



An Exploration of the Relationships among Race, Socioeconomic Variables, and Patient Outcomes in Patients with COVID-19

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Research Question


What are the relationships among Sequential Organ Failure Assessment (SOFA) Score, race, sex, payer, zip code of primary residence, and patient outcomes in patients with COVID-19?

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Review of Literature


A novel respiratory pathogen, coronavirus SARS-CoV-2,¹ caused an outbreak of respiratory illnesses beginning in Wuhan, China in December 2019.² Within weeks, cases had been reported in the United States³ and Europe,⁴ heralding a global pandemic of over 600,000 cases and 28,000 deaths by the end of March 2020.⁵ To date, in the United States, there have been over 106 million cases of coronavirus and over 1.1 million reported deaths.⁶

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Review of Literature


Researchers in medicine, public health, and nursing have been reporting the disparities in healthcare outcomes of minority populations.⁷ Some etiologic factors of these disparities that have been identified include race-associated comorbidities^{8,9}, destitution/socioeconomic status⁸⁻¹², longstanding distrust of health care providers and health care systems⁸, lack of access to health care for treatment of chronic conditions^{9,10}, language barriers^{8,9,11,13}, multiple generations living in the same household^{8,9}, having jobs that cannot be performed remotely⁹, need to use public transit⁹, low level of education¹¹, poor housing conditions¹¹, and knowledge deficits about symptoms to report and how to mitigate the spread of COVID-19.⁹

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Review of Literature


Health care disparities have been further intensified due to COVID-19 and its associated sequelae.^{8,9,14} Black, indigenous, and people of color (BIPOC) and Hispanic people have reported higher infection rates^{14,15} and complications of COVID-19. Data are not consistent regarding infection rate in these racial groups¹⁶ as well as Asian people.

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- ▶ According to the Centers for Disease Control and Prevention, the rate of hospitalization for BIPOC is 2.3 times higher than White persons.¹⁷ These data are corroborated by others. These latter data compared racial minority populations with majority groups.¹⁸⁻²⁴
- ▶ The death rate is up to 1.7 times higher in BIPOC people than non-Hispanic White persons.^{8,24}
- ▶ Hispanic or Latino person have a 2.2 times higher hospitalization rate and 1.8 to 3.2 times higher death rate compared to White persons.
- ▶ Data are lower for persons of Asian, non-Hispanic persons with a 0.8 times higher rate of hospitalization and death than White persons.^{8,14,17}
- ▶ The risk of death from COVID-19 among Asian populations, however, is similar to that of White populations. There are inadequate data to discern differences among other racial/ethnic groups.¹⁴

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- ▶ Data on differences among various race and ethnic groups (non-Hispanic Black, Asian/Pacific Islander, American Indian/Alaskan Native) are corroborated by others.²⁵ The mortality rates were similarly lower in non-Hispanic White persons than the other racial groups with an increased risk of death reported in those younger than 65 years of age.²⁵
- ▶ Data on mortality rates and severity of illness vary among states²⁶ and are inconsistent.¹¹

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Review of Literature


- ▶ In another study, BIPOC and Hispanic patients accounted for more than 50% of in-hospital patients who died from COVID-19. However, Asian persons in this study had more severe cardiopulmonary disease. The authors attributed these latter findings to fear of being attacked based on their race, language barriers, immigration status (which can result in lack of health insurance) and lower socioeconomic status, the latter of which can impact receipt of high quality healthcare.²⁷
- ▶ Other data, albeit inconsistent, acknowledge the relationship among these socioeconomic variables, COVID-19 infection rate, and patient outcomes.^{11,28}

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Methods

- ▶ Type of study:
 - ▶ Retrospective chart review
- ▶ Variables:
 - ▶ Age
 - ▶ Sex
 - ▶ Race
 - ▶ Zip code of primary residence
 - ▶ Payer
 - ▶ Sequential Organ Failure Assessment (SOFA) score on admission

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Methods: SOFA score

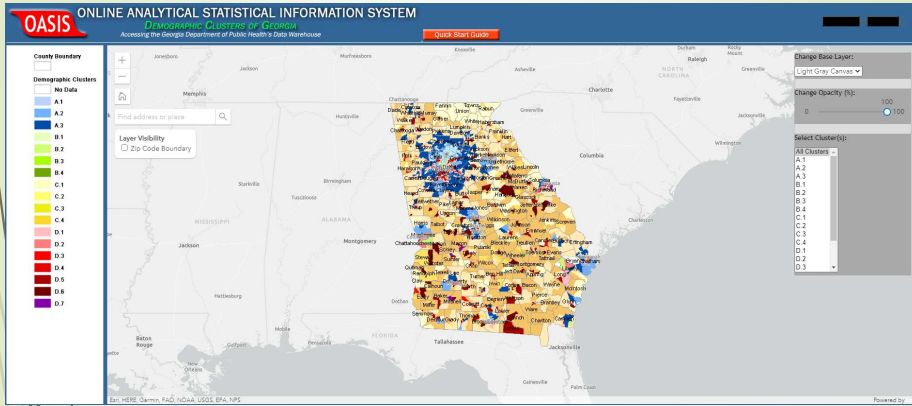
PaO ₂	Norm: 75 - 100	mm Hg		Bilirubin, mg/dL (μmol/L)	<1.2 (<20)	0
FiO ₂		%		1.2-1.9 (20-32)	+1	
See Evidence for estimating FiO ₂ from oxygen flow/delivery rates				2.0-5.9 (33-101)	+2	
On mechanical ventilation Including CPAP	No	Yes		6.0-11.9 (102-204)	+3	
Platelets, ×10 ³ /μL	≥150	0		≥12.0 (>204)	+4	
	100-149	+1				
	50-99	+2				
	20-49	+3				
	<20	+4				
Glasgow Coma Scale If on sedatives, estimate assumed GCS off sedatives	15	0				
	13-14	+1				
	10-12	+2				
	6-9	+3				
	<6	+4				
Mean arterial pressure OR administration of vasoactive agents required Listed doses are in units of mcg/kg/min	No hypotension	0				
	MAP < 70 mmHg	+1				
	DDPamine ≤5 or DOBUTamine (any dose)	+2				
	DDPamine >5, EPINEPHrine ≤0.1, or norEPINEPHrine ≤0.1	+3				
	DDPamine >15, EPINEPHrine >0.1, or norEPINEPHrine >0.1	+4				
Creatinine, mg/dL (μmol/L) (or urine output)	<1.2 (<110)	0				
	1.2-1.9 (110-170)	+1				
	2.0-3.4 (171-299)	+2				
	3.5-4.9 (300-440) or UOP <500 mL/day	+3				
	≥5.0 (440) or UOP <200 mL/day	+4				

<https://www.mdcalc.com/calc/691/sequential-organ-failure-assessment-sofa-score>

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Methods

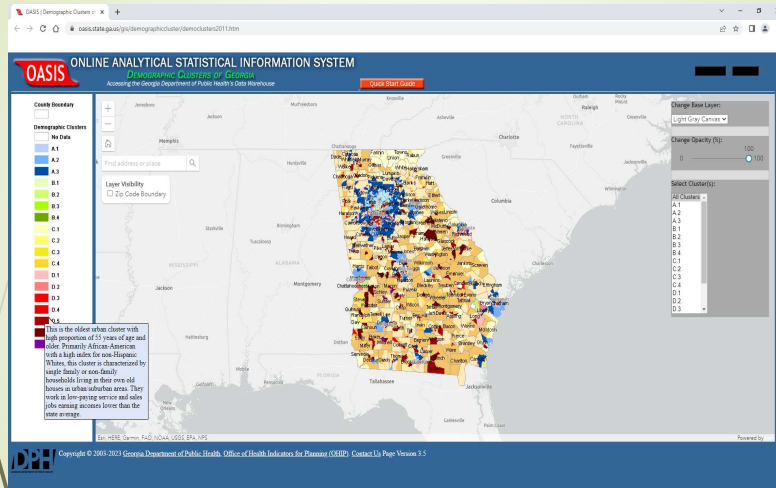


<https://oasis.state.ga.us/gis/demographiccluster/democlusters2011.htm>

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Methods




<https://oasis.state.ga.us/gis/demographiccluster/democlusters2011.htm>

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Approval


The study received endorsement through the Emory University Hospital Nursing Research and Evidence-Based Practice Council, endorsement from the CNO of EUH, and approval by the Emory University IRB.

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Sample/Participants

- ▶ Characteristics of the sample
 - ▶ Inclusion criteria: Adults (at least 18 years of age) hospitalized in the ARICU at Emory University Hospital who tested positive for COVID-19 via polymerase chain reaction (PCR).
 - ▶ Exclusion criteria: Patients under 18 years of age or tested negative for COVID-19 via PCR.

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Sample/Participants

- Sample size:
 - Power Analysis: Given a sample size of 100, we will be powered at 80% power and 5% level of significance to detect moderate effect sizes for all bivariate associations between the measures ($r=0.25-0.30$ for continuous measures, $\omega=0.26-0.31$ for categorical/dichotomous measures); and powered to detect $f^2=0.11$ to 0.17 for a linear prediction model with up to 5 predictors.
 - NOTE: r or $\omega=0.1$ is considered to be “small”, r or $\omega=0.3$ is considered to be “moderate”, r or $\omega=0.5$ is considered to be a “large” effect size and $f^2=0.02$ is considered “small”, $f^2=0.15$ is “moderate” and $f^2=.35$ is “large.” For a dichotomous outcome (such as death with an expected rate of 20%), we will also be powered to detect odds ratios of 1.95 to 2.32, where an odds ratio of 2.5 is considered to be a moderate effect size.

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Data Collection

- How were the data collected?
 - Retrospective chart review
- The data collection instruments were appropriate for the study.
 - SOFA has validity and reliability
 - Arts DGT, deKeizer NF, Vroom MP, deJonge E. Reliability and accuracy of Sequential Organ Failure Assessment scoring. *Crit Care Med.* 2005;33(9):1988-1993.
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Results

Table 1: Descriptive Statistics of Sample

	Overall (N=100)
Age	
Mean (SD)	62.420 (17.120)
Range	25,000 - 99,000
Median	63,500
IQR [Q1, Q3]	54,000, 74,250
Gender	
Male	57 (57.0%)
Female	43 (43.0%)
SOFA score	
Mean (SD)	5.790 (3.160)
Range	1,000 - 14,000
Median	5,000
IQR [Q1, Q3]	3,000, 8,000
Survived or not	
Died	23 (23.0%)
Survived	77 (77.0%)
Organ Failure or not	
OrgFail No	27 (27.0%)
OrgFail Yes	73 (73.0%)
Race: AA vs Caucasian vs Other	
AA	60 (60.0%)
Caucasian	26 (26.0%)
Asian, Hispanic, unknown	14 (14.0%)
Payer	
Government	12 (12.0%)
HMO	21 (21.0%)
Medicare/Medicaid	60 (60.0%)
Commercial, BlueCross	7 (7.0%)
Zip code Vulnerable Yes vs No, Avg, unknown	
No, Average, unknown	56 (56.0%)
Yes	44 (44.0%)

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Results (cont'd)

Table 3: Survival - Compare Characteristics

	Died (N=23)	Survived (N=77)	Total (N=100)	p value
Age				0.325 [†]
Mean (SD)	65,522 (15,500)	61,494 (17,563)	62,420 (17,120)	
Range	34,000 - 90,000	25,000 - 99,000	25,000 - 99,000	
Median	66,000	61,000	63,500	
IQR [Q1, Q3]	55,500, 76,000	54,000, 70,000	54,000, 74,250	
SOFA score				0.689 [‡]
Mean (SD)	6.130 (3.634)	5.688 (3.023)	5.790 (3.160)	
Range	1,000 - 13,000	2,000 - 14,000	1,000 - 14,000	
Median	5,000	5,000	5,000	
IQR [Q1, Q3]	3,500, 9,500	3,000, 8,000	3,000, 8,000	
Organ Failure or not				< 0.001 [‡]
Org Fail No	0 (0.0%)	27 (35.1%)	27 (27.0%)	
Org Fail Yes	23 (100.0%)	50 (64.9%)	73 (73.0%)	
Gender				0.958 [‡]
Male	13 (56.5%)	44 (57.1%)	57 (57.0%)	
Female	10 (43.5%)	33 (42.9%)	43 (43.0%)	
Race: AA vs Caucasian vs Other				0.068 [‡]
AA	16 (69.6%)	44 (57.1%)	60 (60.0%)	
Caucasian	2 (8.7%)	24 (31.2%)	26 (26.0%)	
Asian, Hispanic, unknown	5 (21.7%)	9 (11.7%)	14 (14.0%)	
Payer (merge Comm+BC)				0.454 [‡]
Government	4 (17.4%)	8 (10.4%)	12 (12.0%)	
HMO	5 (21.7%)	16 (20.8%)	21 (21.0%)	
Medicare/Medicaid	14 (60.9%)	46 (59.7%)	60 (60.0%)	
Commercial, BlueCross	0 (0.0%)	7 (9.1%)	7 (7.0%)	
Zip code Vulnerable Yes vs No, Avg, unknown				0.592 [‡]
No, Average, unknown	14 (60.9%)	42 (54.5%)	56 (56.0%)	
Yes	9 (39.1%)	35 (45.5%)	44 (44.0%)	



Study Limitations

- Single site study
- Studied during second surge of COVID-19.

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