COVID-19 Mortality Disparities in U.S. High-Risk Populations: Implications for Vaccine Prioritization

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Introduction

COVID-19 mortality varies substantially across U.S. demographic groups during the first three years of the pandemic.[1] Early Centers for Disease Control and Prevention (CDC) and Advisory Committee on Immunization Practices (ACIP) vaccine allocation prioritized older adults, racial/ethnic minorities, and other high-risk populations disproportionately affected by COVID-19.[1,2] This study evaluated whether observed mortality patterns supported those prioritization strategies.

Objectives

To quantify demographic disparities in COVID-19 mortality using national Centers for Medicare and Medicaid Services (CMS) data and determine whether the highest observed mortality groups, particularly adults ≥85 years and American Indian or Alaska Native (AI/AN) populations, corresponded to populations prioritized in early CDC/ACIP vaccine allocation guidance, including adults ≥75 years.

Methods

This retrospective study analyzed CMS COVID-19 Public Use Files from January 2020 to June 2023, including reported COVID-19 deaths among Medicare beneficiaries nationwide. Mortality was classified by race/ethnicity, sex, age group, and rural versus urban based on CMS geographic designations. Annual means and standard deviations were calculated from monthly mortality proportions within each demographic group. Differences across years were assessed using one-way ANOVA, followed by pairwise comparisons using Welch's t-tests with correction for multiple testing. Statistical significance was defined as p≤0.05.

Discussion/Conclusions

Marked disparities in COVID-19 mortality were observed, with the highest burden among adults ≥85 years and AI/AN populations, alongside persistently higher mortality in males and modest rural differences early in the pandemic. These patterns directly correspond to groups prioritized in early CDC/ACIP vaccine allocation strategies, supporting the rationale of federal distribution decisions.[1,2] Prioritizing high risk populations remains essential to reducing preventable mortality in future public health emergencies. This approach aligns with osteopathic principles emphasizing prevention, population health, and equity in healthcare delivery.[3]

References

1. Centers for Medicare & Medicaid Services. COVID-19 Public Use Files, 2020–2023. Accessed 2025. https://data.cms.gov/
2. Advisory Committee on Immunization Practices. COVID-19 Vaccine Allocation Recommendations. Centers for Disease Control and Prevention. Published 2020. Updated 2021. Accessed 2025. https://www.cdc.gov/coronavirus/covid-19/
3. American Osteopathic Association. Osteopathic philosophy and principles of practice. Accessed 2025. https://osteopathic.org/what-is-osteopathic-medicine/osteopathic-philosophy/

Results

Mortality declined significantly from 2020 to 2023 across all demographic groups (ANOVA, all p<0.001), with the steepest decreases occurring between 2021 and 2022.
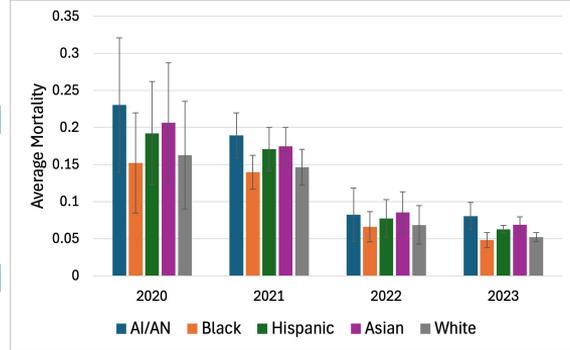

Figure 1. COVID-19 Mortality by Race/Ethnicity, 2020-2023. AI/AN populations demonstrated the highest mortality in each year (ANOVA, all p<0.001); in 2020, mortality was 0.230 compared with 0.163 among Non-Hispanic Whites.

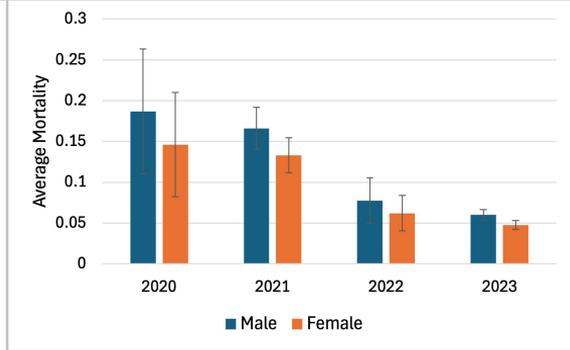Figure 2. COVID-19 Mortality by Sex, 2020-2023. Male patients consistently demonstrated higher mortality than female patients (ANOVA, all p<0.001); in 2020, mortality was 0.187 versus 0.146, respectively.

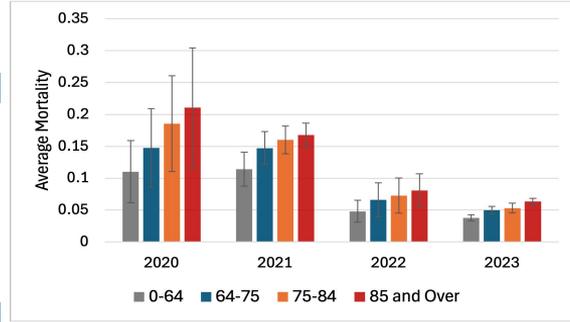Figure 3. COVID-19 Mortality by Age Group, 2020-2023. Mortality increased sharply with age; in 2020, individuals ≥85 years experienced mortality of 0.211 compared with 0.110 among those aged 0-64, and this gradient persisted across all years (ANOVA, p<0.001).
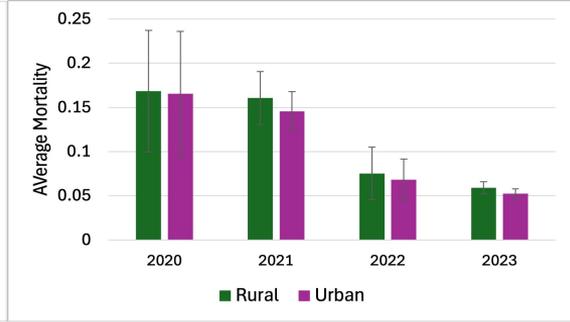

Figure 4. COVID-19 Mortality by Geography (Rural vs Urban), 2020-2023. Rural populations had modestly higher mortality early in the pandemic (ANOVA, all p<0.001); in 2020, mortality was 0.169 versus 0.165 among urban populations.