



# Illinois Stroke Data Report

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**Robynn Cheng Leidig, MPH**  
**CDC Public Health Prevention Service Fellow**  
**Division of Patient Safety and Quality**  
**Illinois Department of Public Health**

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**PROTECTING HEALTH, IMPROVING LIVES**

## Background<sup>1</sup>

- Every year, **795,000+ people** in the US have a stroke (**every 40 seconds**)
- Stroke kills almost **130,000** Americans each year (**every 4 minutes**)
- Stroke is the third leading cause of death in Illinois. In 2010, there were 5,333 deaths in Illinois due to stroke<sup>2</sup>
- About 87% of all strokes are **ischemic strokes**, when blood flow to the brain is blocked



- **Time is of the essence:** Every minute of delay to treatment is said to cost a patient 1.9 million brain cells<sup>3</sup>

## Stroke Hospital Designations<sup>4,5,6</sup>

- The Illinois Department of Public Health (IDPH), Office of Preparedness and Response, Division of Emergency Medical Services and Highway Safety is in charge of designations for stroke centers in Illinois.
- **Acute Stroke Ready Hospital (ASRH)** – are hospitals that can provide emergency stroke care: diagnose, treat, and transport acute stroke patients to a higher level of care as warranted. ASRHs must annually attest their continued compliance to IDPH. These hospitals were previously called “Emergent Stroke Ready Hospitals.”
- **Primary Stroke Center (PSC)** – as certified and defined by a nationally recognized certifying body, PSCs are hospitals that meet standards to support better outcomes for stroke care, including: a dedicated stroke-focused program, staffing by qualified medical professionals trained in stroke care, coordination of post-discharge patient self-care, and other eligibility standards. Certified hospitals may pursue voluntary designation by submitting verification of their PSC certification and a completed IDPH Application for Stroke Center Designation to IDPH.
- **Comprehensive Stroke Center (CSC)** – are hospitals that meet standards to treat the most complex stroke cases which include all components of a PSC plus: advanced imaging techniques, availability of personnel trained in vascular neurology, neurosurgery, and endovascular procedures, 24/7 availability of personnel, imaging, operating room, and endovascular facilities, and other eligibility standards. Currently, there is a proposed law to add CSC as a recognized state designation.

## Hospital Discharge Dataset

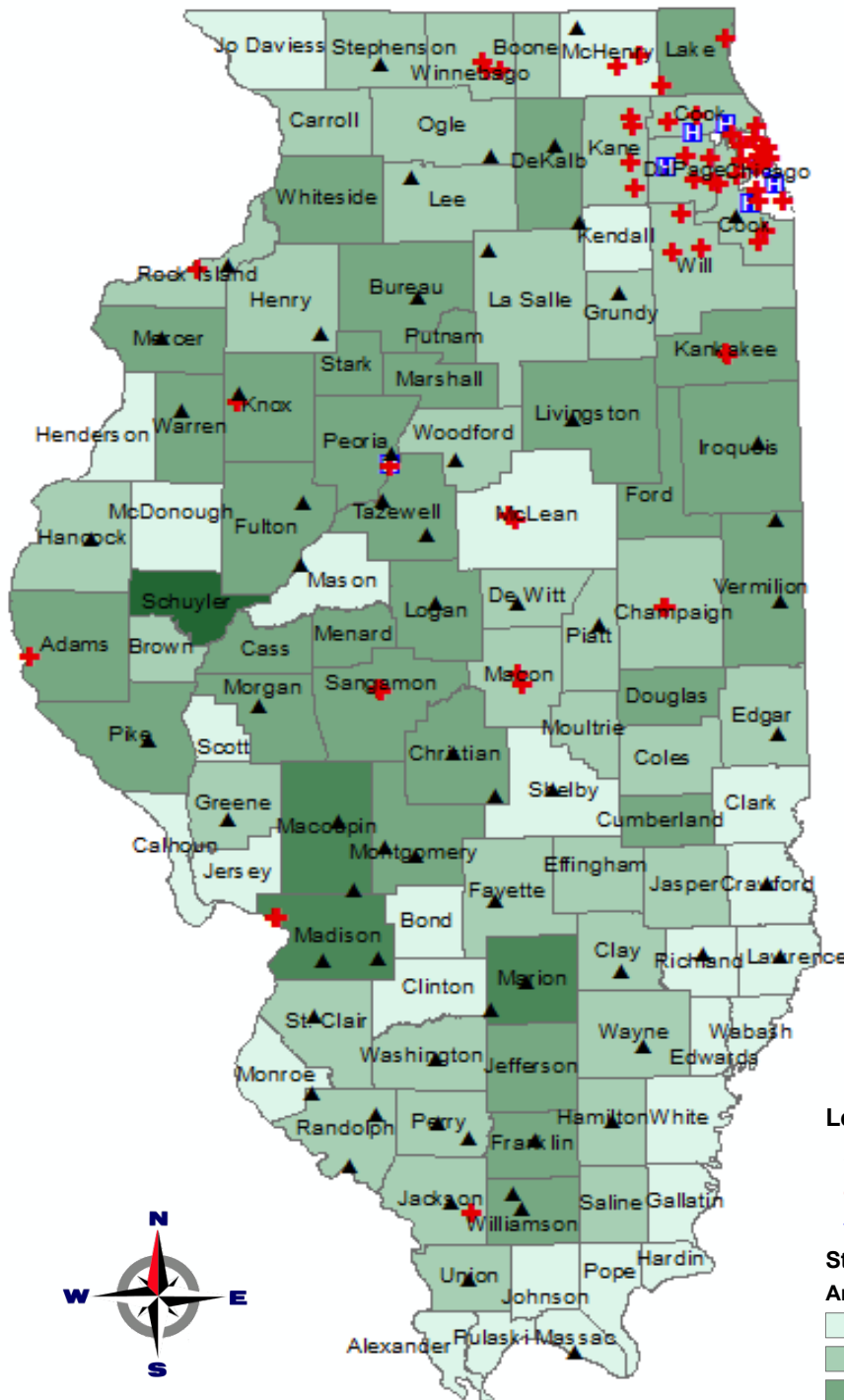
- IDPH Division of Patient Safety and Quality is mandated by law to collect hospital discharge data, which are hospital administrative claims data used for billing. These data are used to analyze quality and safety measures that are published on the Illinois Hospital Report Card, to promote health care transparency.<sup>7</sup>
- The Division also uses these data to implement initiatives for improving the quality, safety, and value of health care, including development of the Illinois Public Health Community Map.<sup>8</sup>

**Illinois Hospital Report Card**  
and Consumer Guide to Health Care

## Stroke Mapping Methodology

- **Stroke counts:** were extracted from the hospital discharge dataset, from Jan 2010 – June 2014 (4.5 years). Only ischemic strokes were included for this analysis, and were defined as the primary diagnosis of hospital discharge (ICD-9 codes 433, 434, 436); transferred patients were removed from the data to avoid duplicate counts. Although stroke counts reflect patients seen in an Illinois hospital, they are based on the patient's home of record.
- **Population counts:** were taken from the 2010 Census, and multiplied by 4.5 to match stroke count data.
- **Stroke rates:** were calculated by dividing stroke counts by population counts and multiplying by 100,000, for an average annual rate.
- **EMS regions:**
  - Stroke and population counts were aggregated by counties or zip codes that fall into a particular EMS region.
  - For EMS regions 1-6, because counties fall neatly into the EMS regions, county stroke counts were aggregated and divided by the county population (multiplied by 4.5), to calculate rates per EMS region 1-6.
  - For EMS regions 7-11, GIS spatial joining was used to assign the center of a zip code to an EMS region, creating a list of unique zip codes for each EMS region 7-11. Zip code counts were aggregated and divided by the EMS region population (based on splitting up county populations and multiplied by 4.5), to calculate rates per EMS region 7-11.
- **Stroke designated hospitals:**
  - A list of the Acute Stroke Ready Hospitals and Primary Stroke Centers was generated from IDPH's EMS website. Although hospitals continue to apply for state-designation, this analysis was done with the publicly available list that was posted on IDPH's website as of June 8, 2015.
  - A list of Comprehensive Stroke Centers, as certified by The Joint Commission, Det Norske Veritas, and The Healthcare Facilities Accreditation Program, was obtained from the American Heart Association, as of July 2015
- **Limitations:**
  - Data from any stroke counts fewer than 10 were suppressed, per patient privacy policies.
  - The stroke count data are limited to Illinois residents who sought care in Illinois; the data do not capture Illinois residents who may have sought care in a different state.
  - EMS regions 7-11 are approximate rates, based on aggregating zip code data. Although assigning zip code centroids to an EMS region avoids double-counting zip codes, these assigned zip codes may not completely match an EMS region.
  - Stroke-designations used in this report are from an IDPH list as of June 8, 2015, which may not have been the most current list of stroke-designated hospitals.

**Stroke average annual rates (per 100,000, Jan. 2010 – June 2014) and designated stroke hospitals, by patient home county**



**Interpretation:**

- The highest stroke rates in Illinois based on patient home address are in Marion, Madison, Macoupin, and Schuyler counties
- The highest concentration of PSC and Comprehensive Stroke Centers are in Northeast Illinois, with few PSCs in Southern Illinois
- See Appendix A for table of stroke rates and hospital designations by county



**Legend**

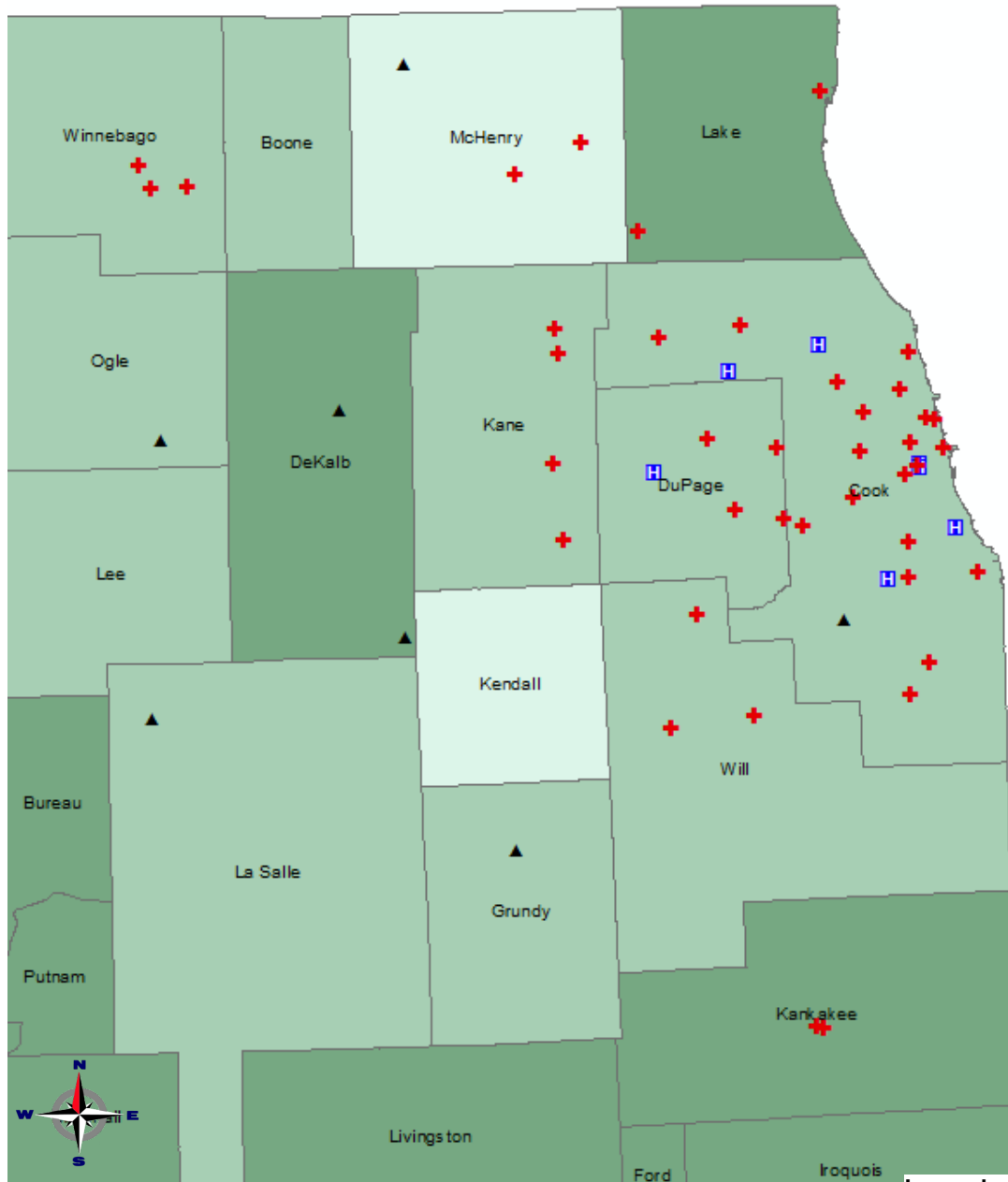
- # ASRH designated stroke centers\_6.8.15
- G PSC designated stroke centers\_6.8.15
- v Comprehensive stroke centers\_Aug

**Stroke\_counties**

**Annual\_Rate**

3 - 104
105 - 181
182 - 492
493 - 3114
3115 - 7345

**Stroke average annual rates (per 100,000, Jan. 2010 – June 2014) and designated stroke hospitals, by patient home county—close-up of Northeast Illinois**



**Interpretation:**

- The highest concentration of PSC and Comprehensive Stroke Centers are in Cook and DuPage counties, although the highest stroke rates in Northeast Illinois are in surrounding areas—Lake, DeKalb, and Kankakee counties

**Legend**

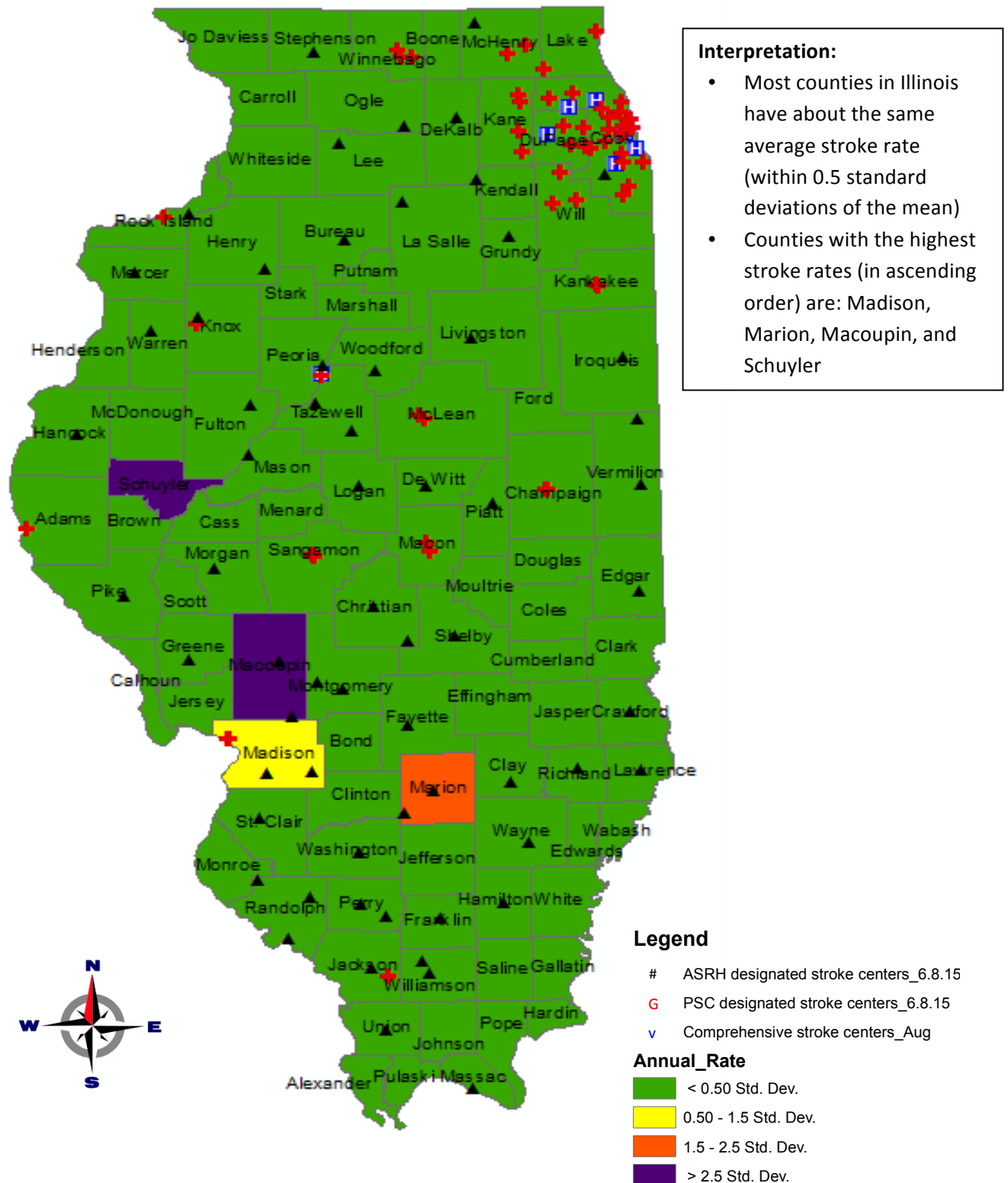
- # ASRH designated stroke centers\_6.8.15
- G PSC designated stroke centers\_6.8.15
- v Comprehensive stroke centers\_Aug

**Stroke\_counties**

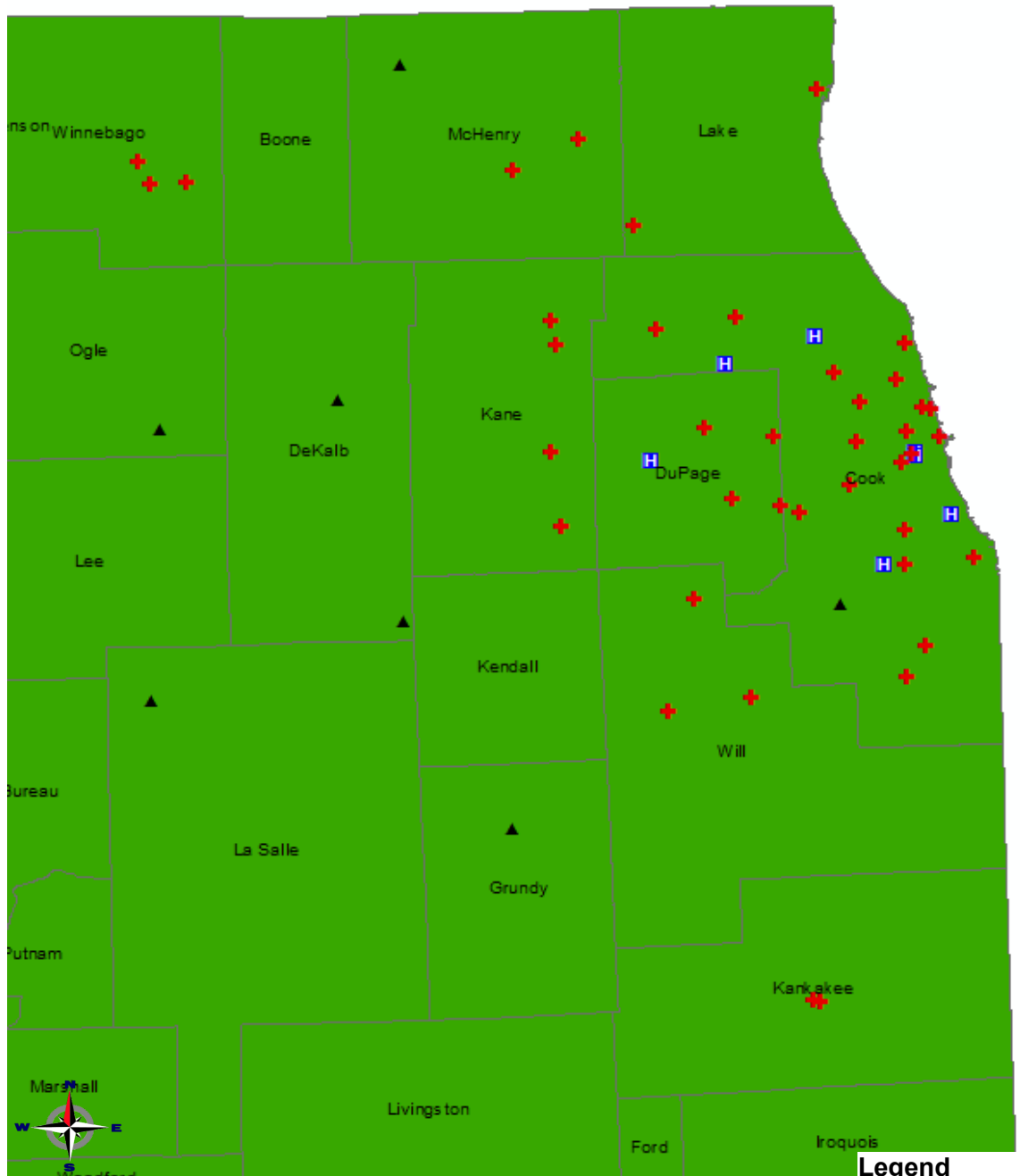
**Annual\_Rate**

- 3 - 104
- 105 - 181
- 182 - 492
- 493 - 3114
- 3115 - 7345

Stroke rates (per 100,000, Jan. 2010 – June 2014) and designated stroke hospitals, by patient home county, compared to state mean rate



Stroke rates (per 100,000, Jan. 2010 – June 2014) and designated stroke hospitals, by patient home county, compared to state mean rate—close-up of Northeast Illinois



**Interpretation:**

- All of the counties in Northeast Illinois have a stroke rate similar to the state-wide average stroke rate (within 0.5 standard deviations)

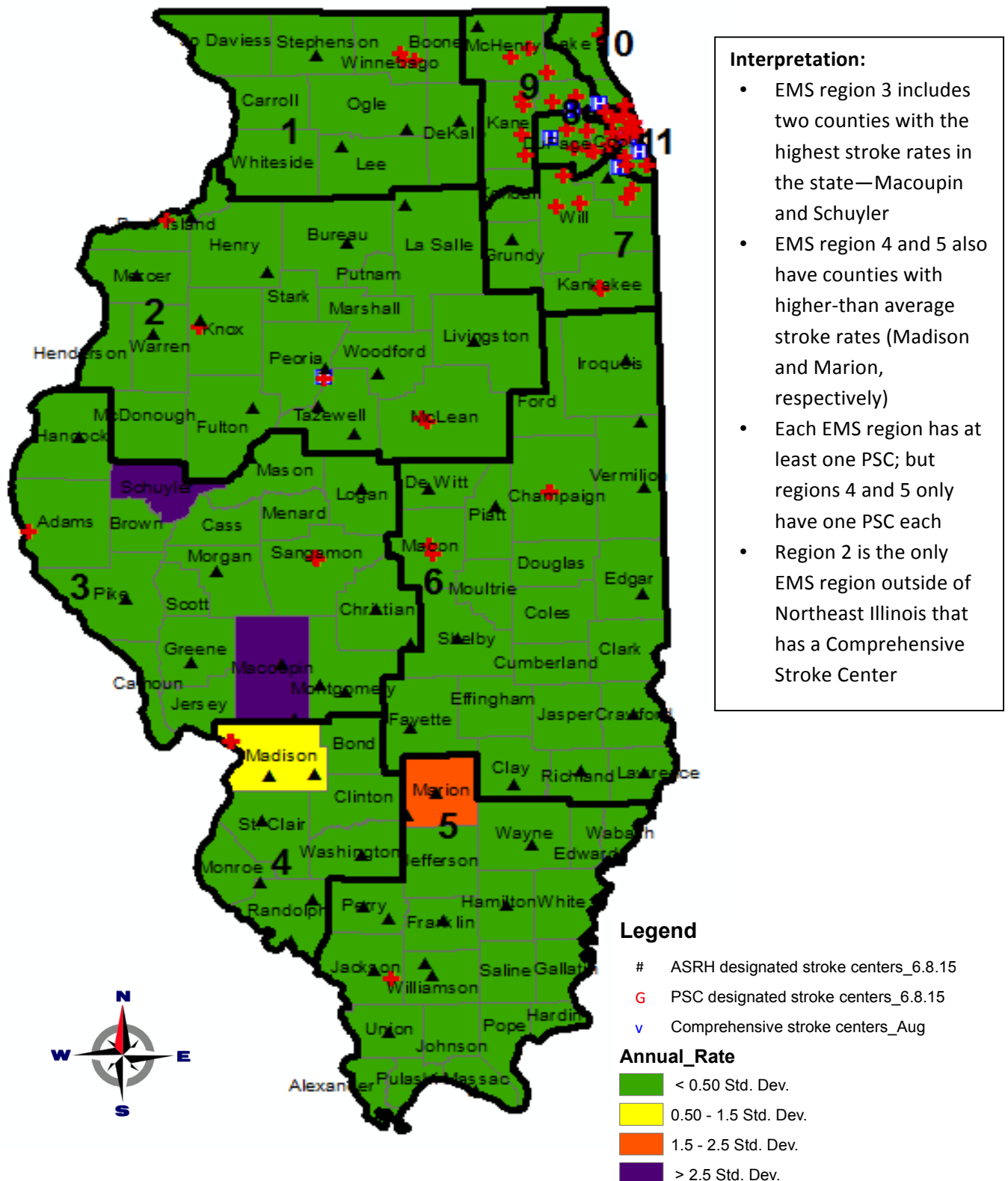
**Legend**

- # ASRH designated stroke centers\_6.8.1
- G PSC designated stroke centers\_6.8.15
- v Comprehensive stroke centers\_Aug

**Annual\_Rate**

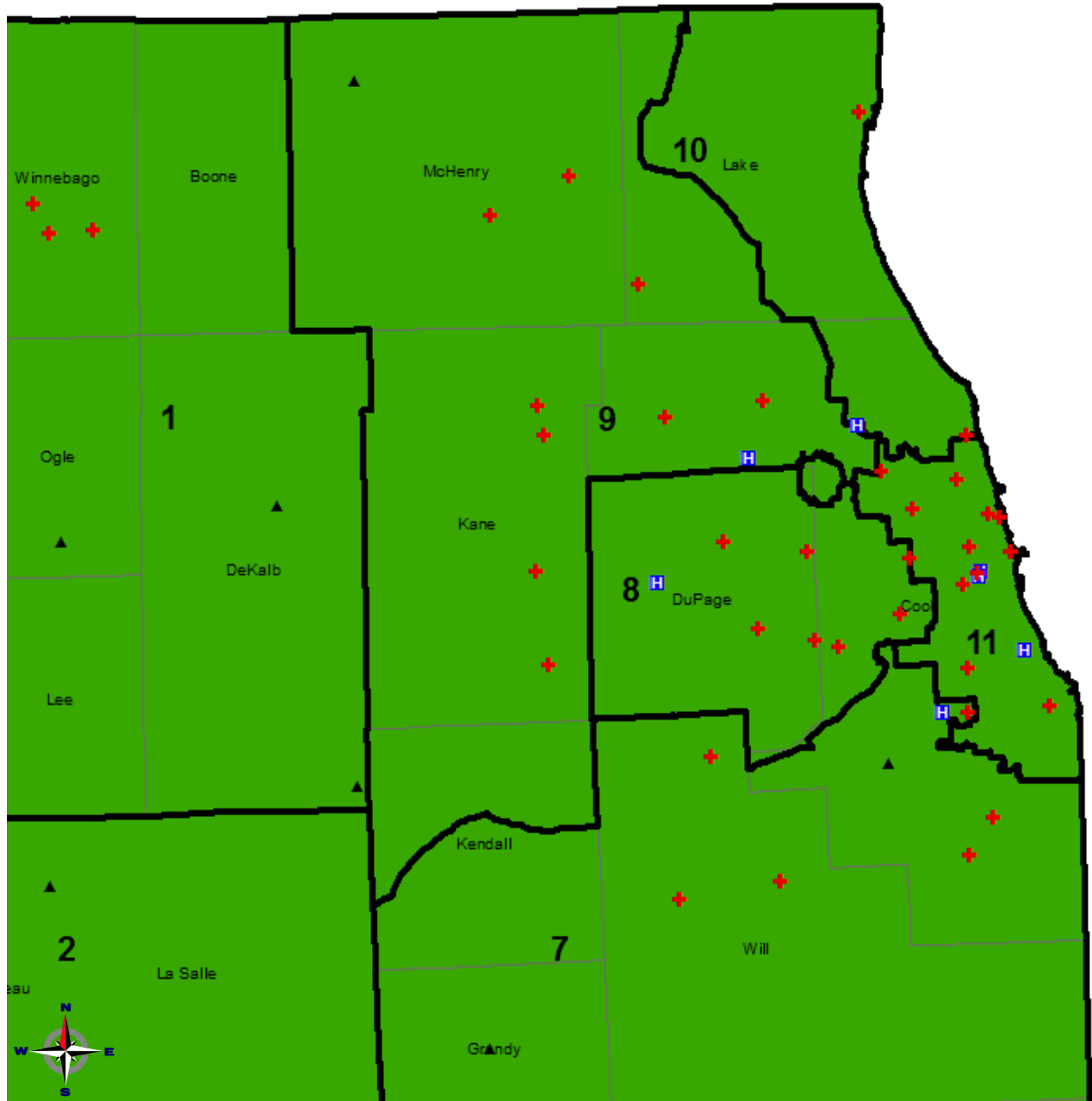
- < 0.50 Std. Dev.
- 0.50 - 1.5 Std. Dev.
- 1.5 - 2.5 Std. Dev.
- > 2.5 Std. Dev.

Stroke rates (per 100,000, Jan. 2010 – June 2014) and designated stroke hospitals, by patient home county and EMS region, compared to state mean rate





Stroke rates (per 100,000, Jan. 2010 – June 2014) and designated stroke hospitals, by patient home county and EMS region, compared to state mean rate—close-up of Northeast Illinois



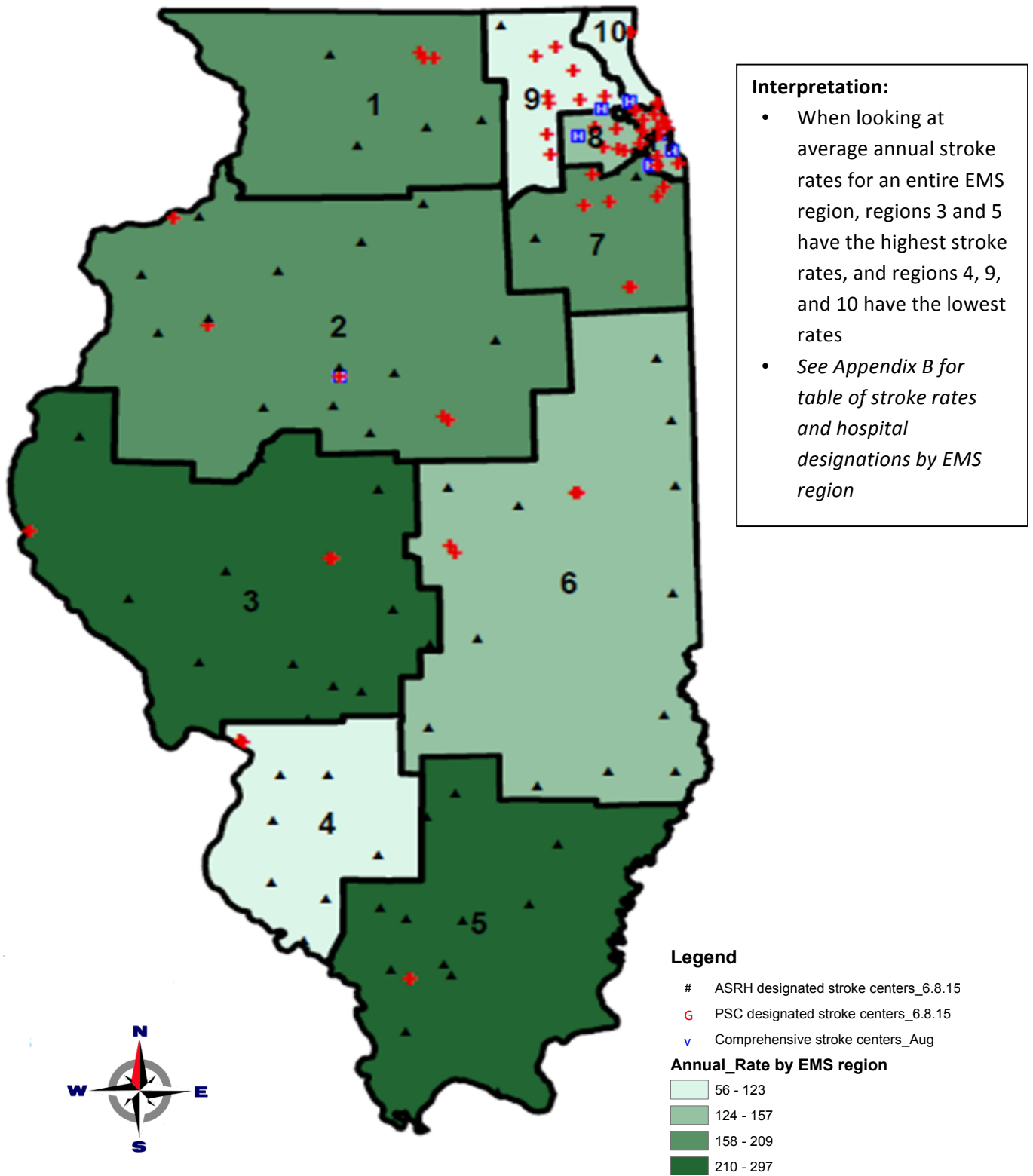
**Interpretation:**

- Most of the Comprehensive Stroke Centers in Illinois are concentrated around EMS Region 11 (Chicago area).
- EMS Regions 7- 11 have more PSCs than ASRH s, whereas EMS Regions 1-6 have more ASRH s than any other type of stroke designated centers.

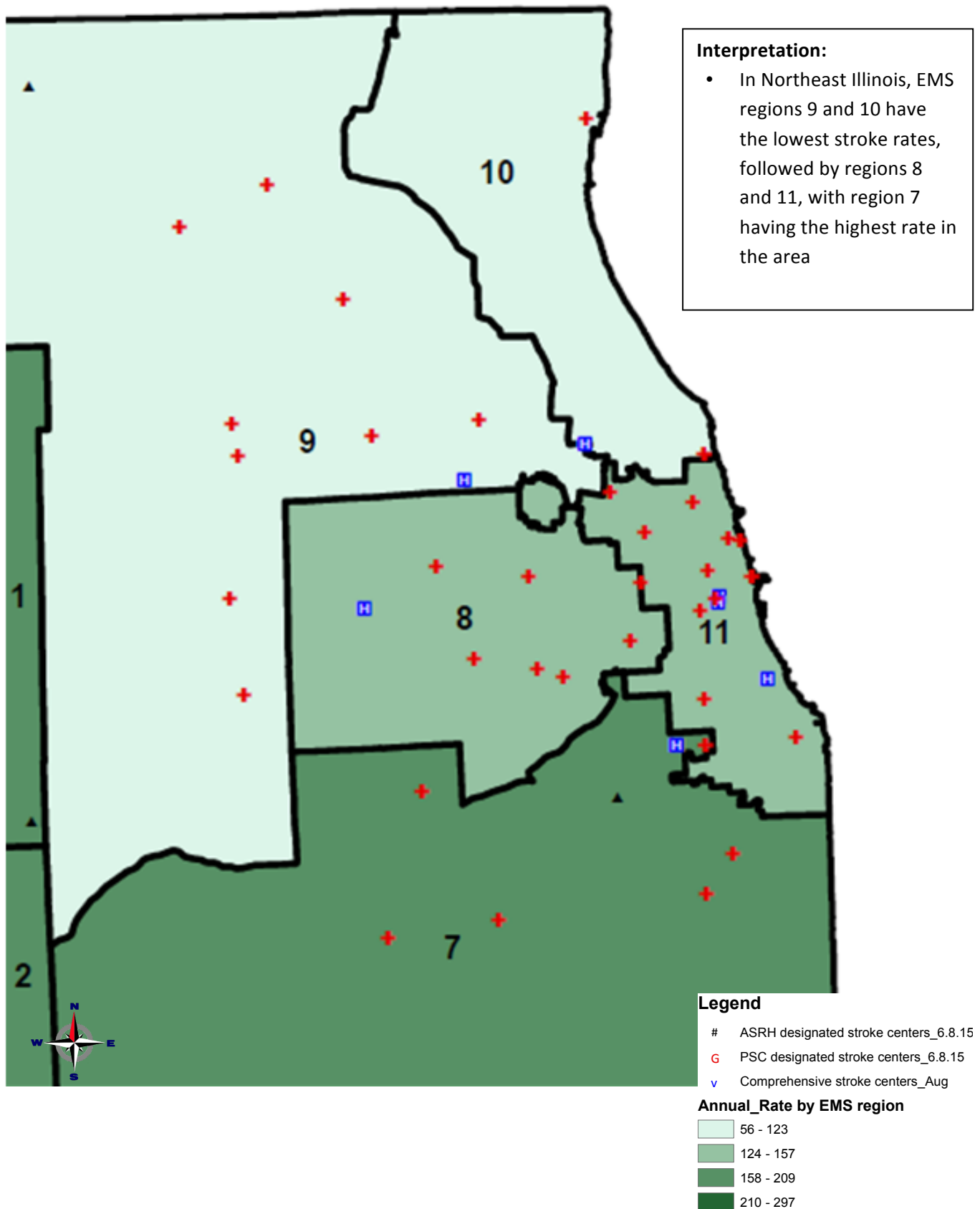
**Legend**

- # ASRH designated stroke centers\_6.8.15
  - G PSC designated stroke centers\_6.8.15
  - v Comprehensive stroke centers\_Aug
- Annual\_Rate**
- < 0.50 Std. Dev.
  - 0.50 - 1.5 Std. Dev.
  - 1.5 - 2.5 Std. Dev.
  - > 2.5 Std. Dev.

Stroke rates (per 100,000, Jan. 2010 – June 2014) and designated stroke hospitals, by patient home EMS region



Stroke rates (per 100,000, Jan. 2010 – June 2014) and designated stroke hospitals, by patient home EMS region—close-up of Northeast Illinois



### Next Steps

- Data and maps should be shared publicly and with appropriate stakeholders for enhanced EMS and stroke planning, coordination, and education.
- Non-designated stroke hospitals may want to consider applying for designation status, especially in high stroke rate areas.
- IDPH will continue to update the maps as more facilities become stroke-designated and as laws are passed.
- Suggested further analyses are:
  - Incorporating stroke outcomes data (e.g. from vital records)
  - Analyzing patient demographics and risk factors
  - Comparing to other stroke resources in the area (e.g. TIAs)
  - Including ICD-9 diagnoses codes for hemorrhagic strokes
  - Incorporating data from Illinois residents receiving care in other states
  - Calculating and comparing to 2004-2008 stroke rates, which were prior to legislative changes in stroke designations.

### References

1. <http://www.stroke.org/understand-stroke/recognizing-stroke/signs-and-symptoms-stroke>
2. <http://www.idph.state.il.us/heartstroke/>
3. <http://www.jems.com/articles/print/volume-37/issue-6/patient-care/time-brain-prehospital-stroke-treatment.html>
4. <http://dph.illinois.gov/topics-services/emergency-preparedness-response/ems/stroke-program>
5. <http://www.ihatoday.org/uploadDocs/1/strokelawupdate2014.pdf>
6. [http://www.heart.org/HEARTORG/HealthcareResearch/HospitalAccreditationCertification/PrimaryStrokeCenterCertification/Primary-Stroke-Center-Certification\\_UCM\\_439155\\_SubHomePage.jsp](http://www.heart.org/HEARTORG/HealthcareResearch/HospitalAccreditationCertification/PrimaryStrokeCenterCertification/Primary-Stroke-Center-Certification_UCM_439155_SubHomePage.jsp)
7. <http://www.healthcarereportcard.illinois.gov/>
8. <http://www.healthcarereportcard.illinois.gov/maps>

### Appendix A. Average annual stroke rates in ascending order, and number and type of stroke-designated hospitals, by county

County	Average Annual Stroke Rate per 100,000	# of ASRH	# of PSC	# of CSC
McLean	3	0	2	0
Shelby	4	1	0	0
Alexander	5	0	0	0
Monroe	28	0	0	0
McDonough	29	0	0	0
Jo Daviess	54	0	0	0
Massac	54	1	0	0
Calhoun	57	0	0	0
White	58	0	0	0
Scott	60	0	0	0

McHenry	62	1	2	0
Henderson	64	0	0	0
Pulaski	65	0	0	0
Clark	65	0	0	0
Gallatin	68	0	0	0
Hardin	77	0	0	0
Lawrence	79	1	0	0
Kendall	84	0	0	0
Jersey	86	0	0	0
Crawford	90	1	0	0
Bond	90	0	0	0
Richland	92	1	0	0
Wabash	93	0	0	0
Pope	94	0	0	0
Mason	97	1	0	0
Edwards	102	0	0	0
Clinton	104	0	0	0
Johnson	104	0	0	0
La Salle	112	1	0	0
Kane	114	0	4	0
Macon	117	0	2	0
Randolph	117	3	0	0
Washington	118	1	0	0
Fayette	119	1	0	0
Edgar	126	1	0	0
Will	128	0	3	0
De Witt	131	1	0	0
Champaign	131	0	2	0
Carroll	133	0	0	0
DuPage	139	0	4	1
Henry	139	1	0	0
Woodford	140	1	0	0
Union	140	1	0	0
Jackson	141	1	1	0
Perry	143	2	0	0
Wayne	146	1	0	0
Boone	147	0	0	0
Jasper	149	0	0	0
Cook	149	1	20	6
Hamilton	150	1	0	0
Rock Island	150	1	1	0
Ogle	155	1	0	0
Hancock	159	1	0	0
Effingham	162	0	0	0

Clay	164	1	0	0
Piatt	169	1	0	0
Stephenson	171	1	0	0
Brown	173	0	0	0
Grundy	174	1	0	0
Lee	175	1	0	0
Winnebago	176	0	3	0
St. Clair	178	1	0	0
Moultrie	178	0	0	0
Greene	179	1	0	0
Coles	181	0	0	0
Saline	181	0	0	0
Peoria	185	1	1	1
Menard	185	0	0	0
Livingston	188	1	0	0
Cumberland	189	0	0	0
Tazewell	189	2	0	0
Warren	191	1	0	0
Cass	192	0	0	0
Kankakee	193	0	2	0
Williamson	193	2	0	0
Stark	193	0	0	0
Logan	196	1	0	0
Whiteside	196	0	0	0
Putnam	196	0	0	0
Lake	198	0	2	0
Adams	205	0	1	0
Montgomery	205	2	0	0
Morgan	206	1	0	0
Jefferson	207	0	0	0
Pike	208	1	0	0
Bureau	210	1	0	0
Ford	211	0	0	0
Mercer	215	1	0	0
Fulton	218	1	0	0
Vermilion	228	2	0	0
Knox	239	1	1	0
Christian	243	2	0	0
Douglas	245	0	0	0
Iroquois	247	1	0	0
DeKalb	254	2	0	0
Marshall	256	0	0	0
Franklin	267	1	0	0
Sangamon	492	0	2	0

Madison	1386	2	2	0
Marion	1622	2	0	0
Macoupin	3114	2	0	0
Schuyler	7345	0	0	0

**Appendix B. Average annual stroke rates and number and type of stroke-designated hospitals by EMS region**

**In numerical order of EMS Region:**

EMS Region	Average Annual Stroke Rate per 100,000	# of ASRH	# of PSC	# of CSC
1	174	5	3	0
2	209	13	5	1
3	297	12	3	0
4	56	7	2	0
5	294	12	1	0
6	152	12	4	0
7	163	2	8	1
8	157	0	7	1
9	98	1	9	2
10	123	0	2	0
11	149	0	11	3

**In ascending order of stroke rate:**

EMS Region	Average Annual Stroke Rate per 100,000	# of ASRH	# of PSC	# of CSC
4	56	5	3	0
9	98	13	5	1
10	123	12	3	0
11	149	7	2	0
6	152	12	1	0
8	157	12	4	0
7	163	2	8	1
1	174	0	7	1
2	209	1	9	2
5	294	0	2	0
3	297	0	11	3