GOOD SYSTEMS
A UT Grand Challenge

Equitable Algorithmic Resource Allocation: Examining and Mitigating Racial/Ethnic Disparities in Crisis Standards of Care during COVID-19

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Introduction

COVID-19 pandemic has exacerbated racial and ethnic disparities across various domains that have been a long-term social problem in the United States for decades. Of the various fields, healthcare is a realm where countless research studies have investigated the racial and ethnic disparities and people from racial and ethnic minority groups – such as Black or Hispanic populations – are disproportionately affected by the COVID-19 pandemic. For example, Black or Hispanic people tend to reside in crowded conditions and work jobs that are difficult to perform remotely, which results in higher probability of being exposed to COVID-19 infections. Interestingly, the healthcare has been rapidly adopting artificial intelligence (AI) technology to mitigate inequalities in providing medical treatments and managing critical care resources. However, AI has been revealed that it can present biases, which may even worsen the racial and ethnic disparities.

Research Goal

The objective is to investigate whether racial and ethnic disparities exist in Crisis Standards of Care (CSC) that is a guideline achieving the joint goals of extending the availability of key resources and minimizing the impact of shortages on clinical care when crisis conditions occur.

Methods

Sample Data of Patients under the following conditions:

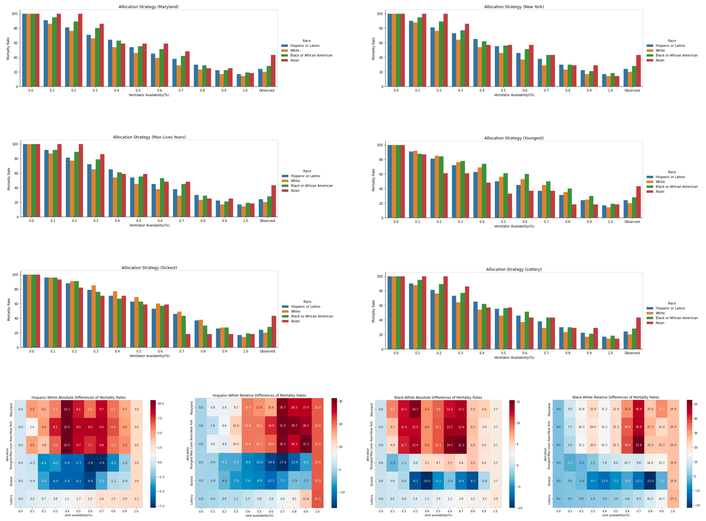
- Who tests positive for COVID-19
- Who is admitted to intensive care unit (ICU)
- Who has lab/vital data for calculating Sequential Organ Failure Assessment (SOFA) score
- Who has Social Vulnerability Index (SVI) score

Data source: Ascension Seton network of hospitals in the Austin Round-Rock Metro area

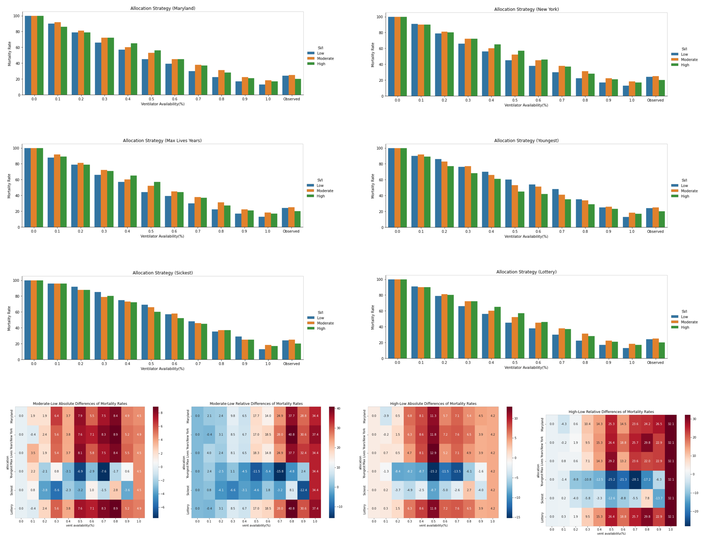
- Allocating mechanical ventilators to patients in the sample based on the following CSCs across ventilator availability levels: Maryland, New York, Max live years, Youngest first, Sickest first, Lottery
- Calculating mortality rates for each race and SVI category based on assumptions

- Comparing mortality rates by race and SVI category across ventilator availability levels through CSCs.
- Calculating absolute and relative differences in mortality rates between vulnerable groups and a reference group

Figures and Results



Generally, mortality rates for Black or Hispanic populations were likely to be higher than White counterparts. However, allocation rules that showed lower average mortality rates presented larger differences in mortality rates between Black or Hispanic populations and White counterparts.



Mortality rates for patients whose SVI scores are high or moderate were likely to be higher than those with low SVI scores. Differences in mortality rates by SVI scores were similar with the differences by race because most people from the racial and ethnic minority groups belong to high and moderate SVI score groups.

Conclusion

People from groups that have been historically marginalized or made vulnerable were exposed to higher mortality rates depending on ventilator allocation strategies during a pandemic, such as COVID-19, that affected the supply of critical care resources. Effective and fair allocation strategy during a pandemic should focus on individuals placed at increased risk of being vulnerable to crisis conditions. In addition, the application of AI to critical care resource allocation strategy would be helpful to reduce human errors and biases in a situation where clinicians have to make a decision promptly with higher complex factors.

Future Research

- Design a framework that incorporates individuals and communities in creating scarce-resource allocation rules to increase the perceptions of fairness and trust for making neutral and fair decisions.
- Build critical care resource allocation rules for crisis conditions by employing machine learning methods based on responsible AI principles.

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