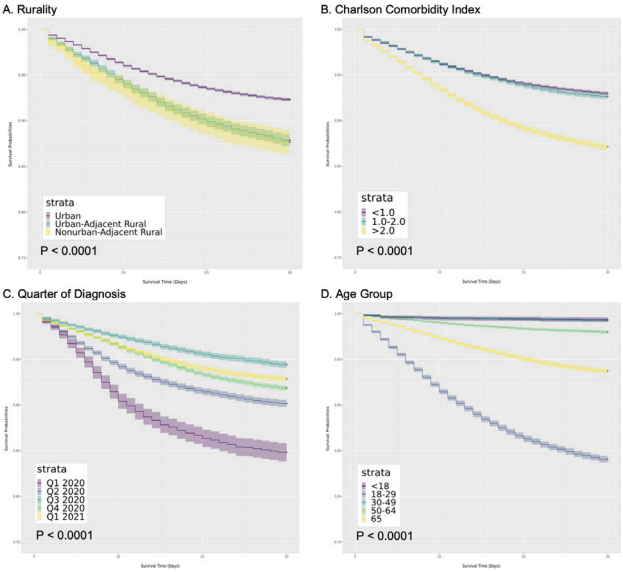
nonurban-adjacent rural (NAR) lines. Hospital admissions for UAR (OR 1.41, p< 0.001, 95% CI: 1.37 – 1.45) and NAR (OR 1.42, p< 0.001, 95% CI: 1.35 – 1.50) were significantly higher than their urban counterparts. Similar distributions were present for all-cause mortality for UAR (OR 1.39, p< 0.001, 95% CI: 1.30 – 1.49) and NAR (OR 1.38, p< 0.001, 95% CI: 1.22 – 1.55) compared to urban populations. These associations persisted despite adjustments for significant differences in BMI, Charlson Comorbidity index Score, gender, age, and the quarter of diagnosis for COVID-19.

Baseline Characteristics Hospitalized COVID-19 Positive Population by Rurality Category, January 2020 – March 2021

Characteristic	Urban, N = 104,051[1]	Urban-Adjacent Rural, N = 11,121[1]	Nonurban-Adjacent Rural, N = 2,725[1]	*P* value[2]
Gender				<0.001
Female	53,905 (52%)	5,597 (50%)	1,310 (48%)	
Male	50,146 (48%)	5,524 (50%)	1,415 (52%)	
Age Group				<0.001
<18	4,261 (4.1%)	540 (4.9%)	91 (3.3%)	
18-29	10,199 (9.8%)	948 (8.5%)	194 (7.1%)	
30-49	24,602 (24%)	2,117 (19%)	400 (15%)	
50-64	26,583 (26%)	2,978 (27%)	770 (28%)	
>=65	38,406 (37%)	4,538 (41%)	1,270 (47%)	
Race				<0.001
White	48,067 (46%)	7,238 (65%)	1,974 (72%)	
Black or AA	25,858 (25%)	2,171 (20%)	473 (17%)	
Asian or NHPI	4,252 (4.1%)	69 (0.6%)	<20	
Other	772 (0.7%)	154 (1.4%)	47 (1.7%)	
Missing/Unknown	25,102 (24%)	1,489 (13%)	224 (8.2%)	
Ethnicity				<0.001
Not Hispanic or Latino	77,099 (74%)	9,649 (87%)	2,487 (91%)	
Hispanic or Latino	20,611 (20%)	1,166 (10%)	172 (6.3%)	
Missing/Unknown	6,341 (6.1%)	306 (2.8%)	66 (2.4%)	
BMI Category				<0.001
<18.5	3,856 (3.7%)	340 (3.1%)	71 (2.6%)	
18.5-24.9	21,035 (20%)	1,989 (18%)	496 (18%)	
25-29.9	26,721 (26%)	2,727 (25%)	669 (25%)	
>30	41,884 (40%)	5,367 (48%)	1,331 (49%)	
Unknown/Missing	10,555 (10%)	698 (6.3%)	158 (5.8%)	
Charlson Comorbidity Index Composite				<0.001
<1.0	54,937 (53%)	5,676 (51%)	1,328 (49%)	
1.0-2.0	23,002 (22%)	2,283 (21%)	558 (20%)	
>2.0	26,112 (25%)	3,162 (28%)	839 (31%)	
Composite Score (CI)	0.00 (0.00, 3.00)	0.00 (0.00, 3.00)	1.00 (0.00, 3.00)	
Comorbidity Incidence				
Hypertension	38,141 (37%)	4,357 (39%)	1,115 (41%)	<0.001
Diabetes Mellitus	23,846 (23%)	2,814 (25%)	720 (26%)	<0.001
Myocardial Infarction	6,337 (6.1%)	799 (7.2%)	210 (7.7%)	<0.001
Congestive Heart Failure	11,969 (12%)	1,501 (13%)	388 (14%)	<0.001
Peripheral Vascular Disease	8,964 (8.6%)	1,166 (10%)	284 (10%)	<0.001
Stroke	9,614 (9.2%)	1,087 (9.8%)	276 (10%)	0.061
Dementia	4,395 (4.2%)	444 (4.0%)	129 (4.7%)	0.2
Chronic Pulmonary Disease	17,371 (17%)	1,933 (17%)	482 (18%)	0.081
Rheumatologic Disease	4,088 (3.9%)	460 (4.1%)	114 (4.2%)	0.5
Mild or Severe Liver Disease	7,426 (7.1%)	807 (7.3%)	220 (8.1%)	0.2
Hemiplegia or paraplegia	1,835 (1.8%)	261 (2.3%)	48 (1.8%)	<0.001
Renal Disease	13,731 (13%)	1,716 (15%)	476 (17%)	<0.001
Any malignancy (except skin)	10,134 (9.7%)	1,153 (10%)	317 (12%)	<0.001
Metastatic solid tumor	2,426 (2.3%)	276 (2.5%)	73 (2.7%)	0.3
HIV/AIDS	1,039 (1.0%)	47 (0.4%)	<20	<0.001
Multiple Comorbidities	54,110 (52%)	5,940 (53%)	1,509 (55%)	<0.001
Current or former smoker	38,099 (37%)	2,384 (21%)	714 (26%)	<0.001
Outcomes				
Any Oxygen Support	13,388 (13%)	2,079 (19%)	588 (22%)	<0.001
Any Mechanical Ventilation	10,087 (9.7%)	1,867 (17%)	477 (18%)	<0.001
Hospital Readmission	3,306 (3.2%)	188 (1.7%)	32 (1.2%)	<0.001
ECMO or MACE	947 (0.9%)	174 (1.6%)	46 (1.7%)	<0.001
All-Cause Mortality	11,240 (11%)	1,763 (16%)	455 (17%)	<0.001
Time to Death in Days (CI)	13 (6, 28)	14 (7, 27)	14 (5, 27)	0.6
Quarter of Diagnosis				<0.001
Jan-Mar 2020	6,145 (5.9%)	85 (0.8%)	25 (0.9%)	
Apr-Jun 2020	24,478 (24%)	1,507 (14%)	438 (16%)	
Jul-Sep 2020	15,851 (15%)	2,114 (19%)	482 (18%)	
Oct-Dec 2020	32,856 (32%)	4,337 (39%)	995 (37%)	
Jan-Mar 2021	24,721 (24%)	3,078 (28%)	785 (29%)	

[1] Statistics presented: n (%)
[2] Statistical tests performed: chi-square test of independence

Survival Curves in Hospitalized Patients Over 30 Days from Day of Admission



This figure shows a survival plot of COVID-19 positive hospitalized patients in N3C by rural category (A), Charlson Comorbidity Index (B), Quarter of Diagnosis (C), and Age Group (D) from hospital admission through day 30. Events were censored at day 30 based on the incidence of death or transfer to hospice care. These four factors had the highest predictive power of the covariates evaluated in this study.

Unadjusted and Adjusted Odds Ratios for Hospitalization and All-Cause Mortality by Rural Category, January 2020 – March 2021

A. Unadjusted Odds-Ratios for COVID-19 Hospitalization			**B. Unadjusted Odds-Ratios for All-Cause Mortality**	
Covariate	Odds ratio (95% CI)	*P* Value	Odds ratio (95% CI)	*P* Value
Rurality				
Urban	Reference		Reference	
Urban-Adjacent Rural	1.62 (1.58, 1.66)	<0.001	1.45 (1.37, 1.54)	<0.001
Nonurban-Adjacent Rural	1.61 (1.54, 1.69)	<0.001	1.56 (1.41, 1.74)	<0.001
C. Adjusted Odds-Ratios for COVID-19 Hospitalization			**D. Adjusted Odds-Ratios for All-Cause Mortality**	
Covariate	Odds ratio (95% CI)	*P* Value	Odds ratio (95% CI)	*P* Value
Gender				
Female	Reference		Reference	
Male	1.25 (1.23, 1.27)	<0.001	1.49 (1.43, 1.55)	<0.001
Race				
White	Reference		Reference	
Black or AA	1.65 (1.61, 1.68)	0.3	1.00 (0.95, 1.06)	0.9
Asian or NHPI	1.61 (1.55, 1.69)	0.002	1.29 (1.15, 1.44)	<0.001
Other	1.68 (1.54, 1.84)	0.002	1.77 (1.43, 2.18)	<0.001
Missing or Unknown	1.51 (1.47, 1.55)	0.5	1.16 (1.08, 1.25)	0.14
Ethnicity				
Not Hispanic/Latinx	Reference		Reference	
Hispanic/Latinx	1.44 (1.40, 1.48)	0.7	1.06 (0.98, 1.15)	<0.001
Missing or Unknown	0.61 (0.59, 0.64)	0.036	1.34 (1.20, 1.49)	<0.001
BMI	1.01 (1.01, 1.01)	<0.001	1.01 (1.00, 1.01)	<0.001
Age	1.03 (1.03, 1.03)	<0.001	1.06 (1.05, 1.06)	<0.001
CCI Index	1.17 (1.16, 1.17)	<0.001	1.09 (1.08, 1.09)	<0.001
Quarter of Diagnosis				
Jan-Mar 2020	3.14 (3.00, 3.29)	<0.001	2.83 (2.57, 3.12)	<0.001
Apr-Jun 2020	1.38 (1.35, 1.42)	<0.001	1.92 (1.79, 2.06	<0.001
Jul-Sep 2020	Reference		Reference	
Oct-Dec 2020	0.90 (0.88, 0.92)	<0.001	1.11 (1.04, 1.19	0.002
Jan-Mar 2021	1.00 (0.97, 1.02)	<0.001	0.88 (0.82, 0.95)	<0.001
Rurality				
Urban	Reference		Reference	
Urban-Adjacent Rural	1.41 (1.37, 1.45)	<0.001	1.39 (1.30, 1.49)	<0.001
Nonurban-Adjacent Rural	1.42 (1.35, 1.50)	<0.001	1.38 (1.22, 1.55)	<0.001

This figure shows the adjusted and unadjusted odds ratios for being hospitalized or dying after hospitalization for the COVID-19 positive population in N3C. Risk is similar between adjusted and unadjusted models, suggesting a real impact of rurality on all-cause mortality. A shows the unadjusted odds ratios for admission to the hospital after a positive COVID-19 diagnosis for all N3C patients. B shows the unadjusted odds ratios for all-cause mortality at any point after hospitalization for COVID-19 positive patients. C shows the adjusted odds ratios for being admitted to the hospital after a positive COVID-19 diagnosis for all N3C patients. D shows the adjusted odds ratios for all-cause mortality for all-cause mortality at any point after hospitalization for COVID-19 positive patients. Adjusted models include adjustments for gender, race, ethnicity, BMI, age, Charlson Comorbidity Index (CCI) composite score, rurality, and quarter of diagnosis. The data provider is included as a random effect in all models.

Conclusion. In N3C, we found that hospitalizations and all-cause mortality were greater among rural populations when compared to urban populations after adjustment for several factors, including age and co-morbidities. This study also identified key demographic and clinical disparities among rural patients that require further investigation.

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34. Long-term clinical outcomes following SARS-CoV-2 infection include persistent symptoms and cardiovascular disease beyond 3 months post-infection

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Session: O-07. COVID-19 Complications, Co-infections and Clinical Outcomes 2

Background. The long-term health effects after SARS-CoV-2 infection remain poorly understood. We evaluated health and healthcare usage after SARS-CoV-2 infection via surveys and longitudinal electronic medical record (EMR) review within the Military Health System (MHS).

Methods. We studied MHS beneficiaries enrolled in the Epidemiology, Immunology, and Clinical Characteristics of Emerging Infectious Diseases with Pandemic Potential (EPICC) cohort from March to December 2020. COVID-19 illness symptom severity and duration were derived from surveys initiated in late 2020. In addition, multi-year healthcare encounter history before and after onset of COVID-19 symptoms was collected from the MHS EMR. Odds of organ-system clinical diagnoses within the 3 months pre- and post-symptom onset were calculated using generalized linear models, controlling for age, sex, and race, and including participant as a random effect.

Results. 1,015 participants were included who were SARS-CoV-2 positive, symptomatic, and had 3-month follow-up data available in the EMR (Table 1). 625 of these participants had survey data collected more than 28 days post-symptom onset, among whom 17% and 6% reported persistent symptoms at 28-84 days, and 85+ days, respectively. 9.6% had not resumed normal activities by one month. The most frequently reported symptoms persisting beyond 28 days were dyspnea, loss of smell and/or taste, fatigue, and exercise intolerance (Figure 1A). When compared with the period 61 to 90 days prior to symptom onset, the first month post-symptom onset period was associated with increases of pulmonary (aOR = 57, 95% CI 28-112), renal (aOR = 29, 95% CI 10-84), cardiovascular (aOR = 7, 95% CI 5-11), and neurological diagnoses (aOR = 3, 95% CI 2-4) (Figures 1B and 1C). Cardiovascular disease diagnoses remained elevated through 3 months (aOR = 2, 95% CI 1-3).

Table 1. Characteristics of SARS-CoV-2+ EPICC participants, and illness duration among those with 28+ days post-symptom onset survey data collection.

	N=1015
Age group (years)	
<18	21 (2.1%)
18-44	594 (58.5%)
45-64	288 (28.4%)
65+	112 (11.0%)
Male	631 (62.2%)
Race/ethnicity	
Black	162 (16.0%)
Hispanic	276 (27.2%)
Other	116 (11.4%)
White	461 (45.4%)
Military status	
Active duty	493 (48.6%)
Dependent	281 (27.7%)
Missing	2 (0.2%)
Retired military	239 (23.5%)
With survey information beyond 28 days post-symptom onset	N=639
New home oxygen therapy	24 (3.8%)
Illness resolved	606 (94.8%)
Time to recovery	
Median (Q1, Q3)	14.0 (8.0, 25.0)
Min - Max	0.0 - 337.0
N	606
Resolved illness duration category	
<28	466 (76.9%)
28-84	106 (17.5%)
85+	34 (5.6%)
Time ill (if not recovered)	
Median (Q1, Q3)	46.0 (33.0, 87.0)
Min - Max	28.0 - 235.0
N	33
Missed work or unable to fulfil normal activities	485 (75.9%)
Returned to normal activities	437 (90.1%)
Number of days off duty/work	
Median (Q1, Q3)	14.0 (10.0, 20.0)
Min - Max	0.0 - 210.0
N	482
Maximum symptom severity reported in survey	
Mild (noticeable but not impairing)	300 (47.5%)
Moderate (impairing but not disabling; interferes with duties)	226 (35.8%)
Severe (disabling; can't perform duties)	91 (14.4%)
Critical (life threatening)	14 (2.2%)

Figure 1

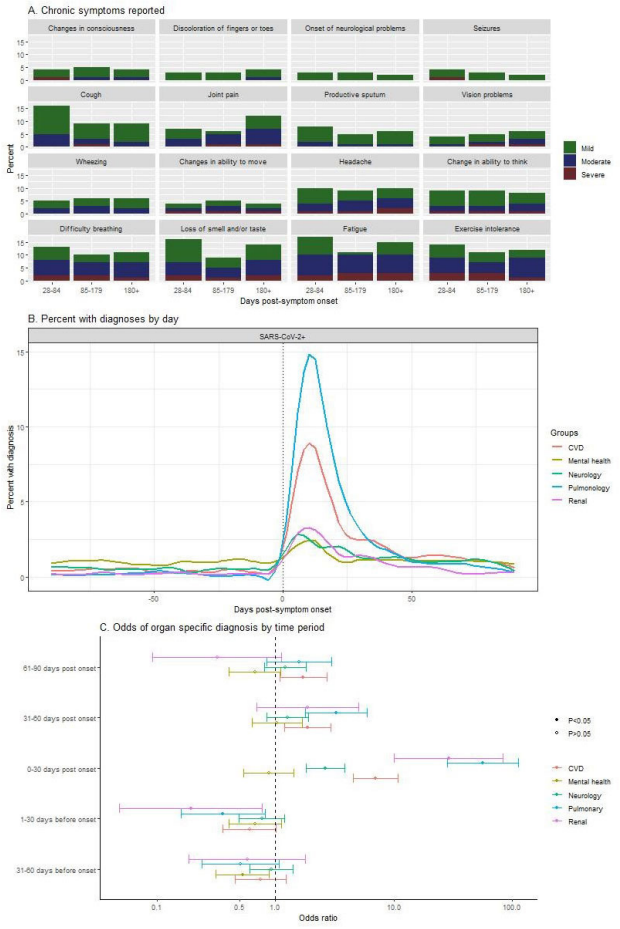

Fig1A. Symptoms reported by EPICC participants with illnesses longer than 28 days; 1B. Percent of participants with organ system specific diagnoses on each day, 90 days pre- and post-symptom onset; 1C. Odds of organ system specific diagnoses within each month, +/- 3 months of symptom onset, were calculated using generalized linear models, controlling for age, sex, and race and included participants as a random effect. Odds shown are relative to the earliest period included in the model, 61-90 days before onset.

Conclusion. In this MHS cohort, a significant proportion of participants had persistent symptoms and cardiovascular disease diagnoses 3 months after COVID-19 illness onset. These findings emphasize the long-term morbidity of COVID-19 and the importance of mitigating SARS-CoV-2 infections. Further analyses will evaluate demographic, clinical, and biomarker predictors of medium-to-long term organ-specific post-acute sequelae.

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35. Health-related quality of life in COVID-19 survivors after 12 months, a prospective cohort study.

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IMPACD2

Session: O-07. COVID-19 Complications, Co-infections and Clinical Outcomes 2

Background. The long-term effects of COVID-19 are still unknown. This study aims to assess the impact of COVID-19 among survivors after one year.