RWD26

Variation in Demographic Characteristics, Socioeconomic Status, Clinical Presentation and Selected Treatments in Mortality Among Patients with a Diagnosis of COVID-19 in the United States

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Background

- As of November 2022, 1,070,947 Coronavirus disease 2019 (COVID-19)-related deaths were reported in the United States (US)[1]
- Older age, male sex, smoking, chronic obstructive pulmonary disease (COPD), cardiovascular disease, diabetes, obesity, hypertension and kidney disease are associated with a higher risk of mortality among patients with COVID-19 infection[2]
- The US case-mortality rate for COVID-19 was reported to be 1.1% as of March 2023[3]
- Research on the impact of neighborhood socioeconomic disadvantage on mortality in COVID-19 patients is lacking

Objective

- This study described the variation in patient demographic and clinical characteristics and utilization of COVID-specific treatments by neighborhood socioeconomic disadvantage among patients confirmed dead after a medical claim with COVID-19 diagnosis

Study Design

- This retrospective cohort study utilized linked data from IQVIA's Professional fee claims (Dx), Longitudinal prescription claims (LRx) and mortality data from Veritas Data Research to identify and characterize patients with a COVID-19 diagnosis between April 1, 2020 and April 30, 2022
- Baseline demographic characteristics were assessed on the index date (first COVID-19 diagnosis = index date)
- A modified version of the Area Deprivation Index (ADI) was used to assess neighborhood socioeconomic disadvantage from HIPAA compliant databases
  - The original ADI measure was created by the Health Resources & Services Administration (HRSA), and subsequently refined, adapted, and validated to the Census Block Group neighborhood level at the University of Wisconsin-Madison. It includes factors for the theoretical domains of income, education, employment, and housing quality from the American Community Survey (ACS) Five Year Estimates in its construction[4]
  - The ADI measure is applied at the 9-digit zip code (ZIP9) level. For this HIPAA-compliant database, a modified ADI score was computed as the median of the ADI scores for all the ZIP9 codes within each ZIP3 area. The individual ZIP3 scores was classified into pentiles based on the distribution of the median scores. The final ADI score pentile cutoffs for the pentiles were at ADI scores of 26, 46, 65, 82. Sensitivity analysis was performed to ensure the validity of this method
- Presence of chain-of-event conditions (COE) (+/- 7 days of the last COVID diagnosis date) and significant contributing conditions (SCC) (over the study period) were assessed[5]

Patient Selection

Table 1. Stepwise patient selection and attrition table

Criteria	N	%
Patient with at least 1 medical claim in Dx during the index period: 4/1/2020-4/30/2022 (estimate of whole population in the database)	277,286,899	100.0%
Patients with >=1 medical claim with a COVID-19 diagnosis in the IQVIA Longitudinal Medical Claims Database (Dx) during the index period	22,862,723	8.2%
Patients with at least 1 medical claim in Dx >180 days prior to the index date (final study population)	17,682,111	6.4%
Patients with a mortality flag in the Veritas Data Research database	563,744	0.2%

Results

Table 2: Age Distribution of Confirmed Deaths

Age Group: (n, %)	N	%
Total Mortality Population	**563,744**	**100.00%**
0 - 17 y	2,023	0.36%
18-34 y	8,606	1.53%
35-44 y	11,517	2.04%
45-54 y	25,572	4.54%
55-64 y	63,136	11.20%
65 -75 y	133,157	23.62%
> 75 y	319,730	56.72%

3 were unknown age

Table 3: ADI Distribution of Confirmed Deaths

ADI Level	N	%
0-20 Most Affluent	58,144	10.3%
21-40	91,629	16.3%
41-60	166,950	29.6%
61-80	189,131	33.5%
81-200 Least Affluent	57,887	10.3%

3 were unknown ADI

Figure 4: Charlson Comorbidity Index (CCI) Score Distribution among Confirmed Deaths

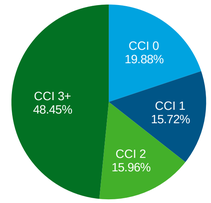

Figure 5: Co-Morbidities Highly Correlated with Death in COVID-19

	Significant contributing conditions	Prevalence	Mortality Rate
Cardiovascular	Essential (primary) hypertension	75.67%	6.61%
	Atherosclerotic heart disease	34.02%	10.95%
	Atrial fibrillation and flutter	31.77%	15.50%
	Congestive heart failure	37.82%	15.79%
	Hypertensive heart disease without CHF	5.00%	7.43%
	Hyperlipidemia, unspecified	39.88%	5.66%
CNS, Cerebrovascular	Alzheimer disease, unspecified	11.20%	23.40%
	Unspecified dementia	23.70%	21.62%
	Stroke, not specified as hemorrhage or infarction (I64)	11.56%	13.37%
Renal	Other specified disorders of kidney and ureter	13.62%	8.74%
	Chronic kidney disease, unspecified	23.64%	15.30%
Metabolic	Unspecified diabetes mellitus without complications	0.69%	7.14%
	Type 2 diabetes mellitus without complications	44.61%	7.46%
	Obesity, unspecified	16.97%	2.75%
Pulmonary	Chronic obstructive pulmonary disease, unspecified	28.08%	12.19%
	Tobacco use	7.27%	3.23%

Figure 1: Mortality Rate Total COVID-19 Study Population Q2-2020 to Q1-2022

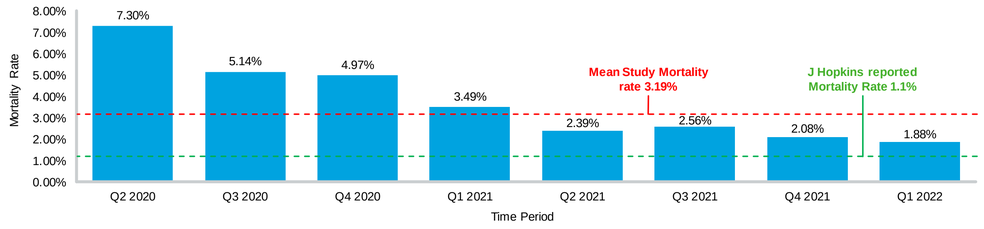

Figure 3: Mortality Rate by Age Group

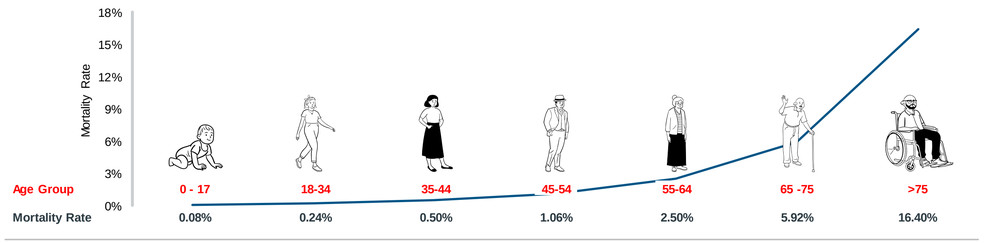

Figure 4. Mortality Rate by ADI Measure

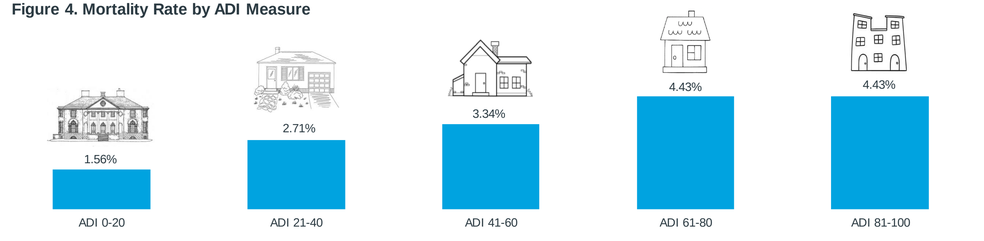

Table 5: Death Rate Among Treated Patients

Patients with >=1 claim for Therapy in study period	N Treated	% Treated	Death rate among treated
Bamlanivimab (+/- etesevimab)	121,230	0.69%	2.20%
Casirivimab/imdevimab	261,886	1.48%	1.41%
Convalescent plasma	70,216	0.40%	16.40%
Remdesivir	382,672	2.16%	12.63%
Ivermectin*	189,583	1.07%	2.54%
Hydroxychloroquine*	225,991	1.28%	2.45%

*Unapproved for use in COVID-19

Conclusions

- **This study evaluated demographic, clinical and socioeconomic characteristics of approximately 50% of the COVID-19 deaths in the U.S.**
- **The case-mortality rate in a claims database of patients with a medical claim for COVID-19 was found to be 3.19%, almost 3 times as high as the overall national mortality rate reported by the Johns Hopkins Coronavirus Resource Center.**
- **The higher mortality rates in men, the elderly, and in patients with several co-morbidities were similar to that reported by the CDC.**
- **Patients with the lowest socioeconomic status had approximately 3 times the mortality rate compared to those in the highest socio-economic group.**

Results

- A total of 563,744 confirmed deaths were identified among patients with a COVID-19 diagnosis in the database. (Table 1)
- More than half the confirmed deaths were among patients aged >75 years, with over 80% deaths among those aged 65 years or more. (Table 2)
- Over 40% of the deaths were observed among patients who were more disadvantaged (ADI score ≥61). The distribution of confirmed deaths by ADI is shown in Table 3.
- The case mortality rate decreased from 7.3% in 2nd Q 2020 to 1.88% in 1st Q 2022 in patients with a medical claim for COVID-19. The overall case mortality rate in this study was 3.19% compared to that reported by J Hopkins for all estimated cases in the US. (Figure 1)
- The overall mortality rate was higher among men (3.67%) than women (2.85%).
- The mortality rate was higher among older patients, increasing from 0.08% in patients aged 0-17 to 16.40% in those aged >75 years. (Figure 2)
- The mortality rate was lower among patients with higher neighborhood socioeconomic status, ranging from 1.56% among those with the least disadvantage (ADI 0-20) to 4.43% among those with the most disadvantage (ADI of 61-100). (Figure 3)
- While almost half of the patients with confirmed death had a Charlson comorbidity index score of >=3, approximately 20% with confirmed death had a score of zero. (Figure 4)
- The confirmed mortality rate for patients utilizing COVID-19 therapies are shown in Table 5. The mortality rate among those using approved therapies ranged from 1.41% (casirivimab/imdevimab) to 2.16% (remdesivir). Unapproved therapies were utilized almost as frequently as approved therapies, and the confirmed mortality rate for those patients ranged from 1.07% (ivermectin) to 1.28% (hydroxychloroquine).
- The prevalence of significant contributing conditions and the mortality rate in the study population of confirmed death cases are shown in (Figure 5).

Limitations

- The Dx and LRx open-source claims databases are subject to missing data hypothetically greater than closed claims; therefore, some diagnoses and medication use may be under reported.
- The linkage between the Veritas Data Research mortality database and the claims data was not complete; therefore, some patients that died during the study period may not have been identified.
- The socioeconomic status assigned to each patient was the median ADI for the patient's 3-digit zip code, therefore, the SES may be under or overestimated at the patient level.

References

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2. Dessie, Z.G., Zewotir, T. Mortality-related risk factors of COVID-19: a systematic review and meta-analysis of 42 studies and 423,117 patients. *BMC Infect Dis* **21**, 855 (2021)
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