

# COVID-19 and sexual assault: trends in US emergency department visits – a cross-sectional analysis

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## ABSTRACT

**Background** Sexual assault often increases during crises, yet trends in United States (US) emergency department (ED) visits for sexual assault during COVID-19 remain unclear.

**Objective** To examine demographic, incident and injury trends in US sexual assault presentations during early and late COVID-19 compared with pre-COVID-19.

**Methods** This study analysed National Electronic Injury Surveillance System All Injury Programme (2014–2021) retrospective data. ED visits for assault (n=246 499) and sexual assault (n=22 752) were compared across pre-COVID-19 (January 2014–March 2020), early COVID-19 (March 2020–January 2021) and late COVID-19 (February 2021–December 2021). Demographic and injury trends were analysed via t-tests, analysis of variance or  $\chi^2$  tests, with national trends assessed using Joinpoint regression and weighted data in SUDAAN.

**Results** From 2017 to 2021, while assault-related ED visits declined (–5.05% annually;  $p=0.003$ ), sexual assault ED visits remained stable (–1.15% annually;  $p=0.57$ ). During COVID-19, sexual assault cases decreased among 0–19 years (46.1% pre-COVID-19 to 37.3% late COVID-19) but increased among 20–34 years (36.0% to 40.3%) and 35–64 years (17.2% to 21.0%). From early to late COVID-19, cases increased among black (31.7% to 32.8%) and Hispanic (13.8% to 15.6%) populations but declined among white populations (49.5% to 47.7%). Assaults by parents (9.0% to 11.2%) and partners (10.9% to 13.5%) increased, as did poisoning-related (1.4% to 5.5%) and anoxia-related injuries (0.1% to 0.7%).

**Conclusions** Despite the pandemic, ED visits for sexual assault persisted, with demographic shifts and increased injury severity (eg, drug-facilitated violence, strangulation-related anoxia). These findings highlight the need for targeted interventions during public health crises.

## BACKGROUND

Over half of women and almost one in three men experience sexual violence during their lifetime, and thus, its health consequences are broadly relevant.<sup>1,2</sup> Sexual assault can lead to immediate health issues, such as sexually transmitted infections (STIs), soft tissue lacerations and fractures, and several long-term effects, such as post-traumatic stress disorder,

## WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ The COVID-19 pandemic resulted in widespread social disruption, including stay-at-home orders and altered healthcare-seeking behaviours, which significantly reduced healthcare visits for most forms of disease and injury. Previous pandemic-related violence research has predominantly examined intimate partner violence trends, with limited focus on sexual assault patterns or injury severity during the pandemic.

## WHAT THIS STUDY ADDS

⇒ This study used a nationally representative sample of US emergency departments to demonstrate that sexual assault-related visit rates persisted throughout the pandemic period, despite significant pandemic-era reductions in other forms of assault. Notably, sexual assault cases demonstrated increased injury severity, with higher proportions of drug-facilitated sexual assaults and strangulation-associated anoxic injuries compared with pre-pandemic patterns.

## HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ These findings highlight the persistent nature of sexual violence during public health emergencies and the need for crisis-specific prevention strategies. The increased injury severity suggests evolving assault patterns during pandemic restrictions, which should be accounted for in future public health emergency preparedness planning.

chronic pain conditions and substance use disorders.<sup>3–7</sup> The COVID-19 pandemic altered the social and structural conditions that shape risk of interpersonal violence. Stay-at-home orders and social distancing led to increased social isolation, greater proximity to potential perpetrators within households and decreased access to formal resources (eg, health and legal services) and informal support networks—all factors known to increase intimate partner violence (IPV), which includes IPV-related sexual violence.<sup>8</sup> At the same time, reductions in public activity

and fewer social interactions outside the home may have decreased the opportunity for non-domestic sexual assaults, complicating expectations for pandemic-related trends in sexual violence.

While early pandemic research documented increased IPV, sexual assault patterns during COVID-19 remain poorly understood. Sexual assaults occur across diverse contexts—intimate partnerships, acquaintances and stranger encounters—each differentially affected by pandemic restrictions. Studies from countries outside the USA on pandemic-era sexual assault trends have reflected these mixed risk factors, with variations in case numbers, victim demographics and injury patterns across different phases of the pandemic.<sup>9–11</sup> However, the impact of the COVID-19 pandemic on sexual assault trends in the USA remains unexamined in the literature.

Emergency departments (EDs) are critical in providing acute sexual assault care.<sup>12</sup> EDs are often the most likely healthcare setting to be equipped with the resources and expertise to provide timely and comprehensive sexual assault care, including treatment of physical injuries, STI diagnosis and treatment, HIV prophylaxis, pregnancy prevention, crisis counselling and forensic evidence collection. Additionally, EDs may offer anonymity that may be preferred by survivors seeking immediate care. Given these factors, EDs have become the preferred healthcare setting for identifying sexual assault trends.<sup>12–15</sup>

Given the pandemic's distinct phases—lockdowns, restricted healthcare access and gradual reopening—we examined sexual assault trends across three periods to understand demographic shifts and injury and perpetration patterns. We hypothesised that early COVID-19 would show decreased ED visits for sexual assault due to healthcare barriers, while late COVID-19 would show increased cases and severity following restriction lifting and accumulated pandemic stress. This study aimed to explore the demographics and epidemiology of sexual assault presentations from 2014 to 2021, before and during the early and late phases of the COVID-19 pandemic, using a national ED database.

## METHODS

### Study design

Data were analysed from the National Electronic Injury Surveillance System (NEISS) All Injury Programme (AIP).<sup>16</sup> The NEISS is a stratified, weighted dataset managed by the US Consumer Product Safety Commission, which collects injury data from roughly 100 US hospitals with an ED. This dataset allows researchers to obtain national estimates of injury data from ED visits. While the NEISS was initially designed for consumer product injuries, the US Consumer Product Safety Commission selected approximately 65 participating hospitals (actual numbers vary slightly from year to year) to obtain data for all injuries, regardless of their association with consumer products (the NEISS-AIP). This study follows the Strengthening the Reporting of Observational

Studies in Epidemiology reporting guideline for cross-sectional studies.

The NEISS database includes date of the ED visit, basic demographics of the injured patient, diagnosis, disposition from the ED, incident locale, body part injured, perpetrator and type of assault, reason for the assault, causative agent/mechanism of the injury, and hospital size. Hospital size (strata) is defined by the number of ED visits per year. Very large hospitals had  $\geq 41$  131 visits per year; large hospitals had 28 151–41 130 visits per year; medium hospitals had 16 831–28 150 visits per year; and small hospitals had  $< 16$  830 visits per year, as well as a class encompassing children's hospitals of all sizes. The NEISS race/ethnicity codes provide six categories: white, non-Hispanic; black; Hispanic; Asian non-Hispanic; Indigenous non-Hispanic; other non-Hispanic.

The three-time periods were defined as: (1) pre-COVID-19: 1 January 2014–10 March 2020; (2) early COVID-19: 11 March 2020–31 January 2021 and (3) late COVID-19: 1 February 2021–31 December 2021. The years 2014–2020 were selected as the pre-COVID-19 period, as years before 2014 have been published previously.<sup>17 18</sup> The onset of the early COVID-19 period was designated on 11 March 2020, coinciding with the WHO pandemic declaration and widespread implementation of US restrictions, including stay-at-home orders. 1 February 2021 was selected as the start of the late COVID-19 period as the approximate date the COVID-19 vaccine became widely available to the public, marking the point at which COVID-19 vaccines became widely available to the US public<sup>18</sup> and many states began relaxing restrictions such as mask mandates, business closures and remote schooling.<sup>19</sup>

Injuries due to assaults were identified using the code INTENT=1 (assault). The NEISS definition of assault is any injury from an act of violence where physical force by one or more persons is used with the intent of causing harm, injury or death to another person or intentional poisoning by another person. Sexual assaults were identified by the NEISS AIP code of REASON=4 (sexual assault). The NEISS defines sexual assault as the use of physical force to compel another person to engage in a sexual act against their will with attempted or completed sex acts and abusive sexual contact. A NEISS update was implemented in 2019, introducing new variables aimed to increase detail injury characterisation. Our analyses and case definitions relied on stable core variables (eg, INTENT and REASON codes) that were not affected by this update.

### Patient and public involvement

Patients and the public were not directly involved in the design, conduct or dissemination of this study. This research used publicly available NEISS data, which does not include direct patient engagement or recruitment. However, the study aims to inform public health strategies and clinical practice relevant to patient populations. Findings will be disseminated through open-access

publications and presentations to relevant stakeholders, including patient advocacy groups and healthcare policy-makers.

### Statistical analysis

To obtain national estimates of ED visits, SUDAAN V.11.0.01 software (RTI International, Research Triangle Park, North Carolina, 2013) was used, accounting for the data's weighted, stratified nature. This gives the estimated number (N) of injuries/ED visits and 95% CIs of the estimates. When the actual number of patients (n) is <20, the estimated number (N) becomes unstable and should be interpreted with caution; thus, both n and N are reported.<sup>20</sup> Comparisons between groups of continuous data were calculated with the t-test (two groups) or analysis of variance (three or more groups). Differences between groups of categorical data were calculated by the  $\chi^2$  test. Changes over time were analysed using Joinpoint regression analysis via the standard Grid Search method (Software V.5.4.0.).<sup>21</sup> SUBPOPN statements were used for all subgroup analyses to ensure appropriate SE estimation. For all analyses, a  $p < 0.05$  was considered statistically significant.

## RESULTS

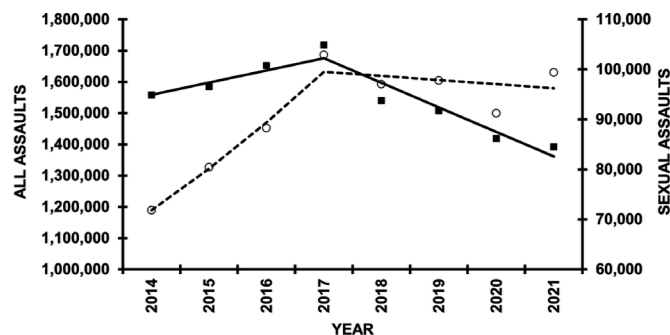
### ED visits due to sexual assault

Over the 8-year study period from 2014 to 2021, there were 246 499 US ED visits for any assault, yielding an estimate of 12 372 201 US ED visits. Of these, there were 22 752 ED visits for sexual assault, corresponding to an estimated 729 820 sexual assault presentations. Sexual assaults accounted for an estimated 5.9% of all ED assault-related visits during the study period. During the pre-COVID-19 era (1 January 2014–10 March 2020), there were an estimated 558 591 (95% CI 536 710 to 578 674) sexual assault presentations. In the early COVID-19 era, there were an estimated 79 305 (95% CI 67 079 to 93 417) sexual assault presentations. In the late COVID-19 era (2 February 2021–31 December 2021), there were an estimated 91 924 (95% CI 79 404 to 106 043) sexual assault presentations.

### Temporal trends

When analysing the entire 8-year study period, the average number of ED presentations for sexual assaults increased at an annual rate of 5.06% per year, corresponding to approximately 3935 additional cases annually. The estimated proportion of assaults due to sexual assault increased over the three periods, from 5.7% in pre-COVID-19, 6.4% in early COVID-19 and 7.1% in late COVID-19 periods, despite the decline in reported sexual assault cases in 2020, in the early pandemic.

Joinpoint regression analyses between the three different periods (figure 1) revealed a significant annual increase of 2.51% in any form of assaults from 2014 through 2017 ( $p = 0.046$ ). During the same period, sexual assaults demonstrated a significant increase of 11.51% per year ( $p = 0.019$ ). From 2017 to 2021, while overall



**Figure 1** Temporal trends in ED visits for sexual assaults vs all assaults, 2014–2021. Lines represent joinpoint regression trends, with sexual assaults (dashed line) and all assaults (solid line). Significant annual changes occurred for all assaults: an increase from 2014 to 2017 (+2.51%,  $p = 0.046$ ) and a decrease from 2017 to 2021 (–5.05%,  $p = 0.003$ ). Sexual assaults increased significantly from 2014 to 2017 (+11.51%,  $p = 0.02$ ) but showed a non-significant decrease from 2017 to 2021 (–1.15%,  $p = 0.57$ ). ED, emergency department.

assaults significantly decreased by 5.05% ( $p = 0.003$ ) annually, annual rates of sexual assault did not significantly change during this period (–1.15%;  $p = 0.57$ ).

### Seasonal trends

There were seasonal variations in sexual assault presentations throughout the study period, with typical peaks in the months of May/June and July/August and troughs in November/December and January/February (online supplemental material).

In 2020, during the early months of the COVID-19 pandemic, there was a notable dip in sexual assault presentations as a proportion of total assaults in March/April to 1.82% (95% CI 1.48% to 2.25%) and in May/June to 1.95% (95% CI 1.59% to 2.38%), which corresponds with the onset of pandemic-related social distancing and lockdowns. In contrast to prior years, where peaks occurred in May–August 2020, there was a later peak in July–October. By 2021, in the late COVID-19 era, estimated proportions of sexual assault returned to their typical peaks in May/June (2.6%, 95% CI 1.97% to 2.68%) and July/August (2.3%, 95% CI 2.21% to 3.08%).

### Demographic trends

Demographics of sexual assault cases by period are shown in table 1. The age distribution changed significantly between pre-COVID-19 and post-COVID-19 eras ( $p < 0.001$ ), with a relative decline in assaults among 0–19 years (pre-COVID-19: 46.1%; early COVID-19: 40.0%; late COVID-19: 37.3%) and rise among 20–34 years (pre: 36.0%; early: 37.3%; late: 40.3%) and 35–64 years (pre: 17.2%; early: 21.8%; late: 21.0%). Racial and ethnic representation also shifted significantly between the early and late COVID-19 periods ( $p = 0.02$ ), with a decline in white patients (49.5% to 47.7%) and an increase in black (31.7% to 32.8%) and Hispanic patients (13.8% to 15.6%).

**Table 1** Patient demographics and incident characteristics of sexual assaults among US EDs by COVID-19 era

	Pre-COVID-19	Early COVID-19	Late COVID-19	Total	P value
Age, years, median (IQR)	20.2 (12.7, 30.0)	21.5 (13.8, 32.0)	22.3 (15.5, 32.5)		<0.001
Age, N (%)					<0.001
0–19	257 244 (46.1)	31 716 (40.0)	34 282 (37.3)	323 240	
20–34	200 921 (36.0)	29 610 (37.3)	37 088 (40.4)	267 619	
35–64	95 861 (17.2)	17 298 (21.8)	19 316 (21.0)	132 475	
65 plus	4535 (0.8)	682 (0.9)	1141 (1.2)	6357	
Sex, N (%)					0.32
Male	66 906 (12.0)	8135 (10.3)	10 263 (11.2)	85 304	
Female	491 685 (88.0)	71 170 (89.7)	81 655 (88.8)	644 510	
Race					0.53
White	227 878 (56.0)	33 931 (49.5)	38 037 (47.7)	299 847	
Black	118 222 (29.0)	21 728 (31.7)	26 148 (32.8)	166 098	
Hispanic	48 012 (11.8)	9465 (13.8)	12 453 (15.6)	69 929	
Asian	3583 (0.9)	955 (1.4)	771 (1.0)	5309	
Native American	2416 (0.6)	1085 (1.6)	558 (0.7)	4059	
Other	7156 (1.8)	1443 (2.1)	1857 (2.3)	10 456	
Hospital size					0.34
Small	95 228 (17.0)	17 039 (21.5)	13 420 (14.6)	125 686	
Medium	123 460 (22.1)	15 940 (20.1)	21 597 (23.5)	160 997	
Large	136 780 (24.5)	16 040 (20.2)	22 779 (24.8)	175 599	
Very large	152 264 (27.3)	22 349 (28.2)	26 608 (28.9)	201 220	
Childrens	50 859 (9.1)	7937 (10.0)	7522 (8.2)	66 317	
ED disposition					0.11
Discharge	518 828 (97.0)	73 229 (96.9)	83 168 (95.8)	675 225	
Admit	15 986 (3.0)	2316 (3.1)	3660 (4.2)	21 962	
Incident locale					0.06
Home	229 547 (63.9)	30 899 (65.1)	25 786 (53.9)	289 615	
School/sports	24 225 (6.7)	2243 (4.7)	2637 (5.5)	29 227	
Street	15 263 (4.2)	2063 (4.3)	2189 (4.6)	19 514	
Other property	90 188 (25.1)	12 241 (25.8)	17 232 (35.8)	119 959	
Perpetrator					<0.001
Spouse/partner	38 135 (10.9)	5868 (12.7)	6791 (13.5)	50 794	
Parent	31 651 (9.0)	4455 (9.6)	5611 (11.2)	41 717	
Other relative	45 362 (12.9)	4839 (10.4)	5407 (10.7)	55 607	
Unrelated caregiver	2585 (0.7)	199 (0.4)	469 (0.9)	3253	
Friend/acquaintance	150 877 (42.9)	19 412 (41.9)	20 409 (40.6)	190 698	
Official authorities	495 (0.1)	49 (0.1)	146 (0.3)	689	
Multiple	51 205 (14.6)	7621 (16.4)	6035 (12.0)	64 861	
Stranger	31 017 (8.8)	3893 (8.4)	5442 (10.8)	40 352	

ED, emergency department.

**Incident locale trends**

Compared with pre-COVID-19, the proportion of sexual assaults occurring in the home increased in the early COVID era from 63.9% to 65.1%, however, this did not reach statistical significance ( $p=0.06$ ). The incident

locale was significantly different in pre-COVID-19 versus late COVID-19 eras ( $p=0.045$ )—the proportion of sexual assaults occurring in the home decreased between early and late COVID-19 eras (65.1% vs 53.9%), and fewer incidents were reported during school or sports activities

between early and late COVID-19 eras (4.7% vs 5.5%). There was also a notable increase in incidents occurring at ‘other properties’ between early and late COVID-19 eras (25.8% vs 35.8%).

### Perpetrator characteristics

Perpetrator characteristics significantly differed between the three study periods ( $p < 0.001$ ). Rates of sexual assault perpetration by a spouse/partner increased with each period, from pre-COVID-19 (10.9%), to early COVID-19 (12.7%), to late COVID-19 (13.5%). A similar trend was seen for perpetration by parents (9.0% vs 9.6% vs 11.2%). Compared with early COVID-19, perpetration by strangers declined slightly during early COVID-19 and increased in the late COVID-19 era (8.8% vs 8.4% vs 10.8%), respectively. There was an increase in multiple perpetrator assault from pre-COVID-19 to early COVID-19 eras (14.6% vs 16.4%), which decreased in the late COVID-19 era (12.0%).

### Mechanism of injury

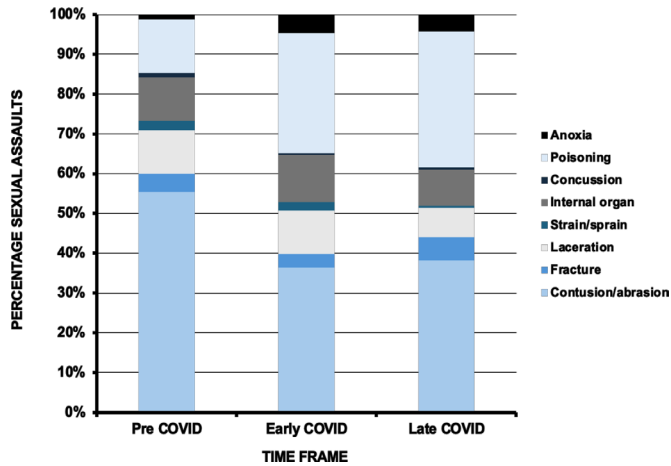
Regardless of the period, the most common sexual assault injury mechanisms were being struck or hit, accounting for 97.9% or more of cases. Compared with pre-COVID-19, during early COVID-19, there was a relative increase in being cut/pierced (0.2% vs 0.6%) as well as inhalation/suffocation (0.1% vs 0.4%), which both subsequently declined in late COVID; however, these differences were not significantly different (table 2).

### Injury diagnoses

Injury diagnoses were significantly different between pre-COVID-19 and post-COVID-19 eras ( $p < 0.001$ ) (figure 2). Excluding unknown diagnoses, the six most common injury diagnoses, in order of frequency, were contusion/abrasion, poisoning, internal organ injury, laceration and anoxia (table 2). Internal organ injuries increased from pre-COVID-19 to early COVID-19 eras from 1.2% to 2.1%, then decreased in late COVID-19 to 1.4%. Poisonings rose from 1.4% pre-COVID-19 to 5.3% in early COVID-19 and remained elevated at 5.5% in late

**Table 2** Sexual assault injury characteristics amongst US emergency departments by COVID-19 era

	Pre-COVID-19	Early COVID-19	Late COVID-19	Overall	P value
<b>Mechanism, N (%)</b>					
Struck	546750 (98.7)	77278 (97.9)	90283 (98.9)	714311	0.63
Cut/pierced	1266 (0.2)	466 (0.6)	232 (0.3)	1974	
Fall	2351 (0.4)	410 (0.5)	446 (0.5)	3207	
Gunshot wound	78 (0.0)	50.33 (0.1)	0 (0.0)	128	
Bite	1864 (0.3)	228 (0.3)	5 (0.0)	2247	
Fire/burn	398 (0.1)	13 (0.0)	14 (0.0)	425	
Overexertion	19 (0.0)	0 (0.0)	0 (0.0)	19	
Pedestrian	107 (0.0)	0 (0.0)	0 (0.0)	107	
Motor vehicle occupant	522 (0.1)	125 (0.2)	97 (0.1)	744	
Inhalation/suffocation	498 (0.1)	347 (0.4)	92 (0.1)	937	
<b>Diagnosis, N (%)</b>					
$<0.001$					
Contusion/abrasion	31923 (5.8)	4927 (6.4)	5488 (6.1)	42338	
Fracture	2578 (0.5)	461 (0.6)	830 (0.9)	3869	
Laceration	6322 (1.2)	1476 (1.9)	1070 (1.2)	8869	
Strain/sprain	1381 (0.3)	295 (0.4)	72 (0.1)	1747	
Internal organ injury	6312 (1.2)	1609 (2.1)	1295 (1.4)	9219	
Concussion	584 (0.1)	47 (0.1)	94 (0.1)	725	
Unknown	489580 (89.5)	63217 (82.4)	75667 (84.0)	628464	
Poisoning	7812 (1.4)	4089 (5.3)	4907 (5.5)	16808	
Anoxia	683 (0.1)	629 (0.8)	610 (0.7)	1922	
<b>Anatomic area, N (%)</b>					
0.08					
Head/neck	32732 (7.5)	6112 (11.3)	6056 (9.9)	44900	
Upper trunk	8968 (2.1)	1375 (2.5)	1410 (2.3)	11753	
Lower trunk	378572 (86.8)	43484 (80.2)	50225 (81.9)	472280	
Upper extremity	8088 (1.9)	1967 (3.6)	2029 (3.3)	12085	
Lower extremity	7896 (1.8)	1273 (2.3)	1633 (2.7)	10802	

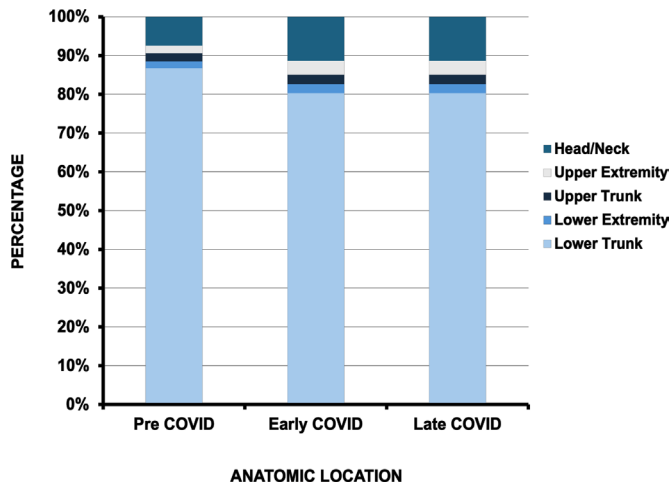


**Figure 2** Proportions of known sexual assault-related injury diagnoses by COVID-19 era. The severity of injuries increased from pre-pandemic to post-pandemic, as indicated by the rise in anoxia and poisonings in each subsequent period. Internal organ injuries increased in early COVID-19, but returned to pre-pandemic levels in late COVID-19.

COVID-19. Additionally, anoxia-related sexual assault injuries increased from 0.1% pre-COVID-19 to 0.8% in early COVID-19 and 0.7% in late COVID-19.

**Anatomic area of injury**

Injuries occurred in five major anatomic locations: head and neck, upper trunk, lower trunk, upper extremity and lower extremity (table 2). Figure 3 demonstrates the six most common anatomic areas of injury by COVID-19 era. Lower trunk injuries, which include the pubic/genital areas, accounted for most frequent injury sites across time periods; however, there was a decline from pre-COVID-19 to early and late COVID (86.8% vs 80.2% vs 81.9%), respectively. Compared with pre-COVID-19, head and neck injuries increased from 7.5% to 11.3% in early COVID-19 and remained elevated at 9.9% in late COVID-19.



**Figure 3** Anatomic locations of sexual-assault-related injuries by COVID-19 era. Compared with pre-COVID-19, there were more head and neck injuries due to sexual assault incidents during COVID-19. The lower trunk comprised the majority of locations regardless of time period.

COVID-19. Lower extremity injuries also rose, from 1.8% pre-COVID-19 to 2.3% in early COVID-19 and 2.7% in late COVID-19.

**DISCUSSION**

This study analysed trends in US ED visits for sexual assault-related injuries before and during the COVID-19 pandemic and revealed three key findings. First, unlike other forms of assault, ED visits for sexual assault did not decline during the pandemic. Second, there were shifts towards victimisation of older age groups, with fewer cases among those 19 years and younger, and increases in cases affecting black and Hispanic populations. Lastly, the severity of sexual assault injury increased during the pandemic, with rises in poisonings (eg, drug-facilitated assaults), anoxia (eg, strangulation) and multiple perpetrator assaults.

While ED visits for assaults of any kind declined during the pandemic, visits for sexual assault did not change significantly during this period. This finding persists despite a documented early COVID drop in sexual assault cases that likely under-represents true case numbers due to healthcare access barriers during the initial pandemic phase.<sup>22</sup> As a result, sexual assaults made up an increasing proportion of total assault-related ED visits during the pandemic. It is also crucial to recognise that sexual assault is widely under-reported by survivors and underdiagnosed by providers even under normal circumstances.<sup>23</sup> Thus, the actual number of community cases of sexual assault during the COVID-19 pandemic was likely far higher than reported here, especially given the known barriers to accessing care during the pandemic.<sup>24</sup> The pandemic’s physical and psychological stressors, such as increased isolation, economic hardship and heightened household tension, may have amplified vulnerability to sexual violence.<sup>25 26</sup> Unlike other forms of assault, sexual assault trends appear to be driven by distinct factors, underscoring the need for targeted, trauma-informed interventions to address survivor needs and reduce sexual assault-related injuries during public health crises.<sup>27–29</sup>

Our study observed a shift in the age and racial/ethnic demographics of sexual assault presentations during the pandemic. The proportion of cases declined among 0–19 years, with increases among 20–34 years and 35–64 years, suggesting that pandemic-related factors, such as reduced school attendance and disruptions in social services, may have limited reporting among younger individuals. Concurrently, there was a slight increase in black and Hispanic patients and a decline in white patients presenting for sexual assault from early to late COVID-19 periods. These trends may reflect changes in reporting practices, healthcare access, or the heightened impact of COVID-19 on marginalised populations, who face a greater risk of sexual violence and are disproportionately affected by structural inequities.<sup>2 30</sup> The pandemic’s exacerbation of social and economic vulnerabilities,

conceptualised within a syndemic framework, may have amplified these disparities.<sup>31</sup> However, we acknowledge that these findings may also reflect underreporting or a lack of trust in healthcare systems, which has historically limited engagement with healthcare among marginalised communities.

There was a rise in sexual assaults perpetrated by spouses, partners and parents during the COVID-19 pandemic, aligning with trends in intimate partner violence.<sup>32 33</sup> Due to pandemic-related stay-at-home orders and remote work arrangements, the heightened proximity of individuals within household settings during lockdowns may have increased the likelihood of intrahousehold conflicts and stress, leading to increased incidents of domestic violence, including sexual assault.<sup>25 26</sup> In contrast, the late COVID-19 period saw a decline in home-based incidents and a rise in assaults in public settings, possibly reflecting the relaxation of restrictions and increased social interactions outside the home.

The significant changes in injury characteristics during the pandemic suggest increased severity of sexual assault-related injuries. Both early and late COVID periods saw a rise in poisonings (eg, 'date rape' or 'drug-assisted rape'), which is a known predictor of severity of injury sustained during sexual assault.<sup>34</sup> This may be related to the parallel rise in substance use during COVID-19 and increased use of drugs or alcohol to incapacitate or coerce victims during the pandemic.<sup>35 36</sup>

There was also a notable rise in anoxia-related injuries (eg, from strangulation and suffocation), which can lead to severe brain damage and death. This trend may explain the parallel rise in head and neck injuries observed during the pandemic.<sup>37 38</sup> These trends may represent a change in violence and aggression of assailant tactics. Additionally, increases in internal organ injuries and multiple-perpetrator assaults, particularly during early COVID, further underscore the heightened severity of sexual assault injuries.<sup>39</sup> Together, these findings suggest that increased psychological strain during the pandemic may have escalated the intensity of violence (Ross *et al*), while disruptions in healthcare access may have contributed to delayed presentations and more severe injuries in US EDs.<sup>40</sup>

Anatomic injury locations also varied across the three periods. The predominance of lower trunk injuries, particularly involving the pubic/genital areas, across all time periods suggests a consistent vulnerability of this anatomical region to sexual assault. There was also an increase in lower extremity injuries during COVID-19 periods, indicating a potential shift in victim behaviours. These injuries, often linked to attempts to escape or resist assault, may suggest survivors were more able to defend themselves during the pandemic, potentially influenced by the #MeToo movement and increased awareness of sexual assault.

## Limitations

NEISS analyses ED data and thus does not represent all sexual assault cases who sought healthcare outside the ED setting, such as urgent care centres or primary care and women's health clinics. Additionally, the ED setting may select for sexual assault incidents that result in physical injury and of increased severity. However, the ED is often the primary point of care for acute sexual assaults and is the preferred healthcare setting to analyse sexual assault trends.<sup>14</sup> The heterogeneity of COVID-19 responses across US states and localities represents important variation that our national-level analysis cannot capture, though our time periods correspond to broad national shifts in pandemic response and social behaviour. There are also several limitations with the NEISS dataset. NEISS was updated in 2019 with new variables and expanded narratives, which may have influenced injury detail in the pre-COVID-19 period; however, our core case definitions were based on unchanged variables. Additionally, there is limited sociodemographic and psychosocial data available, such as sexual orientation and gender identity for both victim and perpetrator, primary language, health insurance status, or information on drug or alcohol use. However, the large, nationally representative sample over 8 years provides robust and geographically and demographically diverse information that provides important insights on sexual assault injury characteristics and trends.

## CONCLUSIONS

Our study found that despite widespread barriers to care during the COVID-19 pandemic, there were persistent presentations for sexual assault care at US EDs despite a decline in all other assaults. Injury severity also rose, with more cases of strangulation and drug-facilitated violence. Additionally, there were shifts towards victimisation of older age groups, marginalised racial and ethnic populations and increased assaults by parents and partners. These findings underscore the persistent burden of sexual violence and its worsening during the pandemic.

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