

Title: Geographical variation in TBI mortality by proximity to nearest neurosurgeon

Background (52)

Trauma is the fourth leading cause of mortality in the US, with 1/3 of deaths secondary to traumatic brain injury (TBI). Previous work examined the influence of distance to the nearest trauma center on trauma mortality, but there has been little specific focus on the geographical impact of neurosurgeons on TBI mortality.

Methods (116)

Using the Medicare Physician and Other Supplier public use file, we identified all neurosurgeons (4521) who billed Medicare fee-for-service during 2017. Physicians' work addresses were identified using the National Provider Identifier registry. For the 3107 counties in the continental US, we calculated minimum distance from the center of the county to the nearest neurosurgeon, along with demographic estimates (2012 ACS) and level of urbanization (2013 Rural-Urban Continuum Codes).

The CDC's WISQARS database was queried to derive county-level 2008-2014 TBI-mortality rates. Rates for counties with fewer than 20 TBI deaths (761 counties) were excluded due to unstable estimates. Our primary endpoint was each county's TBI-specific mortality rate (per 100,000 population). All p-values were $p < 10^{-10}$ unless otherwise stated.

Results (94)

75% of the counties in our dataset did not have a neurosurgeon. The mortality rate for TBI was higher in counties without neurosurgeons compared to those with neurosurgeons (25.4 vs 18.0).

Adjusting for distance, urbanization, population, sex, and age showed the mortality rate to be 4.2 higher in rural counties, and revealed a 4.7 increase in mortality rate for every 10% increase in the proportion of the population aged 65 or older. Additionally, the mortality rate rose by 1.25 per 100,000 for every 20 mile increase in distance to a neurosurgeon (95% CI: .97-1.52).

Conclusions / Public Health Implications: (34)

Counties that are further from the nearest neurosurgeon have higher TBI mortality rates, even after adjusting for urbanization and underlying county demographics. This phenomenon warrants further examination in studies at a patient level.