Assessing Stroke Disparities Using a Spatial Epidemiologic Investigation, 1992-2012

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Overview

- Background
- Methods
- Results
- Public Health Implications
What is a stroke?

- A stroke occurs when blood supply to the brain is blocked or when a blood vessel in the brain ruptures, causing brain tissue to die.
Background: Conditions that increase risk for stroke

- Previous Stroke or Transient Ischemic Attack
- High Blood Pressure
- High Cholesterol
- Heart Disease
- Diabetes
Background: Behaviors that increase risk for stroke

- Unhealthy Diet
- Physical Inactivity
- Unhealthy Weight
- Too Much Alcohol
- Tobacco Use
Stroke Symptoms

- Sudden numbness or weakness
- Severe headache
- Trouble seeing
- Trouble walking
- Sudden confusion
Stroke AHA/ASA Promotion
Background: Treatment

- Ischemic (~85% of strokes)
  - Thrombolytic therapy provided within 3-4.5 hours from onset of symptoms
  - Limits long-term disability and prevents death

- Hemorrhagic (~15% of strokes)
  - Endovascular procedures
  - Depends on cause and severity of bleeding
  - Surgical treatment
## Joint Commission Stroke Certification

### Primary Stroke Center (96)
- Use a standardized method of delivering care
- Tailor treatment & intervention
- Administer IV-thrombolytic
- Designate a stroke unit for continuous patient monitoring
- Promote the flow of patient information across healthcare settings
- Support patient self-management activities
- Analyze & use standardized performance data to continually improve treatment plans, eight measures required
- Demonstrate application of and compliance with clinical practices guidelines published by the AHA/ASA

### Comprehensive Stroke Center (3)
- Provide state-of-the-art care (staff, training, etc.)
- Have neuro-intensive care unit beds for complex stroke patients that provide care 24/7
- Use advanced imaging capabilities
- Provide care to patients with subarachnoid hemorrhage; performing endovascular coiling or surgical clipping procedures for aneurysm & IV-tPA
- Coordinate post hospital care for patients
- Use peer-review process to evaluate the care provided to ischemic & hemorrhagic stroke pts.
- Analyze and use standardized performance measure to continually improve treatment plans; 16 measures required
- Participate in stroke research
Background: Geographic Disparities

- Highest burden of stroke found in southeastern US - "stroke belt"
- It is questionable if counties in north Florida are part of the national stroke belt
- Disparities in hospitalization and mortality rates
- Access to care
Background: Economic Burden

- Stroke costs exceed 73 billion annually in the US
- Stroke costs exceed 5.5 billion annually in Florida

Stroke Expenditures
## Applied Application of Spatial Epidemiology

<table>
<thead>
<tr>
<th>Traditionally</th>
<th>Spatial Epidemiology</th>
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<tbody>
<tr>
<td>Age-adjusted stroke mortality/Hospitalization rates have been mapped in Florida</td>
<td>Rigorous statistical analyses to determine if there are significant differences in stroke burden is lacking in the literature</td>
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The objectives of this study were to investigate geographic disparities of stroke deaths and hospitalizations in Florida 1992-2012.
Research Goal

- Investigate county-level geographical disparities associated with stroke in FL

  Objective 1
  - Investigate the geographical distribution of age-adjusted hospitalization rates and determine clusters of disease

  Objective 2
  - Investigate the geographical distribution of age-adjusted mortality rates and determine clusters of disease
Methods: Study Area
Methods: Data Sources

- Agency for Health Care Administration
  - Hospital discharge data (1992-2012)
  - ICD-9–CM codes 430-438

- Florida Department of Health (FDOH) Office of Vital Statistics
  - Mortality data (1992-2012)
  - ICD-10 codes I60-I69
Methods: Data Analysis

- ArcGIS 10.3
- SAS 9.4
- GeoDa
  - Global Moran’s I
  - Local Moran’s I
Methods: Data Sources

- US Census Bureau
  - County cartographic boundary files

- FL Legislature's Office of Economic and Demographic Research
  - Population estimates
Results: Hospitalizations
Stroke Age-Adjusted Hospitalization Rates, 1992-2012

Number of Hospitalizations per 100,000 persons

- 163.5 - 265.7
- 265.8 - 298.8
- 298.9 - 369.4
- 369.5 - 458.3
- 458.4 - 715.3
Hospitalization Clusters, 1992-2014
Results: Mortality
Stroke Age-Adjusted Mortality Rates, 1992-2012

Number of Deaths per 100,000 Persons
- 9.90 - 44.80
- 44.81 - 55.20
- 55.21 - 65.40
- 65.41 - 89.00
- 89.01 - 132.00
Statistically significant high-rate mortality hotspots consistently appeared in the proposed stroke belt region of Florida.
Despite the decrease in stroke mortality rates over the past 20 years, geographic disparities continue to exist:

- Higher rates in the North
- Lower rates in the South

These tools need to be added to the epidemiologist’s tool box to differentiate significant from non-significant disease clusters.
Conclusion

- Findings from this study are useful for informing public health efforts/policies
- These county-level GIS cluster maps of stroke hospitalizations and mortality rates to:
  - Better understand the burden of stroke
  - Inform data-driven decisions, ultimately leading to interventions aimed at reducing disparities
Health Systems Implications

- Increase certification (Joint Commission) of Primary and Comprehensive stroke centers in areas with increased disparities to provide a better system of stroke care.
- Promote the new certification (2015) of Acute Stroke Ready Hospital in rural and underserved areas in Florida.
- Use Telestroke networks in medical deserts to administer timely stroke care to close disparity gaps.
- Provide data to inform policy/systems changes to have specific stroke protocols as suggested by the ASA/AHA for EMS providers, Emergency departments and Hospitals statewide.
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Questions

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