75.1 (12,361)	

As listed above, the analysis of demographic characteristics shows that the study population differed in all areas being investigated (Table 4.1). There were statistically significant age, ethnicity, gender, and employment differences between the dental and trauma patients (P<.05). Those who were seen for dental reasons were more frequently between the ages of 20-

34 years (41.9%), black (91.7%), male (57.8%), and unemployed (77.3%). Similarly, the frequencies among the trauma patients were greatest for those who were between the ages of 20-34 years (45.0%), black (73.4%), male (71.2%), and unemployed (75.1%).

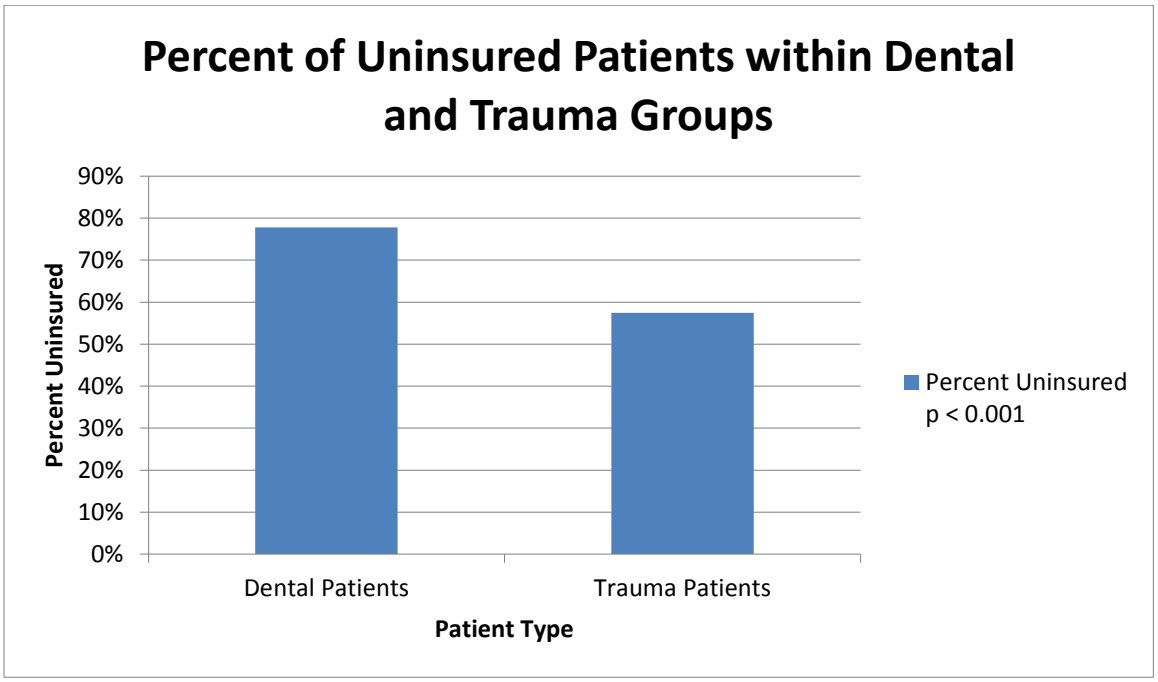

Figure 3.2. Percent of patients within each category presenting to ED (dental or trauma) who are uninsured.

Table 4.2 Descriptive statistics of behavioral/health variables for patients presenting to Grady Memorial Hospital's Emergency Department (n =21,290)

Independent Factors	Total	Dental (n=3441) % (n)	Trauma (n=17849) % (n)	p-value
Insurance Status				<0.001
Insured	8,363	22.2 (765)	42.6 (7,598)	
Uninsured	12,927	77.8 (2,676)	57.4 (10,251)	
Smoking Status				0.009
Smoker	6,700	65.5 (1,463)	62.5 (5,237)	
Nonsmoker	3,914	34.5 (771)	37.5 (3,143)	
Chewing Tobacco Use				<0.001
Yes	308	4.1 (36)	7.9 (272)	
No	4,033	95.9 (849)	92.1 (3,184)	
Alcohol Use				<0.001
Yes	6,315	45.6 (1,055)	56.1 (5,260)	
No	5,371	54.4 (1,258)	43.9 (4,113)	
Drug Use				<0.001
Yes	2,905	22.3 (490)	26.7 (2,415)	
No	8,332	77.7 (1,712)	73.3 (6,620)	
Body Mass Index				<0.001
Not obese (< 30)	17,248	76.4 (2,619)	82.2 (14,629)	
Obese (30 +)	3,973	23.6 (808)	17.8 (3,165)	

Differences in behavioral and health characteristics were also examined between the dental and trauma groups (Table 4.2). As seen in Figure 2 and Table 4.2, there was a statistically significant difference in the rate of insurance between the two groups ($P<.001$). As shown, dental patients were more obese as defined using body mass index compared to trauma ED users (P<.001). The analysis of the behavioral health-related variables also indicates statistically significant differences between the two groups with respect to drug use, alcohol use, and chewing tobacco. Those patients who were seen for dental reasons were more often uninsured (77.8%), smokers (65.5%), did not use chewing tobacco (95.9%), did not drink alcohol (54.4%), did not use drugs (77.7%) and were not obese (76.4%). Patients who were seen for trauma

reasons were more often uninsured (57.4%), smokers (62.5%), did not use chewing tobacco (92.1%), did drink alcohol (56.1%), did not use drugs (73.3%), and were not obese (82.2%).

4.2 Bivariate and Multivariable Analyses

The focus of this research is on the relationship between insurance status and seeking care in the ED for dental reasons. In order to gain a better understanding of this relationship, the use of bivariate and multivariable analyses is essential to determine the association between variables.

Table 4.3 Bivariate model of the association between demographic variables and being a dental patient, for patients presenting to Grady Memorial Hospital's Emergency Department (N =21,290)

Demographic Characteristics	OR (95% CI)	P-value
Age		
20-34	Referent	
35-49	1.23 (1.13-1.33)	<0.001
50-64	1.01 (0.92-1.11)	0.841
Ethnicity		
White	Referent	
Black	3.85 (3.35-4.43)	<0.001
Hispanic	0.64 (0.44-0.93)	0.018
Other	1.58 (1.01-2.49)	0.044
Sex		
Male	Referent	
Female	1.82 (1.69-1.96)	<0.001
Employment Status		
Employed	Referent	
Unemployed	1.13 (1.03-1.23)	0.008

To achieve a better understanding of the complex relationship between insurance status and reason for visiting the ED, baseline bivariate analyses of important factors were assessed (Table 4.3 and Table 4.4). In the bivariate models (Table 4.3), age, ethnicity, gender, and

employment status were found to significantly predict the odds of being a dental patient among those seeking care in the ED. When not adjusting for any other variables, the odds of being a dental rather than a trauma patient among patients between 35-49 years was 1.23 times the odds among those 20-34 years of age. There were no significant differences between the 50-64 and 20-34 groups. The odds of being a dental patient instead of a trauma patient were also significantly higher among patients who were black (OR: 3.85 CI: 3.35-4.43 $p < .001$) and other races (OR: 1.58 CI: 1.01-2.49 $p = .044$) when compared to the odds among white patients.

Table 4.4 Bivariate model of the association between behavioral/health variables and being a dental patient, for patients presenting to Grady Memorial Hospital's Emergency Department (N =21,290)

Independent Factors	OR (95% CI)	P-value
Insurance Status		
Insured	Referent	
Uninsured	2.59 (2.38-2.83)	<0.001
Smoking Status		
Smoker	Referent	
Nonsmoker	0.88 (0.80-0.97)	0.009
Chewing Tobacco Use		
Yes	Referent	
No	2.02 (1.41-2.88)	<0.001
Alcohol Use		
Yes	Referent	
No	1.53 (1.39-1.67)	<0.001
Drug Use		
Yes	Referent	
No	1.27 (1.14-1.42)	<0.001
Body Mass Index		
Not obese (< 30)	Referent	
Obese (30 +)	1.43 (1.31-1.56)	<0.001

In the bivariate model (Table 4.4), insurance status, smoking status, chewing tobacco use, alcohol use, drug use, and BMI were found to significantly influence the odds for being a dental

patient. When not adjusted for any other variables, being uninsured significantly increased one's odds of being a dental patient (OR: 2.59 CI: 2.38-2.83 $p < .001$).

Two multivariable logistic regression models were created (Tables 4.5 and 4.6). The multivariable models are being used to attempt to assess independent relationships while adjusting for potential confounders.

Table 4.5 Multivariable model of the association between demographic variables and being a dental patient, for patients presenting to Grady Memorial Hospital's Emergency Department adjusted for demographic variables.

Demographic Characteristics	OR (95% CI)	P-value
Insurance Status		
Insured	Referent	
Uninsured	2.62 (2.40-2.87)	<0.001
Age		
20-34	Referent	
35-49	1.24 (1.14-1.36)	<0.001
50-64	1.04 (0.94-1.15)	0.841
Ethnicity		
White	Referent	
Black	3.20 (2.76-3.69)	<0.001
Hispanic	0.55 (0.38-0.80)	0.002
Other	1.46 (0.93-2.32)	0.103
Sex		
Male	Referent	
Female	1.88 (1.73-2.03)	<0.001
Employment Status		
Employed	Referent	
Unemployed	0.91 (0.83-1.00)	0.062

Model 1 adjusted for demographic factors such as age, ethnicity, gender and employment status, that were all found to be important factors in the bivariate analysis. When adjusting for demographic factors (Table 4.5), insurance status was found to be statistically significant. Being

uninsured was found to increase one's odds of being a dental patient (OR: 2.62; CI: 2.40-2.87 p<.001).

Table 4.6 Multivariable model of the association between behavioral/health variables and being a dental patient, for patients presenting to Grady Memorial Hospital's Emergency Department, adjusted for behavioral/health variables.

Independent Factors	OR (95% CI)	P-value
Insurance Status		
Insured	Referent	
Uninsured	2.65 (2.23-3.14)	<0.001
Chewing Tobacco Use		
Yes	Referent	
No	2.00 (1.33-2.99)	<0.001
Alcohol Use		
Yes	Referent	
No	1.41 (1.19-1.66)	<0.001
Drug Use		
Yes	Referent	
No	1.13 (0.93-1.37)	0.217
Body Mass Index		
Not obese (< 30)	Referent	
Obese (30 +)	1.19 (0.98-1.44)	0.072
Smoking Status		
Smoker	Referent	
Nonsmoker	0.76 (0.63-0.90)	0.002

Model 2 adjusted for health and behavior related factors (Table 4.6). When adjusting for health and behavior related factors, being uninsured was found to increase one's likelihood of being a dental patient (OR: 2.65 CI: 2.23-3.14 p < .001). More specifically, adjusting for the related factors showed increased odds of being a dental patient. The presence of this increase in both models might suggest some type of effect modification—one or more of the other factors might hide the true effect of being uninsured on the odds of being a dental patient seeking care in the ED.

4.3 Stepwise Logistic Regression

Table 4.7 Results of stepwise logistic regression analysis of all predictors for dental patients presenting to Grady Memorial Hospital's Emergency Department.

Independent Factors	OR (95% CI)	P-value
Insurance Status		
Insured	Referent	
Uninsured	2.58 (2.17-3.07)	<0.001
Chewing Tobacco Use		
Yes	Referent	
No	1.79 (1.19-2.70)	0.005
Alcohol Use		
Yes	Referent	
No	1.37 (1.15-1.62)	<0.001
Smoking Status		
Smoker	Referent	
Nonsmoker	0.72 (0.60-0.87)	<0.001
Sex		
Male	Referent	
Female	1.44 (1.22-1.72)	<0.001
Ethnicity		
White	Referent	
Black	2.77 (2.05-3.73)	<0.001
Hispanic	0.69 (0.31-1.51)	0.350
Other	3.71 (1.66-8.26)	0.001

The stepwise regression was utilized to determine the best predictors of being a dental or a trauma patient reporting to the ED. As shown, lack of insurance, abstaining from alcohol, not chewing tobacco, being female and being black or "other" were found to be the best predictors of visiting the ED for dental reasons. Additionally, smoking was one of the covariates for predicting the use of the ED as a dental patient. The presence of insurance status in this model supports the idea that insurance is an important predictor of being a dental patient using the ED.

CHAPTER V
DISCUSSION AND CONCLUSION

5.1 Discussion of Research Questions

Lack of access to appropriate oral health care is an important public health issue. Many people are unable to afford out-of-pocket dental care (Ramraj, Sadeghi, Lawrence, Dempster, & Quiñonez, 2013). Insurance coverage helps ease the burden and reduce the out-of-pocket expense of costly medical and dental procedures (Ballit, Raskin, Reisine, & Chiriboga, 1979). The lack of insurance may lead patients to seek care in inappropriate settings such as EDs, where symptom relief is often the only treatment available (Lee, Lewis, Saltzman, & Starks, 2012; Davis, Deinard, & Maïga, 2010). Seeking care for dental related issues in EDs is rarely the best option for patients, and it may take away from vital resources needed for trauma and other patients who require care from EDs (McCormick, Abubaker, Laskin, Gonzales, & Garland, 2013).

Determining driving factors for seeking dental care in the ED is of the utmost importance, because shedding light on these factors may allow us to fix the underlying problem rather than continuing to only offer temporizing treatment to patients in need. Grady Memorial Hospital's emergency department houses the Marcus Trauma Center, which is a level 1 trauma center. This means that patients with immediate need for trauma surgeons, operating rooms or skilled specialists are brought directly to Grady. The traditional mission of a hospital emergency department is to provide trauma and emergency services to those who are in danger of losing their life or suffering permanent damage to their health (Diverting Non-Urgent, 2011).

Additionally, when patients are taken to a hospital for trauma, it is unlikely that they are making the decision to visit based on their insurance status; rather, the need for care is so urgent

that they have no other option than to seek emergency care. Although dental-related visits account for only a fraction of visits in the ED, many of these visits are associated with excessive, preventable costs, and because of inadequate treatment and insufficient follow-up, there is potential for repeat ED visits (Davis, Deinard, & Maïga, 2010). For these reasons, characteristics of patients presenting to the ED for dental related care were compared with those who were presenting for trauma care.

The main finding of this investigation was that insurance status is associated with presenting to the ED for dental reasons. Adjusting for age, gender, race/ethnicity, BMI, smoking status, employment status, chewing tobacco use status, alcohol use status, and drug use status, lacking insurance was associated with increased odds of presenting to the ED for a dental reason. This finding is consistent with the findings of Lewis, Lynch, and Johnston (2003), and Mueller, Schur, and Paramore (1998), which both showed significantly higher odds of presenting to the ED for a dental complaint rather than another problem for visits where self-pay was listed as the payer. Patel, Miner, and Miner (2010) found that dental insurance status was not strongly associated with a need for urgent dental care. Though these findings may seem to be inconsistent with the current study, this does not discredit insurance status as a predictor for seeking dental care in the ED. The 2010 study looked at the association between "urgent need" for dental care and insurance status, which is not necessarily associated with whether a patient will present to the ED with a dental concern. The finding from this study that being Hispanic is associated with a decreased likelihood of being a dental patient is consistent with the findings of Beniflah, Little, Simon, and Sturm (2013). They stated that since the passage of the Georgia House Bill 87, which gives local law enforcement the authority to enforce immigration laws, fewer Hispanic patients have presented to the ED.

5.2 Study Strengths and Limitations

This is the first known investigation of Grady Memorial Hospital's ED data to determine the association between insurance status and seeking care in the ED for dental reasons. Grady Memorial Hospital is a hospital with a high volume of patients seen daily. The results of this study assist in identifying the characteristics of subgroups classified by payment method that may be addressed in order to provide more effective care to patients. These results indicate that there is an unmet need for preventive dental care for those without dental insurance.

Some limitations must be acknowledged when interpreting the results of this study. First, dental patients were classified using ICD-9 codes 520-529, which may include reasons for visiting the ED that go beyond problems that could have been prevented by dental care. The decision to classify dental patients by this method was made in order to capture as many dental patients as possible. It is possible that some of the patients utilizing the ED for dental care may have actually been presenting with dental issues secondary to trauma. Due to the limited information available in the data set, these cases could not be clearly identified as primary trauma cases, and therefore, they remained in the sample of patients seeking dental care. Second, the issue of miscoding and coding biases that may occur in hospital-based databases should not be discounted. Because the ICD-9 codes listed are for the primary diagnosis, it may mask additional secondary diagnoses. Third, this study is an analysis of data from one hospital, and therefore, the generalizability may be limited. But, this does not discount the importance of the findings. Grady Memorial Hospital is a unique hospital in that it serves an underserved population with a large majority of black patients. Therefore the findings are of vital importance to this hospital. Fourth, patients' usage of drugs, alcohol, and/or tobacco was self-reported, so the validity of these variables is indeterminate.

Studies have found that patients in EDs substantially underreport drug use (Yih-Ing, Maglione, & Boyle, 1999), that cognitive and situational factors may impact the validity of self-reported alcohol use (Brener, Billy, & Grady, 2003), and that an increase in underreporting of tobacco use has been found (Fendrich, Mackesy-Amiti, Johnson, Hubbell, & Wislar, 2005). Based on these studies, the self-reporting of drug, alcohol and/or tobacco use is further evidenced to be biased and unreliable. Additionally, these questions were asked in a way that makes interpretation with regard to current or past use and the extent of use limited by the nature of the question. Finally, direct evidence on the reason the patients visited the emergency room rather than a dentist was not available. Consequently, there may be other variables that were not accounted for that may contribute to seeking dental care in the ED. Despite these potential limitations, given the limited information currently available on dental-related ED visits, this study affords unique information on a crucial public health issue.

5.3 Implications of Findings

The ACA is attempting to ensure medical insurance coverage for all, but it has left out a vital component: adult dental insurance coverage. This study provides information to support the need to advocate for dental insurance in order to remove pressure on EDs and reduce oral health disparities. The fact that many individuals are without dental insurance is of great concern. Therefore, expansion of government funding facilitating preventive and periodic oral health care for populations in need would likely reduce the tendency for patients to seek dental care in EDs. Clinical implications include targeting strategic dental care access programs to identify uninsured individuals who can improve their oral health. Additionally, it may prove beneficial to both hospitals and patients if a formal referral plan were put in place with dental clinics that are

willing and able to take patients (McCormick, Abubaker, Laskin, Gonzales, & Garland, 2013). An example of this method can be found in a safety net hospital in Miami, Florida that referred an average of 50 patients a day to primary care and dental clinics within the first 18 months of establishing this plan, reducing the ED's volume of patients by 15% (Felland, Hurley, & Kemper, 2008).

5.4 Recommendations for Future Research

Since there may be other factors that contribute to people seeking dental care in the ED, it may be beneficial to investigate the reasons for dental patients' visits to the ED. Lack of insurance and not having a primary dentist are among the most important factors that remain to be investigated. This way, an even more targeted approach may be created. Additionally, comparing insurance statuses of dental patients seeking care in EDs and those seeking care at dental clinics may also be beneficial.

5.5 Conclusion

This research shows that individuals presenting to the ED for dental care have a significantly higher association with an uninsured status in comparison to those presenting for trauma care. Therefore, the need for utilizable and comprehensive dental insurance in this population is defensible. In accordance with these results and other associated research, this comprehensive coverage would be beneficial to the patients in need of oral health care, the already overburdened emergency department, and as a result, the public in general. Until fundamental changes in delivery of and access to preventive dental care to at-risk populations occur, it is likely that ED visits for dental reasons will continue. Because this will likely take a

great deal of time, a comprehensive process that diverts patients going to the ED for dental issues to dental care providers (e.g. community dental clinics) would benefit both the hospital and the patients.

References

Allareddy, V., Rampa, S., Min Kyeong, L., Allareddy, V., & Nalliah, R. P. (2014). Hospital-based emergency department visits involving dental conditions: Profile and predictors of poor outcomes and resource utilization. *Journal Of The American Dental Association (JADA)*, *145*(4), 331-337. doi:10.14219/jada.2014.7

Anderson, L., Cherala, S., Traore, E., & Martin, N. (2011). Utilization of hospital emergency departments for non-traumatic dental care in New Hampshire, 2001-2008. *Journal Of Community Health*, *36*(4), 513-516. doi:10.1007/s10900-010-9335-5

Axelsson, P., Paulander, J., & Lindhe, J. (1998). Relationship between smoking and dental status in 35-, 50-, 65-, and 75-year-old individuals. *Journal Of Clinical Periodontology*, *25*(4), 297-305

Baker, D., Stevens, C., & Brook, R. (1996). Determinants of emergency department use: Are race and ethnicity important? *Annals Of Emergency Medicine*, *28*(6), 677-682

Ballit, H. L., Raskin, M., Reisine, S., & Chiriboga, D. (1979). Controlling the cost of dental care. *American Journal Of Public Health*, *69*(7), 699-703

Bansal, M. M., Khatri, M. M., & Taneja, V. V. (2013). Potential role of periodontal infection in respiratory diseases: A review. *Journal Of Medicine & Life*, *6*(3), 244-248

Berger, E. (2006). Specialty prepares for *The Future of Emergency Care in the United States Health System*: IOM report release anticipated. *Annals Of Emergency Medicine*, *48*(1), 60-65

Berggren, J. (2012, August 6). 2012 NADP/DDPA joint dental benefits report: Enrollment. Retrieved from http://nadp.peachnewmedia.com/store/seminar/seminar.php?seminar=17429

Brener, N. D., Billy, J. G., & Grady, W. R. (2003). Assessment of factors affecting the validity of self-reported health-risk behavior among adolescents: Evidence from the scientific literature. *Journal Of Adolescent Health*, *33*(6), 436. doi:10.1016/S1054-139X(03)00052-1

Caban-Martinez, A., Lee, D., Fleming, L., Arheart, K., LeBlanc, W., Chung-Bridges, K., & ... Pitman, T. (2007). Dental care access and unmet dental care needs among U.S. workers:

The National Health Interview Survey, 1997 to 2003. *Journal Of The American Dental Association (JADA), 138*(2), 227-230

Caldwell N, Srebotnjak T, Wang T, Hsia R. (2013). "How much will I get charged for this?" Patient charges for top ten diagnoses in the emergency department. PLoS ONE 8(2): e55491. doi:10.1371/journal.pone.0055491

Centers for Disease Control and Prevention. (2014). Fast Stats: Oral and Dental Health. Retrieved from http://www.cdc.gov/nchs/fastats/dental.htm

Centers for Medicare and Medicaid Services. (2014). ICD-9-CM and ICD-10. Retrieved from http://www.cms.gov/Medicare/Coding/ICD9ProviderDiagnosticCodes/index.html

Chattopadhyay, A. (2008). Oral health disparities in the United States. *Dental Clinics Of North America*, *52*(2), 297

Cherpitel, C., & Ye, Y. (2008). Drug use and problem drinking associated with primary care and emergency room utilization in the US general population: Data from the 2005 National Alcohol Survey. *Drug & Alcohol Dependence*, *97*(3), 226-230

Christakis, D., Mell, L., Koepsell, T., Zimmerman, F., & Connell, F. (2001). Association of lower continuity of care with greater risk of emergency department use and hospitalization in children. *Pediatrics*, *107*(3), 524-529

Cohen, L., Bonito, A., Eicheldinger, C., Manski, R., Macek, M., Edwards, R., & Khanna, N. (2011). Comparison of patient visits to emergency departments, physician offices, and dental offices for dental problems and injuries. *Journal Of Public Health Dentistry*,*71*(1), 13-22. doi:10.1111/j.1752-7325.2010.00195.x

Diverting Non-Urgent Emergency Room Use: Can it Provide Better Care and Lower Costs? Hearing Before the Subcommittee on Primary Health and Aging of the Committee on Health, Education, Labor and Pensions. United States Senate, 112th-789 Cong., 1 (2011) (testimony of Peter Cunningham). Retrieved from http://www.gpo.gov/fdsys/pkg/CHRG-112shrg81788/html/CHRG-112shrg81788.htm

Dahl, K., Wang, N., & Öhrn, K. (2012). Does oral health matter in people's daily life? Oral health-related quality of life in adults 35-47 years of age in Norway. *International Journal Of Dental Hygiene, 10*(1), 15-21. doi:10.1111/j.1601-5037.2011.00533.x

Davis, E., Deinard, A., & Maïga, E. (2010). Doctor, my tooth hurts: The costs of incomplete dental care in the emergency room. *Journal Of Public Health Dentistry*, *70*(3), 205-210. doi:10.1111/j.1752-7325.2010.00166.x

Dye B, Li X, Thornton-Evans G. (2012). Oral health disparities as determined by selected Healthy People 2020 oral health objectives for the United States, 2009–2010. NCHS data brief, no 104. Hyattsville, MD: National Center for Health Statistics.

Dye, B., Tan, S., Smith, V., Lewis, B., Barker, L., Thornton-Evans, G., . . . Li, C. (2007). Trends in oral health status: United States, 1988-1994 and 1999-2004. *Vital And Health Statistics. Series 11, Data From The National Health Survey*, (248), 1-92

Felland, L. E., Hurley, R. E., & Kemper, N. M. (2008, May). Center for studying health system change: Creating safety valves for non-urgent care. Retrieved from http://www.hschange.com/CONTENT/983/

Fendrich, M., Mackesy-Amiti, M., Johnson, T. P., Hubbell, A., & Wislar, J. S. (2005). Tobacco-reporting validity in an epidemiological drug-use survey. *Addictive Behaviors, 30*(1), 175-181. doi:10.1016/j.addbeh.2004.04.009

Finegold, K. (2013, November). New census estimates show 3 million more Americans had health insurance coverage in 2012. Retrieved from http://aspe.hhs.gov/health/reports/2013/CPSIssueBrief/ib_cps.cfm

Fitzgerald, D., Stevens, R., Fitzgerald, R., & Mandel, I. (1977). Comparative cariogenicity of *streptococcus mutans* strains isolated from caries active and caries resistant adults. *Journal Of Dental Research*, *56*(8), 894

Flynn, P., Call, K., Pintor, J., & Elmi, N. (2014). The projected effect of the Affordable Care Act on dental care for adult Medicaid enrollees. *Journal Of Health Care For The Poor And Underserved, 25*(1, Suppl), 79-94. doi:10.1353/hpu.2014.0059

Garcia, T., Bernstein, A. B., & Bush, M. (2010, May). Emergency department visitors and visits: Who used the emergency room in 2007? *NCHS Data Briefs*. pp. 1-8. doi:10.1037/e665452010-001

Goetzel, R., Gibson, T., Short, M., Chu, B., Waddell, J., Bowen, J., . . . Dejoy, D. (2010). A multi-worksite analysis of the relationships among body mass index, medical utilization, and work productivity. *Journal Of Occupational & Environmental Medicine, 52*(1S), S52-8. doi:10.1097/JOM.0b013e318c95b84

Griffin, S. D., Jones, J. A., Brunson, D., Griffin, P. M., & Bailey, W. D. (2012). Burden of oral disease among older adults and implications for public health priorities. *American Journal Of Public Health*, *102*(3), 411-418

Griffin, S., Barker, L., Griffin, P., Cleveland, J., & Kohn, W. (2009). Oral health needs among adults in the United States with chronic diseases. *Journal Of The American Dental Association (JADA),140*(10), 1266-1274

Griffin, S., Regnier, E., Griffin, P., & Huntley, V. (2007). Effectiveness of fluoride in preventing caries in adults. *Journal Of Dental Research*, *86*(5), 410-415

Highlights of the 2009 Drug Abuse Warning Network (DAWN) findings on drug-related emergency department visits. (2010, December 28). *The DAWN Report*. pp. 1-8. doi:10.1037/e515452011-001

Johnson, J. T., Turner, E. G., Novak, K. F., & Kaplan, A. L. (2005). Factors associated with comprehensive dental care following an initial emergency dental visit. *Journal Of Dentistry For Children*, *72*(2), 78-80

Kelly, S. E., Binkley, C. J., Neace, W. P., & Gale, B. S. (2005). Barriers to care-seeking for children's oral health among low-income caregivers. *American Journal Of Public Health*, *95*(8), 1345-1351. doi:10.2105/AJPH.2004.045286

Lambrew, J., DeFriese, G., Carey, T., Ricketts, T., & Biddle, A. (1996). The effects of having a regular doctor on access to primary care. *Medical Care*, *34*(2), 138-151

Lee, H. H., Lewis, C., Saltzman, B., & Starks, H. (2012). Visiting the emergency department for dental problems: Trends in utilization, 2001 to 2008. *American Journal Of Public Health*, *102*(11), e77-e83. doi:10.2105/AJPH.2012.300965

Lewis, C., Lynch, H., & Johnston, B. (2003). Dental complaints in emergency departments: A national perspective. *Annals Of Emergency Medicine*, *42*(1), 93-99

Loesche, W. (2007). Dental caries and periodontitis: Contrasting two infections that have medical implications. *Infectious Disease Clinics*, *21*(2), 471

Lowenstein, S. R., Koziol, M. J., Thompson, M. M., Bernstein, E. E., Greenberg, K. K., Gerson, L. W., . . . Blanda, M. M. (1998). Behavioral risk factors in emergency department patients: A multisite survey. *Academic Emergency Medicine*, *5*(8), 781-787. doi:10.1111/j.1553-2712.1998.tb02504.x

McCormick, A., Abubaker, A., Laskin, D., Gonzales, M., & Garland, S. (2013). Reducing the burden of dental patients on the busy hospital emergency department. *Journal Of Oral & Maxillofacial Surgery (02782391)*, *71*(3), 475-478. doi:10.1016/j.joms.2012.08.023

Mofidi, M., Rozier, R., & King, R. S. (2002). Problems with access to dental care for medicaid-insured children: What caregivers think. *American Journal Of Public Health*, *92*(1), 53-58

Mueller, C. D., Schur, C. L., & Paramore, L. (1998). Access to dental care in the United States. *Journal Of The American Dental Association (JADA)*, *129*(4), 429

Mueller, C., Schur, C., & Paramore, L. (1998). Access to dental care in the United States: Estimates from a 1994 survey. *Journal Of The American Dental Association (JADA)*, *129*(4), 429

National Association of Dental Plans/Delta Dental Plans Association. (2014). 2013 NADP/DDPA Joint Dental Benefits Report: Enrollment. *Medical Benefits*, *31*(1), 3

National Center for Health Statistics. (2011). Health, United States, 2010: With special feature on death and dying. Hyattsville, MD. Retrieved from http://www.cdc.gov/nchs/data/hus/hus10.pdf

Needleman, I. I., Ashley, P. P., Petrie, A. A., Fortune, F. F., Turner, W. W., Jones, J. J., & ... Porter, S. S. (2013). Oral health and impact on performance of athletes participating in the London 2012 Olympic Games: A cross-sectional study. *British Journal Of Sports Medicine*, *47*(16), 1-5

Neff, J., Lynch, C., & Downs, J. (2010). Alcohol use, predisposing, enabling, and oral health need variables as predictors of preventive and emergency dental service use. *Substance Use & Misuse*, *45*(12), 1930-1947

Okunseri, C., Okunseri, E., Thorpe, J., Xiang, Q., & Szabo, A. (2012). Patient characteristics and trends in nontraumatic dental condition visits to emergency departments in the United States. *Clinical, Cosmetic And Investigational Dentistry*, *4*1-7. doi:10.2147/CCIDEN.S2816

Oral health: Objectives. (2010). Retrieved June 20, 2014, from http://www.healthypeople.gov/2020/topicsobjectives2020/objectiveslist.aspx?topicId=32

Patel, R., Miner, J. R., & Miner, S. L. (2012). The need for dental care among adults presenting to an urban ED. *American Journal Of Emergency Medicine*, *30*(1), 18-25. doi:10.1016/j.ajem.2010.09.011

Petersen, P., Bourgeois, D., Ogawa, H., Estupinan-Day, S., & Ndiaye, C. (2005). The global burden of oral diseases and risks to oral health. *Bulletin Of The World Health Organization*, *83*(9), 661-669

Plančak, D., & Puhar, I. (2012). Periodontal diseases as a risk factor. *Rad Hrvatske Akademije Znanosti I Umjetnosti. Medicinske Znanosti*, *511*(38), 39-47

Quiñonez, C. (2011). Self-reported emergency room visits for dental problems. *International Journal Of Dental Hygiene*, *9*(1), 17-20. doi:10.1111/j.1601-5037.2009.00416.x

Ramraj, C., Sadeghi, L., Lawrence, H. P., Dempster, L., & Quiñonez, C. (2013). Is accessing dental care becoming more difficult? Evidence from Canada's middle-income population. *Plos ONE*, *8*(2), 1-6. doi:10.1371/journal.pone.0057377

Rugg-Gunn, A. (2013). Dental caries: Strategies to control this preventable disease. *Acta Medica Academica*, *42*(2), 117-130. doi:10.5644/ama2006-124.80

Satcher, D. (2000). *Oral Health in America: A Report of the Surgeon General* (United States of America, National Institutes of Health, National Institute of Dental and Craniofacial Research). Retrieved from http://www.nidcr.nih.gov/DataStatistics/SurgeonGeneral/sgr/TOC.htm

Scannapieco, F. A., Wang, B., & Shiau, H. J. (2001). Oral bacteria and respiratory infection: Effects on respiratory pathogen adhesion and epithelial cell proinflammatory cytokine production. *Annals of Periodontology, 6*(1), 78-86. doi: 10.1902/annals.2001.6.1.78

Schrimshaw, E. W., Siegel, K., Wolfson, N. H., Mitchell, D. A., & Kunzel, C. (2011). Insurance-related barriers to accessing dental care among African American adults with oral health symptoms in Harlem, New York City. *American Journal Of Public Health,101*(8), 1420-1428. doi:10.2105/AJPH.2010.300076

Seirawan, H., Faust, S., & Mulligan, R. (2012). The impact of oral health on the academic performance of disadvantaged children. *American Journal Of Public Health*, *102*(9), 1729-1734. doi:10.2105/AJPH.2011.300478

Selwitz, R., Ismail, A., & Pitts, N. (2007). Dental caries. *Lancet*, *369*(9555), 51-59

Sharma, N., & Shamsuddin, H. H. (2011). Association between respiratory disease in hospitalized patients and periodontal disease: A cross-sectional study. *Journal Of Periodontology*, *82*(8), 1155-1160. doi:10.1902/jop.2011.100582

Table 1. Emergency department visits, by selected hospital characteristics: United States, 2010 [Chart]. (2010). In *National Hospital Ambulatory Medical Care Survey: 2010 Emergency Department Summary Tables*. Retrieved from http://www.cdc.gov/nchs/data/ahcd/nhamcs_emergency/2010_ed_web_tables.pdf

Table 4. Wait time at emergency department visits: United States, 2010 [Chart]. (2010). In *National Hospital Ambulatory Medical Care Survey: 2010 Emergency Department Summary Tables*. Retrieved from http://www.cdc.gov/nchs/data/ahcd/nhamcs_emergency/2010_ed_web_tables.pdf

Table 6. Expected source(s) of payment at emergency department visits: United States, 2010 [Chart]. (2010). In *National Hospital Ambulatory Medical Care Survey: 2010 Emergency Department Summary Tables*. Retrieved from http://www.cdc.gov/nchs/data/ahcd/nhamcs_emergency/2010_ed_web_tables.pdf

Table 12. Twenty leading primary diagnosis groups and presence of chronic disease at emergency department visits: United States, 2010 [Chart]. (2010). In *National Hospital Ambulatory Medical Care Survey: 2010 Emergency Department Summary Tables*. Retrieved from http://www.cdc.gov/nchs/data/ahcd/nhamcs_emergency/2010_ed_web_tables.pdf

Texas Dental Association. (2008). Building better oral health: A dental home for all Texans. *Texas Dental Journal, Suppl*, 1-56

Tomar, S., & Asma, S. (2000). Smoking-attributable periodontitis in the United States: Findings from NHANES III. National Health and Nutrition Examination Survey. *Journal Of Periodontology*, *71*(5), 743-751.

U.S. Department of Health and Human Services. (2000). Oral health in America: A report of the Surgeon General. Rockville, MD: U.S. Department of Health and Human Services, National Institute of Dental and Craniofacial Research, National Institutes of Health.

Vellappally, S., Fiala, Z., Smejkalová, J., Jacob, V., & Shriharsha, P. (2007). Influence of tobacco use in dental caries development. *Central European Journal Of Public Health*, *15*(3), 116-121.

Wallace, N., Carlson, M., Mosen, D., Snyder, J., & Wright, B. (2011). The individual and program impacts of eliminating Medicaid dental benefits in the Oregon Health Han. *American Journal Of Public Health*, *101*(11), 2144-2150

Yih-Ing, H., Maglione, M., & Boyle, K. (1999). Validity of self-report of drug use among STD patients, ER patients, and arrestees. *American Journal Of Drug & Alcohol Abuse*, *25*(1), 81

Zeng, Y., Sheller, B., & Milgrom, P. (1994). Epidemiology of dental emergency visits to an urban children's hospital. *Pediatric Dentistry*, *16*(6), 419-423.