

The Impact of Regional Hospital Bed Density on COVID-19 Case Fatality Rate in the United States

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Objectives

❖ The novel coronavirus SARS-CoV-2 (COVID-19) is a rapidly growing pandemic affecting a majority of the countries around the world, with the United States having the greatest number of confirmed cases as of March 29th, 2020. It is predicted that with the current rate of growth of COVID-19, the US healthcare system may not be able to keep up with the resources required to care for these patients.

Methods

❖ For the fifty United States, hospital bed density, as defined by inpatient beds per 1000 people, was obtained from the most recent American Hospital Association (AHA) 2018 database. Case fatality rates per state were calculated from the number of deaths per total number of cases at two intervals during the first three months of the COVID-19 pandemic in the United States (3/29/2020 and 4/19/2020). The United States' data from Worldmeter⁶ were analyzed using Microsoft Excel. Linear regression analysis was performed on the case fatality data as a function of hospital bed density for each US region ((New England, Mid-Atlantic, South, Mid-West, Southwest, and West).

Results

❖ Hospital bed density per one thousand people and COVID-19 case fatality rate for each US region was visually plotted (Figure 1). A linear regression analysis of regional case fatality as a function of hospital bed density was statistically insignificant for month 2 (-0.183 [95% CI -0.633 to 0.267, p=0.32] with R² = 0.242) (Figure 2, Table 1) and month 3 (-0.38 [95% CI -1.41 to 0.64, p=0.36] with R² = 0.21) (Figure 3, Table 1) of the pandemic.

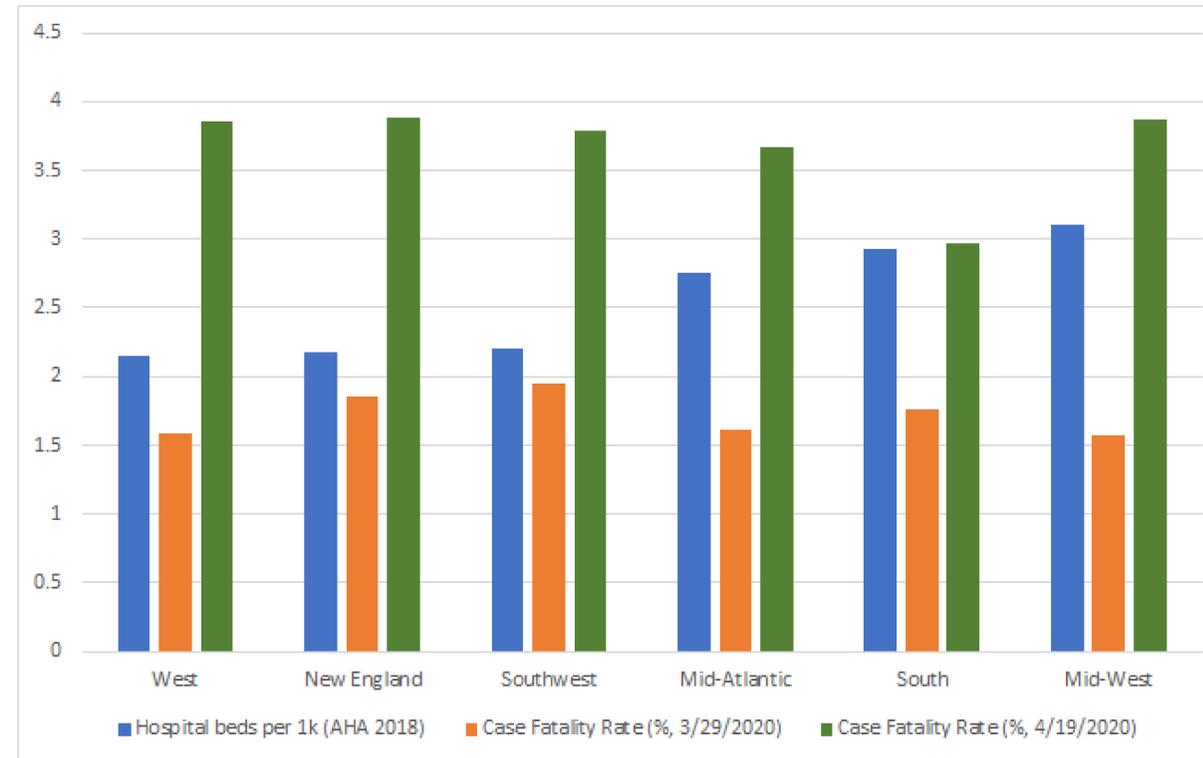


Figure 1. Hospital bed density (as defined by number of inpatient beds per 1000 people - AHA 2018) and case fatality rate (% at 2 and 3 months - 3/29/2020 and 4/19/2020, respectively) for each US region.

US Region	Hospital Bed Density	COVID-19 CFR (3/29/2020)	COVID-19 CFR (4/19/2020)
New England	2.18	1.86	3.88
Mid-Atlantic	2.75	1.61	3.67
South	2.92	1.76	2.97
Mid-West	3.10	1.57	3.87
Southwest	2.20	1.94	3.79
West	2.15	1.58	3.85

Table 1. Hospital bed density (as defined by number of inpatient beds per 1000 people - AHA 2018) and case fatality rate (CFR) for each US region.

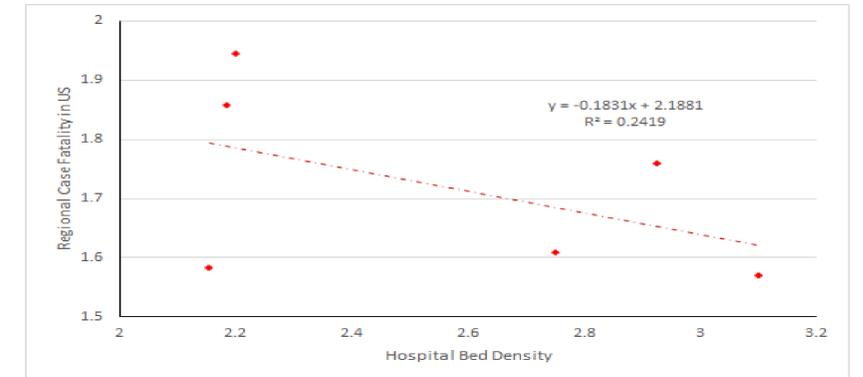


Figure 2. Linear regression analysis of regional case fatality rate as a function of hospital bed density in the United States at 2 months (3/29/2020).

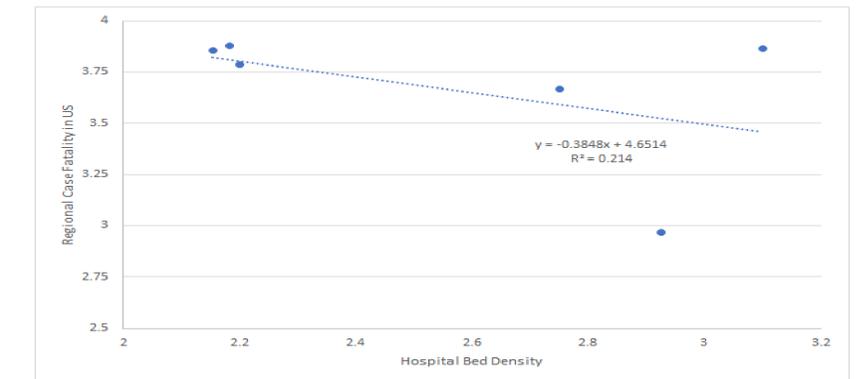


Figure 3. Linear regression analysis of regional case fatality rate as a function of hospital bed density in the United States at 3 months (4/19/2020).

Conclusion

❖ Although there appears to be a weak negative association between case fatality and hospital bed density in each state, this association is statistically insignificant, suggesting that the current US COVID-19 case fatality rate is independent of the number of available inpatient hospital beds. However, we predict that with the rapidly increasing number of US cases, regions with higher hospital bed density will be better equipped to mitigate the fatality rate of this pandemic.