COVID-19 Trends and Factors Associated With an ER Visit in Chicago, 2020

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Background

- Worldwide, the United States is the leading country with the most COVID-19 cases and death at 7.64 million and 213,000, respectively.[1]
- In Illinois alone, there have been over 300,000 COVID-19 cases and 8,910 deaths.[2]
- Early data suggests a drastic decrease in ER visitation.[4]
- Older adults have an increased risk for severe COVID-19 illness.[3]
- A decrease in ER utilization for serious cases of COVID-19 may result in further complications or death.[4]
- **Objective:**
  - **T**o assess the demographic trends and factors associated with ER visitation, which will be useful for identifying those who may need to utilize the ER during future pandemics.
- **Hypothesis:**
  - The percentage of ER visits decreased over time with no change in the rate of ER visits based on age group.
  - Older age will have the strongest, positive association with an ER visit, where an increase in age will result in increased odds of an ER visit.

Methods

- COVID-19 cases under surveillance of the CDPH are confirmed cases that have met the CDC COVID-19 case definition:
  - https://wwwn.cdc.gov/nndss/conditions/coronavirus-disease-2019-covid-19/case-definition/2020/
- Dataset:
  - COVID-19 surveillance data from the Chicago Department of Public Health, 2020
- Outcome of interest: ER visit (N = 30,870).
- Variables:
  - *Sex*: Male (coded as 1) or female (coded as 0).
  - *Race:* White (coded as 1), Black (coded as 2), Hispanic (coded as 3), Asian (coded as 4), or Other (coded as 5).
  - *Clinical:* Fever, Cough, Sore Throat, Olfactory/Taste disorder, Pneumonia, ARDS (clinical symptoms coded as yes=1 and no=0).
  - *Comorbidities:* score calculated, ranging from 0 to 3 or more comorbid conditions.
- Unknown and missing values excluded from analysis.
- SAS studio used to calculate incidence rates between selected variables and outcome of interest
- Bivariate analysis performed in order to calculate odds ratios and test for level of significance using chi-square test (alpha = 0.05)
- Logistic regression analysis performed in order to seek out important factors associated with an ER visit.
- Visualizations created using Microsoft Excel in order to further assess for demographic trends of COVID-19 by month.

Results

Table 1. Characteristics of COVID-19 cases in Chicago with versus without an ER visit, and crude association with ER visits.

	Sample Size, N (%)	ER visit: YES (# and %)	ER visit: NO (# and %)	OR (95% CI)
Sex				
Male	13062 (47.0)	5875 (45.0)	7187 (55.0)	1.35 (1.29, 1.49)*
Female	14296 (53.0)	5358 (37.7)	8911 (62.3)	0.74 (0.70, 0.78)*
Race/Ethnicity				
White	4390 (16.7)	1494 (34.0)	2896 (66.0)	ref
Black	8311 (31.6)	5091 (61.3)	3320 (38.7)	3.06 (2.84, 3.31)*
Hispanic	11620 (44.1)	3685 (31.7)	7935 (68.3)	0.90 (0.84, 0.97)*
Asian	901 (3.4)	354 (39.3)	547 (60.7)	1.25 (1.08, 1.45)*
Other	1098 (4.2)	386 (35.2)	712 (64.8)	1.05 (0.91, 1.20)
Age (years)				
0-19	2324 (8.5)	549 (23.6)	1775 (76.4)	ref
20-39	9505 (34.7)	2666 (28.1)	6839 (71.9)	1.26 (1.13, 1.40)*
40-59	8749 (32.0)	3610 (41.3)	5139 (58.7)	2.27 (2.04, 2.52)*
60-79	5216 (19.1)	4435 (65.4)	2345 (34.6)	5.69 (5.09, 6.36)*
Clinical				
Fever	5812 (22.1)	3539 (60.9)	2273 (39.1)	1.36 (1.27, 1.47)*
Cough	9512 (36.1)	4854 (51.0)	4658 (49.0)	1.14 (1.06, 1.22)*
Sore Throat	3921 (14.9)	1298 (33.1)	2623 (66.9)	0.39 (0.37, 0.43)*
Diarrhea	3138 (11.9)	1592 (50.7)	1546 (49.3)	1.01 (0.93, 1.09)
Olfactory/ Taste disorder	4226 (16.1)	1124 (26.6)	3102 (73.3)	0.31 (0.29, 0.34)*
Pneumonia	2896 (11.0)	2802 (96.8)	94 (3.2)	22.3 (18.0, 27.5)*
ARDS	537 (2.0)	506 (94.2)	31 (5.8)	8.19 (5.68, 11.8)*
Comorbidities				
0	2277 (23.0)	717 (31.5)	1560 (68.5)	ref
1	3511 (35.4)	1819 (51.8)	1692 (48.2)	2.34 (2.09, 2.61)*
2	2164 (21.8)	1498 (69.2)	666 (30.8)	4.89 (4.31, 5.56)*
3+	1963 (19.8)	1613 (82.2)	350 (17.8)	10.0 (8.67, 11.6)*

* denotes statistical significance at alpha = 0.05

Table 2. Logistic regression analysis for factors associated with a COVID-19 emergency room visit.

Variable	OR (95% CI)	p-value	Variable	OR (95% CI)	p-value
Sex (ref = Female)	1.22 (1.00,1.47)	0.0423*	**Clinical**		
Age (ref = 0-19)			Fever	1.09 (0.89, 1.33)	0.4049
20-39	0.64 (0.42,0.99)	0.0443*	Cough	1.12 (0.92, 1.37)	0.2508
40-59	0.65 (0.42, 1.01)	0.0525	Sore Throat	0.66 (0.53, 0.83)	0.0004*
60+	1.36 (0.85, 2.17)	0.1949	Diarrhea	0.99 (0.79, 1.24)	0.9403
Race (ref = White)			Olfactory/Taste disorder	0.38 (0.31, 0.47)	<.0001*
Black	3.08 (2.33, 4.07)	<.0001*	Pneumonia	11.6 (8.14, 16.6)	<.0001*
Hispanic	0.71 (0.53, 0.95)	0.0217	ARDS	1.96 (0.87, 4.42)	0.1057
Asian	1.04 (0.57, 1.89)	0.9115	**Comorbidities** (ref = 0)		
Other	1.30 (0.69, 2.43)	0.4183	1	1.17 (0.93, 1.48)	0.1879
			2	1.64 (1.23, 2.17)	0.0006*
			3+	1.95 (1.39, 2.74)	0.0001*

* denotes statistical significance at alpha = 0.05

Figure 1. Monthly trend of COVID-19 ER visits by Age, March – August

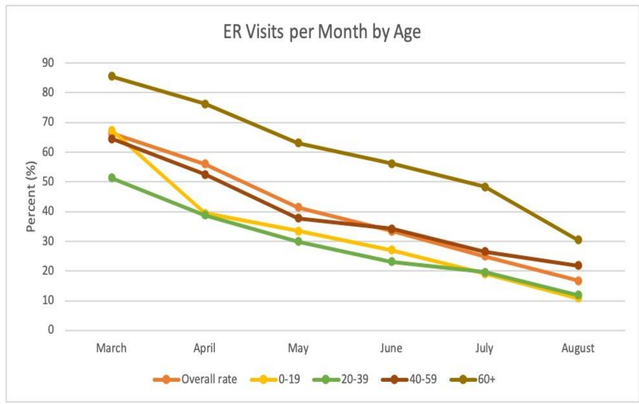


Figure 2. Trend of COVID-19 ER visits per month by Race/Ethnicity, March – August

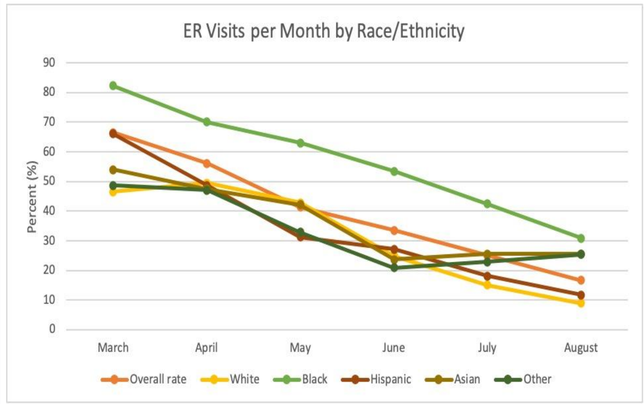
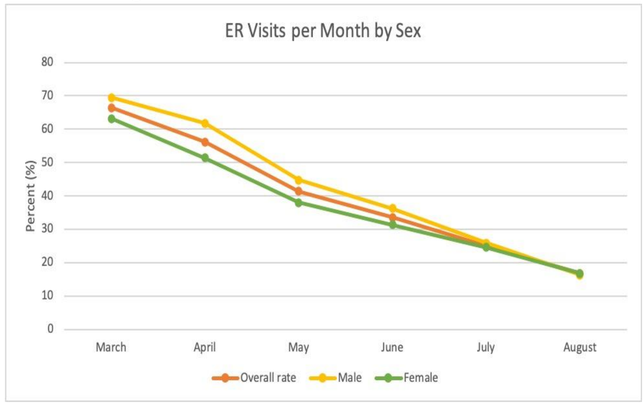


Figure 3. Trend of COVID-19 ER visits per month by Sex, March – August



Discussion

- Although the percentage of ER visits decreased over time (Figure 1), we reject the first null hypothesis. Figure 1 shows a decrease in the ER visitation rate per month for all age groups.
- Trends show that ER visitation rate also decreased for both sexes (Figure 2). Males are more likely to visit the ER for COVID-19 than females (Table 1).
- Figure 3 shows an overall decrease in the trend of ER visitation rate for all races/ethnicities. However, among races, Blacks had the highest incidence rate of ER visitation (Table 1). Blacks were 3 times the odds (OR = 3.06) more likely to visit the ER compared to Whites. Logistic regression shows that Blacks were significantly associated (p-value <.0001) with a COVID-19 ER visit.
  - Consistent with CDC data where Blacks had the highest rate of ER visitation among other races and ethnicities.[5]
  - Compared to Whites, Blacks are more likely to utilize an ER due to social disparities and lack of access to primary care.[6]
- We reject the second null hypothesis that older age will have the strongest, positive association with an ER visit. Logistic regression showed that older age is not significantly associated (p-value = 0.1949) with a COVID-19 ER visit in the presence of other factors.
- Logistic regression showed that Pneumonia had the strongest (p-value <.0001), positive association with a COVID-19 ER visit. Those with Pneumonia were 11.6 times the odds more likely to visit the ER that those without pneumonia.
  - When left untreated, Pneumonia ranks as a top influencer of mortality in the United States.[7]
- As the number of comorbidities increases, the odds of an ER visit increases. Two or more comorbidities was significantly associated with an ER visit. Comorbidities increase the risk of death, highlighting the need for emergency medical intervention in the context of COVID-19.[8]

Limitations

- Substantial amount of missing data for outcome variable (52%), clinical features (over 50%), and comorbid conditions (63%).
- Misclassification bias for race/ethnicity.
- Trends may not be generalizable to rural areas or other states, especially due to limited time range.
- Aside from the date the CDPH received the COVID-19 case report, deidentification of dataset may present issues with accuracy of results.

Conclusions

- ER utilization has decreased in Chicago since the beginning of the COVID-19 pandemic, especially among age, race, and sex demographics.
- Pneumonia and number of comorbidities is significantly associated with an ER visit, suggesting the need for immediate emergency intervention.
- Due to a lack of primary care, Blacks visit the ER more frequently, suggesting underlying disparities and need for expansion in primary care coverage.
- Future efforts should focus on educating public to utilize the emergency room during pandemics in order to prevent severe illness and mortality.

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