# Day 2: Session II

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AHRQ QI User Meeting

September 26-27, 2005

# Methods for Creating Aggregate Performance Indices

AHRQ QI User Meeting

September 27, 2005

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Battelle Health and Life Sciences

# Overview

- Project objectives
- Why composite measures?
- Who might use composite measures?
- Alternative approaches
- Desirable features of a composite
- Proposed approach for the AHRQ QI
- Questions & Answers

# Project Objectives

- Composite measures for the AHRQ QI included in the National Healthcare Quality Report and Disparities Report
- Separate composites for overall quality and/or quality within certain domains (e.g., cardiac care, surgery, avoidable hospitalizations, diabetes, adverse events)
- A methodology that can be used at the national, state and provider/area level

# Project Objectives

- Feedback
  - Does the proposed approach meet user needs for a composite?
  - What analytic uses should the composite address?
  - What are the important policy issues?
  - How should the composite be incorporated into the AHRQ QI software?

# Goals of National Healthcare Reports

- National Level
  - Provide assessment of quality and disparities
  - Provide baselines to track progress
  - Identify information gaps
  - Emphasize interdependence of quality and disparities
  - Promote awareness and change
- State / Local / Provider Level
  - Provide tools for self-assessment
  - Provide national benchmarks
  - Promote awareness and change

# Unique challenges to quality reporting by states

- States release comparative quality information in a political environment
  - Either must adopt defensible scientific methodology or make conservative assumptions
- Examples of reporting decisions:
  - Small numbers issues
  - Interpretive issues (better/worse, higher/lower)
- Purchasers demanding outcomes and cost information from states

# Why Composites?

- Summarize quality across multiple measures
- Improve ability to detect quality differences
- Identify important domains and drivers of quality
- Prioritize action
- Make current decisions about future (unknown) healthcare needs
- Avoids cognitive “short-cuts”

# Why Not Composites?

- Mask important differences and relationships among components (e.g. mortality and re-admissions)
- Not “actionable”
- Difficult to identify which parts of the healthcare system contribute most to quality
- Detract from the impact and credibility of reports
- Independence of components
- Interpretation of components

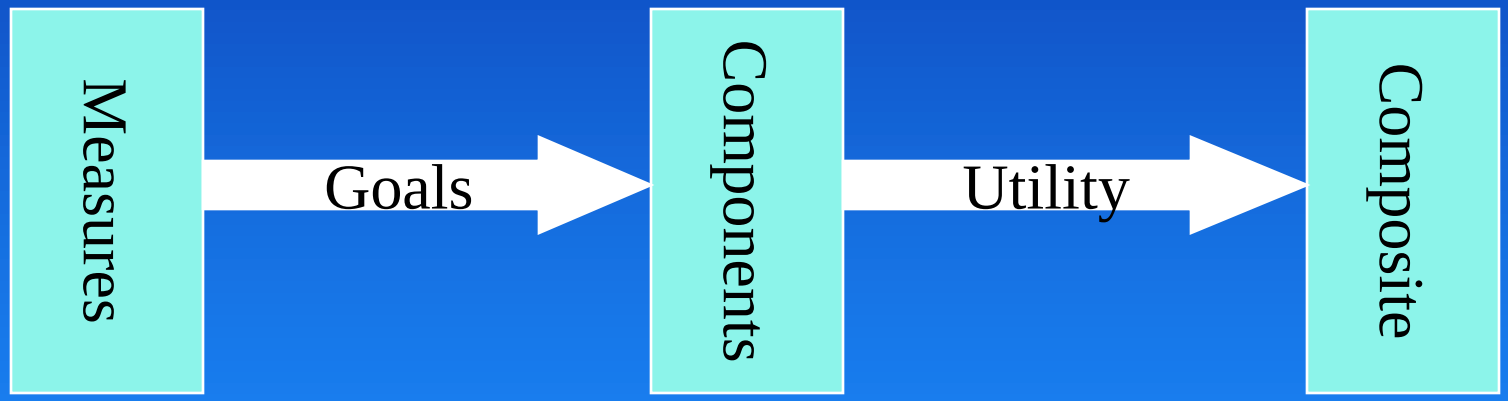
# Who Might Use Them?

- Consumers – To select a hospital either before or after a health event
- Providers – To identify the domains and drivers of quality
- Purchasers – To select hospitals in order to improve the health of employees
- Policymakers – To set policy in order to improve the health of a population

# Examples

- "America's Best Hospitals" (U.S. News & World Report)
- Leapfrog Safe Practices Score (27 procedures to reduce preventable medical mistakes)
- NCQA, "America's Best Health Plans"
- QA Tools (RAND)
- Veteran Health Administration (Chronic Disease Care Index, Prevention Index, Palliative Care Index)
- Joint Commission (heart attack, heart failure, pneumonia, pregnancy)
- National Health Service (UK) Performance Ratings
- CMS Hospital Quality Incentive Demonstration Project

# Examples



# Alternative Approaches

| Approach | Goal | Utility |
|---|---|---|
| Opportunity | Appropriate care | Volume of opportunities |
| Burden | Minimize excess death/costs | Measures with most excess |
| Expected quality | Better than reference | Lowest ratio |
| Variation | Better than reference | Outliers |
| Latent quality | Reduce variation | Measures with greatest variation |

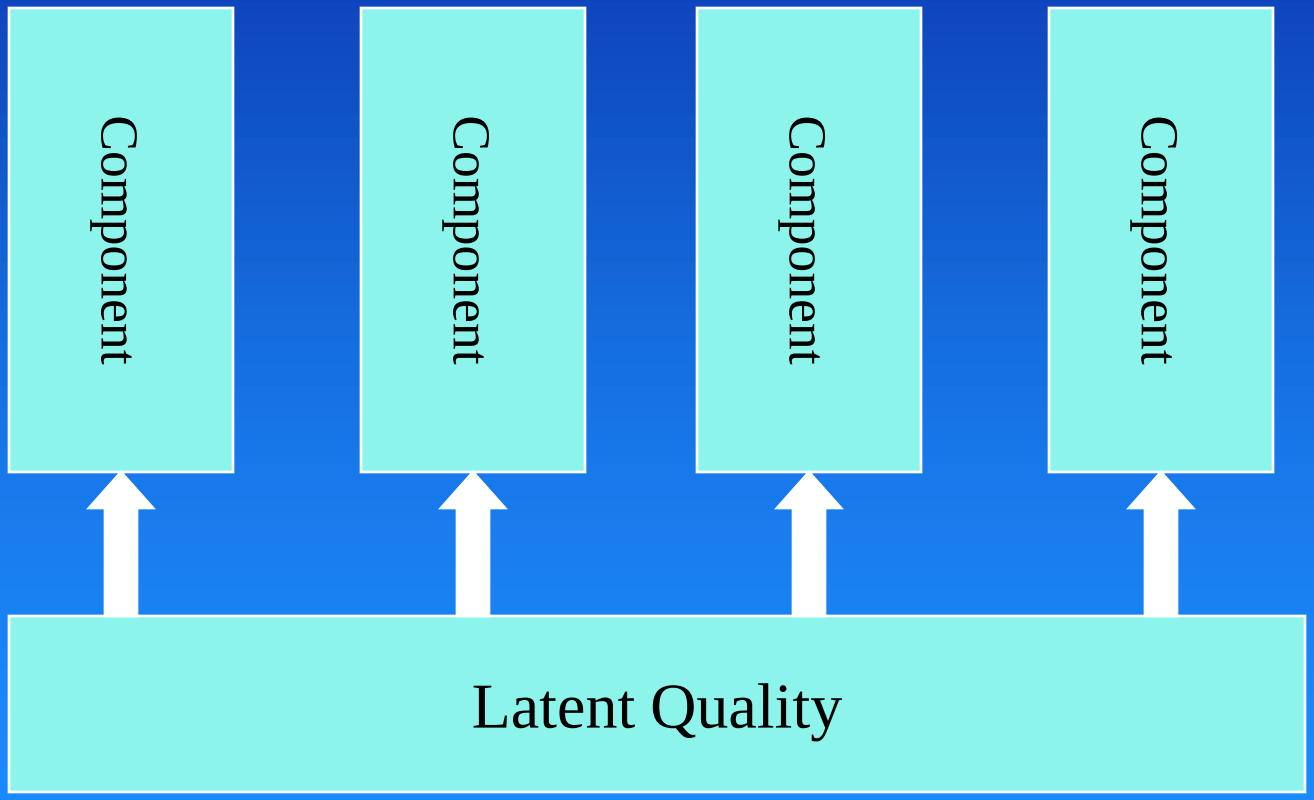
# Desirable Features

- Valid - Based on valid measures
- Reliable – Improve ability to detect differences
- Minimum Bias – Based on unbiased measures
- Actionable – Interpretable metric
- Benchmarks or standards
- Transparent
- Predictive – Should guide the decision-maker on likely future quality based on current information.
- Representative – Should reflect expected outcomes for population

# Proposed Approach

- A modeling-based approach
- Latent quality – observed correlation in individual measures is induced by variability in latent quality
- Individual measures with highest degree of variation have larger contribution to composite
- Theoretical interpretation
- Consistent with goal of reducing overall variation in quality

# Proposed Approach



# Advantages

- Avoids contradictory results with individual measures or the creation of composites that may mislead
- Construction of the composite increases the power of quality appraisals
- Allows for both measure-specific estimates and composites
- Allows for validation with out-of-sample prediction

# Advantages (Continued)

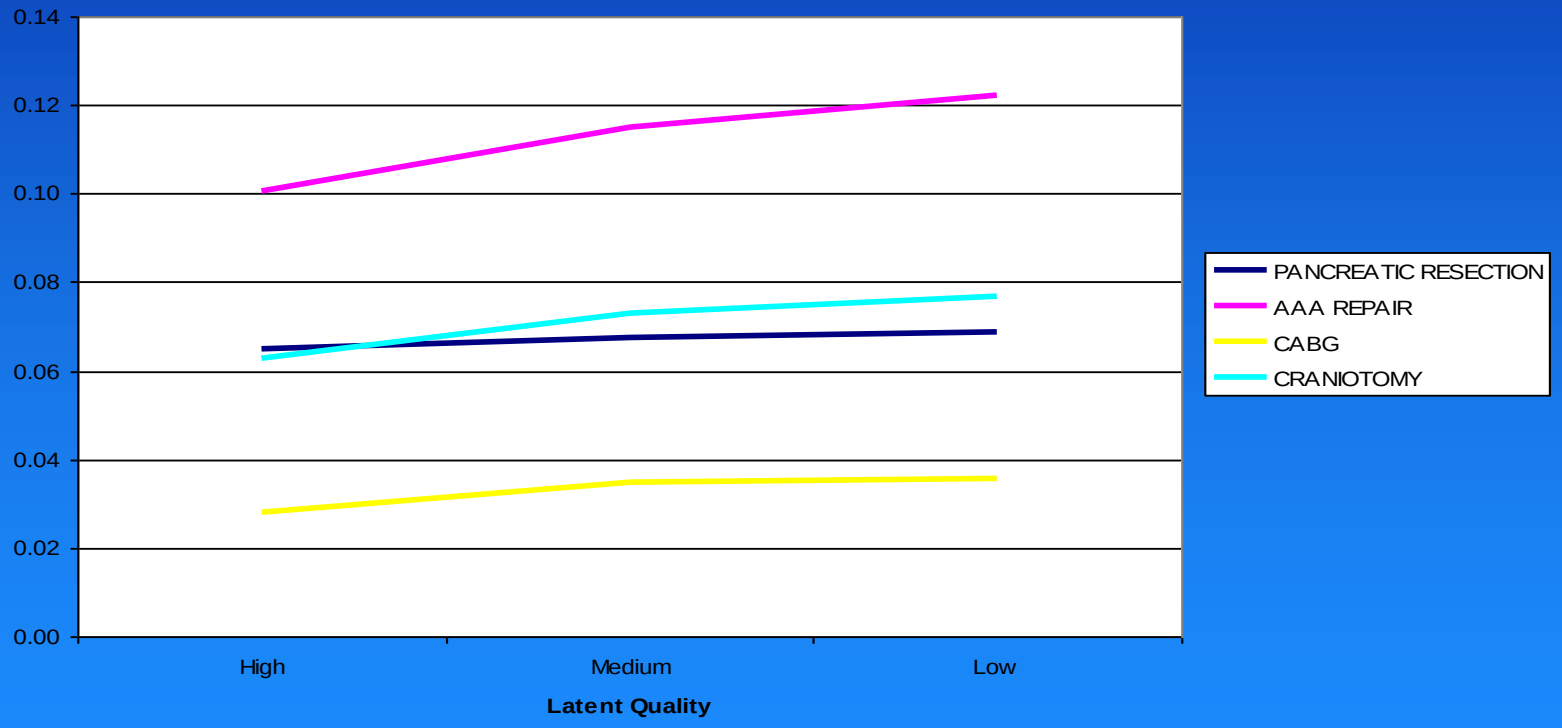
- Hierarchical – for small numbers, the best estimate is the pooled average rate at similar hospitals
- Allows for incorporation of provider characteristics to explain between-provider variability (e.g., volume, technology, teaching status)
- Gives policymakers information on the important drivers of quality

# Overview of AHRQ QIs

- Prevention Quality Indicators
  - Ambulatory care sensitive conditions
- Inpatient Quality Indicators
  - Mortality following procedures
  - Mortality for medical conditions
  - Utilization of procedures
  - Volume of procedures
- Patient Safety Indicators
  - Post-operative complications
  - Iatrogenic conditions

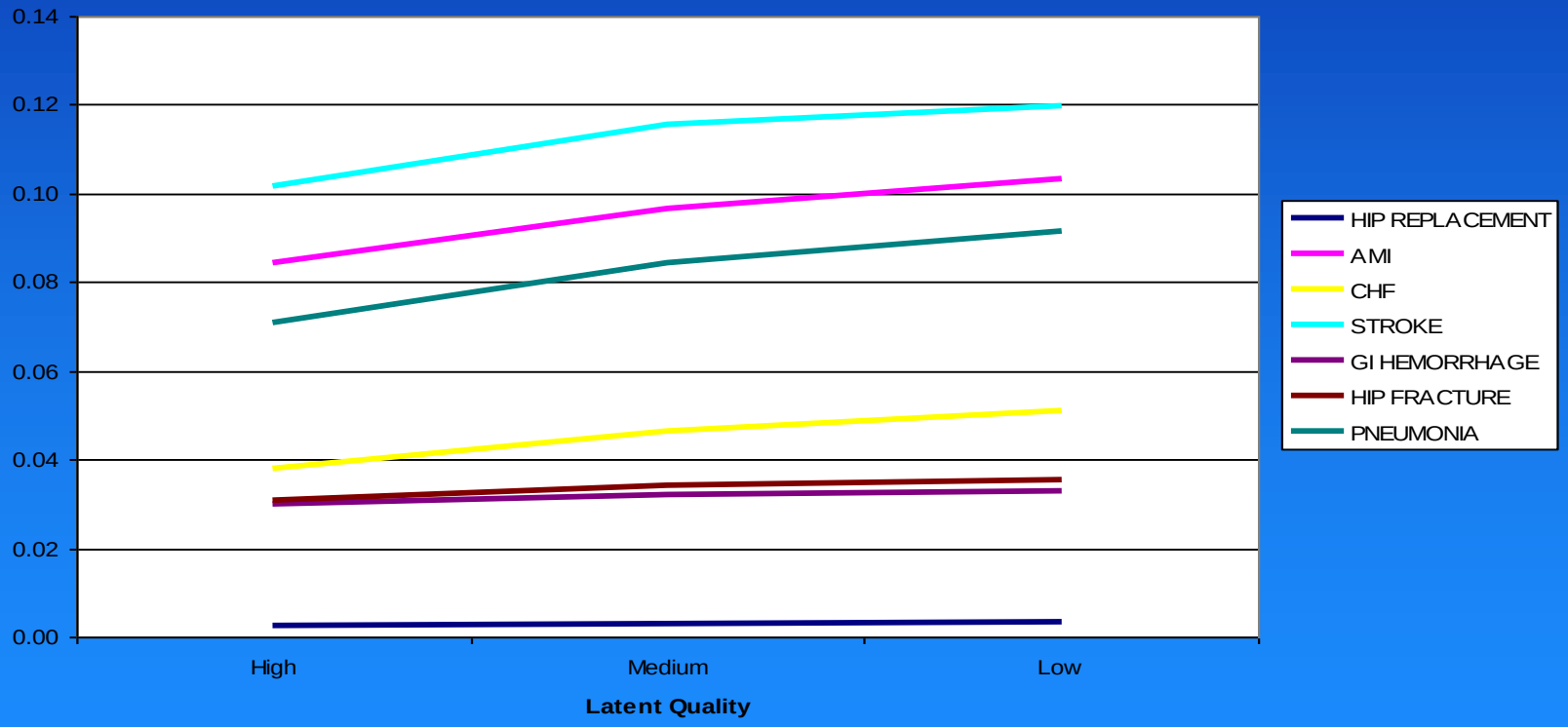
# Examples

## IQI Surgical Mortality



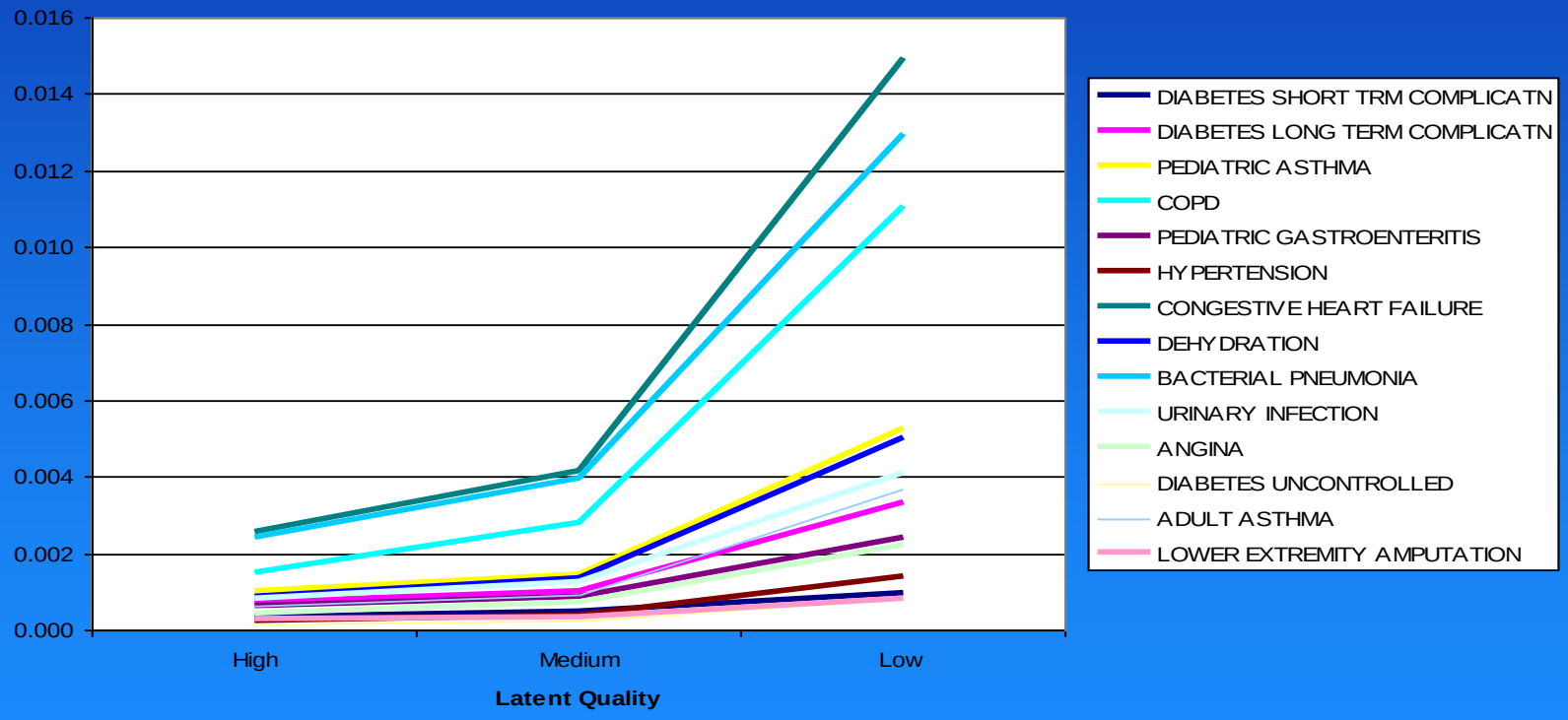
# Examples

## IQI Medical Mortality



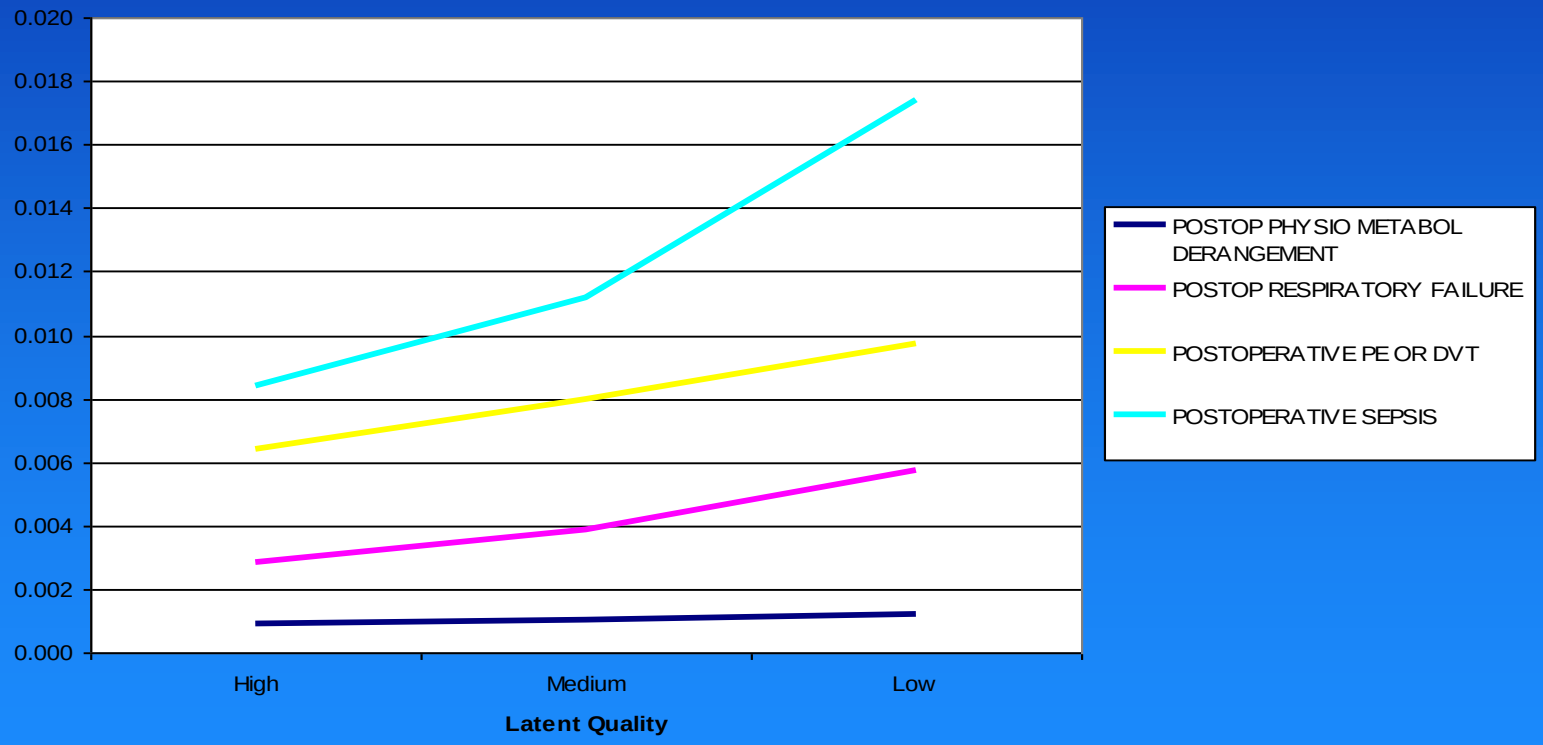
# Examples

## Prevention Quality Indicators



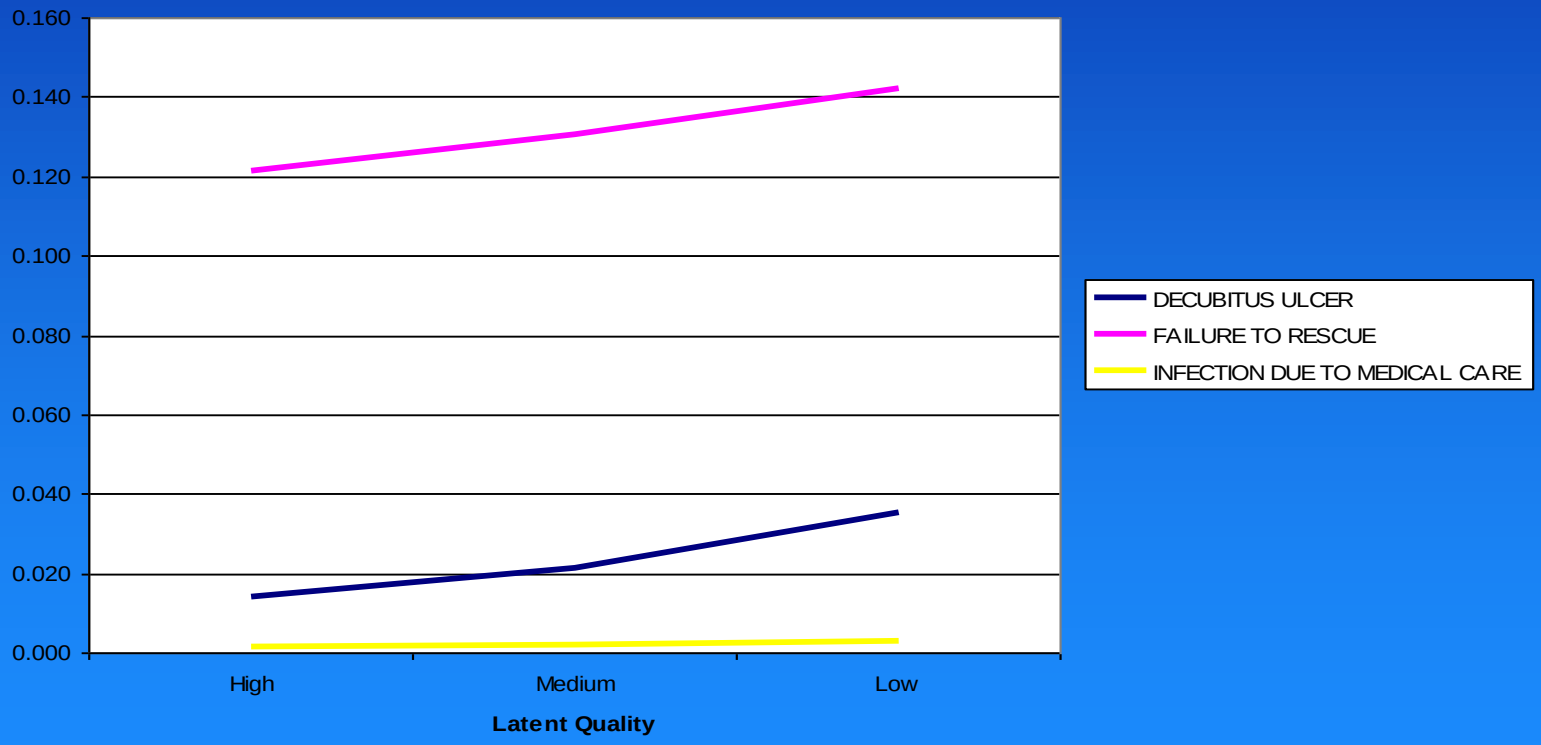
# Examples

## PSI Postoperative Complications



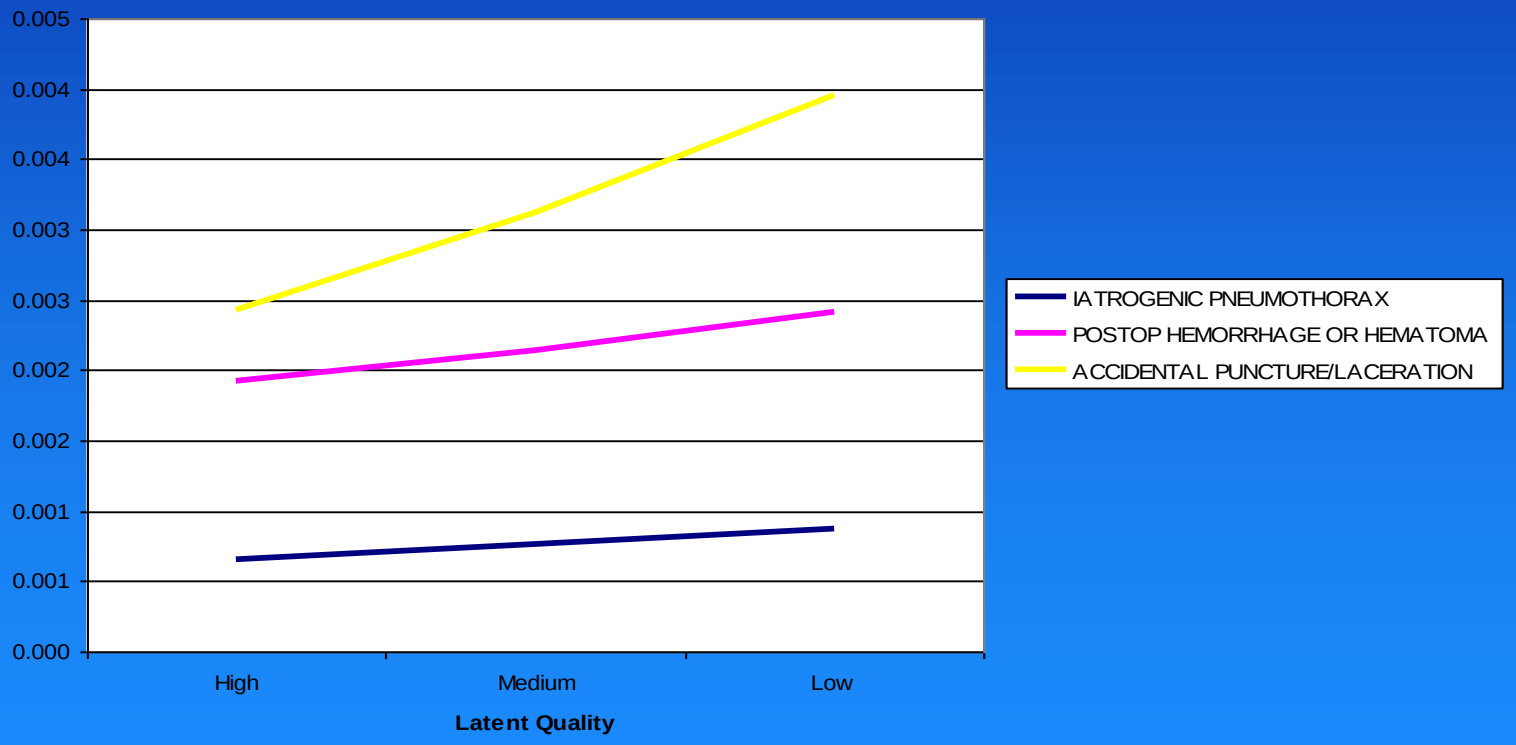
# Examples

## PSI Technical Adverse Events



# Examples

## PSI Technical Difficulty



# Hierarchical Models

- Also referred to as smoothed rates or reliability-adjusted rates
- Endorsed by NQF for outcome measures
- Methods to separate the within and between provider level variation (random vs. systematic)
- Total variation = Within provider + Between provider (Between = Total – Within)
- Reliability (w) = Between / Total
  - Signal ratio = signal / (signal+noise)

# Hierarchical Models

- Smoothed rate is the (theoretical) best predictor of future quality
- Provides a framework for validation and forecasting
- Smoothed rate (single provider, single indicator) =

  Hospital-type rate * (1 – w) +

  Hospital-specific rate * w
- Multivariate versions
  - Other Years (auto-regression, forecasting)
  - Other Measures (composites)
  - Non-persistent innovations (contemporaneous, nonsystematic shocks)

# Outcomes and Process

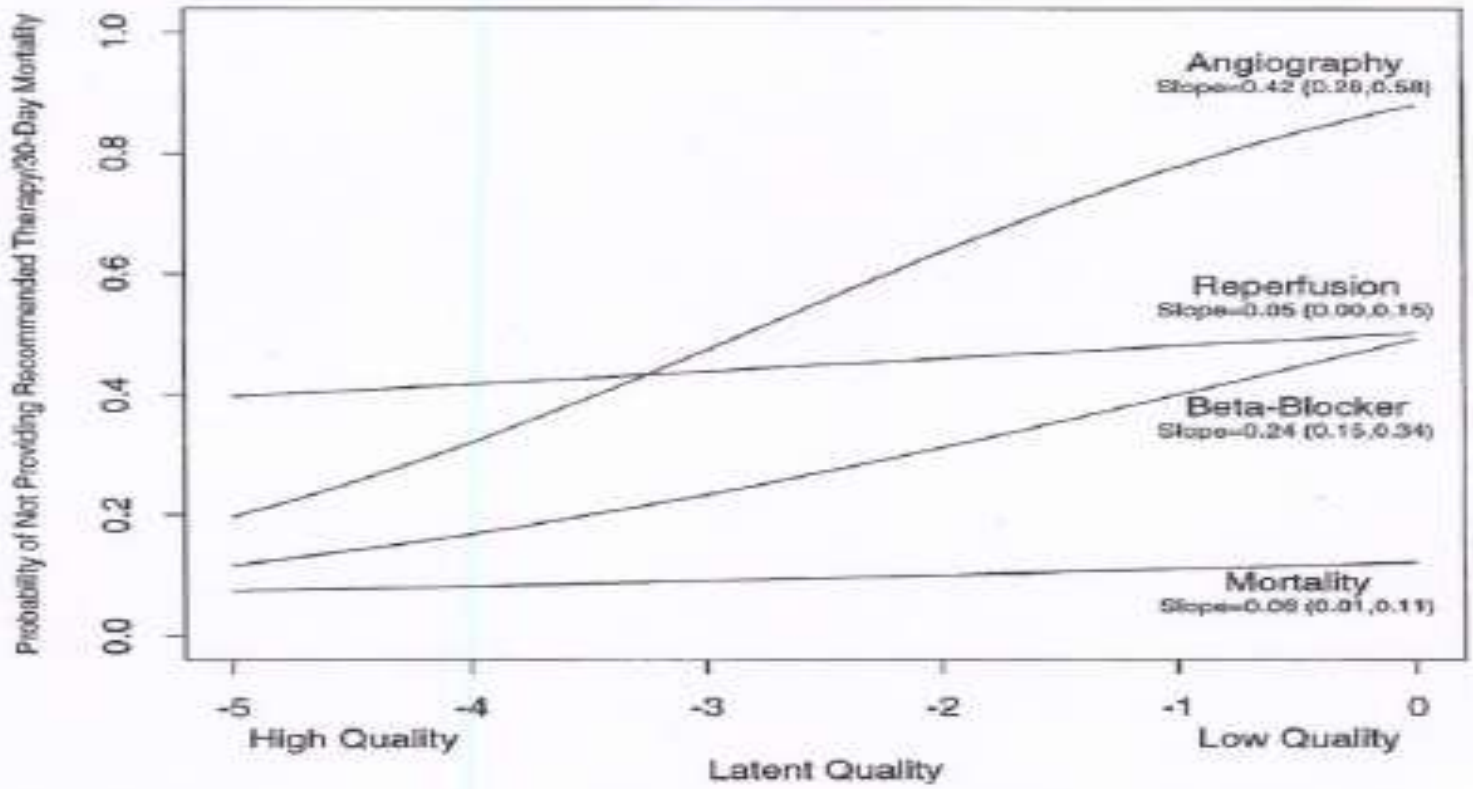
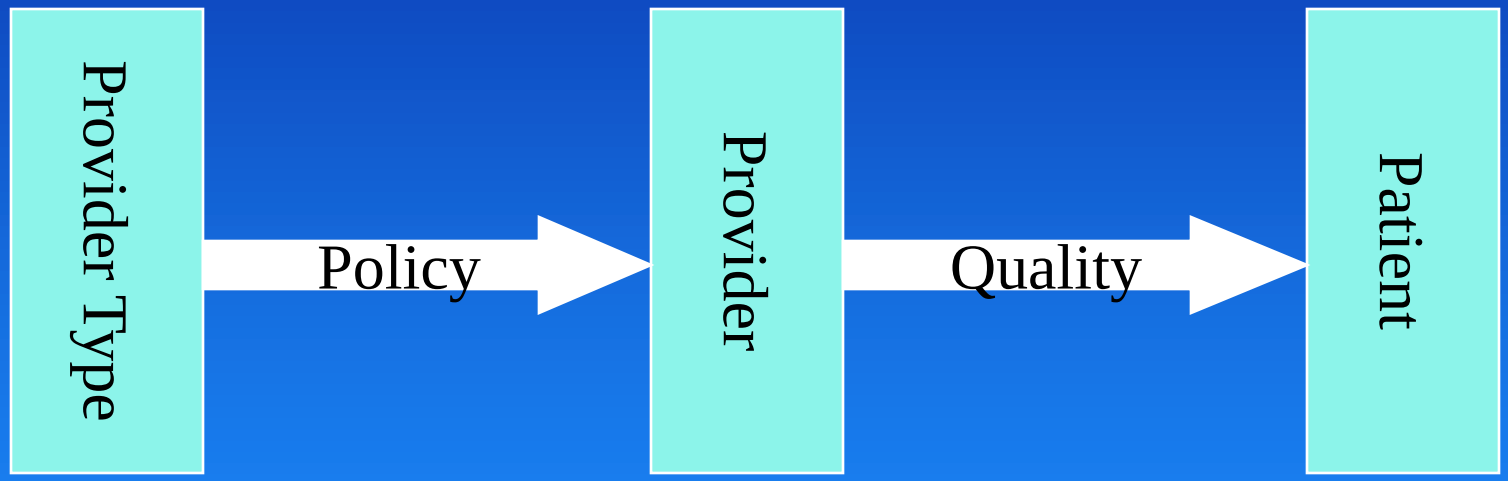



*Figure 3.* "Quality" Characteristic Curves. Mean estimates of the probability of outcome $k$ as a function of latent quality, $\bar{P}_k(\theta') = \Phi(\bar{\beta}_{0k} + \bar{\beta}_{1k}\theta')$. The posterior mean estimates and 95% credible intervals for the slope parameters (the $\beta_{1k}$'s) are also reported.

Source: Landrum et. al. Analytic Methods for Constructing Cross-Sectional Profiles of Health Care Providers (2000)

# Hierarchical Models



# Policy and Prediction

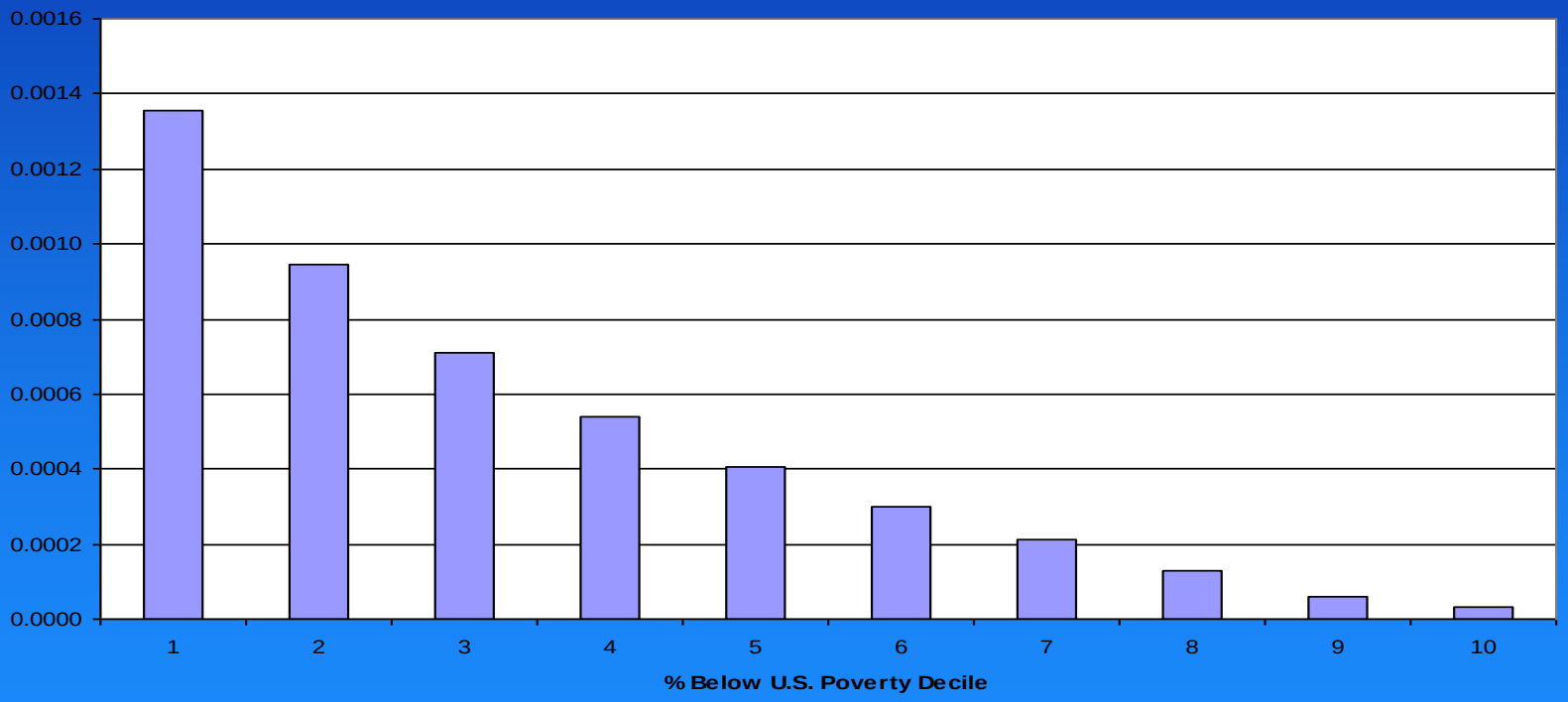
- The best predictor of future performance is often historical performance + structure
- The greater the reliability of the measure for a particular provider, the more weight on historical performance
- The less the reliability of the measure for a particular provider, the more weight on structure
- Volume often improves the ability to predict performance for low-volume providers
- Other provider characteristics (e.g. availability of technology) do as well
- Area characteristics (e.g., SES) do as well

# Socio-Economic Status

- The Public Health Disparities Geo-coding Project - Harvard School of Public Health (PI: Nancy Krieger)
- Evaluated alternative indices of SES (e.g. Townsend and Carstairs)
- Occupational class, income, poverty, wealth, education level, crowding
- Gradations in mortality, disease incidence, LBW, injuries, TB, STD
- Percent of persons living below the U.S. poverty line
  - Most attuned to capturing economic depravation
  - Meaningful across regions and over time
  - Easily understood and readily interpretable

# Socio-Economic Status

## PQI #1 Diabetes Short-term Complication



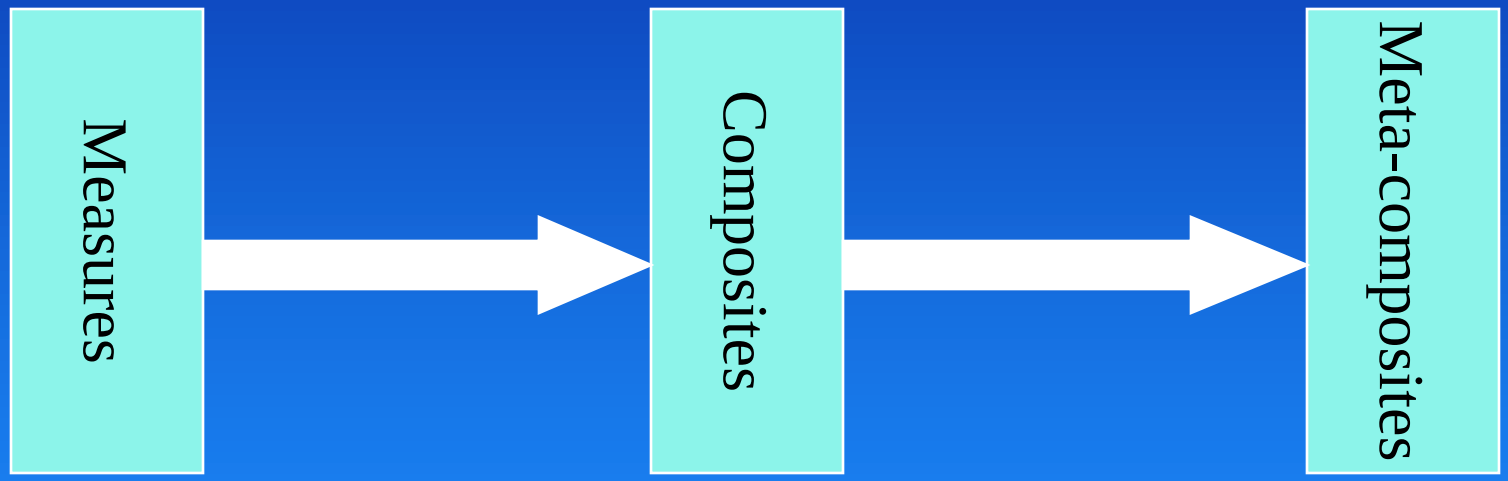
# Limitations

- Measures and methods difficult
- Restrictive assumptions on correlation
- Correlations may vary by provider type
- Requires a large, centralized data source

# Expansions

- Flexibility in weighting the components
- Empirical – domains driven entirely by empirical relationships in the data
- A priori – domains determined by clinical or other considerations
- Combination – empirical when the relationships are strong and the measures precise, otherwise a priori

# Welfare-driven Composites



# Welfare-Driven Composites

- Making current decisions about future needs – maximize expected outcomes, minimize expected costs
- Policymaker focus – for a population
- A provider focus – for their patients
- A employer focus – for their employees
- A consumer focus – based on individual characteristics

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- Mark Gritz and Jeffrey Geppert, Project Directors, Battelle Health and Life Sciences

**Data used for analyses:**

Nationwide Inpatient Sample (NIS), 1995-2000. Healthcare Cost and Utilization Project (HCUP), Agency for Healthcare Research and Quality

State Inpatient Databases (SID), 1997-2002 (36 states). Healthcare Cost and Utilization Project (HCUP), Agency for Healthcare Research and Quality

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# Questions & Answers

- Questions And Answers