



# THE GEORGE INSTITUTE for Global Health



Sydney, AUSTRALIA | Beijing, CHINA | Hyderabad, INDIA | London, UK



*Affiliated with the University of Sydney*

# US public reporting of hospital outcomes: Application to Australia?

**Martin Gallagher**

**Harkness Fellow 2009-10**

**Head Renal Policy, The George Institute for Global Health**

**Head Renal Department, Concord Hospital**

# Overview

- **Drivers of public reporting**
  - US relevance
- **US methodology**
  - Structures
  - Statistical issues
- **Application to Australian hospital data**
- **Other interests....**



A decade of

DISCOVERY · INNOVATION · IMPACT

# Drivers of public reporting

- **Accountability**
- **Improvement**
- **Informing patient choice**



*A decade of*

DISCOVERY · INNOVATION · IMPACT

# Drivers of public reporting

- **Accountability**

- Marshall (*Qual Health Care 2001;10:67-68*)

“they are dissatisfied with what they perceive as the veil of secrecy and professional protectionism currently seen in health care.”

- Anderson

“The mice are in charge of the cheese”

- Queensland, Campbelltown..

'The mice in charge of the cheese': Father slams inaction after girl's hospital death

March 4, 2010

Ads by Google

[Join WSJwines Club Today](#)

Save \$120 on Hand Selected Wines. Sign Up Now & Receive a Free Gift!

[www.WSJwine.com](http://www.WSJwine.com)



A decade of

DISCOVERY · INNOVATION · IMPACT

# Drivers of public reporting

- **Improvement**

- Necessary but not sufficient
- “If you cannot measure it, you cannot improve it”
- Other organisations:

- IHI

- UK NHS

- US NCQA

- Kings Fund

- Commonwealth Fund

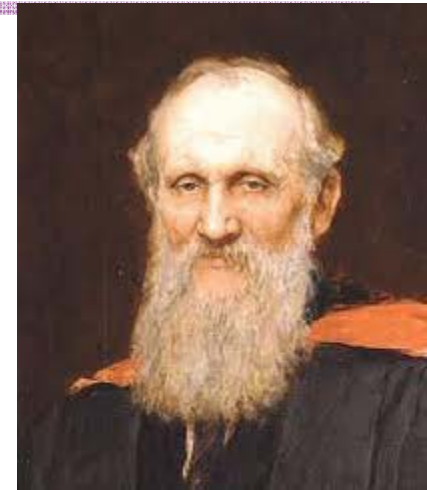
- **Science:**

- “Evidence is scant” & “Rigorous evaluation of many major public reporting systems is lacking” (1)

- Effect trial (2)

- Primary outcomes no different

- Significant reductions in some secondary outcomes (MI mortality)



A decade of

DISCOVERY · INNOVATION · IMPACT

1. Fung CH et al. *Annals of Internal Medicine*. 2008;148(2):111-123.
2. Tu JV et al. *JAMA*. 2009;302(21):2330-2337.

# Drivers of public reporting

- **Informing patient choice**
  - Prominent in the justification for HCFA in 1986
  - Oft cited, but
    - 30% have seen health related quality data
    - 20% have seen data related to hospital quality
    - 14% have seen and used such data
    - 6% have heard of hospitalcompare website
  - US measures relate to acute care

# US methodology

- **Measure development:**

  - Driven by CMS & AHRQ

  - Endorsement by NQF

- **Rules and processes**

  - AHA & ACC attributes of statistical models

    - Define patient sample

    - Include clinically sensible patient covariates

    - High quality and timely data

    - Not include covariates that could represent complications of care

    - Appropriate outcome measured in a standard time period

    - Apply an appropriate statistical approach

    - Disclose detail of methods and model's performance

      - AHA specifically mentioned validation of administrative models against medical record data



A decade of

DISCOVERY · INNOVATION · IMPACT

# What does this mean in practice?

- **AMI mortality model**

Administrative dataset: US Medicare data

- Medical record data

Large clinical registries (Cooperative Cardiovascular Project)

- Derive the models

Many variables from the datasets (27 in Administrative)

- Validate models using linked (sub)datasets

Risk standardised mortality rates for both models in all hospitals

Compare performance: linear regression slope ( $\sim 1$ ) and intercept ( $\sim 0$ )

# What does this mean in practice?

- **Funding source for measure development**  
Tenders let by CMS
- **Convening expert work groups**  
Often subspecialty of interest: Cardiology, Neurology, Orthopaedics  
Seeking out validating datasets
- **Taking measure through NQF process**



A decade of

DISCOVERY · INNOVATION · IMPACT



# Statistical issues

- **Issues**
  - Variation in risk
    - Standardisation
  - Within hospital correlation
  - Imprecision
    - Variation in hosp volume
  - Regression to the mean
  - Multiple comparisons
  - Predetermined proportion  
“abnormal”
- **Hierarchical modeling**
  - Using logistic regression to determine variables
  - Addresses the other issues
  - Best technique for clustered data: Hospitals



A decade of

DISCOVERY · INNOVATION · IMPACT

# Risk adjustment

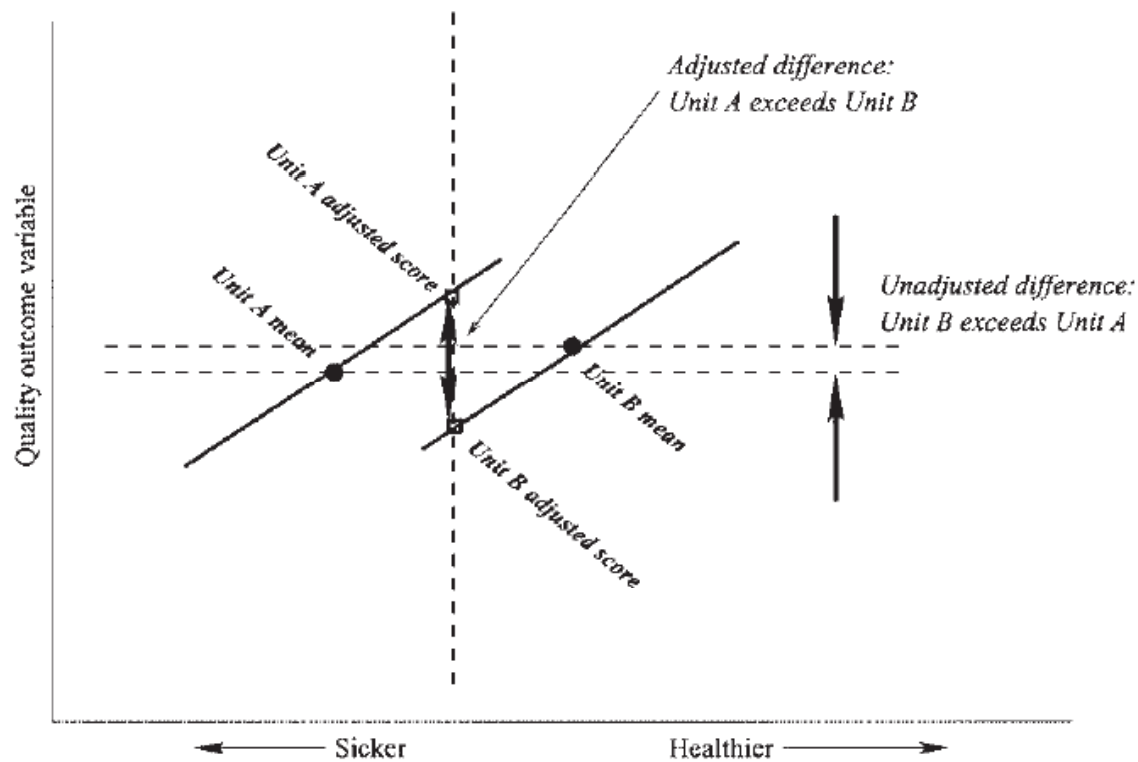


Figure 1 Casemix adjustment using linear regression.

# Risk adjustment

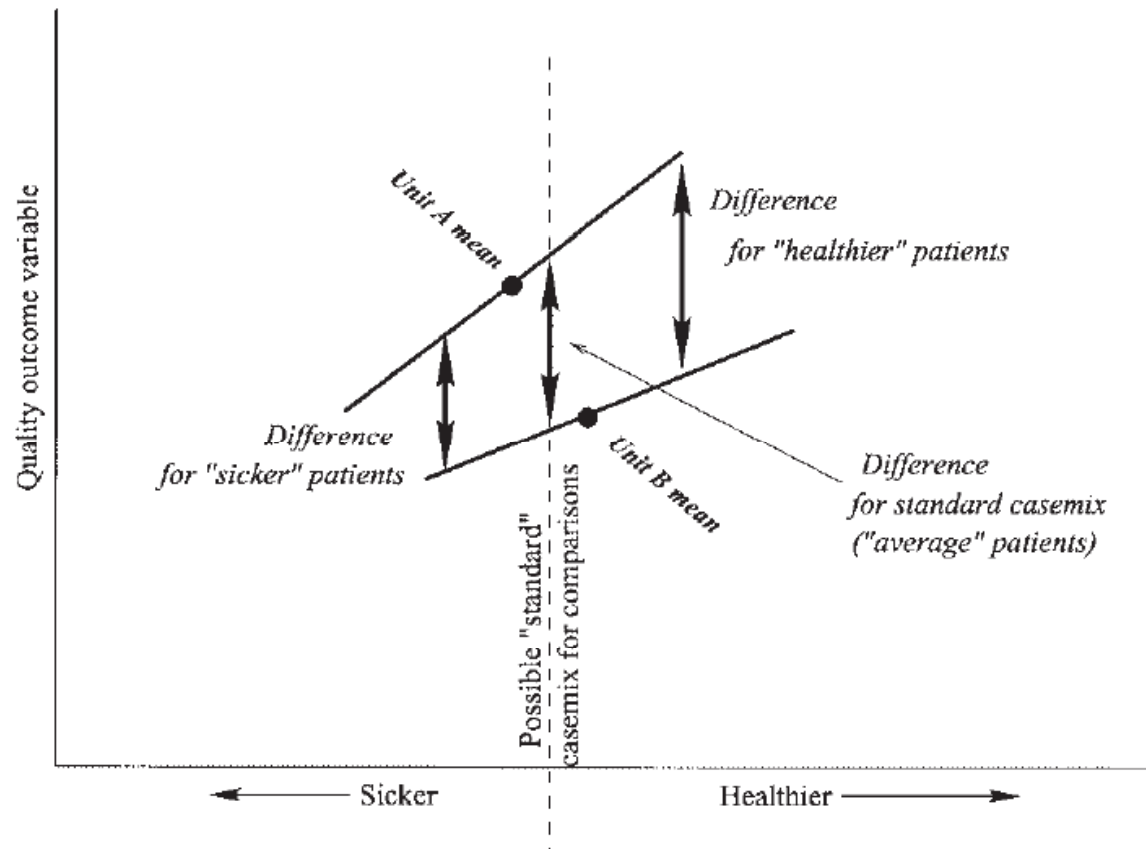


Figure 2 Casemix adjustment when effects of covariates are not the same at every unit.

# Risk adjustment

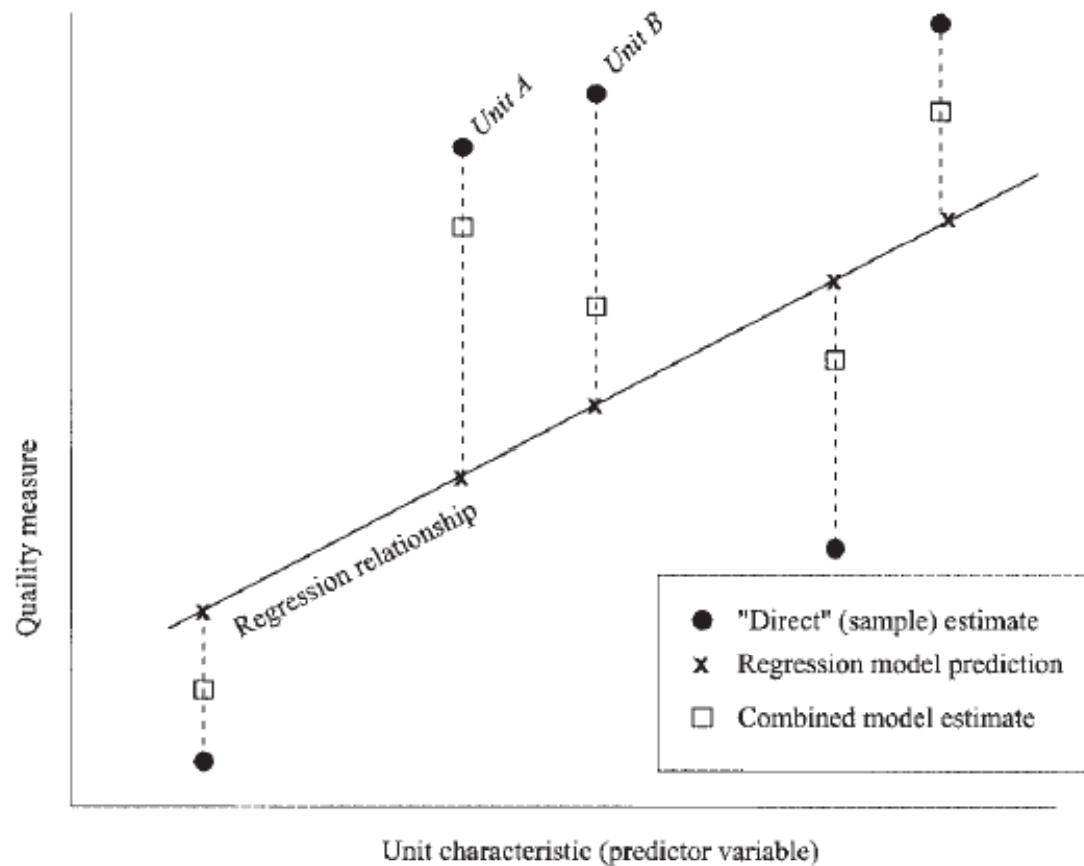


Figure 4 Combining regression predictions and direct estimates using a hierarchical model.



# Harkness questions

- **Are the US methods applicable to existing Australian health datasets?**
- **How do Australian(NSW) hospitals compare?**
- **What implications do such comparisons have for US policy?**
- **Will US methods work in an ICD10 coding environment?**
- **What value do the US methods have for Australia's development of public reporting?**



A decade of

DISCOVERY · INNOVATION · IMPACT

# Project: Methods

- **Data linkage project:**
  - CHeReL at University of Sydney
    - NSW Admitted Patient Data Collection
    - NSW Registry of Births, Deaths and Marriages
  - Cross-walk ICD9 to 10
    - 4000+ codes
- **Replication of US patient selection methods**
  - Derive an “index” admissions cohort
    - Link transferred admissions into a single episode
      - Mortality: link to the first point of care
      - Readmission: link to the last point of care before return to community
    - Exclusions



A decade of

DISCOVERY · INNOVATION · IMPACT

Random selection of 1 admission/pt/yr

# Project: Methods

- **Patient cohort:**

- All hospital admissions in NSW with AMI, heart failure or pneumonia

Approx 169,000 episodes

- 87,000 AMI
- 68,000 heart failure
- 26,000 pneumonia

These link to a total of 994,000 episodes of care (for all conditions)

5 years: mid 2003 to mid 2008

- **Outcomes:**

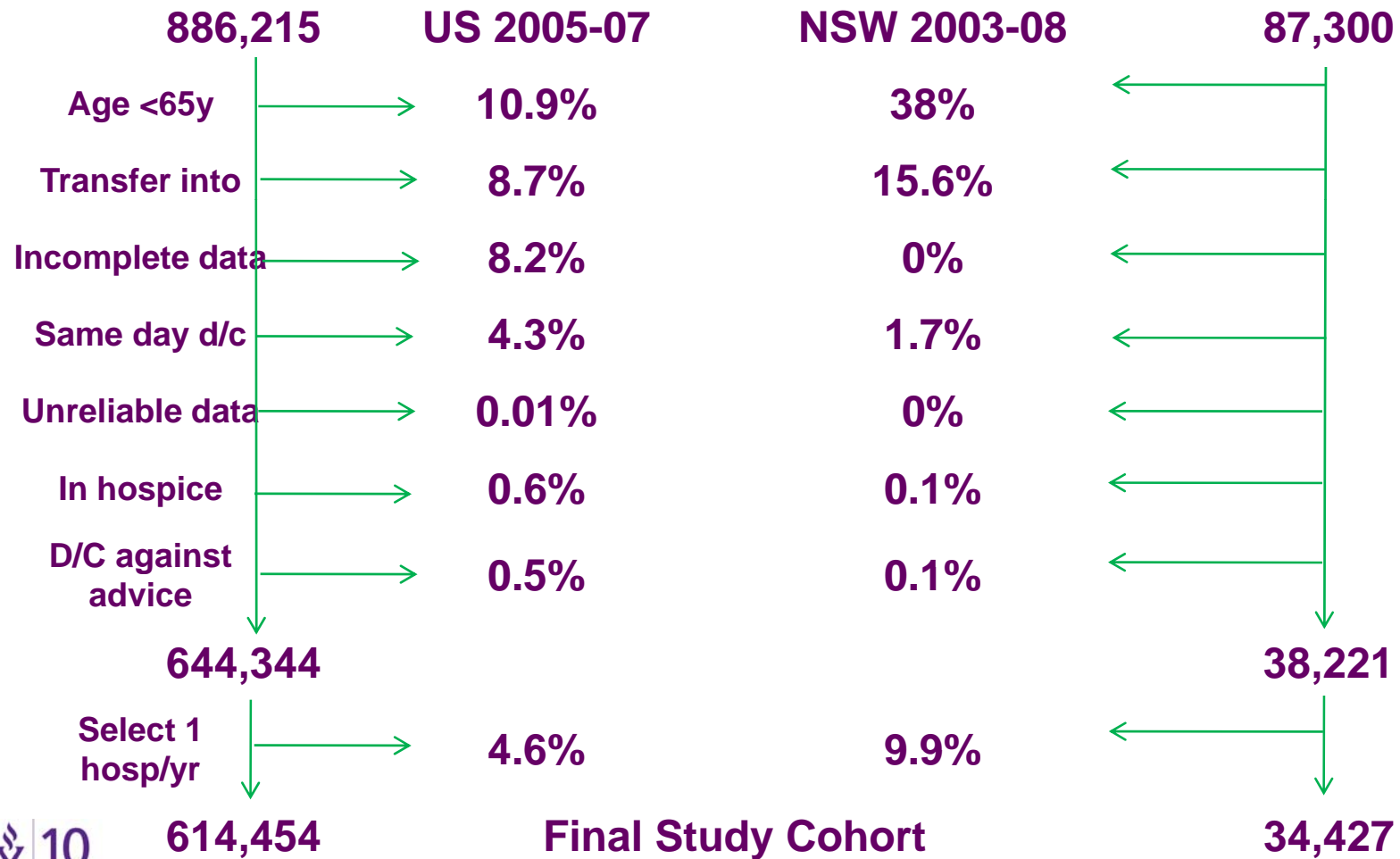
- Mortality from deaths registry
- Readmission from total episodes data



A decade of

DISCOVERY · INNOVATION · IMPACT

# AMI 30 Day Mortality Cohort



A decade of

DISCOVERY · INNOVATION · IMPACT

# Results: AMI Mortality

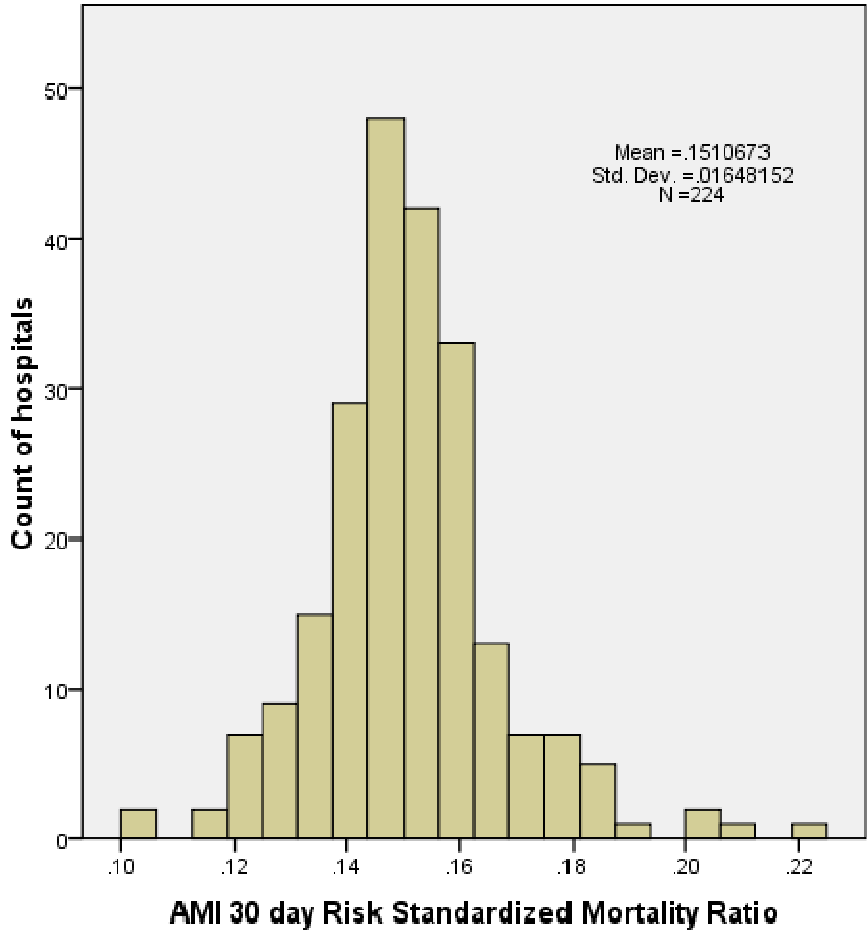
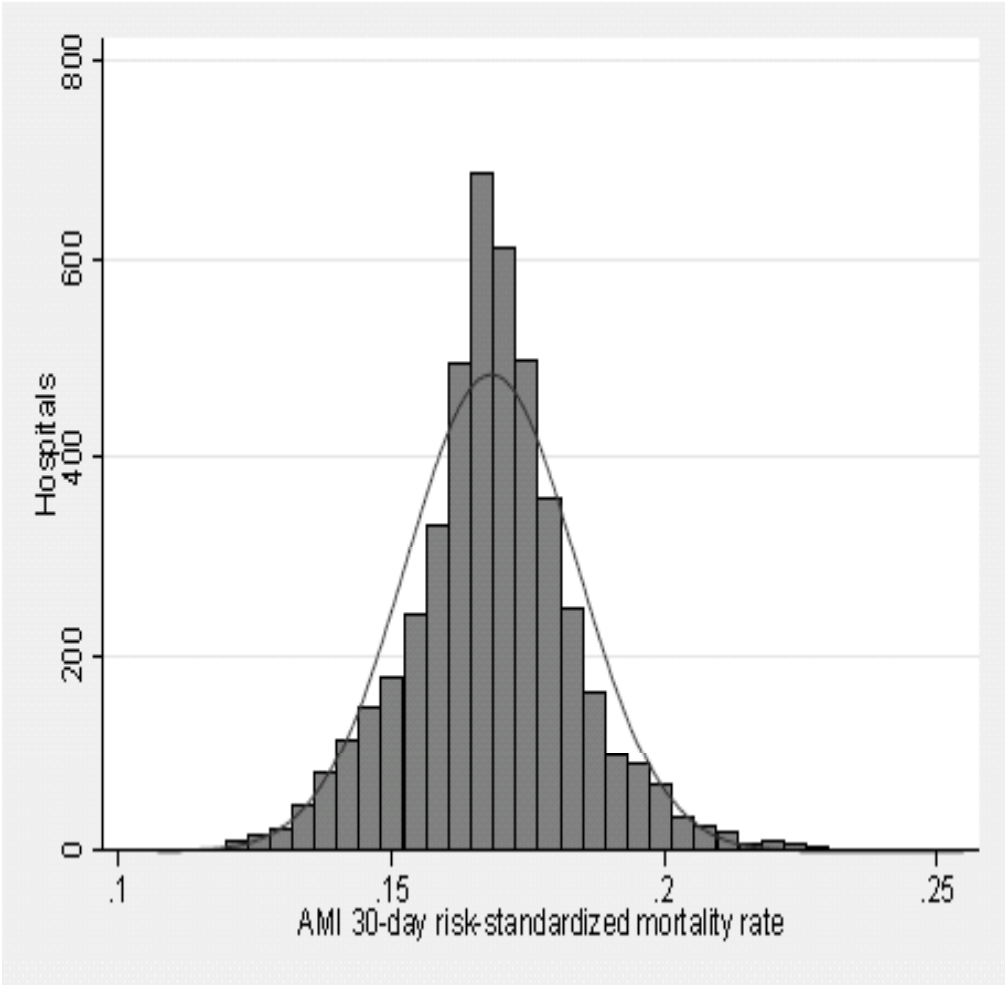
- **Crude mortality rate:**
  - NSW: 15.0%
  - US: 16.8%
  
- **Effects of US risk standardization model**
  - Comparable mortality  
NSW 15.1% v US 16.2%
  - Good predictor of mortality (c statistic 0.68)
  - More smaller hospitals
  
- **Higher number of inter-hospital transfers**



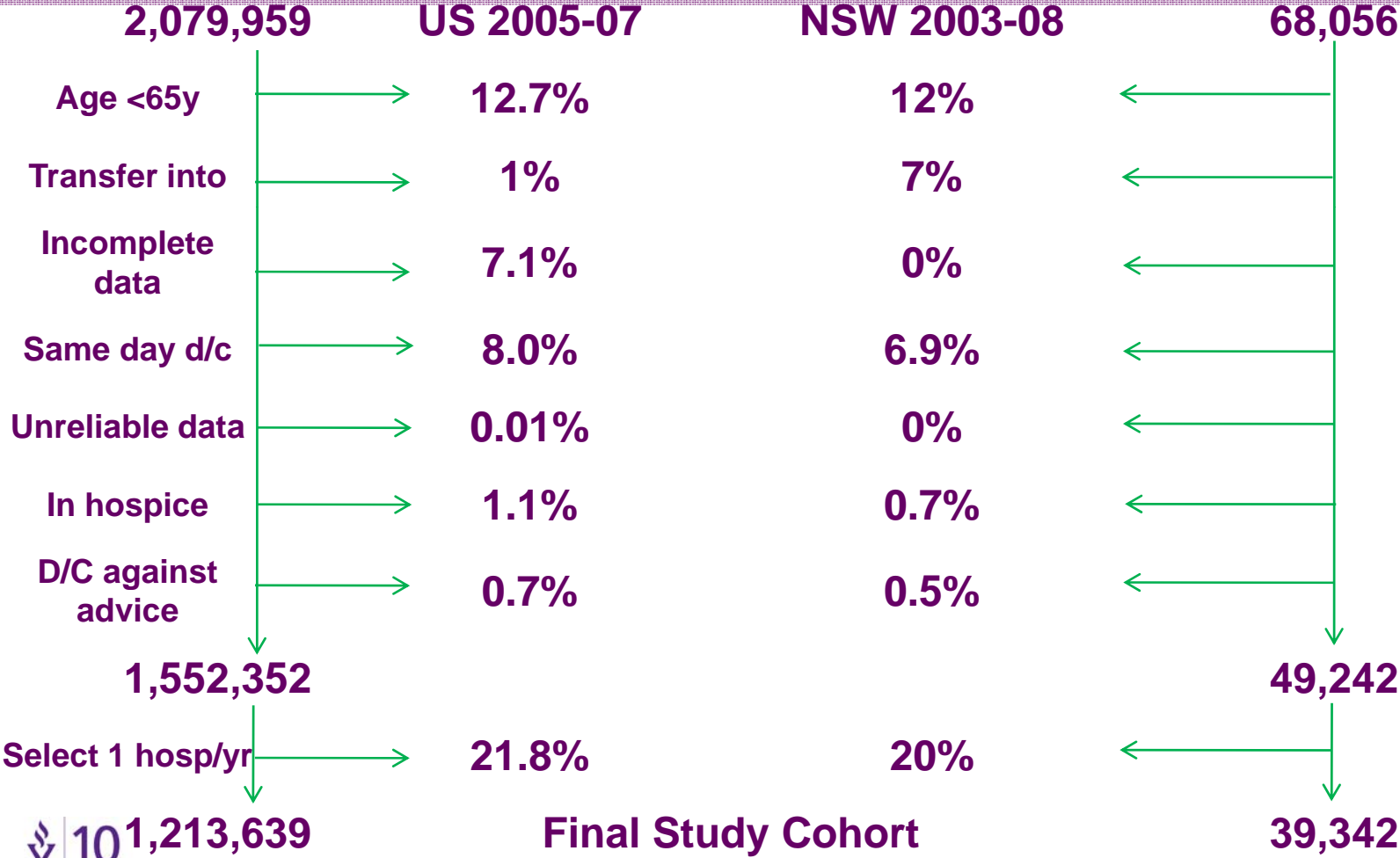
A decade of

DISCOVERY · INNOVATION · IMPACT

# US & NSW AMI Mortality



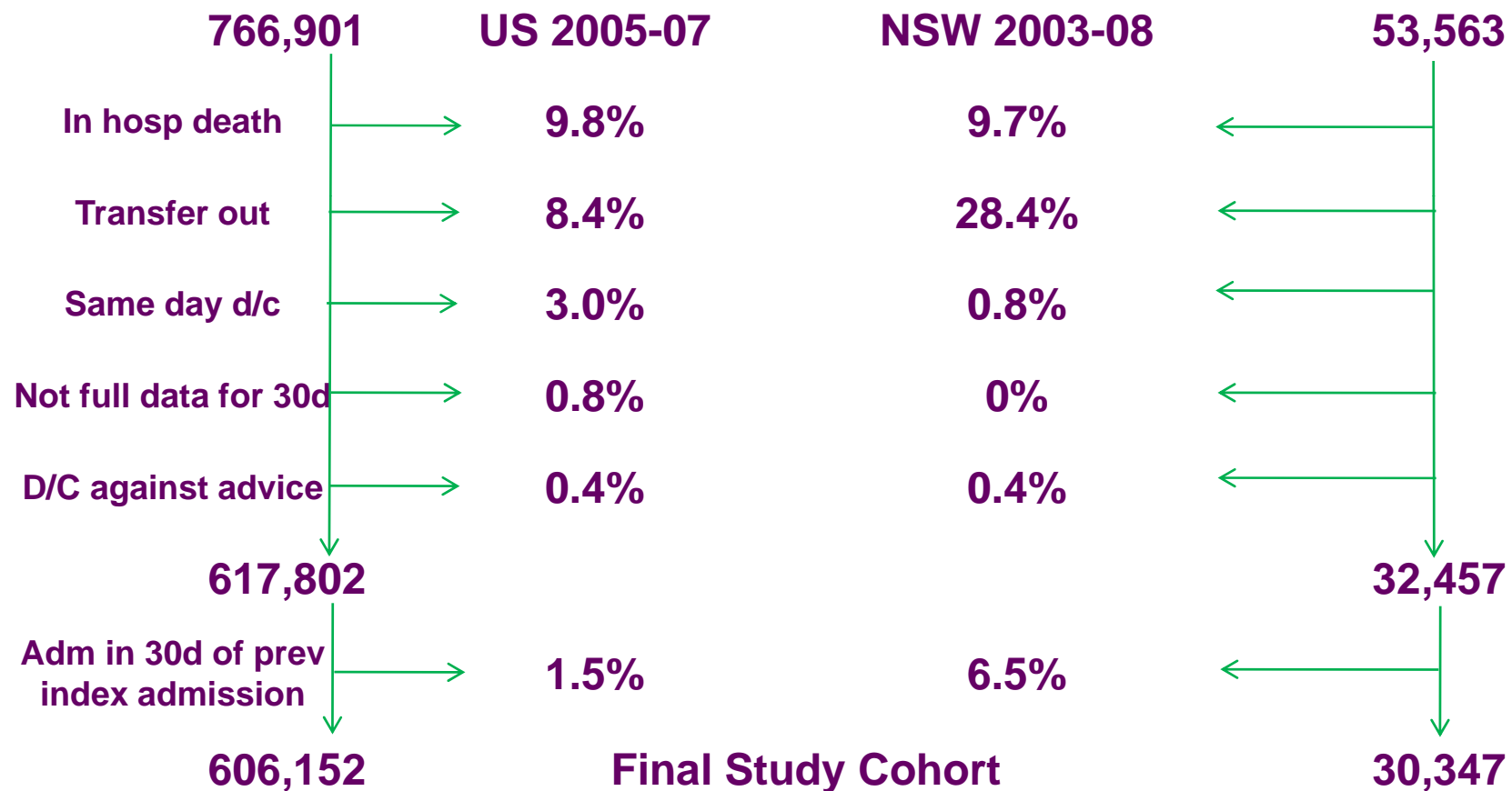
# Heart Failure 30 Day Mortality Cohort



# Heart Failure Mortality

- **Crude mortality rate:**
  - NSW: 13.3%
  - US: 11.2%
- **Effects of risk standardization**
  - Pending
- **Ratio of Heart failure:AMI cases**
  - US 2:1 vs NSW 1.15:1
    - Potentially coding plays a part
    - Larger denominator potentially influencing the mortality figure

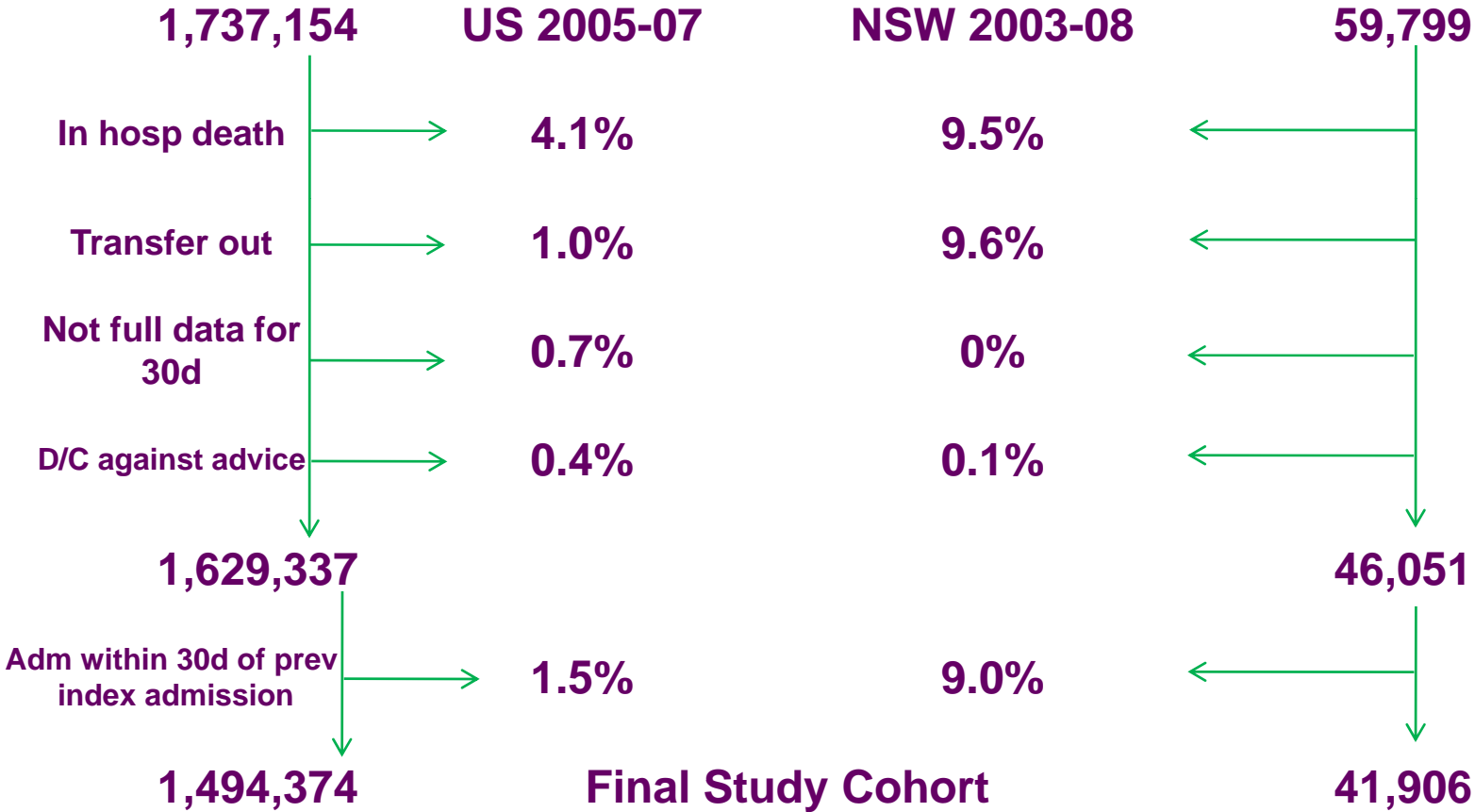
# AMI All Cause 30 Day Readmission Cohort



# AMI 30 Day All Cause Readmission

- **Crude rate**
  - NSW: 23%
  - US: 20%
  - Risk standardization pending
  
- **Exclusions from the readmission pool**

# Heart Failure All Cause 30-Day Readmission Cohort



# Heart Failure Readmission

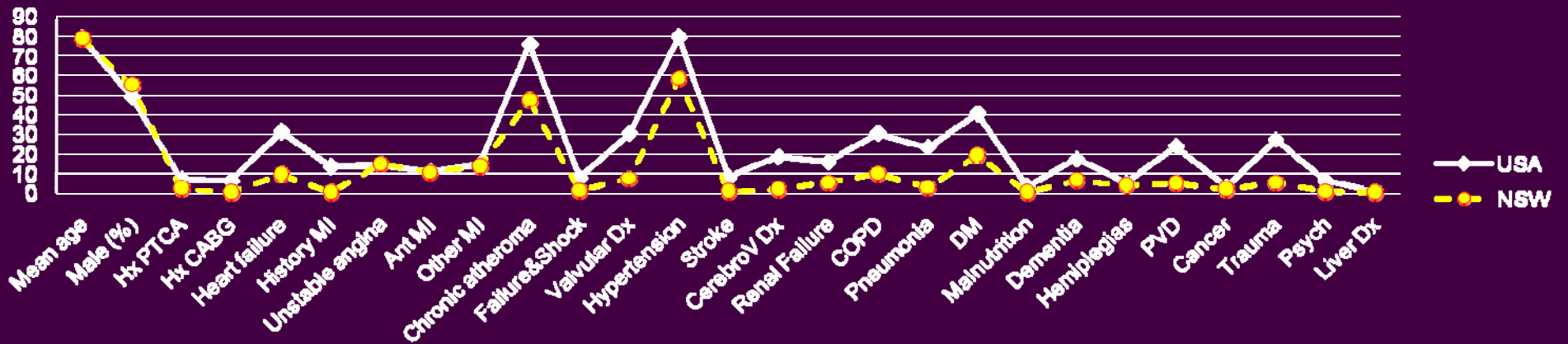
- **Crude rates:**

NSW: 27.4%

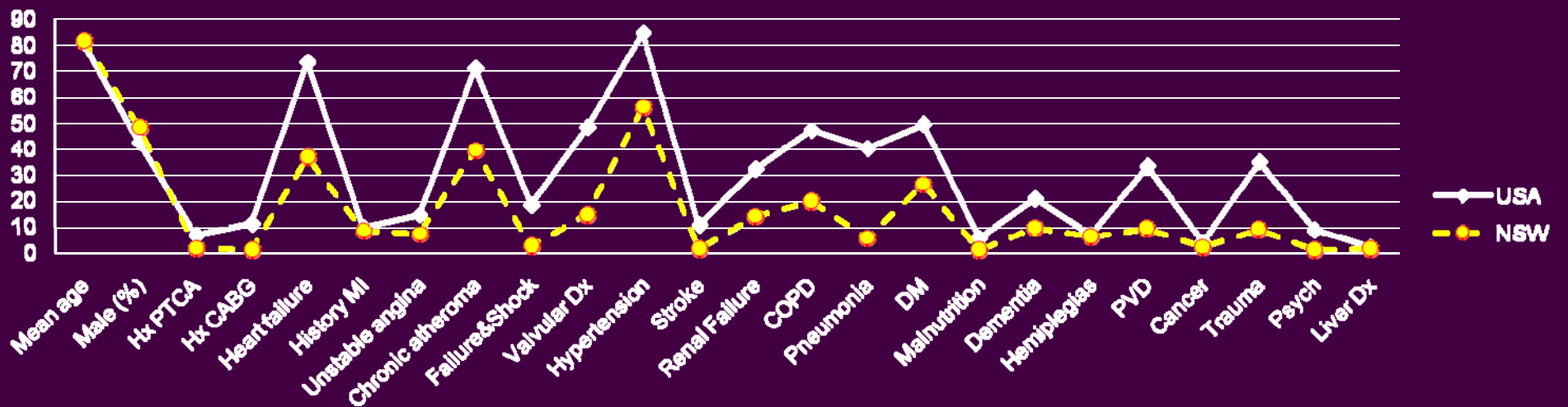
US: 24.5%

# Are these the same populations?

## HCC coding intensity: AMI mortality model



## HCC coding intensity: heart failure mortality model



# Harkness questions

- Are the US methods applicable to existing Australian health datasets? *Yes*
- How do Australian(NSW) hospitals compare? *Strikingly similar outcomes*
- What implications do such comparisons have for US policy? *Readmission rate penalties are unlikely to work*
- Will US methods work in an ICD10 coding environment? *Yes, but more validation work is needed*
- What value do the US methods have for Australia's development of public reporting?



A decade of

DISCOVERY · INNOVATION · IMPACT

# Informing Australian outcomes reporting

- **An evolving field**
  - Lots of questions that Australian data can help answer
  - Tools and methods are likely to evolve
- **Few Aus researchers & clinician leaders at present**
- **Do the measures need to be validated against medical record datasets?**

# Interesting readings

- **Zaslavsky AM. Int J Qual Health Care 2001; 13:481-488**  
Review of statistics relating to quality reporting
- **Bird SM et al. J. R. Statist. Soc. A (2005) 168, Part 1, pp. 1–27**  
Review of UK experience with performance indicators incl SMART targets
- **The Innovator's Prescription: A Disruptive Solution for Health Care**  
Clayton Christensen

<http://www.gongride.org.au/>



10

A decade of

DISCOVERY · INNOVATION · IMPACT

# Acknowledgements

Thanks to :

- The Commonwealth Fund for their Financial support.
- My collaborators at the Center for Outcomes Research and Evaluation (CORE) at Yale University, including Harlan Krumholz, Elizabeth Drye, Jennifer Mattera, Zhenqui Lin.
- My collaborators at the Centre for Health Record Linkage (CHeReL) at Sydney University NSW Health, especially Kim Lim and Lee Taylor.

“This work was performed whilst Dr. Gallagher was based at Yale University as a Harkness Fellow supported by the Commonwealth Fund. The views expressed here are those of Dr. Gallagher and should not be attributed to The Commonwealth Fund or its directors, officers, or staff.”



A decade of

DISCOVERY · INNOVATION · IMPACT