Quantifying and benchmarking disparities in COVID-19 vaccination rates by race/ethnicity

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Introduction

Unequal COVID-19 vaccination rates in the United States have compounded existing disparities in cases, hospitalizations, and deaths among Black and Hispanic populations.[1–3] In this study, we quantify how differential vaccine uptake by race/ethnicity within each US state produced substantial vaccination coverage disparities during the initial scale-up among older adults. We model alternative scenarios for the period after eligibility opened to all adults, including a scenario of persistent differential uptake and scenarios that include efforts to reduce disparities by addressing access barriers, increasing vaccine confidence, and prioritizing disadvantaged geographic areas.

Methods

We analyzed demographic data (population distribution by age, race/ethnicity, census tract) from the American Community Survey.[4] From state websites, we extracted shares of people receiving ≥1 vaccine dose, stratified by age and separately by race/ethnicity, through March 31, 2021 (eMethods in the Supplement). Combining these data, we estimated relative uptake rates for the initial scale-up preceding all-adult eligibility, by race/ethnicity within each state. We defined relative uptake rates as the observed share of vaccinations for a racial/ethnic group, divided by the expected share if uptake across racial/ethnic groups within each age group were proportional to population size. This approach allowed us to control for the interaction of age-based eligibility criteria with differing demography by race/ethnicity, and thereby isolate impacts of differential vaccination accessibility and confidence.

We modeled vaccination scale-up within each census tract in a state under three scenarios. In the '*persistent differential uptake*' scenario we utilized sed observed daily vaccination rates by state reported by CDC between April 1 and July 1 and assumed disparities in state-specific relative uptake rates by race/ethnicity would continue. In the '*equalized uptake*' scenario, we assumed equal vaccination rates in all racial/ethnic groups within a state, set each day as the highest rate observed for any group with ≥200,000 state-level population. In the '*equalized uptake and geographic targeting*' scenario, we modeled the further impact of doubling vaccination rates in the most disadvantaged quartile of census tracts (according to the CDC Social Vulnerability Index), over six weeks beginning April 1. We compared projections in the three scenarios to estimated levels of actual coverage by race/ethnicity as of July 1 to benchmark progress toward addressing vaccine equity.[5]

Results

In most states, relative uptake rates through March 31, 2021 were substantially higher among White compared to Black and Hispanic adults, by a median factor of 1.3 times for White compared to Black adults (IQR, 1.2-1.4) and median 1.3 times for White compared to Hispanic adults (IQR, 1.1-1.6) (Figure 1). Combined effects of disproportionate uptake and age-based eligibility resulted in estimated coverage among Black and Hispanic adults (29%) being one-third lower than among White adults (43%) by the end of March.

Under '*persistent differential uptake*,' Black and Hispanic adults would reach 50% coverage of ≥1 vaccine dose nationally 57 days and 26 days later, respectively, than White adults. Under

'*equalized uptake'*, delays would be reduced to 30 days for Black adults and 17 days for Hispanic adults. Under '*equalized uptake and geographic targeting'*, delays to 50% coverage would narrow to 13 and 8 days for Black and Hispanic adults, respectively; in this scenario coverage disparities between Hispanic and white adults would have been eliminated by July 1, 2021, and the coverage gap would have been reduced by 76% for Black adults (Figure 2).

Actual levels of coverage nationally on July 1 were estimated to be 68%, 67%, and 54% for Hispanic, White, and Black adults, respectively (Figure 2). Actual coverage among Black adults reached levels projected in the '*equalized uptake*' scenario in only 10 of 30 states with reported data and sufficient population size, while coverage among Hispanic adults reached these benchmark levels in 20 of 27 states analyzed.

Discussion

Disparities in vaccination among Black and Hispanic adults highlight the urgent need to invest in policies and interventions to promote vaccine equity. Our results additionally demonstrate the benefits of place-based targeting of efforts to promote vaccination uptake. Limitations of this analysis include incomplete reporting of race/ethnicity in state vaccination data and lack of these data at sub-state level. Nevertheless, by applying consistent rules we reconciled heterogeneous reporting data to quantify vaccination disparities, and demonstrated the need for pro-equity policies to ensure that underserved communities are not left behind.[6]

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Role of the Funding Source
The funders had no role in the study design, management, data analysis, preparation of the manuscript, and decision to submit the manuscript for publication.

Ethical Review
We did not seek institutional review board approaval because our analysis only included de-identified, publicly available data that are considered exempt under the Common Rule.

Access to Data
MBR had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

Additional Information
State-level results and code for the analysis are available at: https://github.com/PPML/covid_vaccination_disparities.

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Figure Captions

Figure 1. Relative rates of COVID-19 vaccination uptake, by race/ethnicity and state, visualized on the log scale. Estimates are shown for populations that exceed 200,000 and have data available on state reporting dashboards. Relative rates of uptake are defined as the observed share of vaccinations for a racial/ethnic group, divided by the expected share if uptake across racial/ethnic groups within each age group were proportional to population size.

Figure 2. Coverage of one or more COVID-19 vaccination doses among population 18 years and older, by racial/ethnic group, aggregated to national level. Panels show scenarios: A) persistent differential uptake, B) equalized uptake, and C) equalized uptake and geographic targeting. Dashed line shows overall coverage among the US population aged 18 years and older.