Measuring QIO Impact

Past Efforts and Future Opportunities

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WVMI & Quality Insights

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Disclaimer I

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Background-The Attribution Imperative

- Flawed evaluation designs beginning in the 6th SOW; missed opportunities
- Several studies purporting to show that QIOs produced quality improvements (and at least one that said they do not)
- IOM's "we can't prove it but we like them anyway"
- CMS emphasis on attribution in the 9th SOW

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Flawed evaluation designs

- Confusion between program and QIO evaluation
- Exclusive reliance on pre-post design
- Poorly specified interventions
- Inaccurate documentation
- Lack of adequate control
- Negative incentives on QIOs

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Typical QIO Scope of Work (6-8)

- Arbitrary improvement requirements
- Remeasurement before interventions effective
- Significant penalty for failure to perform
- Strong disincentive to use control groups
- Strong incentive to select providers based on likelihood of improvement (cherry picking)

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Studies of QIO performance

- Jencks, 2003
- Rollow, 2006
- Weingarten, 2004
- Snyder, 2005
- Institute of Medicine, 2006

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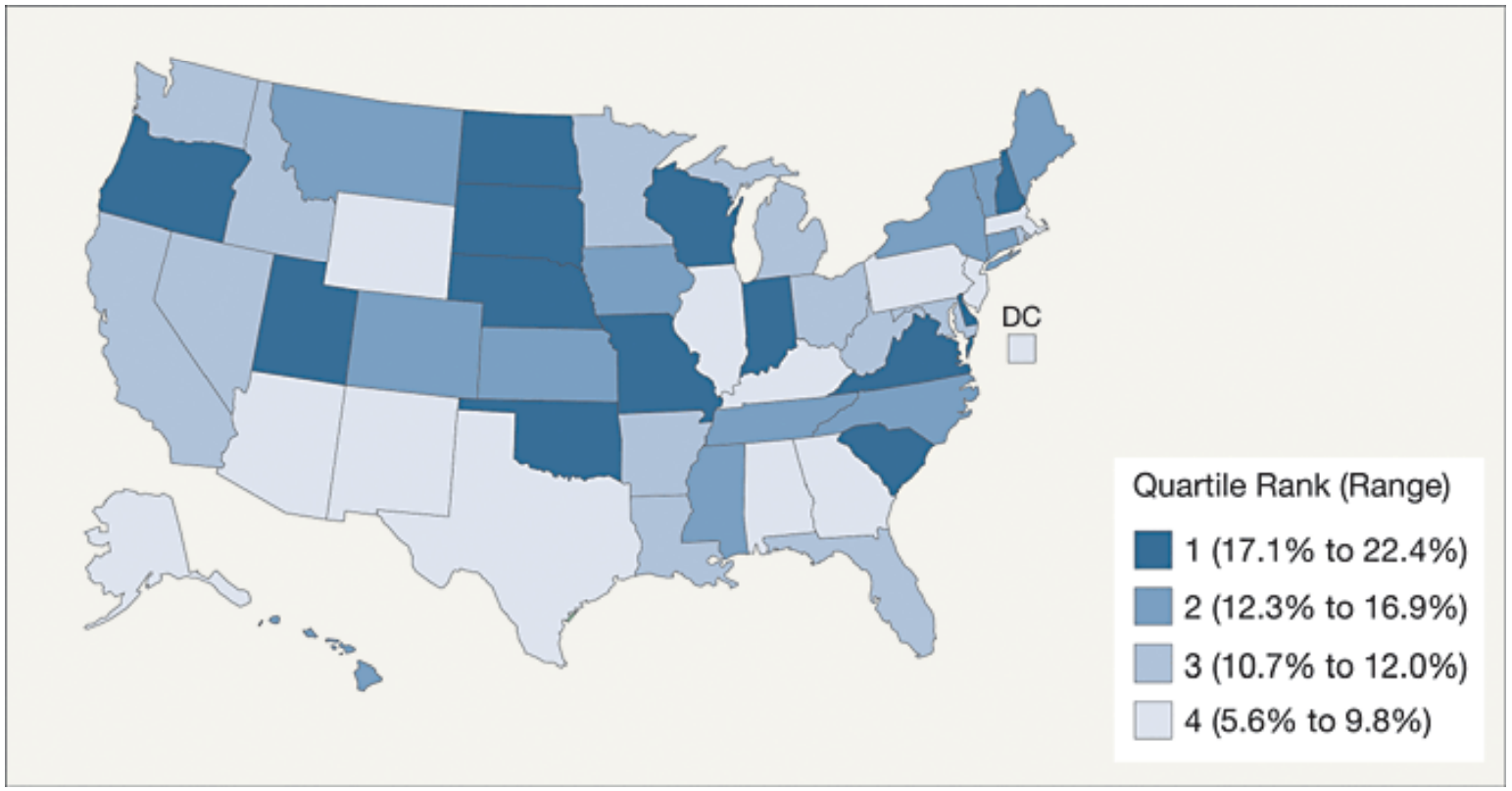
Jencks, 2003*



*Jencks SF, Huff ED, Cuerdon T. Change in the quality of care delivered to Medicare beneficiaries, 1998-1999 to 2000-2001. JAMA 2003;289(3):305-12.

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Weingarten, et al.*

- 15 states
- Quality measures: QIO-collected data, varying sample sizes and periodicity
- Interventions: Retrospective survey of QIO staff using TQIP-like measures
- Did not control for secular trends
- GLM: feedback and checklists strongest positive impacts

**Am J Med Qual*. Jul-Aug 2004;19(4):157-165.

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Snyder and Anderson*

- 5 states
- CMS baseline and remeasurement indicators (sample was state level)
- QIO-supplied data on interventions (believed from TQIP)
- Hospitals grouped empirically into participating and non-participating
- No significant differences between groups

**JAMA.* 2005;293(23):2900-2907.

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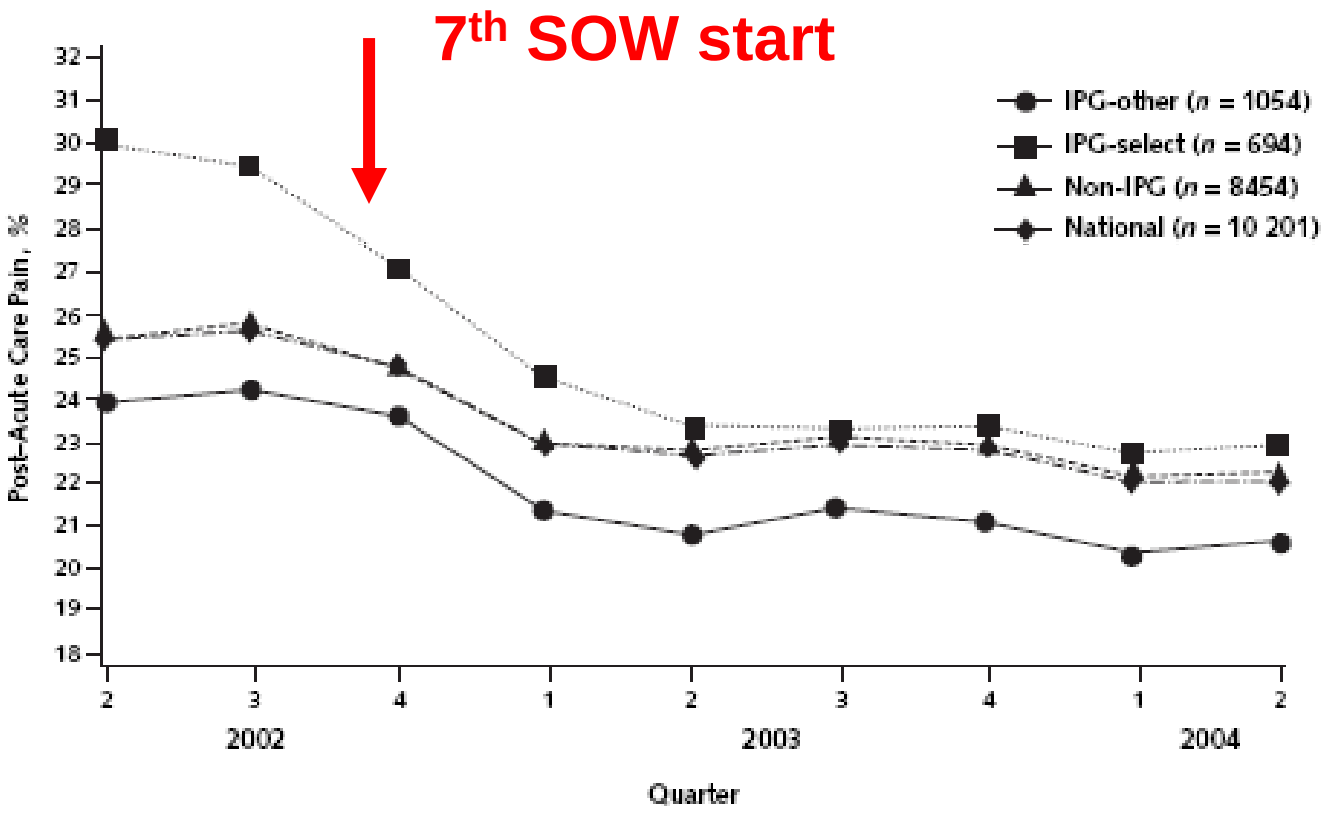
Rollow, 2006*



*Rollow W, Lied TR, McGann P, Poyer J, LaVoie L, Kambic RT, et al. Assessment of the Medicare quality improvement organization program. Ann Intern Med 2006;145(5):342-53.

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Institute of Medicine

On the basis of the QIO contract performance evaluations:

- In general, providers in all settings seem to be improving quality on most of the performance measures on which they are evaluated.
- The IOM committee was not able to identify correlations with substantial implications between subtasks, QIO spending per beneficiary, contract round, region, or level of provider satisfaction.
- However, a small but growing amount of evidence indicates that providers who work intensely with their QIOs achieve higher levels of improvement, are more satisfied with QIO assistance, and value QIO assistance more than those who do not.
- The **lack of an overall program evaluation limits the IOM committee's ability to draw conclusions about the overall impact that the QIOs have had on quality**.

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Summary:

QIOs and The critics

- We did something
- Care improved
- We caused it
- Gosh, we're good!

- What did you do and when did you do it?
- Care was improving anyway
- Care improved where you said you weren't working
- You cherry picked
- Nothing you did worked

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Outline of this talk

- What is “attribution?” Review of philosophy of causation
- How is causation demonstrated in health care systems?
- Demonstrating impact of interventions in processes of care-brief review of literature
- How can we attribute improvements in care to QIO efforts (without lying)?

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Disclaimer II

This is **not** a statistical presentation, but it does include some ideas about statistical techniques that might be useful. The notion of causation is philosophical. Causation *cannot be statistically proved*.

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David Hume

(1711-1776)

Studied the problem of causation

Hume's idea of causation*

We can legitimately say that A causes B if and only if:

- A precedes B in time
- A and B are contiguous in space and time
- Events of type A are constantly conjoined with events of type B

Uzgalis W. Hume's New Account of Causality. Accessed at Oregon State University at http://oregonstate.edu/instruct/phl302/distance/hume/hume.cfm on December 13, 2007.

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A Precedes B?

		Eye color	
		Blue	Brown
Hair color	Blonde	23	5
	Brown	4	11

p=0.0005, Fisher's Exact Test

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“I got the flu shot and I got the flu”

- Temporal precedence is not enough
- Lots of people get flu shots
- Lots of people get the flu
- So it stands to reason that some will get the flu after having the flu shot

Example of the *post hoc ergo propter hoc* logical fallacy

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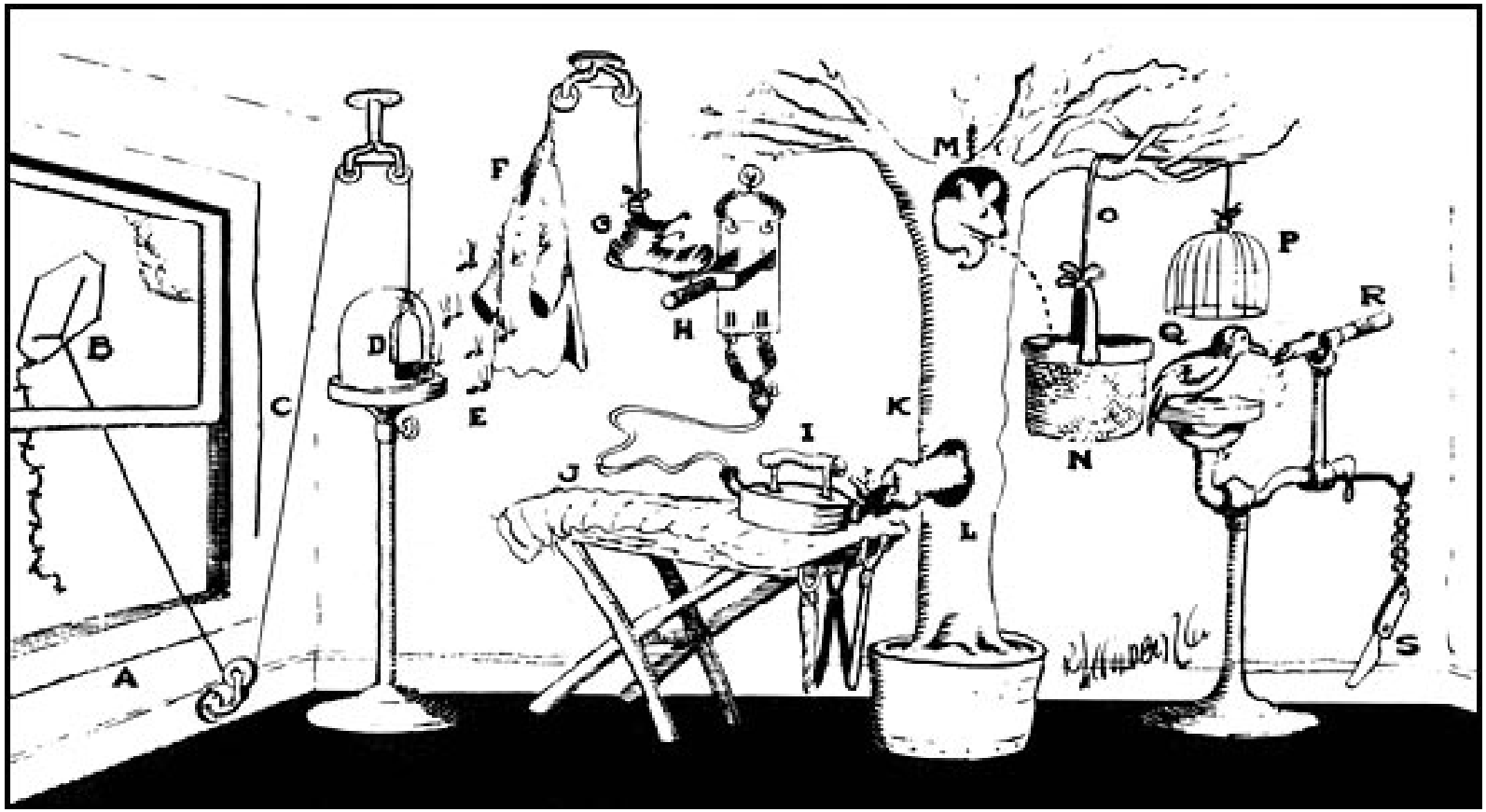
Contiguous in space and time



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Constantly Conjoined

Statistical tests can document that events are "constantly conjoined," typically showing that an observed association of two events:

- Is unlikely to have occurred by chance
- Given sufficient observations
- And the assumption that the two events are actually independent

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When is association enough?

- The short answer is “never, by itself”
- But there are different ways of assessing association
- Some ways of assessing association get at temporal sequence
- A reliable product may be sufficient, even if we don’t always know how it works

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Causation in health care

- Fundamental question: did a treatment do any good?
- Important subordinate questions
  - Can we determine that an intervention took place? and when?
  - How do we know who was exposed to a treatment? and how much of it?
  - What do we mean by “do any good?”
  - Is a treatment effect biologically plausible?

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Why is it difficult to attribute cause in health care *systems*?

- Health systems are complicated, and may not respond identically to the same intervention
- Interventions are complicated, and may not be consistently named or described
- Lots of other things are going on in a health system when we intervene

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Confounds*

- Any variable that is plausibly related to an independent variable of interest and could explain variation in the dependent variable but has not been accommodated.

*Keller, DK. Improvement: Intervention or Normal Trend? 1998 (oral presentation)

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Result of a Confound

- Conclusions about project impact are not justifiable.

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Types of Confounds

Secular Trends
History
Local Modal Issues
Treatment Diffusion
Regression to the Mean
Differential Selection
Experimental Mortality
Multiple Treatments
Pygmalion Effect
Specification Errors
Pre-sensitization
Compensatory Rivalry
Equalization
Competitiveness
Demoralization
Hawthorn Effect
Maturation
Testing
Instrumentation
Interactions

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Conclusions in the face of confounds

- Are possible with proper study design
- The “gold standard” design in clinical practice is the randomized clinical trial (RCT)
  - Randomization done properly causes confounds to be equally likely in intervention and control groups
  - Adequate statistical design permits detecting the effect of intervention in the noise of confounds

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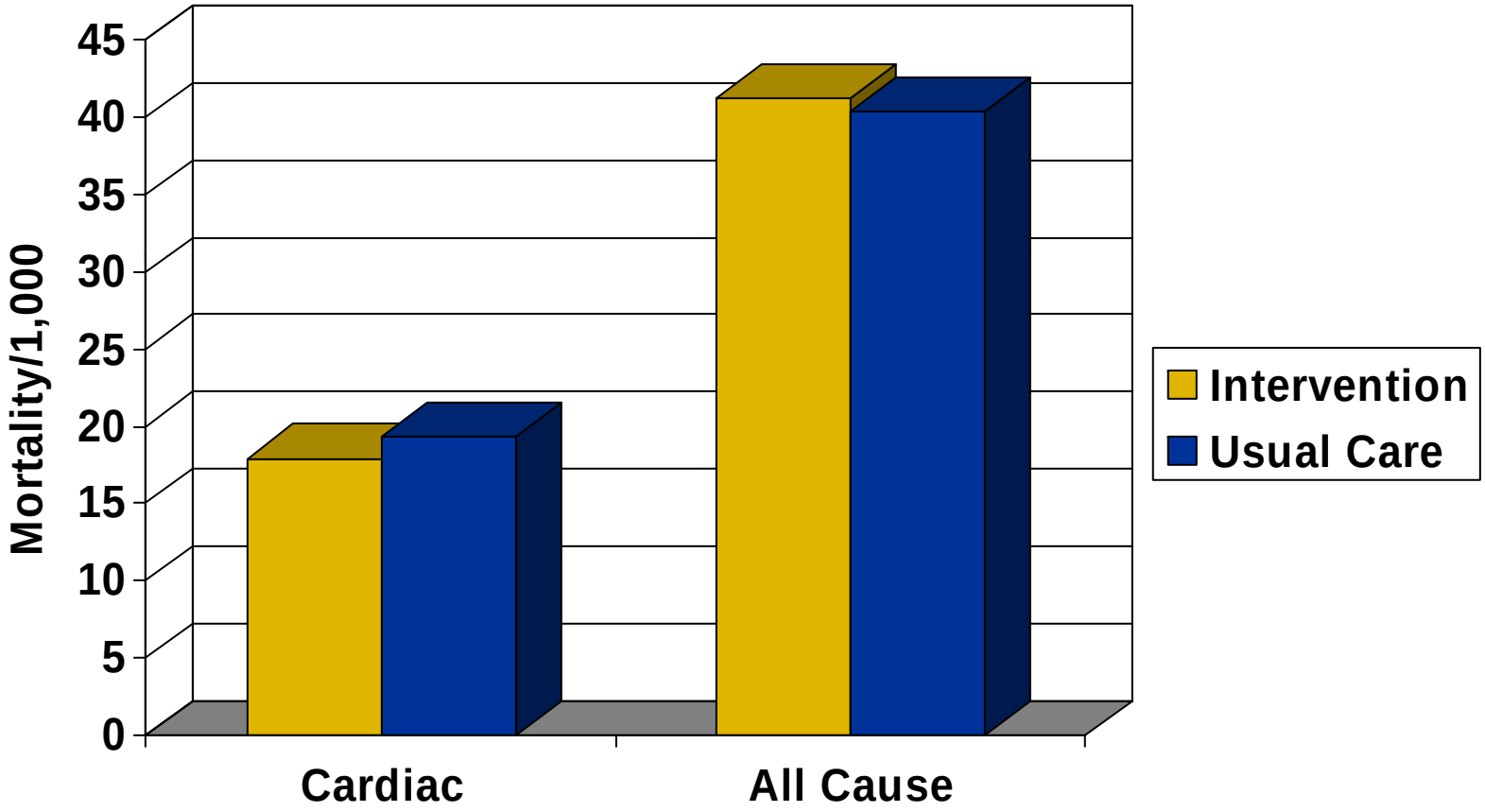
Multiple Risk Factor Intervention Trial (MRFIT) -- Mortality



*Multiple risk factor intervention trial. Risk factor changes and mortality results. Multiple Risk Factor Intervention Trial Research Group. JAMA 1982;248(12):1465-77.

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How MRFIT failed

"After 7 years, the special intervention group had reached its targets in terms of smoking cessation and reduced diastolic blood pressure, with a less-than-desired but still useful fall in cholesterol, but did not differ from the usual care group in terms of total mortality and incidence of coronary heart disease. Smoking had decreased in the control group from 59% to 46%, and diastolic blood pressure from 91 to 84 mmHg; antihypertensive use rose from 19% to 47%. Oddly, altered behaviour of the controls (or their physicians) was not at the time among the three hypotheses put forward by the investigators to explain the lack of difference between the groups." (Gale EA. The Hawthorne studies-a fable for our times? QJM 2004;97(7):439-49.)

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Other arguments against RCTs for health system interventions*

- Cost
- Potential ethical concerns
- Availability of large enough populations
- Time available for followup
- Limits to generalizabilty arising from study design

*After Sanson-Fisher RW, Bonevski B, Green LW, D'Este C. Limitations of the randomized controlled trial in evaluating population-based health interventions. Am J Prev Med 2007;33(2):155-61.

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OK, so what kinds of intervention study designs *should* we use?

- Simple pre-post
- Interrupted time series
- Multiple baseline

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Cochrane Effective Practice and Organisation of Care Group

uOttawa

A REVIEW GROUP OF THE COCHRANE COLLABORATION®

Welcome

The Cochrane Effective Practice and Organisation of Care Group (EPOC) is a Collaborative Review Group of the Cochrane Collaboration: an international organisation that aims to help people make well informed decisions about health care by preparing, maintaining and ensuring the accessibility of systematic reviews of the effects of health care interventions.

EPOC produces systematic reviews of educational, behavioural, financial, regulatory and organisational interventions designed to improve health professional practice and the organisation of health care services, potentially spanning any clinical area.

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- Canadian Institutes of Health Research
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Study Designs for EPOC Reviews*

- **Patient randomised controlled trials (P-RCT)**
- **Cluster randomised controlled trials (C-RCT)**
- **Non-randomised cluster controlled trials**
- **Controlled before and after studies (CBAs)**
- **Interrupted time series designs (ITS)**

*Cochrane Effective Practice and Organisation of Care Group. Study Designs for EPOC Reviews. Accessed at http://www.epoc.cochrane.org/Files/Website/Reviewer%20Resources/FAQ%20-%20Included%20Studies%20-%20EPOC%20-%202007-May-01.doc on 2/14/2008.

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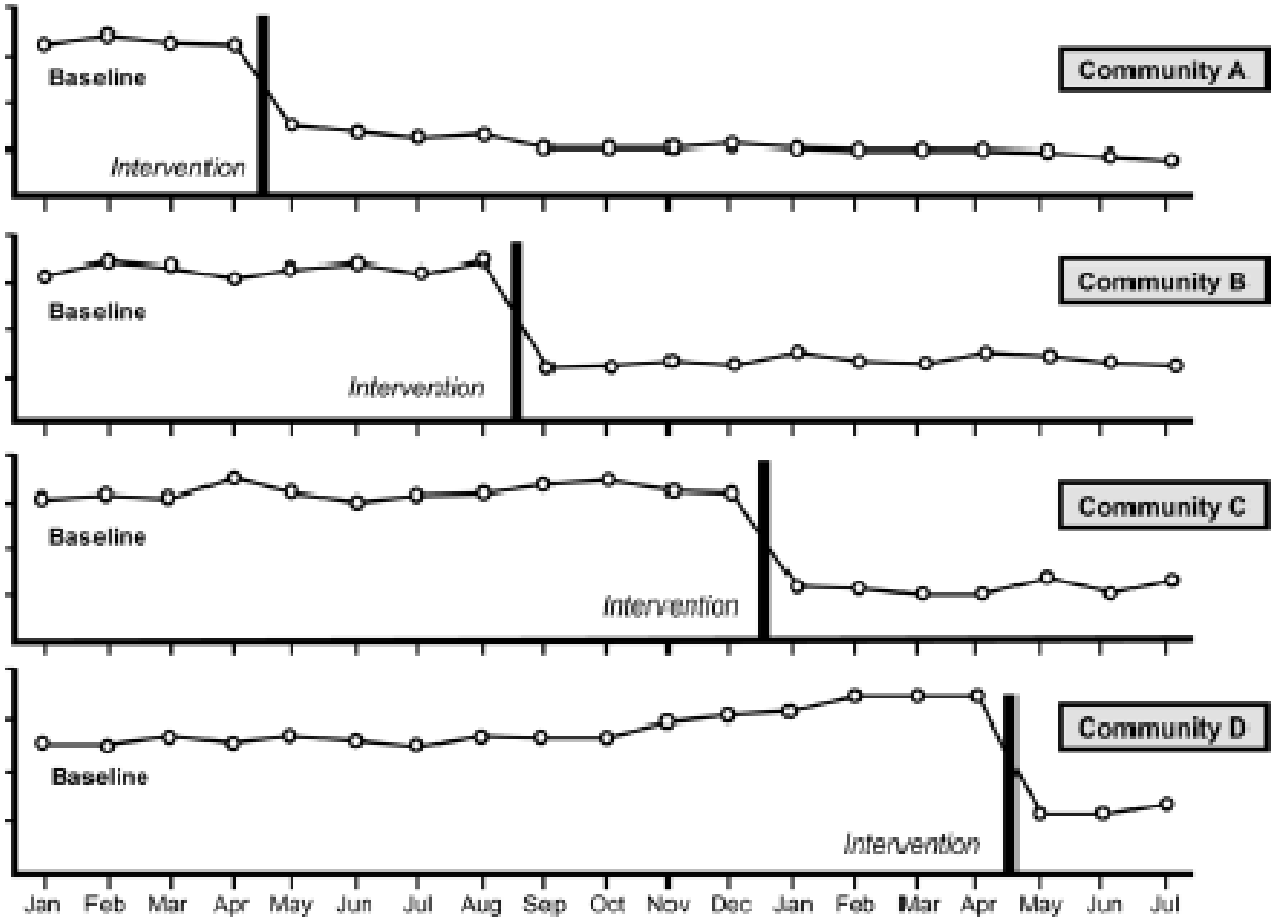
Multiple Baseline*: Particularly attractive for QIOs and Networks



*Hawkins NG, Sanson-Fisher RW, Shakeshaft A, D'Este C, Green LW. The multiple baseline design for evaluating population-based research. Am J Prev Med 2007;33(2):162-8.

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ITS example from our research*

- 6th SOW, hospital quality improvement
- Worked with all hospitals in state
- Periodic data collection depending on hospital size
- Multiple interventions; audit and feedback had well-defined start in all hospitals

*Schade CP, Cochran BF, Stephens MK. Using statewide audit and feedback to improve hospital care in West Virginia. Jt Comm J Qual Saf 2004;30(3):143-51.

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Formal evaluation

- Defined pre-intervention period as July 1998-June 2000 and post-intervention as July 2000-December 2001
- Research questions:
  - Did hospital quality measures improve between pre- and post- intervention periods?
  - Did rate of change of improvement differ in pre- and post- intervention periods?

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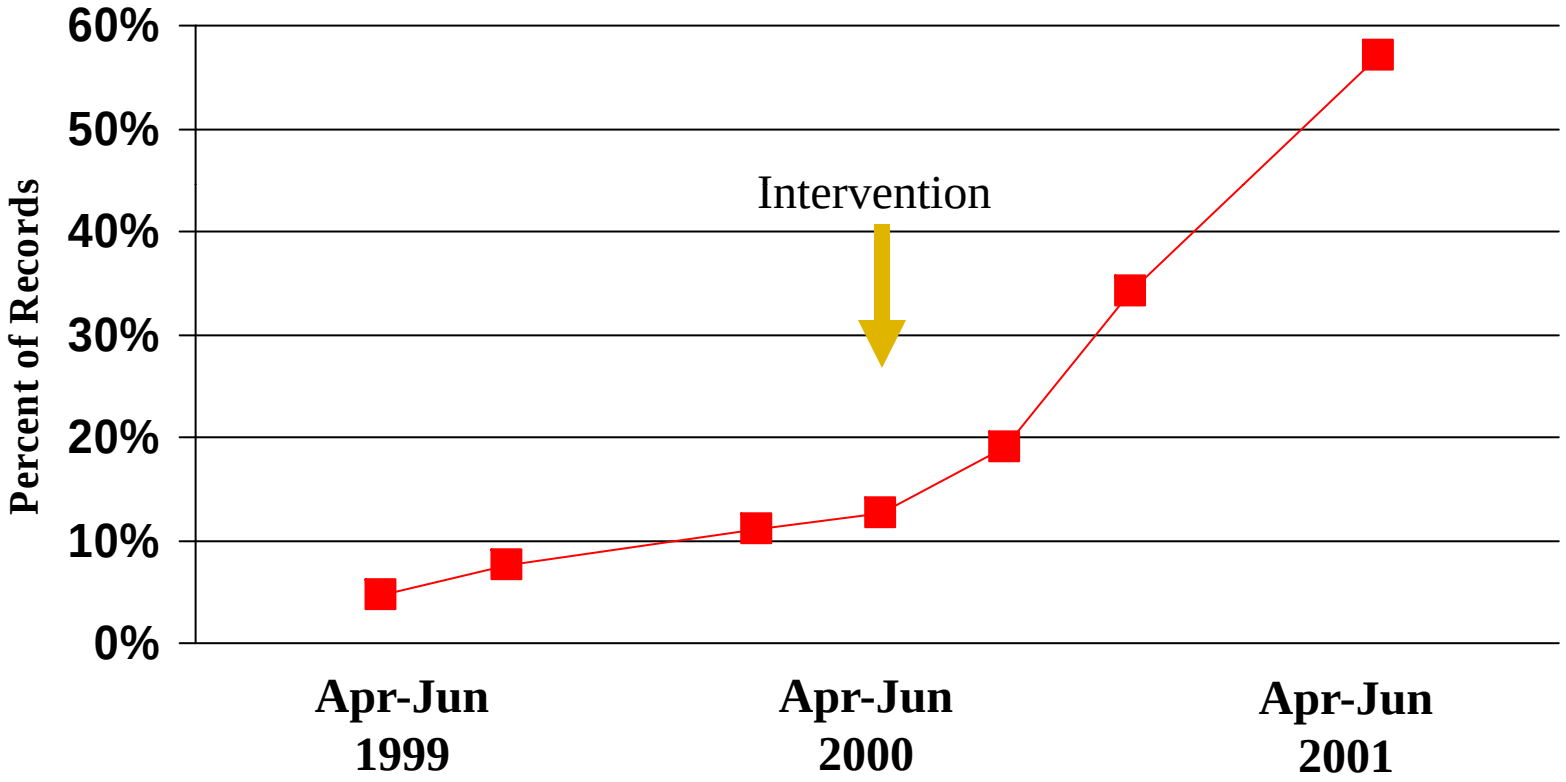
Documentation of Assessment for, or Administration of Pneumococcal Vaccine



Results from 17 largest hospitals monitored quarterly

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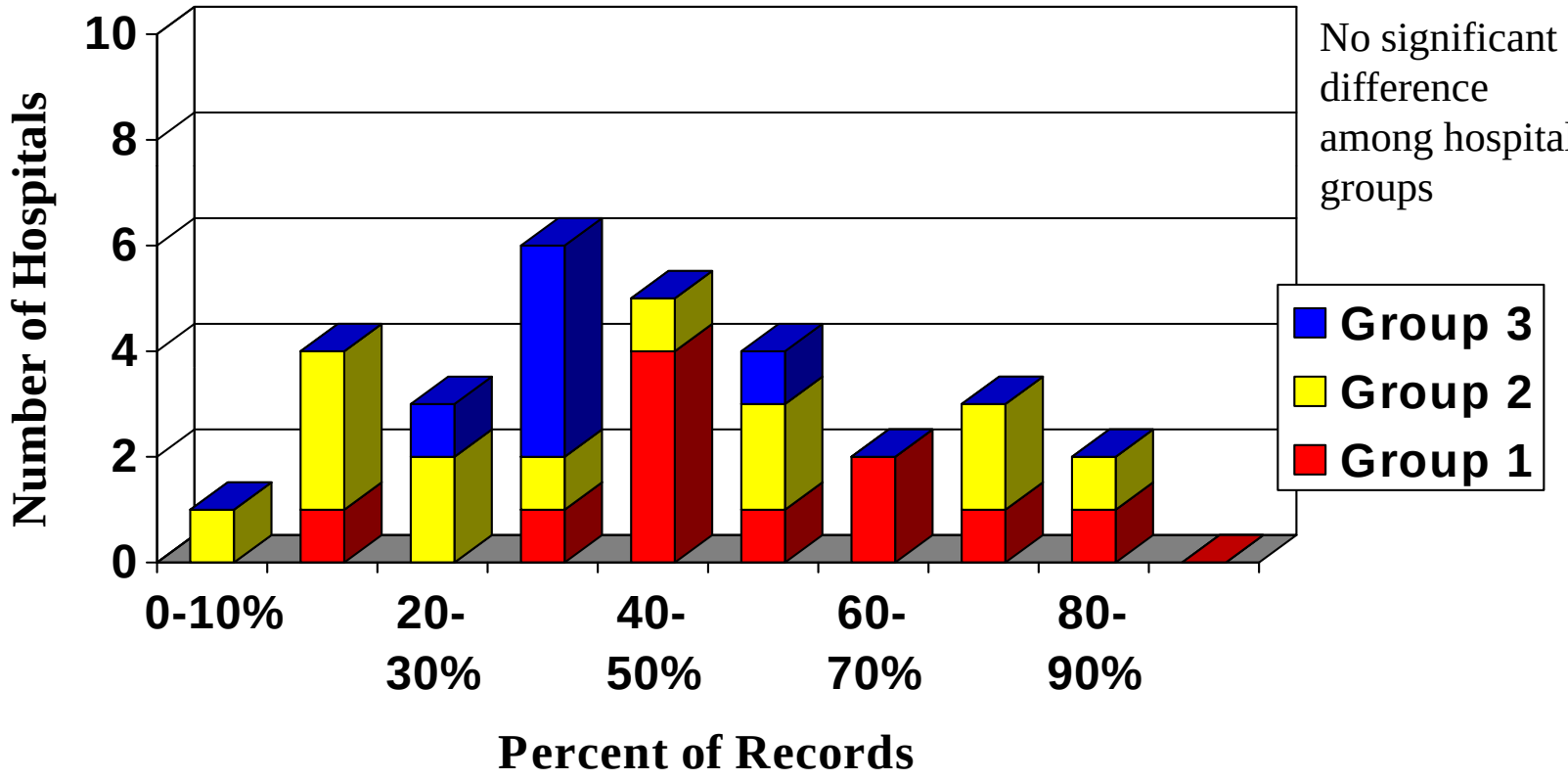
Beta Blockers Within 24 Hours of Admission, AMI Patients (1)



No significant difference among hospital groups

Chart includes surveillance data with collection interval midpoint between 6/30/1998 and 12/31/1999. Minimum 10 cases per hospital.

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Beta Blockers Within 24 Hours of Admission, AMI Patients (2)

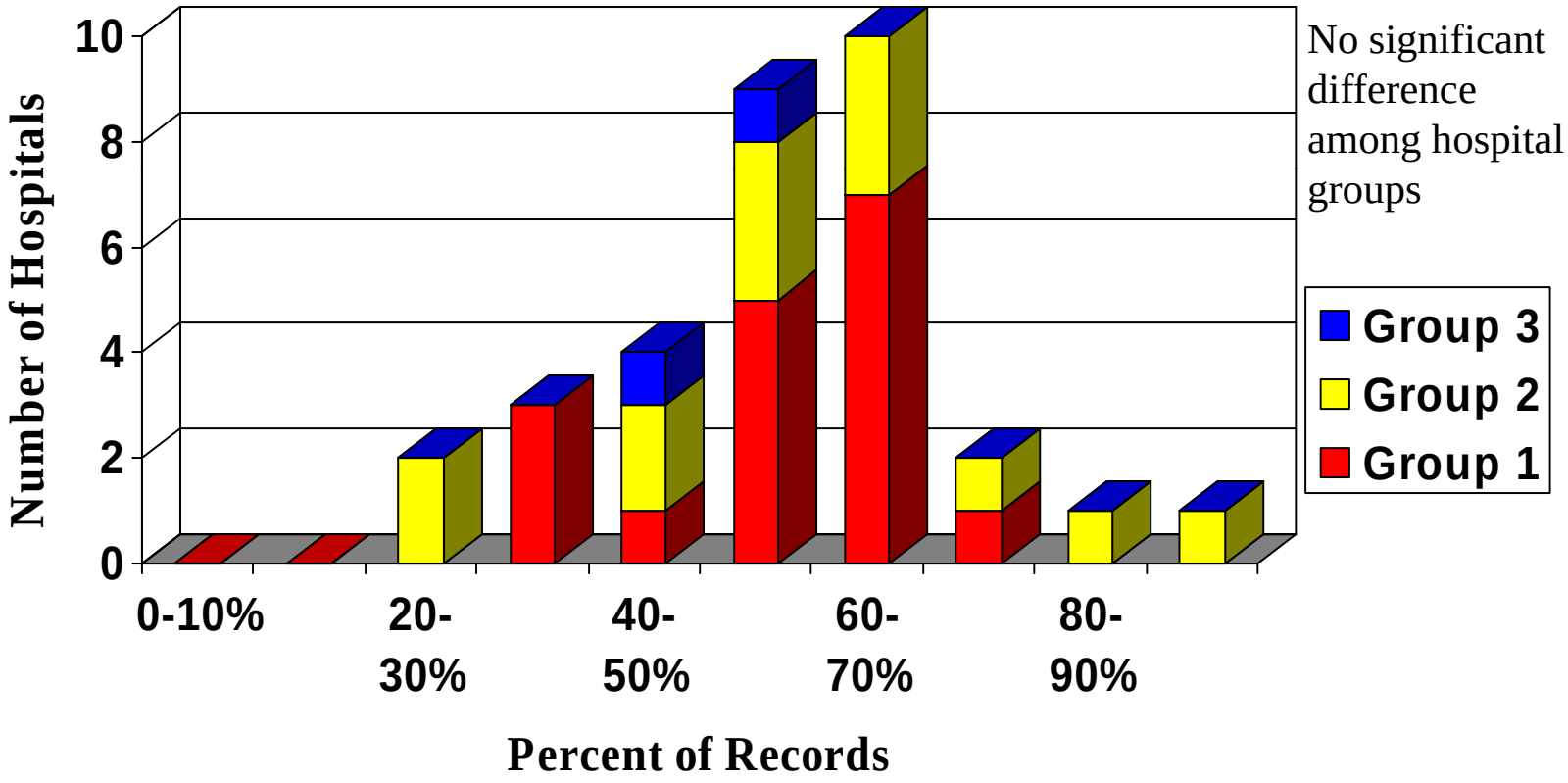

Chart includes surveillance data with collection interval midpoint between 7/1/2000 and 6/30/2001. Minimum 10 cases per hospital.

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Pre-Post Change in Slope of Trend Lines in Largest Hospitals

Quality Indicator	Chi square for trend				
	Before		After		
	χ^2	p	χ^2	p	
Acute myocardial infarction					
Early administration of aspirin	0.305	0.5808	34.026	<0.001	**
Early administration of beta blocker	0.009	0.9244	30.918	<0.001	**
Beta blocker at discharge	3.472	0.0624	1.11	0.2921	
Aspirin at discharge	0.151	0.6976	27.405	<0.001	**
ACE inhibitor in LVEF	0.01	0.9199	1.588	0.2076	
Smoking cessation	2.268	0.1321	5.482	0.0192	**

** Slope positive and significant in post intervention but not pre intervention period.

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Pre-Post Change in Slope of Trend Lines in Largest Hospitals

Quality Indicator	Chi square for trend				
	Before		After		
	χ^2	p	χ^2	p	
Atrial fibrillation					
Warfarin at discharge	3.272	0.0705	2.797	0.0944	d
Heart failure					
LVF assessment and ACEI use	2.042	0.153	58.194	<0.001	**
Left ventricular assessment	0.31	0.5777	5.931	0.0149	**
Not admitted on an ACEI or ARB but discharged on ACEI or documented reason	1.441	0.23	56.21	<0.001	**

** Slope positive and significant in post intervention but not pre intervention period.
d Indicator dropped after 7th quarter of observations.

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Pre-Post Change in Slope of Trend Lines in Largest Hospitals

Quality Indicator	Chi square for trend				
	Before		After		
	χ^2	p	χ^2	p	
Pneumonia					
Timely antibiotic	1.603	0.2055	0.333	0.5639	b
Appropriate antibiotic	5.13	0.0235	1.41	0.2351	
Timely blood cultures	0.092	0.7616	0.287	0.5921	
Pneumococcal immunization	17.655	0	282.335	<0.001	
Stroke					
Antithrombotic at discharge	0.222	0.6374	9.839	0.0017	d**

** Slope positive and significant in post intervention but not pre intervention period.

d Indicator dropped after 7th quarter of observations.

b >85% at baseline.

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Summary of Inpatient Quality Improvement 1999-2001

- 17 evidence-based quality indicators
- Excluded ineligible patients, e.g. contraindications for beta blockers
- All positive indicators-should be 100%
- 14/15 indicators improved significantly from pre-intervention period, not controlling for baseline trends
- 8/15 measures developed significant positive trends from pre- to post-intervention period

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But what about those other interventions?

- 2 **Commit**ment to Participate in Project
- 3 **Data Coll**ection by Participant
- 4 Obtained **Commit**ment from Project Champion
- 5 **Data Diss**emination
- 6 **Sys**tem **Chang**es
- 8 **Provider Ed**ucational Efforts

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Linkage

- Compute midpoint of data collection period for all QI observations
- For every hospital, quarter, and QI combination identify:
  - The closest QI observation with interval midpoint less than the first day of the quarter
  - The closest QI observation with interval midpoint greater than the last day of the quarter

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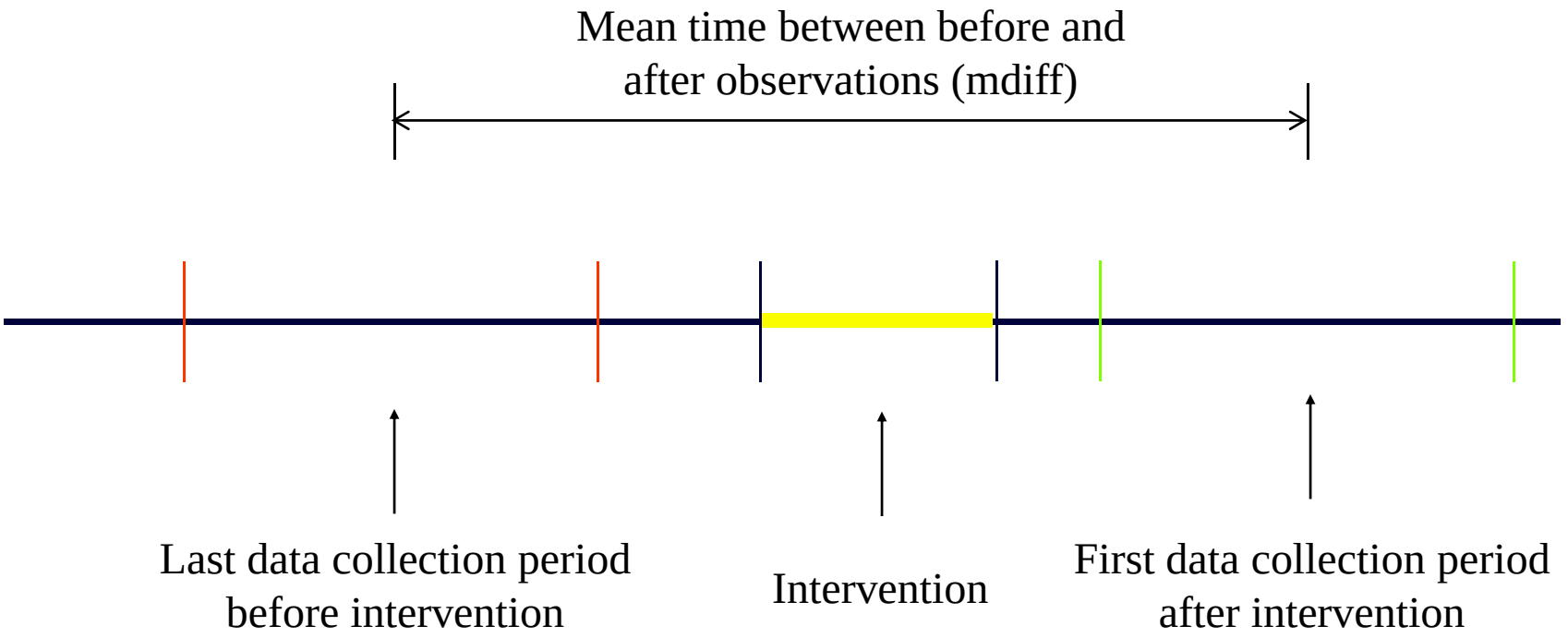
Time period definitions-HIQ cell



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Before/After Quality Indicator Changes

- For most QIs the average absolute change was 5-10% (range 0.5-21%)
- The relative QI change was larger, averaging 34%
- Wide variation in individual observation pre-post changes
- The average pre-post time interval was a little less than 9 months, without much variation among QIs

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Two statistical methods

- Relative risk at the individual QI level:
  - Was a quality measure more likely to improve in an interval with an intervention than without it?
- Multiple regression:
  - After adjusting for secular trend, did any intervention or combination of interventions predict improvement in QI level?

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Relative Risk - Number of Significant Associations*

Event category	Positive	Negative
Data dissemination	2	0
Provider education	0	1
System change	0	1
Commitment	1	2
Data collection	4	1
Any	1	0

*out of 13 quality indicators

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Multiple regression summary

- Most TQIP events not significantly associated with QI change
- 7 significant associations by F test, $p<0.05$
- 2 (of 7) significant *negative* associations
- Secular trend significant in over 1/3 of indicators
- Models explain a tiny proportion of variance of indicator change

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Three potentially significant data issues

- Definitions of intervention types were not well understood
  - There was no reliability assessment on assignment of intervention types
- Start and end time of interventions
- Potential variation in intensity of intervention

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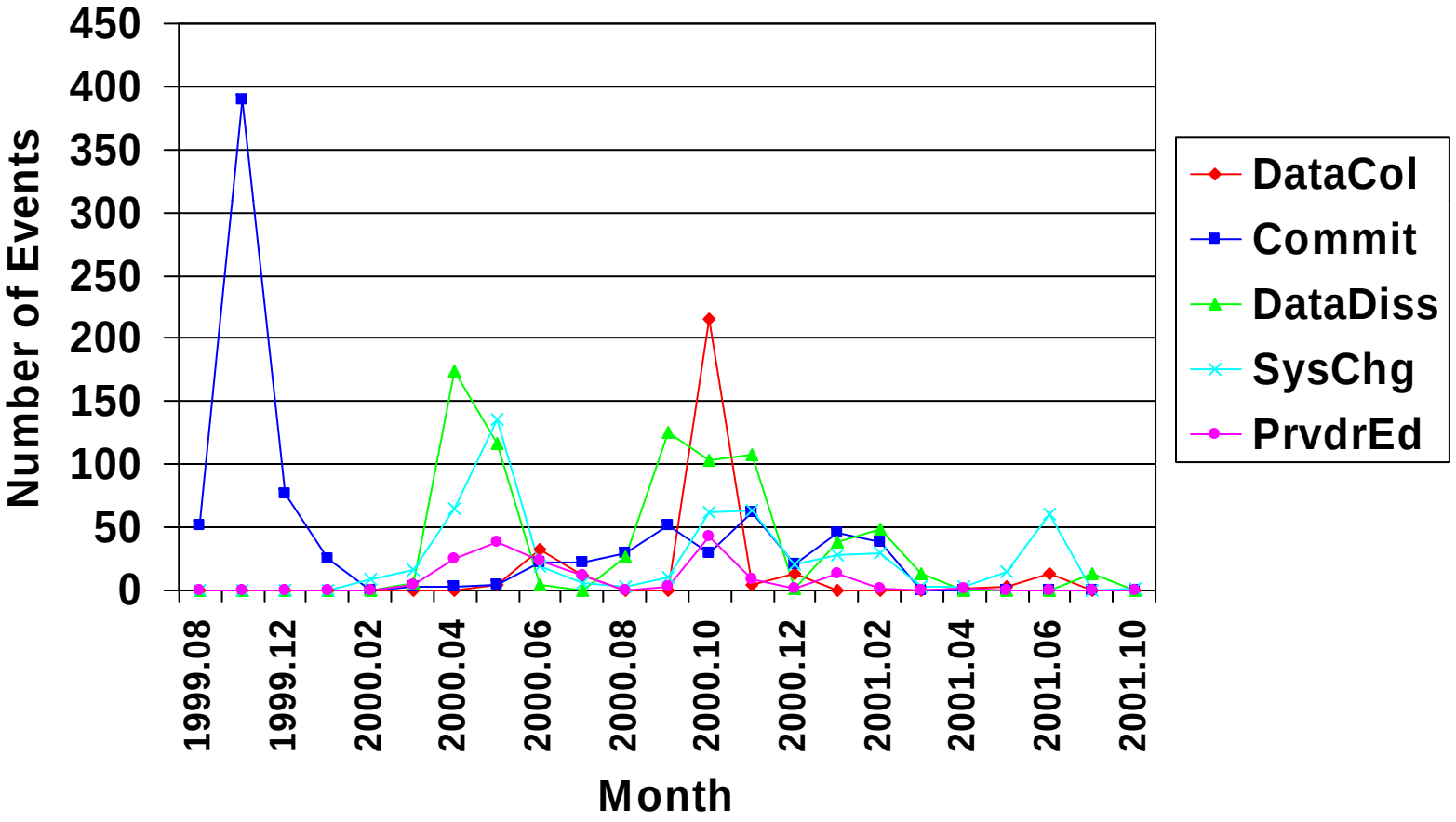
TQIP Inpatient Events by Month



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Lessons from the past

- Carefully collected and audited time series data were useful in documenting impact
- Haphazardly collected, unaudited intervention data were not
- Finding evidence of causality is all about observing well defined events at specific times with respect to outcomes

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Final Exam: The HHQI National Campaign*

- In 2007 we conducted the Home Health Quality Improvement National Campaign
- Objective was to reduce acute care hospitalization (readmission) of patients from home health care
- Almost 5,600 of the 9,000+ home health agencies signed up as participants

*See Schade, C. P., E. Esslinger, et al. (2009). "Impact of a national campaign on hospital readmissions in home care patients." Int J Qual Health Care **21**(3): 176-82.

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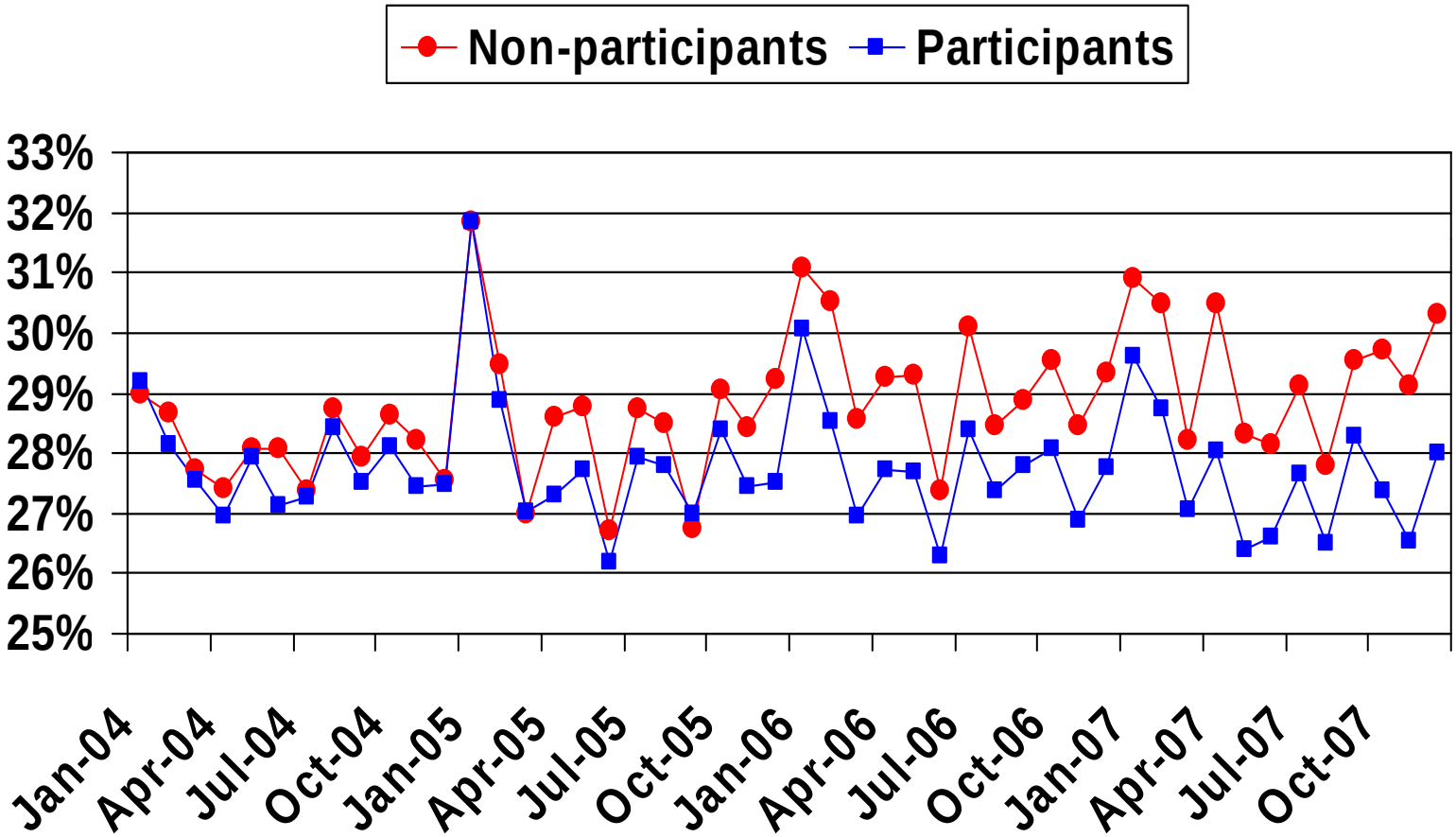
Acute Care Hospitalization Rate Participants and Non-Participants



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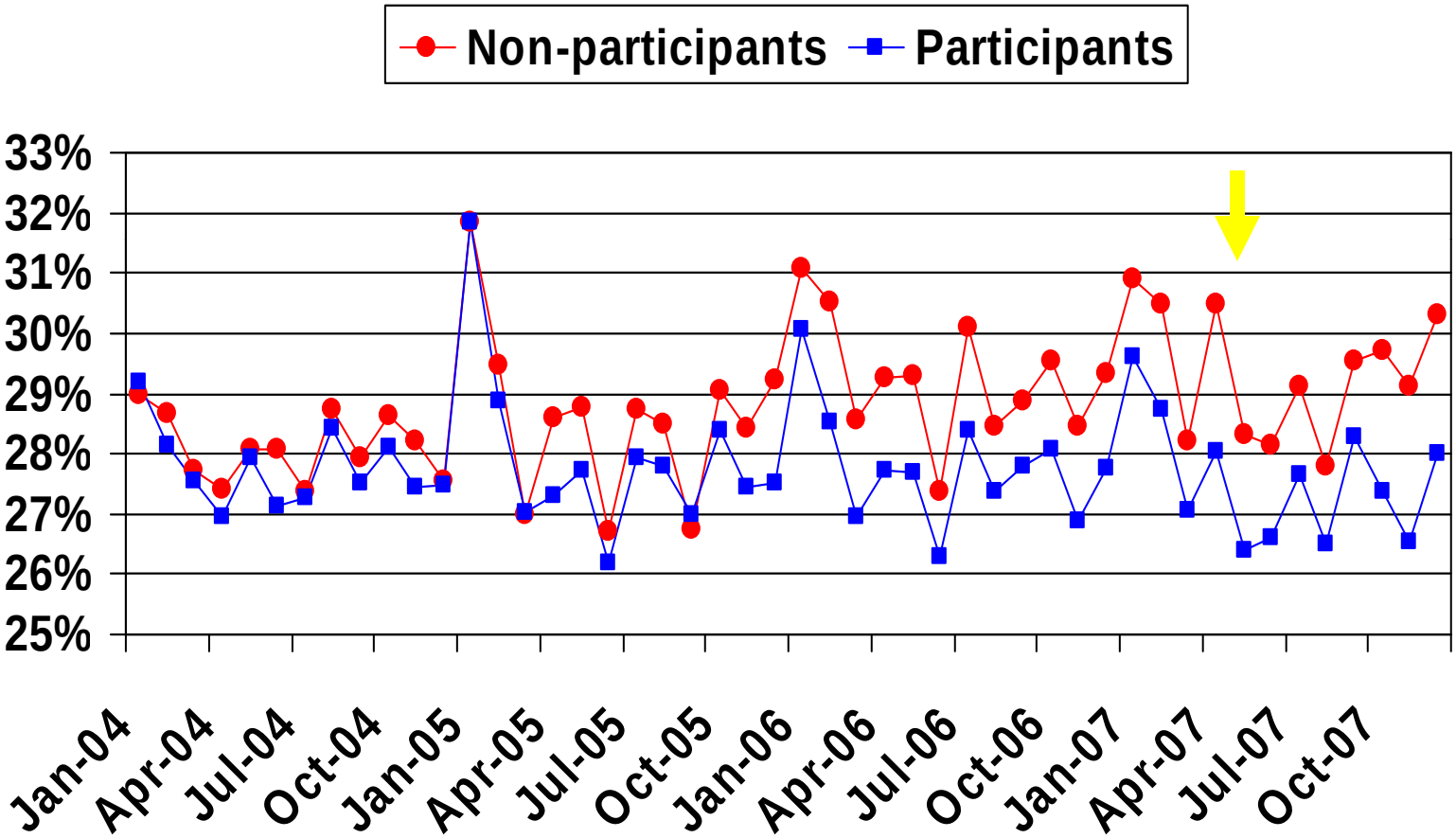
Acute Care Hospitalization Rate Participants and Non-Participants



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Results of Controlling for Confounders

- ACH rates were nearly equal in the paired groups at baseline – 28%
- They were also nearly equal at remeasurement – 28%
- Pre-post changes were less than 0.1% and did not differ significantly (p=0.95)
- Conclusion: Participants did not improve more than non-participants

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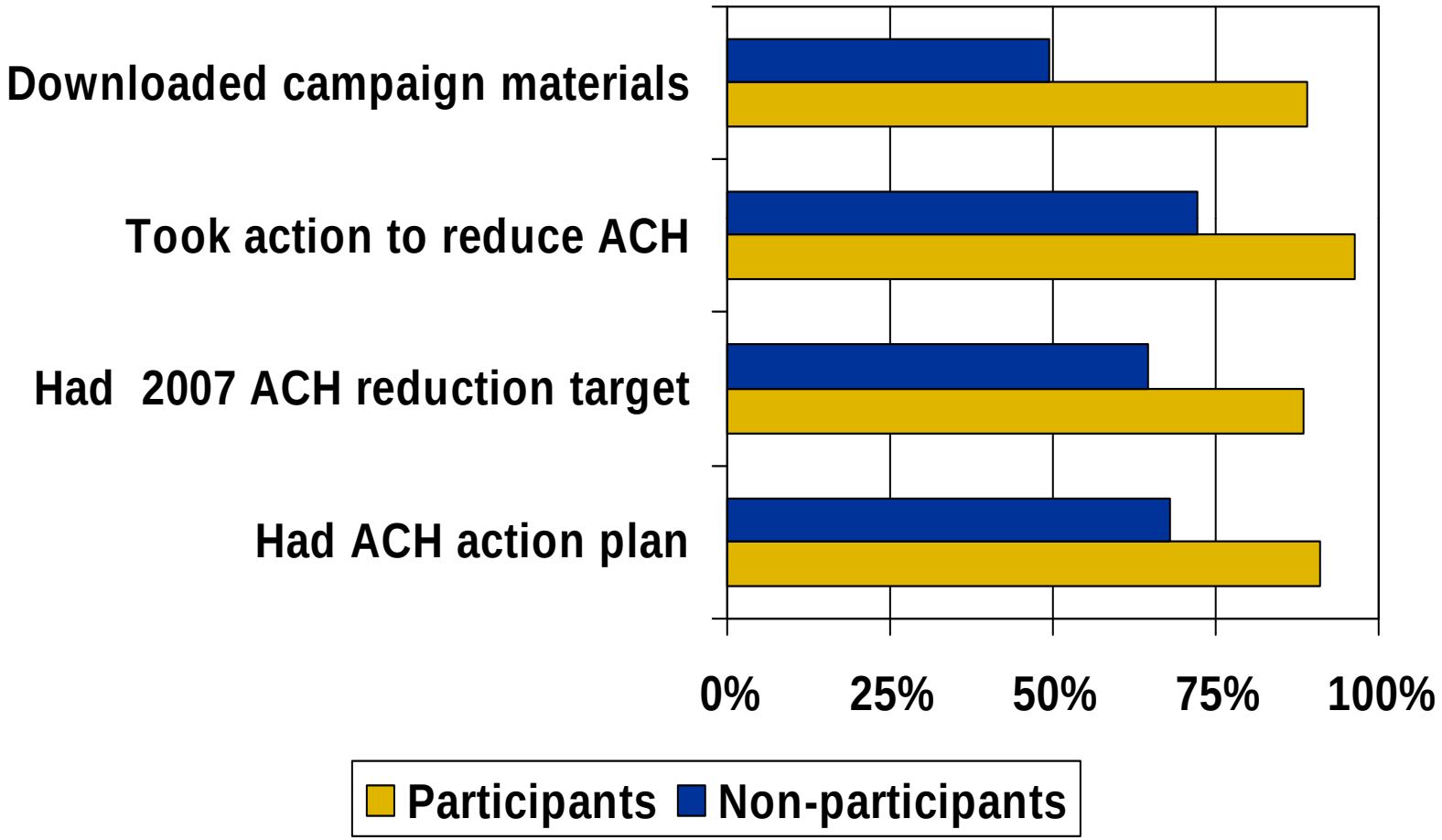
Percent of Agencies with Actions Consistent With Campaign



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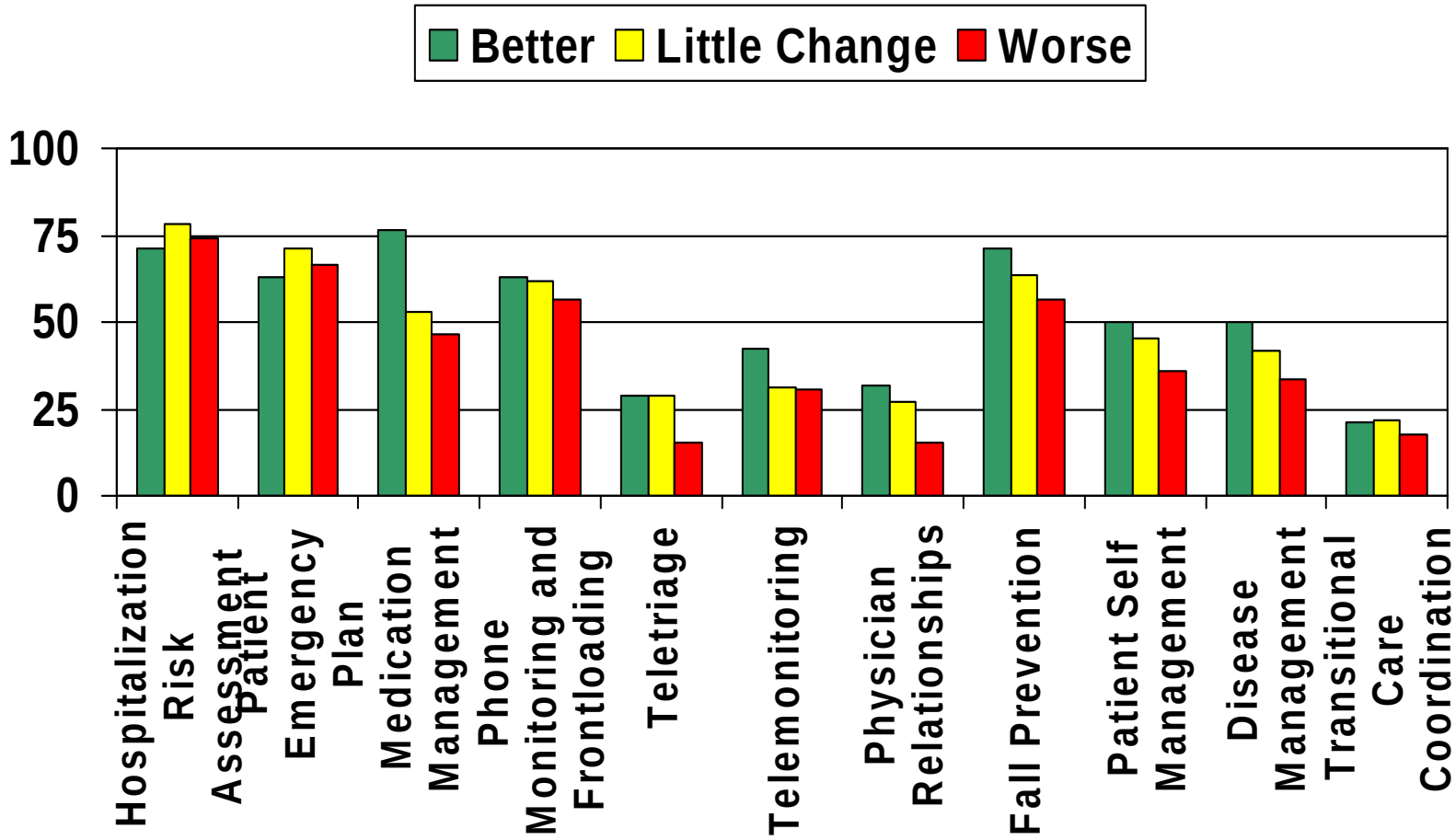
Percent of Agencies Using Specific BPIPs* and Improvement



*Best Practice Improvement Packages

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Improvement was Associated with Campaign-Recommended Practices

- The survey was too small to do statistical testing on individual items
- But when we counted up all 52 items related to campaign-recommended practice...
- The pattern shown on the slide occurred 23 times ($p<0.0001$)
- For every BPIP used, ACH declined 0.25%

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Applying the lessons to QIOs and ESRD Networks

- Agree on taxonomy of interventions and record them consistently
- Record accurate dates/times of interventions
- Spend the up front time documenting interventions in detail, e.g., using the SQUIRE guidelines*
- Measure actual participation in projects

*Davidoff F, Batalden P. Toward stronger evidence on quality improvement. Draft publication guidelines: the beginning of a consensus project. Qual Saf Health Care 2005;14(5):319-25.

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Some promising signs

- CMS is firmly committed to collecting and reporting quality data periodically
  - There does need to be more attention to quality of the data
- QIOs and Networks are being pushed to demonstrate improvement in narrower, better defined areas
- This is a fertile environment for using time series methods

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Can QIOs and Networks ever satisfy Hume's three elements?

- Temporal precedence?
  - Yes, if we collect time data accurately
- Contiguity in space and time?
  - Often no, because the health care system is too complex and externalities are too great
- Regularity of association?
  - Of course! We (WVMI) have a 4 state laboratory (and Networks/QIOs collectively cover the country)

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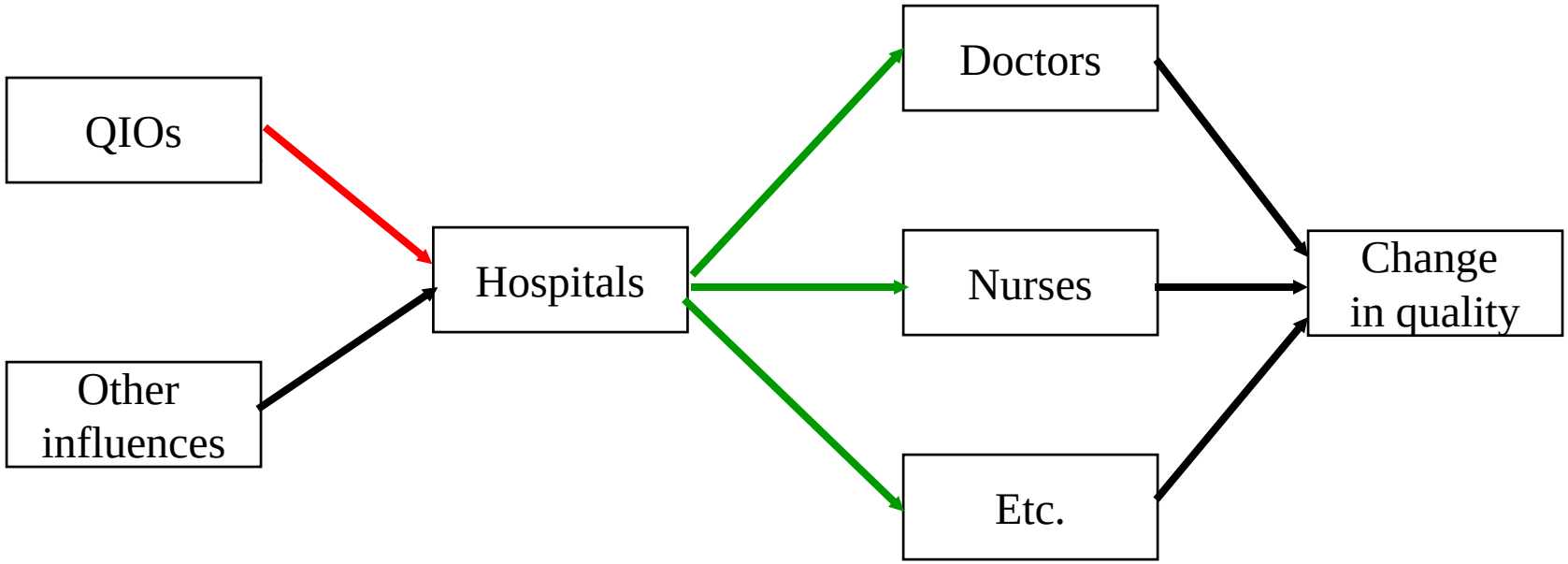
The Hospital Quality Improvement Process



Interventions influenced

Direct QIO interventions

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So, when is association enough?

- Health care quality in specified areas improves more when QIOs/Networks are involved than otherwise
- This happens with multiple kinds of interventions
- And in multiple settings
- And well documented, including savings in cost or improved outcomes

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Questions? Comments?

The results would not have been possible without the WV QIO project staff, and the Pennsylvania Home Health QIOSC staff. Many of our medical and analytic staff helped design interventions, analyze data, and shape the conclusions. Special thanks to Dana K. Keller, Ph.D.

Thank you for coming to this presentation

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