

Association Between 10-Year ASCVD Risk Score And COVID-19 Complications and Mortality: Analysis of Data From The National COVID Cohort Collaborative (N3C)

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Background

The SARS-CoV-2 outbreak is challenging to health care systems due to wide variation in health risk with most patients experiencing few or no symptoms while a minority of patients experience high complication rates and death. Patients with prior cardiovascular events have an increased risk of COVID-19 related mortality compared to those without. Less is known about healthy patients who have not yet developed an event but maybe at risk of developing the disease. The 10-year ASCVD risk score is an important clinical decision tool developed to enhance risk stratification and initiation of interventions to prevent ASCVD. This score may inform patient's future risk of developing COVID-19 complications

Methods

Study Design

This is a retrospective cohort analysis using the N3C database

Study Population:

- Adult patients with a positive COVID-19 reverse transcription polymerase chain reaction (PCR) test between Jan 2020 – Sept 2021
- Patients were eligible regardless of testing location (i.e. inpatient vs outpatient)
- Patients with history of ASCVD were excluded
- Patients missing 10-year ASCVD risk score data were excluded

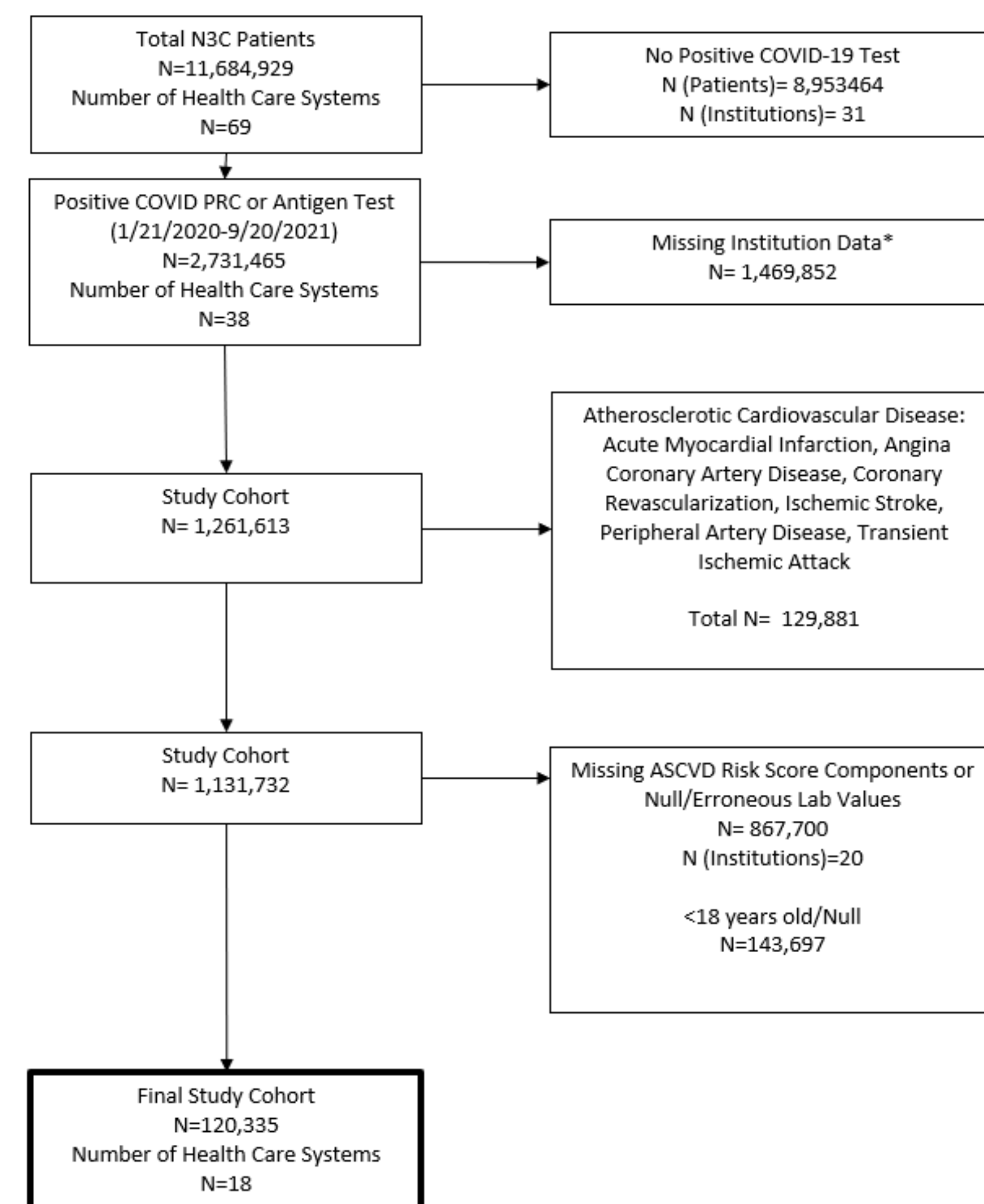
10-Year ASCVD score Definition

- Defined using the ACC calculator and included age, sex, race, SBP, DBP, total cholesterol, LDL-C, HDL-C, diabetes history, smoking, hypertension treatment, statin therapy, aspirin therapy
- Categorized into low (<7.5%), moderate (7.5%-20.0%), and high (>20.0%)

Outcomes:

- Death within 90 days of COVID Diagnosis
- Hospitalization within 14 days of COVID Diagnosis

Figure 1. Patient Flow



*Missing Institution Data indicates SBP, DBP, LDL, HDL, cholesterol, diabetes dx, hypertension dx, statins, hypertension meds, lack of smoking status values were not submitted to N3C

Table 1: Patient Characteristics by 10-year ASCVD Risk Score

	Low Risk (<7.5%) N=66,409 (55.2%)	Moderate Risk (7.5%-20.0%) N=29,848 (24.8%)	High Risk (>20.0%) N=24,078 (20.0%)	Overall N=120,335
Age (Mean±SD)	42.3±11.7	58.1±10.1	70.8±11.9	51.9±16.1
Sex				
Male	21,425 (32.3%)	15,147 (50.7%)	12306 (51.1%)	48,878 (40.6%)
Female	44,984 (67.7%)	14,701 (49.3%)	11,772 (48.9%)	71,457 (59.4%)
Race/Ethnicity				
White	39,154 (59.0%)	17,143 (57.4%)	12,984 (53.9%)	69,281 (57.6%)
African American	8217 (12.4%)	5,063 (17.0%)	5,158 (21.4%)	18,438 (15.3%)
Hispanic/ Latino	8,827 (13.3%)	4,145 (13.9%)	3,555 (14.8%)	16,527 (13.7%)
Other/ Unknown	10,2011 (15.4%)	3,497 (11.7%)	2,381 (9.9%)	16,089 (13.4%)
Time of COVID-19 Test				
2020	40,088 (60.4%)	18,115 (60.7%)	14,743 (61.2%)	72,946 (60.6%)
2021	26,321 (39.6%)	11,733 (39.3%)	9,335 (38.7%)	47,389 (39.4%)
Testing Location				
Outpatient	22,388 (33.7%)	9,897 (33.2%)	6,884 (28.6%)	39,175 (32.6%)
Inpatient	3,979 (6.0%)	3,173 (10.6%)	4,382 (18.20%)	11,515 (9.6%)
Other/ Unknown	40,042 (60.3%)	16,778 (56.2%)	12,812 (53.2%)	69,645 (57.9%)

Figure 3a. Association between Death and 10 Year- ASCVD Risk Score Components

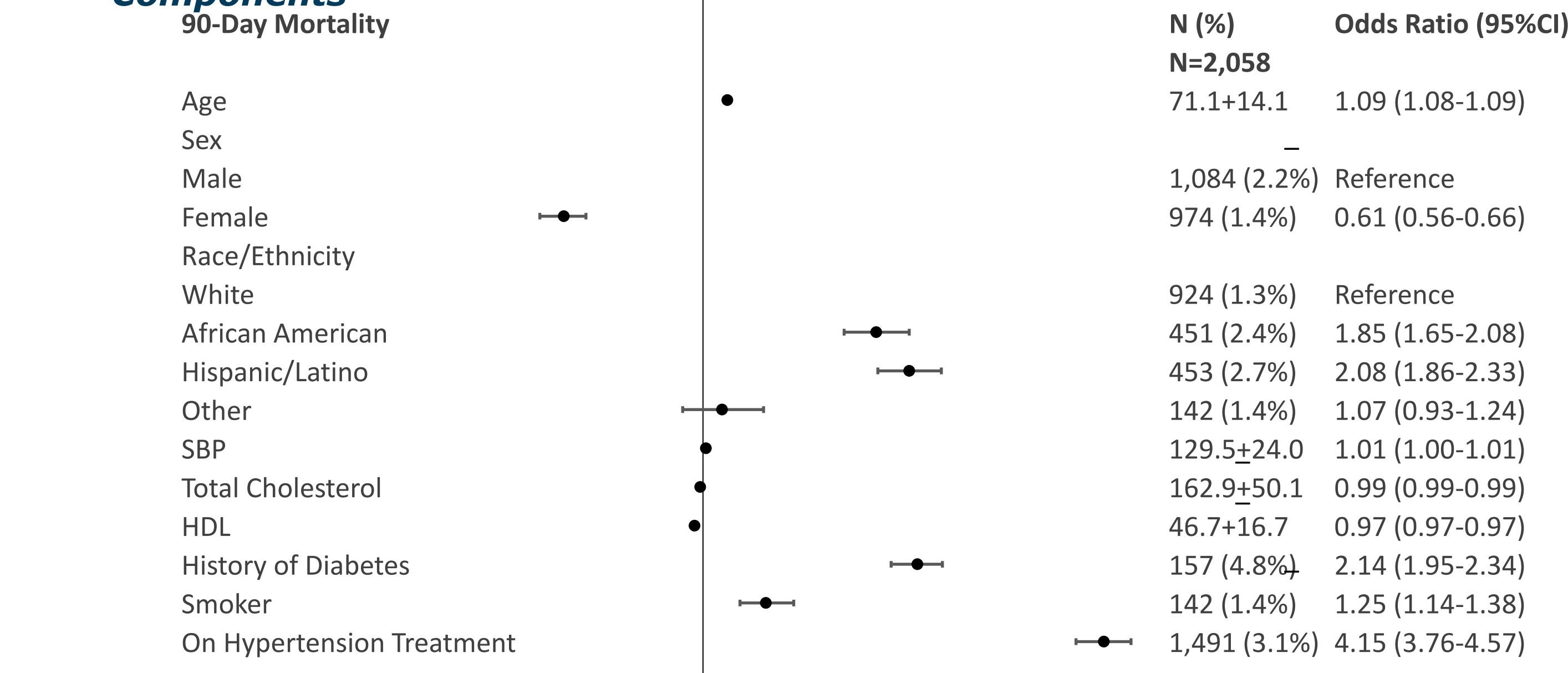
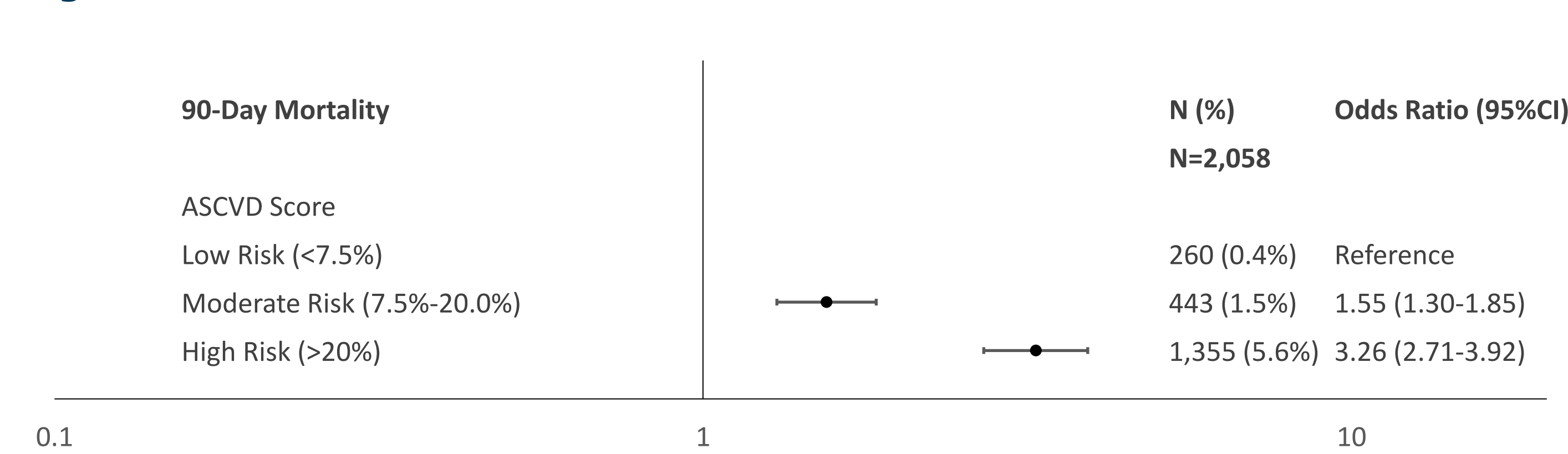


Figure 3b. Association between Death and 10- Year ASCVD Risk Score



Figures 3b and 4b adjusted for age, sex, race/ethnicity, obesity, 10-year ASCVD risk score, time of covid test

Table 2: Patients 10-Years ASCVD Risk Score Components Values

	Overall N=120,335
Systolic BP (mm/Hg) Mean±SD	127.3±17.4
Diastolic BP (mm/Hg) Mean±SD	76.9±10.9
Total Cholesterol (mg/dL) Mean±SD	183.1±44.9
LDL Cholesterol (mg/dL) Mean±SD	106.9±34.8
HDL Cholesterol (mg/dL) Mean±SD	53.1±16.6
10-year ASCVD Risk Score Mean±SD	10.21±10.01

Figure 2. 10-Year ASCVD Risk Score Components

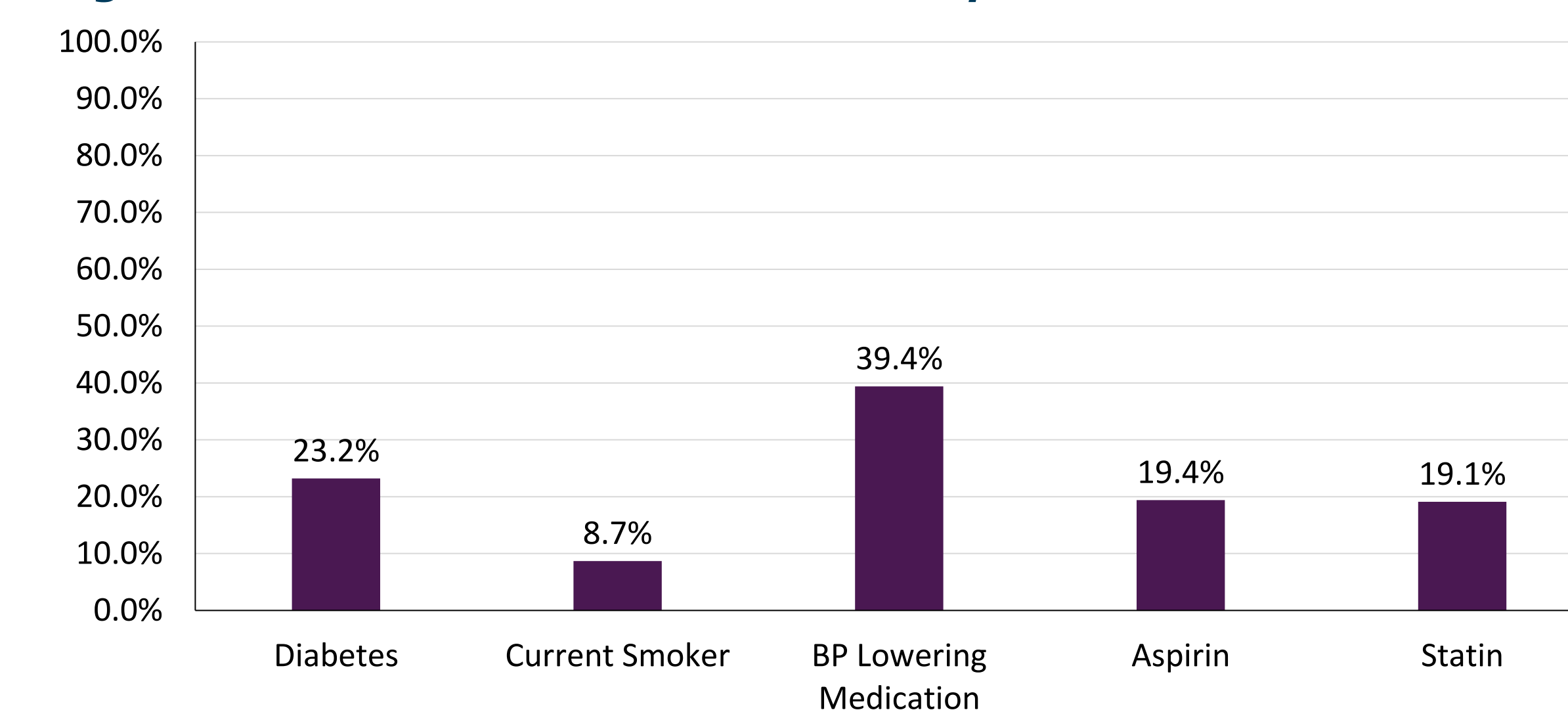


Figure 4a. Association between Hospitalization and 10 Year- ASCVD Risk Score Components

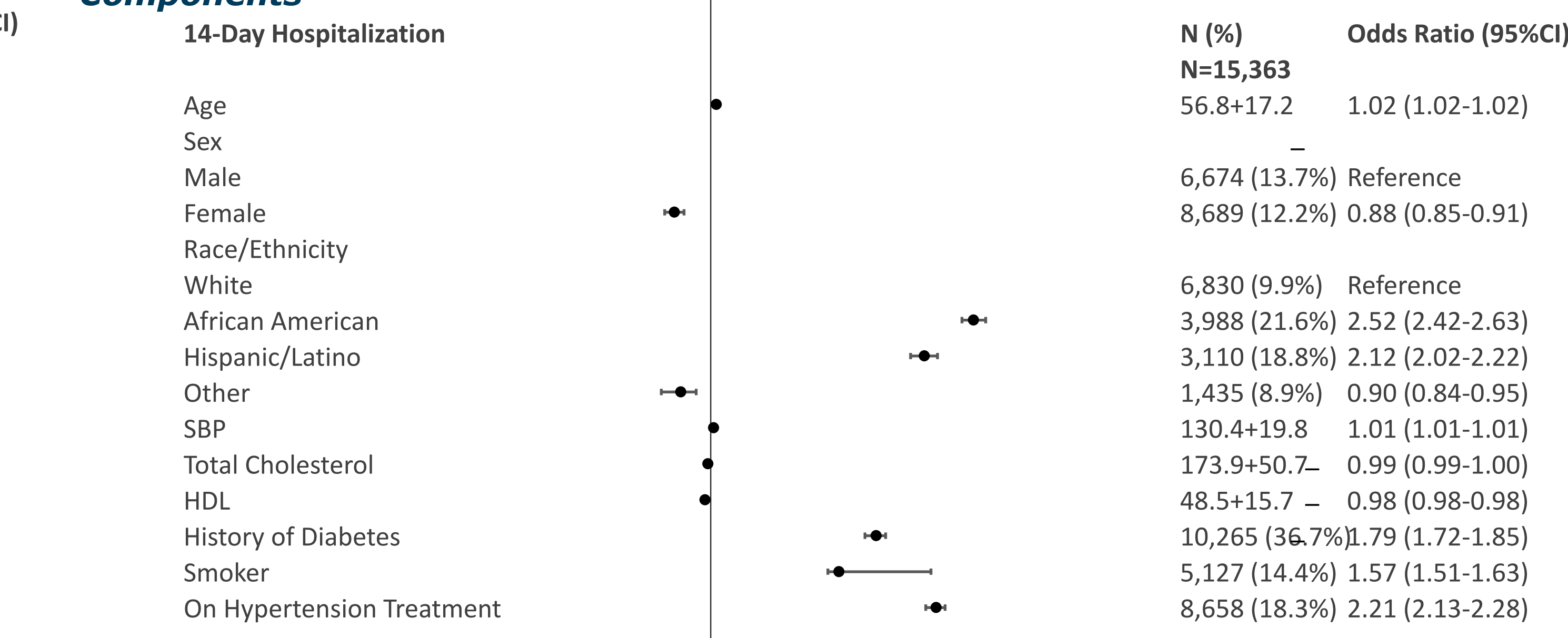
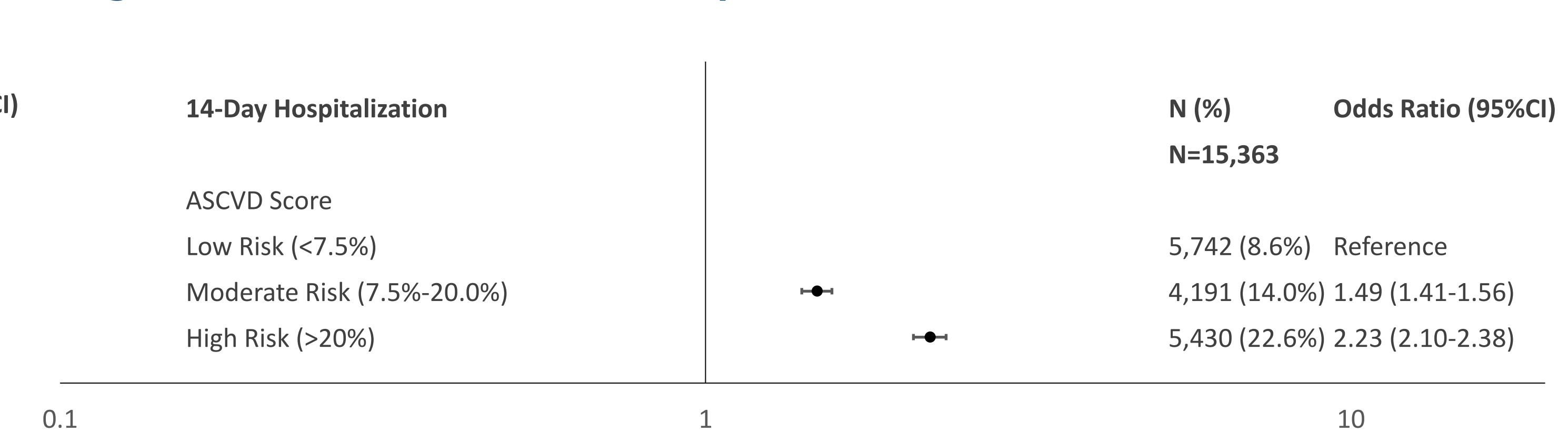


Figure 4b. Association between Hospitalization and 10- Year ASCVD Risk Score



Results

A total of 120,335 patients from 18 institutions were diagnosed with COVID and did not have a history of ASCVD. (Figure 1) The mean age was 51.9±16.1, 59.4% were females, 57.6% white, 15.3% black, and 13.7% Hispanic. Additional patient characteristics broken down by patients 10- Year ASCVD Risk Score category are presented in Table 1. Overall patients had a mean SBP of 127.3±17.4, DBP of 76.9±10.9, and 39.4% were on blood pressure lowering medications. Additional 10-Year ASCVD Risk Score components are presented in Table and Figure 2.

10 Year ASCVD Risk Scores

Most patients were low risk (55.2%) followed by moderate (24.8%) and high risk (20.0%). The average 10-year ASCVD risk score was 10.0±9.9 among patients alive at 90 days, 22.2±9.6 among patients dead at 90 days, 9.6±9.7 among patients not hospitalized within 14 days, 14.6±11.1 among patients hospitalized within 14 days, and 10.21±10.01 overall.

Death Within 90 Days of Diagnosis

In unadjusted analysis, patients who were older (OR 1.09, 95%CI 1.08-1.09), African American (OR 1.85, 95%CI 1.65-2.08), Hispanic/Latino (OR 2.08, 95%CI 1.86-2.33) compared to White, diabetic (OR 2.14, 95%CI 1.95-2.34), smoked (OR 1.25, 95%CI 1.14-1.38), or were taking bp medication (OR 4.15, 95%CI 3.76-4.57) were more likely to die within 90 days of COVID diagnosis. Patients who were female (OR 0.61, 95%CI 0.56-0.66) were less likely to die within 90 days of COVID diagnosis. (Figure 3a) In fully adjusted analysis, patients at moderate risk (OR 1.55, 95%CI 1.30-1.85) and high risk (OR 3.26, 95%CI 2.71-3.92) were more likely to die within 90 days of COVID diagnosis than patients at low risk. (Figure 3b)

Hospitalization within 14 Days of Diagnosis

In unadjusted analysis, patients who were older (OR 1.02, 95%CI 1.02-1.02), African American (OR 2.52, 95%CI 2.42-2.63), Hispanic/Latino (OR 2.12, 95%CI 2.02-2.22) compared to White, diabetic (OR 1.79, 95%CI 1.72-1.85), smoked (OR 1.57, 95%CI 1.51-1.63), or were taking bp medication (OR 2.21, 95%CI 2.13-2.28) were more likely to die within 90 days of COVID diagnosis. Patients who were female (OR 0.88, 95%CI 0.85-0.91) were less likely to die within 90 days of COVID diagnosis. (Figure 4a) In fully adjusted analysis, patients at moderate risk (OR 1.49, 95%CI 1.41-1.56) and high risk (OR 2.23, 95%CI 2.10-2.38) were more likely to die within 90 days of COVID diagnosis than patients at low risk. (Figure 4b)

Conclusion

Analysis from this large and diverse cohort indicates that patients free of ASCVD events but at risk of developing an event based on the 10-year ASCVD risk score are significantly more likely to die compared to patients at low risk of developing ASCVD. This is concerning especially given the high prevalence of patients at risk of ASCVD in the US and worldwide, many of which remain underdiagnosed adding further challenges during this epidemic.

Table and Figure Abbreviations:

ASCVD: Atherosclerotic Cardiovascular Disease
 BP: Blood Pressure
 HDL: High-density lipoprotein
 LDL: low-density lipoprotein
 SBP: Systolic Blood Pressure