

Some $U(0,1)$ Thoughts on Measuring Systems and Facilities

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Design of talk

- Low prevalence of ancient Greek letters
- High prevalence of ancient Greek learning styles (read: discussion)
- Focus on facilities & systems from hospital standpoint
 - Contrast with other facilities (e.g. dialysis, nursing facilities)

Overview

- Definitions
- Discussion points
 - Measuring “system”
 - Unit of analysis
 - Sorting of patients
 - Change in study population

What is a “system”?

- “System” – a contractual arrangement between different facilities – is best viewed as a continuum, rather than dichotomously
- Possible arrangements:
 - Referral arrangements
 - Networks
 - Leased
 - Management contracts
 - Fully owned
- “System” is usually defined as the last two or three
- Complication: Could be phased (manage for 3 yrs, then own)

What does “system-ness” measure?

- Almost always a proxy for “connectedness” on a specific dimension, or “access to external resources”
 - Integrated care
 - HIT
 - Quality improvement resources
 - Access to capital
 - Referral patterns
 - Local community-mindedness

Table 2: Summary of Significant Differences Between Health Networks and Systems in Clusters with Similar Labels: 1994 Health Networks and Systems

<i>Organizational Cluster Label</i>	<i>Hospital Services</i>	<i>Physician Arrangements</i>	<i>Insurance Products</i>
Centralized health network/system	<p>Networks are more <i>differentiated</i> than systems in long-term/chronic care services and more <i>decentralized</i> in all hospital services.</p> <p>Networks use more <i>contracting</i> than systems in long-term care/chronic care services.</p>	<p>Networks are more <i>differentiated</i> and more <i>decentralized</i> than systems in contractual arrangements.</p>	None
Decentralized health network/system	<p>Networks are more <i>differentiated</i> in high-tech services than systems.</p>	<p>Networks are more <i>differentiated</i> and more <i>decentralized</i> than systems in all arrangements.</p>	<p>Networks are more <i>decentralized</i> than systems in HMO products.</p>
Moderately centralized health network/system	<p>Networks are more <i>differentiated</i> and more <i>decentralized</i>.</p>	<p>Networks are more <i>differentiated</i> and more <i>decentralized</i> than systems in all arrangements.</p>	<p>Networks are more <i>differentiated</i> and more <i>decentralized</i> in all products.</p>
Independent hospital network/system	<p>Networks are more <i>differentiated</i> than systems in all services.</p> <p>Networks use more <i>contracting</i> than systems in high-tech services.</p>	<p>Networks are more <i>differentiated</i> and more <i>decentralized</i> in contractual arrangements.</p>	None

Note: Based on *t*-tests across similarly labeled health systems and networks. To achieve a joint $\alpha = .05$ given multiple comparisons, threshold for significance was $p \leq .003$.

Bazzoli et al (1999) used detailed AHA data (available in 1994-1995) to taxonomize into degrees of systems and networks based on differentiation, integration, and centralization

How should we evaluate “systems”?

- Sometimes we want to evaluate *individual hospitals* but control for the effect of being a system
 - Need to know if hospital is part of a system
- Sometimes we want to evaluate a *system* – this will often entail aggregating data from individual units
 - Need to know what hospitals comprise a system (harder)

Measuring system-ness

- Healthcare Cost Reporting Information System (HCRIS, “Medicare cost reports”)
 - “Home office expense”: does the “mother ship” charge the hospital for administrative expense?
 - “Related organizations” – are there organizations with “common ownership or control”?

Among Critical Access Hospitals (2009)

		<i>(S-2 line 40)</i>		
		No HO expense	HO expense	Total
<i>(A-8-1)</i>	Not Owned	607	369	976
	Owned	0	240	240
	Total	607	609	1216

Measuring system-ness, con.

- AHA:
 - System member
 - Is the hospital contract-managed?
- We have attempted to validate these measures (by phoning hospitals) and the results have been disappointing
 - But not many alternatives

Analysis of Facilities within System

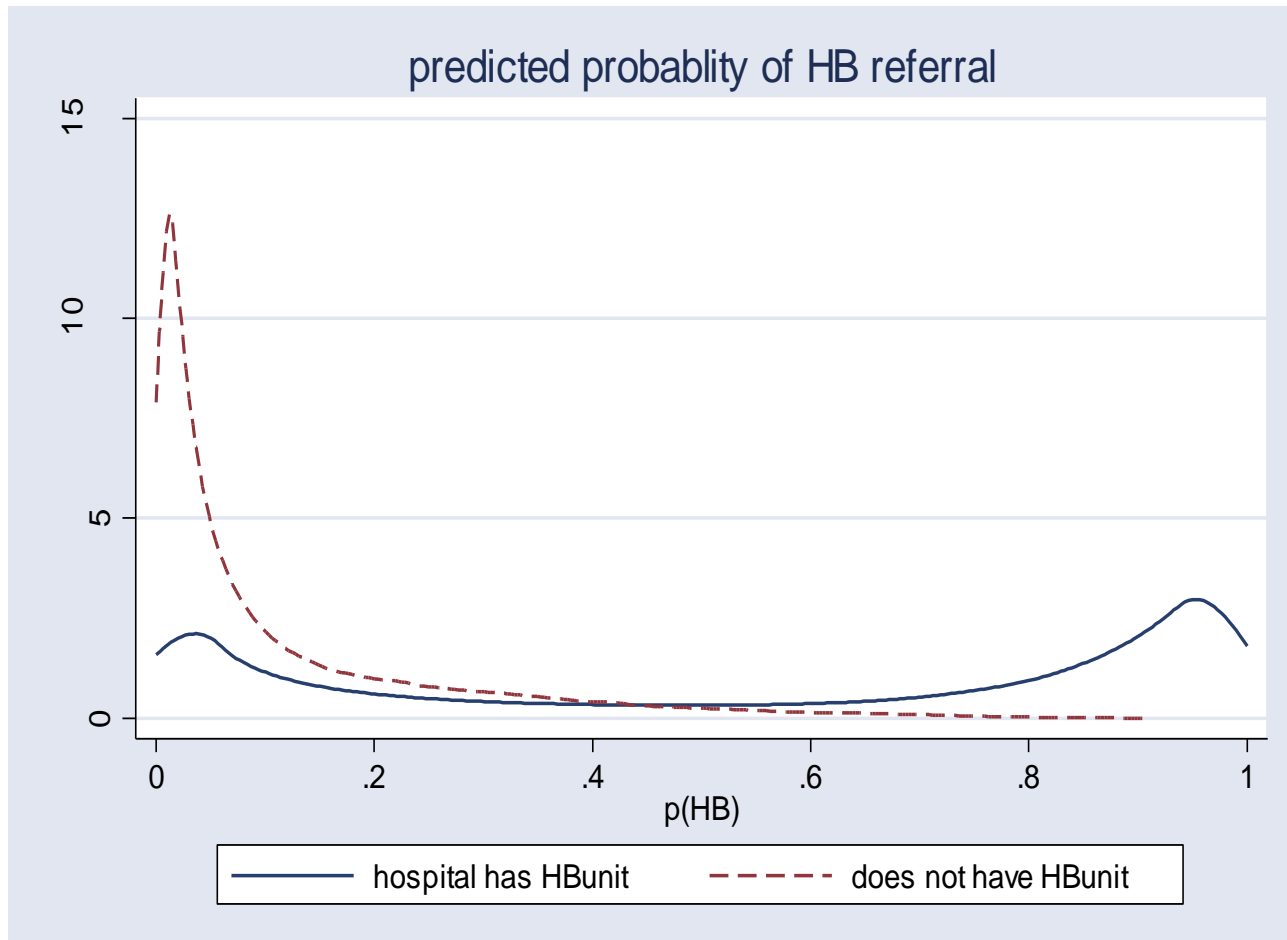
- Take the economist view: trust no one (what's their angle?)
- Facilities in systems may have incentives (financial, quality, etc.) to behave differently
 - Example (Stearns et al 2006): Evaluate free-standing SNFs vs hospital-based SNFs
 - Guess what?
 - Very few hospitals that did NOT have a HB SNF discharged patients to a HB SNF
 - Patients discharged to HB SNF very different from those to FS SNF (can you guess?)
 - Can we ever really “match” these guys?

Driving Force for Referral Decision

	All	By Qualifying Hospital Stay		By SNF setting:	
		Hospital has SNF	No SNF	Hospital-based	Free-standing
Number of cases	652,483	312,239	340,224	187,934	464,594
Percent referred from a hospital with its own SNF unit	47.7	100	0	84.6	32.7
Percent in a hospital-based SNF	28.8	51.1	8.5	100	0

- Single strongest predictor of HB referral is coming from a hospital that operates its own SNF.
- Referral decision appears to be very different when coming from a hospital that does not operate its own SNF

The probability distribution for a HB referral is different in a hospital that has its own unit versus one that doesn't. The other coefficients are also different, so it appears to be a different choice process.

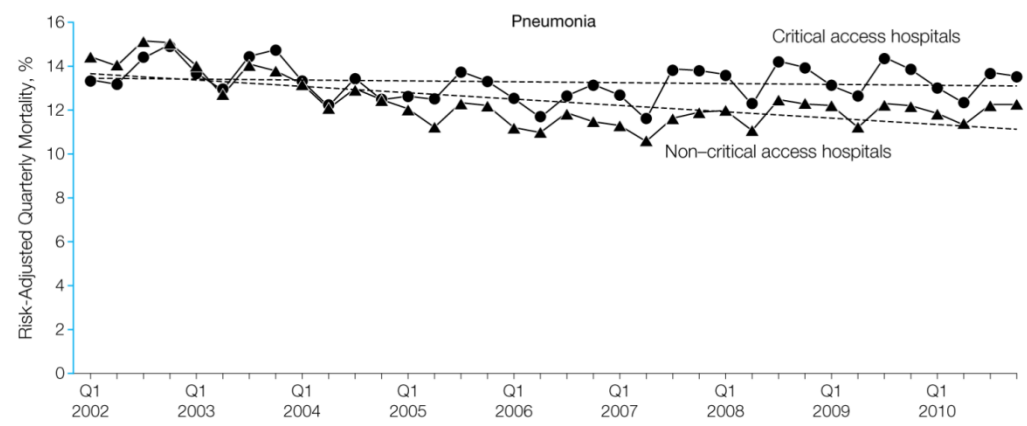
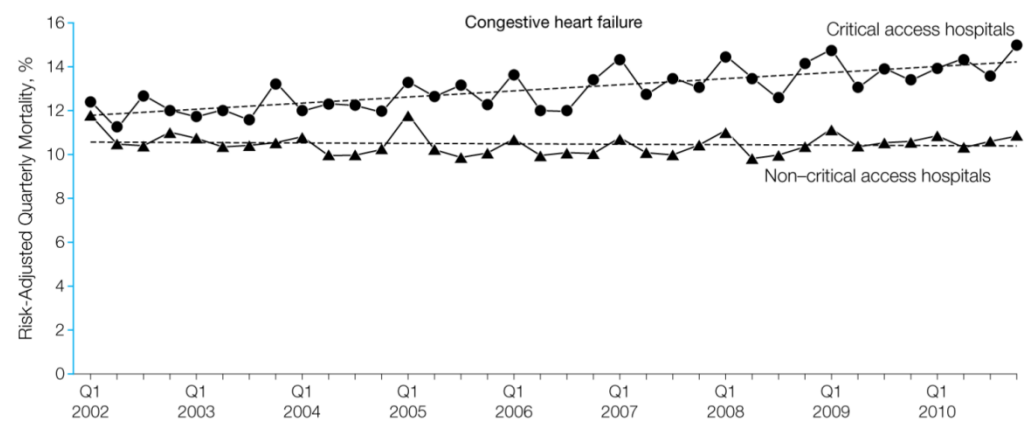
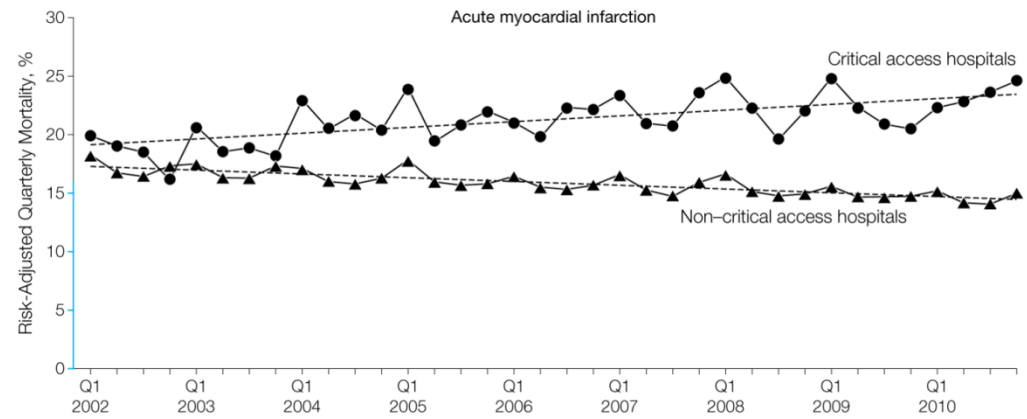


Understanding the dynamics of the care patterns / transition

- Can be especially important to understand the pathways to the “outcome of interest”
 - In facilities/ system analyses, patient outcomes likely to be more associated with events with longer “upstream” influences
 - E.g. trauma– why this particular facility? (how does EMS decide?)

Unit of analysis

- Trends in facility-level adjusted rates vs. “direct” changes
 - Facility-level precision?
 - Functional form assumptions?
- “Match” facilities? Or match patients?
 - Especially if comparing facility types:
To determine whether CAHs had outcomes different from those of other small, rural hospitals without the CAH designation, 2 sets of analyses were conducted. In the first, each CAH was matched to at least 1 non-CAH based on size, rurality, teaching status, and region. (Joynt et al 2013)



Quarterly (risk-adjusted) mortality rates for CAH and non-CAH; linear trends shown.

Joynt et al (2013)

Facility type as the “treatment” variable?

Comparing facilities

- Purpose of comparison
 - Evaluation vs. public reporting vs. payment
 - Adjusted rates?
 - Bayesian / shrinkage?
 - Comparing facilities vs. comparing facility *types*

“Adjusted” differences

- To a large extent, whether facility differences can be “adjusted away” is uninteresting
 - *“Sorry to inform you, but your loved one did not survive the procedure. The good news is that he had a high mortality risk and he lasted longer than we expected.”*
- BUT if we can understand the source of the unadjusted difference, we may be able to develop policy/practice solutions
 - “explained” ≠ “clinically indicated”

Do facility factors explain racial/ethnic disparities in post acute rehab?

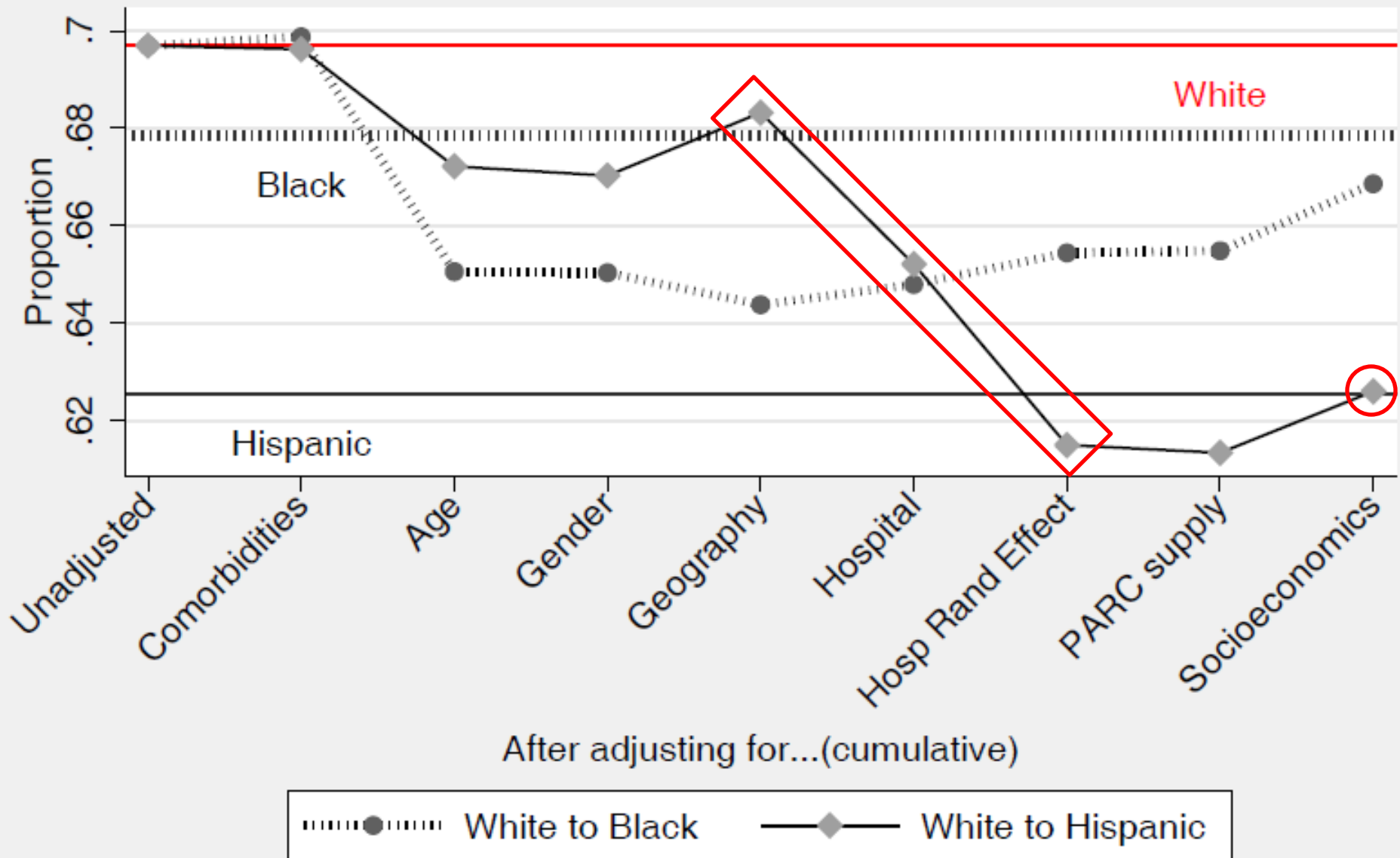
- Consider post-acute rehab care (Home, Home w/ HH, SNF, IRF) for stroke, hip fracture, joint replacement
 - *Generally, racial/ethnic minorities receive less intensive care*
- Can these disparities be explained by hospital characteristics?
- Big Idea: Extension to Blinder-Oaxaca

Model

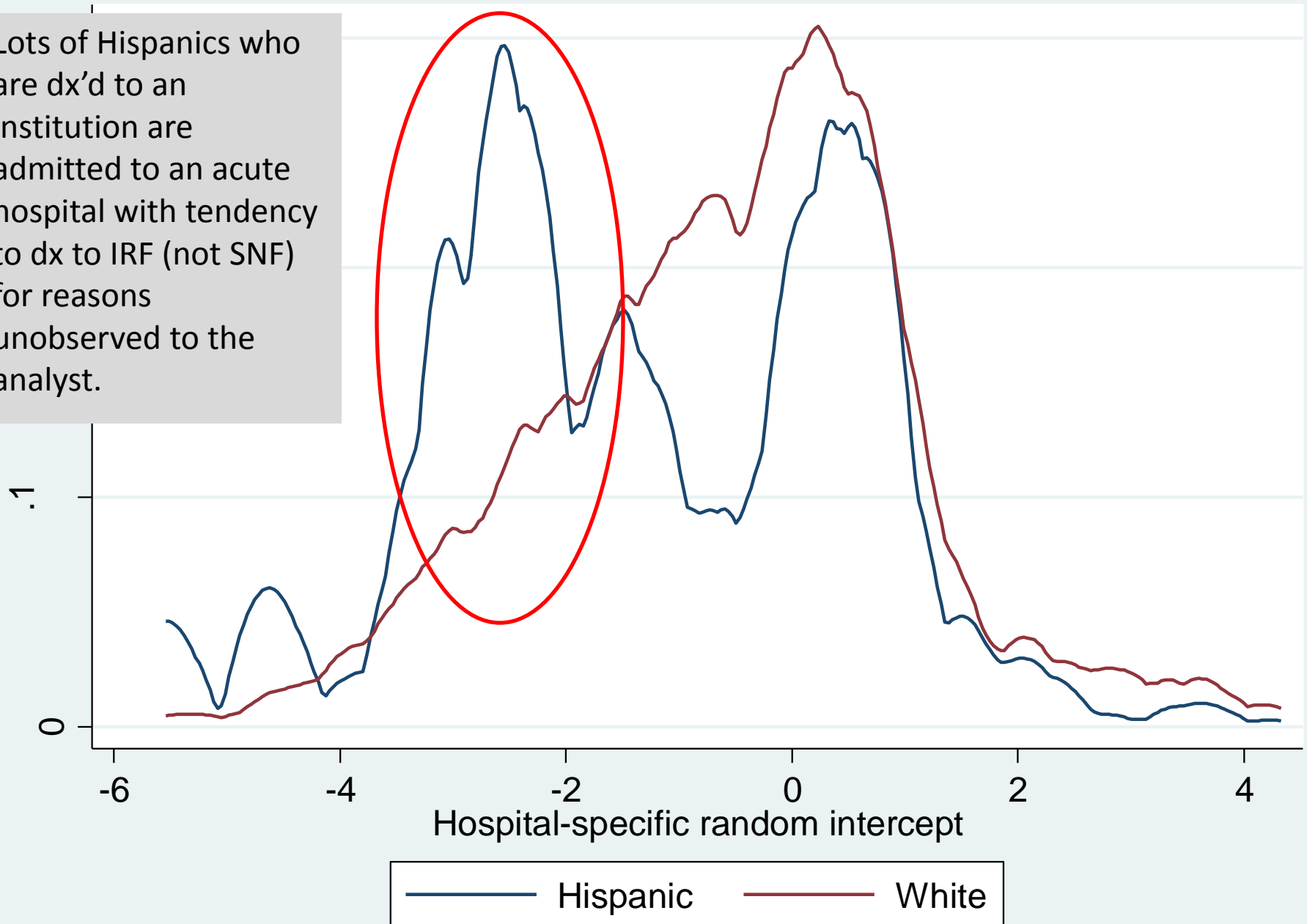
- Multilevel logistic model
 - $\text{Pr}(\text{Institution}) = f(X_{\{ihcs\}} \beta + \mu_h)$
for individual, hospital, county, state variables and a hospital-specific random intercept
 - Disposition patterns may exist for hospital-specific reasons unobservable to the analyst

Probability of Discharge to SNF (vs. IRF)

Stroke



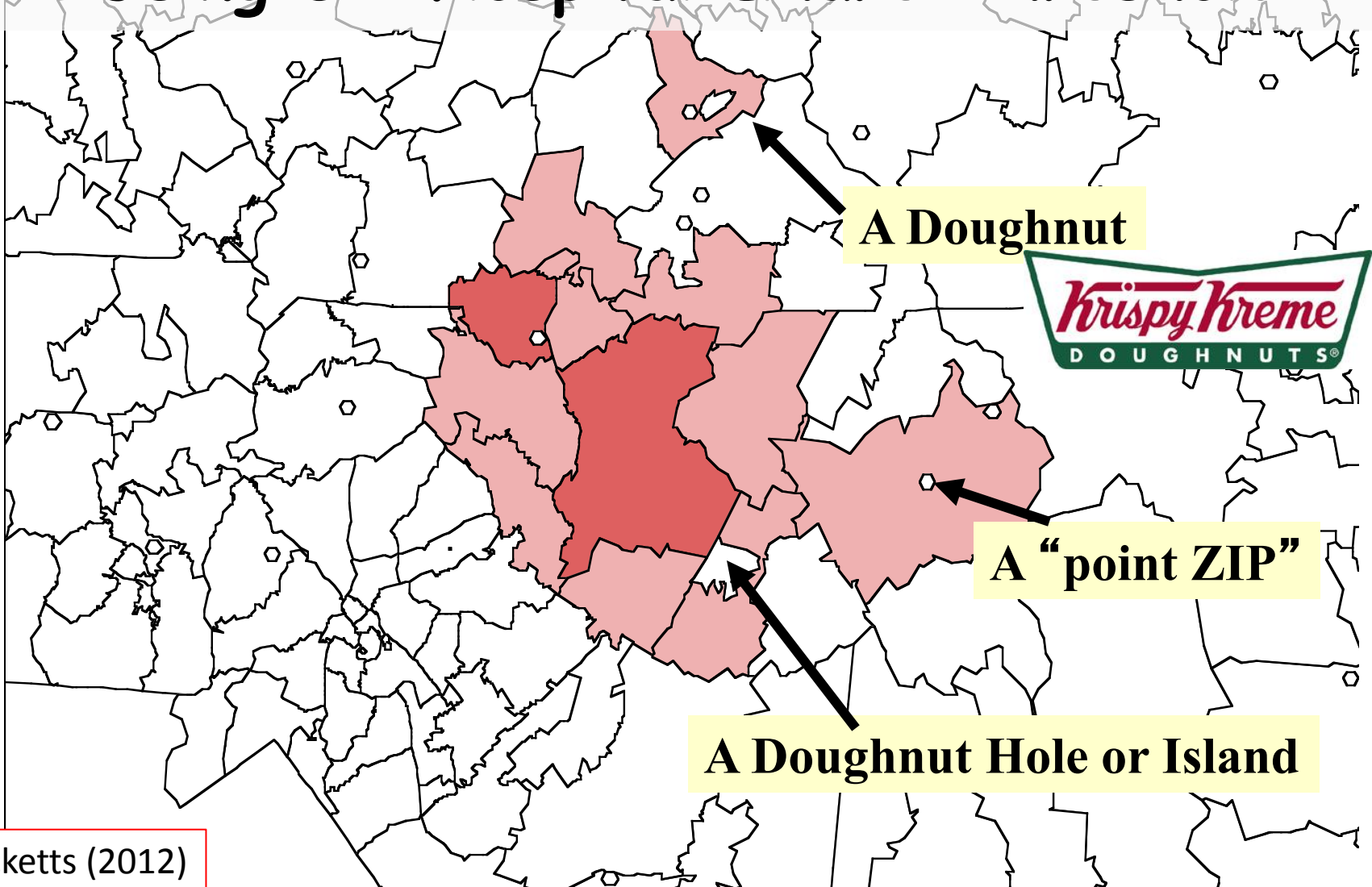
Lots of Hispanics who are dx'd to an institution are admitted to an acute hospital with tendency to dx to IRF (not SNF) for reasons unobserved to the analyst.



Contextual data

- We often want to adjust for the population served by the system/facility
- Easy: county / MSA
 - Official term: "clunky"
- Better(?): Build your own
 - Use fine geography (e.g. ZIP) and market share (HMSA – Medicare inpatient)
 - *Actual versus potential* market share

Example: Concord, NC Using 5% Hospital Share Threshold



...but...

- Assumes that equal likelihood of using hospital within each ZIP.
- What do we know about “sorting” based on something other than distance?
- Consider Medicare patients and distance to a “high quality” hospital – what percent instead attend a “low quality” hospital?
 - Does this vary by race?

EXHIBIT 2**Black And White Medicare Patients' Proximity And Admission To Low-Quality Hospitals For Major Surgery, 2005–08**

Proximity to average or high-quality hospital	Percent admitted to a low-quality hospital		Adjusted odds ratio for admission to a low-quality hospital, black versus white
	White	Black	
CORONARY ARTERY BYPASS GRAFTING			
<5 miles	11.4	14.8	1.33**
5–20 miles	18.1	28.2	1.76**
>20 miles	25.8	31.6	1.35**
ABDOMINAL AORTIC ANEURYSM REPAIR			
<5 miles	13.2	25.1	2.10**
5–20 miles	21.3	30.1	1.59**
>20 miles	22.1	28.9	1.39**
LUNG CANCER RESECTION			
<5 miles	11.9	16.9	1.44**
5–20 miles	21.2	32.5	1.76**
>20 miles	30.1	42.4	1.70**

Holding constant distance to “average or high” quality hospital, black patients more likely to attend low quality than white patients.

➔ Contextual data may not be capture “population” well

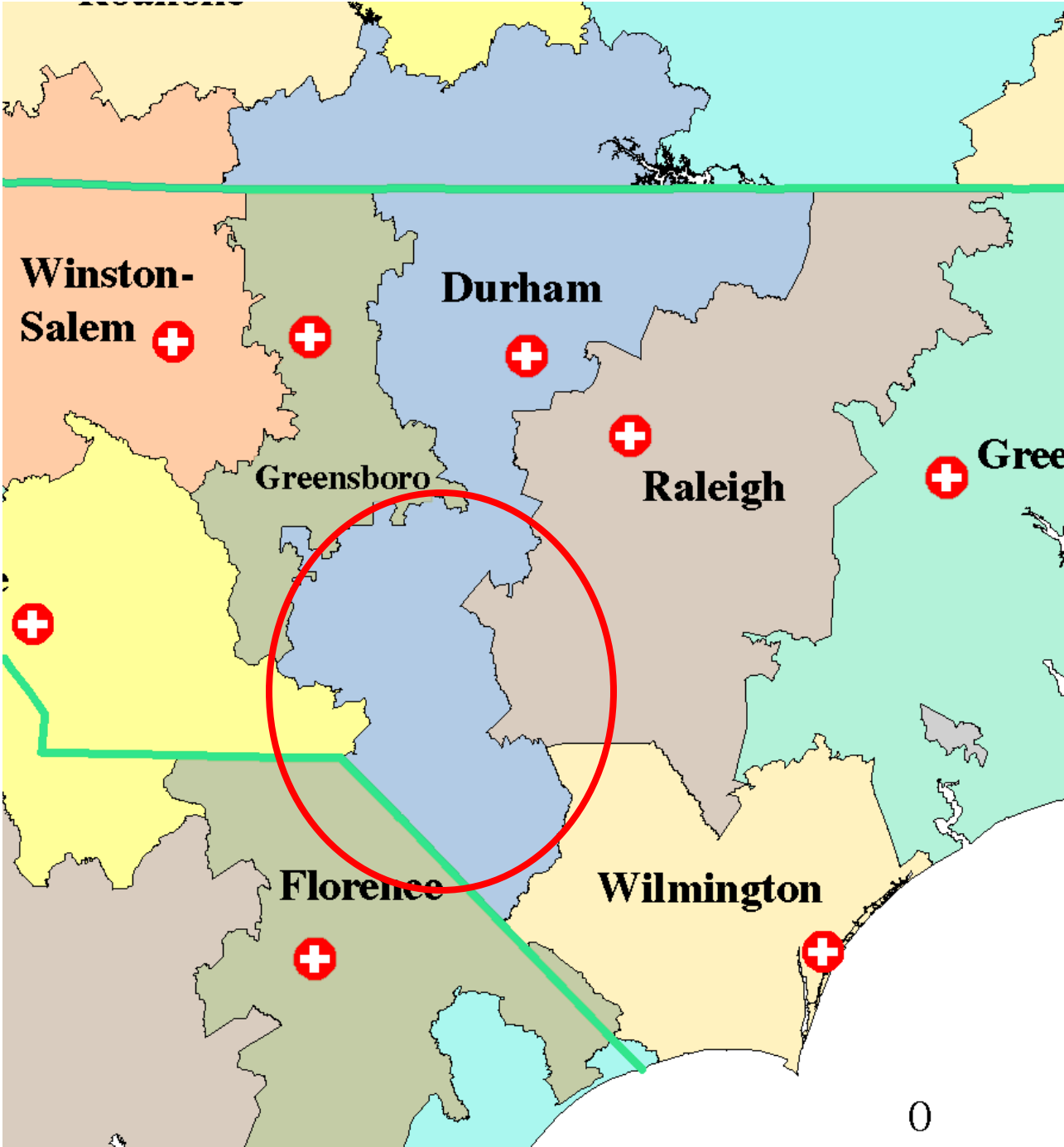
More on “bypass” behavior

- In rural settings, patients who bypass tend to be
 - Commercially insured (vs. Medicare/uninsured)
 - Have more complex procedures
- Thus, those that get care at local hospital may be different from those that do not
- → (Factors that are typically) unobserved selection may be important

Radcliff et al (2008)

Dartmouth's Hospital Referral Regions for Central North Carolina

Based on actual utilization patterns



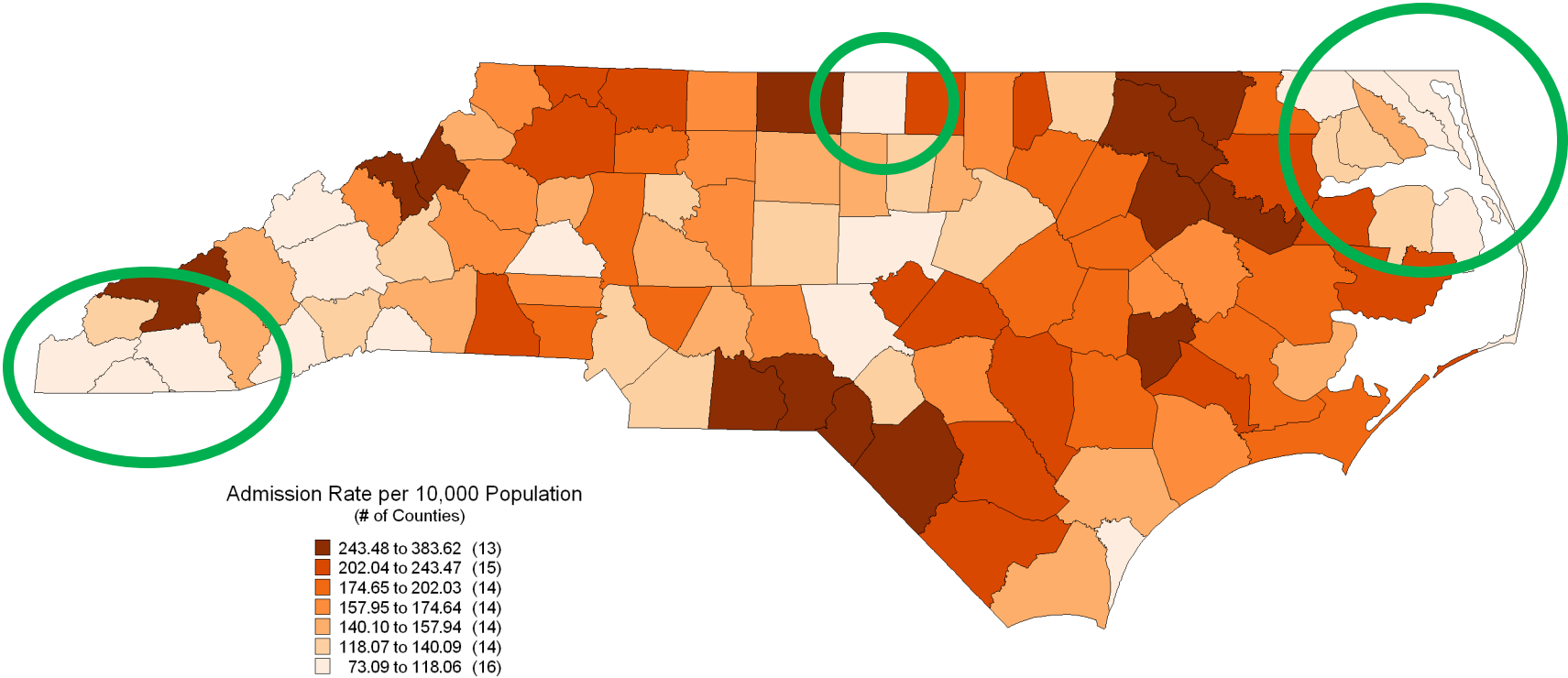


People on this side
go to Hospital A

People on this side
go to Hospital B

Ambulatory Care Sensitive Condition Hospital Admissions (2008) All Conditions

by County for All Persons



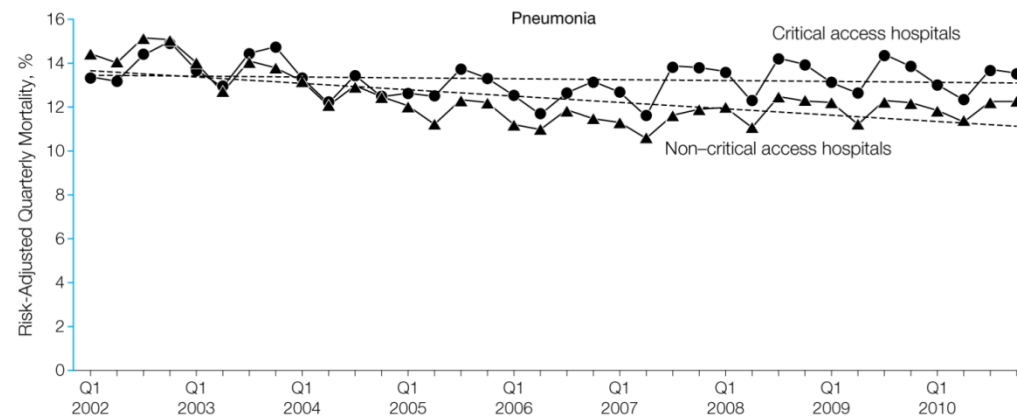
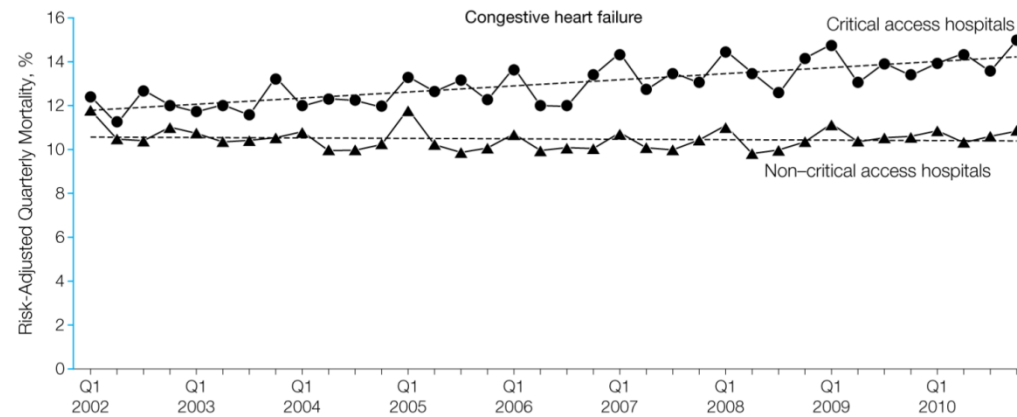
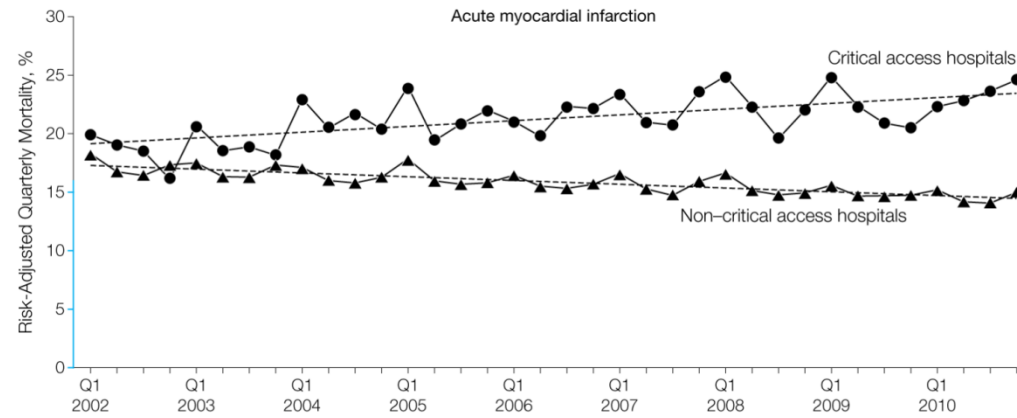
Note: Only admissions to North Carolina Hospitals are included.
Sources: Thomson Inpatient Discharge Database, October 1, 2007 to September 30, 2008; NC Office of State Budget and Management, 2008.
Produced by: North Carolina Rural Health Research and Policy Analysis Center, Cecil G. Sheps Center for Health Services Research, University of North Carolina at Chapel Hill.

Temporal stability

- Although not as large a problem as it is in practices (with physicians migrating in and out of the practice over time), systems and facilities also suffer from turnover (e.g. personnel (provider and management), clinics, services, other facilities...)
 - Case Study: The Stephensons
- For pre-post / longitudinal studies, how stable is “stable enough”?

Subject instability can change outcomes

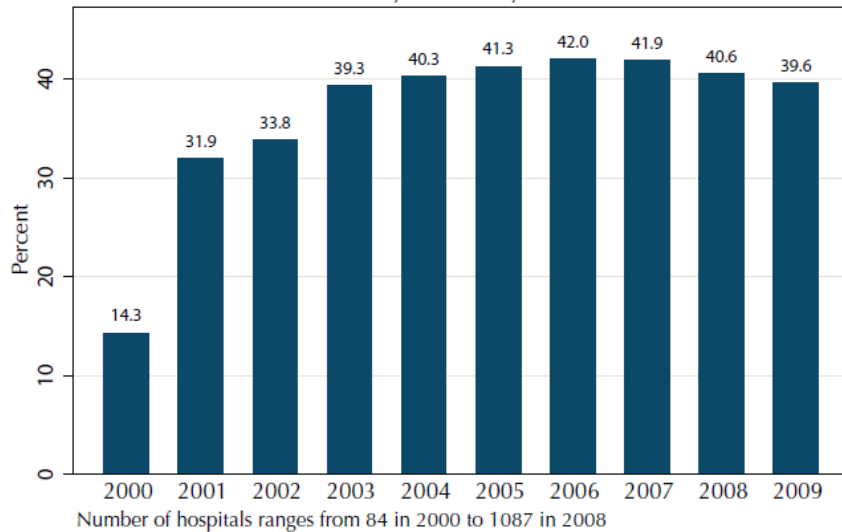
- Consolidation (e.g. due to more centralized system) should channel procedures into “centers of excellence”: increased volume => better outcomes (eg. Gaynor 2006)
- But Hayford (2012) found increases in market share (due to merger) led to more intensive treatment and higher mortality
- Anecdotally, acquisition often associated with consolidation at the “mother ship hospital” (or at least the profitable care)



- Back to Joynt et al
- CAHs in 2002 looked a lot different from CAHs in 2010
 - Does the straight line assume homogeneity?

Figure 1

Percent of CAHs with at least one nursery day
By calendar year



- Concern: CAHs are cutting L&D
- Evidence: From 2001-2006, the CAHs were more likely to offer L&D....
-but that's primarily because bigger hospitals were becoming CAH; by 2007 conversions stopped and the tipping point was reached

Discussion