A Demographic Overview of Children in the Emergency Department: Findings from the NHAMCS, 2019-2021

Madison Taylor B.S., Oklahoma State University Center for Health Sciences, College of Osteopathic Medicine, Tulsa, Oklahoma

Allie Rice B.A., Oklahoma State University Center for Health Sciences, College of Osteopathic Medicine, Tulsa, Oklahoma

Amy Hendrix-Dicken, Ph.D., University of Oklahoma School of Community Medicine, Department of Pediatrics, Tulsa, Oklahoma

Christine Beeson, D.O., University of Oklahoma School of Community Medicine, Department of Pediatrics, Tulsa, Oklahoma

Micah Hartwell, Ph.D. Oklahoma State University College of Osteopathic Medicine at Cherokee Nation, Office of Medical Student Research, Tahlequah, Oklahoma
Oklahoma State University Center for Health Sciences, Department of Psychiatry and Behavioral Sciences, Tulsa, Oklahoma

Corresponding Author: Allie Rice, Oklahoma State University Center for Health Sciences
Address: 1111 W 17th St., Tulsa, OK 74107, United States.
Email: allie.rice@okstate.edu Phone: (918) 582-1972
Author Contributions: Dr. Hartwell had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. Study concept and design: Taylor, Rice, and Hartwell; Acquisition, analysis, or interpretation of data: Hartwell, Rice, and Taylor; Drafting of the manuscript: Taylor, Rice, and Hendrix-Dicken; Critical revision of the manuscript for important intellectual content: Beeson and Hartwell
Ethical Statement: This project does not qualify as human subject research as defined in 45 CFR 46.102 (d) and (f) and is not subject to oversight by the institutional review board. This study adhered to the Strengthening Reporting of Observational Studies in Epidemiology (STROBE) guidelines.
Conflicts of interest/Declarations: Dr. Hartwell receives research funding from the National Institute of Child Health and Human Development (U54HD113173), Human Resources Services Administration (U4AMC44250-01-02 and R41MC45951 PI: Hartwell), and the National Institute of Justice (2020-R2-CX-0014).
Funding: This study was not funded.

Background

Our primary objective was to analyze and describe the population characteristics —including race and ethnicity, age, insurance status, and comorbidities—among all pediatric ED visits included in the National Hospital Ambulatory Medical Survey (NHAMCS). Due to prevalent healthcare disparities, our secondary objective was to evaluate the demographic factors in triage level, ED wait times, and intentional vs unintentional traumas and poisoning.

Method

We conducted a cross-sectional analysis using the 2021 NHAMCS data to determine the prevalence of pediatric ED visits in the United States. Our sample consisted of 337 hospitals in the US, reporting 16,207 ED visits. We used X^2 tests logistic regression to assess wait times, triage level, and self-inflicted injuries or poisoning.

Results

Our results showed that Indigenous children's wait times were twice that of other racial groups. Additionally, rates of ED visits for trauma, poisoning, or overdose were higher in non-MSA regions. Lastly, children aged 15-17 had the highest percentage of emergent triage level visits—nearly double the percentage for all other age group categories.

Conclusion

In summary, our study represents a pediatric ED population primarily composed of children under 7 years of age, within MSA regions, and consistent with the national ethnoracial census. More than 12% of pediatric ED patients had 1 or more comorbidities, and nearly 3 in 5 visits were covered through Medicaid/CHIP. To improve overall access and decrease non-emergent ED usage, we recommend that healthcare workers implement extended hours, expanded language services, and use of telehealth.

Keywords

Pediatrics, Emergency Medicine, Systematic Reviews/meta-analyses, Rural Health, Health Care Disparities.

Introduction

Previous research has shown that trends in pediatric emergency department (ED) visits from 1997 to 2007, remained stable, though were substantial in number.[1] Multiple sources have investigated specific disease-related causes for pediatric ED visits, including diabetes, asthma, and mental health conditions—showing the reliance of individuals with these conditions on ED care.[2–4] Other studies have focused on other causes that may require medical care in an ED such as child maltreatment, unintentional injuries, and self-harm.[5–7] While these studies highlight the importance of emergency medical care, they focus on subsets of children utilizing EDs for care when a larger vantage point may elucidate broader patterns of ED usage and disparities that affect accessibility to or quality of healthcare.

While acute medical situations require immediate care—often within EDs—frequent ED usage is often associated with individuals who experience poorer social determinants of health.[8] A lower socioeconomic status can indicate a lack of health insurance which causes specific populations to utilize EDs more frequently than those with higher socioeconomic status.[9] Due to the Emergency Medical Treatments and Active Labor Act (EMTALA) enacted in 1986, all patients are guaranteed stabilizing medical care despite the ability to pay for that care.[10] This may cause many individuals to utilize ED care as their primary source of medical treatment due to it being more cost-effective. Other barriers that force patients to defer to ED care as opposed to primary care include ethnoracial disparities, language barriers, potential comorbidities, and maternal drug exposure during pregnancy. Additional barriers include geographic region and urbanicity.[11–13]

Given the prevalence of pediatric ED visits and the potential disparities associated with seeking healthcare, our primary objective was to identify and describe the population characteristics—including race and ethnicity, age, insurance status, and comorbidities—among all pediatric ED visits using data from the National Hospital Ambulatory Medical Care Survey (NHAMCS). Our secondary objectives were to evaluate potential differences among these demographic factors in triage level, ED wait times, and intentional vs unintentional traumas and poisoning.

Methods

We utilized data from the 2021 cycles of the NHAMCS to conduct a cross-sectional analysis. The NHAMCS is a national survey that collects information regarding hospital visits from their respective administrative units. In 2021, NHAMCS identified 470 hospitals, of which 377 met eligibility requirements. Of these EDs, 337 responded, which represented 502 emergency service areas across the US and accounted for 16,207 visits. The hospitals and ambulatory care service providers that were included in this study were noninstitutional and temporary EDs while federal, military, and VA hospitals were excluded. In order to gain valid information, all data was randomly collected throughout a random 4-week reporting period.

Inclusion criteria

For this study, we included visits for all children and adolescents under the age of 18, thereby excluding all adults. We also excluded cases where the individuals were reported to be dead on arrival at the hospital.

Patient demographic variables

The child demographic variables we included in our analysis were sex, age, race and ethnicity, comorbidities, payer/insurance status, and urbanicity. Racial groups, provided in the unimputed variable by NHAMCS included White, Black, Asian, Native Hawaiian/Other Pacific Islander (NHOPI), American Indian/Alaska Native (AI/AN), Multiracial, and races not listed. Imputed White and Black race designations were included in those respective categories where racial data was missing in the unimputed variable. We then used the imputed ethnicity variable within NHAMCS to account for Hispanic/Latino ethnicity for White and Black groups. Since groups with less than 30 are not suitable for analytic purposes, *Indigenous* peoples (AI/AN and NHOPI) were consolidated, as were the Multiracial and 'Other race not listed' groups. Comorbidities included asthma, depression, and obesity. Payer type was extracted from the NHAMCS data, which was recorded as expected payer source based on hierarchy: Medicare, Medicaid/CHIP, Private Insurance, Worker's Compensation, Self-Pay, No Charge/Charity, Other, or Unknown. Groups with less than 30 in the sample were consolidated into the 'Other' payer type category. Lastly, urbanity was defined as Metropolitan Statistical Area (MSA) versus non-Metropolitan Statistical Area (non-MSA) based on hospital designation as rural or urban.

Triage level, Wait Times, and self-inflicted injuries or poisoning

Triage levels are defined as "immediacy with which patient should be seen" in NHAMCS. The levels in NHAMCS include immediate (1), emergent (2), urgent (3), semi-urgent (4), and non-urgent (5). Other options for this variable include 'Unknown,' 'No triage reported for this visit but (ESA) does conduct nursing triage,' and 'Visit occurred in ESA that does not conduct nursing triage.' For parsimony, we merged immediate and emergent as they fall within the same scope within the Emergency Severity Index,[14] and collapsed unreported levels into a single 'Unknown' category.

Within the NHAMCS data set, wait times are collected as a continuous variable in minutes. The duration of a wait time can be defined as the amount of time that passes from when the patient entered ED triage to their first provider interaction. Lastly, to investigate rates of self-inflicted injuries or poisoning, we assessed 2 questions: "Is this visit related to an injury/trauma, overdose/poisoning or adverse effect of medical/surgical treatment?" and "Is this injury/overdose/poisoning intentional?" Responses to these questions were re-coded to reflect the following outcomes: 1) not related to trauma or poisoning, 2) unintentional trauma or poisoning, 3) intentional trauma or poisoning 4) questionable injury status, and 5) unknown type.

Statistical Analysis

For our first objective, we assessed the overall sociodemographic profile of children, in the 2021 NHAMCS sample and corresponding population estimates. We also assessed the rates of ED visits by ethnoracial groupings over triage level, mean wait times, and whether the visit was related to intentional or unintentional injuries. This assessment was also completed for the child's age group, the insurance type used for the visit, and the ED's MSA status. Design-based X^2 tests were utilized to determine associations among the categorical variables and binary linear regression was used to assess deviations in wait times. Survey design and sampling weights, provided by the NHAMCS, were employed and an alpha of 0.05 was set for all statistical tests which were conducted using Stata 16.1 (StataCorp., LLC, College Station, TX). This study does not meet the requirement of Human Subjects Research and was not submitted to an institutional review board for ethics review.

Results

Our sample included a total of 3,091 children, representing 28,873,375 children seen in EDs in the US. The majority of children were White, Non-Hispanic (n = 1407, 44.69%), male (n = 1590, 51.35%), between the ages of 0-2 years (n = 974, 34.28%), and had Medicaid/CHIP (n = 1758, 58.51%) (Table 1). Additionally, most children were from a metropolitan statistical area (n = 2687, 89.78%). The majority of children (n = 2633, 87.87%) did not have listed comorbidities. Of the children with comorbidities, the most commonly reported conditions were asthma (n = 253, 6.82%), depression (n = 114, 2.55%), and obesity (48, 1.05%). Across the entire cohort, most children were noted to have an 'unknown' triage level (n = 1313, 38.55%). Further, the majority of the cohort had non-trauma/poisoning-related visits (n = 1902, 62.38%). Of those with a visit related to trauma/poisoning (n = 1041, 32.16%), most were considered unintentional (n = 943, 29.18%). The average ED wait time for the entire cohort was 37.88 minutes (95%CI 31.17-44.59)

Table 1. Sociodemographic profile of children and adolescents visiting the ED from the 2021 National Hospital Ambulatory Medical Care Survey (NHAMCS; n = 3091).

Variable	Sample (n)	Weighted %	Population estimate (N)
Age			
0-2	974	34.28	9,897,390
3-6	664	21.71	6,268,679
7-10	428	13.55	3,913,489
11-14	499	15.78	4,556,781
15-17	526	14.67	4,237,036
Sex			
Female	1501	48.65	14,045,540
Male	1590	51.35	14,827,834
Ethnoracial groups			
White	1407	44.69	12,902,608
Black	715	24.5	7,074,036
Asian	55	1.669	482,021
NHOPI	13	0.4375	126,315
AI/AN	21	0.8275	238,936
Multiracial	29	0.9666	279,082
White Hispanic	719	23.05	6,655,478
Black Hispanic	86	2.383	687,982
Other race not listed	46	1.479	426,916
Payer type			
Private Insurance	963	29.34	8,472,577
Medicare	12	0.3011	86,947
Medicaid/CHIP	1758	58.51	16,893,928
Worker's Compensation	1	0.01431	4,132
Self-pay	83	2.728	787,795
No Charge/Charity	1	0.02344	6,767
Other	46	1.641	473,816
Unknown	227	7.437	2,147,411
Has the following comorbidities			
Asthma	253	6.82	1,969,905
Depression	114	2.55	736,398
Obesity (BMI >= 30)	48	1.09	315,997
Total number of comorbidities per participants			
0	2633	87.87	25,371,551
1	402	10.75	3,103,622
2	47	1.142	329,848
3	8	0.1689	48,775
4	1	0.06781	19,578
Urbanicity			
MSA	2687	89.78	25,922,277
Non-MSA	404	10.22	2,951,097

Ethnoracial Grouping

As part of our secondary objectives, we assessed triage level, visit cause, intentionality, and wait times by ethnoracial groups (Table 2). Of the various ethnoracial groups Indigenous children had significantly longer ED wait times (72.84 mins, 95%CI 47.05-98.63) compared to White children (37.59 mins, 95%CI 30.67-44.50). This is despite the fact that Indigenous children had the highest in-group percentage of emergent cases (22.11%) amongst the ethnoracial groups. When assessing differences among the groups, we found statistically significant differences related to

trauma/poisoning being the cause for the visit ($\chi^2 = 2.18$, $P = .037$) and intentionality ($\chi^2 = 2.69$, $P = .008$).

Table 2. Cross tabulation showing ethnoracial groupings by triage level, cause of visit, and intentionality, and wait time among ED visits in the 2021 NHAMCS.

	White	Black	Asian	Indigenous	Multiracial/ Other	White Hispanic	Black Hispanic
Ethnoracial groups	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)
Triage							
Unknown	585 (40.11)	332 (44.35)	20 (30.15)	12 (30.2)	40 (52.83)	291 (30.91)	33 (19.24)
Emergent	98 (7.745)	35 (4.862)	8 (18.3)	5 (22.11)	2 (5.535)	42 (9.529)	7 (3.113)
Urgent	296 (20.87)	126 (14.87)	13 (26.86)	6 (10.87)	13 (17.91)	139 (21.47)	14 (20.28)
Semi-urg	362 (26.7)	203 (32.91)	13 (23.6)	10 (35.12)	20 (23.72)	191 (32.29)	29 (51.26)
Non-urgent	66 (4.572)	19 (3.016)	1 (1.083)	1 (1.697)	0 (0)	56 (5.811)	3 (6.101)
Was the cause of visit trauma or poisoning?							
No	795 (56.41)	455 (62.59)	37 (74.04)	26 (91.3)	43 (56.59)	482 (69.77)	64 (82.93)
Yes	549 (38.18)	223 (31.89)	16 (18.92)	8 (8.701)	26 (31.2)	201 (24.98)	18 (14.26)
Questionable cause	16 (0.8374)	11 (1.016)	0 (0)	0 (0)	2 (1.32)	12 (1.51)	3 (2.49)
Missing/Not reported	47 (4.566)	26 (4.498)	2 (7.031)	0 (0)	4 (10.88)	24 (3.743)	1 (0.3148)
Was the trauma or poisoning intentional?							
No, unintentional	502 (34.69)	198 (29.59)	14 (18.38)	7 (5.495)	24 (28.46)	181 (21.76)	17 (14.04)
Yes	36 (2.613)	19 (1.535)	2 (0.5482)	0 (0)	1 (0.1872)	13 (2.417)	1 (0.2239)
Questionable injury status	16 (0.8374)	11 (1.016)	0 (0)	0 (0)	2 (1.32)	12 (1.51)	3 (2.49)
Missing/Not reported	853 (61.86)	487 (67.85)	39 (81.08)	27 (94.5)	48 (70.03)	513 (74.31)	65 (83.25)
Waittime							
Mean (95%CI)	37.59 (30.67-44.50)	37.25 (28.81-45.68)	35.87 (23.15-48.58)	72.84 (47.05-98.63)	33.77 (13.24-54.31)	38.41 (29.45-47.36)	31.92 (21.46-42.38)
Regression Coef (95%CI)	1 (REF)	-0.34 (-6.49-5.81)	-1.72 (-13.51-10.07)	35.25 (8.59-61.92)	-3.81 (-22.01-14.38)	0.82 (-7.61-9.25)	-5.66 (-18.06-6.73)

Urbanicity

We also assessed triage level, visit cause, intentionality, and wait times by urbanicity (Table 3). When assessing differences between settings we found statistically significant differences in both trauma/poisoning being a cause for the visit ($\chi^2 = 5.25$, $P = .013$) and intentionality ($\chi^2 = 10.45$, $P < .001$). Wait times for children in EDs within non-metropolitan statistical areas were shorter (23.36 mins, 95%CI 16.55-30.17) than wait times for children in EDs from metropolitan statistical areas (39.16 mins, 95%CI 32.23-46.10).

Table 3. Cross tabulation showing payer type by triage level, cause of visit, and intentionality, and wait time among ED visits in the 2021 NHAMCS.

	Private Insurance	Medicaid/ CHIP	Self-pay	Other	Unknown	Total	Design Based X^2
Insurance type	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	value, P
Triage							
Unknown	466 (45.67)	702 (35.45)	31 (34.3)	21 (20.64)	93 (41.23)	1313 (38.55)	
Emergent	71 (9.063)	101 (6.775)	3 (3.132)	7 (12.39)	15 (9.266)	197 (7.643)	
Urgent	183 (18.98)	343 (19.24)	17 (25.97)	10 (14.83)	54 (21.39)	607 (19.42)	1.28, .27
Semi-urg	215 (23.71)	507 (33.1)	26 (28.16)	20 (49.47)	60 (26.91)	828 (30.08)	
Non-urgent	28 (2.573)	105 (5.433)	6 (8.443)	2 (2.663)	5 (1.201)	146 (4.307)	
Was the cause of visit trauma or poisoning?							
No	575 (58.95)	1119 (66.12)	47 (58.2)	30 (47.68)	131 (51.86)	1902 (62.38)	
Yes	348 (36.82)	553 (29.12)	36 (41.8)	26 (49.28)	78 (29.7)	1041 (32.16)	
Questionable cause	18 (1.88)	24 (0.8282)	0 (0)	1 (0.1451)	1 (0.3177)	44 (1.063)	
Missing/Not reported	22 (2.352)	62 (3.932)	0 (0)	3 (2.891)	17 (18.13)	104 (4.396)	3.55, .013
Was the trauma or poisoning intentional?							
No, unintentional	314 (32.51)	502 (26.93)	35 (40.54)	24 (44)	68 (25.56)	943 (29.18)	
Yes	24 (2.992)	35 (1.359)	1 (1.258)	2 (5.279)	10 (4.137)	72 (2.12)	
Questionable injury status	18 (1.88)	24 (0.8282)	0 (0)	1 (0.1451)	1 (0.3177)	44 (1.063)	
Missing/Not reported	607 (62.62)	1197 (70.88)	47 (58.2)	33 (50.57)	148 (69.99)	2032 (67.64)	2.17, .043
Waittime							
Mean (95%CI)	40.79 (29.41-52.18)	37.35 (30.48-44.22)	34.37 (21.81-46.94)	39.94 (27.48-52.39)	28.2 (15.11-41.28)	37.88 (31.17-44.59)	-
Regression Coef (95%CI)	1 (REF)	-3.44 (-13.81-6.92)	-6.42 (-21.13-8.29)	-0.86 (-17.28-15.57)	-12.59 (-29.1-3.91)	-	-

Payer Type

Triage level, visit cause, intentionality, and wait times were also assessed by payer type (Table 4). We found statistically significant differences among payer types for both trauma/poisoning being a cause for the visit ($\chi^2 = 3.55$, $P = .013$) and intentionality ($\chi^2 = 2.17$, $P = .043$). The Unknown payer group was found to have shorter ED wait times (28.20 mins, 95%CI 15.11-41.28) compared to the private insurance group (40.79 mins, 95%CI 29.41-52.18).

Table 4. Cross tabulation showing age group by triage level, cause of visit, and intentionality, and wait time among ED visits in the 2021 NHAMCS.

	0-2	3-6	7-10	11-14	15-17	Total	Design Based X^2
Age group	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	value, P
Triage							
Unknown	433 (40.64)	287 (40.93)	174 (36.65)	212 (38.71)	207 (31.73)	1313 (38.55)	
Emergent	49 (7.579)	39 (5.249)	16 (4.055)	41 (8.54)	52 (13.68)	197 (7.643)	
Urgent	163 (15.37)	105 (15.86)	95 (21.91)	102 (22.68)	142 (28.35)	607 (19.42)	
Semi-urg	281 (32.51)	193 (32.29)	121 (32.84)	123 (26)	110 (22.96)	828 (30.08)	
Nonurgen	48 (3.904)	40 (5.667)	22 (4.542)	21 (4.071)	15 (3.27)	146 (4.307)	3.68, <.001
Was the cause of visit trauma or poisoning?							
No	734 (77.32)	403 (57.92)	235 (51.01)	245 (51.58)	285 (56.17)	1902 (62.38)	
Yes	201 (17.85)	227 (37.38)	171 (42.61)	222 (41.24)	220 (38.48)	1041 (32.16)	
Questionable cause	12 (0.8791)	12 (1.112)	7 (1.12)	8 (1.534)	5 (0.8602)	44 (1.063)	
Missing/Not reported	27 (3.95)	22 (3.59)	15 (5.252)	24 (5.644)	16 (4.498)	104 (4.396)	7.44, <.001
Was the trauma or poisoning intentional?							
No, unintentional	187 (16.86)	217 (35.73)	160 (39.97)	201 (37.06)	178 (29.81)	943 (29.18)	
Yes	4 (0.1955)	7 (1.066)	8 (1.748)	19 (3.871)	34 (6.636)	72 (2.12)	
Questionable injury status	12 (0.8791)	12 (1.112)	7 (1.12)	8 (1.534)	5 (0.8602)	44 (1.063)	
Missing/Not reported	771 (82.07)	428 (62.1)	253 (57.16)	271 (57.54)	309 (62.69)	2032 (67.64)	9.36, <.001
Waittime							
Mean (95%CI)	39.25 (31.39-47.11)	39.61 (31.48-47.74)	38.15 (30.42-45.88)	35.89 (27.31-44.46)	33.95 (26.18-41.72)	37.88 (31.17-44.59)	-
Regression Coef (95%CI)	1 (REF)	0.36 (-5.97-6.68)	-1.1 (-9.05-6.85)	-3.36 (-9.68-2.95)	-5.3 (-13.57-2.97)	-	-

Child Age

Finally, triage level, visit cause, intentionality, and waiting times were also assessed by child age (Table 5). We found statistically significant differences among child age groups for the triage level ($\chi^2 = 3.68$, $P < .001$), trauma/poisoning being a cause for the visit ($\chi^2 = 7.44$, $P < .001$), and intentionality ($\chi^2 = 9.36$, $P < .001$). The 15-17 age group had the shortest ED wait times compared (33.95 mins, 95%CI 26.18-41.72) to any other age group.

Discussion

Our study results showed the demographic profile of pediatric ED visits consisted of a population slightly skewed to males consisting of primarily White, Black, and White Hispanic children. Approximately 1 in 10 children visiting the ED were reported as having at least one comorbidity—with asthma being the most common. Contemporary studies have found pediatric asthma affects nearly 10% of children between 3 and 17,[15] among which asthma exacerbations may require more frequent ED visits.[16] Among the pediatric ED visits, most were insured through Medicaid/CHIP—showing effective state policy and reliance on this type of insurance.[17] Additionally, we found disparities in pediatric demographics among triage level, trauma visits, and wait times.

When analyzing the variable of triage levels, several demographic factors were associated with the urgency of patient visits. Black Hispanics had the lowest percentage of emergent triage level visits while simultaneously having the highest percentage of semi-urgent triage level visits when compared to all other racial groups. This mid-level of urgency may be determined when children present with high fever, which previous research using NHAMCS data from 2012-2015 found that nearly 25% of visits among Black children and 24% of Hispanic children resulted from high fevers.[18] Lastly, children between the ages of 15-17 had the highest percentage for emergent triage level visits—almost doubling the percentage for all other age group categories. Previous research indicates the prevalence of mental illness is highest for adolescents in this age range which provides room for further investigation.[19,20]

Our results showed that rural hospitals had much higher rates of ED visits for trauma, poisoning, or overdose, than urban hospitals—which is consistent with previous literature related to urbanicity and ED utilization. For comparison, 44.5% of visits among non-MSA EDs were for trauma, poisoning, or overdose, whereas only 30.8% within MSAs were reported as such. Rates of intentional traumas were higher within non-MSAs than visits within MSA settings, though both rates were between 2-3 percent. This may be partially due to the increased mental health associated with the COVID-19 pandemic in the United States.[21] In fact, previous research indicates a higher number of mental health traumas in rural-residing patients with a 36.8% increase in monthly visits for suicide or self-harm post-pandemic.[22] This study also noted that pediatric populations living in rural regions experience "higher suicide mortality than urban-residing children."[22] An additional reason for this disparity relates to the impact of regional

isolation due to lack of access to pediatric care[23] as rural areas are disproportionately designated as Health Professional Shortage Areas (HPSA) for mental health care.[24] Previous research has suggested additional drivers such as transportation, weather-related factors, mis-triaging, and increased healthcare-related costs.[25]

ED visits among Indigenous children had an average wait time of 72.8 minutes—nearly twice that of the overall mean wait time. This difference in wait times is reflective of the nationwide disparity in access to hospital care among Indigenous populations.[26] Data from the NHAMCS also shows that the Indigenous population had the highest percentage of emergent triage-level visits compared to all other racial groups. As traumas commonly have shorter wait times due to the urgency of timeliness for the treatment of these injuries,[27] the longer wait times among this group may be reflective of the disparities in the timeliness of AI/AN treatment.

Implications/Recommendations

Racial and ethnic disparities are well-documented in pediatric healthcare delivery in the setting of EDs. Studies have demonstrated the outcomes for minority children, as well as individuals who are low-income, and uninsured are poorer than their non-Hispanic White counterparts.[28] Previous evidence has shown that emergency room utilization for non-urgent health concerns is higher among minority children than White children.[29] Further, minority children are more likely to use the emergency department for primary care concerns.[28] Our study echoed these findings, highlighting the need for additional analyses related to primary care barriers for minority families, which may include language barriers, specific office hours, differences in communication patterns, and making appointments ahead of time.[28,30] As such, important steps to eliminate barriers to primary care include enhancing accessibility to primary care. This includes the promotion of pediatric primary care medical homes,[31] expanding normal clinic hours,[32] enhancing language services,[33] and leveraging telehealth when possible.[34]

We found that rural hospitals evaluated more trauma, poisoning, and overdoses than urban hospitals. Coupled with hospital-related factors such as inadequate staffing and limited language resources,[30] the vulnerability for minority families and children who utilize these EDs is amplified. These factors illustrate the need for expanded support and resource availability in rural settings to better address these needs.

We also found prolonged wait times for Indigenous children, which mirrored previous findings that demonstrated ED wait times up to 10 times longer for minority children compared to non-Hispanic White children.[30] The potential consequences of long ED wait times are far-reaching and include prolonged discomfort and poorer health outcomes.[28,30] Additional research has shown disparities in ‘queue’ jumping in EDs raising concerns for the impact of bias related to triage processes.[35] As such future research should explore the numerous barriers to care that affect these populations. Research into the effects of ED personnel bias would also be beneficial

in understanding the complexity of providing ED care for minority children. Addressing these shortfalls is paramount to ensure adequate, efficient care for all children.

Limitations

A limitation of the NHAMCS data is that there is likely a high number of pediatric ED visits that are unreported as the methodological report states, "there is still a potential for nonresponse bias in the data that might affect survey estimates". Additionally, there was a large amount of data that was reported as "missing" or "unable to be found." These answers were important to include in our analysis, though it limits the possible discussion and results able to be made. However, given the large sample size and sampling procedures of the NHAMCS, our investigation was able to ascertain a broader perspective of the demographic population using visiting EDs than has been previously studied. Future research may investigate differences in regional pediatric demographic and disparities—which have been noted among other populations ED usage such as the greater likelihood of Black or Hispanic patients to be discharged against medical advice than other races.[36] Further research may investigate differences in pediatric ED visits that mirror disparities in adult visits.

Conclusion

Overall, our study reflected a population of pediatric patients visiting emergency rooms composed of a majority of children under 7 years of age, within MSAs, and generally representative of the national ethnoracial census. More than 12% of pediatric ED patients had 1 or more comorbidities, and nearly 3 in 5 visits were covered through Medicaid/CHIP. Notable disparities from our study were longer wait times among Indigenous children, higher prevalence of traumas and poisonings in non-MSA settings, and differential rates of triage level by ethnoracial groups. Strategies to enhance access to primary care such as extended hours, expanded language services, and use of telehealth should be considered as potential ways to improve overall access to care while decreasing ED utilization for non-emergent concerns. We recommend training for ED physicians, healthcare workers, and staff to identify and mitigate the implicit biases that negatively affect patients in hopes of improving overall healthcare and outcomes.

References

1. Tang N, Stein J, Hsia RY, Maselli JH, Gonzales R. Trends and characteristics of US emergency department visits, 1997-2007. *JAMA*. 2010;304(6):664-670.

2. Sanchez A, Ruttan T. Pediatric diabetes: management of acute complications in the emergency department. *Pediatr Emerg Med Pract*. 2023;20(11):1-24.

3. Marye S. Health insurance, pediatric asthma, and emergency department usage. *Public Health Nurs*. 2021;38(5):931-940.

4. Downey LVA, Zun LS. Identifying Undiagnosed Pediatric Mental Illness in the Emergency Department. *Pediatr Emerg Care*. 2018;34(2):e21-e23.

5. Yusuf HM, Rosenthal E, Kornblith A, Sowar C, Del Toro R, Chen CC. Understanding a community's needs for an emergency department-based childhood injury prevention programme: a mixed-methods study. *Inj Prev*. Published online November 24, 2023. doi:10.1136/ip-2023-044920

6. Goldman-Mellor S, Kwan K, Boyajian J, et al. Predictors of self-harm emergency department visits in adolescents: A statewide longitudinal study. *Gen Hosp Psychiatry*. 2019;56:28-35.

7. Matkins PP, Jordan KS. Pediatric sexual abuse: emergency department evaluation and management. *Adv Emerg Nurs J*. 2009;31(2):140-152.

8. Marcin JP, Schembri MS, He J, Romano PS. A population-based analysis of socioeconomic status and insurance status and their relationship with pediatric trauma hospitalization and mortality rates. *Am J Public Health*. 2003;93(3):461-466.

9. Liu Y, Sharma P, Becker DJ, et al. Social determinants of health and emergency department utilization in Alabama Children's Health Insurance Program. *Am J Manag Care*. 2023;29(3):159-164.

10. Palaniappan A. EMTALA: Testing the Good Faith Admission Requirement. *R I Med J* . 2020;103(6):20-22.

11. Metzger P, Allum L, Sullivan E, Onchiri F, Jones M. Racial and Language Disparities in Pediatric Emergency Department Triage. *Pediatr Emerg Care*. 2022;38(2):e556-e562.

12. Borensztajn DM, Hagedoorn NN, Carrol ED, et al. Febrile children with comorbidities at the emergency department - a multicentre observational study. *Eur J Pediatr*. 2022;181(9):3491-3500.

13. Kelty E, Rae K, Jantzie LL, Wyrwoll CS, Preen DB. Prenatal Opioid Exposure and Immune-Related Conditions in Children. *JAMA Netw Open*. 2024;7(1):e2351933.

14. McHugh M, Tanabe P, McClelland M, Khare RK. More patients are triaged using the Emergency Severity Index than any other triage acuity system in the United States. *Acad Emerg Med*. 2012;19(1):106-109.

15. Mirabelli MC, Hsu J, Gower WA. Comorbidities of asthma in U.S. children. *Respir Med*. 2016;116:34-40.

16. Greiner B, Cronin K, Salazar L, Hartwell M. Asthma-related disparities in emergency department use and clinical outcomes among Spanish-speaking Hispanic patients. *Ann Allergy Asthma Immunol*. 2023;130(2):254-255.

17. Harrington ME. The Children's Health Insurance Program Reauthorization Act Evaluation Findings on Children's Health Insurance Coverage in an Evolving Health Care Landscape. *Acad Pediatr*. 2015;15(3 Suppl):S1-S6.

18. Shapiro DJ, Fine AM. Patient Ethnicity and Pediatric Visits to the Emergency Department for Fever. *Pediatr Emerg Care*. 2021;37(11):555-559.

19. Azarbakhsh H, Moftakhar L, Amiri S, Mirahmadizadeh A. Epidemiology of Suicide by Medication Overdose: A Population-based Study 2011-2019. *Arch Med Res*. 2022;53(3):304-311.

20. Villas-Boas SB, Kaplan S, White JS, Hsia RY. Adolescent Total and Mental Health-Related Emergency Department Visits During the COVID-19 Pandemic. *JAMA Netw Open*. 2023;6(10):e2336463.

21. Pampati S, Verlenden JV, Cree RA, et al. Children's mental health during the COVID-19 pandemic: a population-based cohort study in the United States. *Ann Epidemiol*. 2023;88:7-14.

22. Arakelyan M, Emond JA, Leyenaar JK. Suicide and Self-Harm in Youth Presenting to a US Rural Hospital During COVID-19. *Hosp Pediatr*. 2022;12(10):e336-e342.

23. Petrosyan M, Guner YS, Emami CN, Ford HR. Disparities in the delivery of pediatric trauma care. *J Trauma*. 2009;67(2 Suppl):S114-S119.

24. Shortage areas. Accessed April 19, 2024. https://data.hrsa.gov/topics/health-workforce/shortage-areas

25. Yue JK, Upadhyayula PS, Avalos LN, Cage TA. Pediatric Traumatic Brain Injury in the United States: Rural-Urban Disparities and Considerations. *Brain Sci*. 2020;10(3). doi:10.3390/brainsci10030135

26. King M, Smith A, Gracey M. Indigenous health part 2: the underlying causes of the health gap. *Lancet*. 2009;374(9683):76-85.

27. Lambe S, Washington DL, Fink A, et al. Waiting times in California's emergency departments. *Ann Emerg Med*. 2003;41(1):35-44.

28. Oraka E, Iqbal S, Flanders WD, Brinker K, Garbe P. Racial and ethnic disparities in current asthma and emergency department visits: findings from the National Health Interview Survey, 2001-2010. *J Asthma*. 2013;50(5):488-496.

29. Zhang X, Carabello M, Hill T, He K, Friese CR, Mahajan P. Racial and Ethnic Disparities in Emergency Department Care and Health Outcomes Among Children in the United States. *Front Pediatr*. 2019;7:525.

30. Park CY, Lee MA, Epstein AJ. Variation in emergency department wait times for children by race/ethnicity and payment source. *Health Serv Res*. 2009;44(6):2022-2039.

31. What is medical home? Accessed April 23, 2024. https://www.aap.org/en/practice-management/medical-home/medical-home-overview/what-is-medical-home/

32. Hong M, Thind A, Zaric GS, Sarma S. The impact of improved access to after-hours primary care on emergency department and primary care utilization: A systematic review. *Health Policy*. 2020;124(8):812-818.

33. Butkus R, Rapp K, Cooney TG, Engel LS, Health and Public Policy Committee of the American College of Physicians. Envisioning a Better U.S. Health Care System for All: Reducing Barriers to Care and Addressing Social Determinants of Health. *Ann Intern Med*. 2020;172(2 Suppl):S50-S59.

34. Beheshti L, Kalankesh LR, Doshmangir L, Farahbakhsh M. Telehealth in Primary Health Care: A Scoping Review of the Literature. *Perspect Health Inf Manag*. 2022;19(1):1n.

35. Sangal RB, Su H, Khidir H, et al. Sociodemographic Disparities in Queue Jumping for Emergency Department Care. *JAMA Netw Open*. 2023;6(7):e2326338.

36. Tsai JW, Janke A, Krumholz HM, Khidir H, Venkatesh AK. Race and Ethnicity and Emergency Department Discharge Against Medical Advice. *JAMA Netw Open*. 2023;6(11):e2345437.

Supplement 1. Complete comorbidities among children and adolescents visiting the ED from the 2021 National Hospital Ambulatory Medical Care Survey (NHAMCS; n = 3091).

Variable	Sample (n)	Weighted %	Population estimate (N)
Has the following comorbidities			
Alcohol/Substance Use	32	0.75	216146
Alzheimer's disease/dementia	1	0.01	3076
Asthma	253	6.82	1969905
Cancer	10	0.51	146526
Cerebrovascular disease/stroke (CVA)/transient ischemic attack (TIA)	1	0.00	692
Chronic kidney disease	3	0.13	37389
Chronic obstructive pulmonary disease (COPD)	6	0.18	51825
Congestive heart failure	0	0.00	0
Coronary artery disease (CAD), ischemic heart disease (IHD), or history of myocardial infarction (MI)	2	0.02	4760
Depression	114	2.55	736398
Diabetes mellitus (DM) – Type I	10	0.49	142517
Diabetes mellitus (DM) – Type II	3	0.08	23898
Diabetes mellitus (DM) – Type unspecified	9	0.25	71006
End-stage renal disease (ESRD)	0	0.00	0
History of pulmonary embolism (PE) or deep vein thrombosis (DVT), or venous thromboembolism (VTE)	0	0.00	0
HIV infection/AIDS	0	0.00	0
Hyperlipidemia	3	0.14	39548
Hypertension	11	0.39	111725
Obesity (BMI >= 30)	48	1.09	315997
Obstructive sleep apnea (OSA)	13	0.30	85759
Osteoporosis	1	0.01	2166

Supplement 2. Cross tabulation showing urbanicity by triage level, cause of visit, and intentionality, and wait time among ED visits in the 2021 NHAMCS.

Urbanicity	MSA	Non-MSA	Total	Design Based X^2
	No. (%)	No. (%)	No. (%)	value, P
Triage				
Unknown	1147 (38.87)	166 (35.71)	1313 (38.55)	1.09, .33
Emergent	177 (8.326)	20 (1.65)	197 (7.643)	
Urgent	538 (19.21)	69 (21.25)	607 (19.42)	
Semi-urg	702 (29.78)	126 (32.66)	828 (30.08)	
Nonurgen	123 (3.803)	23 (8.729)	146 (4.307)	
Was the cause of visit trauma or poisoning?				
No	1689 (63.69)	213 (50.86)	1902 (62.38)	5.25, .013
Yes	864 (30.76)	177 (44.49)	1041 (32.16)	
Questionable cause	43 (1.177)	1 (0.05755)	44 (1.063)	
Missing/Not reported	91 (4.374)	13 (4.592)	104 (4.396)	
Was the trauma or poisoning intentional?				
No, unintentional	783 (27.85)	160 (40.81)	943 (29.18)	10.45, <.001
Yes	59 (2.067)	13 (2.588)	72 (2.12)	
Questionable injury status	43 (1.177)	1 (0.05755)	44 (1.063)	
Missing/Not reported	1802 (68.91)	230 (56.54)	2032 (67.64)	
Wait time in minutes				
Mean (95%CI)	39.16 (32.23-46.1)	23.36 (16.55-30.17)	37.88 (31.17-44.59)	-
Regression Coef (95%CI)	1 (REF)	-15.81 (-25.59- -6.02)	-	-