Results

Of the 159 geocoded stroke fatalities, 52% lived within 1 hour of UVMMC (82/159), 30% lived within 2 hours (48/159), and 18% lived further than 2 hours (29/159). The towns with the highest stroke death counts were South Burlington (10), Essex (10), Bennington (9), Burlington (8), and Hartford (8). Due to low counts, stroke mortality rates were calculated at the county level. Two counties had stroke mortality rates above the 2016 national crude rate of 4.4 per 100,000: Essex County (4.8), and Windsor County (4.3). Both Essex and Windsor County are further than a 2-hour drive, and only about half of Windsor county has access to UVM medical center with 2 hours.

Discussion

By count alone, nearly one fifth of Vermont’s fatal stroke population did not have access to IV tPA within a 2-hour drive. Counties with higher mortality rates also appeared further from UVM Medical Center; including Essex, Windsor, Bennington, and Caledonia Counties, suggesting gaps in access to these regions. This research showed strength in the visualization of 1- and 2-hour drive networks towards UVM Medical Center. Geocoded stroke mortalities were overlaid to then visualize the distribution of fatalities in relation to hospital proximity, seen in and 1 and 2 Hour Service Areas to UVM Medical Center.

References


Methods


Address-level resident stroke mortality data was obtained from the Vital Records unit of Vermont DPH for the most recent completed year (2016). Data was cleaned in Excel, imported into ArcGIS, and geocoded. 41 of the original death records were omitted during geocoding due to insufficient address data, leaving 159 to be successfully geocoded. The geocoded addresses were exported as a shapefile and layered on top of the 2019 VT Data - State Boundary shapefile obtained from the Vermont Open Geodata Portal (VOGPP). Stroke counts (210 total) were summarized on the town level and joined to 2019 VT Data – County Boundaries shapefile from VOGP. Stroke counts were then symbolized by quantity and displayed in the choropleth map titled Stroke Death Counts by Town, 2016.

By count alone, nearly one fifth of Vermont’s fatal stroke population did not have access to IV tPA within a 2-hour drive. Counties with higher mortality rates also appeared further from UVM Medical Center; including Essex, Windsor, Bennington, and Caledonia Counties, suggesting gaps in access in these regions. This research showed strength in the visualization of 1- and 2-hour drives in the network analysis map to better understand areas of the state that lack access to advanced care. However, for patients who live within a 2-hour drive, many factors such as comorbidities, age, location of the clot in the brain, as well as behavioral habits may exclude them from being able to get IV tPA. Additionally, these patients are not guaranteed to arrive within the IV tPA administration window. This combination of factors suggests that living within a 2-hour drive is not sufficient enough to guarantee access to advanced stroke care.

One limitation of this research is that the stroke mortality data obtained from Vital Records does not differentiate between ischemic and hemorrhagic stroke deaths. Additionally, deaths were based on an individual’s residence rather than place of death.

Overall, distance to advanced care is an important barrier to consider when thinking about stroke prognosis. Future research in Vermont should consider adding resources to reduce the impact distance may play in rural stroke outcomes.