Examining the Evolving Pandemic:
Treatment Patterns in Patients Hospitalized with COVID-19 by Race and Ethnicity

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Background & Objective

The COVID-19 pandemic continues to highlight existing health disparities; while several studies have characterized racial and ethnic subgroup differences in COVID-19 cases and outcomes such as hospitalization and death, COVID-19 disease severity and inpatient prescribing patterns by race and ethnicity have not been fully characterized.

Objective: To describe differences by race and ethnicity in treatment patterns among hospitalized COVID-19 patients in the US during the first 6 months of the pandemic.

Methods

Data ***(Figure 1)***

- Optum de-identified COVID-19 EHR data comprised of patients with test results for SARS-COV-2 or with COVID-19 related diagnosis codes.

Study Population ***(Figure 1)***

- Hospitalized COVID-19 patients (March - August 2020) with confirmed COVID-19 (ICD-10 code: U07.1 or positive/presumed positive diagnostic SARS-CoV-2 test) within 21 days of admission, excluding patients with missing age, sex, and patients without pre-admission observability.
- Patients with missing race were excluded from analyses modeling race, and patients with missing ethnicity were excluded from analyses modeling ethnicity.

Modeling COVID-19 drugs received by Race and Ethnicity

- We used logistic regression to examine the adjusted relative odds of incident receipt (defined using a 90 day washout) of each drug or drug class of interest (**DEX, HCQ,** and **Non-DEX CSIs**) on the first day of COVID-19 related hospitalization by race (Asian, Black/AA, White), and by ethnicity (Hispanic/Latino, Not Hispanic/Latino).
- Models were adjusted for age, sex, frailty index, Charlson-Quan comorbidity score, insurance, geographic region, skilled nursing facility status, overweight/obese status, smoking history, admission month, and COVID-19 severity (defined as ***IMV*** [procedures indicating IMV or clinical need for IMV], or ***O2/NIV*** [procedures indicating O2/NIV or clinical need for O2/NIV])[1-2]

Data were analyzed using the Aetion Evidence Platform® (2021) and R (v4.0.3).

Results

COVID-19 Severity at Admission ***(Figure 2)***

- **IMV** was more common among Asian patients, relative to White (10.5% vs. 6.6%, ASD = 0.140), but similar between Black/AA vs. White and Not Hispanic/Latino vs. Hispanic/Latino.
- **O2/NIV** was similar between Asian, Black/AA, and White patients; O2/NIV was similar between Hispanic/Latino and Not Hispanic/Latino patients.

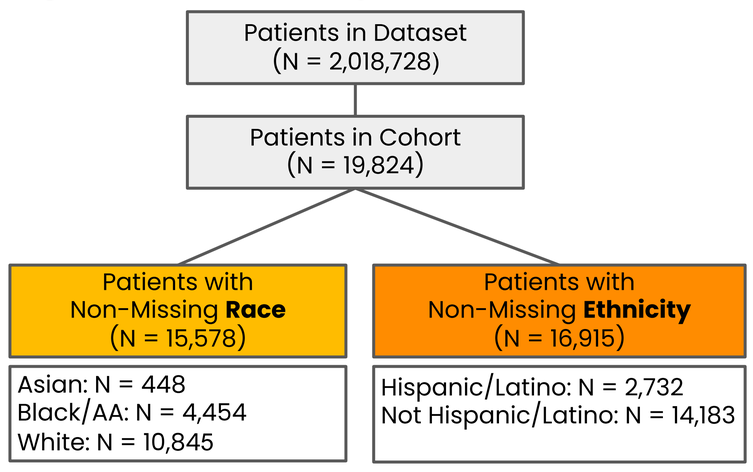
COVID-19 Treatments Received

- Overall, 18.1% (N = 3,482) of patients received **HCQ,** 11.3% (N = 2,181) received a **Non-DEX CSI,** and 9.0% (N = 1,731) received **DEX**.
- The unadjusted prevalence of **HCQ** and **Non-DEX CSIs** was higher among both Asian (26.8% and 9.6%) and Black/AA patients(24.7% and 18.1%), relative to White patients (15.5% and 8.7% respectively). The unadjusted prevalence of **DEX** was lower among Asian and Black/AA patients, relative to White patients (6.9% and 6.6% vs. 10.4%, respectively).
- The unadjusted prevalence **of DEX, HCQ**, and **Non-DEX CSIs** was lower among Hispanic/Latino patients, relative to Not Hispanic/Latino patients (DEX: 7.9% vs. 9.5%, HCQ: 10.8% vs. 19.4%, Non-DEX CSIs: 10.2% vs. 12.1%).

Adjusted Relative Odds of Receiving COVID-19 Treatments ***(Figure 3)***

- **DEX**: Black/AA patients had lower odds of receipt vs. White patients (adj. OR, 95% CI: 0.83, 0.71-0.96). The odds of receiving **DEX** were lower among Hispanic/Latino patients, vs. Not Hispanic/Latino patients (adj. OR, 95% CI: 0.69, 0.58-0.82).
- **HCQ:** The odds of receiving **HCQ** were higher among both Asian patients (adj. OR, 95% CI: 1.57, 1.19-2.05) and Black/AA patients (adj. OR, 95% CI: 1.55 ,1.39-1.73]), compared to White patients. The odds of receiving **HCQ** were lower among Hispanic/Latino patients, vs. Not Hispanic/Latino patients (adj. OR, 95% CI: 0.63, 0.53-0.73).
- **Non-DEX CSIs:** Black/AA patients had higher odds of receiving **Non-DEX CSIs** vs. White (adj. OR, 95% CI: 2.13, 1.09-2.39). Adjusted odds were similar between ethnic subgroups.

Figure 1. CONSORT Diagram



Abbreviations
Black/AA: Black or African American
COVID-19: Novel coronavirus disease 2019
CSI: Corticosteroids of Interest
DEX: Dexamethasone
HCQ: Hydroxychloroquine
IMV: Invasive Mechanical Ventilation
O2: Supplemental Oxygen
NIV: Non-invasive Mechanical Ventilation
Non-DEX CSI: CSI other than DEX

Figure 2. Monthly Trends of COVID-19 Severity by Race (top) and Ethnicity (Bottom)

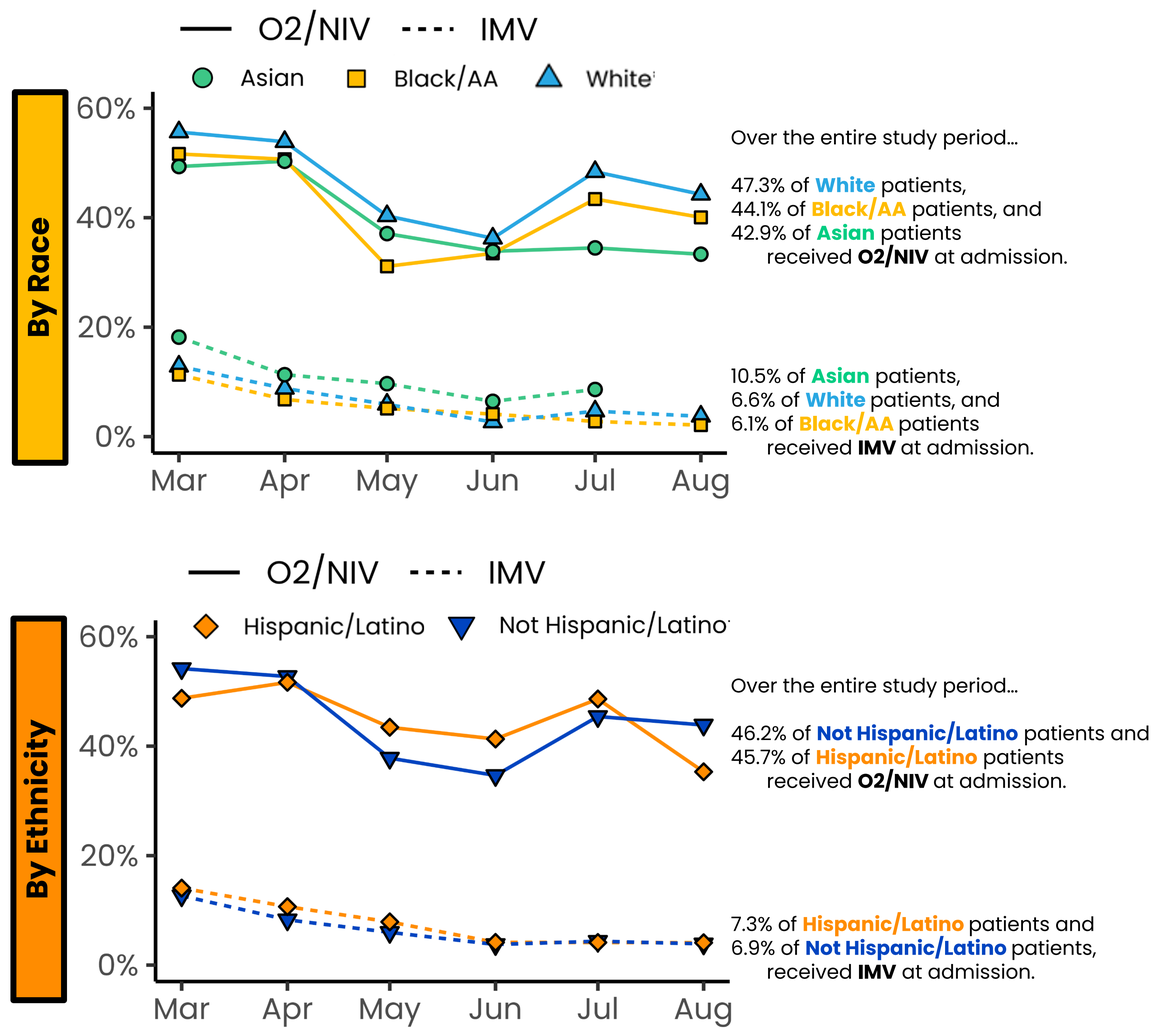
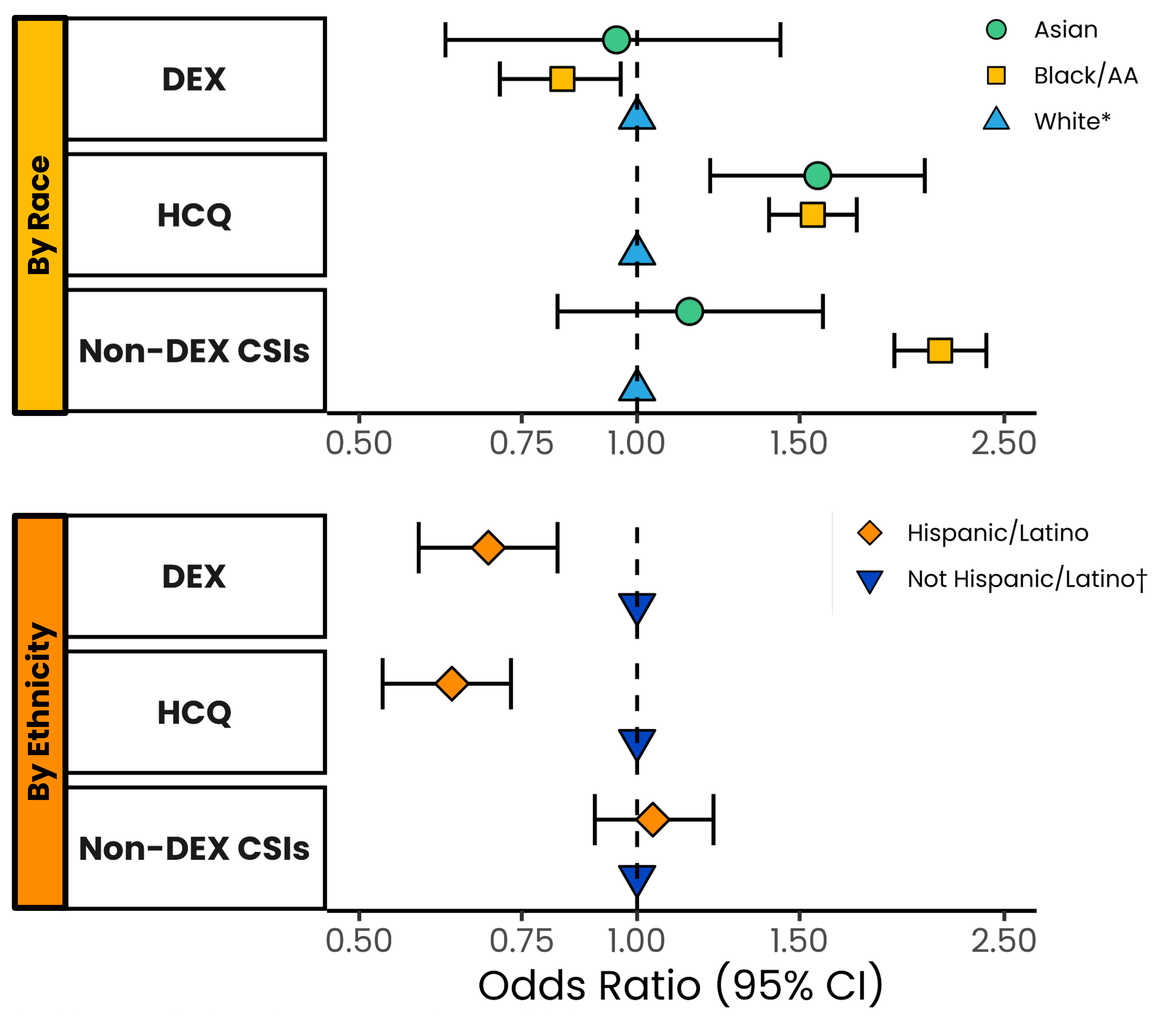


Figure 3. Adjusted Odds of Receiving COVID-19 Drugs by Race (Top) and Ethnicity (Bottom)



* White race is the referent group for models by race.
† Not Hispanic/Latino ethnicity is the referent group for models by ethnicity.

Conclusions

Our study suggests there may have been racial and ethnic differences in inpatient COVID-19 treatment patterns among patients in the Optum data source. Possible explanatory factors, such as baseline risk factors and COVID-19 severity at admission were adjusted for in our models, and therefore do not explain our results. Some early COVID-19 treatments proved to be less effective or safe than others, and differential use of these treatments in racial or ethnic groups with higher risk factors for severe disease may have contributed to more morbidity or mortality in these groups. However, further research is needed to understand the driving factors for differential treatment patterns by race and ethnicity and how differences in treatment patterns between these groups may have affected outcomes during the COVID-19 pandemic.

Disclosure

This work was conducted as a part of a Research Collaboration Agreement (RCA) with the U.S. Food and Drug Administration (FDA) to use Real-world Data to advance the understanding and the natural history of coronavirus disease (COVID-19) in specific patient populations, as well as treatment and diagnostic patterns during the COVID-19 pandemic. This work reflects the views of the authors and should not be construed to represent FDA's views or policies. SEV, IJE, NMG, ARW, and EMG are employees of Aetion, Inc., with stock options or existing equity.

1. Garry EM, Weckstein AR, Quinto K, Lasky T, Chakravarty A, Leonard S, Vititoe S, Rassen JA, Gatto NM. Use of an EHR to inform a claims-based algorithm to categorize inpatient COVID-19 severity. 37th International Conference for Pharmacoepidemiology - All Access, Virtual. Podium, Aug 2021.
2. Garry EM, Weckstein AR, Quinto K, Bradley MC, Lasky T, Leonard S, Vititoe S, Gatto NM. Categorization of COVID-19 severity to determine mortality risk. 37th International Conference for Pharmacoepidemiology - All Access, Virtual. Podium, Aug 2021.