

2007 ESRI Health GIS Conference

Mapping Ill-defined Stroke Hospitalizations Among Medicare Beneficiaries

Linda Schieb, Northrop Grumman

Michele Casper and Isaac Nwaise, CDC

Lee Rivers Mobley, Research Triangle Institute

Stroke

- The third leading cause of death in the U.S.
- A leading cause of long term disability
- Cost of care - \$62.7 billion for 2007

Stroke Types

- Ischemic 67.0%
 - An artery that supplies blood and oxygen to the brain is blocked
- Hemorrhagic 11.6%
 - An artery in the brain bursts
- Late effects 1.1%
 - Residuals of a previous stroke
- Ill-defined 20.3%
 - Definitive diagnosis cannot be made

Importance of Accurate Diagnosis

- Thrombolytic drugs to dissolve blood clots
 - Recommended for Ischemic stroke
 - Contraindicated for Hemorrhagic stroke
- Aspirin or other anti-platelet agents for secondary stroke protection
 - Recommended for Ischemic stroke
 - Contraindicated for Hemorrhagic stroke

Objective

- To examine geographic disparities in ill-defined stroke diagnosis

Study Population

- 1996-2002
- Medicare Beneficiaries in the U.S.
- Not enrolled in an HMO
- Ages 65+
- Blacks, Hispanics, Whites

Race/Ethnicity

- Race and Hispanic ethnicity were not reported separately in the Medicare databases.
- Hispanics are underreported.

Stroke and Sub-type Definitions

■ Stroke

- Principal diagnosis of stroke
- International Classifications of Diseases (ICD-9-CM) codes 430-434 and 436-438
- Excludes transient ischemic attack (ICD-9-CM code 435)

■ Ill-defined stroke

- ICD-9-CM code 436-437

Mapping Methods

- ArcView v9.2
- County-level
- Hospitalizations assigned to county of patient residence

Statistical Methods

■ Spatial Autocorrelation

- GeoDa 0.9.5-i
- First order queen contiguity spatial weights

■ Global Spatial Autocorrelation

- Moran scatter plot and Moran's I

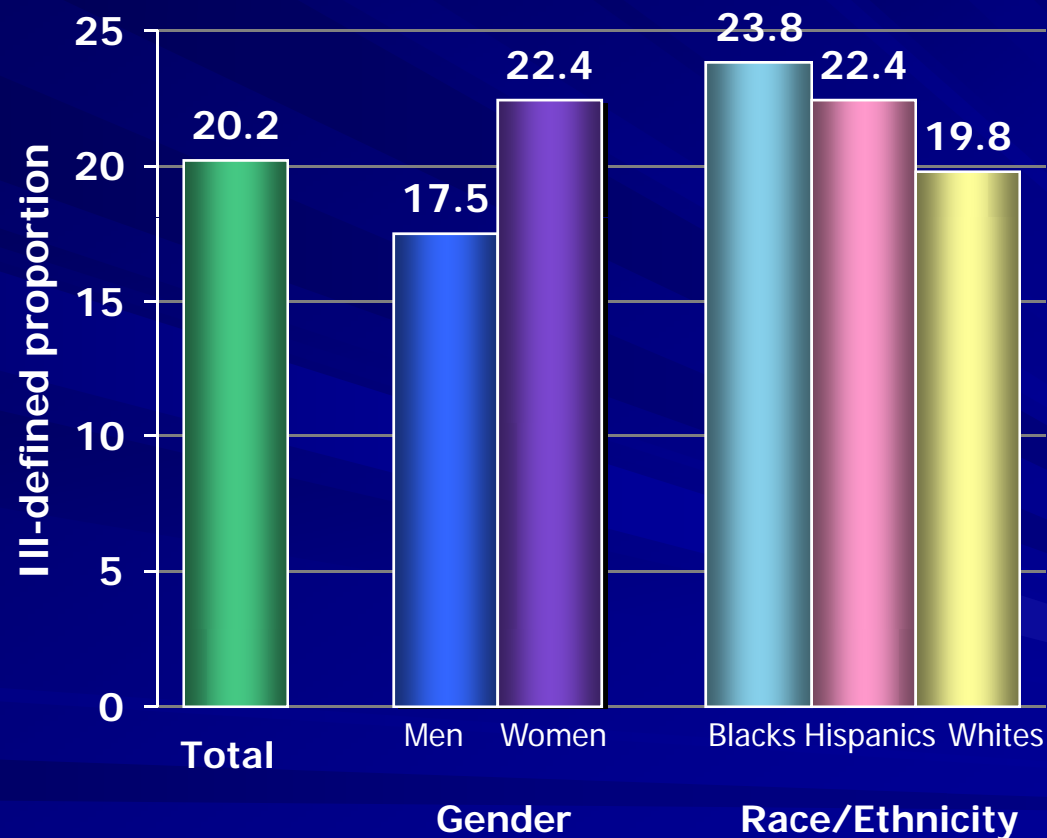
■ Local Spatial Autocorrelation

- Local Indicators of Spatial Association (LISA)

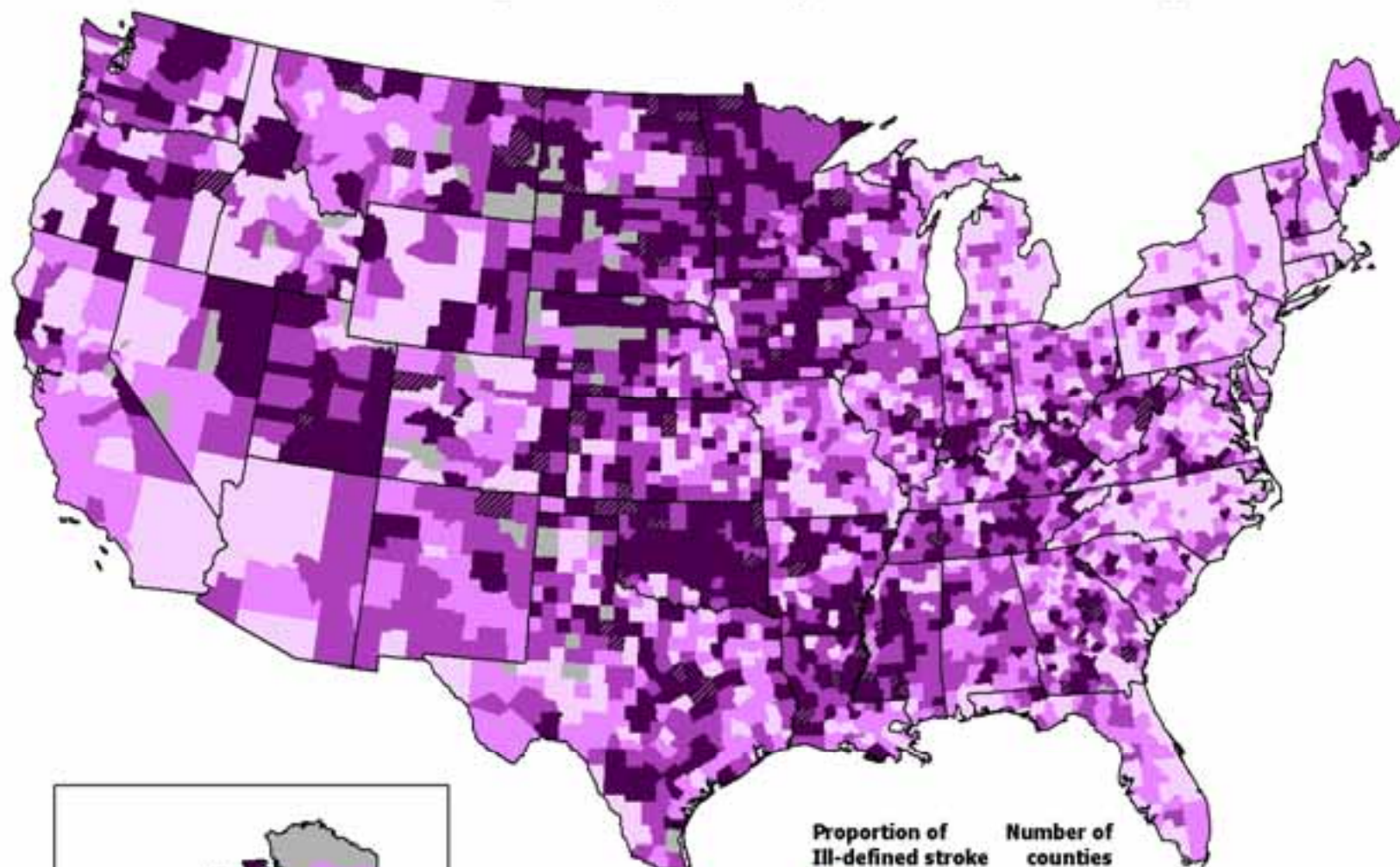
Study Population

	III-defined Stroke Hospitalizations	% of III- defined	Total Stroke Hospitalizations	% of Total Stroke
Total	667,391	---	3,298,782	---
Gender				
Men	251,762	37.7	1,440,294	43.7
Women	415,629	62.3	1,858,488	56.3
Race/Ethnicity				
Black	77,149	11.6	324,408	9.8
Hispanic	10,715	1.6	47,906	1.5
White	562,376	84.3	2,839,164	86.1

Proportion of ILL-defined Stroke Hospitalization Diagnoses



Proportion of Stroke Hospitalizations with Ill-defined Stroke Diagnosis Medicare Beneficiaries Ages 65+ by County, 1996-2002 - Total Population

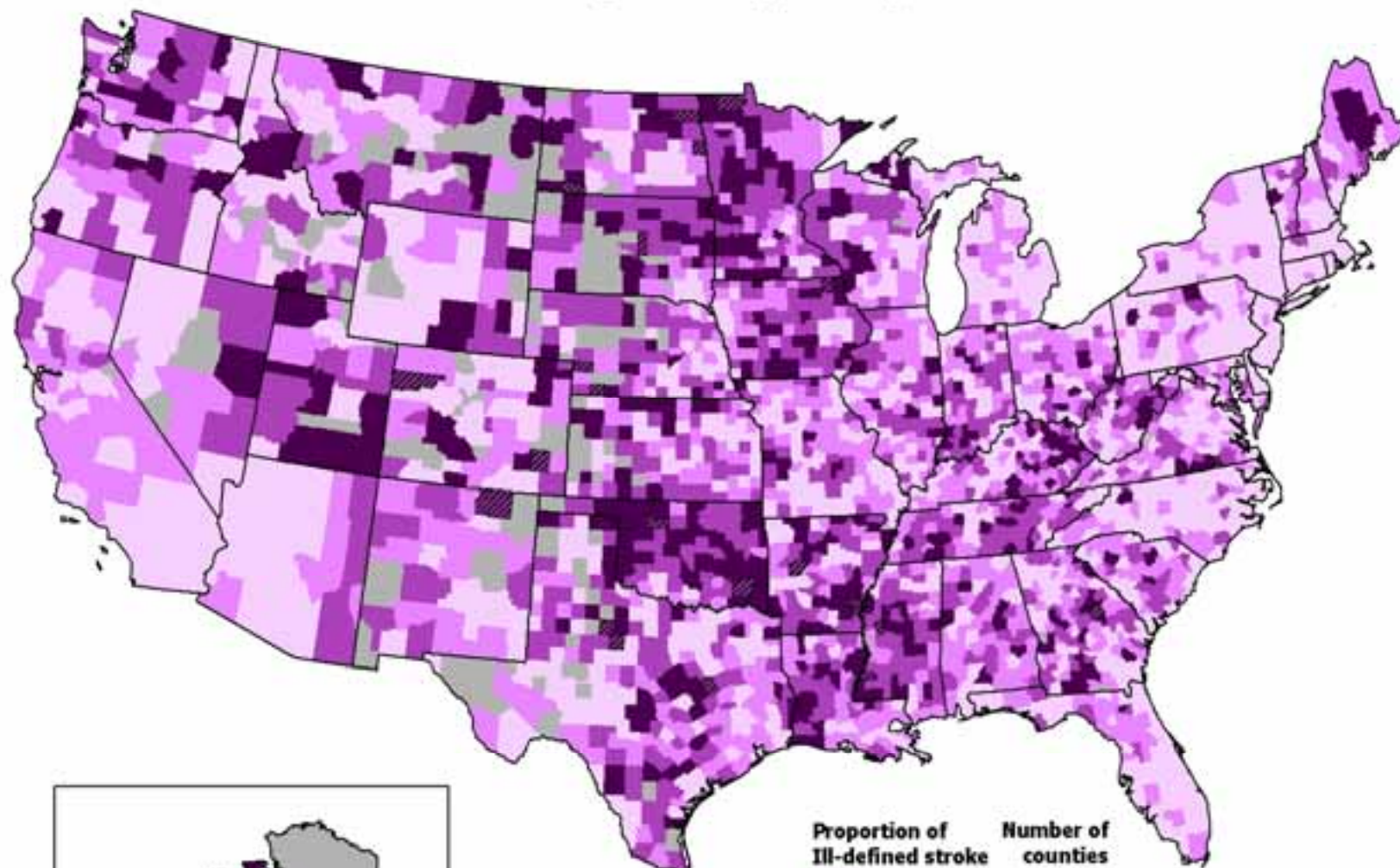


Proportion of Ill-defined stroke	Number of counties
2.6 - 17.4	776
17.5 - 24.6	768
24.7 - 32.9	768
33.0 - 67.5	762
Insufficient data	67
≥ 50.0	71

Note: Counties with less than 20 stroke hospitalizations are categorized as "insufficient data".

Proportion of Stroke Hospitalizations with Ill-defined Stroke Diagnosis

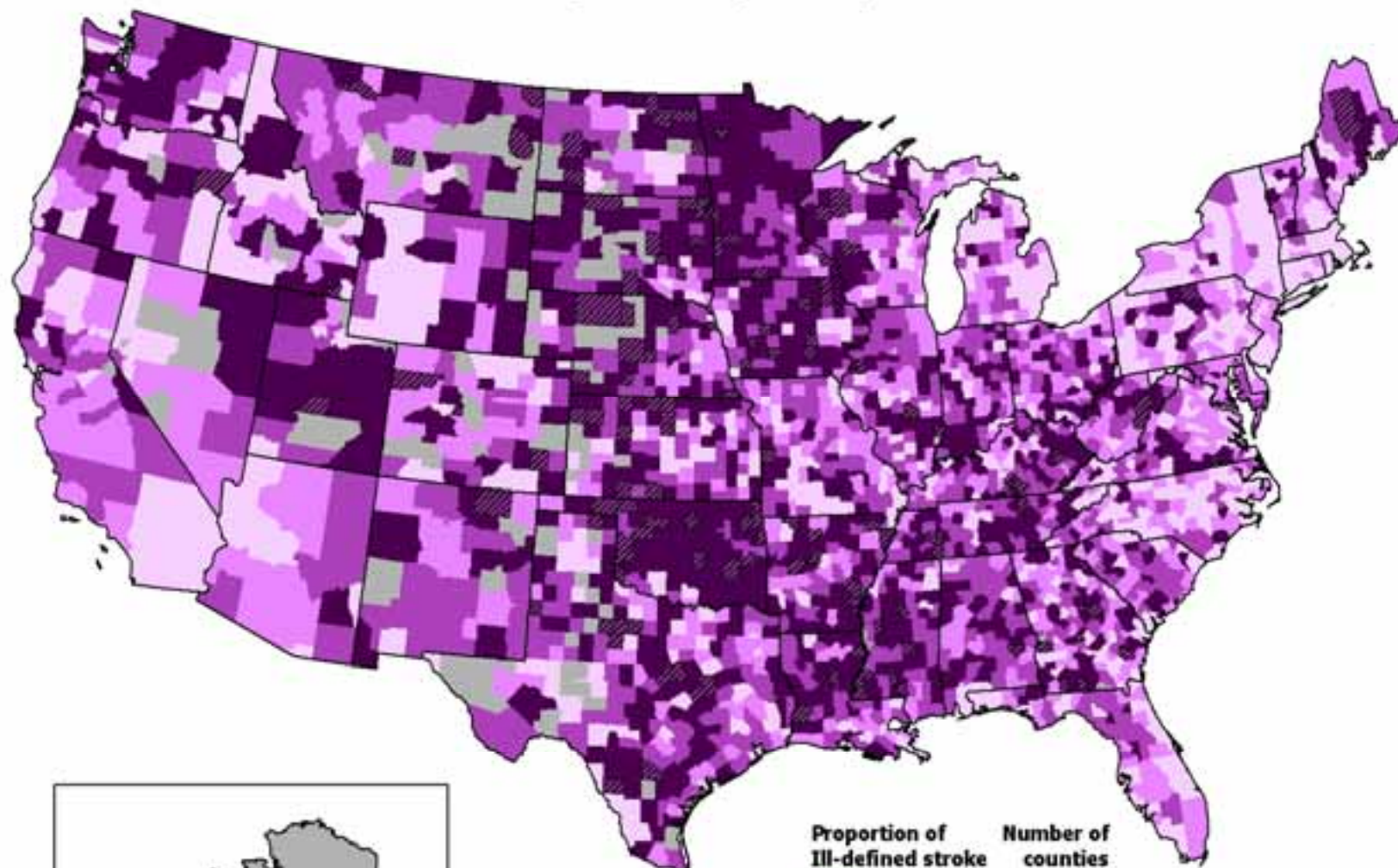
Medicare Beneficiaries Ages 65+ by County, 1996-2002 - Men



Note: Counties with less than 20 stroke hospitalizations are categorized as "insufficient data".

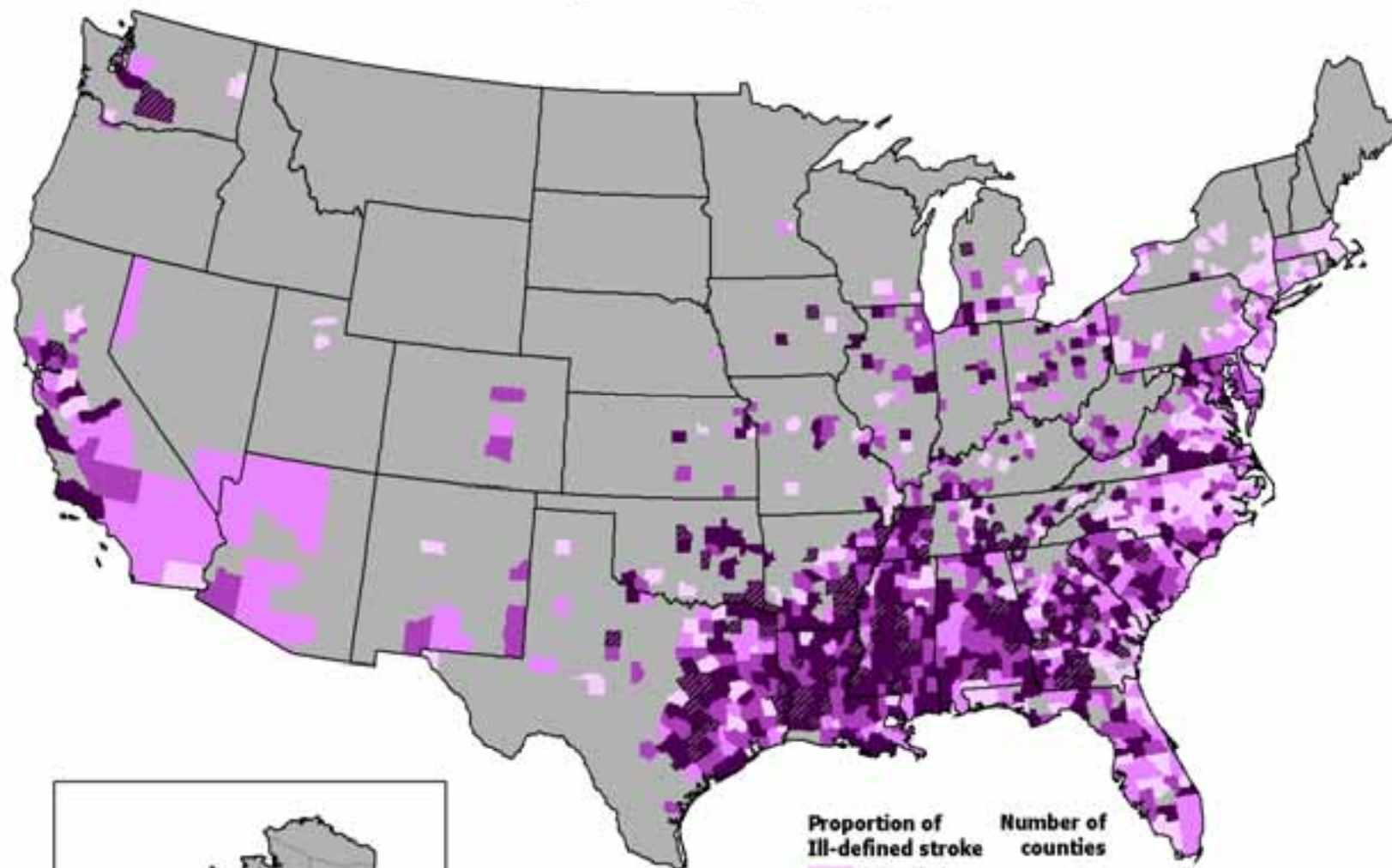
Proportion of Stroke Hospitalizations with Ill-defined Stroke Diagnosis

Medicare Beneficiaries Ages 65+ by County, 1996-2002 - Women



Note: Counties with less than 20 stroke hospitalizations are categorized as "insufficient data".

Proportion of Stroke Hospitalizations with Ill-defined Stroke Diagnosis Medicare Beneficiaries Ages 65+ by County, 1996-2002 - Blacks

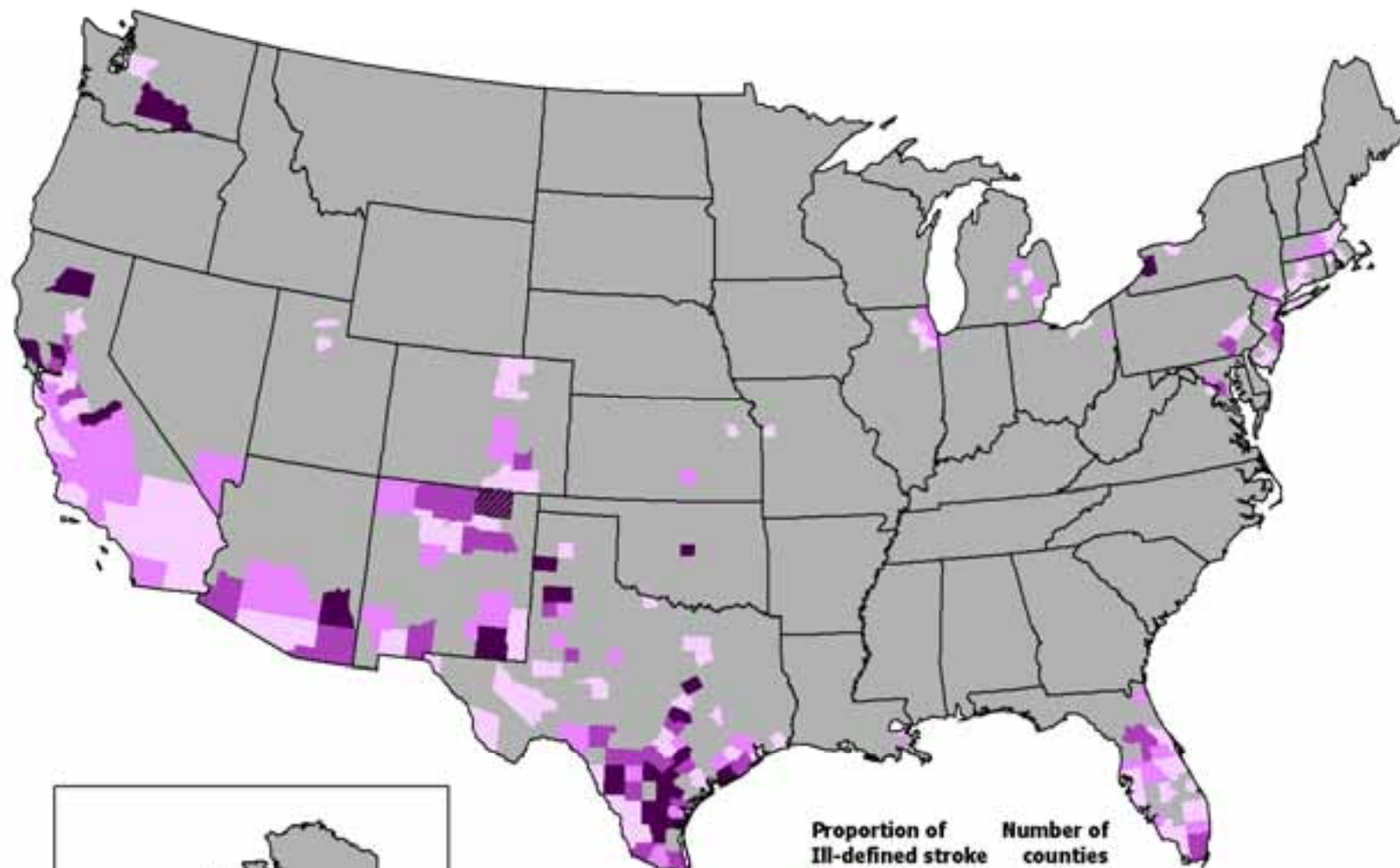


Proportion of Ill-defined stroke	Number of counties
0.0 - 17.4	255
17.5 - 24.6	248
24.7 - 32.9	262
33.0 - 73.4	405
Insufficient data	1971
≥ 50.0	90

Note: Counties with less than 20 stroke hospitalizations are categorized as "insufficient data".

Proportion of Stroke Hospitalizations with Ill-defined Stroke Diagnosis

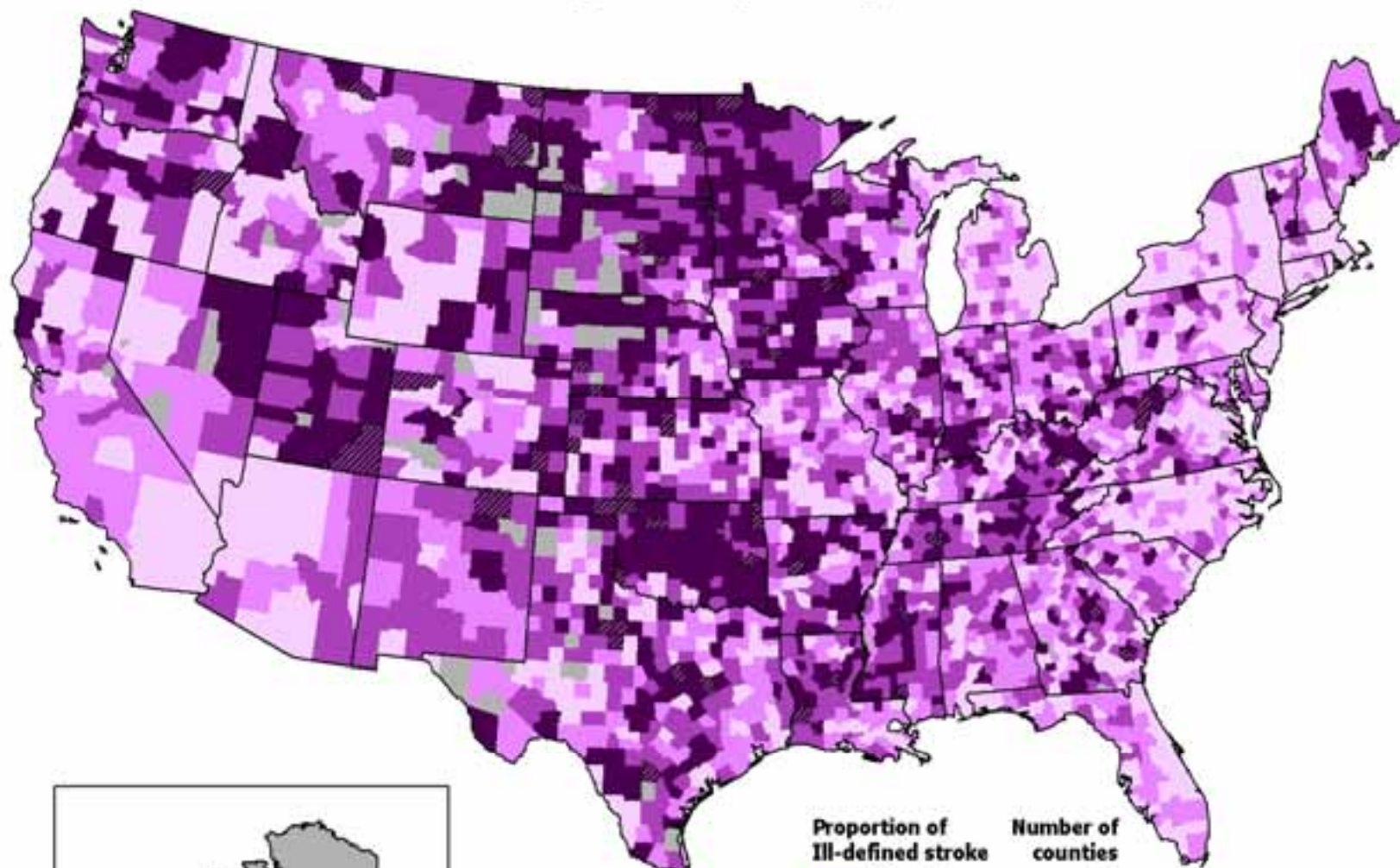
Medicare Beneficiaries Ages 65+ by County, 1996-2002 - Hispanics



Proportion of Ill-defined stroke	Number of counties
0.0 - 17.4	103
17.5 - 24.6	61
24.7 - 32.9	34
33.0 - 54.6	28
Insufficient data	2915
≥ 50.0	1

Note: Counties with less than 20 stroke hospitalizations are categorized as "insufficient data".

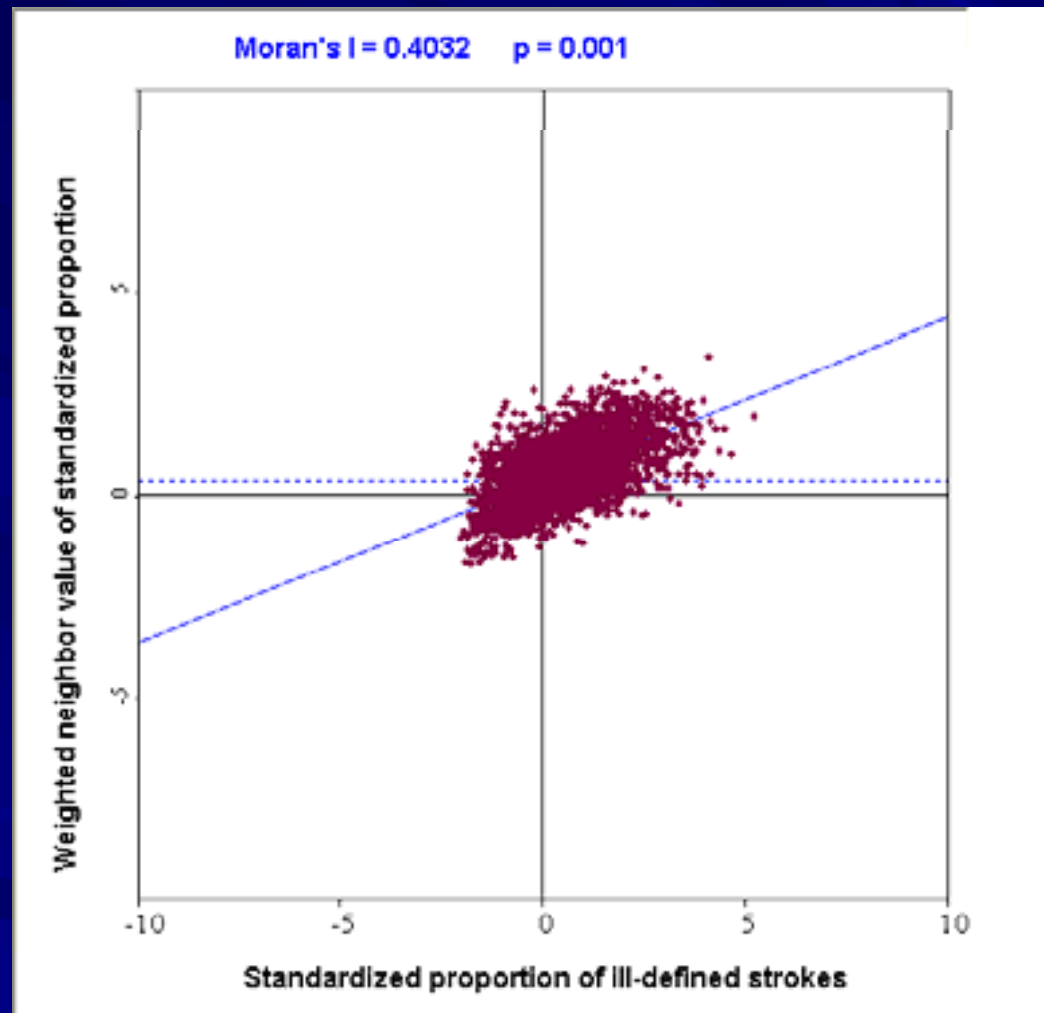
Proportion of Stroke Hospitalizations with Ill-defined Stroke Diagnosis Medicare Beneficiaries Ages 65+ by County, 1996-2002 - Whites



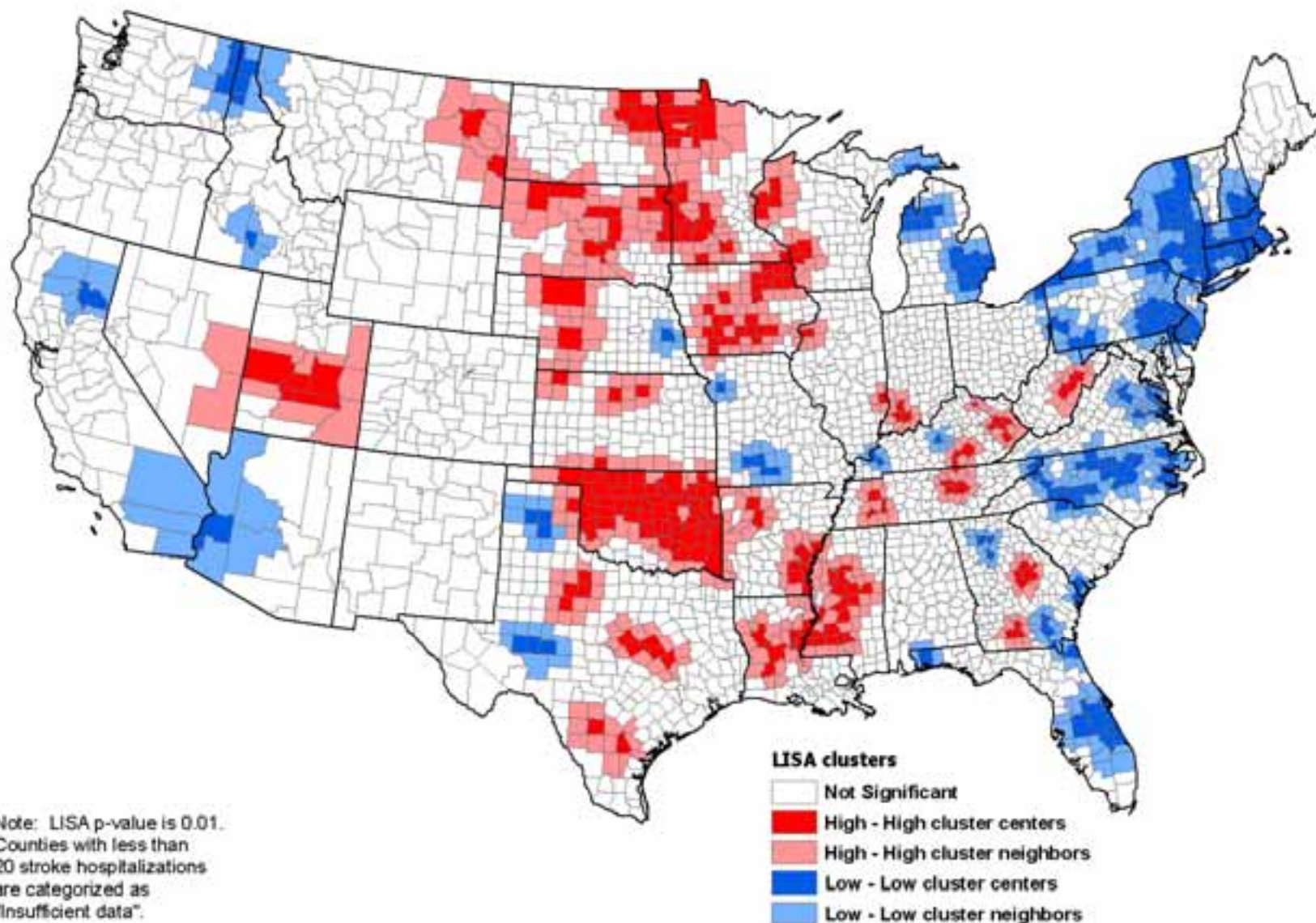
Proportion of Ill-defined stroke	Number of counties
2.6 - 17.4	824
17.5 - 24.6	785
24.7 - 32.9	749
33.0 - 67.5	699
Insufficient data	84
≥ 50.0	62

Note: Counties with less than 20 stroke hospitalizations are categorized as "Insufficient data".

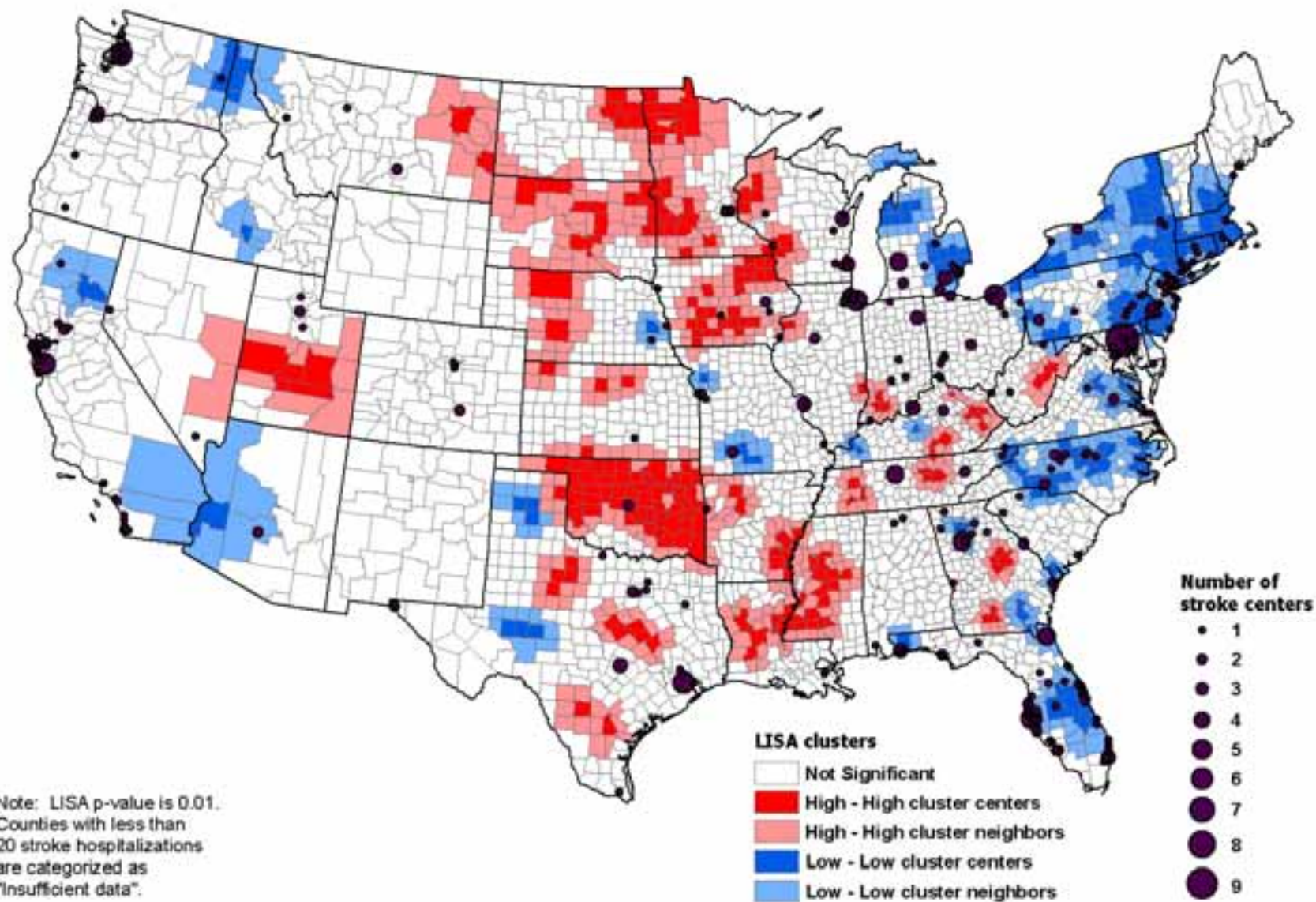
Moran Scatter Plot



Local Indicators of Spatial Association (LISA) Cluster Map for Stroke Hospitalizations with Ill-defined Stroke Diagnosis Medicare Beneficiaries Ages 65+, 1996-2002 - Total Population



Primary Stroke Centers and LISA Cluster Map for Stroke Hospitalizations with Ill-defined Stroke Diagnosis Medicare Beneficiaries Ages 65+, 1996-2002 - Total Population



Limitations

- Medicare data are administrative, not part of a national surveillance system.
- Data do not include strokes among patients younger than 65 (29% of all strokes).
- Data for race and Hispanic ethnicity are not reported separately.
- Data do not distinguish between first or recurrent strokes.

Conclusions

- Clusters of counties with high proportions of ill-defined strokes were located in Oklahoma, North and South Dakota, Minnesota, and Utah.
- Patterns were consistent for all gender and age groups.
- Proportions of ill-defined strokes were higher among women and higher for blacks.
- Stroke centers are unevenly distributed across the U.S.

Next Steps

- Research whether hospitals with stroke centers are less likely to report ill-defined stroke diagnoses.
- Determine the contributions of community and hospital characteristics to the geographic disparities in ill-defined stroke hospitalizations.

Questions?

Additional heart disease and stroke maps:
<http://apps.nccd.cdc.gov/giscvh>