ABSTRACT

***TITLE**: The Role of SHIELD Test Centers in Reducing COVID-19 ICU Admissions in Disadvantaged Communities

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The COVID-19 pandemic, particularly with the emergence of variants such as Alpha, Delta, and Omicron, has presented significant challenges in managing severe cases. These variants, especially Delta, have been associated with higher ICU admissions, disproportionately impacting disadvantaged communities. SHIELD Illinois, a saliva-based COVID-19 testing program, expanded testing across the state, yet its effect on COVID-19 outcomes in these communities remains unclear. This study utilizes SHIELD data to investigate its effectiveness in improving outcomes in socioeconomically disadvantaged areas.

This study explores the relationship between the effective number of SHIELD test centers and COVID-19 ICU admission rates during the Alpha, Delta, and Omicron waves, with a focus on how socioeconomic factors across zip codes influence this relationship in a large academic hospital serving Chicago's western suburbs.

This cohort study conducted a secondary analysis using data from Loyola University Chicago ICU's EHR system and the SHIELD Illinois Testing Program. We analyzed data from March to June 2021 (Alpha wave), August to November 2021 (Delta wave), and December 2021 to March 2022 (Omicron wave). A linear mixed-effects regression model was used to assess the relationship between the effective number of SHIELD test centers and COVID-19 ICU admission rates, adjusting for fixed effects such as SHIELD center density and Area Deprivation Index (ADI) score. A robustness check, using a two-month lag analysis, was performed to assess the timing of testing and ICU admissions across waves.

Our results showed that disadvantaged areas consistently experienced higher ICU admission rates, particularly during the Delta and Omicron waves, despite an increase in SHIELD test centers. Regression models indicate that while ICU rates were significantly higher in these areas, increasing the number of SHIELD centers during the Omicron wave was associated with a reduction in ICU admissions ($\beta = -0.594$, $p < 0.1$). The two-month lag analysis further confirmed that improving SHIELD center effectiveness led to lower ICU rates over time, with disadvantaged areas benefiting from targeted interventions during the Omicron wave ($\beta = -0.678$, $p < 0.1$).

These findings underscore the critical role of strategically deploying and optimizing SHIELD test centers in disadvantaged areas to effectively reduce COVID-19 ICU admissions, especially during the Omicron wave. Targeted resource allocation is essential to minimize severe outcomes and ensure equitable healthcare responses in future pandemics.