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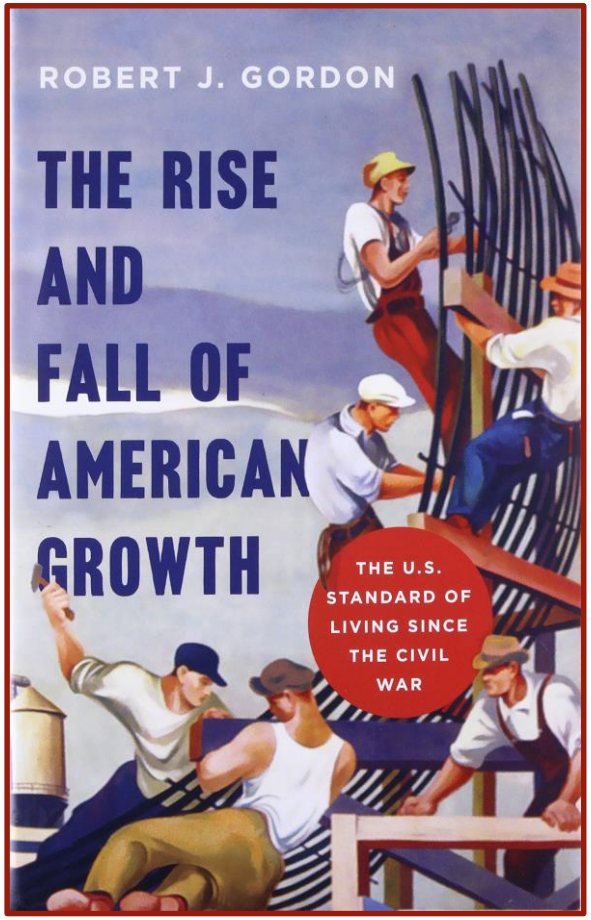
Quantifying Productivity Growth in Health Care Using Insurance Claims and Administrative Data

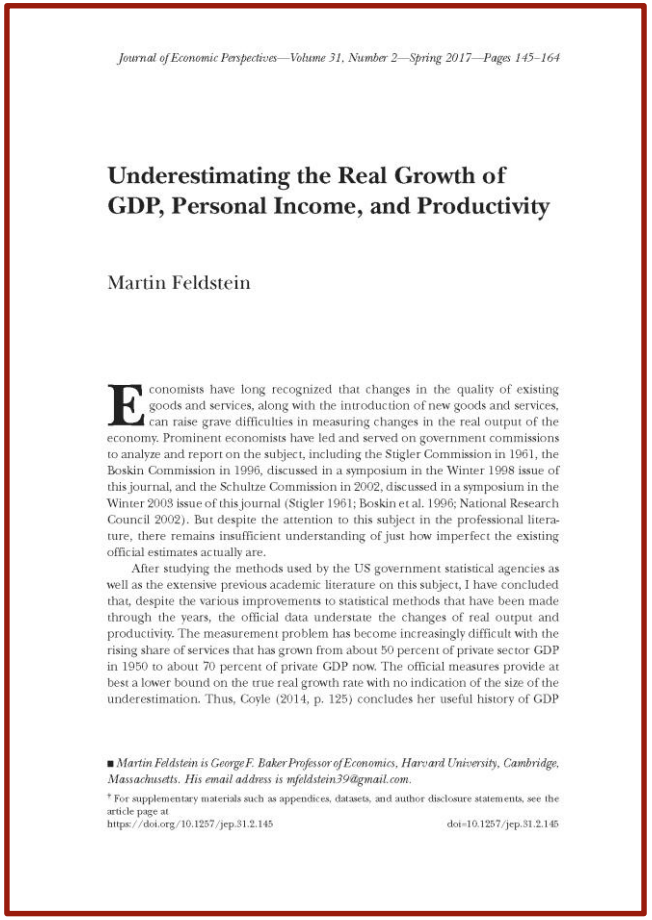
John A. Romley, Abe Dunn, Dana Goldman and Neeraj Sood

March 15, 2019

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There is a big debate about U.S. economic growth





Journal of Economic Perspectives—Volume 31, Number 2—Spring 2017—Pages 145–164

Underestimating the Real Growth of GDP, Personal Income, and Productivity

Martin Feldstein

Economists have long recognized that changes in the quality of existing goods and services, along with the introduction of new goods and services, can raise grave difficulties in measuring changes in the real output of the economy. Prominent economists have led and served on government commissions to analyze and report on the subject, including the Stigler Commission in 1961, the Boskin Commission in 1996, discussed in a symposium in the Winter 1998 issue of this journal, and the Schultze Commission in 2002, discussed in a symposium in the Winter 2003 issue of this journal (Stigler 1961; Boskin et al. 1996; National Research Council 2002). But despite the attention to this subject in the professional literature, there remains insufficient understanding of just how imperfect the existing official estimates actually are.

After studying the methods used by the US government statistical agencies as well as the extensive previous academic literature on this subject, I have concluded that, despite the various improvements to statistical methods that have been made through the years, the official data understate the changes of real output and productivity. The measurement problem has become increasingly difficult with the rising share of services that has grown from about 50 percent of private sector GDP in 1950 to about 70 percent of private GDP now. The official measures provide at best a lower bound on the true real growth rate with no indication of the size of the underestimation. Thus, Coyle (2014, p. 125) concludes her useful history of GDP

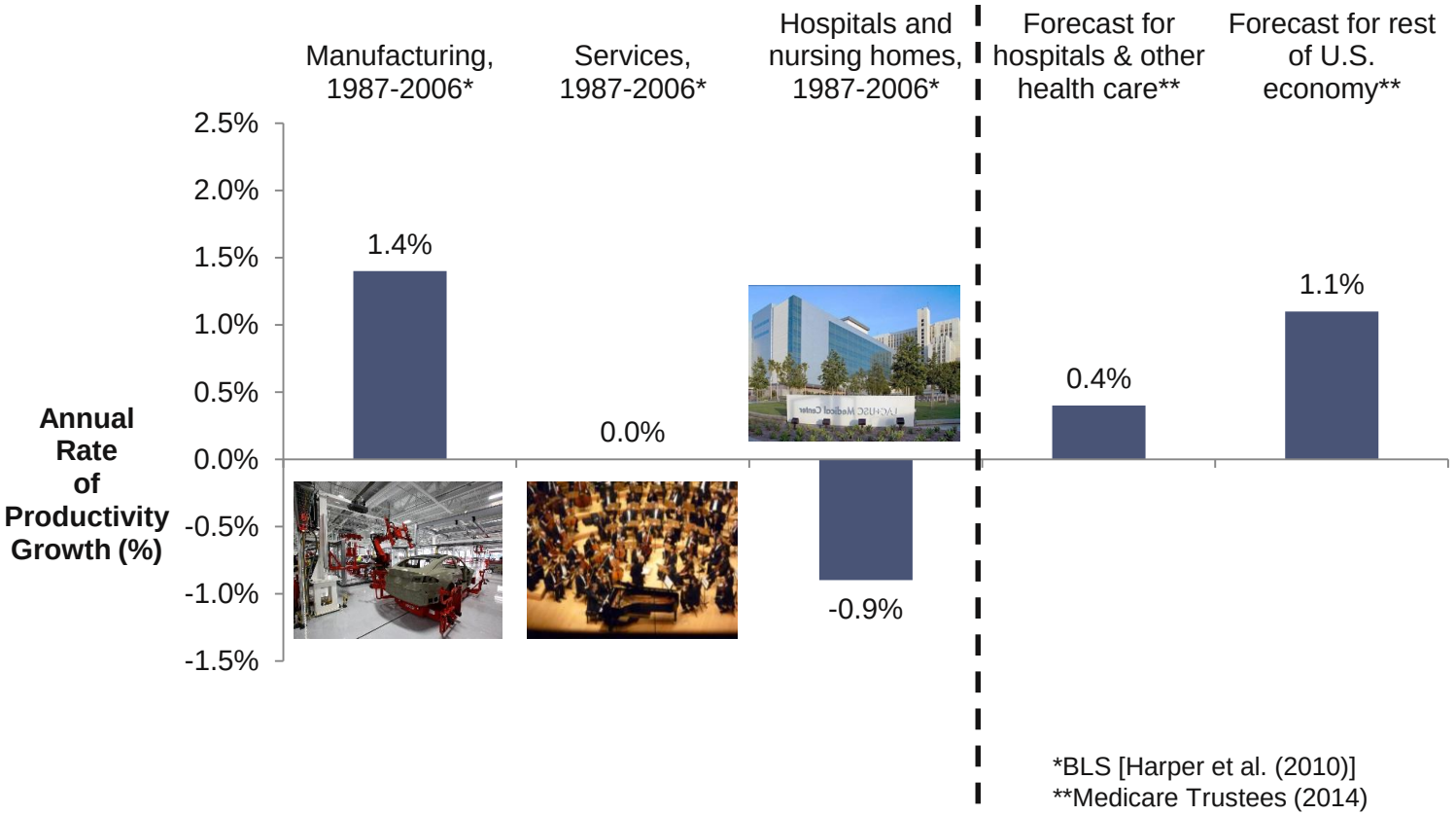
■ *Martin Feldstein is George F. Baker Professor of Economics, Harvard University, Cambridge, Massachusetts. His email address is mfeldstein39@gmail.com.*

† For supplementary materials such as appendices, datasets, and author disclosure statements, see the article page at
https://doi.org/10.1257/jep.31.2.145

doi=10.1257/jep.31.2.145

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Productivity growth in health care is a particular concern



Medicare payments to providers are tied to productivity growth

ACA <u>reduces</u> annual "updates" based on productivity growth in <u>broader economy</u>

- In FY 2019, 2.9% increase for inflation reduced by 0.8%

Adjustment has caused concern about viability of health care providers



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Yet productivity measurement is particularly challenging in health care

Readily confounded by hard-to-measure aspects of

- Quality of care
- Patient severity



WEB FIRST

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

US Hospitals Experienced Substantial Productivity Growth During 2002–11

DOI: 10.1377/hlthaff.2014.0587
HEALTH AFFAIRS 34,
NO. 3 (2015): –
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The People-to-People Health
Foundation, Inc.

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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Neeraj Sood is an associate professor of health economics and director of research at the Leonard D. Schaeffer Center for Health Policy and Economics at the University of Southern California.

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-

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Dealing with the quality of health care is not a new challenge

Boskin Commission addressed 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*



THE
QUARTERLY JOURNAL
OF ECONOMICS

Vol. CXIII November 1998 Issue 4

ARE MEDICAL PRICES DECLINING?
EVIDENCE FROM HEART ATTACK TREATMENTS*

DAVID M. CUTLER
MARK MCCLELLAN
JOSEPH P. NEWHOUSE
DAHLIA REMLER

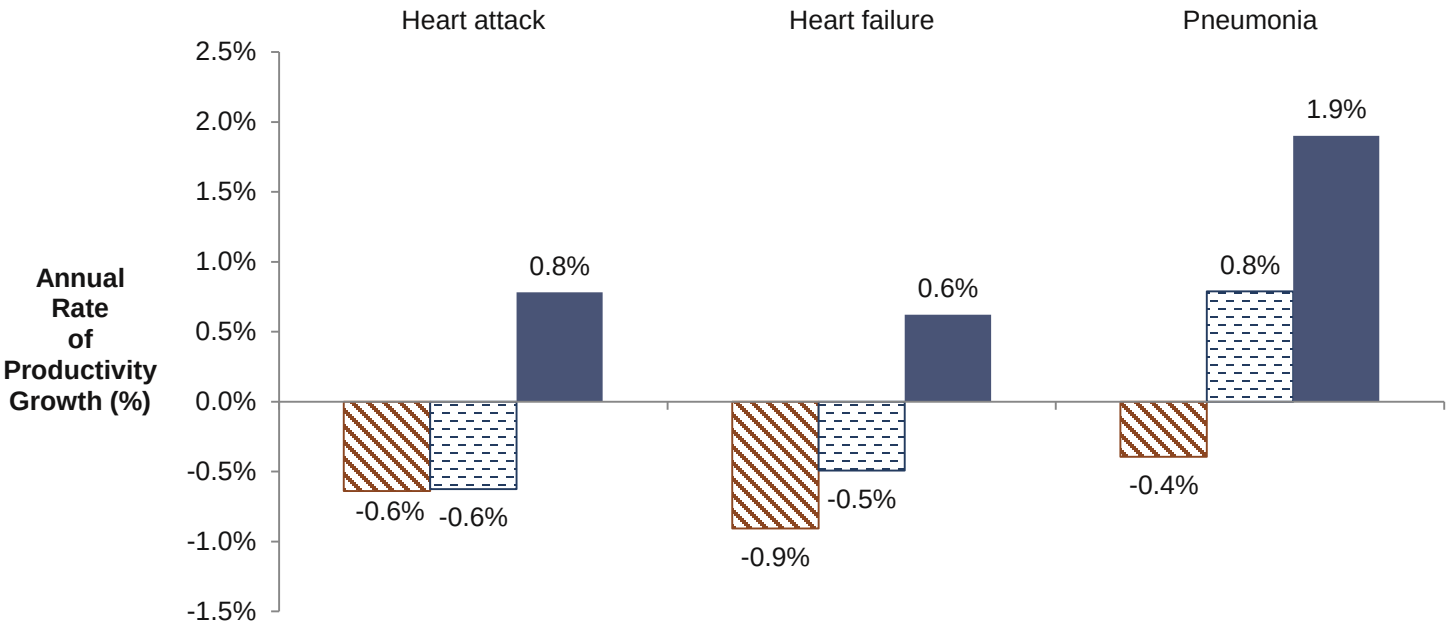
We address long-standing problems in measuring medical inflation by estimating two types of price indices. The first, a Service Price Index, prices specific medical services, as does the current CPI. The second, a Cost of Living Index, measures a quality-adjusted cost of treating a health problem. We 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

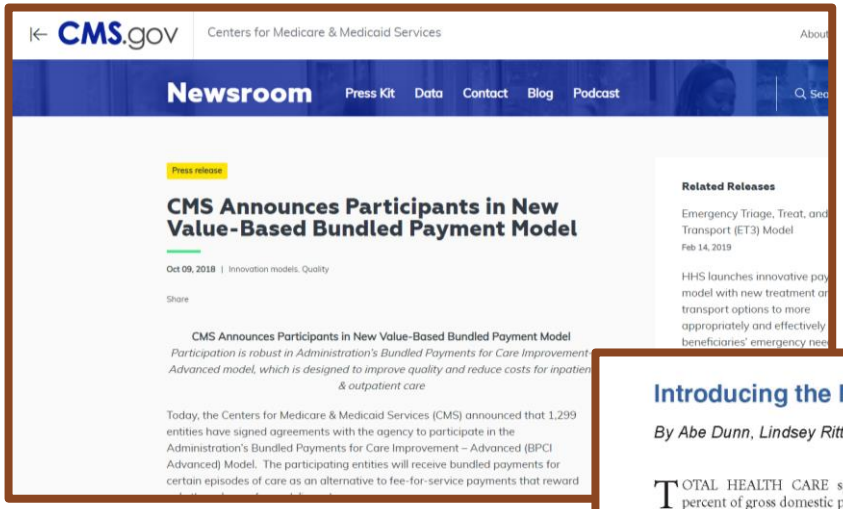
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Accounting for quality, U.S. hospitals actually performed well over 2002-2011



- Hospital output is quantity of stays
- Adjusting stays for patient severity
- Severity-adjusted number of survivors with no unplanned readmissions

A comprehensive view — not limited to the hospital setting — is increasingly relevant





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We analyze treatment episodes starting with hospitalization and ending 90 days after discharge

From 2002 through 2014…

- We are awaiting data for 2015 and 2016

Among older Americans in traditional (fee-for-service) Medicare…

- Medicare accounted for 20% of national health spend in 2017 (CMS)
- Traditional Medicare accounted for 66% of program beneficiaries in 2018 (KFF)

Using health insurance claims and administrative records…

- Data provide longitudinal perspective on care and outcomes

For episodes of heart attack, heart failure and pneumonia

- This focus naturally generalizes to other conditions and procedures

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Empirical approach

We estimate

$$\ln Y_{ht} = \alpha + \mathbf{ln}\, \boldsymbol{I_{ht}}\, \boldsymbol{\beta_I} + \boldsymbol{S_{ht}}\boldsymbol{\beta_S} + \boldsymbol{O_{ht}}\boldsymbol{\beta_O} + g(t) + \epsilon_{ht},$$

in which Y_{ht} is the number of "high-quality" episodes that started at "index" hospital *h* in year *t*,

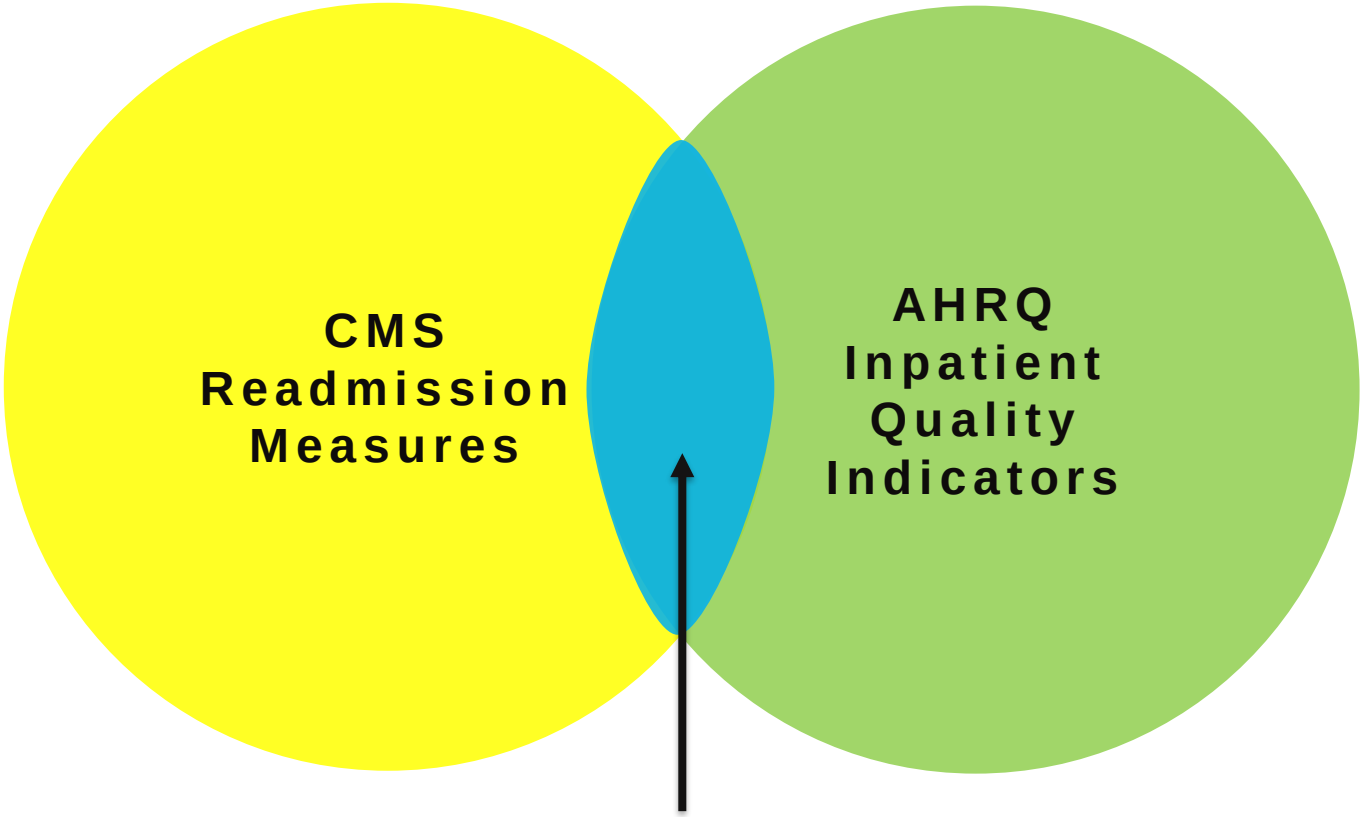
- $\boldsymbol{I_{ht}}$ is the inputs used to deliver these episodes of care,
- $\boldsymbol{S_{ht}}$ is severity measures for patients starting episodes at "index" hospital *h* in year *t*,
- $\boldsymbol{O_{ht}}$ is "other hospital output," and
- $g(t)$ is a function of time

We interpret $\boldsymbol{g(t)}$ as MFP

- Note that Cutler-type measure addresses allocative efficiency and social welfare

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Y_{ht}: We use clinically validated and policy-oriented methodologies to identify episodes



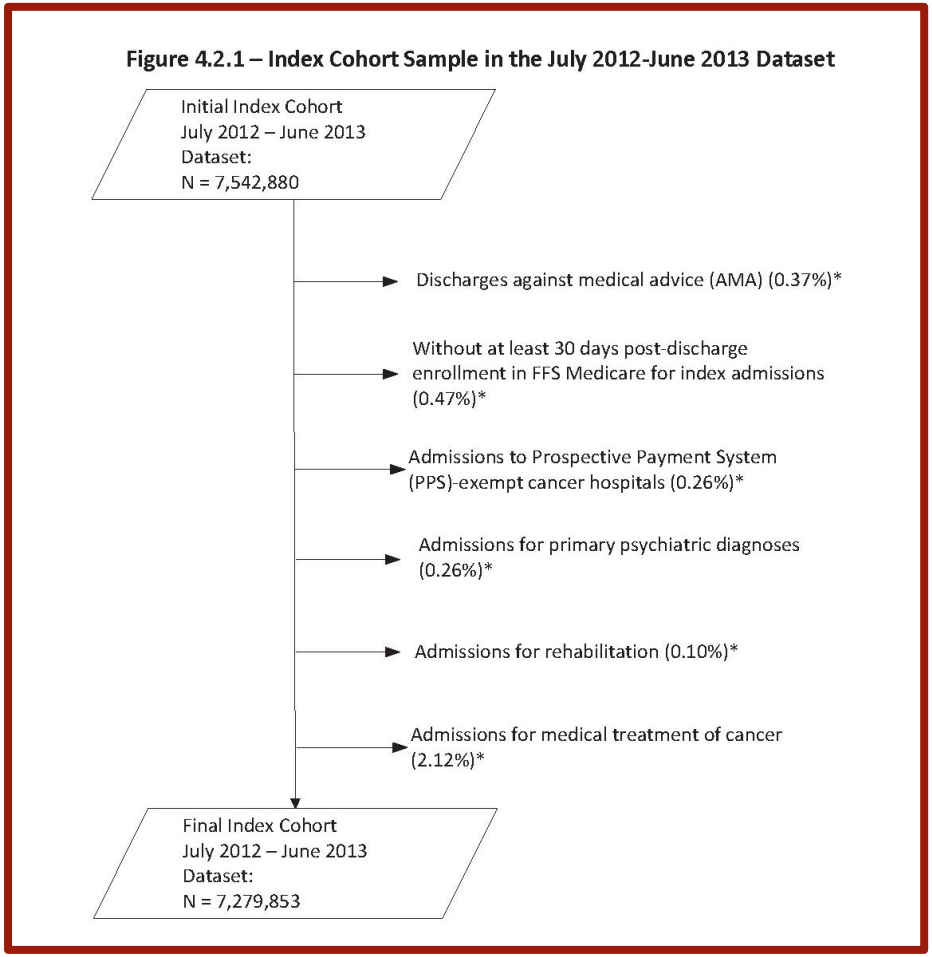
Y_{ht}: Episode duration and quality

The vast majority of providers have selected 90-day post-discharge windows for bundled payment, so we use this duration

In a high-quality episode, the patient

- is alive at the end of the episode
- avoids an unplanned readmission within 30 days of discharge
- returns to the community (i.e., is not institutionalized)

CMS has developed a complex algorithm for flagging unplanned readmissions



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We use a 20% sample of Medicare Inpatient Files to identify index stays / episodes

Stays / Episodes	*Beneficiaries*	*Hospitals*	*Description*
29,841,183	7,880,612	6,353	All stays at short term acute care hospitals in 20% sample
811,517	635,380	5,510	**Heart attack** (acute myocardial infarction, i.e., AMI) stays
798,414	625,301	5,505	Excluding stays in fourth quarter of 2014 (incomplete follow up)
558,999	501,940	5,290	Stays / episodes meeting **CMS readmission measure** criteria

Y_{ht}: Measuring other aspects of quality

Master Beneficiary Summary Files from CMS report validated dates of death

Institutional claims (Inpatient Files, etc.) report discharge to home

- We use last such claim

I_{ht}: We measure inputs using treatment costs

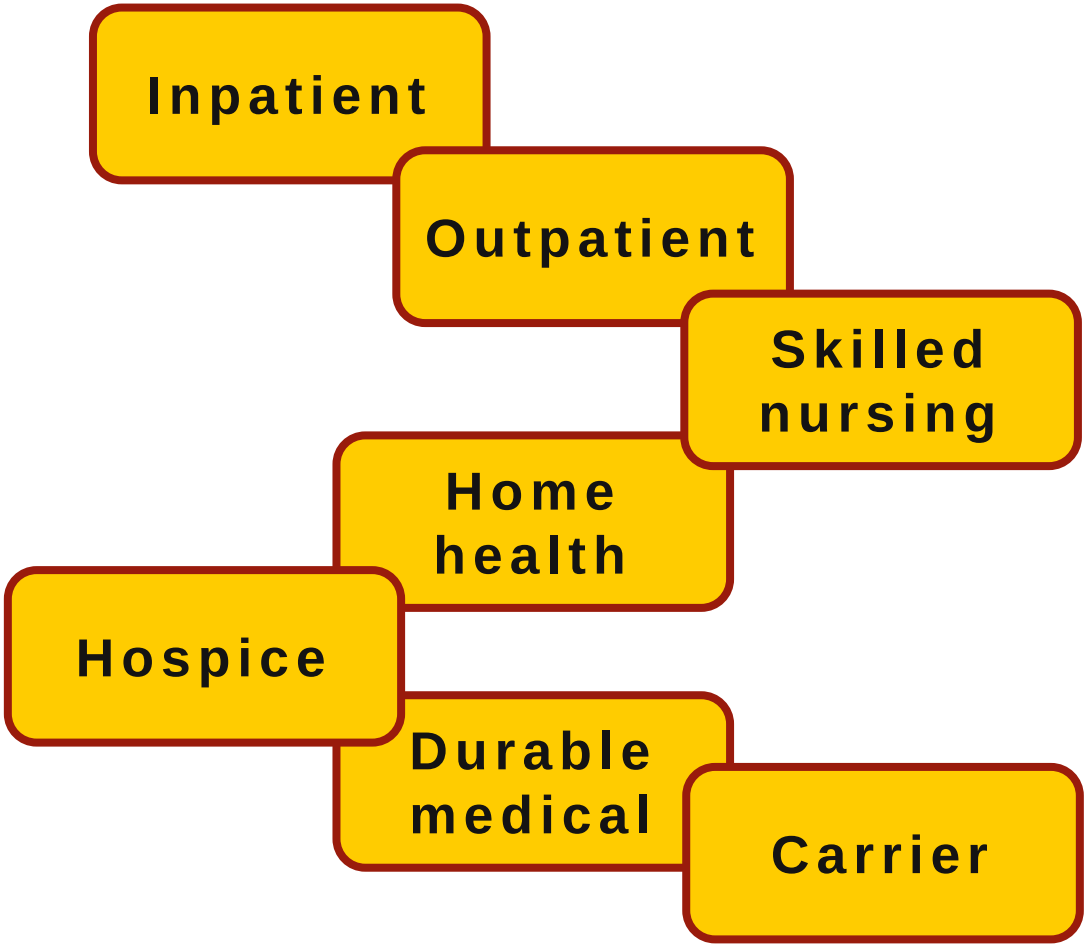
Common in health economics and policy

We deflate institutional / facility costs using inflation measures from CMS

- Health care professionals do not report costs, so we assume zero price-cost margins in 2002 and apply CMS inflation measure

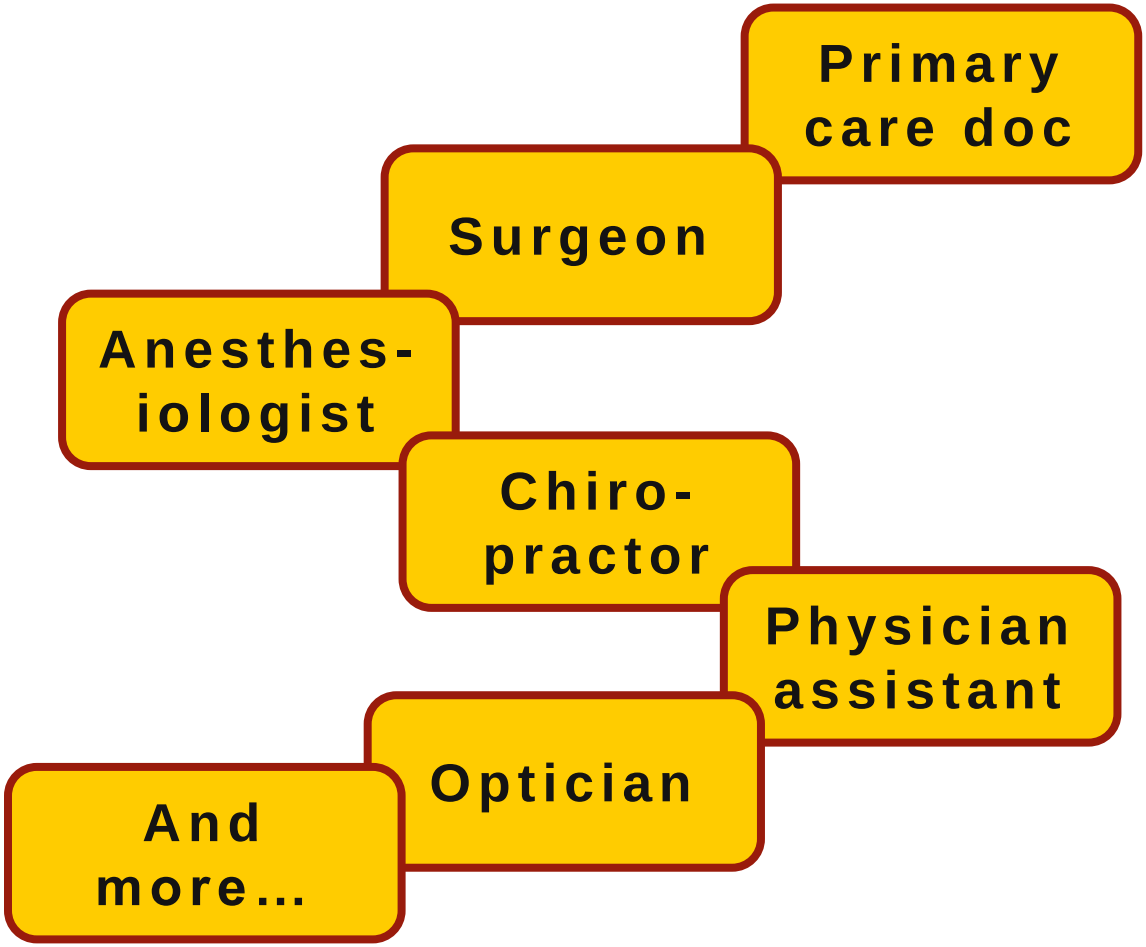
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I_{ht}: We include everything but prescription drugs using various claims files



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I_{ht}: Carrier Files include a wide array of professional services



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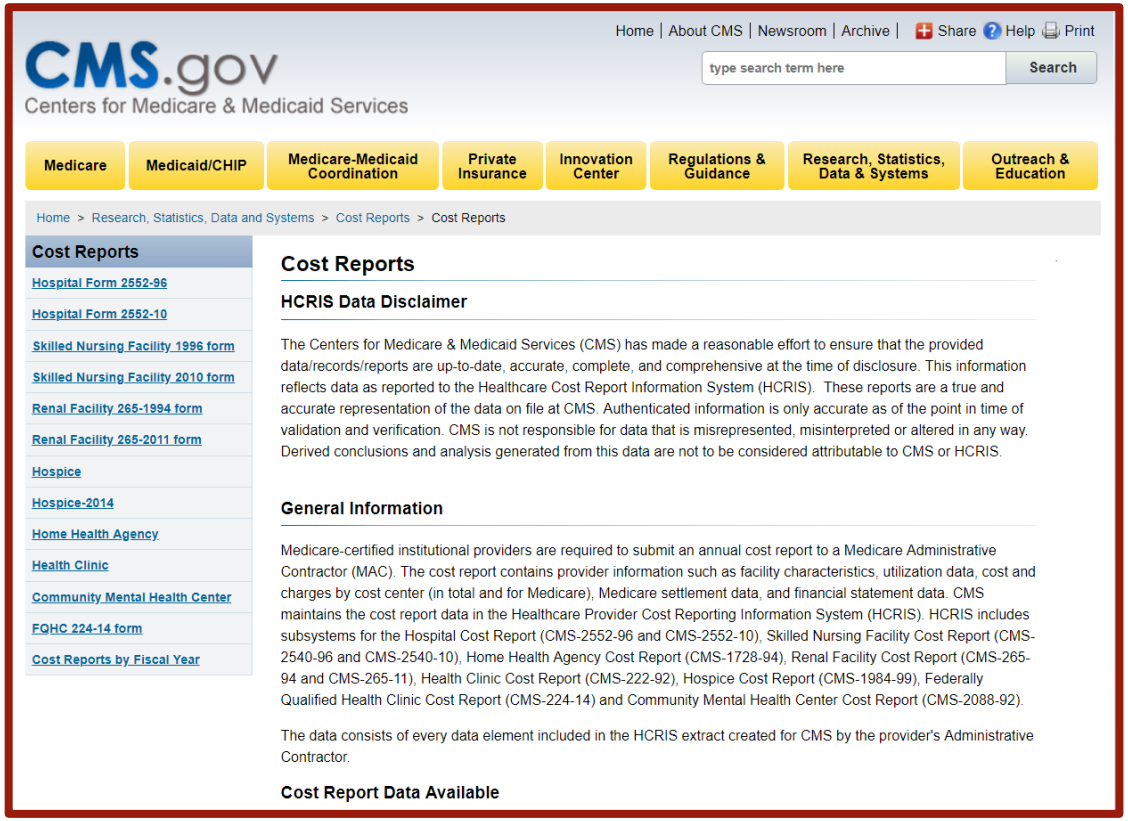
I_{ht}: These claims are "big data"

Within 20% sample, 2014 Carrier File includes 178 million claims

24.6 million of these claims matched to our patients

5.3 million fell within episode windows

I_{ht}: For institutions / facilities, we use "Medicare Cost Reports"



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Home > Research, Statistics, Data and Systems > Cost Reports > Cost Reports

Cost Reports

- Hospital Form 2552-96
- Hospital Form 2552-10
- Skilled Nursing Facility 1996 form
- Skilled Nursing Facility 2010 form
- Renal Facility 265-1994 form
- Renal Facility 265-2011 form
- Hospice
- Hospice-2014
- Home Health Agency
- Health Clinic
- Community Mental Health Center
- FQHC 224-14 form
- Cost Reports by Fiscal Year

Cost Reports

HCRIS Data Disclaimer

The Centers for Medicare & Medicaid Services (CMS) has made a reasonable effort to ensure that the provided data/records/reports are up-to-date, accurate, complete, and comprehensive at the time of disclosure. This information reflects data as reported to the Healthcare Cost Report Information System (HCRIS). These reports are a true and accurate representation of the data on file at CMS. Authenticated information is only accurate as of the point in time of validation and verification. CMS is not responsible for data that is misrepresented, misinterpreted or altered in any way. Derived conclusions and analysis generated from this data are not to be considered attributable to CMS or HCRIS.

General Information

Medicare-certified institutional providers are required to submit an annual cost report to a Medicare Administrative Contractor (MAC). The cost report contains provider information such as facility characteristics, utilization data, cost and charges by cost center (in total and for Medicare), Medicare settlement data, and financial statement data. CMS maintains the cost report data in the Healthcare Provider Cost Reporting Information System (HCRIS). HCRIS includes subsystems for the Hospital Cost Report (CMS-2552-96 and CMS-2552-10), Skilled Nursing Facility Cost Report (CMS-2540-96 and CMS-2540-10), Home Health Agency Cost Report (CMS-1728-94), Renal Facility Cost Report (CMS-265-94 and CMS-265-11), Health Clinic Cost Report (CMS-222-92), Hospice Cost Report (CMS-1984-99), Federally Qualified Health Clinic Cost Report (CMS-224-14) and Community Mental Health Center Cost Report (CMS-2088-92).

The data consists of every data element included in the HCRIS extract created for CMS by the provider's Administrative Contractor.

Cost Report Data Available

I_{ht}: Consider acute-care hospitals

Cost reports have cost-to-charge ratios (CCR)

Claims have charges covered by Medicare

- For covered charges, we have to link line-level records from Inpatient Files to claims

So estimated cost of a hospital stay = Charges * CCR

- Similar for other institutional claims, e.g., home health reports cost per visit and visits are on claim

I_{ht}: Cost data is not infrequently missing

Stays / Episodes	*Beneficiaries*	*Hospitals*	*Description*
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558,999	501,940	5,290	Stays / episodes meeting CMS readmission measure criteria
470,120	426,933	4,837	Excluding episodes with any missing cost-to-charge ratios

S_{ht} and O_{ht} : Patient severity and other hospital output

Patient severity measures include

- AHRQ Inpatient Quality Indicators for risk of inpatient death
- Age, sex and race / ethnicity
- Comorbidities from the index hospital record
- For heart attack, location within heart (e.g., N-STEMI)
- Zip-code sociodemographics from 2000 Census

Other hospital output includes

- Residents per bed from annual CMS IPPS Impact Files
- Tertiary care capabilities

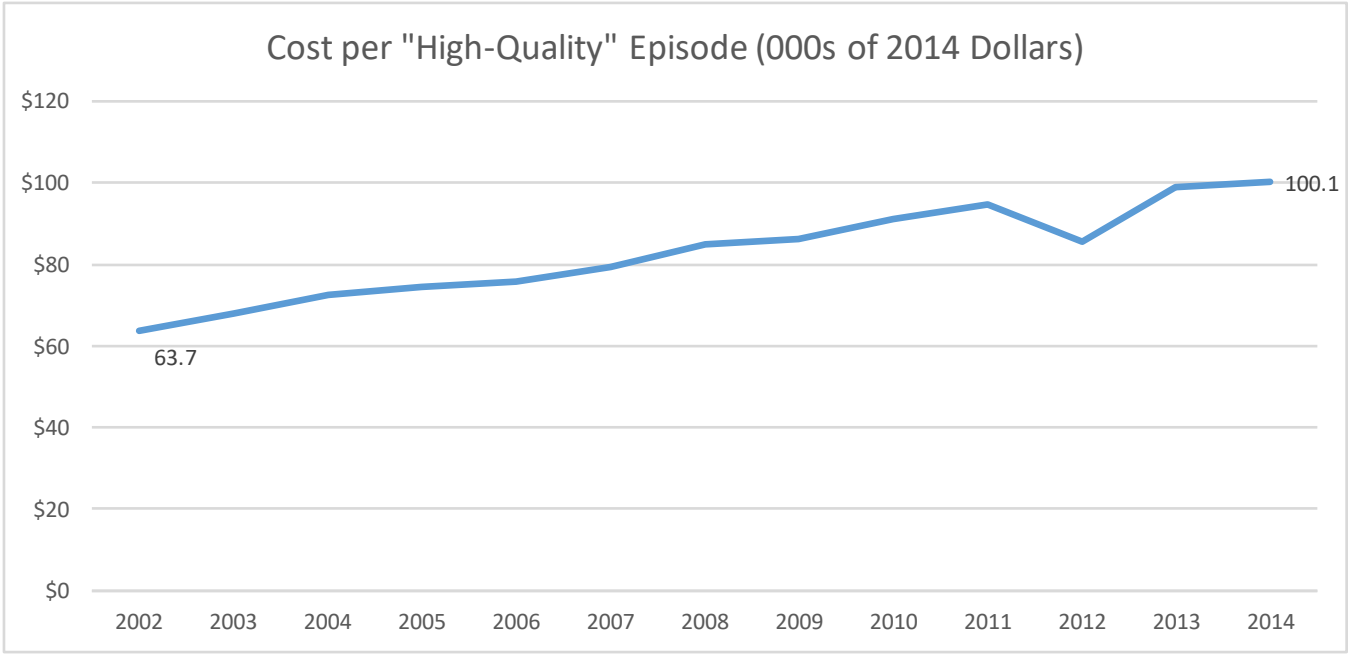
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Analytic sample for heart attack episodes

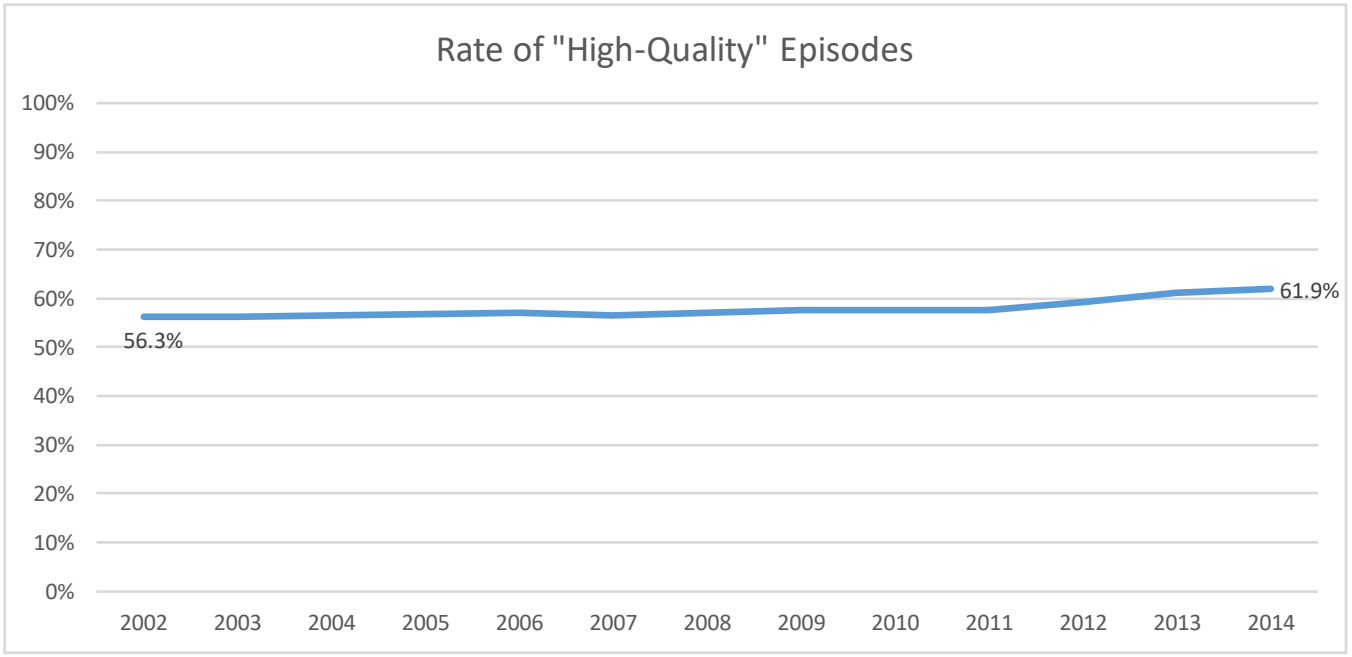
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558,999	501,940	5,290	Stays / episodes meeting CMS readmission measure criteria
470,120	426,933	4,837	Excluding episodes with any missing cost-to-charge ratios
457,120	415,562	4,753	Episodes meeting AHRQ IQI risk measure criteria
449,950	409,423	3,859	Excluding index hospital-years with no sociodemographic data

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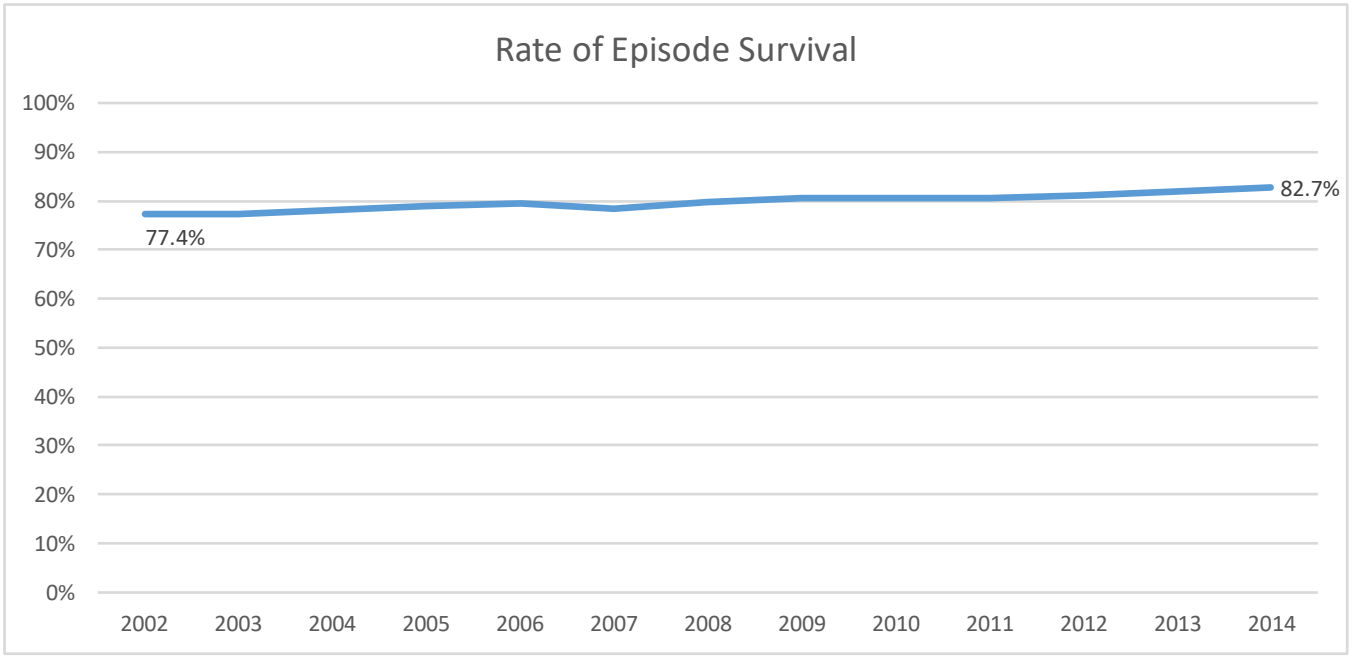
Focusing on heart attack, a/k/a AMI, a simple first look



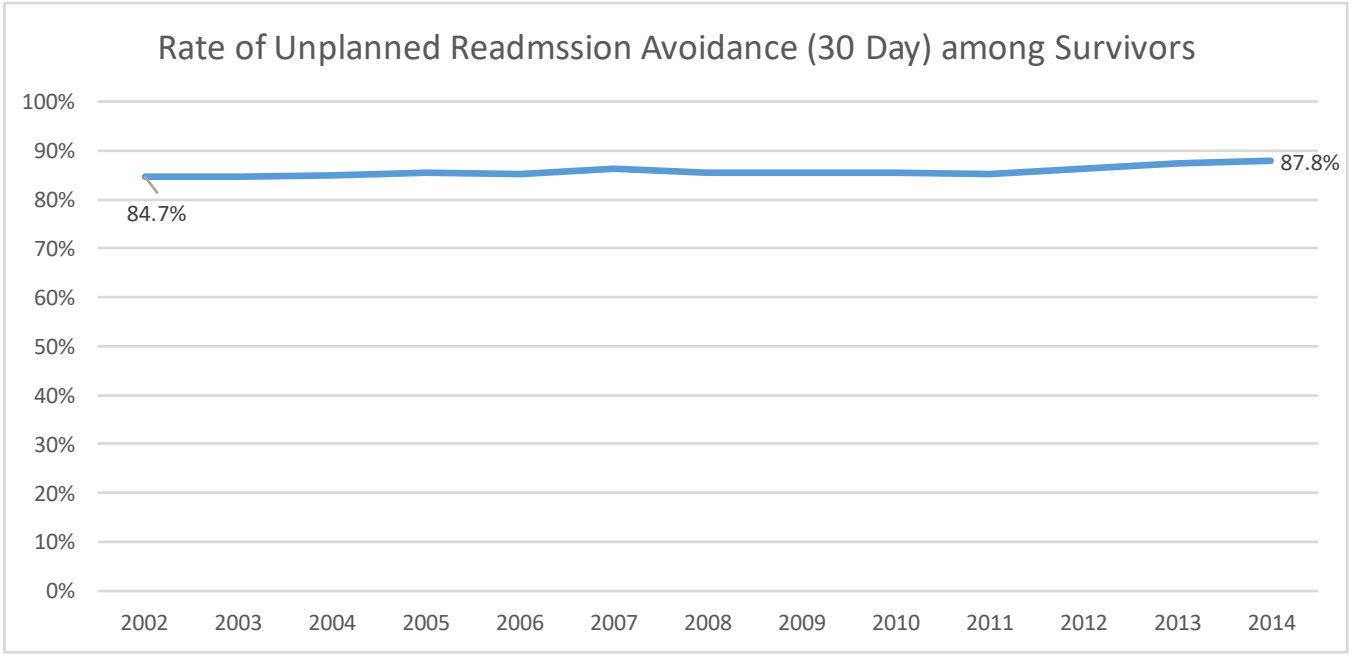
The rate of high-quality episodes has improved



Some of this improvement stems from better survival rates

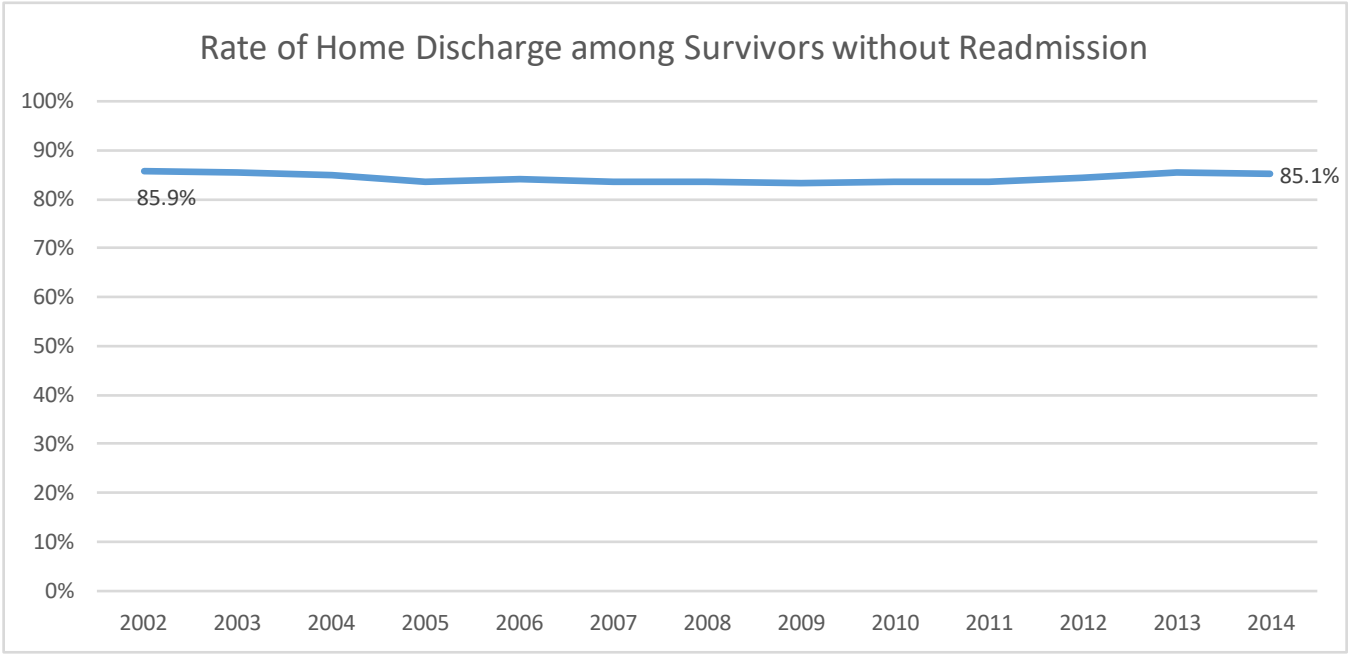


And also greater avoidance of unplanned readmissions



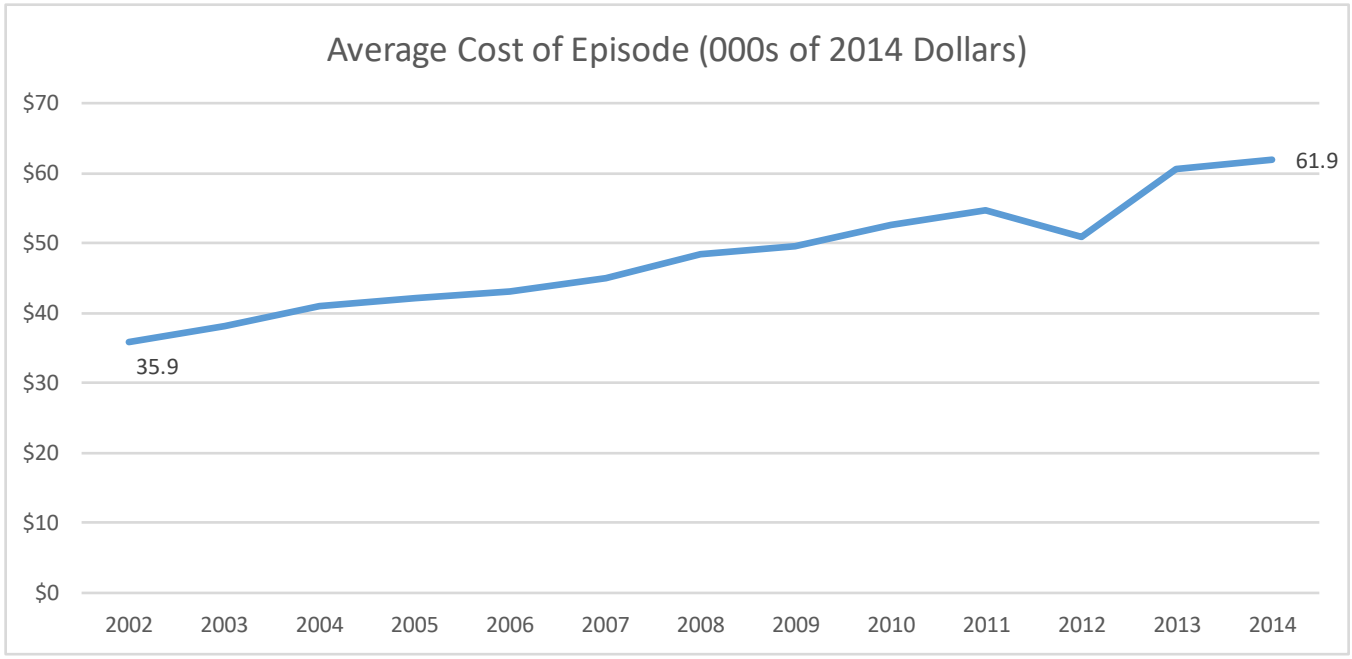
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Return to community has not improved



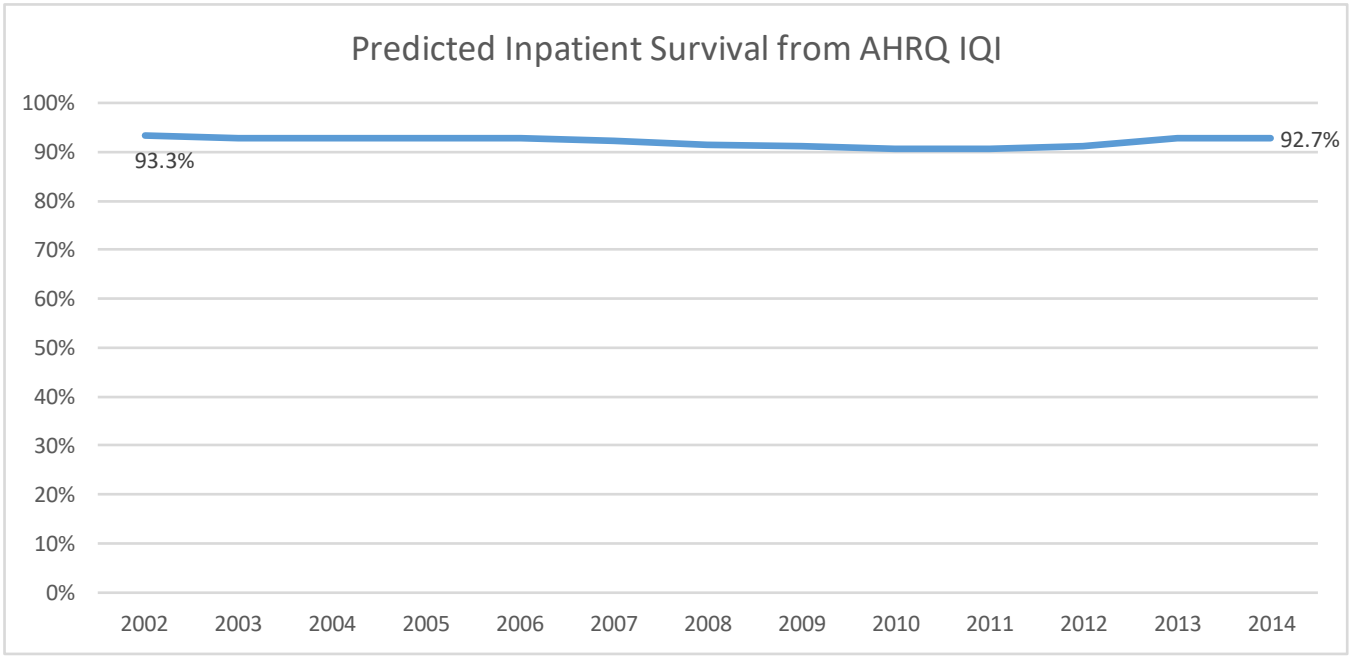
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Cost per high-quality episode has grown due to cost growth



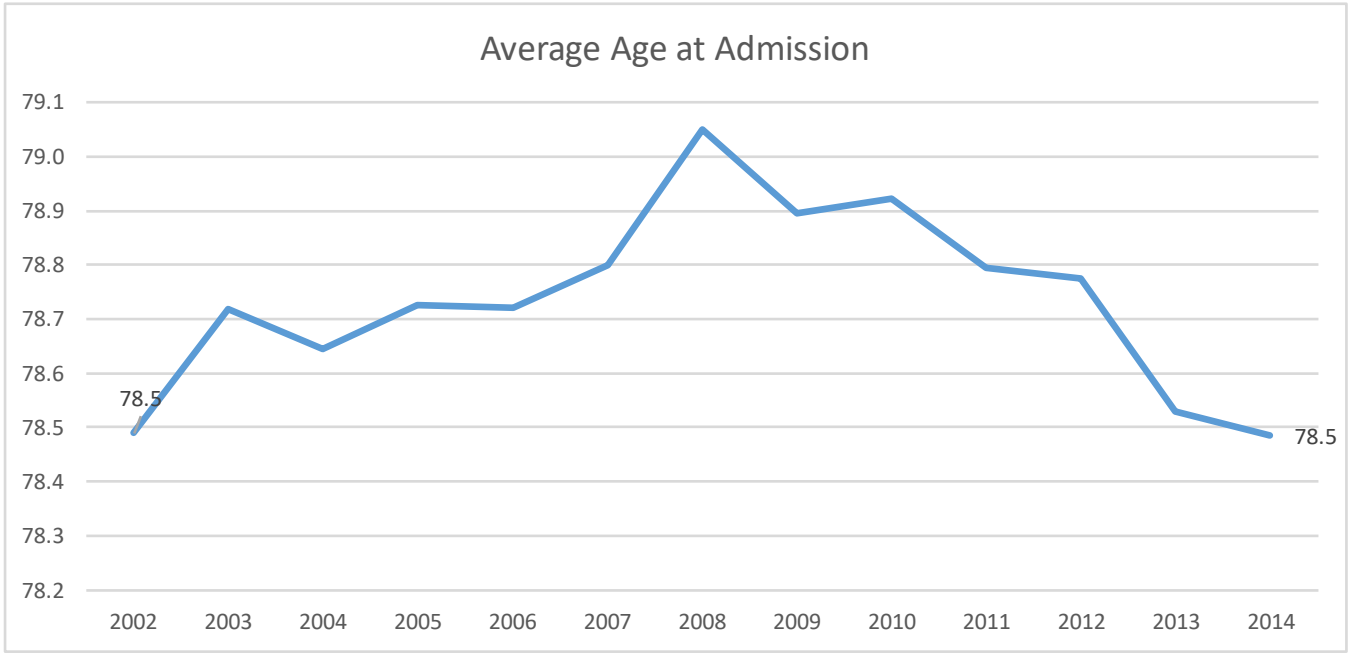
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Turning to severity, predicted survival during index stay has declined somewhat



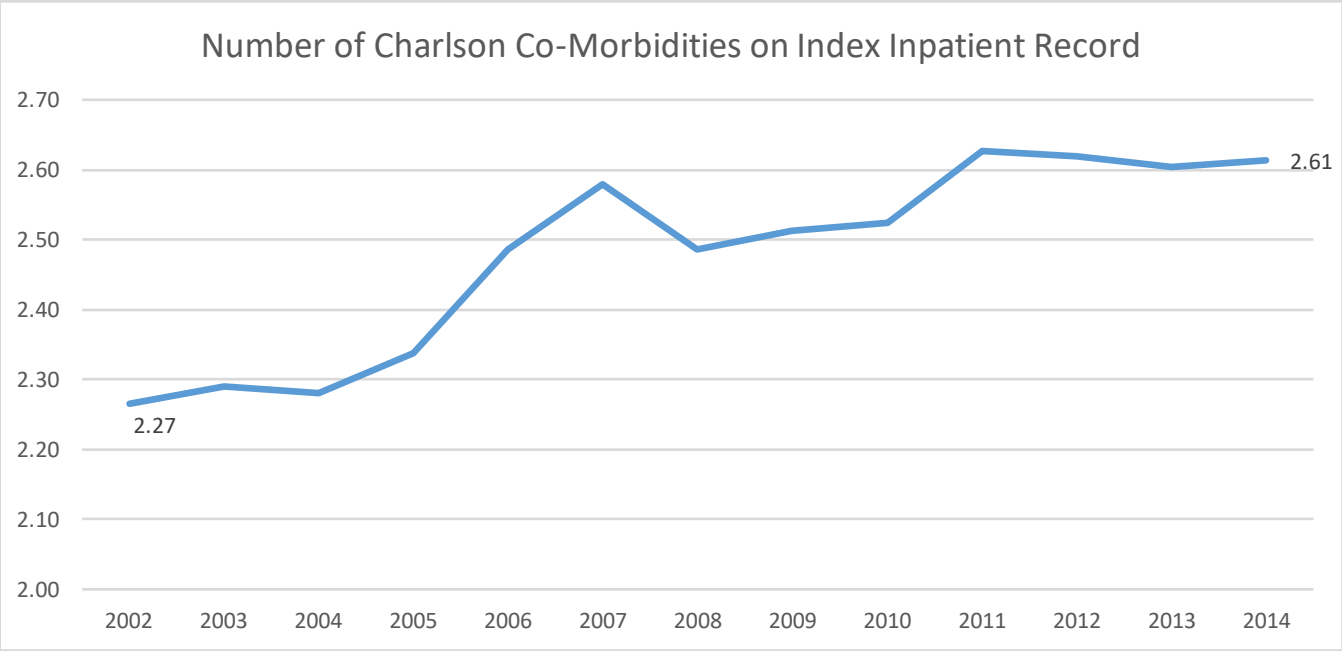
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Patient age increased, then returned to level

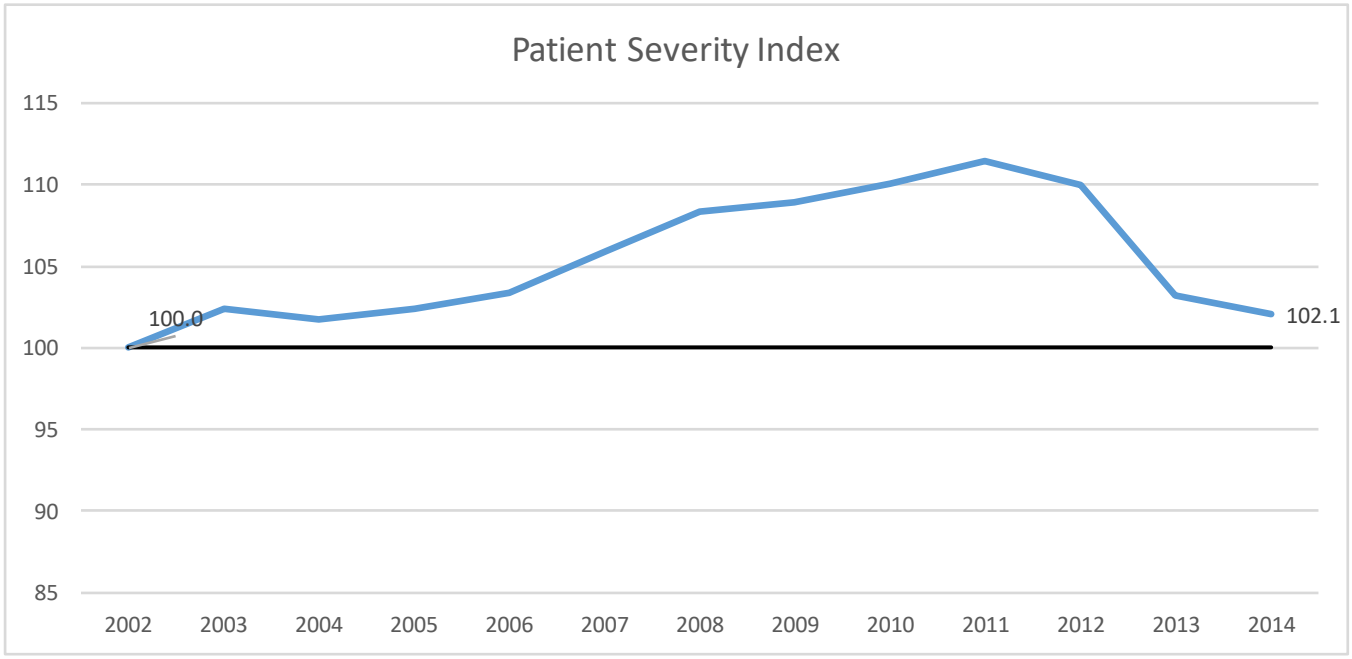


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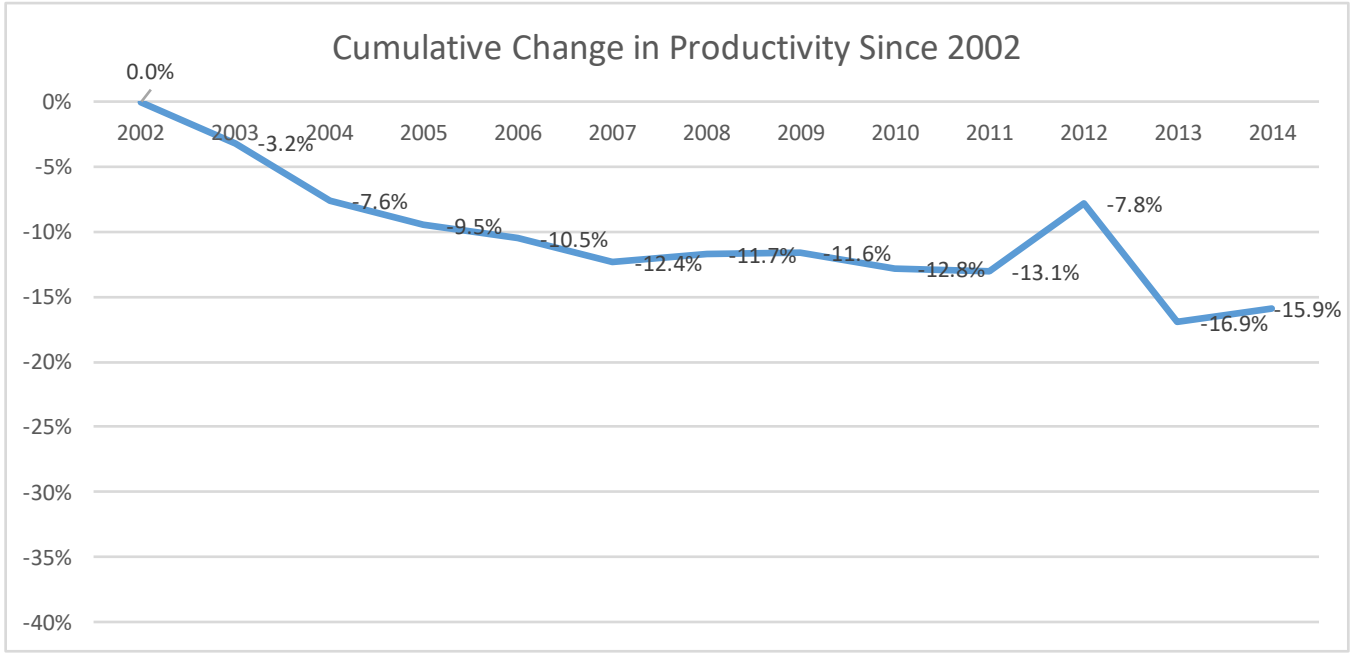
The comorbidity burden grew



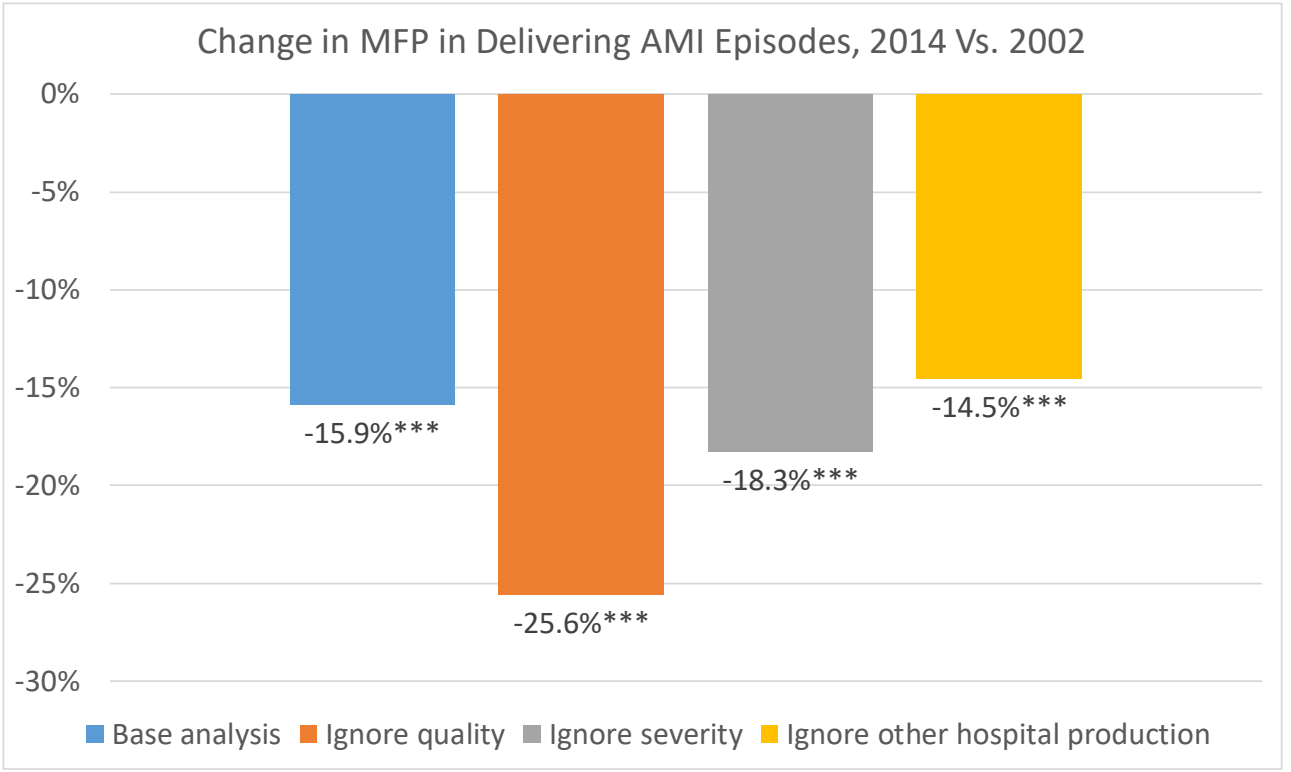
From our regression, we create an aggregate index of patient severity



For heart attack episodes, MFP declined, then stagnated

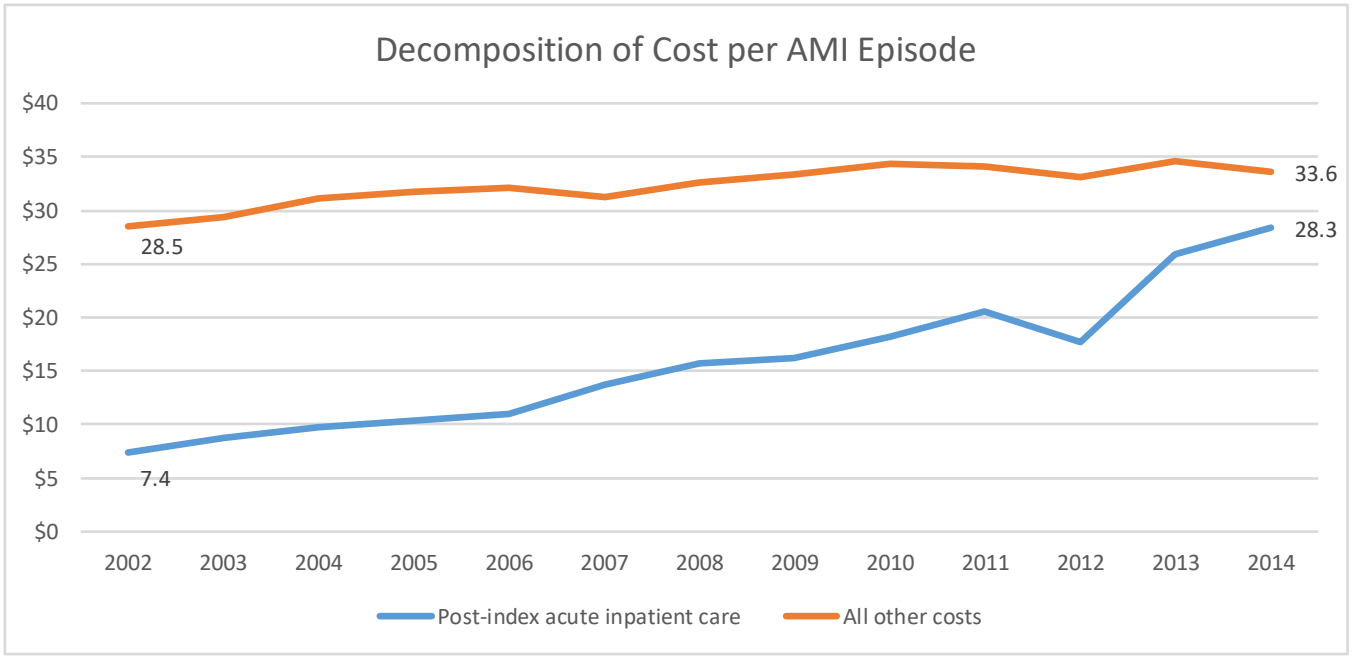


The picture would be more dismal, if quality had not improved



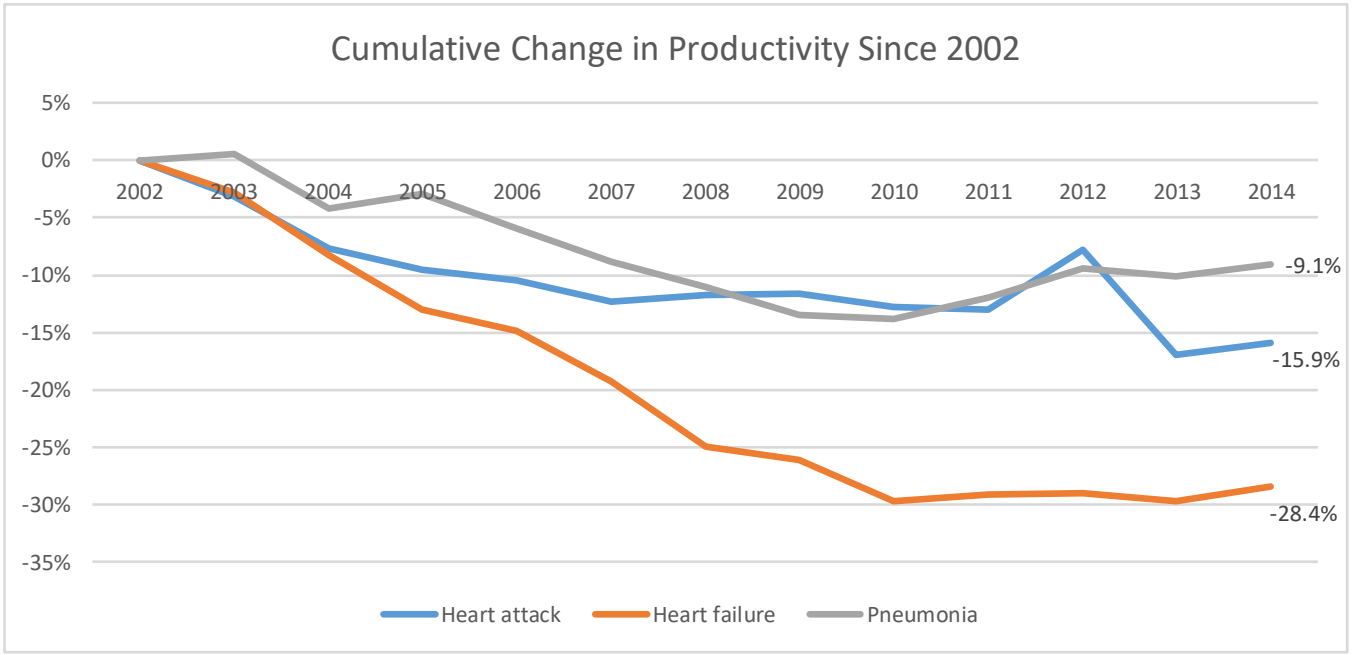
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Hospital readmission costs may be a culprit here



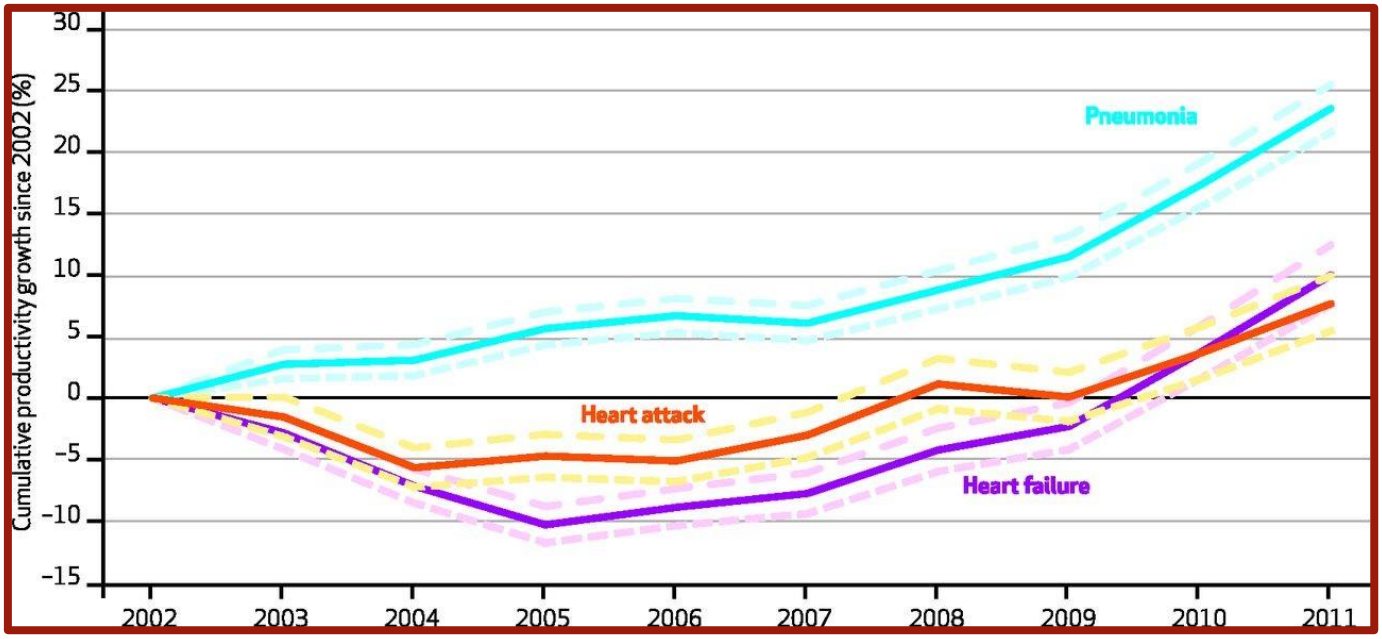
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There is a similar pattern for heart failure and pneumonia



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When we focused on hospital stays (Romley et al. 2015), MFP improved



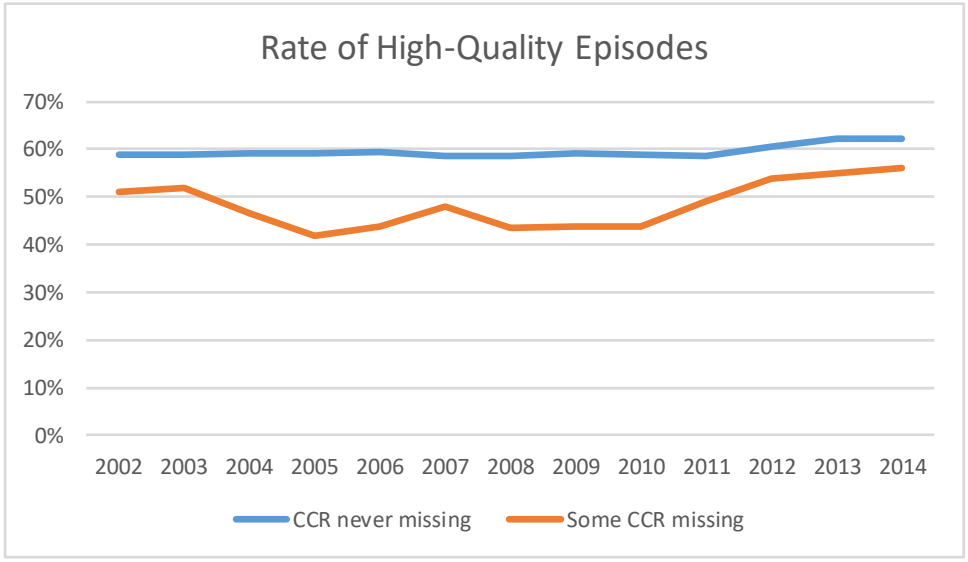
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Near- and longer-term refinements

Address missing facility costs

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Episodes with complete costs differ from those with missing costs



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Near- and longer-term refinements

Address missing facility costs

Incorporate prescription drugs?

Incorporate custodial nursing into return to community

Risk adjust using pre-admission claims

Address diagnostic coding behavior

Analyze 2015 and on, including ICD-10 transition

Analyze additional conditions / procedures

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Conclusions

If our current findings hold up, MFP in delivering episodes declined substantially in the 2000s, and then stagnated

A different picture of health care MFP may emerge when episodes of care are analyzed

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