Stroke and COVID Population: A Health Equity Analysis

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Introduction

The widely-sweeping COVID-19 pandemic has exposed systemic inadequacies that result in racial minorities bearing an unfair share of the burden[1]. Numerous publications reference the social inequities in COVID diagnoses on their own[2,3], or inspect clinical/medical outcomes and determinants of concurrent ischemic stroke and COVID[4].

Our work to examine demographic differences in those with concurrent COVID-19 and stroke through N3C represents an exploratory analysis into one of the largest repositories of national COVID-19 data and sheds light into the demographic and structural factors that impact clinical outcomes and disparities that must be addressed in healthcare. We aim to see if there are any racial discrepancies in medical resource allocation among COVID-19 positive and stroke patients.

Methodology

Our dataset consisted of multiple rounds of cleaning divided into two main stages:

Input Tables

Primary Filter

- Filtered to concurrent COVID-positivity and ischemic stroke
- **Operational definition:** All persons with a COVID diagnosis and inpatient admission for ischemic stroke 1 week before or 6 weeks after visit start date

Main Cohort

Secondary Filter

- Further filtered to only those individuals with insurance information, and an insurance variable was created utilizing established procedures[5]
- The sub-cohort was then rejoined back to main cohort

Payer Plan Sub-Cohort

Planned Analyses were Conducted:

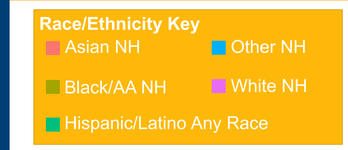
- Data on patient's race/ethnicity, comorbidities, treatments administered (Remdesivir and ECMO) and insurance information was analyzed using various exploratory data methods and visualizations.
- Multivariable logistic regression was utilized to model the relationship between variables (dependent/independent) in the cohorts. Model complexity was analyzed using the F test of significance.

Research Question

Is there equity of patient care in people with concurrent ischemic stroke and COVID positivity?

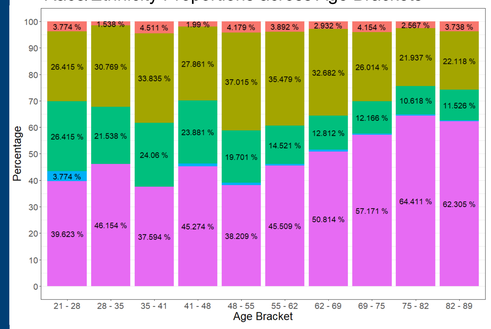
We found the N3C data to be useful in studying a distinct group of patients, and exploring COVID-19 and ischemic stroke treatment across patients' race/ethnicity identities and insurance status. Our exploratory analysis provides a foundation for further insight into demographic trends and discrepancies in apportionment of treatment.

Results

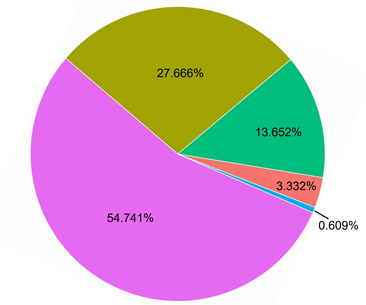


Demographic Distributions

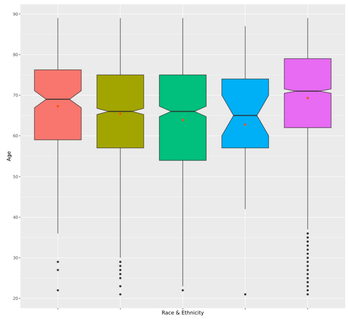
Race/Ethnicity Proportions across Age Brackets



Race/Ethnicity Proportions in Main Cohort

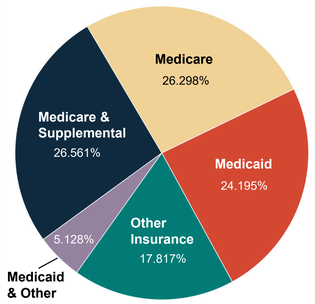


Age Distribution by Race/Ethnicity

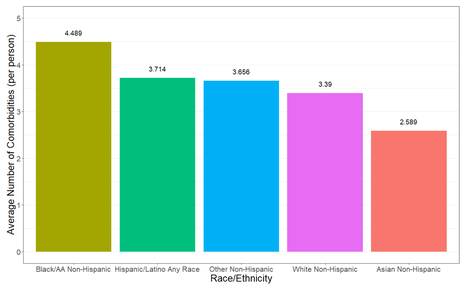


Comorbidities & Deaths

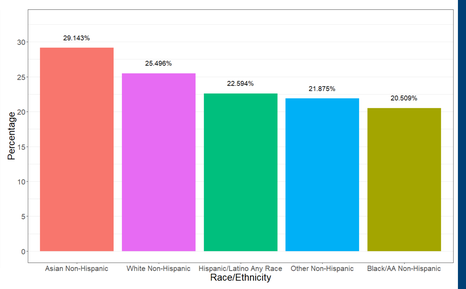
Insurance Type Proportions in Payer Plan Sub-Cohort



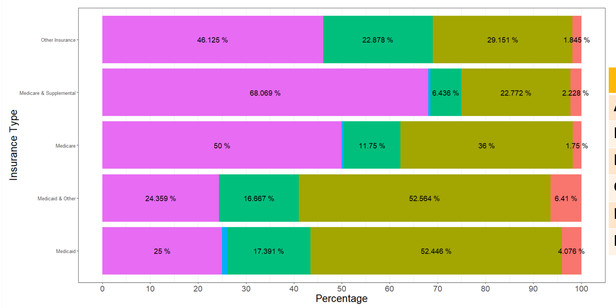
Average Comorbidities (per individual) across Race/Ethnicity



Mortality Proportion across Race/Ethnicity



Race/Ethnicity Proportions by Insurance Type



Regression Model

ECMO Outcome Model

Coefficients	Estimate	Std. Error	Z-Value	p-value	OR
Asian Non-Hispanic	1.6402	0.8805	1.863	0.06250	5.156
Black/AA Non-Hispanic	-0.5692	0.6218	-0.951	0.35999	0.566
Hispanic/Latino Any Race	-0.1548	0.6180	-0.250	0.80228	0.857
Other Non-Hispanic	-16.3493	11258.0034	-0.001	0.99884	7.936039e-08
Medicaid	-2.0340	0.6595	-3.084	0.00204	0.131
Medicare	-18.7708	1444.7406	-0.013	0.98963	7.046189e-09

**** White Non-Hispanic set as reference group for race/ethnicity***
*****Other Insurance set as reference for insurance type***

Conclusions & Discussions

Conclusions:

- The Remdesivir regression had no significant results and was not included; the ECMO model was adjusted for race/ethnicity and insurance type
- Black/AA have the highest comorbidities, and a younger distribution
- Asian Non-Hispanics have the highest mortality rates and ECMO treatment, the lowest average comorbidities and an older age distribution compared to other minorities
- Medicaid patients had lower odds of obtaining ECMO ($p < .01$), there was no significant difference in Remdesivir treatment
- Black/AA Non-Hispanic make up the largest proportion of Medicaid and Medicaid & Other insurance groups, while White Non-Hispanic make up the largest proportion of Medicare, Medicare & Supplemental, and private insurance (Other Insurance)

Limitations:

- The dependent variables do not consist of all possible or probable treatments for COVID or stroke; ECMO, for example, is only given when the patient is in critical condition which doesn't apply to all patients. Without a measure of stroke or COVID severity we were unable to adjust for this.
- Data was not consistent across difference data partners and sources, some variables (such as insurance) were systematically missing from some health institutions and/or locations

Future Work:

- Use a larger and more nationally-representative dataset
- Expand to hemorrhagic stroke
- Consider more covariates within regression models (e.g. severity of COVID-19 and the severity of stroke)
- Health equity analysis across other demographic groups (e.g. patient sex)
- Consider other treatments as outcomes (e.g. Dexamethasone or immune-based therapies, convalescent plasma)
- Examine COVID-19 vaccination distribution and equity in accessibility to vaccines

Acknowledgements

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