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### Permalink

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### Publication Date

2024-10-28

### DOI

10.1089/jwh.2024.0758

### Supplemental Material

<https://escholarship.org/uc/item/0wg297rq#supplemental>

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Peer reviewed

## **Emergency department utilization for behavioral health problems and violence among postpartum individuals in the context of the COVID-19 pandemic**

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**Financial support:** This work was supported by the National Institutes of Health (grant NICHD 1R01HD102319-01A1 to C.M. and S.G.M.), and by the University of California Office of the President (Multicampus Research Programs and Initiatives grant M21PR3278). The sponsors had no role in the study design; collection, analysis, or interpretation of data; writing of the report, or decision to submit the article for publication.

**Conflicts of interest.** No financial disclosures or other conflicts of interest were reported.

**Data sharing statement.** The study data are owned by the California Department of Public Health and, per data use agreements, are not available for sharing. These restricted datasets are available by researcher request at <https://hcai.ca.gov/data/request-data/>. Analytic code is available, as of the date of publication, via email to [sgoldman-mellor@ucmerced.edu](mailto:sgoldman-mellor@ucmerced.edu).

**Author contributions:** SGM designed the study, acquired the data, directed implementation and data analysis for the study, and drafted the article. MO, AG, and CM helped conduct the literature review, assisted in the design of the study, helped interpret the data analysis, and revised the manuscript for critical intellectual content. All authors participated sufficiently in the work to warrant co-authorship. SGM takes responsibility for the paper as a whole.

**Word count:** 2,136

**Tables:** 1

**Figures:** 2

**Key words:** Postpartum; COVID-19; emergency department; psychiatric; behavioral health; assault; drug; alcohol

**Running head:** Postpartum ED behavioral health utilization in COVID-19

## ABSTRACT

**Study Objective.** Distinctive stressors facing pregnant and postpartum individuals during the COVID-19 pandemic may have affected their emergency department (ED) care-seeking for behavioral health concerns and violence victimization. We tested whether incidence of postpartum behavioral health and assault injury ED visits differed for individuals according to their months of postpartum pandemic exposure.

**Methods.** We used statewide, longitudinally-linked hospital and ED administrative claims data from California to classify all individuals with hospital deliveries between Jan. 1, 2016 and Dec. 31, 2020 according to their months of postpartum pandemic exposure. Outcomes comprised 12-month incidence of any ED visit for a psychiatric disorder, drug use disorder/overdose, alcohol use disorder/intoxication, or assault injury, defined using ICD-10-CM codes. Risk ratios compared incidence of each outcome among people with 1 to 12 months of postpartum pandemic exposure to those with 0 months of exposure.

**Results.** Compared to people with 0 months of postpartum pandemic exposure (n=1,163,215), delivering people with 1 to 12 months' exposure (range: n=26,836 to n=273,561) were approximately equally likely to have a postpartum ED visit for psychiatric disorder, drug use disorder, or alcohol use disorder, after adjusting for demographic differences (most  $p > 0.10$ ). Incidence of assault injury was significantly lower among delivering individuals with 11 or 12 months of pandemic exposure ( $RR_{adj} = 0.70$  and  $0.91$ , respectively; both  $p < 0.01$ ) compared to those with 0 months.

**Conclusions.** Contrary to expectations, the pandemic did not appear to have affected ED utilization for most behavioral health conditions among postpartum individuals, but assault injury ED visits declined.

Drug-related deaths and homicides among pregnant and postpartum people in the US increased 40-55% during the first year of the pandemic,<sup>1</sup> outpacing increases in the general population.<sup>2,3</sup> Pregnancy-associated suicide deaths, however, declined.<sup>1</sup> The distinctive stressors facing pregnant/postpartum individuals during the pandemic – including concerns about the virus’ risk to fetuses and neonates, unexpected childcare responsibilities, steep barriers to accessing drug use disorder treatment, and increased rates of domestic violence<sup>4-7</sup> – may have exacted a unique toll on this population’s psychological and behavioral health.<sup>1,8</sup>

No research has examined whether emergency department (ED) utilization for behavioral health problems and violence victimization increased in this population. ED use is an important outcome to examine because EDs provide essential timely care for people with acute behavioral health problems and injuries, are regularly used by pregnant and postpartum people, and they experienced distinct changes in utilization patterns during the first year of the pandemic.<sup>9,10</sup> One possible expectation is that the stress of the pandemic increased the need for acute services for psychological problems, substance misuse, and violence-related injury.<sup>11</sup> Alternatively, concerns over the potential for hospital-acquired COVID infections during the pandemic period, particularly for postpartum people, may have inhibited their use of the ED.<sup>12</sup> Although the immediate crisis of the COVID-19 pandemic has waned, this question remains salient given the inevitability of future pandemics and the necessity for public health emergency preparedness around health system capacity.<sup>13,14</sup>

Here, we examine the incidence of postpartum ED visits due to psychiatric disorder, drug and alcohol misuse, and violence victimization among California residents who delivered a live infant during the first year of the pandemic and we compare these estimates to pre-pandemic

patterns. For context, we also examined frequency of ED visits for study outcomes among all reproductive-aged women in California across the study period.

## **METHODS**

*Study design and setting.* This study was approved by the institutional review boards of the California Health and Human Services Agency and the University of California, Merced. We obtained hospital and ED discharge data from the California Department of Health Care Access and Information (HCAI) on all visits to all California-licensed hospitals from January 1, 2016, to December 31, 2021, by people with a California residential zip code.

First, to assess ED visit frequencies among all reproductive-aged women, we extracted all ED visit records for female patients aged 10-54 years. Second, to assess prospective incidence of ED utilization among delivering individuals, we extracted all records for people aged 10-54 years with an inpatient delivery of a live infant and a unique identifier (scrambled Social Security number [SSN]). Unique identifiers allowed for linkage between individuals' hospital and ED records for follow-up analysis among delivering people.

*Selection of participants for follow-up analysis.* Delivery hospitalizations were identified using International Classification of Diseases-Clinical Modification, version 10 (ICD-10-CM) diagnosis codes O80, Z37.0, Z37.2-.3, Z37.5-.6, and Z38. If a person delivered more than once during a calendar year, only the first observed delivery in that year (“index delivery”) was retained for analysis; repeated deliveries to the same person across calendar years were retained.

*Measures.* We first ascertained monthly counts of emergency department visits for each study outcome among California reproductive-aged women, and monthly counts of COVID-19 deaths among the entire state population, for the period January 1, 2016 to December 31, 2021.

For the follow-up analysis among delivering individuals, we categorized each person according to their total months of postpartum exposure to the pandemic. The postpartum period comprised the 12 months after index delivery. Our exposure variable was categorized as 0 for people delivering between January 1, 2016, and March 31, 2019, 1 for people delivering in April 2019, 2 for those delivering in May 2019, etc.; it was categorized as 11 for people delivering in February 2020 and 12 for people delivering between March 1 and December 31, 2020.

*Outcomes.* We examined four outcome categories of interest: psychiatric disorder (including suicidal/self-harm behavior), drug use disorder or drug overdose, alcohol use disorder or intoxication, and assault injury. An ED visit was defined as an outcome event based on the presence of a qualifying ICD-10-CM diagnosis within the first three coding positions; qualifying diagnoses for each outcome category are shown in **Supplemental Table 1**. Delivering people in each postpartum pandemic exposure category were followed forward from their index delivery date to ascertain 12-month cumulative incidence of any postpartum ED visit for each outcome category.

We assessed basic sociodemographic characteristics of delivering people at index delivery: age group (10-17, 18-24, 25-29, 30-34, and 35-54 years) and race and ethnicity (White, non-Hispanic; Black, non-Hispanic; Hispanic; American Indian/Alaska Native, non-Hispanic; Asian/Pacific Islander, non-Hispanic; and other or multiple racial/ethnic groups).

*Analysis.* We used descriptive statistics to examine monthly frequency of ED visits by study outcome among reproductive-aged women. For the follow-up analyses among delivering individuals, we then calculated cumulative incidence of each outcome according to exposure status (i.e., the percentage of delivering people in each exposure category with one or more ED visits for that outcome within the 12-month follow-up period). We used a generalized linear model (GLM) with log link and Poisson family to calculate risk ratios comparing incidence among those with 1, 2, 3...12 months of postpartum pandemic exposure to incidence in those with 0 months of exposure, with the dummy-coded exposure variable. All models adjusted for age and race or ethnicity due to changes in the composition of birthing people during this period.<sup>15</sup> All models specified cluster-robust standard errors to account for multiple deliveries to the same individual across the study period. Analyses were conducted using Stata v. 16 (StataCorp LLC, College Station, TX).

## **RESULTS**

Among all reproductive-aged women in California, the average monthly counts of ED visits prior to the pandemic were 28,370 for psychiatric disorder, 6,100 for drug use disorder or overdose, 4,630 for alcohol use disorder or intoxication, and 3,675 for assault injury. These monthly counts exhibited notable declines between November 2019 and April 2020 (between 25% and 39%; see **Figure 1**), whereafter they rebounded but remained subject to large fluctuations.

In total, the study sample included 1,748,766 index deliveries, which took place at 261 hospitals across the state. There were 1,163,215 delivering people with 0 months of postpartum



exposure to the pandemic (i.e., who delivered between 1 January 2016 and 31 March 2019). For those with one to 12 months of postpartum pandemic exposure, cohort sizes ranged between 26,836 (1 month) and 273,561 (12 months). Study individuals' sociodemographic characteristics are shown in **Table 1**, grouped by any (vs. no) months of postpartum exposure to the pandemic. Compared to those with any postpartum pandemic exposure, people with no pandemic exposure had lower average age and higher proportions of non-Hispanic White race/ethnicity.

Approximately 1.6% (n=32,360) of delivering people across the study period made an ED visit for psychiatric disorder during the 12 months of postpartum follow-up. Far fewer presented with a postpartum ED visit for drug use disorder or overdose (n=7,229; 0.4%) or assault injury (n=7,800; 0.4%). The rarest outcome was any postpartum ED visit for alcohol use disorder or intoxication (n=3,184; 0.15% of delivering individuals).

**Figure 2** shows adjusted risk ratio ( $RR_{adj}$ ) model results for all study outcomes, according to months of postpartum pandemic exposure. Compared to those with no postpartum exposure to the pandemic, people with 1-12 months of pandemic exposure were no more likely to make a postpartum psychiatric ED visit after accounting for covariates ( $RR_{adj}$  ranged from 0.92 to 1.08, all  $p > 0.05$ ). Risk of a postpartum ED visit for drug use disorder or drug overdose was also no different between those with vs. those without pandemic exposure, except for those exposed to 9 postpartum pandemic months, who had reduced risk ( $RR_{adj}=0.76$ , 95% CI=0.62, 0.95,  $p=0.015$ ).

Incidence of a postpartum ED visit for alcohol use disorder or intoxication largely did not differ by postpartum pandemic exposure, although the rarity of this outcome resulted in somewhat unstable results (signified by highly variable RR estimates and wide confidence intervals). Risk was reduced among delivering individuals with 6 months of postpartum

pandemic exposure ( $RR_{adj}=0.68$ , 95% CI=0.49, 0.96,  $p=0.03$ ), but marginally increased among those with 4 or 5 months of pandemic exposure ( $RR_{adj}=1.27$  and 1.24, respectively; both  $p<0.10$ ).

Incidence of assault injury was consistently lower across most postpartum pandemic exposure cohorts compared to the pre-pandemic cohort. This pattern reached conventional levels of statistical significance only in delivering individuals with 11 or 12 months of pandemic exposure ( $RR_{adj}=0.70$  and 0.91, respectively; both  $p<0.01$ ).

## **DISCUSSION**

This is the first population-based study to examine postpartum people's ED utilization for behavioral health problems and violence victimization during the early period of the COVID-19 pandemic. We found that 12-month postpartum risk of an ED visit for psychiatric disorder, drug use disorder or overdose, and alcohol use disorder or intoxication largely did not change among California residents who had postpartum pandemic exposure in 2020-2021 when compared to those who had no pandemic exposure. Postpartum risk of an ED visit for assault injury, however, was significantly lower among those with  $\geq 11$  months of postpartum pandemic exposure.

Prior evidence on the impact of the pandemic on behavioral health and injury outcomes among pregnant and postpartum individuals is inconsistent. Studies using outpatient data found that pre- vs. post-pandemic postpartum depression rates remained stable,<sup>16</sup> although pregnancy-associated deaths from suicide declined from 2019 to 2020.<sup>1</sup> However, some types of prescription and illicit drug use moderately increased in this population during the pandemic,<sup>17,18</sup> and pregnancy-associated drug deaths increased substantially nationwide.<sup>1</sup> To our knowledge, no

other study has examined pandemic-era nonfatal assault injury among pregnant or postpartum individuals, although pregnancy-associated homicide deaths rose.<sup>1</sup>

The postpartum population experienced widespread changes in emergency department and other healthcare delivery service use during the pandemic.<sup>8</sup> Our own analyses show that among California reproductive-aged women, ED utilization rates for study outcomes exhibited steep declines at the outset of the pandemic and again (after rebounding) in late 2020. Although measured differently, postpartum incidence of emergency care for behavioral health problems does not appear to have changed as dramatically. The mostly null “net effects” we observed could have resulted from (a) postpartum people experiencing little net change in their behavioral health morbidity during the pandemic (except for assault injury), (b) postpartum people experiencing worsening behavioral health but seeking ED care for those problems at lower rates, (c) postpartum people experiencing improving behavioral health but seeking ED care at higher rates, or (d) postpartum ED patients prioritizing the reporting of physical, rather than mental, health problems during the pandemic (perhaps due to stigma). Emergency department use for mental and behavioral conditions among pregnant and postpartum individuals remains an understudied topic, and more research is needed to distinguish these post-hoc and non-mutually exclusive explanations, which we could not examine with our study data. Future research should also investigate why ED utilization for assault injury declined in this patient population. One possibility, which we could not elucidate, is that violence-injured postpartum people during the pandemic were more likely than their pre-pandemic peers to have children at home whom they felt they could not safely leave behind during a trip to the ED.<sup>19</sup> Emergency departments can

provide opportunities to help initiate referrals for longer-term outpatient behavioral health care and social services; however, in practice such opportunities are often unrealized.<sup>20</sup>

There are several limitations of the study that should be considered. First, the study sample was limited to people giving birth in hospitals and with a valid unique identifier between 2016 and 2020. The rate of “community births” (i.e., home births or births in non-hospital birthing centers) increased substantially during the pandemic, and these community-birthing individuals were less likely than those with hospital births to have characteristics associated with adverse behavioral health outcomes (e.g., smoking during pregnancy, teen pregnancy, and preterm or low-birthweight births), which may have created a selection effect in our results.<sup>21</sup> Results from our study period may not be applicable to the experiences of postpartum individuals whose index deliveries occurred in 2021 or later. Second, we were unable to differentiate “true rates” of underlying morbidities from ED care for those morbidities; relatedly, pandemic healthcare impacts could have affected detection or recording of study diagnoses, as alluded to above. Third, while our cohort study design and choice to use a 12-month outcome allowed us to clearly define the population denominator and calculate incidence of rare outcomes, it did preclude examination of short-run effects of different pandemic periods (e.g., shelter-in-place orders).<sup>22</sup> Finally, our California data may not be national generalizable.<sup>23</sup> We also note that our study used an observational design and that causality cannot be determined from the associations presented here.

With the exception of visits for assault injury, the outset of the COVID-19 pandemic does not appear to have substantially affected ED utilization for mental and behavioral conditions among postpartum people. These findings underscore the relevance of EDs as sources of care for

urgent behavioral health problems for priority populations, even in the context of mass population health and healthcare crises.

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## TABLES

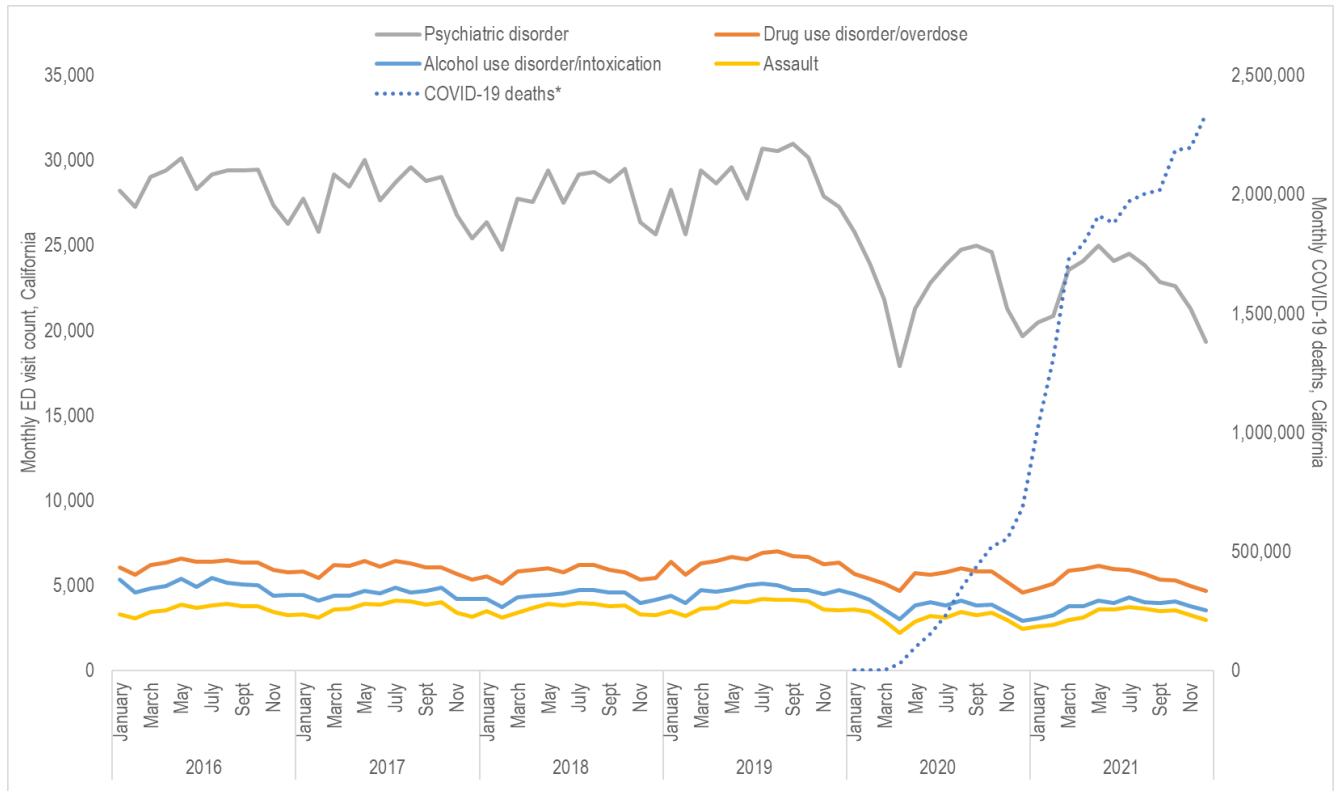
**Table 1.** Characteristics of California people with hospital deliveries of live infants, by months of postpartum exposure to the COVID-19 pandemic (1-12 months of exposure combined).

	<b>0 months of postpartum pandemic exposure</b>	<b>1 to 12 months of postpartum pandemic exposure</b>
Total cohort N	1,163,215	585,551
Age group, n (%)		
10-17 years	44,275 (3.8%)	3,740 (0.6%)
18-24 years	198,266 (17.0%)	101,852 (17.4%)
25-29 years	312,680 (26.9%)	155,495 (26.6%)
30-34 years	350,603 (30.1%)	183,637 (31.4%)
35-54 years	257,391 (22.1%)	140,827 (24.1%)
Race/ethnicity, n (%)		
NH White	390,102 (33.5%)	184,275 (31.5%)
NH Black	74,646 (6.4%)	36,414 (6.2%)
Hispanic	482,422 (41.5%)	250,990 (42.9%)
NH Asian/PI	158,553 (13.6%)	78,540 (13.4%)
NH AI/AN	3,916 (0.3%)	2,089 (0.4%)
Other/multiple	53,575 (4.6%)	33,238 (5.7%)

NH: non-Hispanic. PI: Pacific Islander. AI/AN: American Indian/Alaska Native.



**Figure 1.** Monthly emergency department visit counts for study outcomes among reproductive-aged women, California, 2016-2021.



\*Monthly counts of COVID-19 deaths in California obtained from Johns Hopkins University’s Center for Systems Science and Engineering online database <sup>24</sup>.

**Figure 2.** Adjusted risk ratios for study outcomes among delivering individuals according to their postpartum months of exposure to the COVID-19 pandemic, California, 2016-2021.

