Community Education in Stroke

9/27/18

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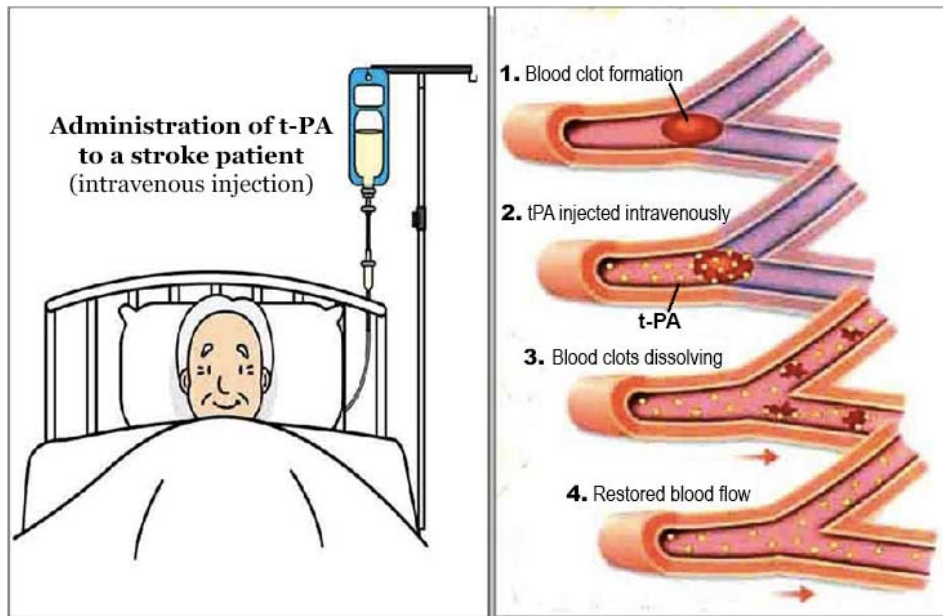Northwestern University

Disclosures

- NINDS StrokeNet RCC PI (U24-NS107233)
- AHRQ E-SPEED PI (R18-HS025359)
- PCORI CEERIAS PI (AD-1310-07237)

Outline

- **Background**
- Barriers to stroke preparedness
- Prior community interventions
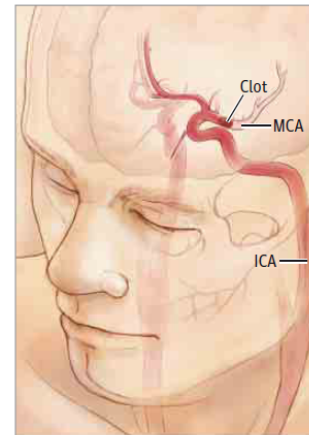- CEERIAS study
- Future directions

Acute Stroke Treatments

tPA

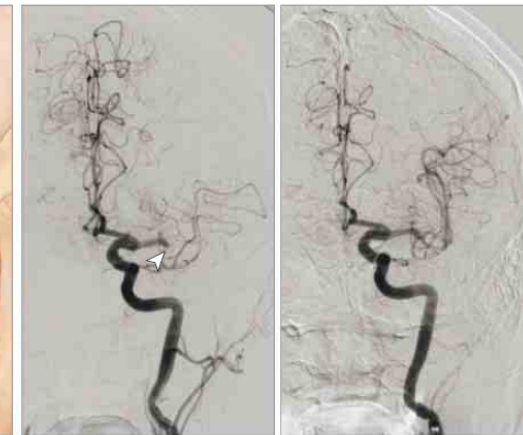**Thrombectomy**
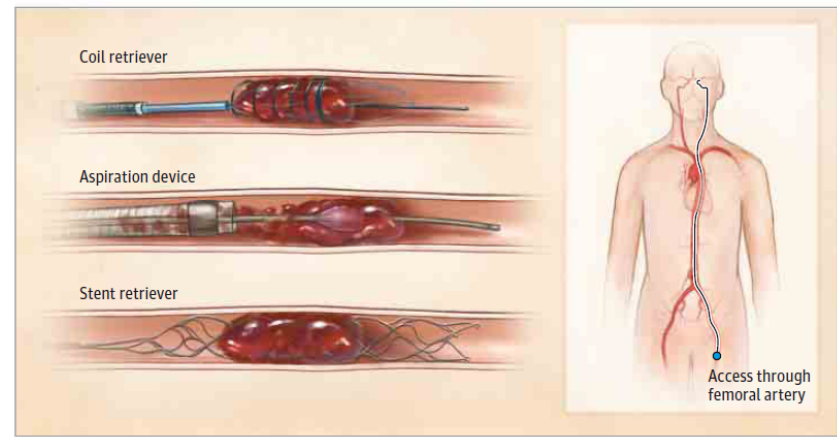
Potent Effects on Outcomes

20% absolute benefit (NNT 5)

Legend: Good outcome, sICH

Categories: EVT, IVT/SOC
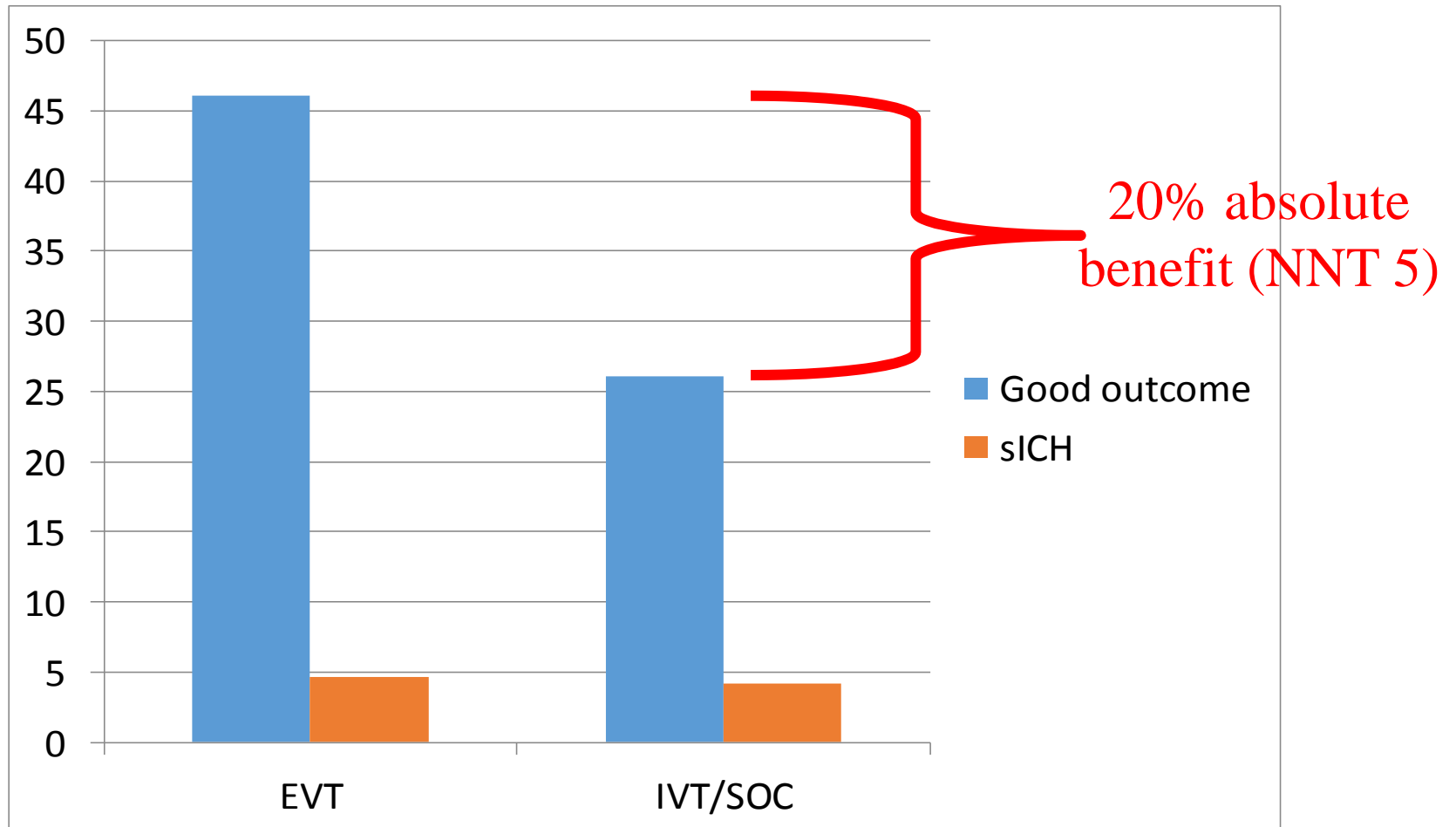
Under-utilization Nationwide

Schwamm LS Stroke 2014; Menon B Stroke 2015; Smith EE CQCO 2018

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Time Dependence

Saver JL Lancet 2010; Saver JL JAMA 2016
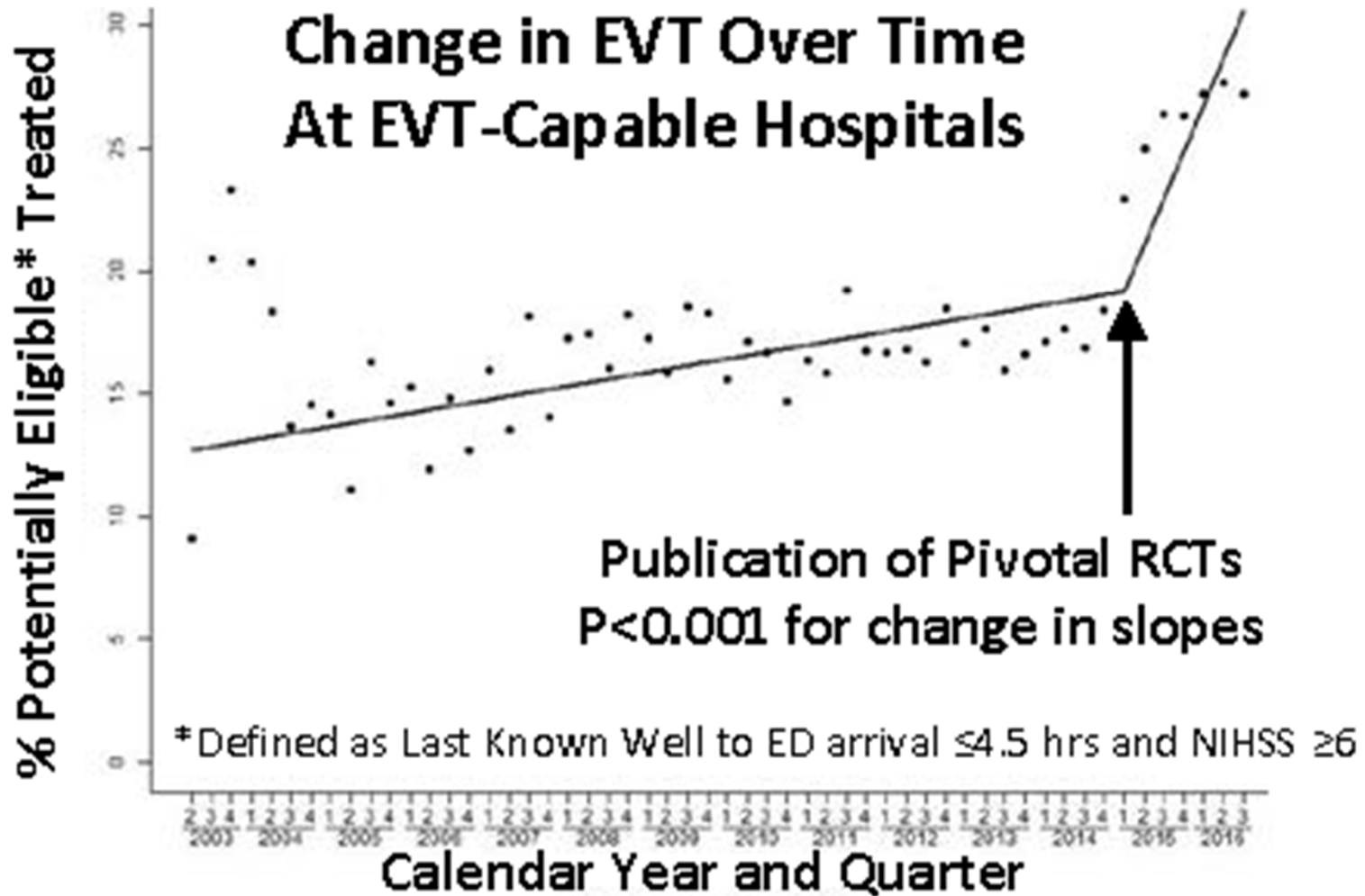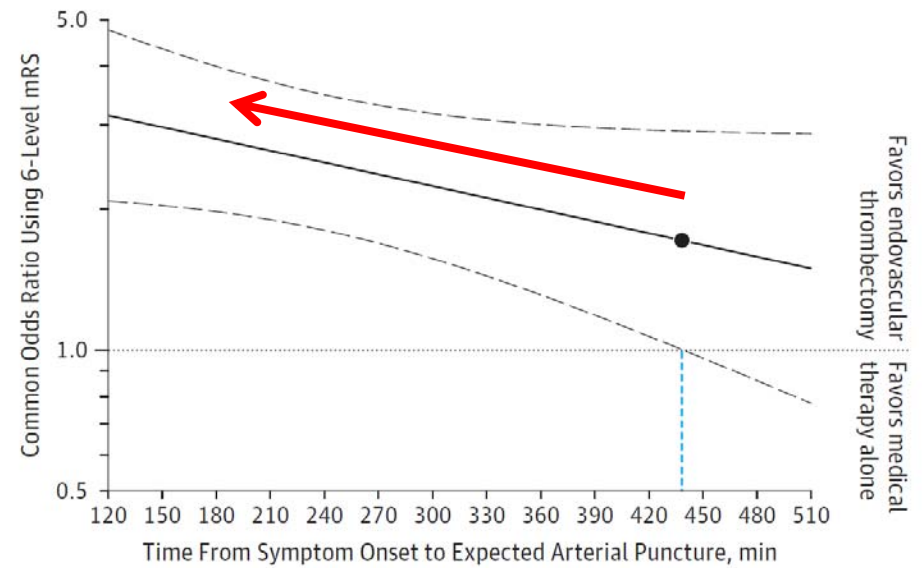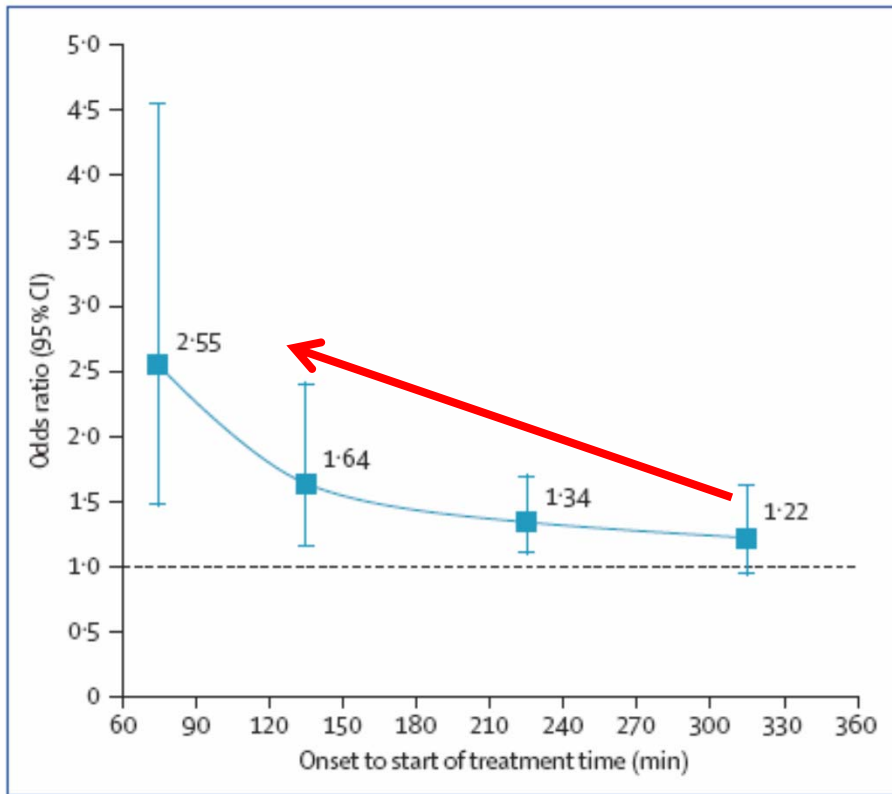
Impact of Optimized Stroke Care

Improved access and efficiency of patient care

Increased use of acute stroke therapies

Fewer peri-stroke complications

Reduced morbidity and mortality

Improved long-term outcomes

Reduced health care costs
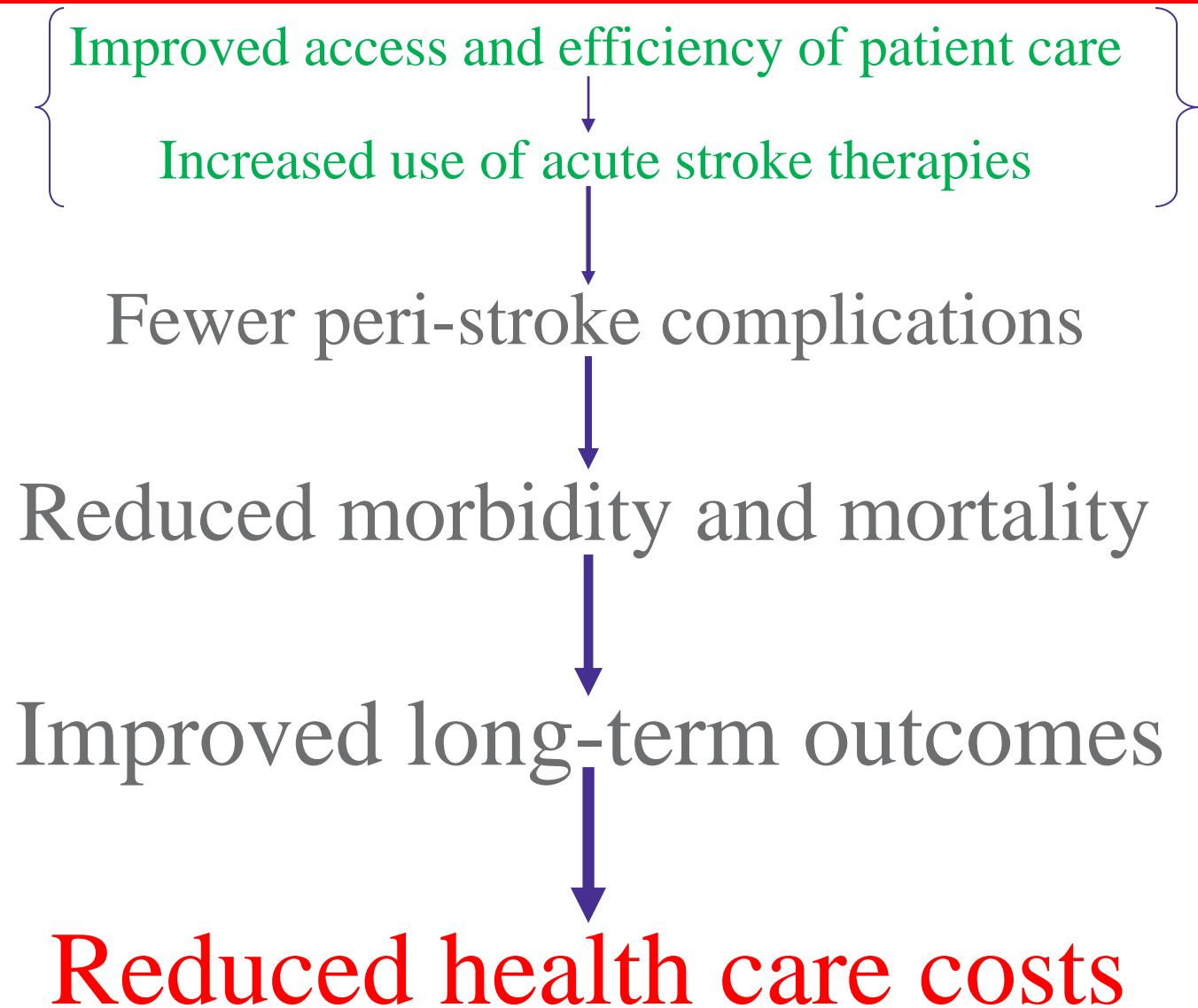
Barriers to Acute Stroke Delivery

- **Community**
  - ➢ Delayed recognition of stroke symptoms
  - ➢ Reluctance to call EMS
- **Prehospital**
  - ➢ Geographic access to stroke centers
  - ➢ Screening errors
- **Hospital**
  - ➢ Process errors and delays
  - ➢ Resource limitations
- **Patient**
  - ➢ Refusal and contraindications
  - ➢ Vascular access

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Improving Access: Stroke Centers

Comprehensive Stroke Center

Primary Stroke Center

Acute Stroke Ready Hospital
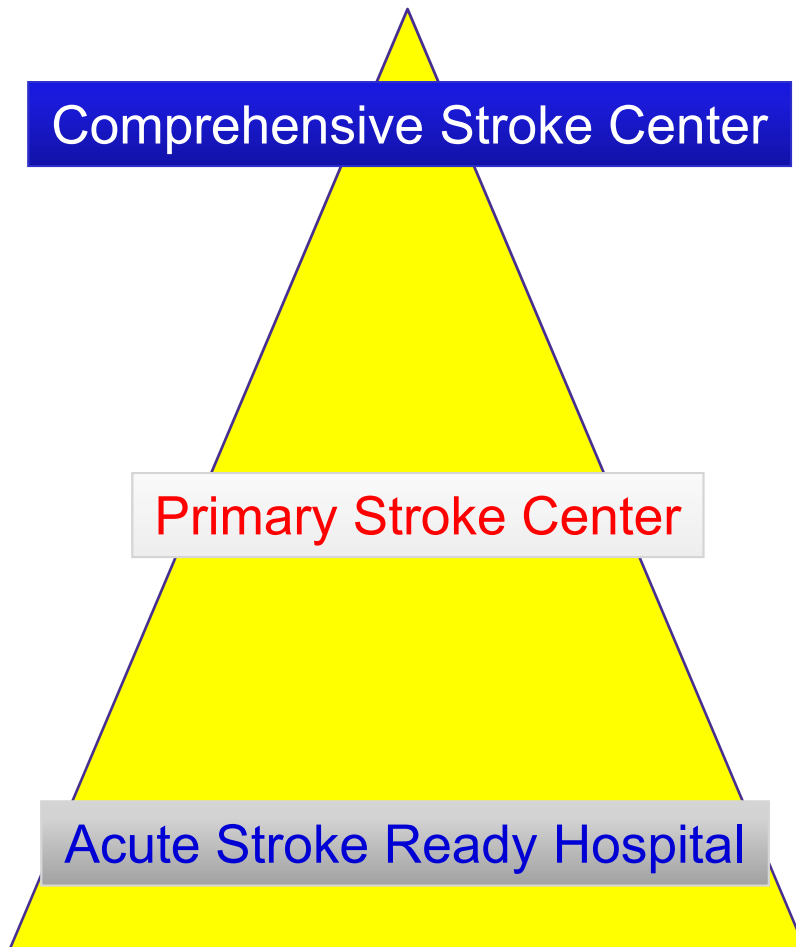
Academic medical center;
Tertiary care facility; EVT; NICU;
neurosurgery

Wide range of hospitals;
standard stroke care; stroke unit;
use TPA

Rural hospitals; basic care;
drip and ship;
use tele-technologies

Access to Stroke Centers in US

Reducing Hospital Delays

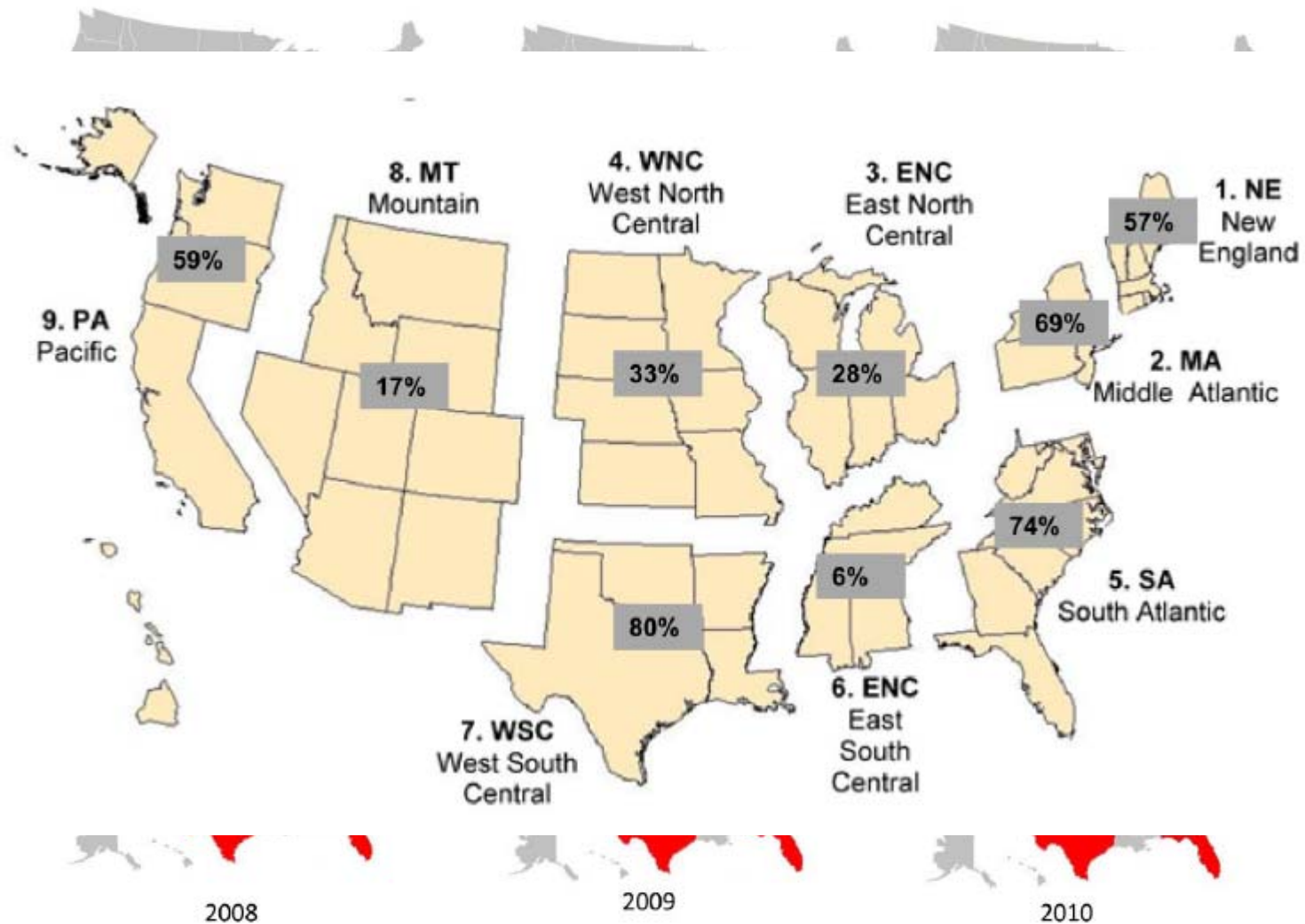|	Study Period		Adjusted Odds Ratio (95% CI)	P Value
	Preintervention (n = 27 319)	Postintervention (n = 43 850)		
tPA DTN time, median (IQR), min	77 (60-98)	67 (51-87)		< .001
tPA DTN time ≤ 60 min, % (95% CI)	26.5 (26.0-27.1)	41.3 (40.8-41.7)		< .001
End of each period	29.6 (27.8-31.5)	53.3 (51.5-55.2)		< .001
Improvement in tPA DTN time ≤ 60 min, % per year (95% CI)	1.36 (1.04-1.67)	6.20 (5.58-6.78)		< .001
In-hospital all-cause mortality, %	9.93	8.25	0.89 (0.83-0.94)	< .001
Discharge to home, %	37.6	42.7	1.14 (1.09-1.19)	< .001
Independent ambulatory status, %	42.2	45.4	1.03 (0.97-1.10)	.31
Symptomatic intracranial hemorrhage within 36 h, %	5.68	4.68	0.83 (0.76-0.91)	< .001

Time in Calendar Quarter and Year

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Barriers to Acute Stroke Delivery

Received tPA 4%

Viable exclusion 12%

Hospital failure 7%

Overnight stroke 8%

Patient delay 69%

Douglas VC. Neurology 2005

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Stroke Chain of Survival
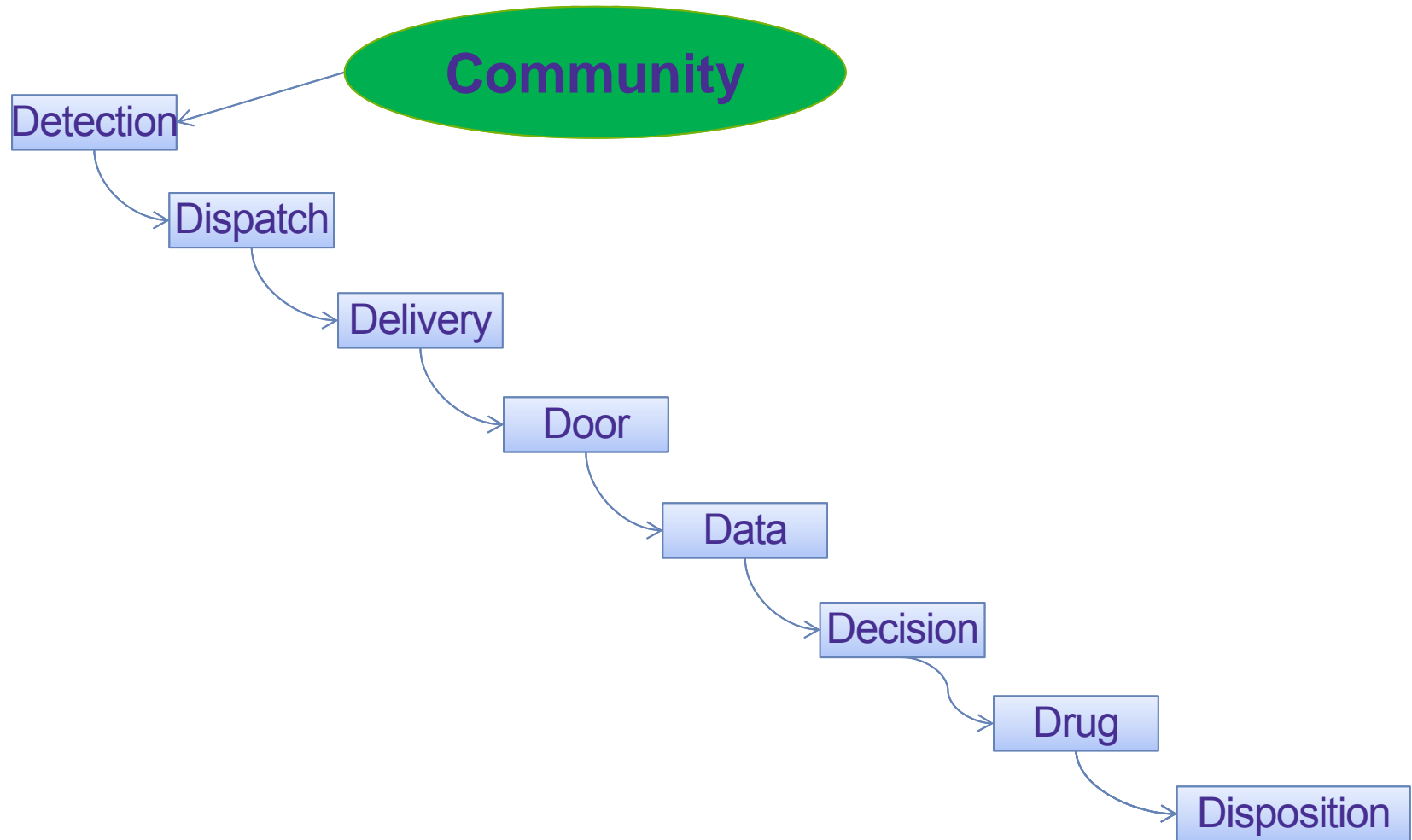
Outline

- Background
- **Barriers to stroke preparedness**
- Prior community interventions
- CEERIAS study
- Future directions

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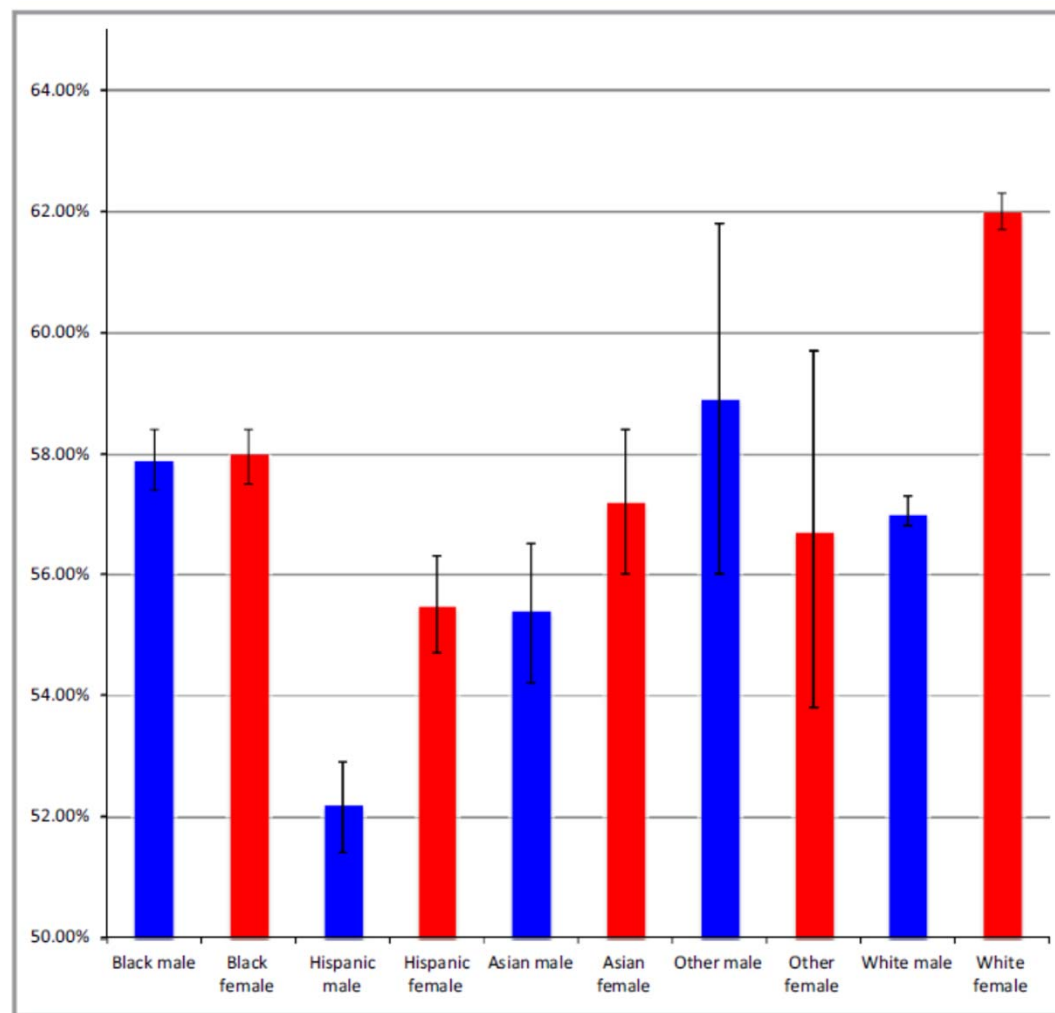# EMS Use for Stroke

- 90% of 9-1-1 activations for stroke are made by bystanders
- 60% of stroke patients arrive by EMS
  - ➢ Less among minorities, men

Wolters 2015, Wein 2000; GWTG group 2015

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Stroke Preparedness

- Pre-requisites to calling 911
  - Knowledge
  - Attitudes/perceptions of risks/benefits
  - Social and cultural norms
  - Mistrust of healthcare
  - Self-efficacy

- Prior studies have largely failed to translate knowledge into behavior
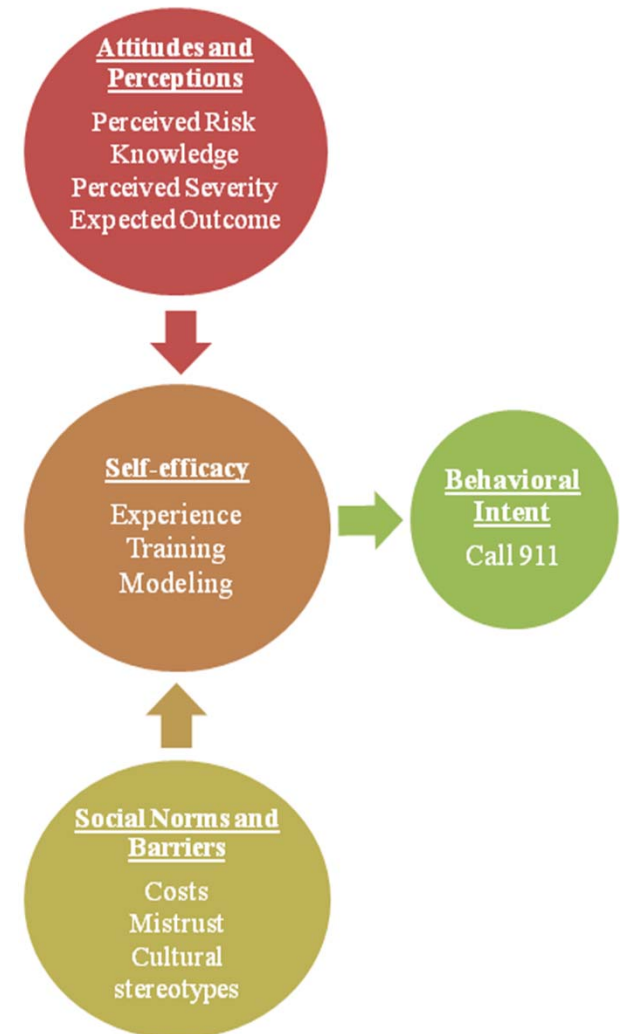
Stroke Knowledge

- Knowledge of risk factors, warning signs, and treatments lower among minorities
  - Literacy, education, language
  - Not improving or minimally improving over time
 - Despite public education campaigns

Table 3. Comparison of Knowledge of Stroke Warning Signs and Risk Factors Between Survey Years, Greater Cincinnati/Northern Kentucky Population

	1995 (N=1880)	2000 (N=2173)	2005 (N=2156)
No. of correct risk factors known			
0	606 (32.2%)	620 (28.5%)	624 (28.9%)
1	827 (44.0%)	899 (41.4%)	829 (38.4%)
2	398 (21.2%)	571 (26.3%)	600 (27.8%)
3	49 (2.6%)	83 (3.8%)	103 (4.8%)
No. of correct warning signs known			
0	845 (45.0%)	689 (31.7%)	689 (32.0%)
1	612 (32.6%)	606 (27.9%)	575 (26.7%)
2	321 (17.1%)	618 (28.4%)	553 (25.6%)
3	102 (5.4%)	260 (12.0%)	339 (15.7%)

Kleindorfer 2009

Other Barriers

- ## Low perceived risk
  - ➤ "I have things under control and am not at risk"
- ## Low perceived severity
  - ➤ "it will go away or get better"
  - ➤ "it's not that bad to go to the hospital"
- ## Socio-cultural factors
  - ➤ Mistrust of healthcare
  - ➤ Fatalism/acceptance
  - ➤ Belief in alternative treatments
  - ➤ Costs/financial burdens
- ## Low self-efficacy
  - ➤ "there is nothing I can do about it"
  - ➤ "I need to check with someone else first"
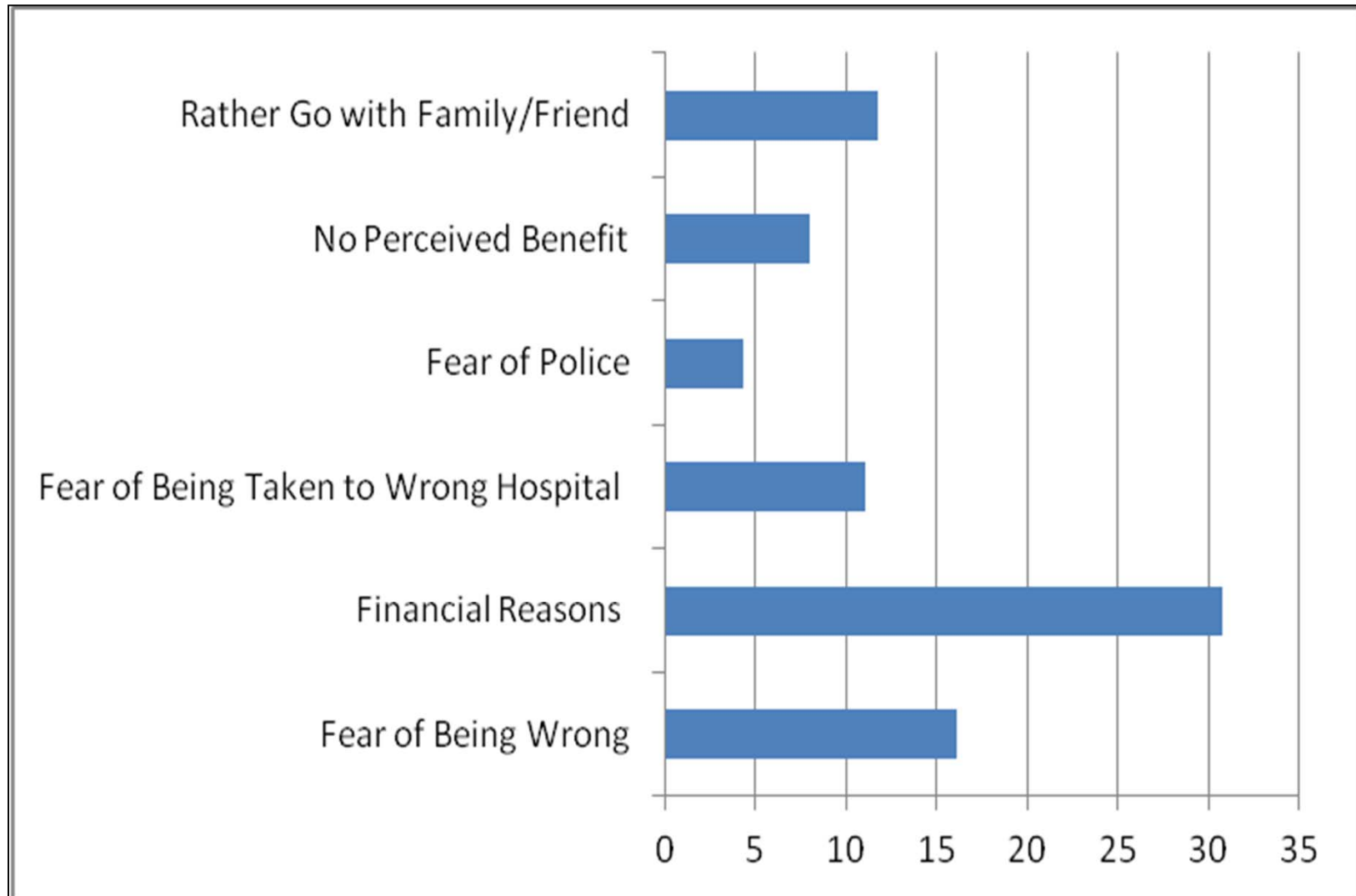
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Barriers to Calling 9-1-1

Outline

- Background
- Barriers to stroke preparedness
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- CEERIAS study
- Future directions

Mass Media

- ## Mass media campaigns
  - ➢ FAST mnemonic most commonly used
  - ➢ National, regional, and local initiatives around the globe
  - ➢ Some were purely public but others mixed professional (paramedics, doctors, nurses) and public education
  - ➢ Modest temporary effects in knowledge increase and some showed increase in ED presentations
  - ➢ Difficult to sustain due to costs, competing health priorities
  - ➢ Not tailored to subgroups
  - ➢ Does not address other barriers

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Pre-Post

- **Quasi-experimental pre-post studies**
  - ASPIRE study in Baltimore-Washington DC
  - **Community and professional intervention provided including pre-hospital routing changes**
  - 531 community interventions, reaching >10,256 participants; 3,289 intervention evaluations were performed, and 19,000 preparedness bracelets and 14,000 stroke warning magnets were distributed
  - A **doubling of patients arriving < 3 hours noted** and **increase in tPA use** in the post-intervention period
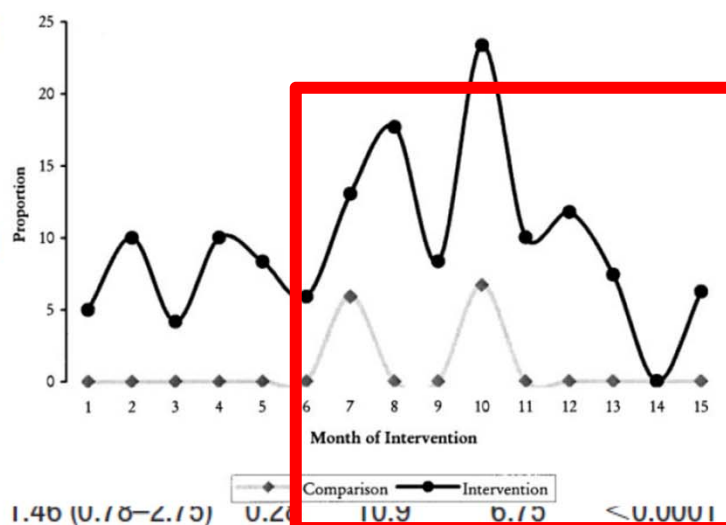
Boden-Albala 2015

Controlled Studies

- ## Controlled pre-post studies
  - ➤Temple TLL Project in East Texas
  - ➤Community and professional educatior
  - ➤An intervention and control community
  - ➤Mixed intervention: personal, media

IS THERE treatment *for a* stroke?

Just **ask** Annon Card. *Stroke Survivor*

every **minute** counts *call* 911
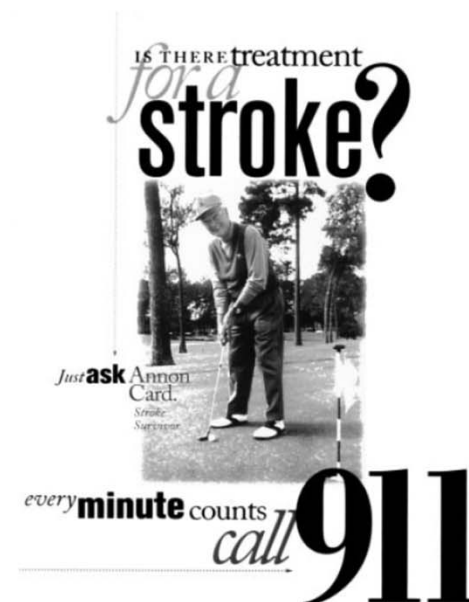
Proportion of Patients Presenting Within 2 Onset

Community	Phase I, %	Phase II, %
All cerebrovascular events (ischemic stro)		
Intervention	26.5	36.5
Comparison	21.4	30.3
Ischemic stroke		
Intervention	28.1	31.7
Comparison	20.7	27.6

1.46 (0.78–2.75)   0.2(10.9   6.75   <0.0001

*Compares log delay time data.

Month of Intervention

Comparison — Intervention

Morgenstern 2002

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RCT

Men   Women
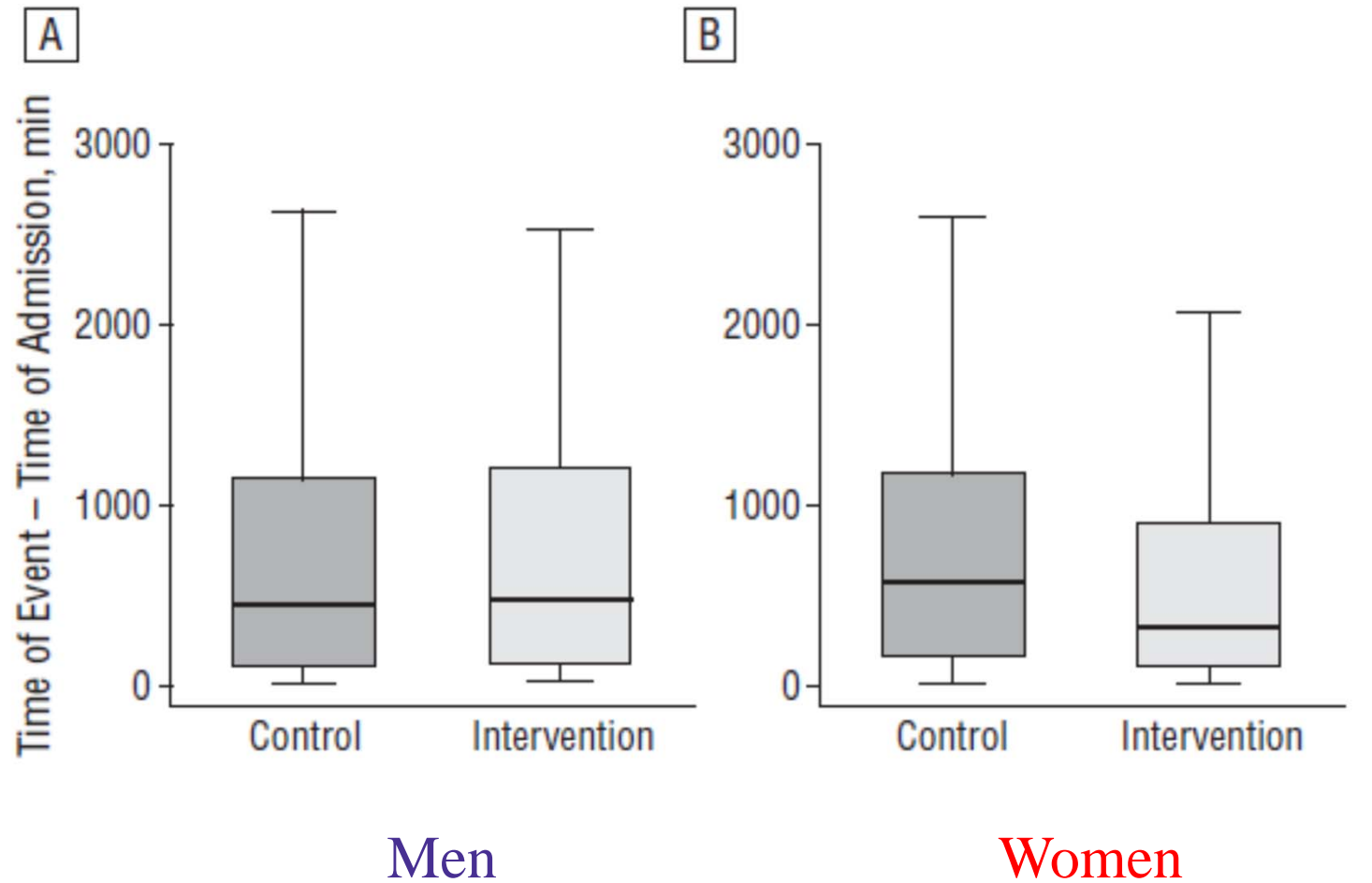
CBPR

- ## Community-based interventions

Method of Peer Leader Delivery	Workshop 1	Workshop 2
Introduction	Recognize that stroke is an emergency and treatable	Recognize that stroke is an emergency and treatable
Read	Stroke is common in Flint For tPA, the faster you call 911 the better Review: F.A.S.T.	Review: F.A.S.T. Overcoming barriers to calling 911 Coping with stress Review: calling 911
Audio	What is a stroke Stroke is common among African Americans African Americans have greater post-stroke disability Stroke is treatable: tPA is a clot-buster medicine Call 911 to get help	What to expect when you call 911 Waiting for help to arrive Navigating the Emergency Department Stroke risk factors Stroke prevention: hypertension
Interactive activities	Think F.A.S.T. tPA Activity Workshop review: discussion	What to expect when you call 911: Discussion Stroke role play Workshop review: discussion
Video media	Stroke Clips: F.A.S.T. Signs of Stroke Music Video	Signs of Stroke Music Video

tPA indicates tissue plasminogen activator.

Youth-based

- Youth-based
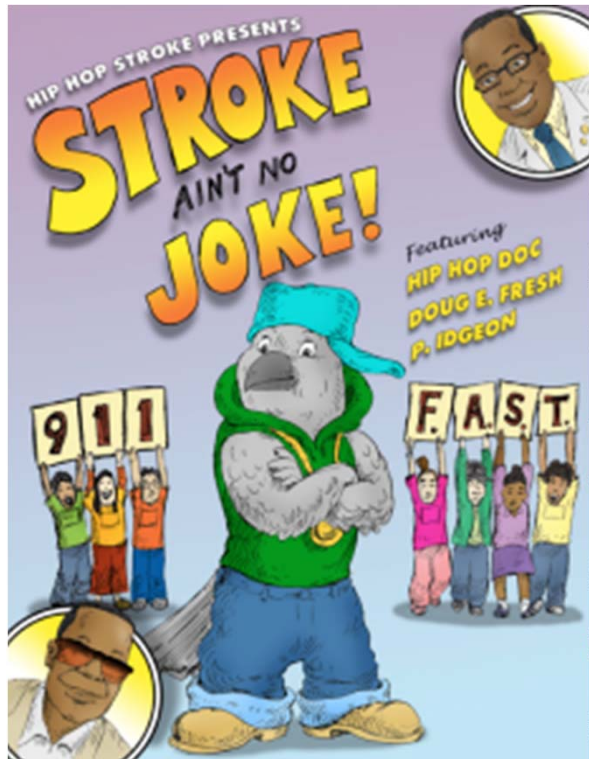
behavioral/clinical outcomes

Outline

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CEERIAS Study

Goal to increase EMS use by engaging in community-based networks and implementing a social contract with residents ("make a pledge")

FAST

Plan with your family:

Agree <u>today</u> to call 911 when stroke signs occur even if the patient objects at the time: <u>Make a Pact to Act FAST</u>

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Pact to Act FAST

- Planning for stroke emergency like one does for fire emergencies
- Teach basic message (FAST) but also engage in personal discussions (using real-life data and stories)
- Utilize trusted community networks in Chicago
  - ➢ Churches
  - ➢ Schools
  - ➢ Community centers
- Trained as "stroke promoters"
- Get residents to "pledge" in front of family, neighbors, coworkers

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Community Engagement

Over 80 community partners in CEERIAS

Promoter Training

Intervention Implementation

- Trained 242 "stroke promoters" from community organizations

- Distribu... ...act t... ...s and other F... ...mag... ...)

- Receiv... ...s to Souths... ...den
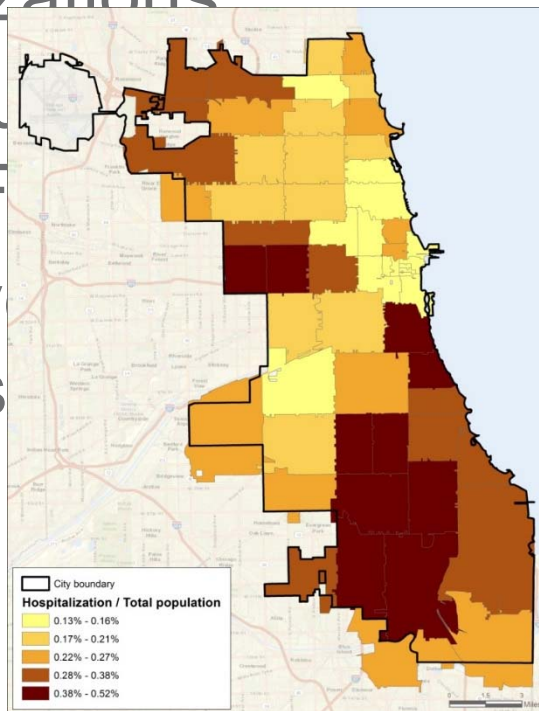
Figure A. Stroke admission rate

Hospitalization / Total population
- 0.13% - 0.16%
- 0.17% - 0.21%
- 0.22% - 0.27%
- 0.28% - 0.38%
- 0.38% - 0.52%

City boundary
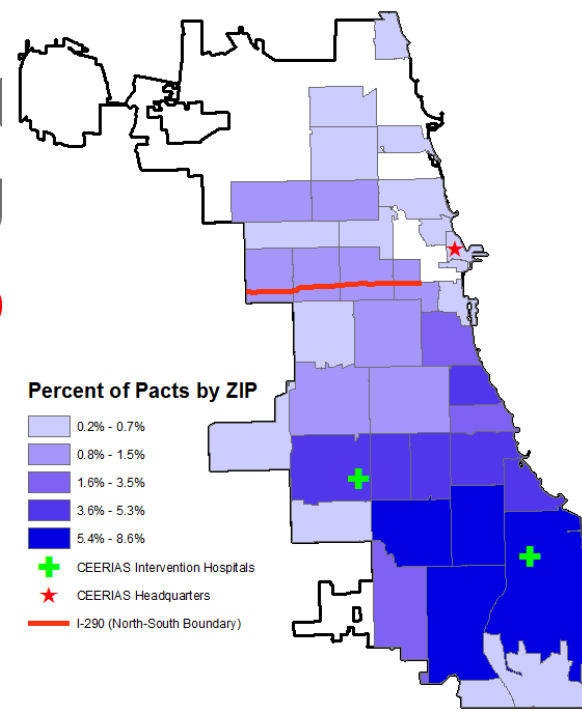
Figure B. Percent of Pacts completed by ZIP code

Percent of Pacts by ZIP
- 0.2% - 0.7%
- 0.8% - 1.5%
- 1.6% - 3.5%
- 3.6% - 5.3%
- 5.4% - 8.6%
- + CEERIAS Intervention Hospitals
- ★ CEERIAS Headquarters
- — I-290 (North-South Boundary)

Interrupted Time Series
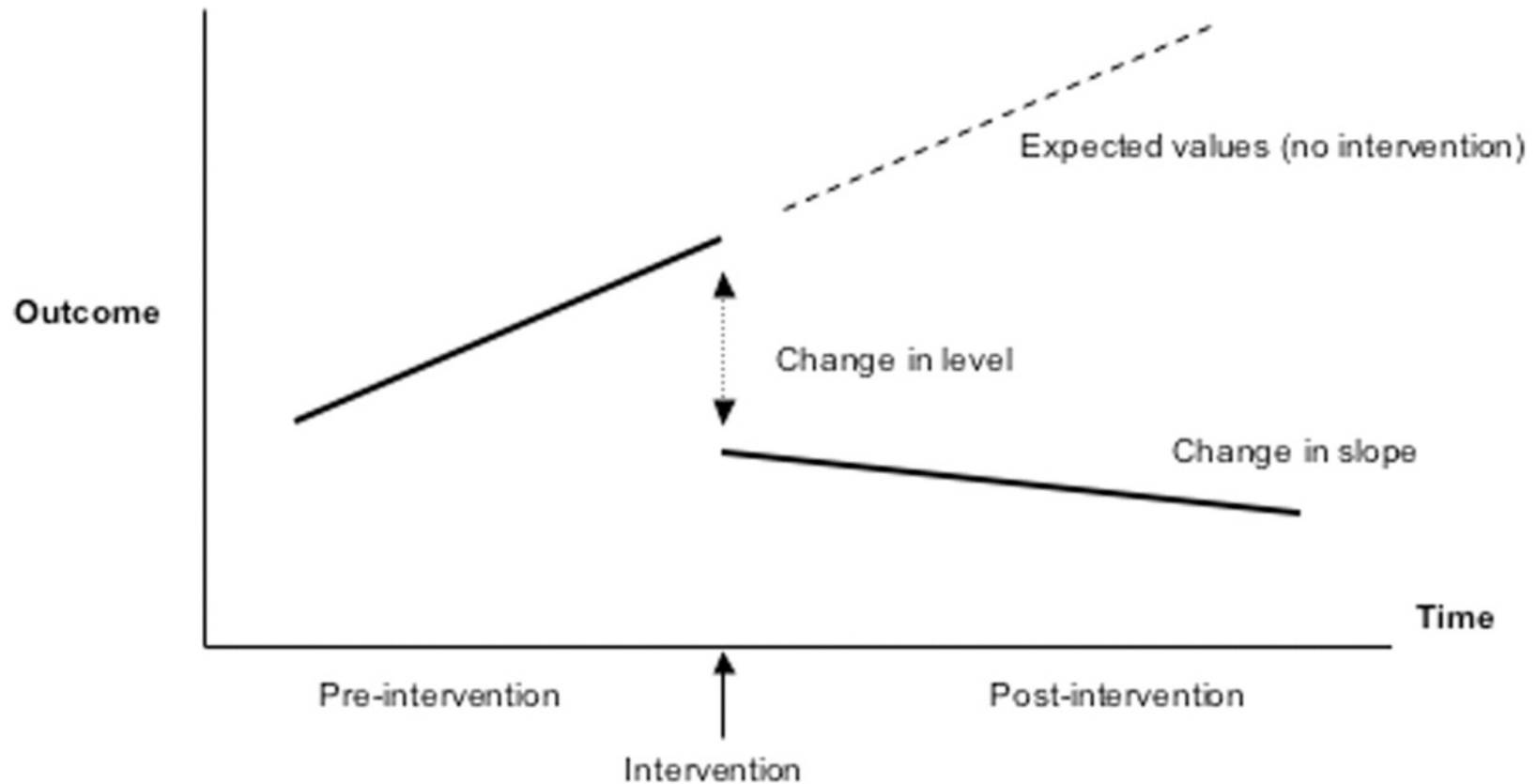
Outcomes

- **Behavioral change**
  - ➤ % AIS patients arriving < 3 hours
  - ➤ % AIS patients arriving by EMS
  - ➤ Comparison between target community and control communities in Chicago and St. Louis
- **GIS analysis of EMS calls**
  - ➤ EMS calls overall pre- and post-CEERIAS
  - ➤ EMS calls with suspected stroke pre- and post
  - ➤ Geospatial weighted regression (GWR) adjusting for age, race-ethnicity, risk factors, neighborhood SES, insurance, and crime

Results: Early Arrival

ITS regression model for early arrival at the intervention hospital and comparison to north side hospitals and St. Louis hospitals

	Intervention Hospital		Comparison with north side Chicago hospitals		Comparison with Saint Louis hospitals	
Early Arrival (<3 hours)						
	β±SE	P-value	β±SE	P-value	β±SE	P-value
Intercept	0.29±0.030	<.0001	-0.15±0.	0.0003	0.03±0.03	0.309
Time	-0.002±0.001	0.230	0.005±0.	0.016	-0.003±0.001	0.057
Level change	-0.001±0.052	0.982	-0.04±0.	0.531	0.03±0.05	0.517
Slope change	0.005±0.003	0.124	-0.003±0.005	0.560	0.007±0.004	0.072

Note: Intervention hospital (black line); north side Chicago hospitals (gray line), Saint Louis hospitals (red line)

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Results: Early Arrival

Subgroup analysis for early arrival at the intervention hospital by age, gender, and race		
Early Arrival (<3 hours)		
	β±SE	P-value
Age <66 years		
Level change	0.05±0.06	0.455
Slope change	0.008±0.004	0.036
Male		
Level change	-0.006±0.08	0.943
Slope change	0.01±0.005	0.028
African-Americans		
Level change	-0.06±0.06	0.319
Slope change	0.009±0.004	0.037

~1%/month increase in early
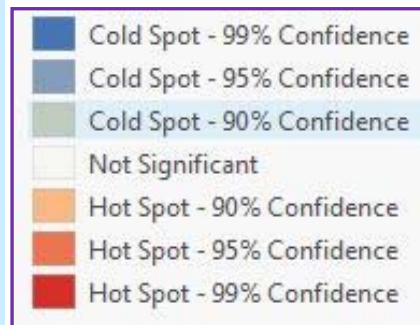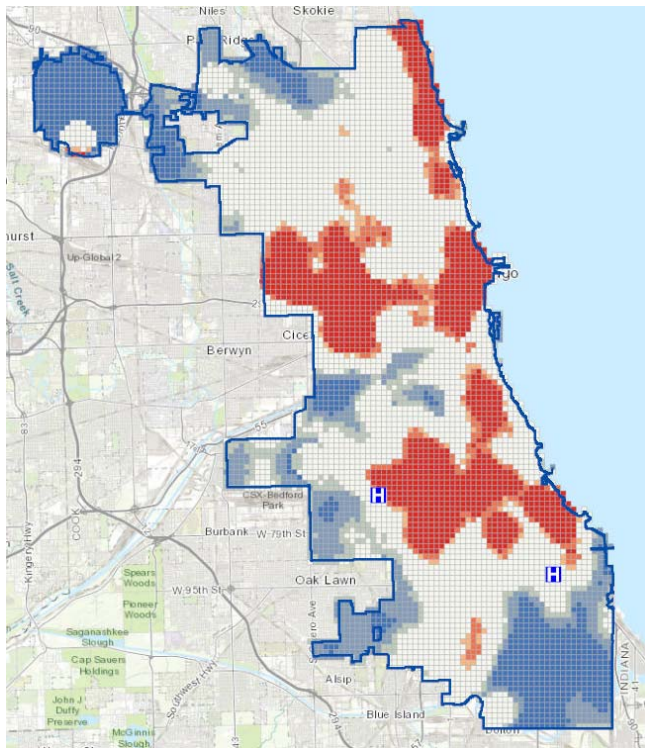arrival in these subgroups

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Results: EMS use

ITS regression model for EMS arrival at the intervention hospital and comparison to north side hospitals and St. Louis hospitals					
	Intervention Hospital		Comparison with north side Chicago hospitals		Comparison with Saint Louis hospitals
EMS Arrival					
Intercept	0.59±0.037	<.0001	0.03±0.04	0.500	0.01±0.04	0.727
Time	-0.001±0.002	0.928	0.003±0.002	0.160	-0.0002±0.002	0.900
Level change	0.06±0.077	0.475	-0.09±0.09	0.296	0.04±0.08	0.589
Slope change	-0.008±0.005	0.112	0.00004±0.005	0.994	-0.007±0.005	0.153

No effect on EMS use for
confirmed stroke
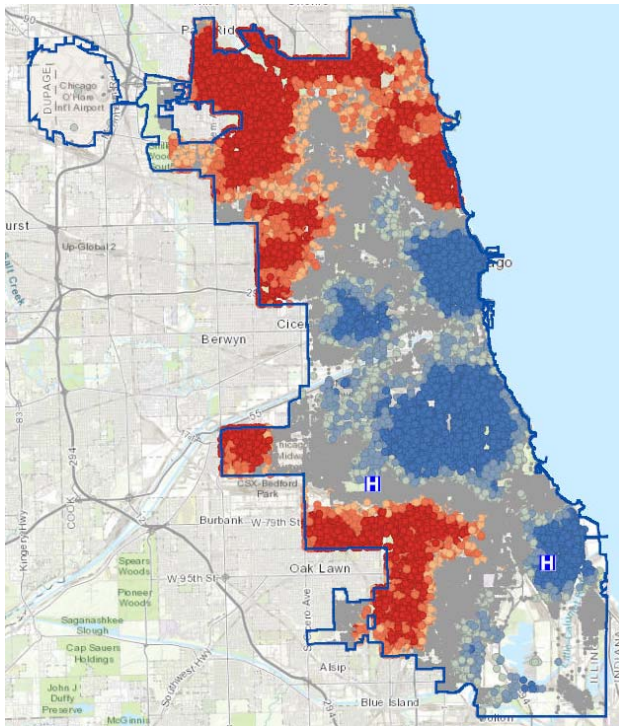
Results: GIS

**Pre-CEERIAS
(1/1/14-2/16/15)**

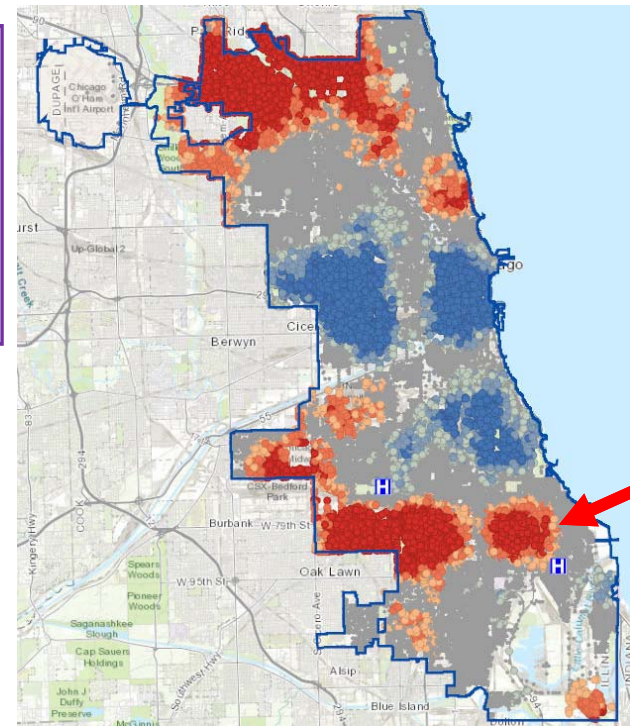**Post-CEERIAS
(4/1/16-4/14/17)**

Cold Spot - 99% Confidence
Cold Spot - 95% Confidence
Cold Spot - 90% Confidence
Not Significant
Hot Spot - 90% Confidence
Hot Spot - 95% Confidence
Hot Spot - 99% Confidence

All EMS calls

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Results: GIS

Pre-CEERIAS
(1/1/14-2/16/15)

Post-CEERIAS
(4/1/16-4/14/17)

Cold Spot - 99% Confidence
Cold Spot - 95% Confidence
Cold Spot - 90% Confidence
Not Significant
Hot Spot - 90% Confidence
Hot Spot - 95% Confidence
Hot Spot - 99% Confidence
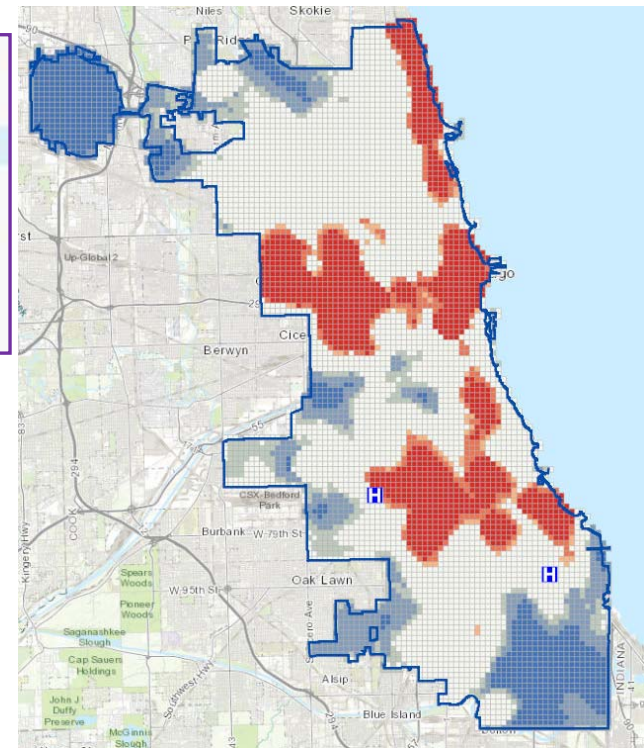
Paramedic suspected stroke calls

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Outline

- Background
- Barriers to stroke preparedness
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Priorities

- **Community engagement to tailor message**
- **Sustainability plans should be adopted**
  - ➢ Schools, churches, community organizations
  - ➢ Hospitals
  - ➢ Social media
- **Fidelity and reproducibility are critical**
- **Controlled studies are needed**
  - ➢ Cluster randomized RCTs are gold standard
- **Outcomes need to be actual behaviors**
  - ➢ EMS use for confirmed stroke may miss false positives wherein the intended behavior occurred
- **Policy level interventions**
  - ➢ Cost of ambulance remains an issue in some areas

Thank You!

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