

# Emergency department visits and dental procedures: Mission of Mercy, 2013–2016

This article was published in the following Dove Press journal:  
*Clinical, Cosmetic and Investigational Dentistry*

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**Objective:** This study compared attendees at Wisconsin Mission of Mercy (MoM) events with and without prior emergency department (ED) visits for dental care in terms of demographic characteristics and dental procedures received.

**Methods:** De-identified archival data available from the America's Dentists Care Foundation (2013–2016) were analyzed. Summary statistics were calculated based on prior ED visit status for county-level characteristics and type of dental procedures received. Generalized estimating equation models with logistic links were fitted to examine associations between the predictor and independent variables.

**Results:** Most attendees were White, adult females (mean age 37 years). Current dental pain was reported by 61% vs 33% of attendees with and without prior ED visit. Cleaning (57%) was the most common procedure received by attendees with no prior ED visits, while extractions (47%) were the most common for those with prior ED visits. Among MoM attendees, males had higher odds of prior ED visits compared to females. Compared to White, Black had higher odds and Hispanic had lower odds of having prior ED visits. In the multivariable analysis, dental pain (OR: 3.32; 95% CI: 2.75, 4.02) had the strongest association with prior ED visits. Attendees with prior ED visit history had higher odds of receiving extractions and restorative care, compared to cleaning after adjustment for person and county-level characteristics.

**Conclusion:** Among MoM attendees, prior ED visits were associated with not being Hispanic, being male, and having dental pain. Compared to attendees with no prior ED visit, those with prior ED visits had higher odds of receiving restorative care and extractions.

**Keywords:** oral health, access to dental care, emergency services

## Introduction

Wisconsin Mission of Mercy (MoM) events serve as an opportunity for dental professionals to give back to the community by seeing patients who otherwise have difficulty accessing regular dental care. These events are organized across the country and are managed at the local level with assistance from the America's Dentists Care Foundation to address acute dental needs of attendees. As of 2017, the program had served a total of 254,000 patients and provided \$166 million in free oral health care.<sup>1,2</sup> Wisconsin Dental Association describes a successful MoM event as one that among other things raises public awareness about barriers to accessing dental care and provides free care to patients currently in pain or with infection.<sup>3</sup>

In 2008, Okunseri et al reported that Native Americans, adults and those residing in entire dental health professional shortage areas in Wisconsin had a significantly higher

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likelihood of visiting emergency departments (EDs) and physician offices for nontraumatic dental conditions.<sup>4</sup> According to a report published by the Anderson Economics Group, more than 7,000 of ED visits at a cost of \$15 million were due to preventable dental conditions in the state of Michigan alone in 2011.<sup>5</sup> Despite the high price tags associated with these preventable visits, many continue to use ED as their primary dental home.<sup>6</sup> In another study based on national data, from 2001 to 2008, ED visits for dental conditions increased primarily among people aged 18–44 who were uninsured African Americans.<sup>7</sup> These studies document the burden and impact of ED use for dental care and provide a testament to the problem of inadequate access to dental care.

The level of ED use for dental conditions is one indication for organizing MoM events in states. However, information on MoM attendees with and without prior ED visits and the type of dental procedures received is understudied. Findings from this study have the potential to improve how providers prepare for MoM events. In addition, they could provide much-needed information for appropriate programs and policy development to address problems associated with access to dental care. This study compared attendees at MoM events with and without prior ED visits for dental care in terms of demographic characteristics and dental procedures received.

## Methods

In this study, we analyzed de-identified archival data from the America's Dentists Care Foundation for 2013–2016. The Wisconsin MoM organizing committee selects different sites for MoM events based on a number of criteria, some of which include “having a strong local dental society with dentists interested in helping to plan and volunteer, and local community involvement (e.g., oral health coalition, businesses, practitioners) to help with recruitment of volunteers and fundraising (dollars and in-kind donations). The site selected is expected to house the dental treatment space and have sufficient local hotels and other housing options for 900 + volunteers, the majority of whom will travel to the community” (3). The events are usually 2 days long with children and adults invited to receive free dental care. Patients are accepted on a first come, first serve basis and no questions are asked regarding their financial status.

## Data collection

Demographic and health history data are collected via a written registration form followed by a more detailed exit interview where information on dental procedures received and patient experience are collected and entered into a central database. The data are de-identified by organizers of MoM to remove attendees' identities. Information related to prior ED use is self-reported during the exit interview by answering the question “Have you ever visited an emergency room or emergency clinic for dental pain?”. The America's Dentists Care Foundation provided the software package hosted on the same server that has been used to collect data at all Wisconsin MoM events since 2013. Travel effort by attendees was quantified as the self-reported travel time collected via a questionnaire. Some of the questions in the questionnaire were “What, if any, insurance do you have that pays for dental care?”, “Do you have a place to be seen for dental care after today?”, “Before coming to the clinic today, were you in dental pain?”. All missing data due to age, sex, and race/ethnicity were excluded from our database. The Marquette University Institutional Review Board determined that our study did not require approval due to the de-identified nature of the data to be analyzed.

## Statistical analysis

Summary statistics were calculated separately for participants with or without prior ED visits for demographic and county-level characteristics such as age, travel time to the event, dentist per population rate of participant's county of residence, gender, race/ethnicity, dental pain, dental insurance, having a place to go for dental care, as well as the various types of dental procedures received at the MoM event. *t*-test or Student's *t*-test and Chi-square test were performed to identify any significant differences in the continuous and categorical variables.

Logistic regression was conducted to study the association (odds ratio) between prior ED visit and demographic and county-level characteristics. An additional generalized estimating equation (GEE) model with logistic link treating the provision of each type of procedure as correlated binary outcomes was fitted to study the association (odds ratio) between ED visit history and the type of dental procedure performed, adjusting for person and county-level characteristics including year of the event, age, sex, race/ethnicity, dental insurance, dental pain, place to go for dental care, dentist per capita rate in the resident county,

and self-reported travel time. The multivariate GEE model was chosen instead of separate logistic regressions for each procedure type as it provides more precise estimates of the effects by incorporating the correlations between the procedure types. Travel time was log-transformed to improve linearity.

## Results

Over the 4-year study period, 5,333 Wisconsin residents have visited a Wisconsin MoM event. Of them, 1,032 (19%) reported having ever visited an emergency room for dental pain. Table 1 shows the distribution of

**Table 1** Descriptive statistics of demographics and county-level characteristics as well as type of procedure received with and without prior emergency visits status for MoM attendees

Attendees <sup>a</sup>	No prior emergency department visit		With prior emergency department visit		P-value
	4301		1032		
	Mean	SD	Mean	SD	
Age	36.9	18.6	37.2	14.3	0.522
Self-reported travel time	36.4	23.8	39.9	26.3	<0.001
County based travel distance	44.2	64.9	48.8	64.3	0.039
	N	% <sup>b</sup>	N	% <sup>b</sup>	
<b>Gender</b>					0.14
Female	1644	55.0	395	52.0	
Male	1337	45.0	368	48.0	
<b>Race/Ethnicity</b>					<0.001
Black	95	4.0	43	7.0	
Hispanic	757	30.0	116	18.0	
White	1532	62.0	465	72.0	
Other	98	4.0	20	3.0	
Dental pain	1414	33.0	631	61.0	<0.001
Have dental insurance	1154	27.0	329	32.0	0.001
Have place to go for dental care	1584	37.0	347	34.0	0.026
Extraction	1222	28.0	480	47.0	<0.001
Restorative care	1618	3.08	366	35.0	0.098
Cleaning	2443	57.0	450	44.0	<0.001
Root canal	68	2.0	25	2.0	0.051
X-ray	459	11.0	140	14.0	0.007

**Notes:** <sup>a</sup>Only attendees from Wisconsin are included. <sup>b</sup>Calculated from non-missing values.

demographic characteristics of attendees based on no prior and with prior ED visit history. There was no substantial variability in age or gender between the two groups. White attendees were overrepresented, while Hispanic attendees underrepresented among those reporting a prior ED visit. Slightly more attendees with a history of ED visit reported that they had dental insurance (32% vs 27%), fewer reported having a place to go for dental care (34% vs 37%), and almost twice as many reported having dental pain before the current MoM visit (61% vs 33%). They also had longer mean self-reported travel time (40 vs 36 mins) and county-based travel distance (49 vs 44 miles). Cleaning was the most prevalent dental procedure received by attendees with no prior ED visit history, while extraction was the most prevalent procedure received by those with prior emergency department visits.

Table 2 shows multivariable logistic regression analysis of factors associated with prior ED visit among MoM attendees. Compared to females, males had higher odds (OR 1.22; 95% CI: 1.02, 1.47) of having had a prior ED visit. Compared to White, Blacks had higher odds (OR: 1.41; 95% CI: 0.94, 2.11) of prior ED visits and Hispanics had lower odds (OR: 0.60; 95% CI: 0.47, 0.76) and both were statistically significant. Among MoM attendees, those who reported that they had dental pain had higher odds (OR=3.32; 95% CI: 2.75, 4.02) of prior ED visit. In addition, attendees with longer self-reported travel time had higher odds of prior ED visits with 7% increase in odds per every twofold increase in the travel time (95% CI: 1%, 14%).

Table 3 shows the effect of prior ED visit history in a multivariable logistic regression analysis of factors associated with dental procedures received at the MOM adjusting for person and county-level characteristics, including year of event, age, sex, race/ethnicity, dental insurance, dental pain, having a place to go for dental care, dentist per capita rate in resident county, and travel time. Prior ED visit was associated with higher odds of having an extraction, restorative care, or x-ray compared to cleaning, with estimated ORs ranging from 1.44 to 2.76.

## Discussion

We found that a substantial number of attendees had no history of ED visits prior to attending the Wisconsin MoM events. Although this finding was surprising to investigators, it does not negate the fact that Wisconsin continues to rank near the

**Table 2** Multivariable analysis of factors associated with prior emergency department visits for dental pain among Mission of Mercy attendees

Variable	Odds Ratio (OR)	95% CI	p-value
Year 2013	Reference		
Year 2014	0.99	0.77, 1.28	0.95
Year 2015	1.14	0.88, 1.46	0.32
Year 2016	0.56	0.34, 0.94	0.03
Age	1.00	0.99, 1.00	0.24
<b>Gender</b>			
Female	Reference		
Male	1.22	1.02, 1.47	0.03
<b>Race/Ethnicity</b>			
White	Reference		
Black	1.41	0.94, 2.11	0.10
Hispanic	0.60	0.47, 0.76	<0.0001
Other	0.65	0.38, 1.11	0.11
Have dental insurance	1.17	0.95, 1.44	0.14
Dental pain	3.32	2.75, 4.02	<0.0001
Have place to go for dental care	0.82	0.67, 1.01	0.06
Dentist rate in resident county (per 100,000 people)	1.01	0.94, 1.09	0.81
Self-reported travel time (twofold change)	1.07	1.00, 1.14	0.06

**Table 3** Multivariate logistic regression analysis of association between dental procedures received at the Mission of Mercy events and prior emergency department visits

Procedure	OR <sup>a</sup>	95% CI	p-value
Cleaning	Reference		
Extraction	2.76	2.01, 3.80	<0.0001
Restorative care	1.44	1.10, 1.90	0.008
Root canal	1.68	0.86, 3.28	0.13
X-ray	1.80	1.27, 2.54	0.001

**Note:** <sup>a</sup>Adjusting for personal and county-level characteristics, including year of the event, age, sex, race, dental insurance, dental pain, place to go for dental care, dentists per capita in resident county, and self-reported travel time

bottom in measures of dental Medicaid utilization and reimbursement. We identified that majority of the attendees at the MoM events were White adult females. This finding regarding race/ethnicity was not entirely surprising because White represents the majority population that resides at those locations (Lake Geneva, Fond du Lac, Eau Claire, and Green Bay) where MoM events took place. However, our data on ED visits support the contention that inadequate access to dental care exists even in White communities.

In this study, there was a statistically significant difference in the mean self-reported travel time between attendees

with and without prior ED visits attending the MoM events. Attendees with no prior ED visit had shorter travel time which corresponded to the reported shorter county travel distances to the MoM event. County-based travel distance is largely dependent upon the geographic density distribution within a county and may be a good measure of access to the MoM event. It is possible that attendees took advantage of the event to address their urgent dental needs in the absence of the opportunity to visit a regular dental office. In addition, this finding is consistent with the idea that most people would prefer to travel shorter distances to seek more routine dental care.

Compared to attendees without prior ED visits, attendees with prior ED visits had higher odds of receiving extractions and restorations rather than cleanings at MoM events. This result indicates that attendees who received extractions most likely had teeth that were too diseased to be retained or restored. The combination of extractions and restorative care indicates a high burden of dental caries among attendees. This finding was not entirely surprising to investigators because they reflect a group of attendees with acute dental needs who are ready to take advantage of any opportunity such as the MoM to receive

urgently needed dental care. Since attendees with prior ED visits have increased dental needs, they could also be repeat ED users. Repeat ED visits for nontraumatic dental conditions have cost, policy, and practice implications. One potential practice and policy implication of this finding is the need to engage in more population-based preventive approaches. One population-based preventive approach which shows promise is the common risk factor approach which is typically directed at a risk factor related to more than one chronic disease.

Among attendees of MoM events, males had higher odds of having had prior ED visits compared to females. This finding is in sharp contrast to published literature based on state and national data indicating that females are more likely to use EDs for dental care.<sup>4,7</sup> However, this finding could reflect that males wait longer for the disease process to reach a crisis level before seeking dental care. Our findings in terms of the proportion of individuals reporting that they visited the ED was somewhat consistent with that reported by Paramore et al, who reported that about 27% of attendees stated that they had visited the ED for a nontraumatic dental condition prior to attending MoM event.<sup>8</sup>

Another interesting finding was that the year with highest prior ED visits (23%) correlated with the lowest proportion of patients reporting having a place to go for dental care (29%), and the year with the lowest prior ED visits (14%) had the highest proportion reporting having a place to go for dental care (51%). The finding that prior ED use was not higher for Blacks and was actually lower for Hispanics is somewhat in contrast with the documented evidence of racial/ethnic minority populations being disproportionately affected by inadequate access to dental care. Only about a third of the attendees at the MoM events reported that they had dental insurance and two-thirds did not regardless of any prior dental ED use history. Our finding is consistent with prior published literature regarding the association of a lack of dental insurance with low utilization of regular dental care. In addition, this finding suggests that the MoM events may be the only available source of dental care utilized by attendees.

Certain study limitations must be considered when interpreting our findings. First, we used a convenience sample, thus making it difficult to generalize our findings beyond the population that attended the MoM events in Wisconsin. In addition, our findings do not

constitute a causal relationship from the observed association between prior ED visit for dental care and dental procedures received at MoM events. Second, we used self-reported information that is subject to recall bias, and we also experienced a fair amount of missing data, especially for the year 2016, which was excluded from our analyses. Despite these limitations, our findings are clearly representative of the population attending MoM events at different locations in Wisconsin. Some strengths of the study are as follows: it expands our knowledge regarding the associations of factors related to prior ED use for dental care needs amongst attendees of MoM events; it provides some information about the different dental procedures attendees receive at these MoM events; and it provides a level of visibility into the impact of MoM events and the problem of access to dental care in Wisconsin. However, it is important to note that MoM events are not designed to be a permanent solution to the problem of access to dental care but rather serve as a stop-gap program addressing the urgent needs of a limited population. Policy-makers and dental health advocates must strive to identify and promote appropriate population-based policies that will enhance the prevention of common dental diseases. In addition, Thomas et al reported on the need to build community capacity and to integrate population health into MoM events to help address the connection between oral health and systemic health.<sup>9</sup>

## Conclusion

This study demonstrates that among MoM attendees, prior ED visits were associated with being Hispanic, male, and having dental pain. Compared to attendees with no prior ED visit, those with prior ED visits had increased odds of receiving restorative care and extractions at MoM events. Future research should explore the ethics, practice and program concerns of MoM events in addressing access to dental care.

## Acknowledgments

This research was funded by Delta Dental of Wisconsin. An abstract from this study was presented as a poster at the American Association for Dental Research (AADR) Meeting in Fort Lauderdale, FL, USA, in March 2018.

## Disclosure

FE reports to be employed by Delta Dental of Wisconsin during the conduct of the study and served as a board

director for the America's Dentists Care Foundation. The remaining authors declare that they do not have any conflicts of interest.

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