Disruption of Pediatric Emergency Department Use during the COVID-19 Pandemic

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Objectives: There is evidence of substantial declines in pediatric emergency department (ED) utilization in the United States in the first several months of the coronavirus disease 2019 (COVID-19) pandemic. Less is known about whether utilization changed differentially for socioeconomically disadvantaged children. This study examined how changes in pediatric ED visits during the initial months of the COVID-19 pandemic differed by two markers of socioeconomic disadvantage: minoritized race (MR) (compared with non-Hispanic White [NHW]), and publicly insured (compared with privately insured).

Methods: This study used electronic medical records from a large pediatric ED for the period January to June 2020. Three time periods in 2020 were compared with corresponding time periods in 2019. Changes in overall visits, visits for MR versus NHW children, and Medicaid-enrolled versus privately insured children were considered, and changes in the acuity mix of ED visits and share of visits resulting in inpatient admits were inspected.

Results: Compared with 2019, total ED visits declined in time period (TP) 1 and TP2 of 2020 (54.3%, 48.9%). Declines were larger for MR children (57.3%, 57.8%) compared with NHW children (50.5%, 39.3%), and Medicaid enrollees (56.5%, 52.0%) compared with privately insured (48.3%, 39.0%). The MR children group experienced steeper percentage declines in high-acuity visits and visits, resulting in inpatient admissions compared with NHW children. In contrast, there was little evidence of difference between TP0s of 2019 and 2020.

Conclusions: The role of socioeconomic disadvantage and the potential effects on pediatric ED visits during COVID-19 is understudied. Because disadvantaged children sometimes lack access to a usual source of health care, this raises concerns about unmet health needs and worsening health disparities.

Key Words: acuity, COVID-19, insurance, race/ethnicity

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The coronavirus disease 2019 (COVID-19) pandemic has brought about seismic disruptions to societies and healthcare systems around the world. In the United States, a national emergency was declared on March 13, 2020; subsequently, many states closed schools and businesses and issued "stay-at-home" orders. The Centers for Disease Control and Prevention recommended delaying elective care but prioritizing urgent care; yet, sharp declines in emergency department (ED) visits in the United States[1–4] were experienced across the population the early months of the pandemic.[5–7]

The decline in pediatric ED visits could have occurred because of reduced need—for example, fewer vehicular injuries or fewer infections or injuries incurred at schools—but the decline also could have occurred because of fear of COVID-19 infection, perhaps exacerbated by access issues from city-, county-, and state-imposed lockdowns[4,8,9] There is evidence that ED visits for serious health conditions declined, however, and that delayed ED care may have increased deaths,[3,7] implying that urgent healthcare needs went unmet. In studies using single EDs[8,10] and multiple EDs,[1,5,7] one relatively unexplored issue is whether declines in pediatric ED visits differed by socioeconomic disadvantage. Communities of color and low-income, publicly insured communities have borne the most serious health and economic

Key Points

- Compared with the same time periods in 2019, there were statistically significant decreases in pediatric emergency department visits during the first 3 months of the coronavirus disease 2019 pandemic (mid-March 2020 through mid-June 2020).
- Declines in visits were larger for children in minoritized race and ethnicity groups compared with non-Hispanic White children and in Medicaid enrollees compared with privately insured individuals. Steeper percentage declines in high-acuity visits and visits were found in children in minoritized race and ethnicity groups compared with non-Hispanic White children, resulting in inpatient admissions.
- The role of socioeconomic disadvantage and the potential effects on pediatric emergency department visits during the coronavirus disease 2019 pandemic is understudied. Because disadvantaged children sometimes lack access to a usual source of health care, this raises concerns about unmet health needs and worsening health disparities.

brunt from the pandemic, and evidence indicates that in "normal" times such communities are likely to depend upon the ED for healthcare needs because they often lack access to a usual source of care.[11]

Our study focused on the largest pediatric ED in Alabama. Like other states in the US Deep South, Alabama is a highly rural state, characterized by a large African American population, high poverty rates, poor rankings on health indicators, and among the highest numbers of ED visits in the United States in 2019.[1] Studies on pediatric ED visit changes during COVID-19 have largely excluded data from the Deep South, however, leaving a critical gap in this literature.

Our study hypothesis was that declines in pediatric ED visits would differ by socioeconomic disadvantage. The primary indicator of socioeconomic disadvantage was minoritized race (MR) compared with non-Hispanic White (NHW). We also considered Medicaid enrollment as a proxy measure of low family income. We considered changes in visits by acuity levels, visits that resulted in inpatient admissions, and whether these changes differed by race and by insurance status. Finally, we compared changes in the early months of the pandemic when state-imposed restrictions such as stay-at-home orders were in place in Alabama with subsequent months when these restrictions were largely relaxed.

Methods

We conducted a retrospective, observational study investigating changes in pediatric ED volume during the early months of the pandemic in the largest pediatric ED facility in Alabama. We used electronic medical record (EMR) data for all pediatric patients (age range 0–<19 years) presenting to the ED from January 1 through June 15, 2020 and for 2019. We extracted date of visit, patient's race/ethnicity, patient's insurance status, patient's acuity level, and whether the ED visit resulted in an inpatient admission.

For analysis purposes, our main variables of interest were recoded as follows. Race/ethnicity was categorized as the binary indicator NHW versus MR; MR primarily consisted of African American patients, but it also included Hispanic patients and those identified as other races because they were too few to permit a separate category. Subsequently sensitivity analyses that excluded the "other race" category were conducted and found no change in the results. Insurance status was categorized as private, Medicaid (which covered children up to 141% of the federal poverty level); ALL Kids (Alabama children's health insurance program); self-insured/not reported; and out-of-state. Acuity levels in the EMR were listed on a 5-point scale, from level 1 (most resource intensive) to level 5 (least resource intensive), and with two separate categories for patients presenting with trauma. The levels were recoded for analysis purposes into three categories: high acuity, which included levels 1 and 2 and the two categories of trauma, mid-acuity, which included level 3, and low acuity, which included levels 4 and 5. Inpatient admission was coded as a binary indicator of whether the ED visit resulted in an inpatient admission.

We compared patients presenting at the ED in three time periods (TPs) in 2020 with those presenting during the same periods in 2019. January 1 to March 15 was TP0. During January 1 through March 15, 2020, no COVID-19 cases had yet been detected in Alabama; hence, no restrictions had yet been required. This permitted us to determine whether there were differences in 2020 and 2019 that could not be attributed to COVID-19.

March 16 to April 30 was TP1. In 2020, this was the period when restrictions were in place in Alabama. Limits on businesses and large gatherings started on March 16, parks and beaches closed on March 18, the largest city and county issued stay-at-home orders on March 24, and statewide stay-at-home orders were imposed on April 3.[12]

May 1 through June 15 was TP2, which, in 2020, was the period when restrictions were relaxed, with nonemergency medical procedures permitted to start from April 28, and businesses, restaurants, salons, parks, and beaches were allowed to begin reopening from May 1, although a "safer at home" advisory remained. The population was asked to voluntarily adopt safety measures, but mask mandates were not introduced until July 2020.

We presented data from the three time periods from 2019 and 2020 to illustrate changes in ED visits for the full sample, as well as by MR and insurance status. For changes in acuity and inpatient admission, we focused only on MR status. We used χ^2 analyses to test whether the distribution of these characteristics changed for pediatric patients presenting in 2020 versus in 2019. Statistical significance was set at $P < 0.05$. All of the analyses were completed using STATA version 16 (StataCorp, College Station, TX). The study protocol was approved as exempt by the institutional review board of the University of Alabama at Birmingham.

Results

There were 33,017 total and 4979 high-acuity ED visits in 2019 and 23,533 total and 3855 high-acuity ED visits in 2020. Of the 56,550 pooled total ED visits, 26,683 were NHW and 29,867 were MR children. Of the latter group, 96.9% were African American, 0.9% were Hispanic, and 2.2% were other races/biracial/unreported. Insurance type differed by race ($P < 0.01$); specifically, among MR children, 76.9% were insured by Medicaid, 4.9% by ALL Kids, 13.1% were privately insured, and 3.0% were uninsured/out of state/unknown. For NHW children, the corresponding figures were 49.3%, 6.6%, 41.1%, and 4.1%, respectively. Of the overall sample, 52.0% were boys and 48.0% girls.

Table 1 shows the total visits to the ED for the three time periods in 2019 and 2020 and the distributions by race, acuity level, inpatient admits, and insurance status. In TP0 2020, 15,182 pediatric patients presented to the ED compared with 15,725 in TP0 2019, a decline of 3.4%. In contrast, in TP1 2020, 4093 patients presented for care, a decline of 54.3% from the 8950 patients in TP1 2019; in TP2 2020, 4258 patients presented, a decline of 48.9% from the 8342 patients in TP2 2020. Compared with 2019, MR patient visits in TP1 2020 declined by 2690 (57.8%)

Table 1. Distributions of sample characteristics in 2019 and 2020

	Total											
	T0 (January 1–March 15)				T1 (March 16–April 30)				T2 (May 1–June 15)			
	2019		2020		2019		2020		2019		2020	
	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)
Total	15,725		15,182		8950		4093		8342		4258	
Race												
NHW	7090	(45.1)	6974	(45.9)	4295	(48.0)	2128	(51.9)	3855	(46.2)	2341	(55.0)
MR[a]	8635	(54.9)	8208	(54.1)	4655	(52.0)	1965	(48.1)	4487	(53.8)	1917	(45.0)
	$P = 0.13$				$P < 0.001$				$P < 0.001$			
Acuity[b]												
High	2397	(15.3)	2337	(15.4)	1397	(15.6)	744	(18.2)	1185	(14.2)	774	(18.2)
Mid	2991	(19.0)	3088	(20.4)	1975	(22.1)	1074	(26.3)	1790	(21.5)	1252	(29.4)
Low	10,329	(65.7)	9749	(64.3)	5570	(62.3)	2272	(55.6)	5361	(64.3)	2230	(52.4)
	$P < 0.01$				$P < 0.001$				$P < 0.001$			
Inpatient admission												
Admission	2103	(13.4)	2122	(13.4)	1285	(14.4)	828	(20.2)	1159	(13.9)	906	(21.3)
No admission	13,622	(86.6)	13,060	(86.0)	7665	(85.6)	3265	(79.8)	7183	(86.1)	3352	(78.7)
	$P = 0.12$				$P < 0.001$				$P < 0.001$			
Insurance												
Medicaid	10,295	(65.5)	9947	(65.5)	5673	(63.4)	2469	(60.3)	5271	(63.2)	2479	(58.2)
ALL Kids[c]	871	(5.5)	874	(5.8)	510	(5.7)	221	(5.4)	505	(6.1)	238	(5.6)
Out of state	47	(0.3)	44	(0.3)	37	(0.4)	7	(0.2)	37	(0.4)	5	(0.1)
Private	3904	(24.8)	3776	(24.9)	2377	(26.6)	1229	(30.0)	2227	(26.7)	1358	(31.9)
Self-pay/unknown	608	(3.9)	541	(3.6)	353	(3.9)	167	(4.1)	302	(3.6)	178	(4.2)
	$P = 0.62$				$P < 0.001$				$P < 0.001$			

The strictest limitations on gatherings, businesses, and travel, including a statewide stay-at-home order, were in place in Alabama between March 16 and April 30, 2020 (T1 2020). T0 2020 had no restrictions, and T2 2020 represents the "safer-at-home" period, during which restrictions were relaxed. No statewide mask mandate existed during any of these periods. EMR, electronic medical record; MR, minoritized race; NHW, non-Hispanic White.

[a]*This category includes all of the patients not categorized as NHW.*

[b]*High acuity includes those categorized as 1 or 2 on the EMR acuity score. Mid-acuity includes category 3. Low acuity includes categories 4 and 5 on the scale.*

[c]*Alabama's Child Health Insurance Program (CHIP).*

and by 2570 (57.3%) in TP2 2020. In contrast, NHW patient visits declined by 2167 (50.5%) in TP1 and by 1513 (39.3%) in TP2 2020. The magnitude of declines differed across acuity level. In 2020 as compared with 2019, low-acuity visits declined from 5570 to 2272 (59.2%) in TP1 and from 5361 to 2230 (58.4%) in TP2; high-acuity visits declined from 1397 to 744 (46.7%) in TP1 and 1185 to 774 (34.7%) in TP2. Visits resulting in inpatient admissions declined from 1285 to 828 (35.6%) in TP1 and from 1159 to 906 (21.8%) in TP2. Finally, compared with 2019, the number of Medicaid-enrolled patients presenting to the ED declined by 3204 (56.5%) in TP1 and 2792 (52.9%) in TP2 of 2020, whereas the number of privately insured patients declined by 1148 (48.3%) in TP1 and by 869 (39.0%) in the same periods. Unsurprisingly, although the number of out-of-state patients was small in 2019, the percentage decline for this group was especially high in TP1 and TP2 of 2020.

The uneven decline by race, acuity, and insurance status contributed to a change in the distribution of patient characteristics between 2019 and 2020. From TP1 2019 to 2020, the share of NHW patients increased from 48.0% to 52.0% ($P < 0.05$); the share of privately insured patients increased from 26.6% to 30.0%, whereas the share of Medicaid patients fell from 63.4% to 60.3% ($P < 0.05$); the share of low-acuity visits fell from 62.3% to 55.6% and the share of visits resulting in an inpatient admission increased from 14.4% to 20.2% ($P < 0.05$). Similarly, between TP2 2019 and 2020, the share of NHW patients increased ($P < 0.05$), the share of privately insured patients increased, the share of Medicaid patients declined ($P < 0.05$), the share of low-acuity visits fell ($P < 0.05$), and the share of visits resulting in an inpatient admission increased ($P < 0.05$). There were no statistically significant changes in the distribution of patient race/ethnicity, insurance status, or inpatient admissions in the pre-COVID-19 period of TP0 of 2020 as compared with TP0 of 2019; the one exception was acuity level, in which a significant difference was seen because of the increased share of mid-acuity cases from 19.0% to 20.4%.

Table 2 shows changes in total ED visits by acuity level and inpatient admissions for NHW and MR children. Compared with

Table 2. Distributions of sample characteristics in 2019 and 2020 by race/ethnicity

	T0 (January 1–March 15)				T1 (March 16–April 30)				T2 (May 1–June 15)			
	2019		2020		2019		2020		2019		2020	
	N	%	N	%	N	%	N	%	N	%	N	%
NHW												
Total	7090		6974		4295		2128		3855		2341	
Acuity[a]												
High	1392	19.7)	1377	(19.8)	819	(19.1)	426	(20.0)	627	(16.3)	441	(18.8)
Mid	1969	(27.8)	2011	(28.9)	1256	(29.3)	701	(33.0)	1130	(29.3)	844	(36.1)
Low	3724	(52.6)	3582	(51.4)	2217	(51.7)	999	(47.0)	2095	(54.4)	1056	(45.1)
	$P < 0.31$				$P < 0.001$				$P < 0.001$			
Inpatient admission												
Admission	1336	(18.8)	1343	(19.3)	812	(18.9)	532	(25.0)	691	(17.9)	582	(24.9)
No admission	5754	(81.2)	5631	(80.7)	3483	(81.1)	1596	(75.0)	3164	(82.1)	1759	(75.1)
	$P = 0.52$				$P < 0.001$				$P < 0.001$			
MR[b]												
Total	8635		8208		4655		1965		4487		1917	
Acuity												
High	1005	(11.6)	960	(11.7)	578	(12.4)	318	(16.2)	558	(12.4)	333	(17.4)
Mid	1022	(11.8)	1077	(13.1)	719	(15.5)	373	(19.0)	660	(14.7)	408	(21.3)
Low	6605	(76.5)	6167	(75.2)	3353	(72.1)	1273	(64.8)	3266	(72.8)	1174	(61.3)
	$P < 0.05$				$P < 0.001$				$P < 0.001$			
Inpatient admission												
Admission	767	(8.9)	779	(9.5)	473	(10.2)	296	(15.1)	468	(10.4)	324	(16.9)
No admission	7868	(91.1)	7429	(90.5)	4182	(89.8)	1669	(84.9)	4019	(89.6)	1593	(83.1)
	$P = 0.17$				$P < 0.001$				$P < 0.001$			

The strictest limitations on gatherings, businesses, and travel, including a statewide stay-at-home order, were in place in Alabama between March 16 and April 30, 2020 (T1 2020). T0 2020 had no restrictions and T2 2020 represents the "safer-at-home" period, during which restrictions were relaxed. No statewide mask mandate existed during any of these periods. MR, minoritized race; NHW, non-Hispanic White.

[a]*High acuity includes those categorized as 1 or 2 on the EMR acuity score. Mid-acuity includes category 3. Low acuity includes categories 4 and 5 on the scale.*

[b]*This category includes all patients not categorized as NHW.*

2019, NHW children presenting to the ED declined from 4295 to 2128 (50.5%) in TP1 of 2020 and from 3855 to 2341 (39.2%) in TP2 of 2020. High-acuity visits declined by 48.0% in TP1, but by just 29.7% in TP2; visits resulting in inpatient admissions declined by 34.5% in TP1 and by only 15.8% in TP2. For MR children, the overall number presenting to the ED declined by 57.8% in TP1 and 57.2% in TP2; high-acuity visits declined by 45.0% in TP1 and 40.3% in TP2, and visits resulting in inpatient admissions declined by 37.4% in TP1 and 30.8% in TP2. For both groups, the share of high-acuity cases and the share of cases resulting in inpatient admissions were higher in TP1 and TP2 of 2020 compared with 2019. There were no statistically significant differences in these shares between TP0 2019 and TP0 2020, except for the distribution of acuity level for MR children, in which mid-acuity visits increased from 11.8% to 13.1%.

Discussion

A growing body of literature has documented substantial declines in pediatric ED visits during the COVID-19 pandemic in several countries.[13–15] In the United States, such declines have been confirmed by studies using data from single and multiple EDs, and declines in overall visits as well as declines in visits for specific health conditions have been documented.[1,5,7,8]

We added to this literature in several ways. First, we considered changes in pediatric ED visits by socioeconomic disadvantage, measured by minoritized race/ethnicity and by public insurance coverage. Communities of color and low-income communities have disproportionately borne the adverse health and economic brunt of the pandemic,[16,17] and children from these communities tend to disproportionately depend on the ED for healthcare needs[11]; hence, exploring how their ED use was affected in the pandemic has strong public health relevance. Second, we considered ED visits when state-level restrictions were in place compared with when they were comparatively relaxed. It has been speculated that restrictions exacerbated the decline in pediatric ED visits. For example, in the Netherlands, ED visits declined by 18% in the prerestriction period of the pandemic but declined by 29% after restrictions were imposed.[13] In the United States, a study from Pennsylvania considered the impact of stay-at-home orders but did not include a

comparison time period when stay-at-home orders were relaxed.[8] Another multistate study indicated a gradual rebound in ED visits from April but did not comment on whether this was correlated to changes in state restrictions.[7] Third, we considered data from an ED in a Deep South state. The US Deep South is characterized by high poverty, large African American populations, lower public health rankings, and higher rates of ED usage compared with the rest of United States, and yet the impact of the pandemic on pediatric ED visits in this vulnerable region has not been explored.

Consistent with other studies, we found that ED visits declined substantially in TP1 and TP2 of 2020 compared with 2019—54.3% and 48.9%, respectively; however, we found substantially larger declines for MR children compared with NHW children. Furthermore, MR children did not experience a rebound after state restrictions were relaxed, whereas NHW children experienced a partial rebound. The number of MR children presenting to the ED declined by approximately 57% to 58% in TP1 as well as TP2 of 2020 compared with 2019, whereas the number of NHW children declined by 50.5% in TP1 but only by 39.3% in TP2. As a result, although MR patients consisted of 52% to 55% of all ED patients before the pandemic, their share fell well below 50% of all patients in the pandemic period. Similar patterns were seen for publicly insured versus privately insured patients. Visits by Medicaid-enrolled patients declined by 56.5% in TP1 and 52.9% in TP2 in 2020 compared with 2019, while privately insured patients experienced a decline of 48.3% in TP1 and a then a partial rebound in TP2 such that the decline was only 39.0%. Also, although MR children were overall more likely to have lower-acuity visits than NHW children, our results suggested that MR children avoided ED visits for high-acuity health conditions during the pandemic even after state restrictions were relaxed. For NHW children, high-acuity visits declined by 48.0% in TP1 of 2020 compared with TP1 2019, but partially rebounded so that the decline was only 29.7% in TP2, whereas for MR children high-acuity visits declined by 45% in TP1 and 40.3% in TP2. Similarly, visits resulting in inpatient admissions declined by 34.5% in TP1 and by 15.8% in TP2 for NHW children, but they declined by 37.4% in TP1 and by 30.8% in TP2 for MR children.

Although there are few studies that stratify pediatric ED visit declines by race/ethnicity, findings from one Connecticut ED found that African American children bore a disproportionate share of the decline in ED visits for mental health diagnoses as compared with White children.[10] Notably, our findings regarding the racial mix of ED patients are different from another study based on 27 EDs from unspecified states, which reported that the shares of NHW, African American, Hispanic, and other patients in the overall patient pool were, respectively, 35.9%, 21.4%, 30.0%, and 12.8% in the pandemic period, compared with, respectively, 32.3%, 22.3%, 33.4%, and 12.0% in the prepandemic period.[5] In contrast, we found the share of NHW patients increased to 52% to 55% in the pandemic period compared with 46% to 48% in the prepandemic period. This emphasizes the importance of looking at declines in pediatric ED visits by region, with attention paid to socioeconomically disadvantaged states such as those in the Deep South, because otherwise critical differences with public health implications may be obscured when looking at aggregated data.

Our results suggest that declines in pediatric ED visits are yet another way the COVID-19 pandemic may be exacerbating health disparities. The relatively larger declines in ED visits among MR and Medicaid-enrolled children, including the relative decline for high-acuity visits, are likely to be directly linked to the greater disruption and greater apprehension of disease experienced by these communities. MR and low income are predictors of high ED usage in "normal" times, often for low-acuity conditions, because MR and low-income families frequently lack access to a usual source of care. Furthermore, ED use often is initiated because parents in disadvantaged families may have lower levels of health literacy and are therefore less able to discern the seriousness of their child's health condition(s) and are seeking reassurance.[11] Also, EDs play a crucial role in diagnosing and treating conditions that otherwise have the potential to become potentially disabling or life-threatening; there is some indication that delays in seeking care have led to such adverse outcomes among adults in the United States[8] and among children in at least one European nation.[6] Finally, our findings also are consistent with delays in other essential pediatric health services such as vaccinations, particularly for publicly insured children.[18,19]

We acknowledge several limitations to our study. First, we derived our information from patient EMR data provided by the ED; hence, we did not obtain information on reasons why patients did not come to the ED, whether urgent care was delayed, and whether there were subsequent adverse health consequences. Nor did we know whether patients were able to access alternate sources of care, such as telehealth visits for low-acuity conditions or direct inpatient admission arranged by healthcare providers for higher-acuity conditions. Second, the Hispanic population in our sample was small, which precluded us from examining Hispanic patients as a separate category in our analyses. Third, our study design did not permit us to establish a causal link between stay-at-home orders and change in ED visits, and it could be speculated that our findings occurred because NHW and relatively affluent, privately insured communities became less concerned about the virus over time. Finally, although our study makes the important contribution of presenting information from a US Deep South state ED, the results may not be generalizable to the entire country.

Conclusions

Our findings showed that there were disproportionately larger declines in ED visits for MR and publicly insured children compared with their NHW and privately insured counterparts. The group of MR children also experienced relatively large and persistent declines in high-acuity visits and visits resulting in inpatient admissions. Although this study focused on clinical encounters, its implications extend to population health and public health systems levels. Interventions, coordination, and

communication must be in place to ensure that this population of children, who depend disproportionately on the ED for health services, receives the care that they need. Clear communication from public health officials targeted to disadvantaged populations is necessary, serving to guarantee that EDs have in place protocols to ensure the safety of their patients and that emergency visits not be delayed. Continued data monitoring, research, community outreach, and rapid communication among researchers, health plans, providers, patient advocates, and families of patients also are essential to ensure that delayed or forgone ED care during the pandemic neither leads to long-term adverse health consequences nor exacerbates existing disparities in health.

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