Epidemiology of Rural/Urban Stroke Disparities in the Greater Cincinnati / Northern Kentucky Stroke Study

Adam Jasne MD,¹ Cole Brokamp PhD,^{1,2} Kathleen Alwell BSN,¹ Charles J. Moomaw PhD,¹ Matthew L. Flaherty MD,¹ Opeolu Adeoye MD MS,¹ Daniel Woo MD MS,¹ Jason Mackey MD MS,³ Simona Ferioli MD,¹ Sharyl Martini MD PhD,⁴ Felipe de los Rios la Rosa MD,^{1,5} Brett M. Kissela MD MS,¹ Jane Khoury PhD,^{1,2} Dawn Kleindorfer MD¹

1. University of Cincinnati, Cincinnati, OH; 2. Cincinnati Children's Hospital Medical Center, Cincinnati, OH; 3. Indiana University, Indianapolis, IN; 4. Michael E. DeBakey VA Medical Center, Houston, TX; 5. Baptist Health Neuroscience Center, Miami, FL

Introduction

Stroke mortality is higher in rural areas than urban. Limited data exist as to why. We sought to evaluate whether the Greater Cincinnati/Northern Kentucky Stroke Study (GCNKSS) could be used to evaluate these disparities.

The GCNKSS is a population-based epidemiologic study capturing all ischemic stroke cases in region surrounding Cincinnati, Ohio, with a total population of 1.3 million. The study region includes Hamilton and Clermont counties in Ohio and Boone, Kenton, and Campbell counties in Kentucky. Census areas within the region contain a wide variety of population densities, but due to proximity to Cincinnati (in Hamilton County), few meet commonly-used rurality criteria.

Methods

- Identified all ischemic stroke cases among non-institutionalized individuals in the GCNK region in 2010
- Geocoded cases to census tract based on home address
- Evaluated association between census tract-level stroke rate and tract characteristics:
 - population density, rural %, impervious development %, socioeconomic deprivation index, age, race, and sex
- Analyzed association unadjusted and adjusted for age, race, and a composite socioeconomic deprivation index

Figure 1. Region map, GCNKSS 2010

Geographic distribution of 15 hospitals in the Greater Cincinnati / Northern Kentucky Stroke Study region

Figure 2. Unadjusted stroke rate by census tract, GCNKSS 2010

Results

We identified 1,633 individuals who suffered a stroke during the study period

- Demographics: 54.1% female, 20.1% black
- County of residence:
 - 63.1% Hamilton, 14.1% Clermont, 11.0% Kenton, 6.1% Boone, 5.8% Campbell

After adjustment for confounders, a quartile decrease in population density had a small but significant association with increased stroke rate.

A decrease of ~17,000 people/km² was associated with an increase of 1.5 strokes / 10,000 people / year.

Conclusions

- Rural/urban stroke disparities persist even in areas such as GCNK, considered by some metrics to be non-rural.
- Our results support an understanding of rurality as a continuum, rather than a binary variable.
- Our results suggest that the GCNKSS can be used to study rural/urban stroke disparities.
- Future research should leverage the GCNKSS to evaluate factors that contribute to regional rural/urban disparities, how they relate to national and international disparities, and potential approaches to addressing them.