Clinical Characteristics and Outcomes Based on Race of Hospitalized Patients with COVID-19 in a New Orleans Cohort

Victoria Silver, DO[1]
Andrew G. Chapple, PhD[2]
Allison H. Feibus, MS[3]
Jeremy Beckford, BA[4]
Natalie A. Halapin, MD[1]
Delphi Barua, MD[1]
Angellica Gordon, MD[3]
Will Baumgartner, MD[1]
Seth Vignes, MD[1]
Cullen Clark, MD[1]
Sanjay Kamboj, MD[1]
Stephen C. Lim, MD[5,6]
Scott P. Mackey, DO[5,6]
Paula S. Seal, MD, MPH[1,4,6]
Joseph M. Kanter, MD, MPH[5,6,7]
Caryn Bell, PhD[7]
Meredith E. Clement, MD[1,4,6]

[1]Louisiana State University Health Sciences Center (LSUHSC) Department of Medicine, New Orleans, LA
[2]Biostatistics Program, LSUHSC School of Public Health, New Orleans, LA
[3]LSU School of Medicine - New Orleans, LA
[4]LSUHSC Department of Medicine, Section of Infectious Diseases, New Orleans, LA
[5]LSU New Orleans Emergency Medicine, New Orleans, LA
[6]University Medical Center, New Orleans, LA
[7]Louisiana Department of Health
[8]Tulane Department of Global Community Health and Behavioral Sciences, Tulane University School of Public Health and Tropical Medicine, New Orleans, LA

Summary: This retrospective study included 249 patients admitted with COVID-19 to a safety net hospital in March, 2020. We found minor racial differences in comorbidities and initial disease severity, and race was not associated with outcomes; however, Black patients were overrepresented in hospitalizations (87%).

Corresponding Author:
Meredith E. Clement, MD
1542 Tulane Avenue, Suite 331C
New Orleans, LA 70112
Email: mclem5@lsuhsc.edu
Phone: 252-902-4961

Alternate Corresponding Author:
Victoria Silver, DO
433 Bolivar Street
New Orleans, LA 70112
Email: vsilve@lsuhsc.edu
Phone: 847-867-0831

Abstract

Background: In Louisiana, deaths related to COVID-19 have disproportionately occurred in Black persons. Granular data are needed to better understand inequities and develop prevention strategies to mitigate further impact on Black communities.

Methods: We conducted a retrospective study of patients admitted to an urban safety-net hospital in New Orleans, LA with reactive SARS-CoV-2 testing from March 9-31, 2020. Clinical characteristics of Black and other racial/ethnic group patients were compared using Wilcoxon rank-sum test and Fisher's exact tests. The relationship between race and outcome was assessed using Day-14 status on an ordinal scale.

Results: This study included 249 patients. Median age was 59, 44% were male, 86% were age ≥65y or had ≥1comorbidity. Overall, 87% were Black, relative to 55% Black patients typically hospitalized at our center. Black patients had longer symptom duration at presentation (6.41 versus 5.88 days, p=0.05), and were more likely to have asthma (p=0.008), but less likely to have dementia (p=0.002). There were no racial differences in initial respiratory status or laboratory values except higher LDH in Black patients. Patient age and initial oxygen requirement, but not race (adjusted proportional odds ratio = 0.92, 95%CI: 0.70-1.20), were associated with worse Day-14 outcomes.

Conclusion: Our results demonstrate minor racial differences in comorbidities or disease severity at presentation, and Day-14 outcomes were not different between groups. However, Black patients were disproportionately represented in hospitalizations, suggesting that prevention efforts should include strategies to limit SARS-CoV-2 exposures and transmission in Black communities as one step towards reducing COVID-19 related racial inequities.

Key Words: COVID-19; SARS-CoV-2; hospitalizations; racial inequities; racial disparities

Introduction

The United States now has more than four million reported cases of SARS-CoV-2, the novel coronavirus which causes the clinical syndrome known as COVID-19.[1] Nationwide, COVID-19 has been shown to profoundly impact Black communities, with city and state public health data demonstrating disproportionately higher incidence and mortality rates among Black persons regardless of geographic region.[2,3,4,5,6]

In Louisiana (LA), the first case of COVID-19 was diagnosed on March 9, 2020,[7] and in subsequent days the state drew the distinction of having the fastest-growing COVID-19 outbreak worldwide.[8] Since then, there have been more than 103,000 cases diagnosed in the state.[8] New Orleans, LA emerged as an early epicenter of the epidemic, and in early March the city had one of the highest mortality rates globally.[9] Mortality rates were shown to be higher in Black Louisianans when Louisiana became one of the first states to release data by race/ethnicity. Most recent statistics from the Louisiana Department of Health show that Black persons represent 52% of deaths from COVID-19, while accounting for only 33% of the state's population.[9,10] In terms of hospitalizations, recently published data from a large integrated health system show that Louisiana mirrors other states that have experienced a dramatic overrepresentation of Black persons who require hospital admission for COVID-19 infection.[11,12,13]

The objective of this study was to investigate trends in admission data as well as clinical characteristics and outcomes with respect to race among patients hospitalized with COVID-19 during the acceleration phase of the New Orleans's pandemic. This review provides a single center experience from University Medical Center (UMC), a tertiary care academic medical center that serves as the primary safety-net hospital for the Greater New Orleans metropolitan area.

Methods

We performed a retrospective review of patients hospitalized during the month of March 2020 who had screened positive for SARS-COV-2 on a reverse transcription-PCR nasopharyngeal swab. During the study period, our institution did not yet have in-house point of care testing for SARS-CoV-2. Test platforms varied during the month, with the majority of tests conducted by the Louisiana Office of Public Laboratory or private laboratory companies. When providers had suspicion for the virus, they would contact the state health department in order to have testing approved. In March 2020, testing through the State Public Health Lab was limited to patients meeting the following criteria: hospitalized with severe respiratory illness with no other known cause, suspected outbreak of COVID-19 among associated individuals with recent onset of fever and lower respiratory symptoms, recent fever and lower respiratory symptoms in a healthcare worker with direct contact to a laboratory-confirmed COVID-19 case, suspected COVID-19 in a patient associated with a high-risk exposure setting such as a long-term care facility or a correctional facility, suspected COVID-19 in a homeless patient. Patients who did not meet the State testing criteria could undergo testing through a commercial laboratory at their physician's discretion.

An initial report was generated from our electronic health record that included all consecutive patients who underwent SARS-CoV-2 testing through March 31, 2020. Patient charts were then manually reviewed to determine whether SARS-CoV-2 was detected on testing. For those with positive/reactive SARS-CoV-2-testing, data abstraction into a REDCap database was conducted for the following elements: age, self-identified race and ethnicity, sex, body mass index (BMI), insurance type, days of symptoms at the time of hospitalization, presence of comorbidities, zip code, as well as laboratory and vital sign data from presentation and clinical outcomes. Race and ethnicity were documented according to patient self-identification at the time of hospital registration. Race categories are pre-specified in the

electronic health record and include American Indian or Alaskan Native, Asian, Black or African American, and White or Caucasian; ethnicity was categorized as Hispanic or non-Hispanic. Median income data was obtained for each participants' 5-digit Zip code tabulation area (ZCTA) from the United States Census Bureau using the advanced search feature on the landing page at data.census.gov and the MABLE Geocorr tool. Analyses were run using R statistical software, Version 3.6.2.

All charts were reviewed until April 14, 2020 to allow for a minimum of two weeks of follow up for all patients. Patients were excluded if they had been transferred in from a hospital outside of our health system, as we would not have access to initial data points.

Patient Consent Statement

Prior to initiation of data collection, the study was approved by the LSU Institutional Review Board and University Medical Center Research Review Committee. The study was approved as medical chart review only, and the requirement for obtaining written informed consent was waived.

Analysis

Baseline Assessments:

Patient demographics, comorbid conditions, and clinical characteristics at presentation were compared among Black and other racial/ethnic group patients. Because of relatively small numbers among other racial/ethnic group patients, all other races/ethnicities were grouped in analyses. Distributions of continuous variables were compared across racial groups using a Wilcoxon rank-sum test, and categorical variables were compared using a Fisher exact test. Charlson Comorbidity Index (CCI), which predicts 10-year survival in patients with multiple

comorbidities, was calculated for each patient in the cohort and used as a measure of total comorbidity burden.

Outcomes:

We examined outcomes that occurred during hospitalization including acute kidney injury, new dialysis requirement, requirement for invasive mechanical ventilation (IMV), and, in those who were extubated, any instance of reintubation. Two regression analyses were conducted. First, in order to determine the association between race and severity of illness at presentation, multivariable logistic regression was used to determine covariates associated with supplemental oxygen requirement on admission. Adjusted odds ratios (aOR) are reported for the logistic regression along with 95% confidence intervals, with confidence intervals above one indicating an increased odds of oxygen need. To assess the association between patient race and hospital outcome, we examined Day-14 patient outcomes according to an ordinal scale, using the following scoring system: death assigned a score of 1, hospitalized and requiring invasive mechanical ventilation (IMV) assigned a score of 2, hospitalized but not requiring IMV a score of 3, and discharged a score of 4. The adjusted proportional odds (aPO) of better outcomes are reported for the cumulative logistic regression along with 95% confidence intervals, with confidence intervals above one indicating that that factor is associated with better outcomes in general. The analyses included the following covariates: Charleston Comorbidity Index (CCI), age ≥65 years, BMI ≥40 kg/m^2, smoking status (former or current), male sex, hypertension, asthma, income by ZCTA, and time (in days) since symptom onset. Asthma and hypertension were included separately since they are not incorporated into the CCI. For predicting Day-14 outcome, supplemental oxygen support was also included as a covariate. Covariates were standardized so that the magnitude of the confidence intervals would be directly comparable.

Results

A total of 249 patients hospitalized and PCR positive for SARS-CoV-2 at our institution between March 9, 2020 and March 31, 2020 were included in the analysis (**Table 1**). All patients included had symptoms consistent with COVID-19 infection at admission, with the exception of two patients that were admitted for other reasons and developed symptoms concerning for SARS-CoV-2 infection during their stay necessitating testing. Two patients were excluded due to missing racial information. Male patients constituted 44.2% of the cohort. Of the cohort, 87.1% percent self-identified as Black, 6.4% identified as White, 1.6% identified as Asian, 5.2% identified as other, and 1.1% of the cohort identified as Hispanic; 1.5% of patients selected multiple races. Mean age of the cohort was 59.6 years (Black patients 59.2 years, other racial/ethnic group patients 62.5 years). The majority of patients (86%) had at least one of the following conditions or comorbidities: age ≥65, hypertension, diabetes mellitus, cardiovascular disease, asthma, chronic lung disease, BMI ≥40, end-stage renal disease, cancer, or liver disease. The most common comorbidities were hypertension (79%), hyperlipidemia (52%) and diabetes mellitus (52%). At time of presentation, 58.6% of patients were febrile (T ≥100.4°F).

Black patients were more likely to have a diagnosis of asthma (p=0.008), but less likely to have dementia (p=0.002). There was no difference in the mean calculated CCI score between Black patients and other racial/ethnic group patients. **Figure 1** displays the number of admissions over time and demonstrates the racially disproportionate rates of hospitalizations between Black and other racial/ethnic group patients over March 2020. Mean days from Louisiana's first diagnosed case to time of presentation was different for Black and other racial/ethnic group patients (13.41 vs. 16.19 days, p=0.005, see **Table 2**). Mean symptom duration prior to presentation was 6.41 days for Black patients versus 5.88 days for other racial/ethnic group patients (p=0.05). There were no racial differences in imaging findings and respiratory status, including respiratory rate and oxygen requirement, at the time of presentation. The only lab value that demonstrated a statistically significant difference was initial

lactate dehydrogenase (LDH, p=0.03), with higher values in Black patients compared to other racial/ethnic group patients.

When we examined in-hospital outcomes (for all durations of follow up), we found that Black patients had higher rates of acute kidney injury (AKI, 48.8% vs 37.5%) and requirement for dialysis (16.6% vs 12.5%) and intubation (30.0% vs 21.9%), although these rates were not statistically significant (see **Figure 2a**). When we looked specifically at outcomes at Day-14 of hospital follow-up, we found that Black patients were more often still hospitalized and less often had been discharged or had died; these rates also were not statistically significant.

For the adjusted regression analyses, the only factor associated with increased likelihood of requiring supplemental oxygen at presentation was BMI ≥ 40 mg/kg^2 (aOR=1.37, CI 1.04, 1.82, see **Figure 3a**). Race was not associated with oxygen requirement on admission (aOR = 1.15, CI 0.88, 1.49). Only patient age ≥65 and initial supplemental oxygen requirement were associated with a significant shift in Day-14 patient outcome scores, with both increasing the probability of poor outcomes (see **Figure 3b**). Race was not independently associated with Day-14 outcome (aPO = 0.91, 95% CI 0.70-1.20).

Discussion

Our study represents the experience of an urban safety net hospital in New Orleans during a time when Louisiana was experiencing the fastest initial increase of COVID-19 cases in the world.[8] We examined all COVID-19 cases admitted to our hospital over the month of March – the three weeks following Louisiana's first case – and demonstrate a rapid uptick in hospitalizations among Black patients. As compared to other racial/ethnic group patients, Black patients presented closer to the time of the first diagnosed case, and as Figure 1 demonstrates, the upward trend in the number of daily cases in other racial/ethnic group patients did not begin until the end of the month. We found that ultimately Black patients accounted for 87% of COVID-19 hospitalizations at our institution during the month of March. Similar to findings from

recent publications, this was a significant overrepresentation of Black persons hospitalized at our center relative to the overall population.[11,13] Typically, our hospital's census is 55% Black patients.[14] Our region is represented by Orleans and Jefferson Parishes, of which Black residents comprise 60% and 28% of the population, respectively.[9]

We found a statistically significant difference in the duration of symptoms prior to hospital presentation between Black and other racial/ethnic groups, suggesting potential barriers in access to care for Black patients. Similarly, one recently published study from California and another from Louisiana show that the majority of Black patients have been tested for SARS-CoV-2 in the hospital (either in the emergency department or once hospitalized) versus in primary care or urgent care clinics, which is consistent with known literature demonstrating barriers for Black patients in accessing primary care.[12,13 15] While Louisiana is a Medicaid Expansion state, having insurance does not mean all Louisianans have unrestricted access to primary care or unbiased care providers.

In this study, Black and other racial/ethnic group patients hospitalized with COVID-19 had few differences in comorbidities or baseline clinical status at the time of presentation to the hospital. The only racial differences in comorbidities included higher rates of asthma in Black patients and a higher rate of dementia in other racial/ethnic group patients. There was no difference in initial respiratory rate, oxygen saturation level, fever, or proportion of those with abnormal radiographic findings on chest imaging. Markers of inflammation were not significantly more elevated in Black patients relative to other racial/ethnic group patients except for venous LDH. Controlling for covariates, there was no race difference in oxygen requirement at presentation, suggesting that Black patients were not sicker or further along in their disease course at the time of presentation. We included a cumulative logistic regression for Day-14 outcome, with an ordinal scale of death, requirement of mechanical ventilation, persistent hospitalization and discharge. In this adjusted analysis, there were no proportional odds differences between Black and other racial/ethnic group patients.

The relative similarities in comorbidities and other clinical characteristics across race may inform our finding that Black patients were not more likely to have poor outcomes, despite our overall state-level data showing that Black persons are experiencing grave inequities in COVID-19 mortality. Our study demonstrates that Black patients have a greater likelihood of being exposed to SARS-CoV-2 and/or requiring hospitalization but are not at increased risk of decompensating once hospitalized. This finding amplifies findings from other recent reports of racial inequities in COVID-19, i.e. disproportionate hospitalization rates but no increases in mortality once hospitalized. Increased likelihood of viral exposure and subsequent infection among Black persons observed in our study aligns with previous work from the H1N1 influenza pandemic; in one prior study, people of color were more likely to have difficulty avoiding public transportation, staying home from work, and accessing childcare separate from other children.[16]

The stark reality in present-day New Orleans, LA is that people of color are less able to implement social distancing measures due to the essential nature of their occupations on the front lines, for example, in service or healthcare industries.[17] Furthermore, challenges exist with respect to quarantining because of shared households and increased housing density.[18] In recent months, our team has observed many cases of COVID-19 in family members hospitalized simultaneously. These challenges can in part be attributed to residential segregation, a foundation of structural and institutional racism.[16] As a community loses its ability to secure housing, impact on future generations is felt with inequities in educational opportunities and future employment options. These inequities are at the forefront of the COVID-19 outbreak in Orleans and Jefferson Parishes, and highlight the need for further exploration of the health burden of residential segregation.[16]

Direct efforts to decrease exposure among Black persons in Louisiana may alleviate the inequities currently observed with COVID-19. Louisiana has implemented a COVID-19 Health Equity Task Force to better understand and interpret public health data, improve access to testing and quality care for all communities, and ensure that reopening of the state occurs in a

way that does not exacerbate health disparities.[19] Crucial to this effort will be integrating resource coordination and social support measures with contact tracing efforts. Members of marginalized communities face considerable barriers in their ability to safely and practically isolate or quarantine at home. Direct food or grocery assistance, income replacement, and childcare assistance can reasonably increase one's likelihood of successful isolation or quarantine periods. In other circumstances, individuals may require alternative temporary housing to avoid undue exposure to family members. Investments in such social supportive measures will serve to decrease community spread of virus and limit the undue impact of this outbreak on individuals and families at-risk for continued disparate burden of disease in this pandemic. In addition to public health initiatives to counter structural and institutional racism, multi-sector partnerships and a community-driven effort are also needed.[20]

This study has several limitations. First, this was a retrospective analysis subject to the shortcomings of chart review; however one advantage is collection of information with greater degree of detail (e.g. days since symptom onset) that is not available with electronic abstraction of structured data elements. Second, although this study reveals our hospital's unique experience as a large, urban, safety net hospital, this is a single-center study that does not represent the entire New Orleans or Louisiana experience of COVID-19 hospitalizations. Third, while we do have 14 days of follow up on all patients, we were only able to access data for readmissions within our hospital system, and so results may not truly reflect hospital outcomes if patients were readmitted outside of our healthcare network. Fourth, we used income by zip code as we did not have individual patient income, which would have been more accurate. Finally, the comparator group is not ideal in combining multiple races and ethnicities but was relatively small, a direct reflection of COVID-19 epidemiology in New Orleans in which Black patients were disproportionately affected.

Conclusions:

We present the data of hospitalized patients in March 2020 who tested positive for SARS-CoV-2 at a tertiary care academic medical center located in New Orleans and an analysis of clinical characteristics and outcomes by race. Our results indicate that, among patients hospitalized at the beginning of the COVID-19 outbreak in New Orleans, LA, there were minimal racial differences in rates of comorbidities or severity of disease at the time of presentation. Similarly, and unique to our analysis, Day-14 overall outcomes were not different for Black and other racial/ethnic group patients. However, Black patients were disproportionately represented in hospitalizations, a similar finding to data recently emerging from other Southern cohorts. Our findings suggest that Black patients have a greater likelihood of being infected with SARS-CoV-2, and we propose that mitigating inequities with respect to race should start with limiting viral exposure and transmission in this population.

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Table 1. Demographics and Comorbidities by Race for Patients Hospitalized with COVID-19

Variables	**All Patients** n=249 Number (%) or Mean (SD)	**Black Patients** n=217 Number (%) or Mean (SD)	**Other Racial/Ethnic Group Patients** n=32 Number (%) or Mean (SD)	**p-value**
Age ≥ 65	89 (36)	73 (34)	16 (50)	0.078
Male Sex	110 (44)	100 (46)	10 (31)	0.130
Insurance				0.2885
None	21 (8)	16 (8)	5 (16)	
Public Insurance	196 (79)	172 (79)	24 (75)	
Private Insurance	32 (13)	29 (13)	3 (9)	
Any Comorbidity	232 (93)	202 (93)	30 (94)	1.000
BMI ≥ 40	58 (23)	51 (24)	7 (22)	1.000
Ever Smoker	95 (38)	86 (40)	9 (28)	0.246
Asthma	49 (20)	48 (22)	1 (3)	**0.008**
Chronic pulmonary disease	32 (13)	31 (14)	1 (3)	0.092
Hypertension	198 (80)	174 (80)	24 (75)	0.487
Myocardial Infarction	27 (11)	25 (12)	2 (6)	0.546
Cardiovascular Disease	80 (32)	67 (31)	13 (41)	0.312
Dementia	21 (8)	13 (6)	8 (25)	**0.002**
Liver Disease	12 (5)	11 (5)	1 (3)	1.000
Diabetes Mellitus	130 (52)	118 (54)	12 (38)	0.089
Mean HbA1c (%)*	8.41 (2.56)	8.49 (2.59)	7.56 (2.15)	0.238

ESRD	24 (10)	21 (10)	3 (9)	1.000
Malignancy	30 (12)	25 (12)	5 (16)	0.559
HIV Infection	6 (2)	5 (2)	1 (3)	0.566
CCI*	2.37 (2.31)	2.38 (2.32)	2.31 (2.32)	0.939
Median Home Income (thousands of dollars)	38.83 (11.21)	38.10 (9.79)	43.78 (17.59)	**0.029**

[a]SD, standard deviation; [b] ESRD, end stage renal disease; [c]HbA1c, glycosylated hemoglobin; [d]HbA1c only analyzed in patients with diagnosis of diabetes

Table 2. Clinical Characteristics at Presentation by Race for Patients Hospitalized with COVID-19, March 2020

	All Patients n=249 Number (%) or Mean (SD)	**Black Patients** n=217 Number (%) or Mean (SD)	**Other Racial/Ethnic Group Patients** n=32 Number (%) or Mean (SD)	p-value
Time since start of pandemic (days)	13.77 (5.66)	13.41 (5.55)	16.19 (5.91)	**0.005**
Symptom Duration at Presentation	6.35 (8.21)	6.41 (7.81)	5.88 (10.69)	**0.050**
Abnormal Chest X-ray	222 (89)	193 (89)	29 (91)	1.000
Abnormal Chest CT	15 (6)	13 (6)	2 (6)	1.000
Initial O2 Required	137 (55)	122 (56)	15 (47)	0.346
D-Dimer (ng/mL)	1816.09 (5661.56)	1956.94 (6020.53)	806.6 (1065.28)	0.626
GFR (mL/min)	65.69 (29.87)	64.96 (29.98)	70.41 (29.16)	0.334
Ferritin (ng/mL)	778.51 (1345.84)	803.42 (1420.44)	616.57 (682.33)	0.520
LDH (U/L)	375.79 (231.8)	386.03 (241.29)	298.35 (117.38)	**0.030**
CRP (mg/dL)	12.52 (10.81)	12.46 (8.57)	13 (21.11)	0.089
WBC (*10^3/uL)	6.98 (3.35)	7.03 (3.31)	6.62 (3.59)	0.173
ALC (*10^3/uL)	1.15 (1.5)	1.17 (1.59)	0.98 (0.57)	0.453
ANC (*10^3/uL)	5.16 (2.88)	5.18 (2.8)	5.02 (3.43)	0.265
Fever at Presentation (T≥ 100.4 °F)	141 (56.6)	128 (59.0)	13 (40.6)	.0575
Respiratory Rate (breaths/min)	22.77 (6.01)	22.94 (6.13)	21.66 (5.08)	0.298
Oxygen Saturation on Room Air (%)	91.49 (8.93)	91.21 (9.12)	93.31 (7.48)	0.136

[a]SD, standard deviation; [b]CT = computed tomography, [c]GFR, glomerular filtration rate; [d]CRP, C-reactive protein; [e]WBC, white blood cell; [f]ALC, absolute lymphocyte count; [g]ANC, absolute neutrophil count

Figure Legends:

Figure 1: Admissions over time by Race

Figure 2a: Hospital outcomes by Race over the Follow-up period; **Figure 2b**: Day-14 Outcomes by Race

Figure 3a: Logistic Regression for Initial Oxygen Requirement; Figure 3b: Cumulative Logistic Regression for Ordinal Day-14 Outcomes

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Figure 1

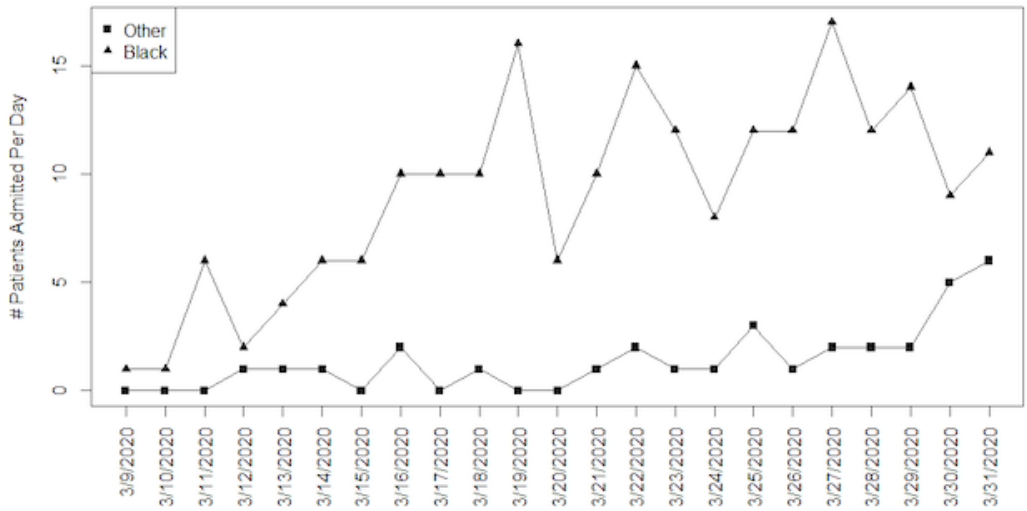
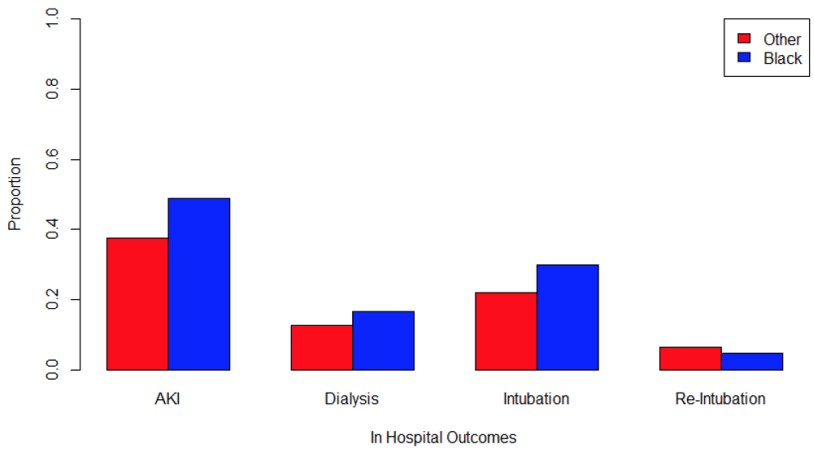


Figure 2ab



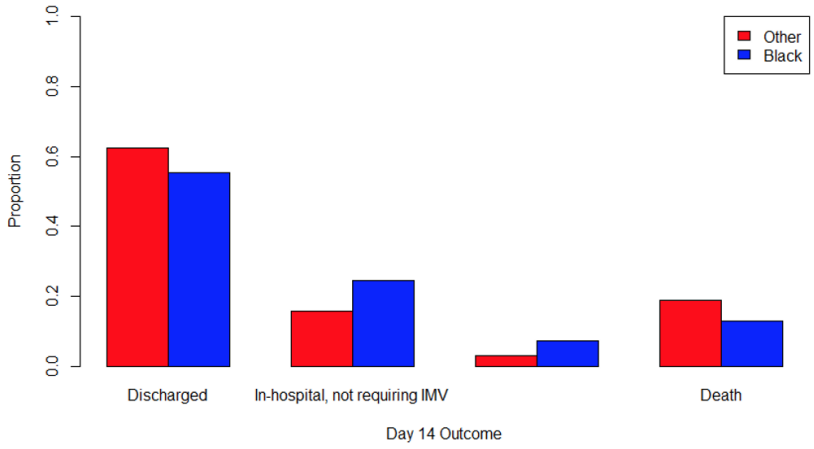


Figure 3ab