Quality and Productivity in Health Care

John A. Romley

May 3, 2016

Overview

- **Some perspective**
- **Quality and productivity in hospitals**
- **New directions**
- **Conclusions and implications**

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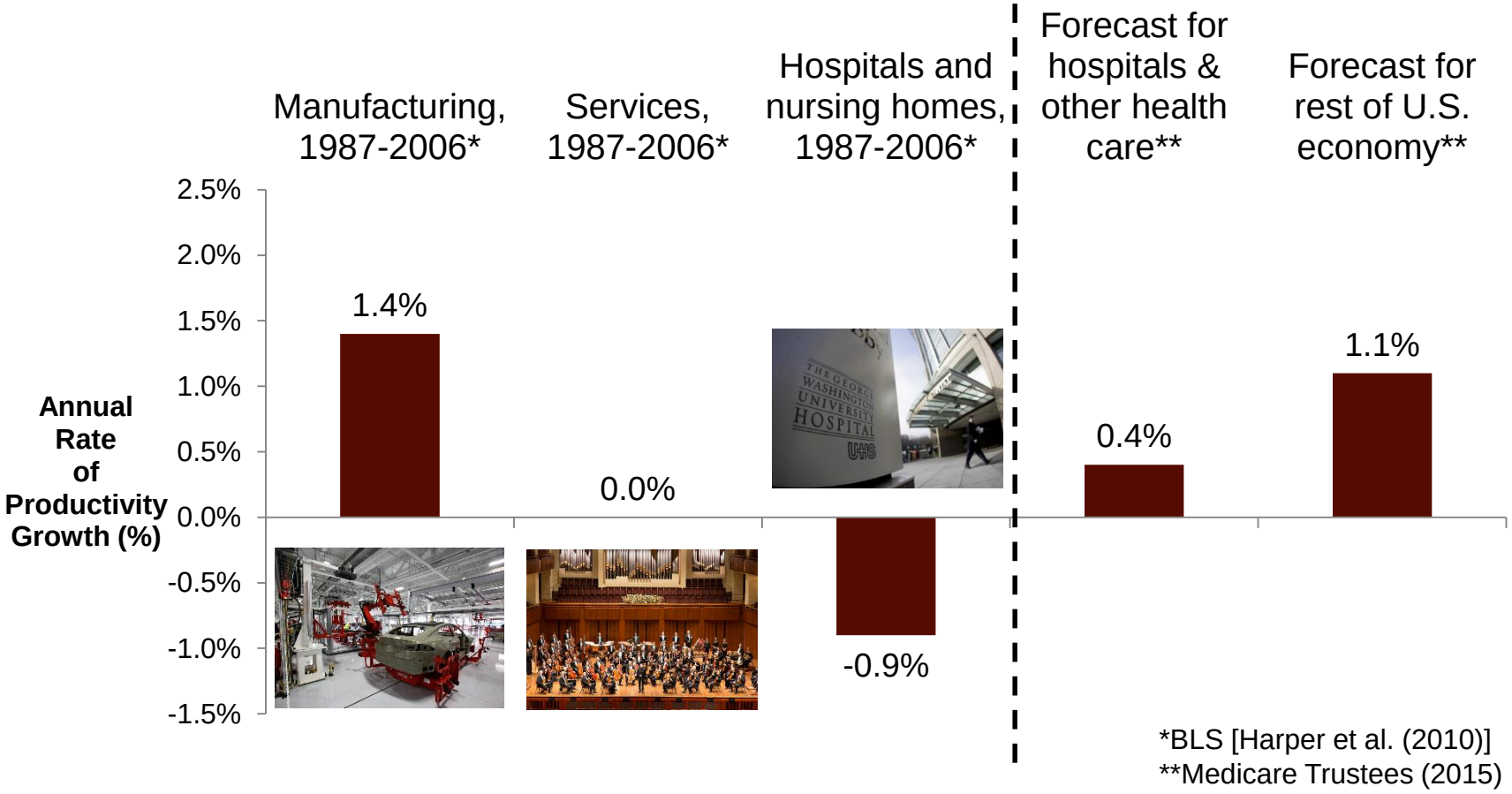
Conventional wisdom holds that a "cost disease" limits productivity improvement in health care



*BLS [Harper et al. (2010)]
**Medicare Trustees (2015)

Yet productivity measurement is particularly challenging in health care

- **Health care is not cement concrete, or even automobiles**
- **In this context, productivity can be readily confounded, by unmeasured aspects of**
  - **Product quality, i.e., quality of care**

Quality is relevant to productivity measurement

- **Quality of care is a critical element of system performance**
  - **Ultimately, quality means better health, i.e., good outcomes**
- **Health care providers produce quality, as well as quantity**
  - **Quality and quantity may be substitutes, or complements**
- **Question: What if quality were improving (or deteriorating) over time, but was ignored?**

Quality is not a new challenge in the policy domain

- **Boskin Commission addressed bias in CPI**
  - **Found upward bias due to improvements in product quality**
- **Cutler et al. analyzed heart-attack care**
  - **Adjusting for better outcomes, price of treatment *decreased***

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ARE MEDICAL PRICES DECLINING?
EVIDENCE FROM HEART ATTACK TREATMENTS*

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We address long-standing problems in measuring medical inflation by estimating two types of price indices. The first, a Service Price Index, prices specific medical services, as does the current CPI. The second, a Cost of Living Index, measures a quality-adjusted cost of treating a health problem. We apply these indices to heart attack treatment between 1983 and 1994. More frequent reweighting and accounting for price discounts lowers the measured price change for heart attacks by three percentage points annually. Accounting for quality change lowers it further; we estimate that the real Cost of Living Index fell about 1 percent annually.

I. INTRODUCTION

The difficulties of deriving accurate price indices for service industries are well-known [Griliches 1992]. In this paper we address the issue of appropriate price indices for medical care. We focus on medical care because it is a large and growing part of the

BLS has incorporated quality of care into hospital PPI

Yet productivity measurement is particularly challenging in health care

- **Health care is not cement concrete, or even automobiles**
- **In this context, productivity can be readily confounded by unmeasured aspects of**
  - **Quality of care**
  - **Patient severity**

Against this backdrop, existing evidence on hospital productivity growth has limitations

Item	*BLS*	*Health literature**
Output measure	Revenues	Revenues, stays
Sensitive to quantity?	Yes	Yes
Sensitivity to quality?	Limited	Limited-to-none
Sensitive to severity?	Across DRGs, but not within	Across DRGs, but not within

*Ashby et al. (2000), Cylus & Dickinsheets (2007)

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Romley, Goldman and Sood (2015) revisited the issue of productivity growth in hospitals

WEB FIRST

By John A. Romley, Dana P. Goldman, and Neeraj Sood

US Hospitals Experienced Substantial Productivity Growth During 2002–11

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ABSTRACT **The need for better value in US health care is widely recognized. Existing evidence suggests that improvement in the productivity of American hospitals—that is, the output that hospitals produce from inputs such as labor and capital—has lagged behind that of other industries. However, previous studies have not adequately addressed quality of care or severity of patient illness. Our study, by contrast, adjusts for trends in the severity of patients' conditions and health outcomes. We studied productivity growth among US hospitals in treating Medicare patients with heart attack, heart failure, and pneumonia during 2002–11. We found that the rates of annual productivity growth were 0.78 percent for heart attack, 0.62 percent for heart failure, and 1.90 percent for pneumonia. However, unadjusted productivity growth appears to have been negative. These findings suggest that productivity growth in US health care could be better than is sometimes believed, and may help alleviate concerns about Medicare payment policy under the Affordable Care Act.**

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Health spending in the United States has grown less rapidly in recent years, compared to its long-term trend.[1] However, the sustainability of the US health care system continues to be a serious concern.[2] Against this backdrop, the Institute of Medicine

in American manufacturing grew by 1.37 percent per year from 1987 through 2006.[4]

Some observers have noted that service industries such as health care may suffer from what has sometimes been called a "cost disease"—in which a heavy reliance on labor limits opportunities for cost efficiencies stemming from tech-

We studied hospital productivity for heart attack (HA), heart failure (HF) and pneumonia (PN)

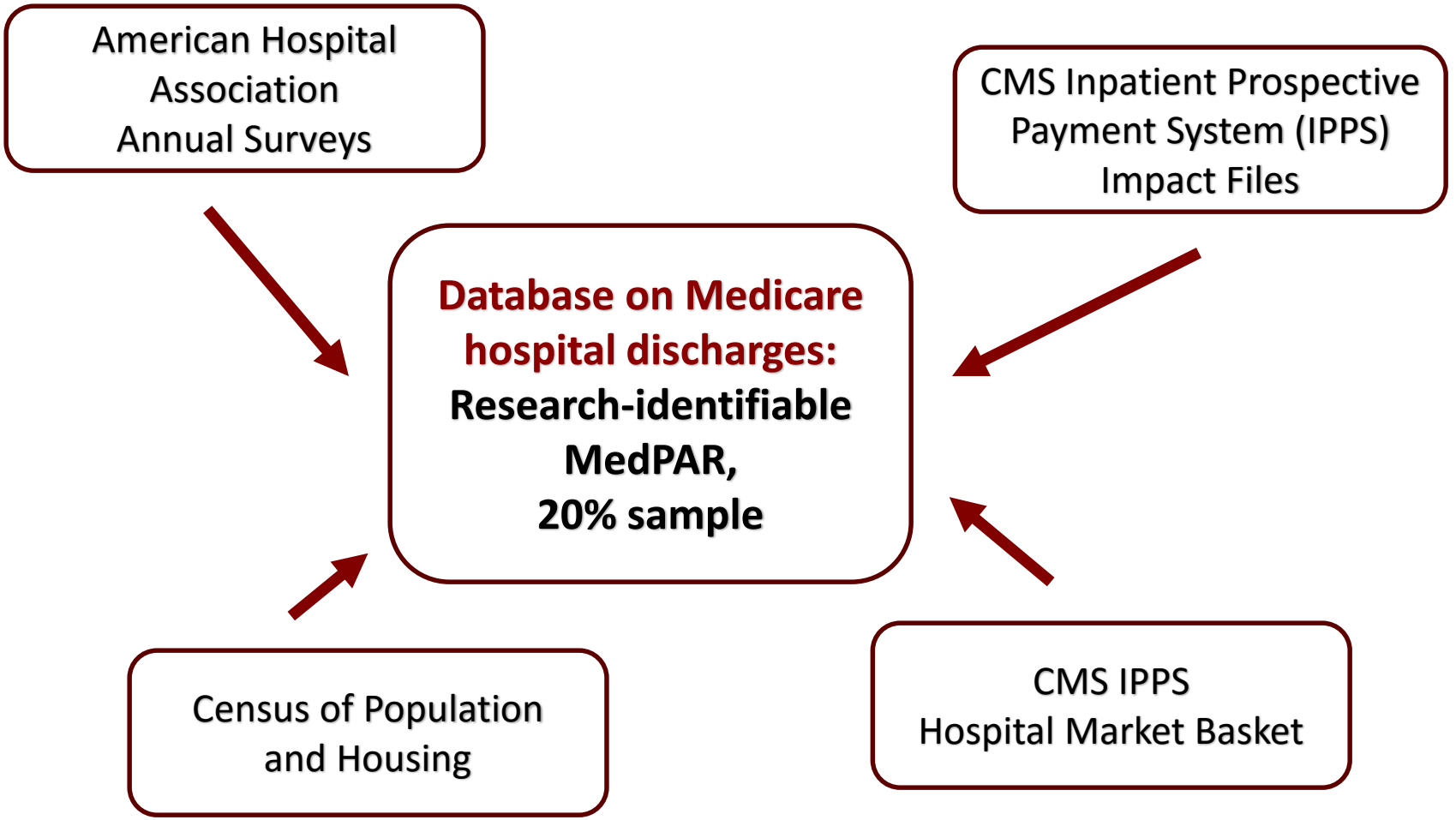
- **These are leading causes of death in the U.S…**

  …and common admitting diagnoses to the hospital

- **CMS has been paying very close attention**
  - **Publicly reports, and now pays according to, hospital performance on these conditions**

- **Measures of patient severity / health risk have been developed specifically for these conditions**
  - **Included in AHRQ Inpatient Quality Indicators (IQIs)**

Among elderly fee-for-service Medicare beneficiaries over 2002-2011



Hospital productivity and inputs

- **We measured productivity using the ratio of a hospital's output to its inputs**
  - **Unit of analysis was the hospital-year**
- **Production inputs were measured with a dollar-denominated index**
  - **Specifically, total facility costs for all patients with condition**
  - **Charges converted to costs with cost-to-charge ratio, then adjusted for area wages and hospital cost inflation**

How we identified patient cohorts

AHRQ Quality Indicators Web Site: http://www.qualityindicators.ahrq.gov

AHRQ QUALITY INDICATORS
Inpatient Quality Indicators
Technical Specifications

IQI #15 Acute Myocardial Infarction (AMI) Mortality Rate

Provider-Level Indicator

Mortality Indicator for Inpatient Medical Conditions

Numerator

Number of deaths (DISP=20) among cases meeting the inclusion and exclusion rules for the denominator.

Denominator

All discharges, age 18 years and older, with a principal diagnosis code of AMI.

ICD-9-CM AMI diagnosis codes:

41001	AMI ANTEROLATERAL, INIT	41051	AMI LATERAL NEC, INITIAL
41011	AMI ANTERIOR WALL, INIT	41061	TRUE POST INFARCT, INIT
41021	AMI INFEROLATERAL, INIT	41071	SUBENDO INFARCT, INITIAL
41031	AMI INFEROPOST, INITIAL	41081	AMI NEC, INITIAL
41041	AMI INFERIOR WALL, INIT	41091	AMI NOS, INITIAL

Exclude cases:

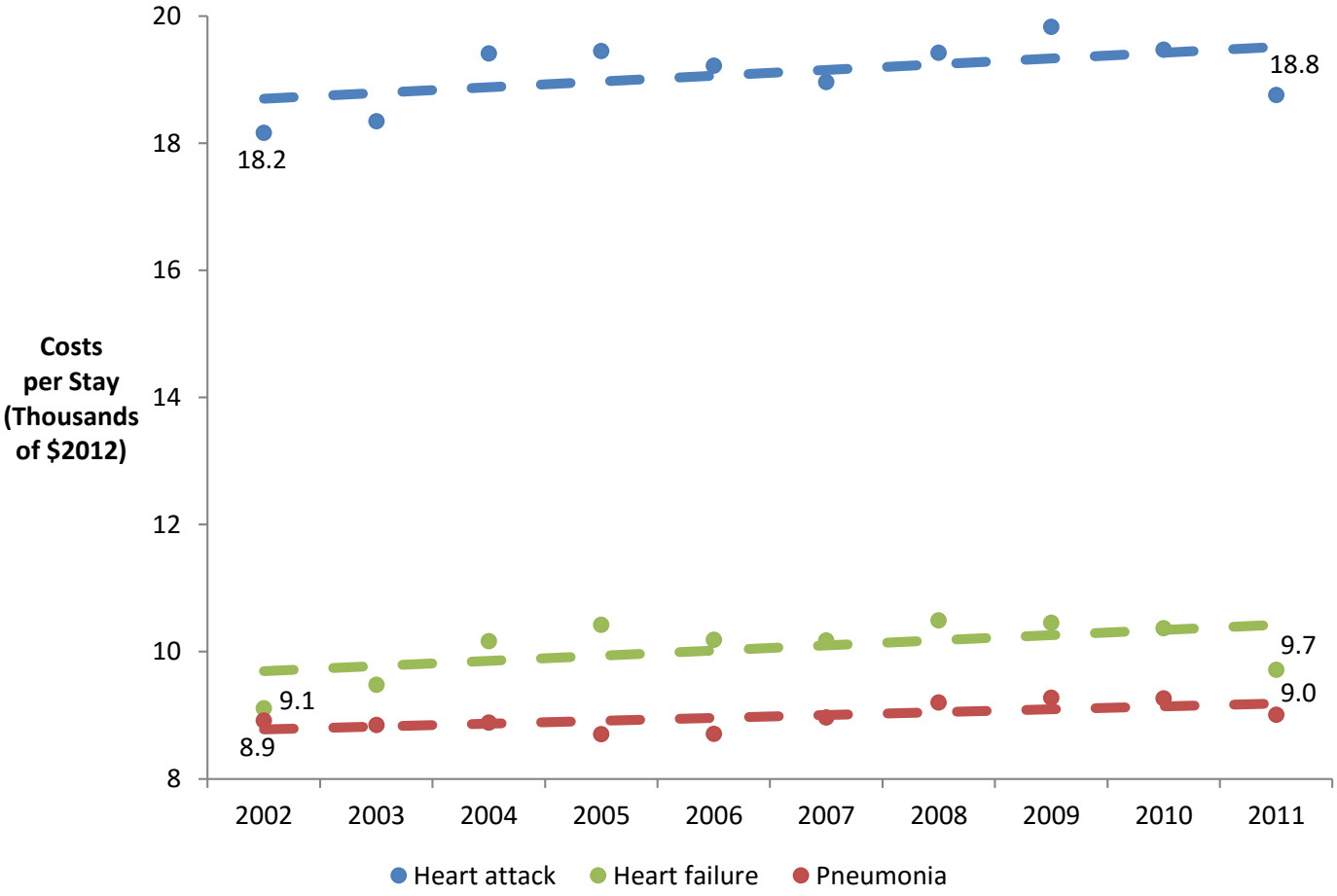
- missing discharge disposition (DISP=missing), gender (SEX=missing), age (AGE=missing), quarter (DQTR=missing), year (YEAR=missing) or principal diagnosis (DX1 =missing)
- transferring to another short-term hospital (DISP=2)
- MDC 14 (pregnancy, childbirth, and puerperium)

Some summary statistics

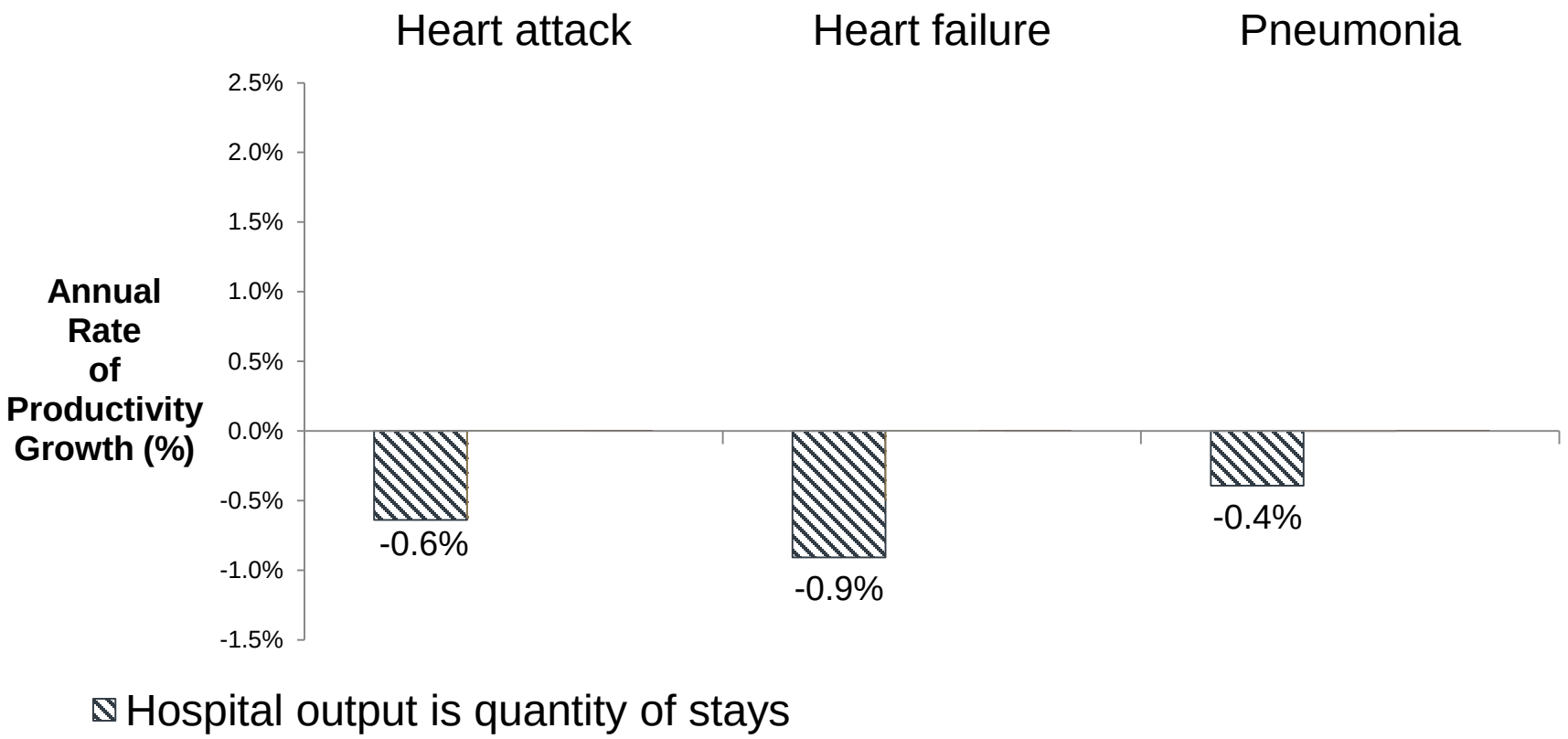
	Heart attack	*Heart failure*	*Pneumonia*
Patient stays, n	403,253	906,918	764,623
Hospitals, n	3,315	3,621	3,675
Year of admission	2006.0	2006.4	2005.9
Adjusted cost per stay (2012 dollars)	$18,762	$10,017	$8,942
30-day survival with no unplanned readmissions	78.7%	71.8%	77.4%
Teaching hospital	4.4%	3.4%	2.5%

Notes: Statistics are means unless otherwise indicated; all statistics calculated at the patient stay level.

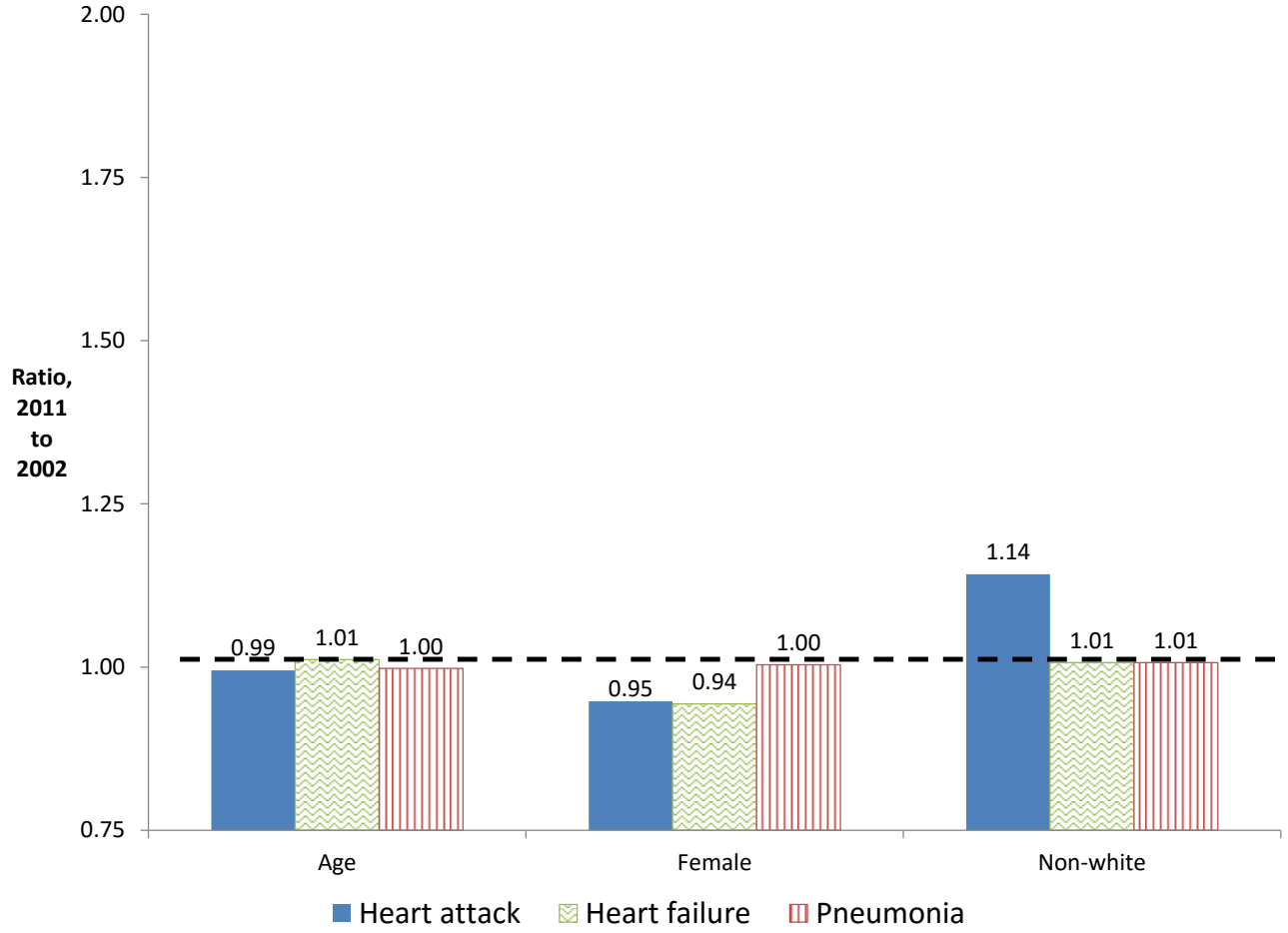
For costs per stay, the trend lines do not point to productivity growth



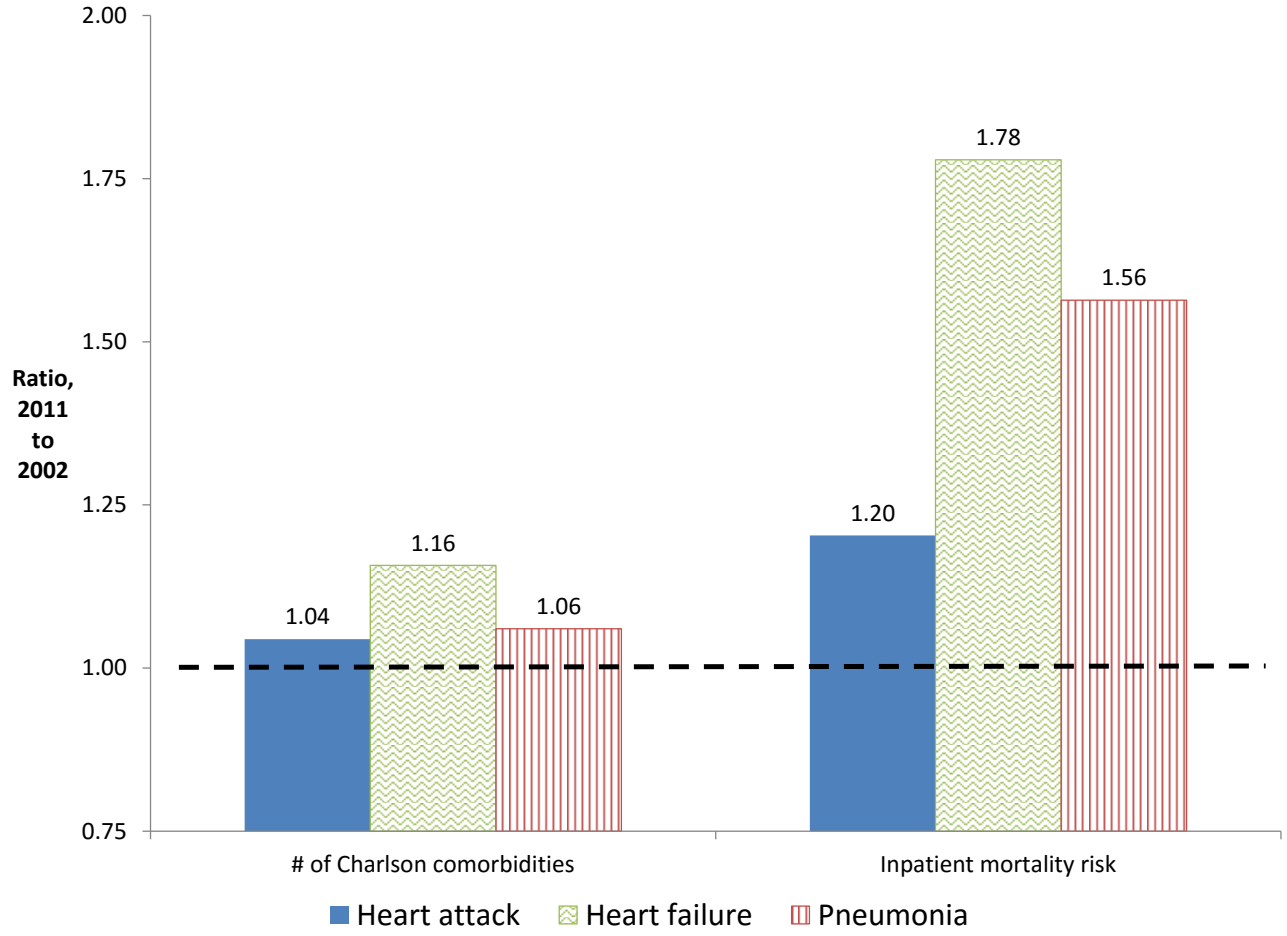
In regression analysis, “naïve” productivity growth was negative over 2002-2011 for all conditions



But patient demographics were changing between 2002 and 2011



In addition, patient severity was increasing



Clinical experts for AHRQ developed model of inpatient mortality risk in administrative data sets

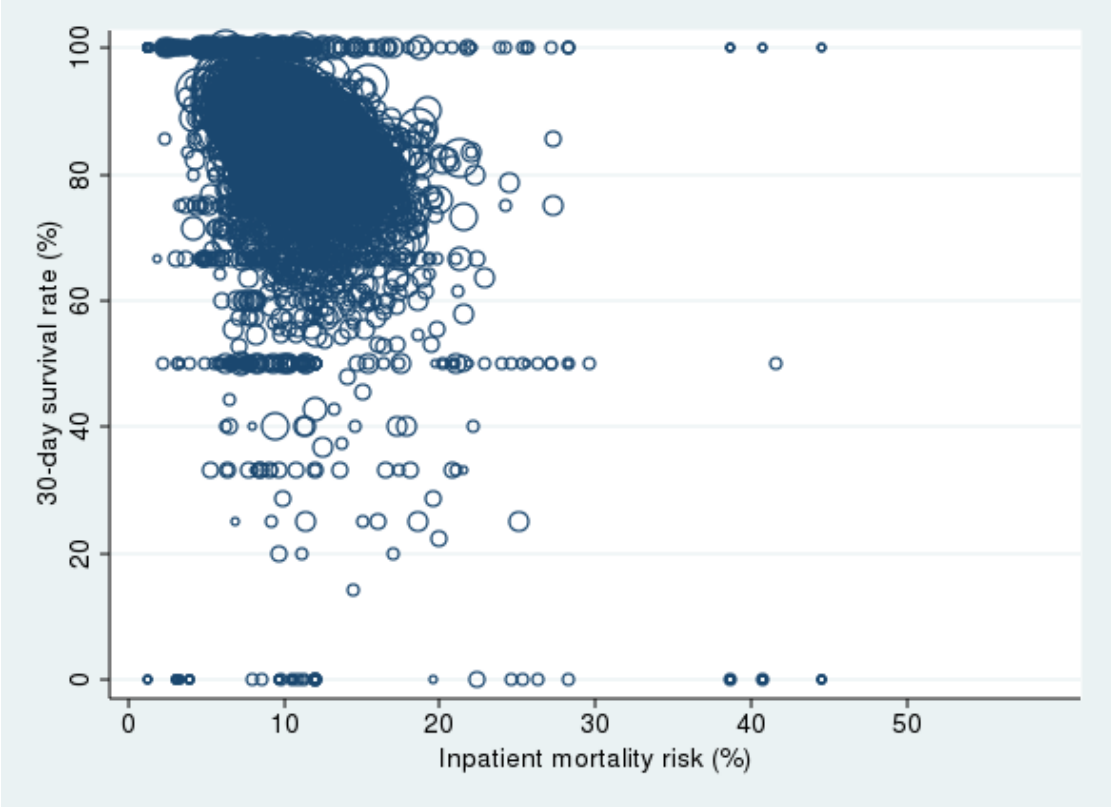
APR-DRGs from 3M play important role

IQI

Table 7. Risk Adjustment Coefficients for IQI #15— AMI Mortality

Parameter	Label	DF	Estimate	Standard Error	Wald Chi-Square	Pr > Chi-Square
Intercept		1	-5.5309	0.1025	2912.8843	<.0001
Age	18 to 39	1	-0.5723	0.1438	15.8301	<.0001
Age	40 to 44	1	-0.7079	0.1302	29.5492	<.0001
Age	45 to 49	1	-0.2508	0.0847	8.777	0.0031
Age	50 to 54	1	-0.23	0.0716	10.3304	0.0013
Age	55 to 59	1	-0.1458	0.0644	5.1317	0.0235
Age	65 to 69	1	0.1264	0.0462	7.4857	0.0062
Age	80 to 84	1	0.123	0.0506	5.9012	0.0151
Age	85+	1	0.1959	0.0487	16.1528	<.0001
APR-DRG	'1611' to '1612'	1	1.1742	0.3682	10.1694	0.0014
APR-DRG	'1613' to '1614'	1	2.87	0.1589	326.1709	<.0001
APR-DRG	'1621' to '1622'	1	2.3699	0.253	87.7313	<.0001
APR-DRG	'1623'	1	3.9284	0.1762	497.1341	<.0001
APR-DRG	'1624'	1	4.6219	0.1993	537.5819	<.0001
APR-DRG	'1651' to '1652'	1	1.0558	0.1471	51.5343	<.0001
APR-DRG	'1653'	1	2.6729	0.1227	474.6562	<.0001
APR-DRG	'1654'	1	3.8062	0.1407	731.6044	<.0001
APR-DRG	'1731' to '1734'	1	3.8338	0.1753	478.5413	<.0001
APR-DRG	'1742'	1	1.4064	0.1109	160.7569	<.0001
APR-DRG	'1743'	1	3.035	0.1096	766.6736	<.0001
APR-DRG	'1744'	1	4.4992	0.1026	1922.9611	<.0001
APR-DRG	'1901'	1	1.4033	0.1255	125.084	<.0001
APR-DRG	'1902'	1	2.3416	0.1028	519.1431	<.0001
APR-DRG	'1903'	1	3.3619	0.0984	1167.0483	<.0001
APR-DRG	'1904'	1	4.9943	0.0982	2585.3541	<.0001
MDC	5	1	3.5402	0.1069	1096.7232	<.0001
TRNSFER		1	-0.2032	0.0352	33.3572	<.0001
c-statistic	0.84					

AHRQ inpatient mortality risk is well correlated with 30-day survival

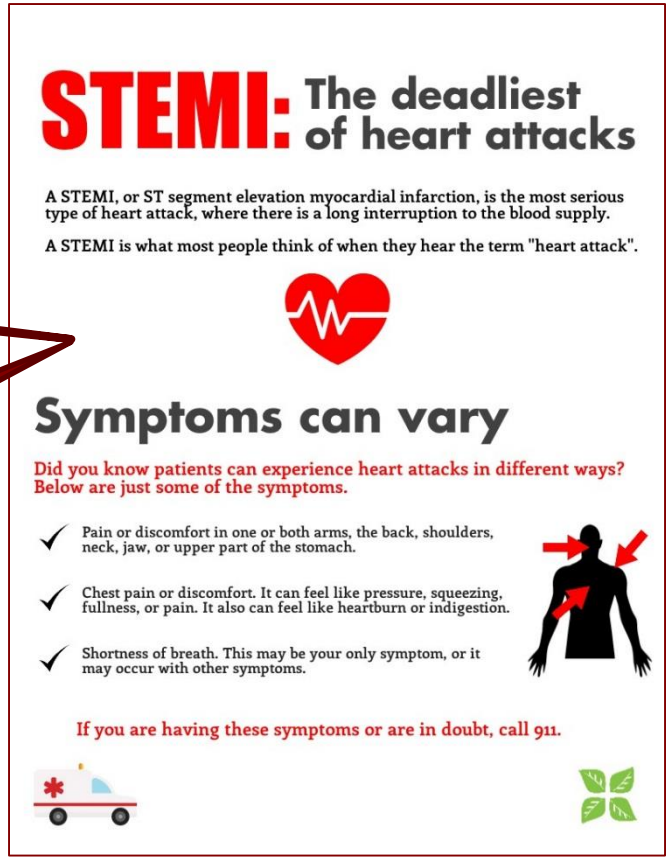


Heart attack

For heart attack, we adjusted for the location within the heart

Location (ICD-9-CM code)
Anterolateral (410.0x)
Other Anterior Wall (410.1x)
Inferolateral Wall (410.2x)
Inferoposterior Wall (410.3x)
Other Inferior Wall (410.4x)
Other Lateral Wall (410.5x)
True Posterior Wall (410.6x)
Sub-Endocardial (410.7x)
Other Specified Sites (410.8x)
Unspecified site (410.9x)

STEMI share increased 25.2% between 2002 and 2011

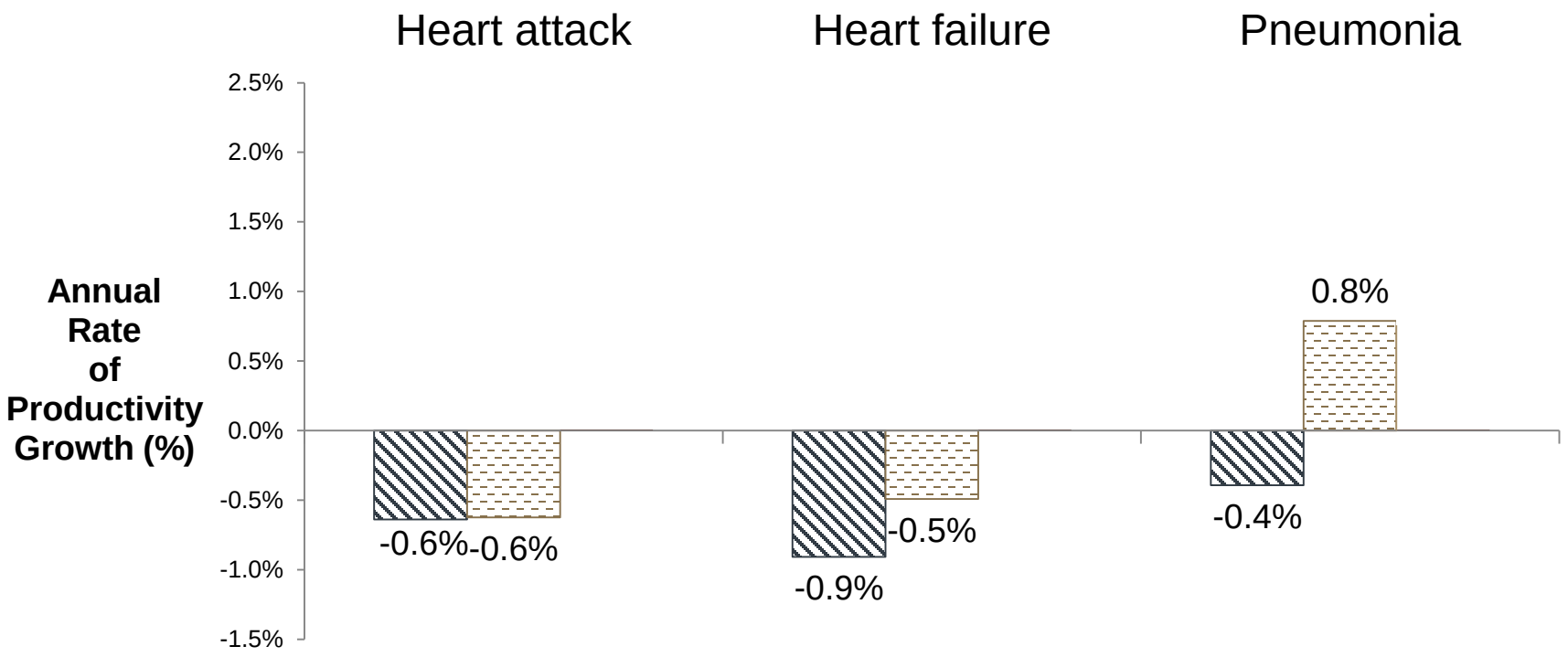


Finally, following Fisher et al. (2003), we adjusted for contextual factors in patient zip codes

	Heart attack	*Heart failure*	*Pneumonia*
Patient zip code characteristics			
Median household income ($000)	41.9	41.3	41.7
Social Security income ($000)	11.3	11.2	11.3
Poor	12.3%	13.1%	12.7%
Employed	58.3%	57.9%	58.3%
Less than high school education	20.3%	21.2%	20.8%
Urban	71.3%	74.5%	71.7%
Hispanic	8.6%	9.5%	9.2%
Single	42.0%	43.1%	42.2%
Elderly in an institution	4.6%	4.6%	4.8%
Non-institutionalized elderly with physical disability	29.5%	30.0%	30.0%
Sensory disability among elderly	12.3%	13.1%	12.7%
Mental disability	11.0%	11.4%	11.4%
Self-care disability	9.8%	10.1%	10.0%
Difficulty going-outside-the-home disability	20.6%	21.3%	20.9%

Notes: Statistics are means unless otherwise indicated; all statistics calculated at the patient stay level.

With adjustment for patient severity, measured growth improves for HF and PN



Should we be worried about our patient severity measures?

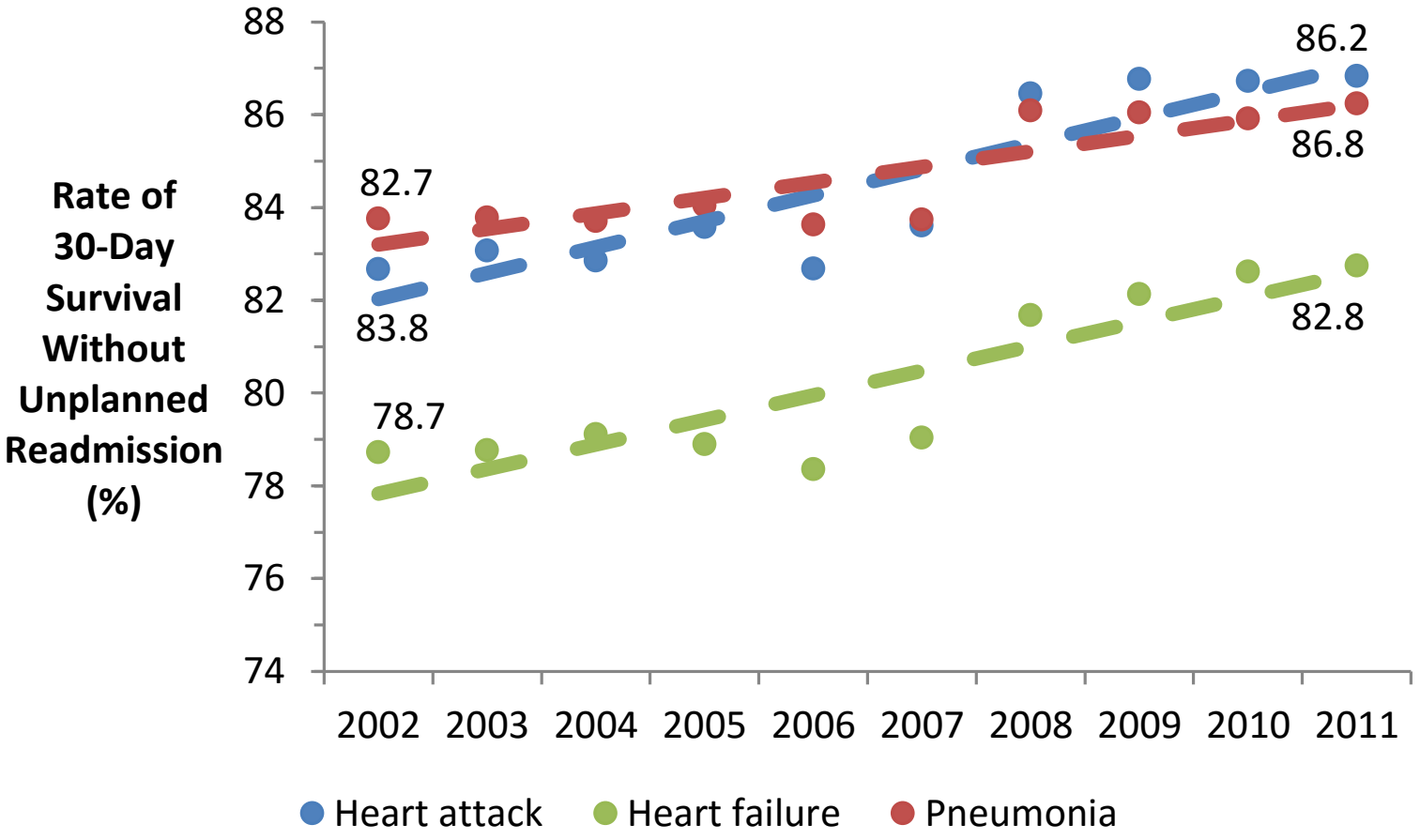
- There is reason to be believe comorbidity has grown
- But, MS-DRG adoption created incentives for "documentation and coding" response by hospitals
- Severity measurement merits careful investigation

Identifying high-quality stays: Survival without an unplanned readmission

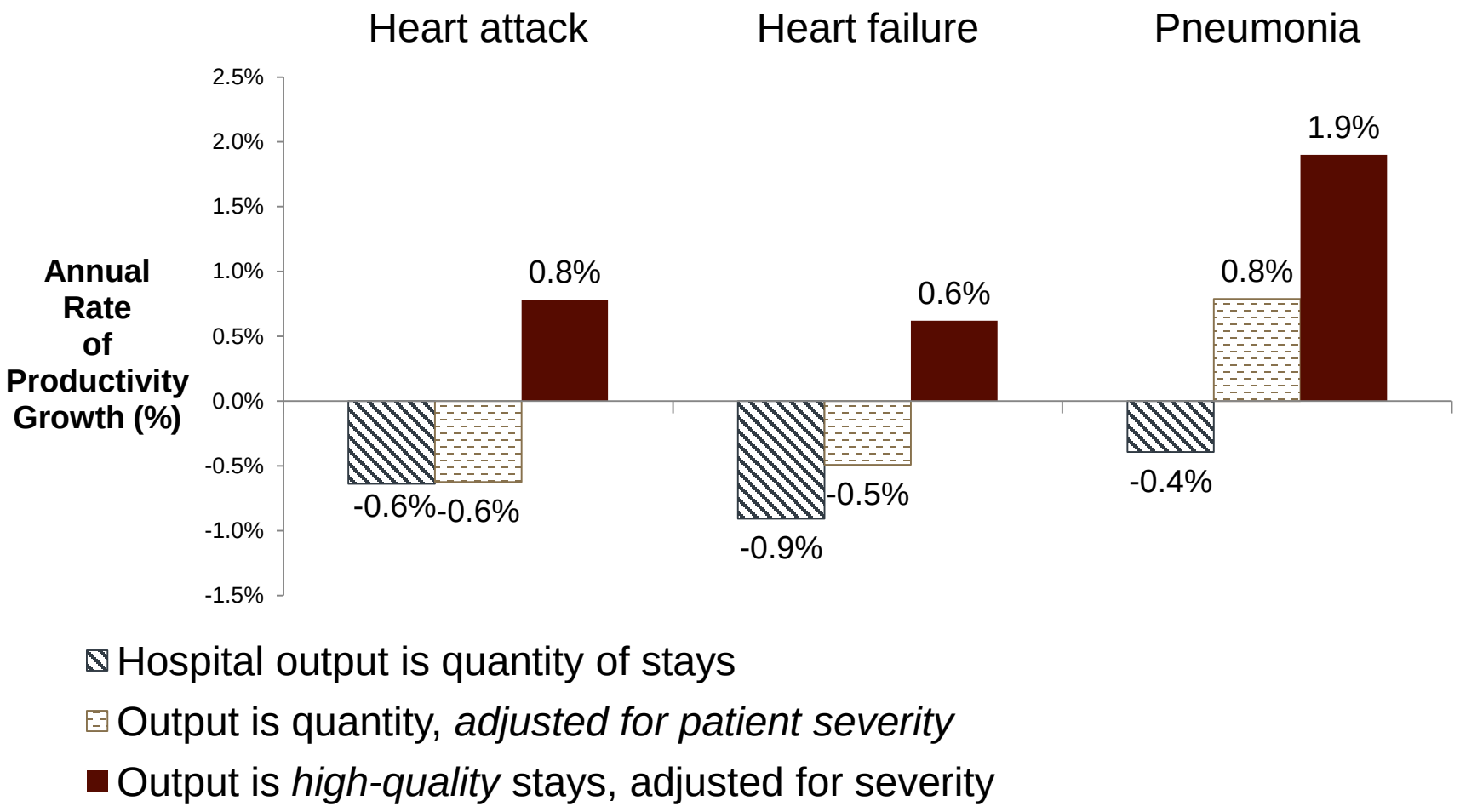
- **MedPAC identifies efficient hospitals based on these patient outcomes**

- **We measured unplanned readmission rate following CMS methodology**

The quality of hospital stays increased



Accounting for quality, U.S. hospitals actually performed well over 2002-2011



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In addition, we have begun to explore post-acute care

- **Nursing homes seem like strong candidates for a cost disease**
- **Ultimately, we want to understand productivity not only by site of care, but also for episodes of care**
- **As of today, we have examined outcomes for Medicare beneficiaries admitted to a SNF**
  - **After hospitalization for hip / knee replacement or stroke**
  - **Over 2007-2012**

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We are also exploring hospital-physician integration

- **On one hand, clinical integration could improve quality while lowering costs**
  - **On the other hand, *financial* integration could incentivize low-value care with fee-for-service**

- **We follow Baker, Bundorf and Kessler (2014) in characterizing hospital-physician relationships**
  - **Ranging from unintegrated to contractually integrated (e.g., IPA) to fully integrated, based on survey data**
  - **Their study found private insurers paid high prices for inpatient care in counties with high share of fully integrated**

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