

Impacts of Socioeconomic Status on Dentoalveolar Trauma

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ABSTRACT

Introduction: Children sustain dentoalveolar trauma and lose teeth at the same rate regardless of socioeconomic status; however, debate surrounds these rates in adults. It is known socioeconomic status plays a major role in access and treatment in health care. This study aims to clarify the role of socioeconomic status as a risk factor for dentoalveolar trauma in adults.

Methods: A single center retrospective chart review took place from January 2011 through December 2020 for patients requiring oral maxillofacial surgery consultation in the emergency department, due to either dentoalveolar trauma (Group 1) or other dental condition (Group 2). Demographic information including age, sex, race, marital status, employment status, and type of insurance were collected. Odds ratios were calculated by chi-square analysis with significance set at $P < 0.05$.

Results: Over the course of 10 years, 247 patients (53% female) required an oral maxillofacial surgery consultation, with 65 (26%) sustaining dentoalveolar trauma. Within this group, there were significantly more subjects who were Black, single, insured with Medicaid, unemployed, and 18–39 years old. In the nontraumatic control group, there were significantly more subjects who were White, married, insured with Medicare, and 40–59 years old.

Conclusions: Among those seen in the emergency department requiring an oral maxillofacial surgery consultation, those with dentoalveolar trauma have an increased likelihood of being single, Black, insured with Medicaid, unemployed, and 18–39 years old. Further research is needed to determine causality and the most critical/influential socioeconomic status factor in sustaining dentoalveolar trauma. Identifying these factors can assist in developing future community-based prevention and educational programs.

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INTRODUCTION

Dentoalveolar trauma (DAT) represents a serious public health problem, with approximately one-third of children and one-fifth of adolescents and adults sustaining a traumatic dental injury in their lifetime.^{1,2} Complex risk factors and confounding variables, including one's socioeconomic status (SES), play a large role in these rates of trauma. There is debate surrounding the impact of SES on the rates of DAT in children; however, most studies demonstrate no correlation between DAT rates and SES.³⁻⁶ Current dentoalveolar research has focused on the pediatric population rather than the adult population, thus creating a gap in knowledge surrounding the effects of socioeconomic factors on DAT in the adult population.²

While there is a gap in dentoalveolar research in adults, a few studies do address the effects of SES on other types of injuries in the adult population. For example, Zalecki et al demonstrated that males sustain traumatic dental injuries at least twice as often as females (ratio ranging from 1.5-2.5:1.0, males:females).⁷ Others have similarly demonstrated that risk factors for oral and maxillofacial trauma include the male sex and a younger age.^{5,8-10} While these risk factors are well-known, there is a gap in knowledge regarding other socioeconomic factors in adult trauma, such as relationship status, employment status, and insurance type. One study indicates a higher rate of hospitalization following general trauma in adults of a lower SES ver-

sus those in a higher SES; yet there was no significant difference between groups when comparing rates of maxillofacial and dental injuries.¹¹ This brings up another highly debated topic – the definition of low SES.

Low SES can be defined in a variety of ways: annual income, type of insurance, the highest level of educational achievement, and type of employment.¹² Based on average annual income, the most common racial or ethnic group living below the poverty line in Wisconsin (the location in which this study took place) is White, followed by Black and Hispanic, yet the race/ethnicity of the highest paid Wisconsin workers is also White.¹² The largest demographic living in poverty is females aged 18–24 years old, followed by males aged 18–24 years old, and females aged 25–34 years old, respectively.^{12,13} Overall, 11.3% of those living in Wisconsin in 2019 were considered living in poverty.¹² For this study, insurance type is the primary determinant of SES; Medicaid insurance and no insurance coverage are indications of a lower SES.¹⁴ As a baseline, in Wisconsin, 5.71% of the population is uninsured, and 13.4% have Medicaid coverage.¹²

While SES is a difficult topic to standardize across research, prior studies demonstrate an influence of SES on the incidence of adult trauma. Until now, however, there has been virtually no investigation that delineates the relationship between SES factors and DAT. Our study analyzed patient demographics and SES factors in adults who sustained DAT through a single-center retrospective review across 10 years to understand prospective disparities related to these injuries.

METHODS

The OTO Clinomics platform and processes for querying the electronic medical record in our health system were approved by the Medical College of Wisconsin/Froedtert Hospital Institutional Review Board (PRO00036649). The Clinical Research Data Warehouse, a component of the Clinical and Translational Science Institute of Southeast Wisconsin (UL1TR001436), maintains a monthly updated mirror of the entire electronic health record system in a Jupyter Hub (jupyter.org).

The Froedtert and the Medical College of Wisconsin health network predominantly serves southeastern Wisconsin and contains over 1.3 million individual patient records. Its academic medical center is the only Level 1 trauma center in the region.

Patient Demographics

Electronic medical records for all adult patients (≥ 18 years) requiring oral maxillofacial surgery (OMFS) consultation after being seen in the emergency department (ED) from January 2011 to December 2020 were selected for data extraction. Data extracted for each patient included diagnosis, age, race, ZIP code of primary residence, marital status, employment status, and insurance status at, or nearest to, the date of encounter.

Regional Demographic and Socioeconomic Data

US Census Bureau data (2010–2014) was accessed to determine the median age, race and/or ethnic distribution, median household income, educational level, and insurance status distribution for adults in each ZIP code from southeast Wisconsin. ZIP codes were stratified by median income into groups of $< \$42,000$, $\$42,000$ – $\$53,100$; $\$53,101$ – $\$59,300$; $\$59,301$ – $\$67,500$; $\$67,501$ – $\$77,800$; $\$77,801$ – $\$87,000$; and $> \$87,000$. This stratification was used to be consistent with DATAUSA (datausa.io), a publicly accessible database compiling multiple government sources, including the Census Bureau, the Bureau of Labor Statistics, and the Bureau of Economic Analysis.

Statistical Analyses

Patients were divided into 2 groups. Group 1 was composed of patients sustaining DAT, which included International Classification of Diseases 10 (ICD 10) codes S02.5XXA, 5XXB, 5XXD, 5XXG, 5XXK, 5XXS, K08.411–414, K08.419, S03.2XXA, 2XXD, 2XXS, M26.34, M26.33. Group 2 was composed of patients requiring OMFS consultation due to any other etiology (eg, infections, abscesses, temporomandibular joint disorders, or follow-up from previous dental procedure); ICD 10 codes K00–K14 (K04.7, K08.89, K12.2) and M26.60. Group 2 was used as a control group.

Patient characteristics all were obtained through query of the electronic medical record by one researcher. Population-level data were computed from census records. Age between groups was compared using independent 2-group *t* test. Median values and interquartile ranges are reported and $P < 0.05$ represents statistically significant differences. Odds ratios were performed to compare the likelihood of a certain age, sex, race, marital status, employment status, and insurance type in Group 1 versus Group 2. All statistical tests were performed within the Jupyter notebook using R language (3.6.1).

RESULTS

Over the course of 10 years, 247 patients (53% female) required an OMFS consultation in the ED. Of the 65 patients (26%) who sustained DAT (Group 1), the average age was 42 years old, with the majority of patients ages 18–39 years (52%). Additionally, 57% were male, 68% were single, 63% were Black, 54% had Medicaid insurance coverage, and 40% were unemployed (Table, Figure 2).

By comparison, of the 182 (74%) control subjects who required OMFS consultation for a different reason (Group 2), the average age at consultation was 47 years old (18–90 years), with an even distribution across age ranges 18–90 years old. Further, 56% were female, 49% were single, and 55% were White. There were no significant differences in rates of insurance type (33% Medicaid, 37% Medicare, 26% private insurance). A majority (51%) were employed full time (Table, Figure 1).

Statistically significant differences between the two groups

were found for almost all variables tested. There were significantly more subjects with DAT who were Black ($P=0.002$), single ($P=0.010$), insured with Medicaid ($P=0.005$), unemployed ($P=0.012$), and 18–39 years old ($P=0.036$). Conversely, the nontrauma group had significantly more subjects who were White ($P<0.001$), married ($P=0.017$), insured with Medicare ($P=0.017$), and 40–59 years old ($P=0.027$). While there was no statistically significant difference in number of males between the two groups ($P>0.597$), a majority of those who sustained DAT were male (57%) (Table).

Overall, there was an increased likelihood that those who sustained DAT were Black (OR 2.55; 95% CI, 1.42–4.55), single (OR 2.14; 95% CI, 1.18–3.85), insured with Medicaid (OR 2.37; 95% CI, 1.33–4.17), unemployed (OR 2.31; 95% CI, 1.27–4.17), and 18–39 years old (OR 1.93; 95% CI, 1.09–3.45) (Table).

DISCUSSION

There is a gap in knowledge regarding the influence of race and SES in adult DAT. This study uniquely addresses this gap by demonstrating significant correlations between adult DAT and race, age, insurance, employment status, and marital status. Further, while not statistically significant, our study demonstrates the majority of those who sustained DAT were male, consistent with other reports that males have a higher likelihood of sustaining trauma than females.^{5,10,15}

When looking at age at the time of OMFS consultation, results demonstrated that those who sustained DAT were more likely to be younger adults (aged 18–39 years). Sbordone et al and Rose et al similarly found a higher percentage of those sustaining maxillofacial trauma to be males aged 19–39 years old.^{16,17} A comparable trend also was found when looking at emergency hospital admissions due to violence, showing an increased prevalence in young males.¹⁸

While there is limited research surrounding the incidence of DAT and marital status, a few studies indicate unmarried or single individuals have an increased likelihood of sustaining violence-related or burn injuries, respectively.^{19,20} The current study expands these findings to indicate that DAT is more prevalent in those who are single.

Moreover, prior reports suggest Black patients are more likely

Table. Comparison of Adult Patient Characteristics Among Those Who Sustained Dentoalveolar Trauma to Those Who Received Oral Surgery Consultation Due to a Different Etiology

	Group 1 DAT (n=65)		Group 2 No DAT (n=182)		Odds 1 vs 2	CI for OR	Chi-square Value	P value
Race (%)								
White	31%	20	55%	101	0.36	0.19–0.65	11.5	<0.001 ^b
Black	63%	41	40%	73	2.55	1.43–4.55	9.2	0.002 ^c
Asian	0%	0	2%	3			0.2	0.689
American Indian	2%	1	1%	1	2.82	0.17–50.0	0.0	1.000
Other ^a	5%	3	2%	4	2.16	0.47–10.0	0.3	0.579
Sex								
Male	57%	37	44%	80	1.68	0.95–2.94	2.7	0.098
Female	43%	28	56%	102	0.59	0.34–1.05	2.7	0.098
Marital status								
Single	68%	44	49%	90	2.14	1.18–3.85	5.8	0.010 ^d
Married	15%	10	31%	57	0.40	0.19–0.84	5.8	0.017 ^d
Widowed	9%	6	8%	15	1.13	0.42–3.03	0.0	1.000
Divorced	8%	5	8%	14	1.00	0.35–2.86	0.0	1.000
Separated	0%	0	1%	2			0.0	0.960
Insurance								
Medicaid	54%	35	33%	60	2.37	1.33–4.17	7.8	0.005 ^c
Medicare	20%	13	37%	67	0.43	0.22–0.85	5.7	0.017 ^d
Private	18%	12	26%	47	0.65	0.3–1.32	1.1	0.297
Combo	3%	2	2%	4	1.41	0.25–7.69	0.0	1.000
None	5%	3	2%	4	2.16	0.47–10.0	0.3	0.579
Employment								
Full Time	37%	24	51%	92	0.57	0.32–1.01	3.2	0.0732
Part Time	8%	5	6%	11	1.30	0.43–3.85	0.03	0.858
Unemployed	40%	26	22%	41	2.31	1.27–4.17	6.3674	0.012 ^d
Retired	15%	10	18%	33	0.83	0.38–1.79	0.0873	0.7676
Self Employed	0%	0	3%	5			0.8376	0.3601
Age group (%)								
<18	0%	0	1%	1			0.0	1.000
18-39	52%	34	36%	66	1.93	1.09–3.45	4.4	0.036 ^d
40-59	23%	15	38%	70	0.47	0.25–0.90	4.9	0.027 ^d
≥60	25%	16	25%	45	0.99	0.52–1.92	0.0	1.000
Mean	42.25		46.79					
SD	18.44		17.73					

^a“Other” race encompassed American Indian or Alaska native and multiracial.
 Statistically significant values included ^b $P<0.001$, ^c $0.01<P<0.05$, and ^d $P<0.05$.

to sustain maxillofacial and general trauma than those who are White or other races.^{15,17} Comparable results were found when researching penetrating trauma as well; penetrating trauma was more likely to occur in patients who identified as Black or Hispanic versus White patients.²¹ This study specifically reveals that those seen in the ED for DAT were more likely to be Black. In contrast, there have been reports of facial trauma being more likely to occur in individuals who are White versus those who are Black. Hanba et al analyzed the National Electronic Injury Surveillance System to reveal that both White and Asian individuals (of either sex and across age groups) had significantly greater rates of facial fracture injury than Black individuals.²²

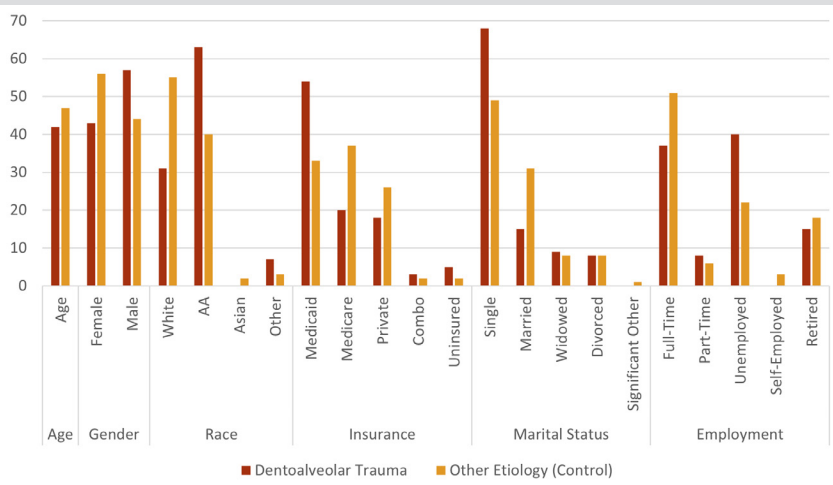
The last statistically significant SES factors correlating with DAT were employment status and insurance type. Individuals who sustained DAT were more likely to be both unemployed and insured by Medicaid. While this study looked at those who

sustained DAT due to a variety of etiologies (eg, assault, fall, motor vehicle accidents), a different study looking at assault by burn injury showed an increased likelihood that victims were female, Black, single, unemployed, and insured by Medicaid.²⁰ Another study looking at recurrent trauma found an increased prevalence of trauma in males, those who are Black, and the uninsured.^{20,21,23} Further, penetrating trauma victims were more likely to be either uninsured or receive state or county aid.²⁴

While these comparable studies demonstrate significant differences in trauma rates across various socioeconomic factors, prior to this study, none have taken into account rates of DAT, in particular. Most studies on DAT focus on the etiology or type of injury but fail to evaluate risk factors.^{9,25,26} Our study explores these socioeconomic risk factors, revealing a significant difference between individuals requiring an OMFS consultation for DAT or for another etiology. Specifically, results showed an increased likelihood of individuals sustaining DAT to be young (18-39 years old), single, unemployed, Black, and insured by Medicaid.

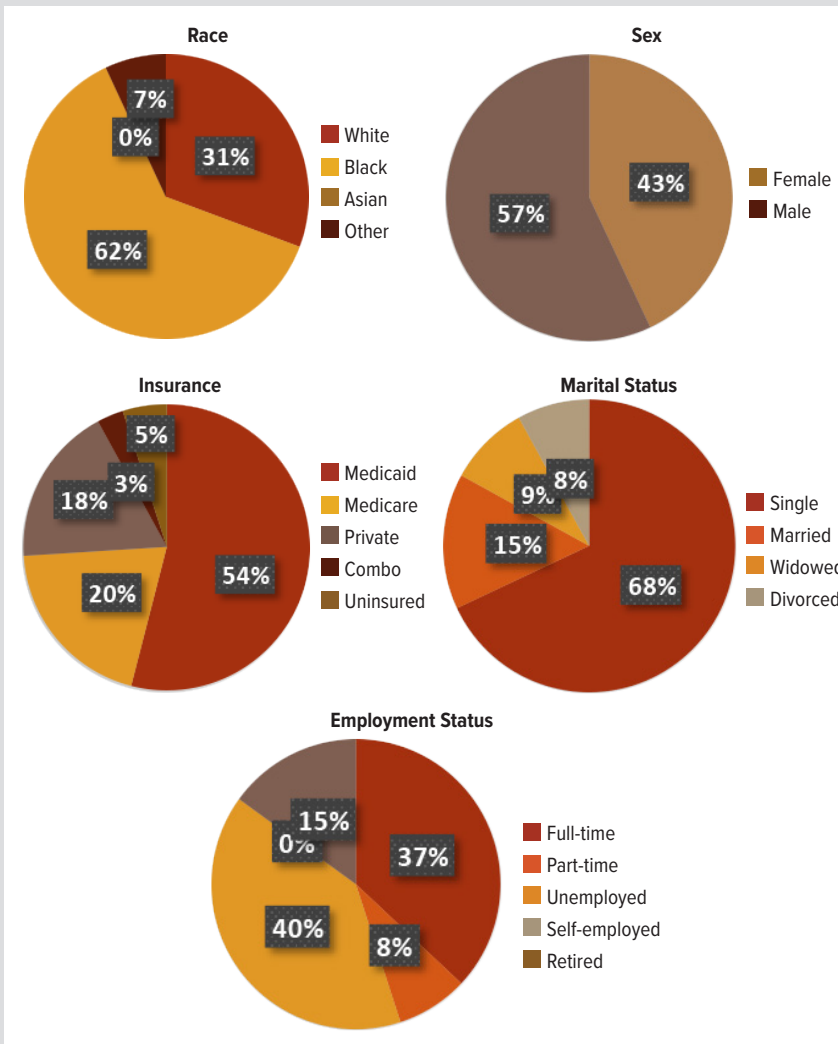
It is interesting to point out that there is an oral health access issue in Wisconsin.²⁷ The Wisconsin Oral Health Program noted that in a statewide basic screening survey of adults aged 21-74 in 2010 and 2011 (N = 1495), there were disparities for vulnerable populations, although the overall difficulties with dental services were low. They found that Black patients were significantly twice as likely to have untreated decay and were also significantly more likely to report having difficulty gaining access to dental services than White patients. Additionally, adults with an income less than \$25,000 had significantly higher percentages of untreated decay, need for dental care, and self-reported oral health problems.²⁷ These findings would suggest Black patients are more likely to seek dental care at a nontraditional clinic, such as an ED. Yet, in our study, more Whites patients (N = 101) than

Figure 1. Demographic Data Between Those Sustaining Dentoalveolar Trauma and Those Requiring Oral Maxillofacial Surgery Consult for a Different Etiology Based on Percentages



Note: "Other" race encompassed American Indian or Alaska native and multiracial. Statistically significant values included ^b $P < 0.001$, ^c $0.01 < P < 0.05$, and ^d $P < 0.05$.

Figure 2. Demographic Breakdown of Those Sustaining Dentoalveolar Trauma



Black patients (N=73) went to the ED for a dental issue that was not considered DAT.

A few limitations to our study include its bias as a single-center study; generalizations may not accurately translate to other populations in different areas of the country or world. Regional, cultural, and seasonal differences all affect the incidence of trauma. Furthermore, retrospective data collection is limiting when compared to a prospective, longitudinal data collection. By the same token, this dataset includes only patients actually seen for OMFS in the ED; thus, patients requiring outpatient follow-up only for DAT may skew results. Finally, while variables were analyzed between groups, each variable may have an influence on the other, and confounding variables do exist.

Yet, it is critical these issues are addressed to determine not only the best way to research effects of SES on trauma/injury but also to determine the best way to decrease the risk of injury in specific populations, whether that is through educational and social programs or another methodology. In this study, the likelihood of DAT was more common in Black individuals, which may be, in part, reasoned by racial/ethnic disparities. Non-White populations are more likely to live in socioeconomically disadvantaged areas than White populations, which is the case in Wisconsin.²⁸ Furthermore, while DAT trauma was more common in individuals who were unemployed and insured by Medicaid, Girasek et al noted that individuals of a lower SES are less likely to believe injury is preventable and, thus, less likely to practice effective injury-prevention measures.^{28,29} This highlights that there is need for greater understanding of the reasons certain SES factors lead to a higher likelihood of trauma—whether that be due to environmental, social, behavioral, or perceptual differences—and how to best implement change to decrease trauma risk.

CONCLUSIONS

While there is a gap in knowledge of the effects of socioeconomic and racial inequalities on DAT in adults, this study reveals that those who sustain DAT are more likely to be young adults, Black, insured with Medicaid, single, and unemployed. By highlighting the various social determinants correlating to DAT, it is hoped that this research will aid in establishing social support and educational programs to decrease the disproportionate incidence of dentoalveolar trauma.

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