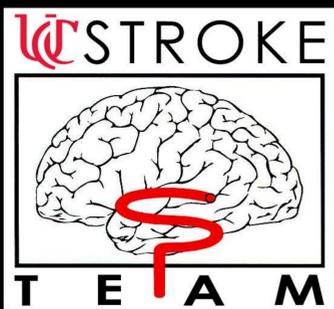


Geographic Access to Acute Stroke Care in the United States

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Disclosures

- **Research/Salary – NIH/NINDS**
 - OA, KCA, BC, MM, PK, CB, DK
- **Research/Salary – Genentech**
 - PK
- **Research/Salary – Penumbra**
 - PK
- **Speakers' Bureau – Genentech**
 - DK



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Background

- **Only 3-5% of acute ischemic stroke (AIS) patients receive intravenous (IV) recombinant tissue plasminogen activator (rt-PA)**
- **Less than 1% receive endovascular therapy**

Adeoye Stroke 2011; Hassan Stroke 2012

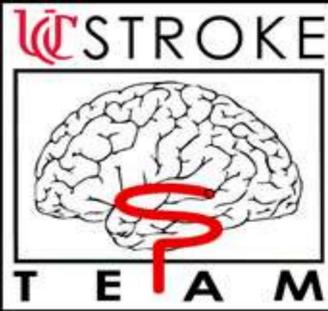
Background

- **The ASA recommends designation of Acute Stroke Ready Hospitals (ASRH), Primary Stroke Centers (PSC) and Comprehensive Stroke Centers (CSC)**
- **PSC certified hospitals are more likely to treat AIS patients with rt-PA and treatment at designated stroke centers is associated with lower 30-day mortality**

Background

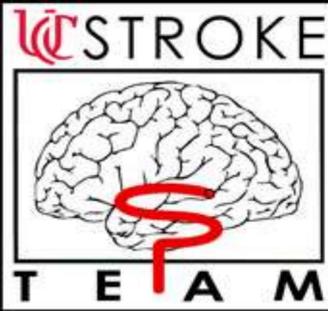
- **Goal - inform planning for stroke certification for US hospitals**
- **Describe access of the US population to all hospitals that actually deliver acute stroke care (IV and endovascular therapy)**

Methods - Medicare Provider and Analysis Review (MEDPAR)



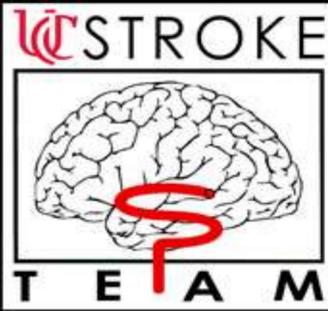
- **A claims-based dataset that contains every fee-for-service Medicare-eligible hospital discharge in the US**
- **Fiscal year 2011 data were used**

Methods - Medicare Provider and Analysis Review (MEDPAR)



- **Acute ischemic stroke primary discharge diagnosis ICD-9 codes:**
 - 433.xx (occlusion and stenosis of precerebral arteries)
 - 434.xx (occlusion of cerebral arteries)
 - 436 (acute, but ill-defined, cerebrovascular disease)

Methods - Medicare Provider and Analysis Review (MEDPAR)



- **Among ICD-9 codes 433, 434 and 436:**
 - Patients receiving IV thrombolysis were identified using ICD-9 code 99.10 (thrombolytic use)
 - Patients receiving endovascular therapy were identified by ICD-9 code 39.74 (endovascular removal of obstruction from head and neck vessels)
 - Hospitals that gave a single dose of rt-PA or performed a single thrombectomy procedure were considered capable

Methods – Population Data

- **2010 Nielsen Claritas Census Estimations**
- **Rely on a regularly refined and validated projection methodology based on the most recent decennial Census data**

Methods – Access Calculations

- **Block groups, or subdivisions within Census tracts, of 600 to 3000 people were used as the primary geographic unit for analysis**
- **A population-weighted center point (centroid) was assigned within each block group**

Methods – Access Calculations

- **The shortest road distance was determined between each block group centroid and each hospital**
- **Distances were converted to total prehospital ambulance transport times**
- **Travel times were computed based on posted speed limits for roads in each path**

Results

- **370,351 AIS primary diagnosis discharges**
 - 14,926 (4%) received IV rt-PA
 - 1,889 (0.5%) received endovascular therapy
- **4,583 acute care hospitals in MEDPAR**
 - 2,895 (63%) did not give any doses of IV rt-PA
 - 4,252 (93%) did not perform thrombectomy
 - 327 (7%) hospitals gave at least one dose of IV rt-PA and performed at least one thrombectomy

Results

- **The 327 hospitals that gave at least one dose of rt-PA and performed one thrombectomy procedure discharged approximately 28% of all AIS cases**
- **Hospitals that did not give any doses of IV rt-PA discharged 17% of all AIS cases**

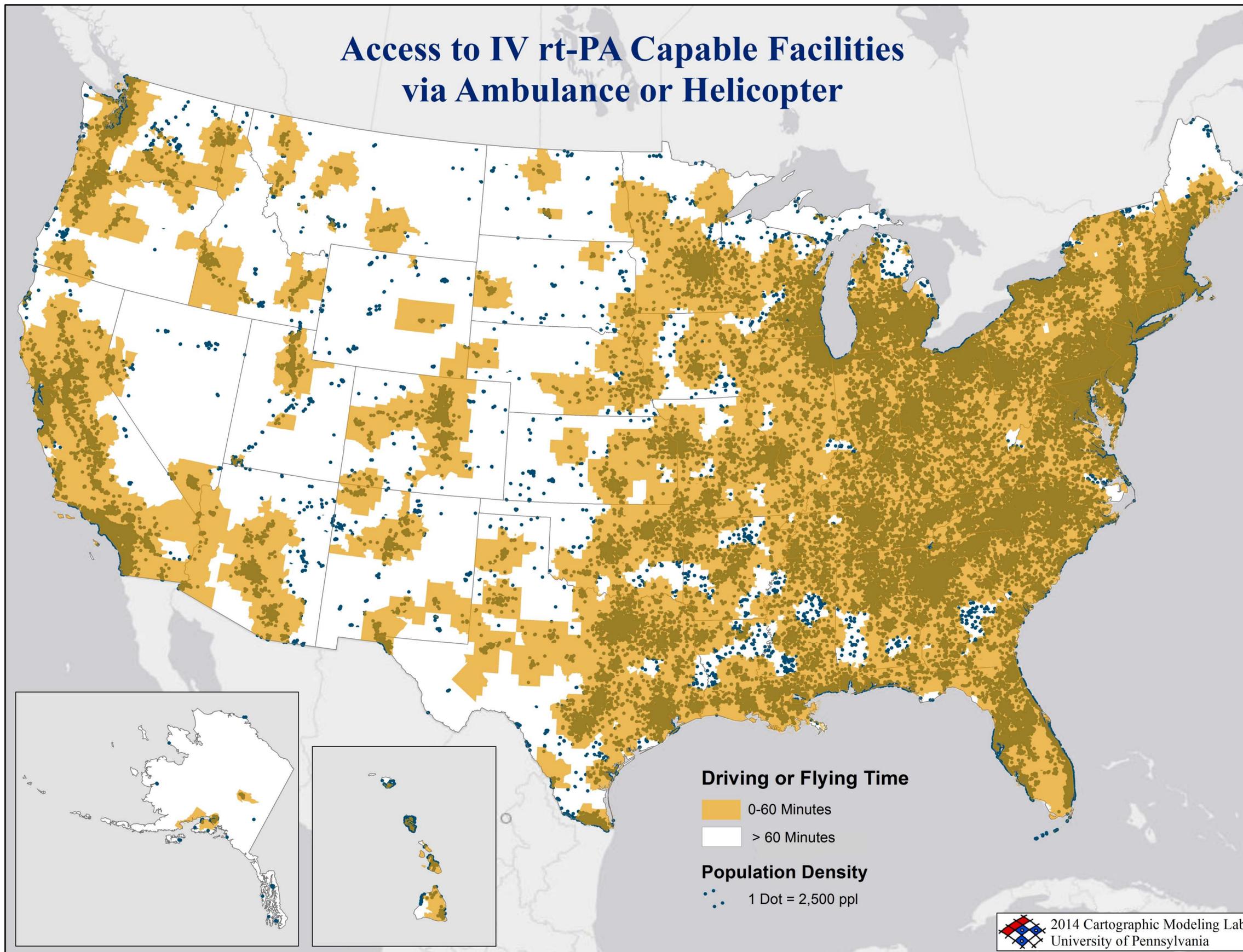
Results - Access

- **By ground:**
 - 81% percent of the US population had 60-minute access to IV rt-PA capable hospitals
 - 66% had access to PSCs
 - 56% had access to endovascular capable hospitals

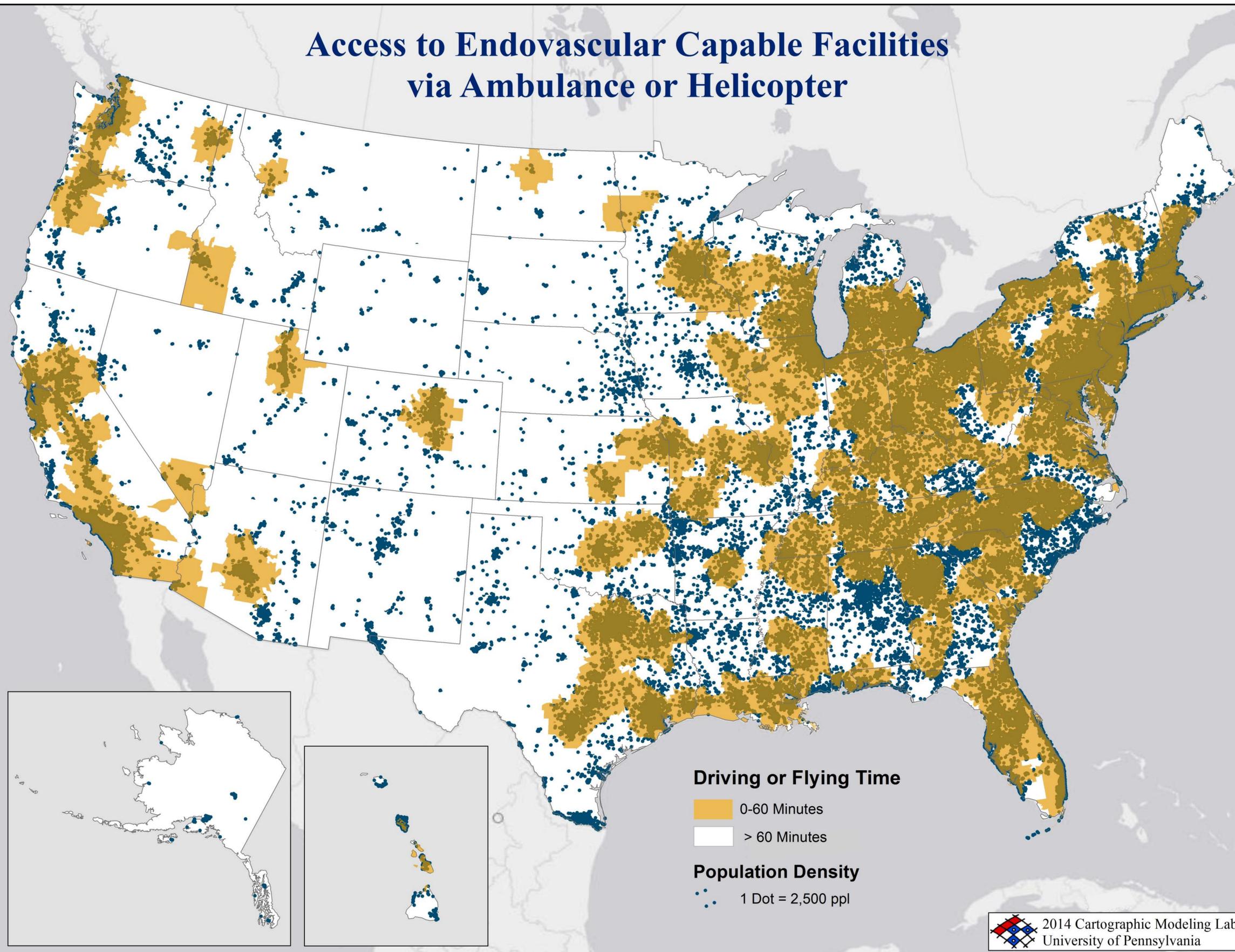
Results - Access

- **By air:**
 - 97% percent had 60-minute access to IV capable hospitals
 - 91% had access to PSCs
 - 85% had access to endovascular capable hospitals

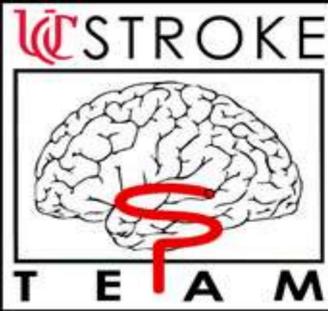
Access to IV rt-PA Capable Facilities via Ambulance or Helicopter



Access to Endovascular Capable Facilities via Ambulance or Helicopter

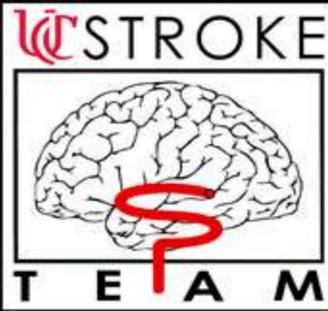


Discussion



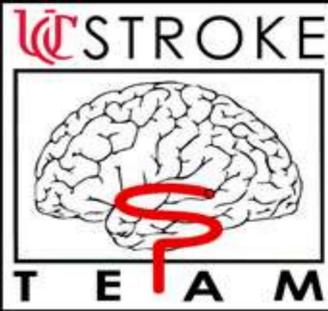
- **Despite adequate geographic access, acute stroke treatment rates in the US remain extremely low**
- **These data should inform the planning and optimization of stroke systems in the US**

Discussion



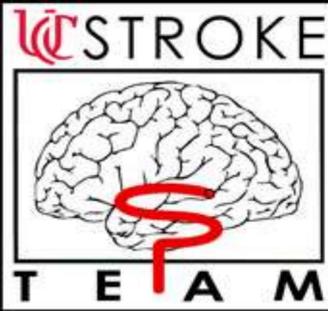
- **Given that one in five US stroke discharges were from hospitals that did not give any rt-PA, there's much room for improvement in the current US system of stroke triage**

Limitations



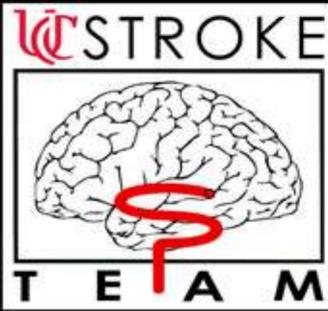
- **Calculations reflect potential access and not true access**
- **Use of an administrative dataset to estimate rt-PA and endovascular thrombectomy treatment rates**
- **Reliability of rt-PA and thrombectomy ICD-9 codes**
- **PSC designation is a continually evolving process**

Conclusion



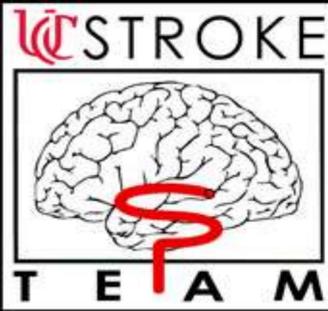
- **To reduce time from symptom onset to an acute stroke capable hospital:**
 - **Public education to ensure 911 called**
 - **EMS should transport quickly to appropriate hospital**
 - **Hospitals that do not provide acute stroke care should have plans in place to facilitate rapid evaluation and treatment by stroke experts**

Conclusion



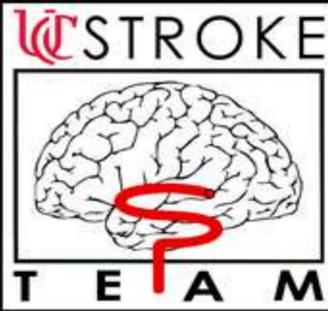
- **Monitoring and reporting of regional stroke outcomes could help to incentivize hospitals and prehospital systems to work together to collaboratively facilitate acute stroke care.**

Addendum



- PSCs were hospitals designated as such as of December 2010
- Of the 327 hospitals, 278 (85%) were PSCs
- Of 821 PSCs, 93% administered at least one dose of IV rt-PA; 23% of non-PSCs administered at least one dose of IV rt-PA.
- Thirty three percent of PSCs performed at least one thrombectomy while 1.5% of non-PSCs performed at least one thrombectomy procedure.

Addendum



- **Crossing state lines was allowed in access calculations**
- **Time to scene and time from scene to hospital were calculated using Euclidian distances**