

Association between state ICU bed utilization and income-based equality rankings during the 2020 COVID-19 surge

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The COVID-19 pandemic has strained healthcare systems in the United States, particularly hospital and ICU bed availability. We investigated the impact of income-based equality rankings on ICU bed utilization during the 2020 winter surge, hypothesizing the utilization of ICU beds is associated with the rankings of income-based equality among states. We conducted a cross-sectional study comparing different population-adjusted metrics of hospital bed and COVID-19 infection among three income-based equality state groups (upper-, middle-, and lower-rank). State-aggregated data of COVID-19 hospital cases was collected on November 29, 2020, and was further adjusted to the 2019 population data from the Census Bureau. The fifty states were grouped according to the income-based equality ranking. Mean values of the population-adjusted metrics of hospital bed and COVID-19 infection were compared among the groups with one-way ANOVA, followed by pairwise comparisons using the Tukey HSD procedure for multiple comparison adjustment. Log transformation was applied to the percent-based utilization data for better normal approximation. Low-rank states exhibited higher ICU bed utilization (9.4% increase, $p=0.022$) and staff shortage (12.8% increase, $p=0.0013$) compared to middle-rank states. Additionally, low-rank states had elevated COVID-19 inpatient bed utilization (16.4%) compared to upper- (10.5%, $p=0.039$) and middle-rank (11.9%, $p=0.0064$) states. Upper- and middle-rank states showed lower percentages of inpatients with COVID-19 infection ($p=0.019$, $p=0.036$). Our findings indicate states with higher income-based equality rankings performed significantly better regarding ICU bed utilization and staff shortages during the 2020 winter surge, emphasizing the need to address income-based disparities for improved healthcare delivery and emergency preparedness.

Keywords: COVID-19, income-based equality, ICU bed utilization, healthcare disparities, pandemic response, healthcare preparedness.