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Finding high quality hospitals in Philadelphia.

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Outline

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Hospital quality measures are hard to aggregate

- I want to identify the features of high quality hospitals
- Hospital quality includes process and outcome measures
  - Process measures include appropriate antibiotic use, frequent hand washing
  - Outcome measures include 30 day readmission rates, risk adjusted mortality
- It is hard to determine which observed measures of quality are good indicators of high quality hospitals
  - What is the relative importance of different measures?
  - How can we account for hospital characteristics like teaching status and ownership type?
  - Apparent high performance of hospitals could be a result of locating near a healthy population
- Quality should measure how much a hospital can improve a patient's health, not how healthy she was to begin with

Hospital Compare contains publicly reported hospital quality data

Process	Average		Jefferson	
measure	US	PA	Adherence	Patients (N)
Antibiotic timing	87%	88%	82%	303
Correct antibiotic	93%	93%	98%	302

Table: Hospital compare sample data, 7/1/2009-12/31/2009

Research tip: you can get this data now!

I use process measures and hospital characteristics

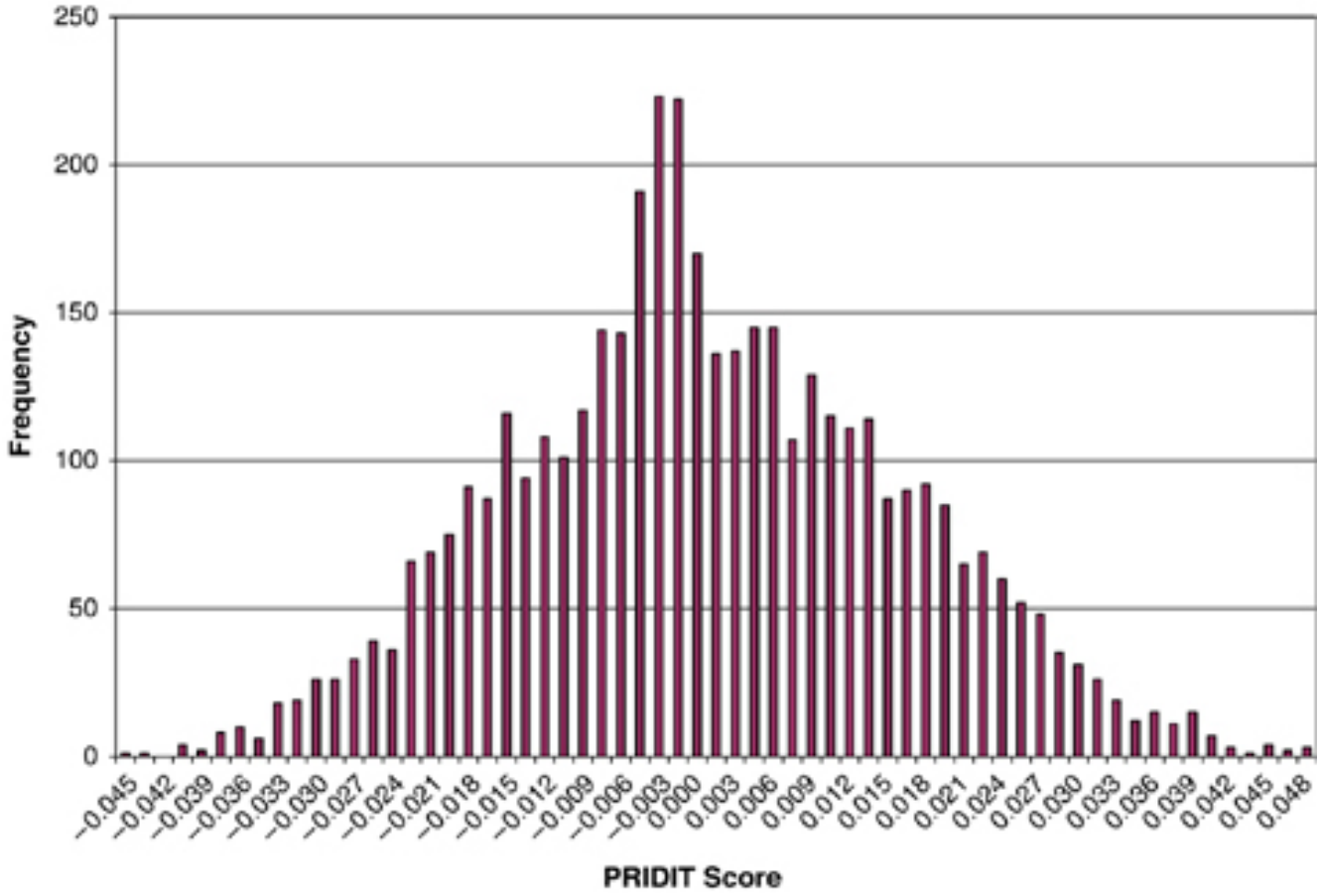
- 20 process measures from 4 areas at a single point in time
  - Heart attack (8 measures)
  - Heart failure (4 measures)
  - Pneumonia (6 measures)
  - Surgical infection prevention (2 measures)
- I include 3 other demographic variables
  - Acute care or critical access hospital
  - Hospital ownership (govt, nfp, fp)
  - Teaching intensity (several levels)

Reporting data is optional for some hospitals, mandatory for others (or Medicare would reduce their payments)
My sample includes 4,217 hospitals that report any data

I aggregate all information into an overall quality score

- Combine all quality metrics with a statistic called *PRIDIT*
  - P = Principle Components Analysis
  - Ridit is a scoring system originally from biometrics
  - Problems that involve ranks: how rural or urban is an area?
- Scores range from -1 to 1
- Scores are all relative
- Higher scores on a variable don't always translate to higher quality
  - "Teaching to the test" could lead to lower overall quality
  - I assume that in isolation each process measure positively correlates with quality
  - In the results, all process measures are positively associated with quality

Hospital quality is evenly distributed



Lots of hospitals in the middle, a few "outliers" of high and low quality

A few variables account for most of the variation in quality

- Patients given beta-blocker at arrival and at discharge
  - Well reported ($\sim$85%)
  - Not universally adhered to ($\sim$85%)
- All 4 heart failure measures (esp. assessment of left ventricular function)
- Measures with total adherence are not useful for measuring quality
  - Oxygen assessment for pneumonia–99% adherence!
- Surgical measures not well reported and so did not explain much variation
- The more teaching at a hospital, the better it is

Outline

Map hospitals in Philadelphia to make results more relevant

- *PRIDIT* results are a rank ordering of over 4,000 hospitals
  - The ranks are all relative
  - Most people end up in one of a few local hospitals
  - Few people care about precise rankings–they just want to know what's best
- Solution to the problem of too much information–rank hospitals by their decile
- Making the information locally relevant–map Philadelphia hospitals with a color-code by deciles
  - GIS data came from PASDA
  - Deep red for the top decile
  - Deep green for the lowest decile
  - A rainbow in the middle
  - ArcGIS facilitates this color coding scheme

North Philly hospitals come out on top

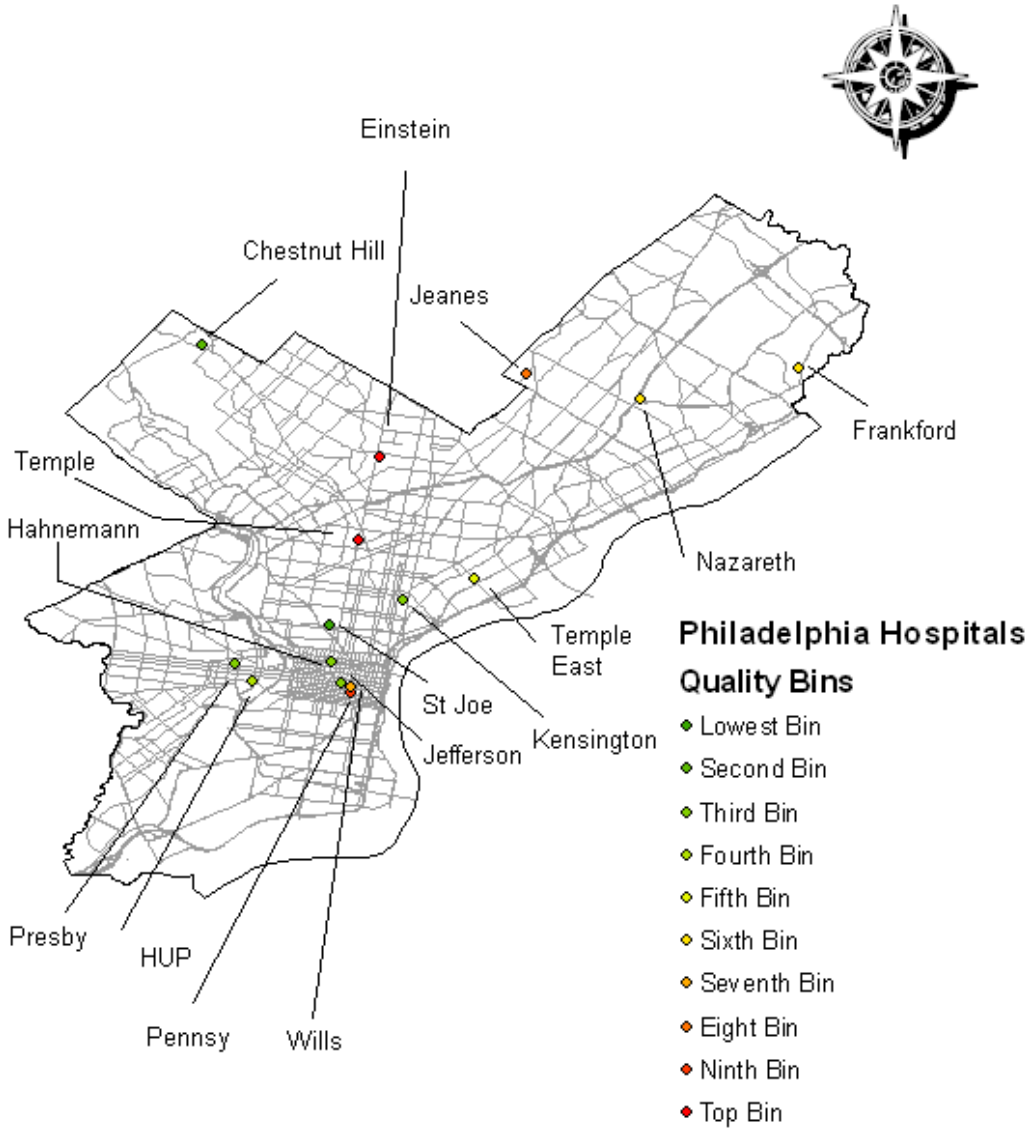


Figure: Philadelphia hospitals by quality

Best hospitals are "islands of quality"

- Higher quality hospitals are in North Philly–not selection on healthier population
- Center city hospitals of middle to lower quality
  - Despite academic medical centers being higher quality in general
  - Pennsy higher than HUP and Presby–the effects of patient sorting within a health system?
  - Swath of green/yellow from Presby to Temple East–my main story is that most hospitals are of similar quality
  - Problem of harmful competition?
- "Islands of quality" idea–Medicare doesn't pay more for higher quality care, so maybe it is randomly distributed

Outline

Using national data and multiple observations

- National GIS data
  - Philadelphia is unusual–several academic medical centers in a small area
  - Urban vs. rural comparison is important
  - Many hospitals in sparsely populated areas are critical care hospitals
- Multiple observations of the same hospital over time
  - Measure the stability of rankings over time
  - Measure the relative importance of each measurement over time
  - More hospitals report more data over time
- Contribute to the ultimate goal of Hospital Compare–help individuals choose the best hospital near them