Morbidity and Mortality among Adults Experiencing Homelessness Hospitalized with COVID-19

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Summary: Most hospitalized COVID-19 patients experiencing homelessness were persons of racial/ethnic minority groups and had underlying health conditions. Hispanic and Non-Hispanic Black persons accounted for most mechanical ventilation and deaths. Severe illness was common among persons experiencing homelessness hospitalized with COVID-19.

Abstract

People experiencing homelessness (PEH) are at higher risk for chronic health conditions, but clinical characteristics and outcomes for PEH hospitalized with COVID-19 are not known. We analyzed population-based surveillance data of COVID-19-associated hospitalizations during March 1-May 31, 2020. Two percent of the people hospitalized with COVID-19 for whom a housing status was recorded were homeless. Of 199 cases in the analytic sample, most were of racial/ethnic minority groups, and had underlying health conditions. Clinical outcomes such as ICU admission, respiratory support including mechanical ventilation, and deaths were documented. Hispanic and Non-Hispanic Black persons accounted for most mechanical ventilation and deaths. Severe illness was common among persons experiencing homelessness who were hospitalized with COVID-19.

Keywords: Homelessness; COVID-19; SARS-CoV-2; clinical outcomes

Background

SARS-CoV-2, the virus that causes coronavirus disease 2019 (COVID-19), can spread easily among people in close contact with one another, causing infections ranging from asymptomatic to fatal.[1] Older adults and those with underlying health conditions are at increased risk for severe illness from COVID-19.[2] People experiencing homelessness often have health conditions common to older adults (e.g., cognitive impairment, frailty, depression, and difficulties with daily living activities), but develop these conditions at a younger age than the general population.[3] Additionally, chronic conditions like hypertension, diabetes, respiratory diseases, and cardiovascular disease are more prevalent among people experiencing homelessness than in the general population, and are often untreated.[4,5] Thus, people experiencing homelessness, particularly those living in close quarters, could be at increased risk for severe COVID-19.

Point-prevalence COVID-19 testing among people experiencing homelessness have shown a high proportion of asymptomatic infections at the time of testing, raising questions about the severity of COVID-19 in this population.[6,7] However, drawing conclusions is difficult; there have been few comparable surveys conducted in the general population. One study at an urban medical center showed that people experiencing homelessness were more likely to be hospitalized than the general population, but other outcomes were similar.[8] Further data are needed to elucidate the clinical course of COVID-19 among people experiencing homelessness.

We used data from the Centers for Disease Control and Prevention (CDC) COVID-19-Associated Hospitalization Surveillance Network (COVID-NET) to evaluate the clinical characteristics and outcomes of COVID-19-associated hospitalizations among persons experiencing homelessness.

Methods

COVID-NET is a population-based surveillance system that collects data on laboratory-confirmed COVID-19-associated hospitalizations.[9,10] The current network includes 99 counties in 10 Emerging Infections Program sites (California, Colorado, Connecticut, Georgia, Maryland, Minnesota, New Mexico, New York, Oregon, and Tennessee) and four additional states through the Influenza Hospitalization Surveillance Project (Iowa, Michigan, Ohio, and Utah).[10] COVID-NET represents approximately 10% of the U.S. population. In participating sites, trained surveillance officers identified laboratory-confirmed COVID-19-associated hospitalizations by reviewing hospital, laboratory, and admission databases, and infection control logs for hospitalized patients. They completed standardized case report forms based on medical record reviews for a random sample of identified cases. Cases in the current analysis had a documented positive SARS-CoV-2 result by reverse transcription-polymerase chain reaction during hospitalization or up to 14 days before admission.

We included data from patients aged ≥18 years hospitalized with COVID-19 during March 1-May 31, 2020 and identified in the medical record as being homeless or residing at a shelter at the time of hospitalization in 13 U.S. states (Iowa did not report cases with documented homelessness). We assessed patient demographic and clinical characteristics (e.g., age, race/ethnicity, underlying health conditions, symptoms at admission), and outcomes: intensive care unit (ICU) admission, length of hospitalization, ventilator use, vasopressor support, systemic corticosteroid use, and death during hospitalization. We assessed outcome distributions by key characteristics. Descriptive statistics including unweighted frequencies and weighted percentages were generated for population-based estimates; weights were applied to reflect the probability of being sampled for complete chart

abstractions. Confidence intervals (95% CI) were calculated using Taylor series linearization method. Analyses were performed using SAS 9.4.

This activity was reviewed by CDC and was conducted consistent with applicable federal law and CDC policy.[§] Participating sites obtained approvals for the COVID-NET surveillance protocol from their Institutional Review Boards, as applicable.

Results

Among 28,917 cases reported in COVID-NET during March 1-May 31, 2020, 70% (20,189) were missing data on homelessness status. Of 8,728 cases with information about housing at the time of hospital admission, 201 (2%, 95% CI=1.5-2.4%) were identified as experiencing homelessness through complete chart abstractions. We excluded two cases aged <18 years leaving N=199 for analysis. The median age of patients experiencing homelessness hospitalized with COVID-19 was 53 years (IQR=48-58). Most were male (n=165, 84%), non-Hispanic Black, Hispanic, or non-Hispanic other race/ethnicity (n=126, 62%), and had health insurance (n=163, 85%) (Table 1). At least one underlying health condition was recorded for 83% of patients (n=155); the most common health conditions were hypertension (n=77, 44%), obesity (body mass index [BMI] ≥30 kg/m^2) (n=59, 24%), chronic lung disease (n=43, 22%), cardiovascular disease (n=36, 25%), and diabetes (n=32, 16%). Current tobacco smoking (n=105, 46%) and alcohol abuse (n=70, 34%) were common, and almost one in 12 was diagnosed with a mental health disorder (n=38, 8%) based on ICD-10 discharge diagnosis codes.

Most patients had signs and symptoms at admission (n=168, 92%), including cough (n=107, 54%), fever/chills (n=102, 53%), and shortness of breath (n=89, 51%) (findings not shown in tables). Other symptoms such as chest pain, headache, nausea/vomiting, and myalgias were less common (20-23%). Half of patients (n=102, 54%) were hospitalized for

[§] See e.g., 45 C.F.R. part 46.102(l)(2), 21 C.F.R. part 56; 42 U.S.C. §241(d); 5 U.S.C. §552a; 44 U.S.C. §3501 et seq.

>4 days (median=4, IQR=2-12), and one in six persons (n=37, 17%) were admitted to the ICU (Table 2). Invasive mechanical ventilation (n=18, 11%), vasopressor support (n=11, 6%), systemic steroids (n=20, 16%), and renal replacement therapy or dialysis (n=4, 4%) were documented. Invasive mechanical ventilation was most common among patients aged ≥65 years (n=3, 20%), and patients with no underlying health conditions (n=8, 21%). Six patients (1%) died – all were symptomatic; most were male, had underlying health conditions, and were aged ≥50 years. Hispanic persons and Non-Hispanic Black persons accounted for most documented mechanical ventilation and deaths.

Discussion

We used weighted population estimates to evaluate characteristics and outcomes of hospitalized patients with COVID-19 experiencing homelessness. Most patients were male, from racial/ethnic minority groups, and had underlying health conditions. Most patients were symptomatic and were often hospitalized for >4 days.

In a previously published COVID-NET analysis, hospitalized COVID-19 cases in the general population had a higher prevalence of underlying health conditions (92%), but were generally older; among 2,491 hospitalizations, median age was 62 years (IQR=50-75).[11] In our analysis of patients experiencing homelessness, the median age was 53 years, and there were greater proportions of people from racial/ethnic minorities and current smokers. Despite the younger age, it is notable that 83% of our sample had underlying health conditions. Furthermore, outcomes in the general population, namely ICU admission and mechanical ventilation, did not differ by race/ethnicity, and white patients had higher prevalence of in-hospital death than other racial/ethnic groups. In our analysis, Hispanic and Non-Hispanic Black persons accounted for most documented mechanical ventilation and deaths. Future studies could explore the incremental contribution of homelessness to hospitalizations and clinical outcomes related to COVID-19. While sample size was too low to include children

and youth experiencing homelessness in the current analysis, additional information is needed to better understand the collective influence of homelessness on COVID-19 from a public health and clinical perspective.

This analysis is subject to limitations. Data on housing status were missing from most patients at the time of analysis, as hospital records often do not have housing information. The number of hospitalized COVID-19 patients experiencing homelessness was likely underestimated because of undiagnosed cases and limited testing early in the pandemic in the U.S. Among people experiencing homelessness, the true prevalence of chronic conditions might be underdiagnosed due to limited access to health care. People experiencing homelessness might be admitted for inpatient hospitalization for other reasons in addition to medical reasons. Lastly, results do not account for alternative factors that could affect the outcomes such as testing coverage, quality of care, and barriers to health care (e.g., transportation, stigma).

Most hospitalized COVID-19 patients experiencing homelessness had underlying health conditions. Clinical outcomes such as ICU admissions, respiratory support like mechanical ventilation, and deaths were documented. Residing in congregate settings like homeless shelters could increase risk of COVID-19 if there are difficulties with implementing infection prevention and control measures; the high proportion of underlying conditions might also increase the risk of severe disease.[12,13] These findings fill a critical gap in understanding morbidity and mortality among people hospitalized with COVID-19 experiencing homelessness and highlight the importance of targeting effective prevention strategies including COVID-19 vaccination efforts among marginalized groups.[14,15]

Notes

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References

1. Centers for Disease Control and Prevention. Coronavirus Disease 2019 (COVID-19): Frequently Asked Questions. 2020; https://www.cdc.gov/coronavirus/2019-ncov/faq.html. Accessed October 30, 2020.
2. Centers for Disease Control and Prevention. People Who Are at Increased Risk for Severe Illness. 2020; https://www.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/people-at-increased-risk.html. Accessed September 5.
3. Brown RT, Kiely DK, Bharel M, Mitchell SL. Geriatric Syndromes in Older Homeless Adults. *J Gen Intern Med.* 2012;27(1):16-22.
4. Pribish A, Khalil N, Mhaskar R, Woodard L, Mirza A-S. Chronic Disease Burden of the Homeless: A Descriptive Study of Student-Run Free Clinics in Tampa, Florida. *J Community Health.* 2019;44:249-255.
5. Baggett TP, Liauw SS, Hwang SW. Cardiovascular Disease and Homelessness. *J Am Coll Cardiol.* 2018;71(22):2585-2597.
6. Baggett TP, Keyes H, Sporn N, Gaeta JM. Prevalence of SARS-CoV-2 Infection in Residents of a Large Homeless Shelter in Boston. *JAMA.* 2020;323(21):2191-2192.
7. Yoon JC, Montgomery MP, Buff AM, et al. COVID-19 Prevalence among People Experiencing Homelessness and Homelessness Service Staff during Early Community Transmission in Atlanta, Georgia, April-May 2020. *Clin Infect Dis.* 2020:ciaa1340.
8. Hsu HE, Ashe EM, Silverstein M, et al. Race/Ethnicity, Underlying Medical Conditions, Homelessness, and Hospitalization Status of Adult Patients with COVID-19 at an Urban Safety-Net Medical Center. *MMWR Morb Mortal Wkly Rep.* 2020;69:864-869.
9. Garg S, Kim L, Whitaker M, et al. Hospitalization Rates and Characteristics of Patients Hospitalized with Laboratory- Confirmed Coronavirus Disease 2019- COVID-NET, 14 States, March 1-30, 2020. *MMWR Morb Mortal Wkly Rep.* 2020;69(15):458-464.

10. Centers for Disease Control and Prevention. Coronavirus Disease 2019 (COVID-19)–Associated Hospitalization Surveillance Network (COVID-NET). Atlanta, GA: US. Department of Health and Human Services, CDC; 2020. https://www.cdc.gov/coronavirus/2019-ncov/covid-data/covid-net/purpose-methods.html

11. Kim L, Garg S, O'Halloran A, et al. Risk Factors for Intensive Care Unit Admission and In-hospital Mortality Among Hospitalized Adults Identified through the US Coronavirus Disease 2019 (COVID-19)-Associated Hospitalization Surveillance Network (COVID-NET). *Clin Infect Dis.* 2020.

12. Lewer D, Braithwaite I, Bullock M, et al. COVID-19 among people experiencing homelessness in England: a modelling study. *Lancet Respir Med.* 2020;8:1181-1191

13. Yoon JC, Montgomery MP, Buff AM, et al. COVID-19 prevalence among people experiencing homelessness and homelessness service staff during early community transmission in Atlanta, Georgia, April-May 2020. *Clin Infect Dis.* 2020;ciaa1340.

14. Centers for Disease Control and Prevention. Interim guidance for homeless service providers to plan and respond to Coronavirus Disease 2019 (COVID-19). Atlanta, GA: US. Department of Health and Human Services, CDC; 2020. https://www.cdc.gov/coronavirus/2019-ncov/community/homeless-shelters/plan-prepare-respond.html

15. Centers for Disease Control and Prevention. Interim guidance for health departments: COVID19 vaccination implementation for people experiencing homelessness. Atlanta, GA: US. Department of Health and Human Services, CDC; 2020. https://www.cdc.gov/coronavirus/2019-ncov/community/homeless-shelters/vaccination-guidance.html

Table 1. Characteristics of people experiencing homelessness hospitalized with coronavirus disease 2019 (COVID-19) – March 1–May 31, 2020 (N=199)

Characteristics	Unweighted n	Weighted %	Underlying health conditions	Unweighted n	Weighted %
Age (median, IQR)		53 (48-58)	Any condition	155	83.0
18-49	101	40.6	No condition	43	15.4
50-64	69	38.5	Hypertension	77	43.9
65+	29	20.9	Chronic lung disease	43	22.3
Race/ethnicity			Asthma	26	16.7
Non-Hispanic White	68	36.9	Emphysema/COPD	19	9.5
Non-Hispanic Black	69	33.4	Chronic metabolic disease	37	18.6
Hispanic or Latino	38	23.8	Diabetes mellitus	32	15.9
Non-Hispanic Other[a]	19	4.3	Cardiovascular disease[g]	36	24.9
Unknown	5	1.6	Coronary artery disease	12	6.5
Sex			Congestive heart failure	12	10.3
Male	165	83.5	Cardiomyopathy	5	4.6
Female	34	16.5	Myocardial infarction	4	2.8
Geographic region[b]			Pulmonary embolism	4	4.1
West	83	49.5	Peripheral vascular disease	4	4.6
Midwest	53	10.6	Cerebral vascular accident	3	3.1
South	44	31.8	Peripheral artery disease	1	1.9
Northeast	19	8.1	Gastrointestinal/Liver disease	34	18.7
Insurance			Hepatitis C (HCV)	21	12.8
Yes	163	84.5	Cirrhosis/End stage liver disease	10	7.8
No	34	15.2	Alcoholic hepatitis	5	0.9
Unknown	2	0.4	Hepatitis B (HBV)	3	0.5
Smoking			Chronic liver disease	1	0.2
Current	105	45.9	Neurologic disorder	28	23.8
Former	33	21.2	Epilepsy/seizure/seizure disorder	14	13.2
Never	61	32.9	Traumatic brain injury	9	7.8
Alcohol abuse			Dementia/Alzheimer's disease	3	2.1
Current	70	33.7	Cognitive dysfunction	2	0.4
Former	17	10.4	Immunosuppressive condition	6	2.0
Never	112	55.9	Renal disease	9	5.3
Substance abuse or dependence[c]			Blood disorders/hemoglobinopathy	6	4.5
Yes	17	3.1	Rheumatologic/Autoimmune disease	2	1.3
No	182	96.9	Other		

Mental disorder[d]			Wheelchair dependent	4	5.6
Yes	38	8.4			
No	161	91.6			
Body mass index[e]					
Underweight	10	5.1			
Normal	50	27.6			
Overweight	57	33.2			
Obese	59	23.6			
Unknown	23	10.5			
Pregnant[f]	1	3.3			

Note: Weights were applied to reflect the probability of being sampled for complete chart abstraction; weighted percentages and unweighted case counts are presented.

[a] Other race groups were Asian or Pacific Islander, American Indian or Alaska Native, Multiracial.

[b] Geographic regions are west (California, Colorado, New Mexico, Oregon, Utah), Midwest (Michigan, Minnesota, Ohio), northeast (Connecticut, New York), south (Georgia, Maryland, Tennessee)

[c] Substance abuse or dependence based on International Classification of Diseases 10th revision (ICD-10) discharge diagnosis codes for abuse/dependence of opioids, cocaine, or other stimulants.

[d] Mental disorder based on ICD-10 discharge diagnosis codes for schizophrenia, schizoaffective disorder, bipolar disorder, major depressive disorder, mood disorder, other anxiety disorder, post-traumatic stress disorder, personality disorder, attention deficit hyperactivity disorder.

[e] Body mass index (BMI) based on calculated weight and height (kg/m^2), and if BMI is missing, by ICD-10 discharge diagnosis codes: underweight (less than 18.5), normal (18.5-24.9), overweight (25.0-29.9), obese (30.0 and above).

[f] Pregnant- restricted to women aged 18-49 years (n=16).

[g] Cardiovascular disease excludes hypertension.

Table 2. Prevalence of clinical outcomes by key characteristics among people experiencing homelessness hospitalized with COVID-19 – March 1–May 31, 2020

			Highest level of respiratory support							
	Hospital length of stay above median (>4 days) [a]	ICU admission	Invasive mechanical ventilation	BiPAP/CPAP	HFNC	Any respiratory support (i.e., HFNC, BiPAP/CPAP, ventilator)	Vasopressors	Renal replacement therapy or dialysis	Systemic steroids	Death during hospitalization
	Unweighted n (Weighted %)									
Overall (N=199)	102 (54.0)	37 (16.9)	18 (11.3)	3 (2.6)	6 (1.1)	27 (15.0)	11 (6.4)	4 (3.6)	20 (15.5)	6 (1.1)
Race and ethnicity										
White NH (n=68)	33 (49.5)	13 (16.0)	4 (11.6)	1 (0.5)	2 (1.0)	7 (13.0)	5 (7.1)	1 (0.5)	10 (17.0)	2 (1.0)
Black NH (n=69)	38 (58.3)	12 (15.1)	7 (11.6)	2 (7.2)	0 (0.0)	9 (18.7)	4 (4.7)	3 (10.2)	6 (8.5)	2 (1.1)
Hispanic or Latino (n=38)	18 (59.1)	9 (22.5)	6 (12.6)	0 (0.0)	2 (1.5)	8 (14.1)	2 (9.5)	0 (0.0)	3 (26.2)	2 (1.5)
Other NH (n=19)	11 (46.7)	2 (8.5)	1 (4.2)	0 (0.0)	1 (4.2)	2 (8.5)	0 (0.0)	0 (0.0)	1 (4.2)	0 (0.0)
Age, years										
18-49 (n=101)	50 (54.9)	18 (22.1)	8 (8.1)	2 (5.9)	4 (1.8)	14 (15.8)	3 (1.3)	2 (5.9)	8 (22.1)	1 (0.4)
50-64 (n=69)	34 (43.1)	14 (13.2)	7 (9.9)	0 (0.0)	1 (0.5)	8 (10.4)	6 (9.4)	2 (3.1)	9 (11.1)	3 (1.4)
≥65 (n=29)	18 (71.4)	5 (13.4)	3 (20.1)	1 (0.9)	1 (0.9)	5 (21.8)	2 (10.8)	0 (0.0)	3 (11.0)	2 (1.7)
Sex										
Male (n=165)	84 (52.4)	31 (14.6)	16 (11.0)	2 (2.9)	5 (1.1)	23 (15.0)	9 (5.2)	4 (4.3)	14 (14.2)	5 (1.1)
	18	6	2 (12.6)	1 (1.1)	1	4 (14.8)	2 (12.6)	0 (0.0)	6	1 (1.1)

Female (n=34)	(61.9)	(28.1)		(1.1)				(22.6)	
Overweight or obese BMI[b]									
Yes (n=116)	58 (50.5)	23 (18.4)	10 (11.0)	0 (0.0)	4 (1.3)	14 (12.3)	7 (10.1)	2 (2.1)	12 (18.5)	4 (1.3)
No (n=60)	36 (64.1)	11 (12.4)	7 (14.9)	3 (7.9)	1 (0.6)	11 (23.3)	4 (2.2)	2 (7.4)	6 (8.7)	1 (0.6)
Any symptoms										
Yes (n=168)	85 (53.6)	29 (16.8)	15 (11.7)	2 (2.6)	5 (1.0)	22 (15.3)	11 (7.0)	4 (3.9)	20 (16.9)	6 (1.2)
No (n=31)	17 (59.2)	8 (18.1)	3 (6.8)	1 (2.3)	1 (2.3)	5 (11.3)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Any underlying health conditions										
Yes (n=155)	77 (54.3)	24 (17.5)	10 (9.7)	2 (2.9)	4 (0.9)	16 (13.4)	8 (7.1)	4 (4.3)	17 (18.1)	5 (1.1)
No (n=43)	24 (46.5)	13 (15.4)	8 (21.3)	1 (1.2)	2 (2.4)	11 (24.9)	3 (3.5)	0 (0.0)	3 (3.5)	1 (1.2)

Note: Weights were applied to reflect the probability of being sampled for complete chart abstraction; weighted percentages and unweighted case counts are presented. For mechanical ventilation, BiPAP/CPAP, and HFNC, patients are assigned based on the highest level of respiratory support required during hospitalization (i.e., invasive mechanical ventilation, then BiPAP or CPAP, then HFNC); ICU, intensive care unit; BiPAP, bilevel positive airway pressure; CPAP, continuous positive airway pressure; HFNC, high flow nasal cannula; NH, non-Hispanic; BMI, body mass index. Subgroup totals may not add to 199 due to missing data.

[a] Hospital length of stay is calculated from earliest admission date to latest discharge date in days.

[b] BMI based on calculated weight and height (kg/m^2), and if BMI is missing, by ICD-10 discharge diagnosis codes: underweight (less than 18.5), normal (18.5-24.9), overweight (25.0-29.9), obese (30.0 and above).