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The impact of the COVID-19 pandemic and governor mandated stay at home order on emergency department super utilizers

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ABSTRACT

Background: Despite the trend of rising Emergency Department (ED) visits over the past decade, researchers have observed drastic declines in number of ED visits due to the COVID-19 pandemic. The purpose of the current study was to examine the impact of the COVID-19 pandemic and governor mandated Stay at Home Order on ED super utilizers.

Methods: This was a retrospective chart review of patients presenting to the 12 emergency departments of the Franciscan Mission of Our Lady Hospital System in Louisiana between January 1, 2018 and December 31, 2020. Patients who were 18 years of age or older and had four ED visits within a one-year period (2018, 2019, or 2020) were classified as super-utilizers. We examined number and category of visits for the baseline period (January 2018 – March 2020), the governor's Stay at Home Order, and the subsequent Reopening Phases through December 31, 2020.

Results: The number of visits by super utilizers decreased by over 16% when the Stay at Home Order was issued. The average number of visits per week rose from 1010.63 during the Stay at Home Order to 1198.09 after the Stay at Home Order was lifted, but they did not return to Pre-COVID levels of approximately 1400 visits per week in 2018 and 2019. When categories of visits were examined, this trend was found for emergent visits ($p < 0.001$) and visits related to injuries ($p < 0.001$). Non-emergent visits declined during the Stay at Home Order compared to the baseline period ($p < 0.001$), and did not increase significantly during reopening compared to the Stay at Home Order ($p = 0.87$). There were no changes in number of visits for psychiatric purposes, alcohol use, or drug use during the pandemic.

Conclusions: Significant declines in emergent visits raise concerns that individuals who needed ED treatment did not seek it due to COVID-19. However, the finding that super utilizers with non-emergent visits continued to visit the ED less after the Stay at Home Order was lifted raises questions for future research that may inform policy and interventions for inappropriate ED use.

1. Introduction

The first case of the SARS-CoV-2 virus was reported in the United States on January 20, 2020 [1]. On March 11, 2020, COVID-19 was officially classified as a pandemic by the World Health Organization (WHO) [2, 3]. While hospitals and clinics were inundated with patients in critical condition due to the virus [4,5], the pandemic resulted in significantly fewer non-COVID-19 related hospital admissions in early 2020 [6-8]. COVID-19 has had an enormous impact on every aspect of delivery of healthcare as noted in the reductions in in-person outpatient visits and increased telehealth appointments [8,9]. However, it is still too early to determine the full impact of COVID-19 on healthcare systems and specific patient populations.

Over the past decade, the number of annual ED visits in the United States rose significantly from an estimated 124,945,264 in 2008 to 144,841,803 in 2017 [10]. Despite the trend of rising ED visits [10], researchers have observed drastic declines in number of ED visits during the beginning of the COVID-19 pandemic. As COVID-19 spread and healthcare resources became strained, patients were encouraged to avoid using healthcare resources unnecessarily [14]. In the United States, ED visits were estimated to have declined more than 40% in early 2020 [11-13] with an overall reduction in both urgent [15,16] and non-medically urgent emergency department visits [17]. Studies

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indicate visits increased after many stay at home orders were lifted, though visits to emergency departments, clinics, and hospitals did not return to pre-COVID-19 levels [6,18].

The impact of the pandemic on ED visits of super utilizers has not been examined. There is no consistent definition of super utilizers; however, the lowest common threshold in the literature is patients with four or more ED visits in a 12 month period [19-21]. These individuals account for a disproportionate number of hospital visits and healthcare costs [19,21-23]. Numerous studies have examined patient characteristics [19,21-25], patient complaints [24], super utilizer behavior classification [20], and appropriateness of care for these patients [26,27]. Interventions for reducing ED visits by super utilizers have demonstrated modest impacts [28].

The purpose of the current study is to examine the impact of the COVID-19 pandemic on super utilizer behavior in EDs across a large healthcare system in Louisiana. Understanding the impact of the COVID-19 pandemic on this subset of ED patients can promote better understanding of drivers of ED super utilizer behavior. It was hypothesized that a decrease in the number of ED patient visits would be noted at the onset of the COVID-19 pandemic, mimicking overall ED trends that have been reported. However, it was hypothesized the ED utilization rates by super utilizers would also mimic overall ED trends reported in the literature by returning to baseline levels as Louisiana entered subsequent phases of reopening.

2. Methods

2.1. Study setting and population

This was a retrospective chart review of patients presenting to the 12 emergency departments in the Franciscan Mission of Our Lady Hospital System in Louisiana between January 1, 2018 and December 31, 2020. Patients who were 18 years of age or older and had four ED visits within a one-year period (2018, 2019, or 2020) were classified as super-utilizers. There is no universally accepted definition of super utilizers; however four or more visits per year is the most commonly used threshold in the literature [21]. The one year period during which patients presented four or more times was classified as the index year. Patient data was used for the index year. For example, if a person had two visits in 2019 and four visits in 2020, only the visits for the index year were used. This study was approved by the institution's IRB.

2.2. Data collection

Patients were identified using the electronic medical record, Epic. All data was abstracted from the medical record using tools provided by Epic. No individual chart abstraction was required. Data collected through Epic included patients' age, race, biological sex, insurance status, date of the visit, location of the ED within the system, and diagnostic codes. Patients' diagnoses were based on the International Classification of Diseases, Tenth Revision (ICD-10) codes. Emergency department visits were classified using the New York University (NYU) ED profiling algorithm [25,29,30]. In Billings and colleagues' original work, ED visits were coded as “ED Care Needed: Not Preventable,” “ED Care Needed: Preventable/Avoidable,” “Emergent: PCP Treatable,” “Non-Emergent,” “Alcohol,” “Injury,” “Psychiatric,” and “Unclassified.” However, we used the method validated by Ballard et al. [31], combining “ED Care Needed: Not Preventable” and “Emergency Care Needed: Preventable/Avoidable” into an “emergent” Category and Emergency: PCP treatable and “Non-emergent” into the “Non-emergent” category. We examined the categories: “Alcohol,” “Injury,” “Psychiatric,” separately. Number of COVID-19 related visits by super utilizers can be found in Supplement 1.

In March 2020, Louisiana was one of the states with the highest incidence rates in the country [32,33]. On March 23, 2020, Louisiana's governor issued a Stay At Home Order, limiting business, recreational, religious, educational, community, and non-emergent medical activities [34]. The state slowly repealed limitations as it entered Phase one on May 15, 2020 [35], Phase 2 on June 5, 2020 [36], and Phase 3 on September 11, 2020 [37]. Louisiana moved back into Phase 2 on November 24, 2020 after a spike in COVID-19 cases [38]. The impact of the governor's phased approach to mitigating the COVID-19 pandemic on Louisiana's healthcare system has not been examined. There were three time periods in the current study. We labelled visits in 2018, 2019, and January – March 22, 2020, as the “Pre” time period. The Governor's Stay at Home Order went into effect on March 23, 2020. In order to round to a 7-day week, we designated “Stay at Home” time period to be March 22 – May 16. Phase 1 in Louisiana began in Louisiana on May 15, 2020. Visits from the week beginning with May 17, 2020 through the week ending December 31, 2020 were labelled “Post.” For reference, Phase 2 began on June 5, 2020. Phase 3 began September 11, 2020. However, Phases 1, 2, and 3 were combined into the Post-Stay at Home Order time period.

2.3. Statistical methods

Emergency department visits were aggregated by number of visits per week from January 1, 2018 through December 31, 2020. Of note, week 156 ended on December 26, 2020. The remaining days of 2020 did not comprise a full 7-day week; therefore, they were excluded from the autoregression analysis. The Pre period included weeks 1–116. The Stay at Home period included weeks 117–124, and the Post period included weeks 125–156. We used IBM SPSS (v27) Time Series Modeler with a first order autoregression model (AR-1) to correct for serial dependence in these time series data. Ljung-Box Q's were used to check the adequacy of the final models. Only one of the series had Q with a $p < 0.001$. For simplicity we kept the AR(1) model for all the time-series examined. Differences in the number of ED visits by super utilizers presenting during the Pre-COVID, Stay at Home Order, and Post-Stay at Home Order time periods were examined using dummy codes for the Periods. Dummy codes were created for yearly quarters to control for seasonality. The first 13 weeks of the year comprised Q1, and subsequent quarters were composed of 13 week periods.

3. Results

3.1. Demographic and visit-related information

There were 355,295, 361,976, and 328,099 total ED visits in 2018, 2019, and 2020, respectively. There were 207,953 super utilizer visits over the study period by 28,499 unique patients. Of note, there were 1134 visits related to COVID-19 by super utilizers beginning on week 116 through the end of the study. For the index year 2018, there were 73,202 ED visits by 12,795 patients. In 2019, there were 73,697 visits by 12,855 patients identified as super utilizers, and there were 61,054 visits by 10,578 patients identified as super utilizers in 2020. The average number of visits per patient per year for super utilizers were 7.62, 7.40, and 7.70 for 2018, 2019, and 2020, respectively.

Mean age of the entire population of super utilizers for the study period was 46.85 (SE = 18.67). The sample was 41.8% male, 57.4% Black, 39.9% White, 1.3% Hispanic, and 1.4% other ethnicity. Medicaid recipients accounted for 40.6% of patients, 22.4% were Medicare, 25.3% were uninsured, and 11.7% had private insurance. When we examined the three time periods in 2020, we found no significant differences in age, biological sex, or race. However, there was a significant difference in insurance status (Table 1; $X^2 = 19.51$; $o < 0.003$), with a significantly higher number of self-pay patients presenting during the Stay at Home and Post periods.

3.2. Overall model

The autoregression analysis indicated a significant seasonal effect in the data, with significantly fewer ED visits by super utilizers in the

Table 1
Patient demographics by year.

	2018	2019	2020 Total	2020 Pre	2020 SAH	2020 Post
Total # ED Visits	355,295	361,976	328,099	85,095	36,867	206,137
# Super Utilizers	12,795	12,855	10,578	6780	4787	10,097
# ED Visits by Super Utilizers	73,202	73,697	61,054	13,810	8085	39,159
# Visits/week (Mean SD)	1400.31 (93.26)	1413.52 (67.12)	1169.50 (96.68)	1199.17 (66.20)	1010.63 (45.89)	1198.09 (75.163)
Visit per Super Utilizer (Mean SD)	7.62 (7.75)	7.40 (5.80)	7.70 (6.75)	7.49 (6.23)	7.95 (7.23)	7.72 (6.82)
Age (Mean SD)	45.87 (18.41)[a]	47.27 (18.49)[b]	47.29 (18.52)[b]	47.07 (0.23)	47.03 (0.28)	47.01 (0.19)
Biological sex (%)						
Male	40.04[a]	41.00[b]	42.14[b]	40.71	41.86	41.79
Female	59.96[a]	59.00[b]	57.86[b]	59.29	58.14	58.21
Race (%)						
White	38.89[a]	37.31[b]	39.14[a]	37.48	37.39	38.77
Black	58.80[a]	60.30[b]	58.15[a]	60.22	59.87	58.52
Hispanic	1.05[a]	1.17[a]	1.34[a]	1.19	1.23	1.35
Other	1.18[a]	1.22[a]	1.36[a]	1.11	1.50	1.37
Insurance status (%)						
Private	11.43[a]	11.27[a]	10.87[a]	10.59[a]	10.63[a]	10.86[a]
Medicaid	44.48[a]	43.40[a]	39.65[b]	41.71[a]	40.11[a]	40.12[a]
Medicare	23.57[a]	23.98[a]	19.56[b]	20.72[a]	20.01[b]	19.22[b]
Self-pay	20.53[a]	21.35[a]	27.92[b]	26.98[a]	29.25[b]	29.79[b]

Superscripts denote a subset of time periods whose column proportions do not differ significantly from each other at the $p < 0.05$ level.

Table 2
Autoregression model statistics.

	R^2 season model	R^2 overall	R^2 Improvement	F Improvement	p
Overall	0.72	0.76	0.04	3.08	0.05
Alcohol	0.04	0.06	0.02	1.28	0.28
Drug	0.06	0.08	0.02	1.43	0.24
Injury	0.54	0.63	0.08	6.23	0.00
Psychiatric	0.17	0.19	0.02	1.20	0.30
Emergent	0.29	0.54	0.25	18.38	0.00
Non-emergent	0.72	0.76	0.04	3.15	0.05

winter months compared to the other quarters. The R^2 for the baseline model was 0.757. The R^2 improved significantly when time periods were added to the mode (Table 2; R^2 Improvement = 0.04; $F_{(2,149)} = 12.65$; $p < 0.05$). After controlling for seasonality, there were significantly fewer ED visits during the Stay at Home ($t = -8.47$, $p < 0.001$) compared to the Pre period. Number of visits by super utilizers increased significantly during the Post compared to the Stay at Home period ($t = 3.00$, $p < 0.01$), but remained significantly lower than the Pre period ($t = -8.613$, $p < 0.001$). Data is presented in Fig. 1.

3.3. Categories of visits

There were no significant differences for the three time periods among number of visits related to alcohol, drug use, or psychiatric disorders (Tables 2 & 3; Fig. 2A, B, and C). There were significantly fewer presentations related to injuries, emergent ED visits, and non-emergent ED visits during the Stay at Home Order compared to the Pre period (Tables 2 & 3; Fig. 3A, B, and C). However, during the Post period, visits for injuries and emergent care significantly increased compared to the Stay at Home period but remained statistically lower compared to the Pre period. Non-emergent visits did not increase significantly during the Post period compared to the Stay at Home Order.

4. Discussion

The purpose of the current study was to examine the impact of state mandated COVID-19 restrictions on ED super utilizer visits in one of the largest healthcare systems in Louisiana. There were several important findings. First, number of patients identified as ED super utilizers in 2020 was 17.3% and 17.7% less than total number of super utilizers in 2018 and 2019, respectively. Second, the total number of visits by ED super utilizers decreased by 16.6% and 17.1% in 2020 compared to 2018 and 2019, respectively. Visits declined significantly during the Stay at Home Order then increased significantly when the Stay at Home Order was lifted, though they did not return to Pre-COVID-19 levels. While there were fewer super utilizers during 2020, the average number of visits per super utilizer remained unchanged. Finally, visits by super utilizers for alcohol use, drug use, and psychiatric disorders were not affected by the Stay at Home Order. Visits for emergent ED care, and injuries increased significantly when the Stay at Home Order was lifted, but they did not return to Pre-COVID-19 levels. Non-emergent ED visits decreased during the Stay at Home Order and remained significantly lower through December 2020.

Our findings that there was a significant reduction in overall ED visits across the system is consistent with other studies examining the impact of COVID-19 on healthcare utilization [6,13,16,18]. A proposed reason for reduction in ED visits is fear of contracting COVID-19 in the

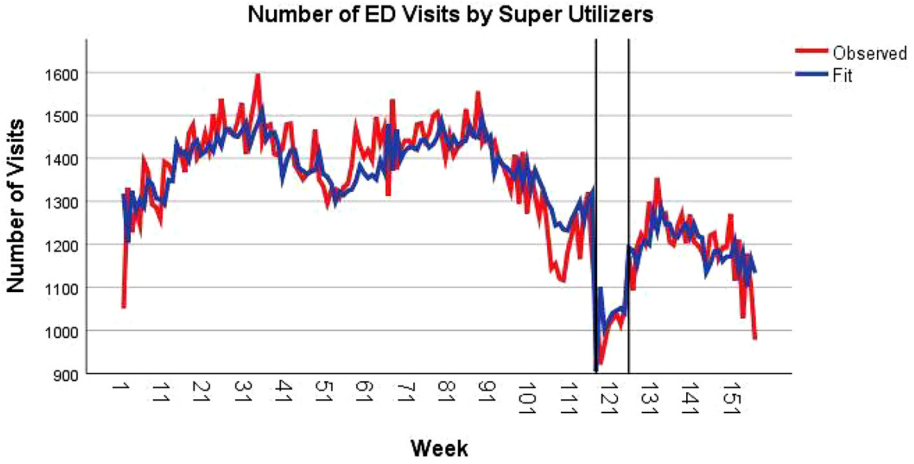

Fig. 1. Autoregession model and goodness of fit for Overall number of visits by super utilizers from January 2018 through December 2020. Vertical lines indicate the initiation of the Stay at Home Order, and subsequently, the initiation of Phase 1.

Table 3
Mean and comparisons of types of visits by time period.

	Mean	t
Overall		
Pre-COVID	1373.512[a]	Pre,SAH = −8.47
SAH	1021.662[b]	SAH,Post = 3.00
POST	1156.009[c]	Pre,Post = −8.61
Alcohol		
Pre-COVID	12.43[a]	Pre,SAH = −1.62
SAH	9.609[a]	SAH,Post = 1.27
POST	12.031[a]	Pre,Post = −0.42
Drug		
Pre-COVID	12.135[a]	Pre,SAH = −0.22
SAH	11.793[a]	SAH,Post = −0.67
POST	10.656[a]	Pre,Post = −1.75
Injury		
Pre-COVID	126.73[a]	Pre,SAH = −7.14
SAH	77.544[b]	SAH,Post = 2.72
POST	97.967[c]	Pre,Post = −7.25
Psychiatric		
Pre-COVID	28.205[a]	Pre,SAH = −1.43
SAH	24.774[a]	SAH,Post = 1.54
POST	28.221[a]	Pre,Post = −1.68
Emergent		
Pre-COVID	270.87[a]	Pre,SAH = −9.52
SAH	199.549[b]	SAH,Post = 3.70
POST	229.964[c]	Pre,Post = −10.07
Non-emergent		
Pre-COVID	625.59[a]	Pre,SAH = −7.67
SAH	437.19[b]	SAH,Post = 1.72
POST	483.5[b]	Pre,Post = −9.25

Superscripts denote a subset of time periods whose column proportions do not differ significantly from each other at the $p < 0.05$ level.

ED among patients [39-41]. However, other authors propose a more complex interaction related to unanticipated effects of government enforced lockdowns including fewer traffic accidents, fewer accidents related to nightlife and intoxication, fewer elective procedures reducing ED visits for complications, and reduced spread of infectious diseases of all sorts due to social distancing [42,43]. Additional mitigating factors that have been proposed include increased use of telehealth services and patient triaging [8,18,44-46]. In fact, the CDC recommended that healthcare systems provide care in the safest way possible, one of which included optimizing telehealth services to minimize the need for in-person services [46]. All of these potential factors may be responsible for the significant reduction in emergency department visits during the COVID-19 pandemic.

Our results suggest the aforementioned hypotheses may apply to the super utilizer population as well. Fewer patients visited the ED four times or more and were labelled as super utilizers in 2020 compared to 2018 and 2019. Total number of ED visits by super utilizers declined significantly. Most notably, visits dropped drastically on the week that the Stay at Home Order was issued and remained significantly lower until Phase 1 began, indicating that the Stay at Home Order itself was largely responsible for the reduction in visits. While visits rose after the Stay at Home Order was lifted, they have not returned to the level seen prior to the COVID-19 pandemic. The lower number of visits during the Post-Stay at Home Order period suggests individuals continued to avoid the ED, possibly out of fear of contracting COVID-19. Of note, super utilizers who continued to utilize the ED during the pandemic did not reduce their visits at all. The average number of visits per patient was consistent with pre-COVID levels. This suggests there are a subset of super utilizer who did not or could not explore alternatives, and this may be a special population of interest for future research and policy makers.

When the visits were categorized into visit types for the super utilizers, interesting patterns emerged. The data indicates that visits related to alcohol, drug use, and psychiatric disorders were not impacted by the Stay at Home Order or subsequent reopening. Giannouchos and colleagues reported a reduction in ED visits for mood and personality disorders among a total ED population after March 2020 [17]. It is unclear at this time, whether the differences between studies reflect differences in patient demographics or differences that emerge when examining super utilizers with mental health and substance abuse visits rather than the total population of individuals mental health and substance abuse patients. However, Lucero and colleagues reported that of all types of visits, substance abuse and alcohol related encounters were least reduced during the pandemic [47]. It is possible that the relatively small number of visits for alcohol, drug use, and psychiatric purposes by super utilizers impacted the power to

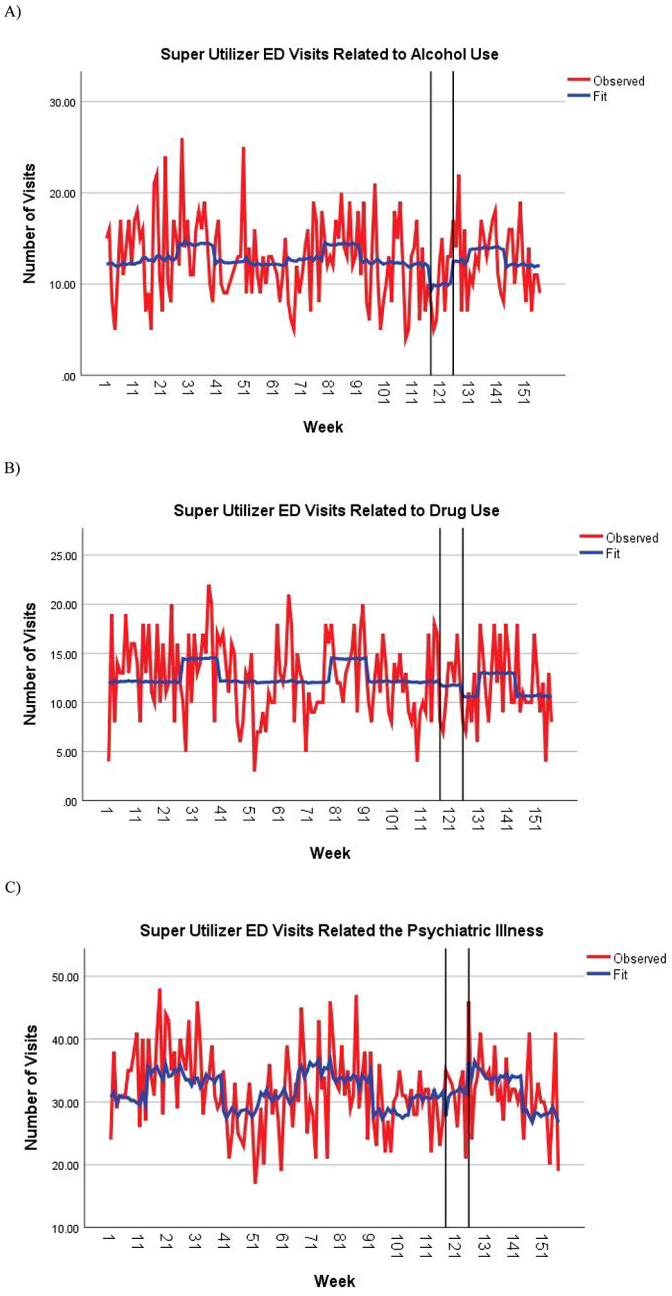

Fig. 2. Autoregession model and goodness of fit by Category of Visits for number of visits by super utilizers from January 2018 through December 2020 for A) Alcohol Related Visits, B) Drug Related Visits, and c) Psychiatric Visits. Vertical lines indicate the initiation of the Stay at Home Order, and subsequently, the initiation of Phase 1.

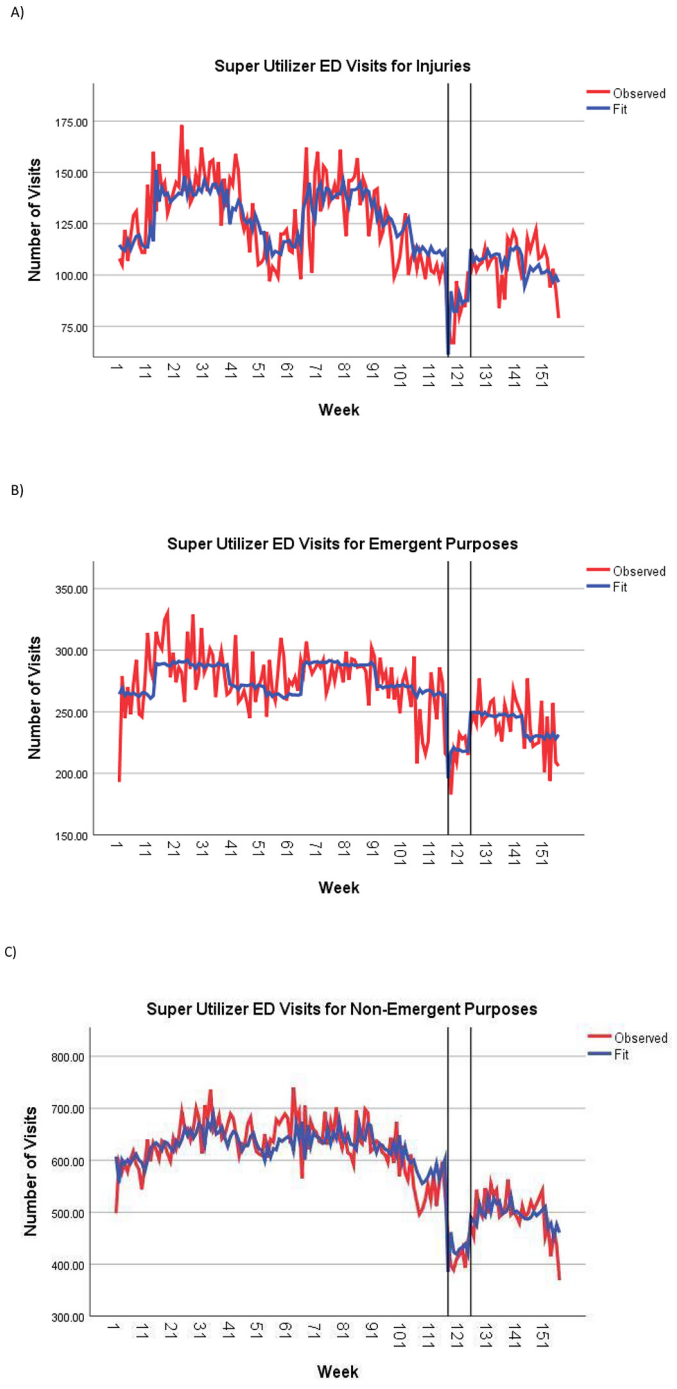

Fig. 3. Autoregession model and goodness of fit by Category of Visits for number of visits by super utilizers from January 2018 through December 2020 for A) Injuries, B) Emergent Visits, and c) Non-emergent Visits. Vertical lines indicate the initiation of the Stay at Home Order, and subsequently, the initiation of Phase 1.

detect the effects of the pandemic. Further research is needed to better discern the impact of the COVID-19 pandemic on super utilizers who typically present with severe mental health problems and/or substance use. In our data, super utilizer visits for these conditions remained stable throughout the three years examined.

Our study is consistent with the literature that found a reduction in emergent and non-emergent ED Care visits as well as a reduction in visits related to injuries during the Stay at Home Order [11,17]. Super utilizer visits for emergent conditions and injuries increased significantly when the Stay at Home Order was rescinded, though they did not return to Pre-COVID levels. As other authors have suggested [41,48], it is possible that fear of contracting COVID outweighed their need for ED care. Interventions to reduce public fear of contracting COVID-19 in the ED may be warranted to ensure individuals who need emergent care present to the ED to receive it. Recent research indicates that dividing the ED into respiratory and non-respiratory pods, and centering messages to the public around this may increase the number of visits to the ED. [49] This continues to raise concerns regarding whether individuals are failing to receive needed care because they are avoiding face-to-face healthcare services due to COVID-19 [6,18]. The long-term implications of this require further research. Alternatively, if individuals experiencing symptoms of emergent conditions or injuries were able to have their healthcare needs met via alternative methods such as telehealth, this may further inform policy makers about changes in the healthcare system that might mitigate super utilizer behavior. Additional research is needed to determine whether individuals sought healthcare elsewhere.

Visits for non-emergent conditions did not rise significantly when the Stay at Home Order was lifted. Further research is needed to understand reasons for this finding, but it is possible that individuals who used the ED for non-emergent conditions found alternate means of receiving care that allowed them to refrain from ED use. Alternatively, it is possible that patients who tended to frequent the ED for non-emergent needs became more discerning about their needs, choosing not to seek care when it might not be needed. Future studies may have significant implications for directing non-emergent super utilizers toward more appropriate resources.

This study has several limitations. First, while we examined patients from across the state of Louisiana presenting to one of the largest healthcare systems in the state, it is unclear whether these findings would generalize to other states or countries. In addition, studies indicate that approximately 25% of super utilizers multiple sites per year [50,51], therefore, it is possible that we did not capture all super utilizers in the region. Third, this study was retrospective and confined to ED visits, which limited our ability to interview patients about fears of COVID-19 or examine whether patients chose to seek care elsewhere. Further research is warranted to better understand what happened to the patients who no longer used the ED, particularly for non-emergent visits. This information has serious implications for counseling super utilizers who do not use the ED appropriately.

In conclusion, the COVID-19 pandemic in general, and the Louisiana governor's Stay at Home Order, in particular, significantly reduced the number of ED visits by super utilizers. While visits for injuries and emergent reasons rose after the reopening phases began, visits for non-emergent purposes did not increase significantly. Further research is warranted to understand where these patients sought care in order to inform interventions for super utilizers who tend to frequent the ED for non-emergent purposes in the future.

Declaration of competing interest

The authors have no conflicts of interest to declare.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ajem.2021.04.022.

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