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Opportunities to Improve: Health Care Delivery Performance in Massachusetts

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Executive Summary

Massachusetts is a national leader in health care reform but also has high overall health care costs compared with the national average. This project seeks to identify opportunities to achieve better care at lower cost through health care delivery improvements in Massachusetts. We consider the three hospital referral regions (HRR) in Massachusetts that are based on regional health care markets. For each Massachusetts HRR, we select a comparison set of four HRRs from around the U.S. that are similar demographically and have the same or higher quality of health care but lower levels of preventable utilization and costs.

We find significant opportunities to reduce cost and improve care. If providers in the three Massachusetts regions reduced their potentially avoidable hospital events to the average level of their respective matched comparison regions, they would collectively have nearly 132,000 fewer avoidable emergency department visits, about 31,000 fewer preventable adult hospitalizations (about 8,500 due to asthma or related chronic lung conditions and about 2,500 due to diabetes), and about 7,300 fewer Medicare hospital readmissions.

All three Massachusetts regions appear to be delivering a higher intensity of hospital care at the end of life than their matched high-performing regions. They also spend more on imaging services than the comparison regions. Conversely, the three Massachusetts regions also show less use of hospice services for Medicare decedents with a cancer diagnosis in 2007. These markers of service intensity and utilization suggest fruitful avenues for delivery system reform.

There are also measures on which Massachusetts regions outperform their comparisons. Two of three Massachusetts regions have lower rates of hospitalizations among long-stay nursing home residents than their matched high-performing regions. All three Massachusetts regions show better performance in follow-up appointments for Medicare patients with hospital discharges in certain conditions, and two show lower readmissions for these conditions as well.

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Introduction

Massachusetts is a national leader in health care reform. After landmark legislation in 2006 expanding health insurance coverage for nearly all residents (Massachusetts Laws Chapter 58), Massachusetts enacted additional legislation addressing health care delivery and costs in 2008, 2010 and 2012. This series of laws takes a multi-faceted approach to addressing the cost problem by providing incentives to reduce the use of expensive but preventable services and encourage efficient delivery of care. This project is intended to advance the goals of these reforms by identifying opportunities to achieve better care at lower cost through health care delivery improvements in Massachusetts.

Delivery systems in the three hospital referral regions (HRR) of Massachusetts are systematically compared to those in selected high-performing regions elsewhere in the country that are similar to with respect to demography, socioeconomic status, and insurance coverage. By high-performing, we mean overall indicators of health system performance such as access to health care, prevention and treatment, costs and avoidable use, and health outcomes, as measured in a series of reports from the Commonwealth Fund. A total of 24 measures are compared across three broad domains of health system performance – health care spending, potentially avoidable hospital use, and service intensity and setting.

Overall we find significant opportunities to reduce cost and improve care. If providers in the three Massachusetts regions reduced their potentially avoidable hospital events to the average level of their respective matched comparison regions, they would collectively have nearly 132,000 fewer avoidable emergency department visits, about 31,000 fewer preventable adult hospitalizations (about 8,500 due to asthma or related chronic lung conditions and about 2,500 due to diabetes), and about 7,300 fewer Medicare hospital readmissions.

All three Massachusetts HRRs appear to be delivering a higher intensity of hospital care at the end of life than their matched high-performing regions. They also spend more on imaging services than the comparison regions. Conversely, the three Massachusetts regions also show less use of hospice services for Medicare decedents with a cancer diagnosis in 2007. These markers of service intensity and utilization suggest fruitful avenues for delivery system reform.

There are also measures on which Massachusetts regions outperform their comparison HRRs. Two of three Massachusetts regions have fewer hospitalizations among long-stay nursing home residents than their matched high-performing regions. All three regions show better performance in follow-up appointments for Medicare patients with hospital discharges in certain conditions, and two show lower readmissions for these conditions as well.

This report is divided into five sections. First, the Massachusetts policy context for delivery system improvement is described. Second, prior studies of health care delivery in the Commonwealth are summarized. This is followed by a description of the study framework, metrics, and methods. The fourth section provides findings in each of the three study domains. Finally, implications are drawn for delivery system improvement in Massachusetts.

Massachusetts Policy Context

In 2008, the state began to closely scrutinize cost trends and collect detailed information from health care organizations and insurers with Chapter 305. In 2009, a commission on payment reform created by Chapter 305 recommended a shift from fee-for-service reimbursement, which creates incentives for more services regardless of need, toward a global payment system, where providers deliver care to a specific population with a predetermined budget. Also in 2009, the RAND Corporation modeled several potential methods of controlling health spending in Massachusetts, concluding that bundled payment strategies (paying for episodes of care rather than for each service delivered) offered the most promising option for reducing spending.[1] Before the state implemented the recommendation to move toward global payments, the largest insurer (Blue Cross Blue Shield of Massachusetts) initiated a global payment system called the Alternative Quality Contract (AQC) in 2009, enrolling seven provider organizations in that year and another four in 2010. An early evaluation of the impact of the AQC shows promising results.[2] By the fall of 2012, about 20 percent of Massachusetts residents were enrolled in coverage linked to a global budget. In 2010, Chapter 288 allowed the state to deny excessive rate increases in the individual and small group markets, required health plans to offer at least one selective or tiered provider network product[3] with premium discounts relative to the comprehensive network product, and laid out more cost and quality metrics. The denial of rate increases was contentious, but withstood insurer challenges.

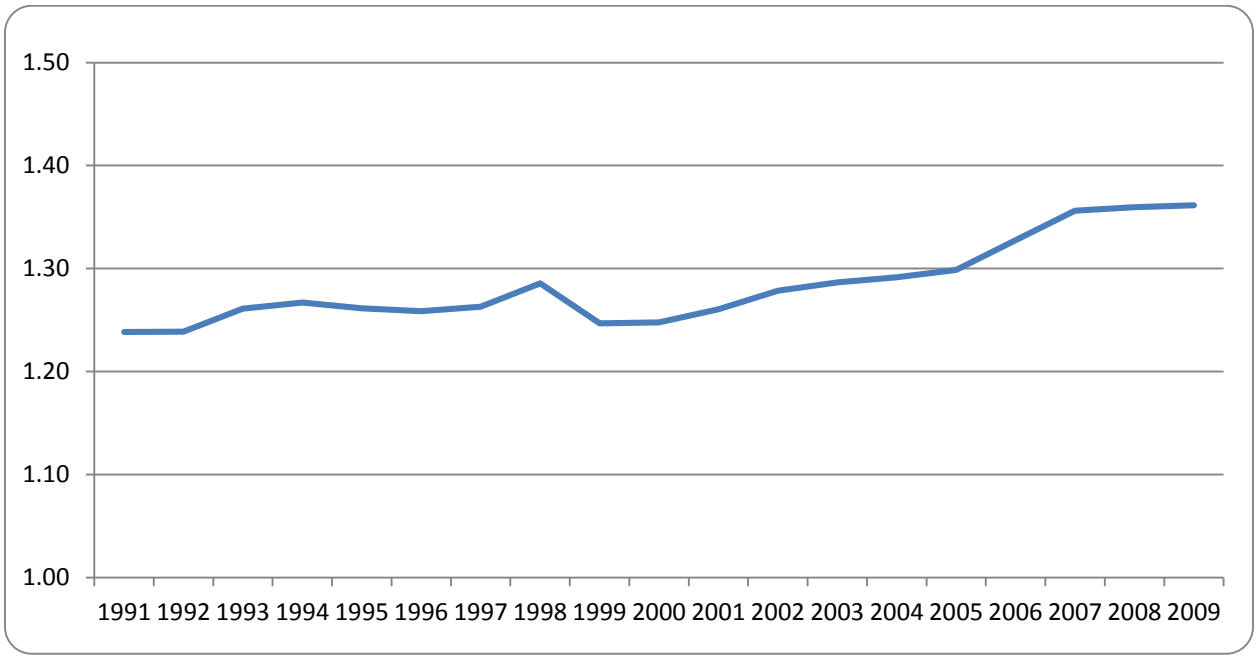
In 2012, Chapter 224 set growth benchmarks tied to the broader economy, established the Health Policy Commission,[4] an independent commission to certify providers and monitor costs, set a target of global payment participation for 80 percent of Medicaid enrollees by 2015, required more disclosure of cost and quality data, liberalized regulations on primary care providers to allow physician assistants and nurse practitioners more participation, and invested in wellness, information technology, the health care workforce, and resource planning.[5,6,7]

Prior Evidence about Massachusetts Health Care Delivery Performance

Costs

Massachusetts spends more per capita on health care than any other state, even after adjusting for higher wages and research spending in the state.[8] In 2009 (the last year for which state level spending estimates are available), Massachusetts spent $9,278 per capita for health care compared with the U.S. average of $6,815. Massachusetts' per capita health care costs have been consistently higher than the U.S. average since at least 1991, and the gap increased from 2000-2009 even as the rate of increase in Massachusetts per capita costs slowed since 2007. See Figure 1 for a graphical illustration.

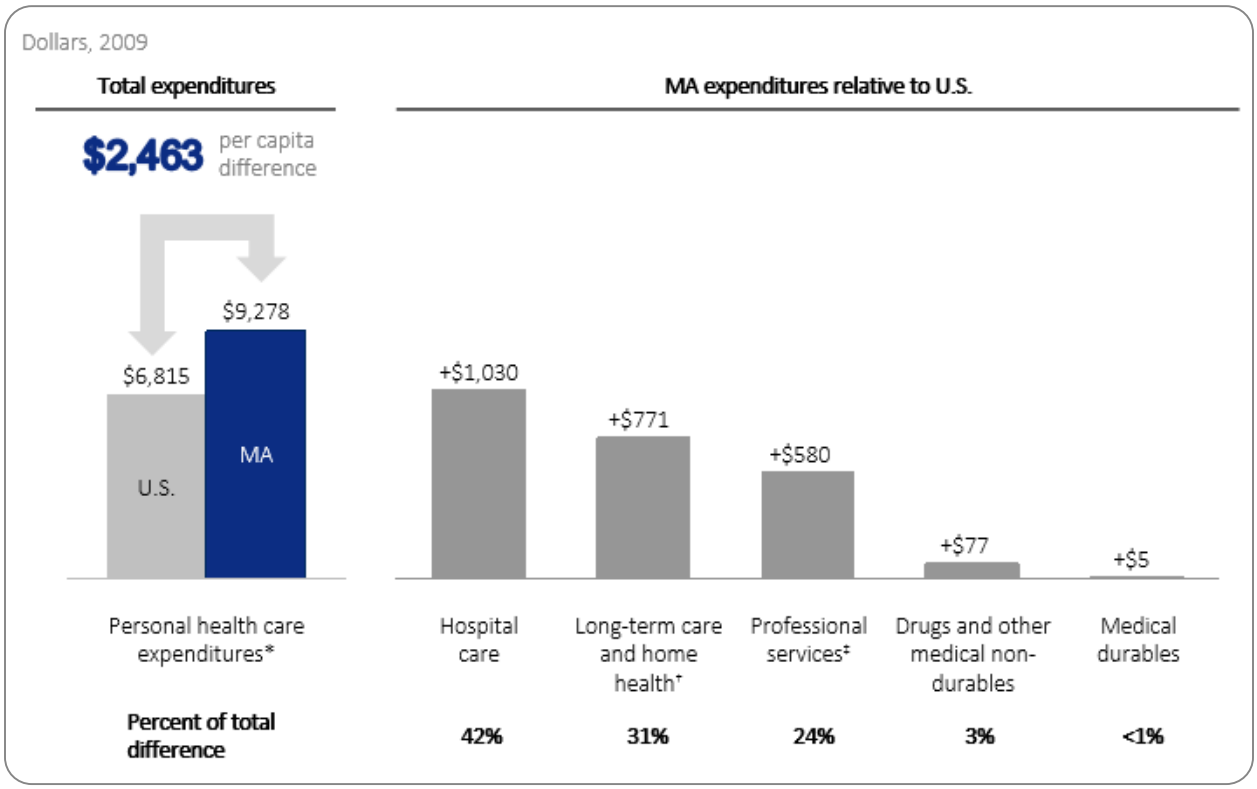
Figure 1: Ratio of Massachusetts to U.S. Per Capita Health Care Spending



Source: Centers for Medicare & Medicaid Services (2011). Health Expenditures by State of Residence.[9]

All payers (Medicare, Medicaid, private and others) have experienced spending growth since 1991, though from 2001-2009 Medicare and Medicaid experienced slower growth in Massachusetts than in the U.S. as a whole.[10] The high and increasing cost of health care in Massachusetts means that it takes up a larger share of state and private spending, competing with other priorities. If no cost containment measures are taken, health spending is expected to double between 2009 and 2020.[11] Rising costs are causing insurance purchasers to select products with fewer benefits and/or higher cost sharing, which can reduce access to care.[12]

Figure 2: Per Capita Personal Health Care Expenditures* by Category of Service Compared to U.S.

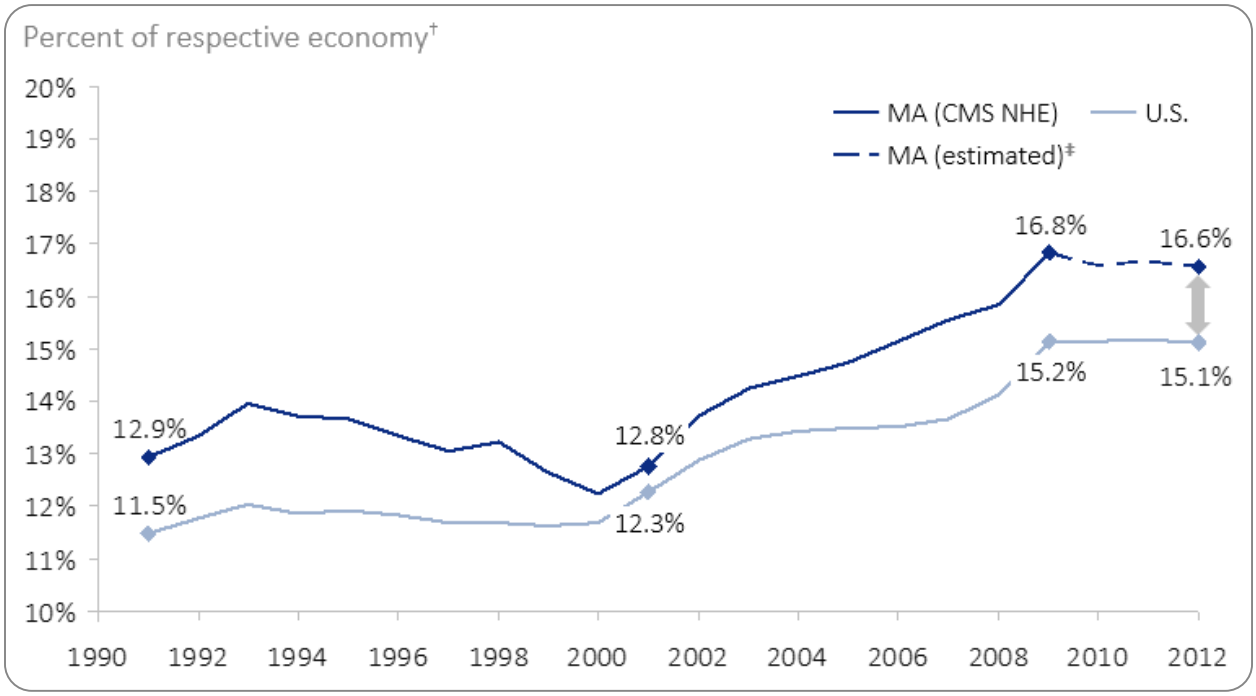


As shown in Health Policy Commission, 2013 Cost Trends Report, p.8.[13] Notes from figure:
"*Personal health care expenditures (PHC) are a subset of national health expenditures. PHC excludes administration and the net cost of private insurance, public health activity, and investment in research, structures and equipment.
†Includes nursing home care, home health care, and other health, residential, and professional care.
‡Includes physician and clinical services, dental services, and other professional services.
Source: Centers for Medicare & Medicaid Services; HPC analysis."

As shown in Figure 2, Massachusetts spends more than the U.S. average for all categories of medical services, but most of the difference is due to higher spending on hospital care (inpatient and outpatient), long term care, and professional services. The rate of hospital outpatient visits in Massachusetts is about 55 percent higher than the U.S. average. Massachusetts residents are older, wealthier and more likely to have health insurance than the average person in the U.S., but these factors are not sufficient to explain the greater utilization and spending. Massachusetts also has more specialist physicians per capita and more academic medical centers (AMCs), which tend to provide a higher intensity of care than community hospitals. Price increases (rather than increases in utilization or changes in the kinds of providers or services) have accounted for the majority of spending increases over the past several years.[14] There is tremendous variation in prices among providers, even taking into account severity of patient conditions, without any apparent relationship to the quality of services.[15] Legislation passed in 2012 (Chapter 224) seeks to curb price increases by bringing greater transparency through comprehensive disclosure requirements.[16]

The Massachusetts Health Policy Commission has estimated the trend in personal health care expenditures relative to the size of the economy (see Figure 3). Massachusetts has been consistently above the U.S. average, but the Commission estimates that both have stabilized since 2009.

Figure 3: Personal Health Care Expenditures* Relative to Size of Economy



As shown in Health Policy Commission, 2013 Cost Trends Report.[17] Notes from figure:
"*Personal health care expenditures (PHC) are a subset of national health expenditures. PHC excludes administration and the net cost of private insurance, public health activity, and investment in research, structures and equipment.
†Measured as gross domestic product (GDP) for the U.S. and gross state product (GSP) for Massachusetts.
‡CMS state-level personal health care expenditure data have only been published through 2009. 2010-2012 MA figures were estimated based on 2009-2012 expenditure data provided by CMS for Medicare, ANF budget information statements and expenditure data from MassHealth, and CHIA TME reports for commercial payers.
Source: Centers for Medicare & Medicaid Services; Bureau of Economic Analysis; Center for Health Information and Analysis; MassHealth; Census Bureau; HPC analysis."

Delivery System Investigations

Several investigations suggest areas with potential for improvement in the delivery of health care in Massachusetts. In the 2014 Commonwealth Fund State Scorecard on Health System Performance, Massachusetts ranks highly on many dimensions; it ranks as the top state on access to care, but it does comparatively poorly on the dimension of avoidable hospital utilization, ranking 46th in potentially avoidable emergency department visits among Medicare beneficiaries and 42nd in hospital admissions for ambulatory care-sensitive conditions among Medicare beneficiaries ages 75 and older (34th for ages 65-74). Table 1 below shows a list of eight avoidable hospital care indicators for Massachusetts, based on the 2014 Commonwealth Fund Scorecard.

On five of the eight scorecard measures in this dimension, Massachusetts ranks below the median state, evincing substantially higher preventable hospital utilization than average. Moreover, delivery system performance in Massachusetts is significantly worse than the best state on all eight measures. These data suggest substantial room for delivery system improvement – and substantial cost savings – in Massachusetts.

Table 1: Commonwealth Fund Avoidable Hospital Care Indicators[18]

Indicator	Most Recent Data Available			Potential Improvement if MA Performed at Level of Best State	Change over Time
	MA Rate	Best State Rate	MA Rank		
Hospital admissions for pediatric asthma, per 100,000 children (2004 & 2010)	179	26	38	NA	-36 (worsened)
Medicare hospital admissions for ambulatory care sensitive conditions, ages 65-74 (per 1,000 beneficiaries, 2008 & 2012)	30	13	34	NA	9 (improved)
Medicare hospital admissions for ambulatory care sensitive conditions, ages 75+ (per 1,000 beneficiaries, 2008 & 2012)	80	41	42	NA	17 (improved)
Medicare 30-day hospital readmissions (per 1,000 beneficiaries, 2008 & 2012)	54	26	38	6,109 fewer admissions among Medicare beneficiaries	13 (improved)
Percent of short-stay nursing home residents with a hospital readmission within 30 days (2006 & 2010)	19	12	18	NA	0 (no change)
Percent of long-stay nursing home residents hospitalized within a six-month period (2006 & 2010)	17	7	19	NA	-1 (no change)
Percent of Medicare home health patients with a hospital admission (2012)	17	14	25	NA	NA
Potentially avoidable emergency department visits among Medicare beneficiaries (per 1,000 beneficiaries, 2011)	218	129	46	54,193 fewer ED visits among Medicare beneficiaries	NA

Other data sources present a picture that is consistent with this assessment. State data from 2006-2010[19] show that preventable emergency department (ED) visits have remained at about 49 percent of all ED visits during this time; however, the growth rate of preventable ED visits has decreased faster than the growth rate of total ED visits. The cost of preventable ED visits was about $558 million in 2010. The rate of preventable ED visits is higher among some groups in the population—particularly those who use Medicaid, ConnectorCare (a subsidized plan for low-income, uninsured residents) or who are uninsured. Preventable hospitalizations are concentrated in the Medicare population (nearly two-thirds) and 59 percent involved chronic conditions. They accounted for about $641 million in hospital costs, or about eight percent of inpatient costs in the state. The rate and cost of preventable hospitalizations has not grown in recent years, and officials are hopeful that Medicare Accountable Care Organizations and state information technology initiatives will help to coordinate care and reduce preventable hospitalizations.[20] Estimated costs for potentially preventable readmissions based on all hospital discharges in 2009 were $704 million. Readmissions in Massachusetts remained higher than national averages for heart attack, heart failure and pneumonia in 2009. Readmission rates did not vary much by payer, region, or type of hospital (teaching versus community, disproportionate share (DSH) versus non-DSH).[21]

The following section describes the development of our analytical framework, after which we present findings from our analysis.

Framework Development

Prior Literature

There have been many efforts to analyze U.S. health care costs from a variety of perspectives. Those comparing the U.S. to other developed nations find that the U.S. spends more and yet receives questionable value, depending on what metrics are used (e.g., innovation is high, but population health measures lag).[22,23] Experts seeking to identify major drivers of growth in health care spending have generally settled on technological changes in medical practice as the largest single driver, accounting for around half of spending growth over extended periods of time. This driver is potentially influenced by use of effectiveness research, to ensure that new technologies (which tend to be more expensive) are proven effective before adoption, and payment reform, to ensure that providers do not have an incentive to steer patients toward more expensive treatments (which are often newer treatments) when they are not essential.[24] Both of these levers are addressed in the Affordable Care Act (ACA), and Massachusetts has passed legislation that encourages payment reform above and beyond the ACA.

There is a risk that some of the consolidation and integration among health care providers that could occur through payment reform efforts may result in an upward pressure on prices by increasing provider market power. High prices are another element of high health care costs in

the U.S. and in Massachusetts,[25, 26] and appear to stem in part from higher physician compensation in the U.S. relative to other countries as well as more use of expensive outpatient procedures, more diagnostic tests per capita relative to other countries and higher reimbursements for diagnostics.[27]

The Institute of Medicine and others looking to improve quality and identify savings opportunities estimate that at least 30 percent of health expenditures (about $750 billion in 2009) are wasted, with about half of the waste in inadequate care (i.e., unnecessary care, care that is delivered inefficiently, and lack of adequate preventive care for people at all levels of involvement with the health care system) and the other half in administrative bottlenecks, excessive prices, and fraud.[28] Both the ACA and Massachusetts reforms seek to address these issues—Massachusetts in particular has called for a high degree of transparency among health care providers with respect to price and utilization data. The payment reform pilots utilized in both the ACA and under Massachusetts reform seek to change incentives away from inefficiently-delivered or potentially unnecessary care and toward preventive and coordinated care.

Health care expenditures are very concentrated – in 2009, the most expensive one percent of the U.S. population in terms of health spending accounted for about 22 percent of health expenditures, the top five percent for about half of expenditures, and the top 30 percent of the population for about 90 percent of expenditures.[29] This suggests that efforts targeted to care improvements to the highest-cost users of services might offer good opportunities for a reduction in spending. This population may be reached through payment reform efforts and scrutiny of potentially avoidable hospital use.

The Commonwealth Fund established the Commission on a High Performance Health System in 2005 to provide national leadership on setting goals for and evaluating the nation's health care system.[30] It has designed several scorecards to track health system performance, using key indicators to highlight areas of success as well as areas in need of improvement. We draw extensively on their approach and have adopted many of the measures they have used for our analysis of opportunities for delivery system improvement in Massachusetts.[31]

Key Informant Interviews

The first phase of the project involved semi-structured telephone interviews of 30-60 minutes with six nationally-known health policy experts[32] to identify the most important opportunities to reduce costs through delivery system changes and the best metrics and level of analysis to measure such opportunities. Interviewees felt that Massachusetts has powerful health care institutions that command high prices and drive use to more expensive sites and levels of care (e.g., teaching rather than community hospitals, specialists rather than generalists, and MRIs rather than x-rays). In Western Massachusetts, market power stems in part from limited regional alternatives. In the Boston area, academic medical centers have built strong reputations, leading to high consumer demand. All Massachusetts regions have higher than average numbers of both

primary care and specialty physicians per capita, so patients have more opportunities to receive comparatively high cost care.[33]

The interviewees familiar with the recent legislation (Massachusetts Laws Chapter 224) felt it provides a strong framework for advancing cost-containing reforms, and that it builds on and adds strength to reforms in the Affordable Care Act.

Most of our interviewees felt that payment reform was a very important change that could drive delivery system improvement by changing the incentives of health system participants. There was less agreement on whether accountable care organizations in their current forms would be sufficient to change the system in a sustainable way.

Our interviewees also suggested other potential methods to address the cost problem, including reducing avoidable hospital and emergency department utilization and readmissions, improving coordination with post-acute care providers, and enhancing primary care. Several interviewees also emphasized the possibility of better utilization of resources by shifting patients into lower-cost institutions and procedures. Suggested metrics to measure progress over time included per capita cost measures, readmission rates and other avoidable use measures, type of setting for routine procedures and imaging, and receipt of appropriate primary care. With respect to geographic levels of analysis, most interviewees felt that hospital referral regions (HRR) established by the Dartmouth Atlas[34] offered the best option for generating comparisons, in addition to looking at state-level data.

Selection of Metrics

Our metrics are intended to assess the delivery system and de-emphasize non-delivery system related drivers of cost, such as pricing. Price transparency is an important feature of reforms in Massachusetts, but has been addressed in other analyses.[35] Our choice is further limited to metrics that are already available or can be derived from available data sources that cover the relevant geographic areas and levels of analysis. Data availability precludes drawing on potentially useful measures based on medical records (examples include the proportion of discharged patients who received a reconciled medication list or a transition record with specific elements).

We selected metrics based on these criteria, findings from previous research, and information gleaned from our six interviews. They are organized under three domains: a) health care spending, b) potentially avoidable hospital use and c) service intensity and setting. The first is a direct measure of spending while the remaining two capture important delivery-system related drivers of spending.

For metrics based on secondary sources we used widely used and reliable sources such as the Commonwealth Fund, the Centers for Medicare & Medicaid Services (CMS), the Dartmouth Atlas of Health Care and the Institute of Medicine (IOM). For calculated metrics, we utilized hospital discharge data from the Agency for Healthcare Research & Quality (AHRQ)

Healthcare Cost and Utilization Project (HCUP) and hospital billing data from states that do not participate in HCUP.

The table below has listing and explanation of the metrics. The following section discusses the metrics in each topic area. Appendix B includes more detailed information, including a detailed source description, for each metric.

Table 2: List of Metrics

Metric (year, source)	Metric Definition
Health Care Spending	
1. Medicare spending (2011, CMS)	The Medicare program includes most people 65 and over and younger people with disabilities. Medicare spending measures exclude people in Medicare Advantage plans, which was 18 percent of Massachusetts enrollees in 2011 and 25 percent nationwide. To ensure comparability across areas, we have used per capita spending adjusted for differences in area prices (standardized) and the health of enrollees (risk-adjusted).
2. Reimbursement per commercially insured enrollee ages 18-64 (2009, CMWF)	This measure includes all reimbursed costs for health care for commercially-insured people of age 18-64 in the Thomson Reuters Marketscan database (larger employers) outside of managed care plans whether paid by health plans, consumers or other third party payers. Prescription drugs used outside hospitals are not included. Estimates were adjusted for age, sex, partial year enrollment and regional wage differences.
3. Total single premium, private sector (2011, AHRQ)	Average total health premiums (employer and employee contributions) from a sample of all officially registered private sector establishments. This does not include health care services or prescriptions or co-payments for these.
Potentially Avoidable Hospital Use	
4. Adult preventable hospitalization rate overall (2011, authors' tabulation)	Includes hospitalizations that may be prevented by adequate ambulatory care in the community--conditions include diabetes, asthma and chronic obstructive pulmonary disease (COPD), hypertension, heart failure, angina (without a cardiac procedure), dehydration, bacterial pneumonia, or urinary tract infection. The composite index is AHRQ Prevention Quality Indicator #90. Measured per 100,000 adult population of ages 18 and over, and adjusted for age and sex to standardize for differences across regions.
5. Pediatric preventable hospitalization rate, overall (2011, authors' tabulation)	Includes hospitalizations among children ages 6 to 17 that are related to the quality of pediatric health care and may be amenable to prevention at the system or provider level. Includes asthma, diabetes with short-term complications, gastroenteritis and urinary tract infections. Also known as AHRQ PDI#90. Measured per 100,000 population ages 6-17.

Table 2: List of Metrics (continued)

Metric (year, source)	Metric Definition
6. Avoidable ED visit rate (2011, authors' tabulation)	Includes emergency department visits that are non-emergent, treatable in a primary care setting, or preventable/avoidable with adequate availability of primary care. Based on an algorithm developed in New York University and measured per 100,000 population for all ages, and adjusted for age and sex to standardize for differences across regions.
7. Medicare 30-day hospital readmission rate (CMS, 2010)	The percentage of Medicare enrollees (people over 65 and younger people with disabilities) readmitted within 30 days of an acute hospital stay.
8. Adult asthma/COPD admission rate (2011, authors' tabulation)	Includes hospital admissions for asthma/COPD. A combination of AHRQ prevention quality indicators (measures PQI#5 and #15). Measured per 100,000 population of adults ages 18 and over, and adjusted for age and sex to standardize for differences across regions.
9. Adult diabetes admission rate (2011, authors' tabulation)	Includes hospital admissions for uncontrolled diabetes, short- and long-term complications of diabetes and amputations from diabetes. A combination of AHRQ measures PQI#1,#3, #14, and #16. Measured per 100,000 population of adults ages 18 and over, and adjusted for age and sex to standardize for differences across regions.
10. Long-stay nursing home residents hospitalized (CMWF, 2010)	The percent of long-stay (at least 3 months) nursing home residents covered by Medicare (people over 65 and younger people with disabilities) who were hospitalized within 6 months of their baseline assessment in 2010.
11. Short-stay nursing home residents readmitted (CMWF, 2010)	The percent of first-time nursing home residents covered by Medicare (people over 65 and younger people with disabilities) who were readmitted to hospitals within 30 days of discharge to the nursing home in 2010.
12. Home health patients hospitalized (CMWF, 2010)	The percent of home health patients covered by Medicare (people over 65 and younger people with disabilities) with an acute care hospitalization in 2010.
13. Medicare hospital readmission and follow-up after discharge (DAP, 2010)	The percent of patients covered by Medicare (people over 65) with a hospital readmission within 30 days after discharge for one of the conditions below, and the percent with no timely follow-up visit to any clinician after discharge, in 2010.
13a) Medicare heart attack (AMI) 30-day readmission rate *13b) Medicare congestive heart failure 30-day readmission rate* *13c) Medicare pneumonia 30-day readmission rate*	

Table 2: List of Metrics (continued)

Metric (year, source)	Metric Definition
13d) Medicare heart attack (AMI), no ambulatory visit within 14 days *13e) Medicare congestive heart failure, no ambulatory visit within 14 days* *13f) Medicare pneumonia, no ambulatory visit within 14 days*	
Service Intensity and Setting Metrics	
14. Imaging per capita Medicare standard costs (IOM, 2011)	Costs for all kinds of imaging for Medicare patients (people over 65 and younger people with disabilities). To ensure comparability across areas, we have used per capita spending adjusted for differences in area prices (standardized).
14a. Imaging events per 1,000 Medicare beneficiaries (IOM, 2011)	The number of imaging events per 1,000 Medicare beneficiaries (people over 65 and younger people with disabilities).
15. Percent of discharges from profitable DRGs (2011, authors' tabulation)	The percent of inpatient discharges among belonging to profitable Diagnostic Related Groups (DRGs), profitability determined by a literature search and clinical consultation.
16. Percent of discharges at AMCs (2011, authors' tabulation)	The percent of total inpatient discharges in an HRR from academic medical centers (AMCs), which includes hospitals designated by the Dartmouth Atlas as AMCs.
17. Hospital Care Intensity Index (DAP 2010)	The Dartmouth Atlas Hospital Care Intensity Index – indicates the intensity, relative to the national average, of inpatient hospital (days) and physician use (visits) for Medicare patients (people over 65 and younger people with disabilities) with chronic conditions in the last two years of life.
18. Percent Medicare cancer decedents with no or late hospice (CMWF, 2007)	The percentage of Medicare decedents with cancer who never enrolled in hospice or enrolled only during the last three days of life.

Health Care Spending Metrics

Measures of total health expenditures that are available at the state level are not available for smaller geographic areas. Thus, we have included three metrics that provide markers of health care spending for various population groups. Medicare covers adults over 65 but excludes younger people unless they are permanently disabled. Spending from Medicare Advantage Plans (managed care) is not included. Enrollment in Medicare Advantage varies considerably by state,

which could affect our comparisons.[36] Managed care plans are also not included in the measure of reimbursement per commercially insured enrollee ages 18-64, which includes working age adults and their dependents. Only larger employers tend to report to the database from which this data was taken. To address this shortfall, we also included the total single premium for private sector establishments. This is calculated from a sample of all registered businesses, but is imperfect in that premiums do not reflect actual spending.

Potentially Avoidable Hospital Use Metrics

Figure 2 illustrated that a substantial proportion of the higher spending on medical services in Massachusetts (when compared to other states) is due to high spending on hospital inpatient and outpatient services. Prior investigations have found that Massachusetts performs worse compared with other states in hospital readmissions, ambulatory-care sensitive admissions (i.e., those that could have been prevented with high quality ambulatory care), and avoidable ED visits (i.e., those that are non-emergent, treatable in a primary care setting, or preventable with primary care treatment).[37]

In order to examine the frequency of preventable/avoidable use, we include multiple measures of admissions and readmissions in our set of metrics.[38] In addition to preventable hospitalizations overall for adults and children, we have also included two condition-specific admission rates—for asthma and COPD, and for diabetes. These are two common conditions that, if properly treated, should not lead to hospitalization. In addition to overall hospital readmissions for Medicare patients (people over 65 or younger people with a permanent disability), we have included readmissions for heart attacks, congestive heart failure, and pneumonia. We have also included measures of follow-up visits after hospitalization for these conditions. We have also included hospital admissions from nursing homes for long-stay patients (3 months or longer) and readmissions for first-time nursing home residents who had been discharged from a hospital to a nursing home for 30 days or less. In addition, we have included hospitalizations among home health patients.

Service Intensity and Setting Metrics

Massachusetts payment reforms create incentives to redirect patients from more expensive to less expensive settings of care where comparable quality of services can be acquired, and several of our interviewees identified this as the best opportunity to lower cost growth over the next two years. In the Boston area in particular, residents have a choice of academic medical centers or community hospitals--the share of total discharges at academic medical centers (AMCs) may reflect higher prices and higher use/intensity of care. The remaining measures allow an examination of high-price and high-intensity service utilization. These include: a) utilization rate of high-margin services, calculated as the proportion of all discharges for services known to be highly profitable (e.g., specific cardiovascular procedures or types of orthopedic surgery); and b)

imaging events per 1,000 Medicare beneficiaries. The latter measure represents one of the starkest examples of the increase in volume and intensity of services that has characterized Medicare utilization over recent decades. Trends in these rates can be used as proxies of overall changes in the delivery system. The hospital care intensity index measures hospital length of stay and also the number of physician visits during a hospital stay. A final measure of potential care intensity or inappropriate site of care is the percent of Medicare decedents with cancer who never enrolled in hospice or enrolled only during the last three days of their life.

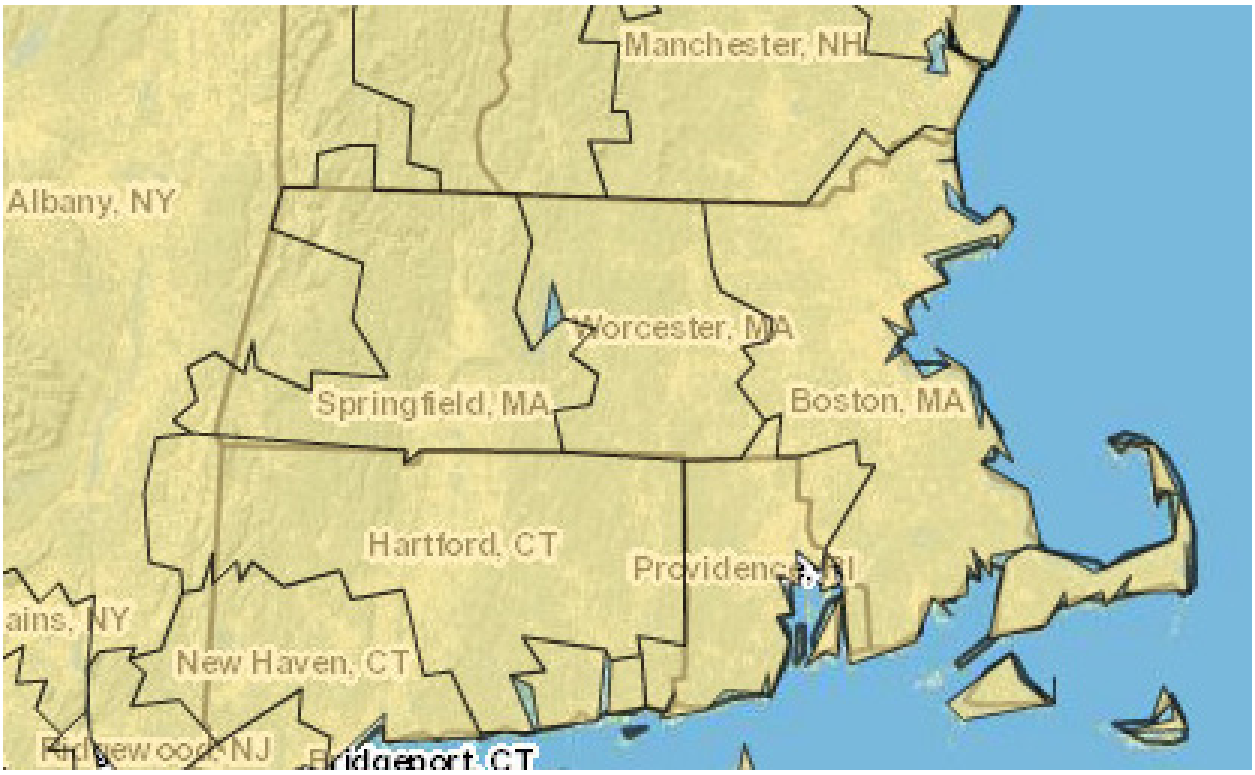
Selection of High-Performing Matched Comparison Regions

A key aim of this project is to measure the extent to which the Massachusetts health care delivery system has room to improve, and, over time, what progress can be made in system change. These aims are best achieved by comparing the delivery system measures between Massachusetts and other geographic areas that are similar in terms of population characteristics, but have performed substantially better in terms of these metrics.

Hospital Referral Regions (HRRs)

Our expert key informants thought it most appropriate to use HRRs as our level of analysis, since regions of Massachusetts may differ. HRRs are created by the Dartmouth Atlas of Health Care based on regional health care markets. Specifically, HRRs are created by aggregating individual hospital service areas [39] based on where their Medicare residents travelled for major cardiovascular surgery and neurosurgery. There are 306 HRRs in the U.S., each with at least one site performing major cardiovascular surgery and neurosurgery. [40] A map of the three Massachusetts HRRs—Boston, Springfield and Worcester—is shown in Figure 4. Our analysis of these HRRs is based on discharges (inpatient or emergency department) in hospitals in the state of Massachusetts by residents from the three Massachusetts HRRs.

Figure 4: Massachusetts HRRs



Source: Dartmouth Atlas of Health Care, Data by Region.[41]

To select comparable high-performing regions, we employed a multi-step process:

Demographic, socioeconomic status and health insurance coverage similarity. We used standard statistical techniques utilizing matching algorithms to generate an initial set of 20 comparison HRRs that was closest to each of the three MA HRRs based on the following eight measures: 1) percent female, 2) percent 65 and older, 3) percent white, 4) median income, 5) percent under the federal poverty line, 6) percent with less than a high school education, 7) percent with a bachelor's degree or higher and 8) percent of adults 18-64 with health insurance.

Difference in avoidable use and cost between candidate HRRs and Massachusetts HRR. Once we had the 20 closest socio-demographic matches, we ranked them by the amount by which their rank on the "avoidable use and cost domain" in the Commonwealth Fund Local Scorecard exceeded the rank of the Massachusetts HRR to which they were matched.[42] In order to capture the areas where the opportunity for improvement in Massachusetts might be highest, we then selected the four comparison HRRs (for each Massachusetts HRR) with the greatest positive difference performance on the 'avoidable use and cost' dimension of the scorecard. We made

sure that selections were in the top quartile of overall performance to avoid comparison HRRs that were delivering lower-quality care.[43]

Availability of data. We acquired hospital utilization data for comparison HRRs through AHRQ's State Inpatient Databases or through a special requests to states.[44] We were able to get emergency department utilization for all comparison HRRs except Seattle (comparison for both Boston and Springfield), as Washington does not collect this data. We were able to select our top matches for all Massachusetts HRRs except Springfield, where we had to eliminate the top match and the fifth and sixth alternates for lack of data availability.[45]

Table 3 shows the comparison HRRs for each Massachusetts HRR. Maps of all HRRs can be seen at the Dartmouth Atlas of Health Care.[46] We compared each Massachusetts HRR with the simple average of the comparison HRRs. Appendix C includes data for all HRRs.

Table 3: Comparison HRRs

	Massachusetts HRR		
	Boston	**Worcester**	**Springfield**
Comparison HRRs	San Mateo County, CA	Minneapolis, MN (WI)*	Seattle, WA
	Seattle, WA	St. Paul, MN (WI)*	Burlington, VT (NY)*
	San Francisco, CA	Madison, WI	Iowa City, IA
	Burlington, VT (NY)*	Burlington, VT (NY)*	Rochester, NY

*HRR also includes hospitals in second state mentioned in parenthesis.

Findings

Health Care Spending

As noted above, Massachusetts health care spending per capita exceeds the national average. Lacking a single comparative spending metric for smaller geographic areas, we utilize three metrics that capture different population groups and types of expenditures.

Compared to the average of their comparison HRRs, all Massachusetts HRRs have higher per capita Medicare spending (standardized and risk adjusted). This is illustrated in Figure 5 and shown in Table 4. The difference is highest between the Boston HRRs and its comparison areas. When it comes to reimbursement for commercially insured enrollees (ages 18-64) in large employers, the Worcester and Springfield HRRs are lower than their comparison groups and the Boston HRR is higher. With respect to single premiums, all Massachusetts HRRs are higher than their comparisons (Springfield by a higher margin). This last measure does not include actual payments for health services, employee out-of-pocket cost sharing such as deductibles and

copayments, nor does it adjust for differences in the scope of benefits across regions. While data at the HRR level are not as complete as we would like to evaluate costs, these data paint a similar picture to the more comprehensive total health expenditure data in showing that Massachusetts HRRs frequently have somewhat higher costs than their comparison groups.

Figure 5: Health Care Spending

Ratio of Dollars Spent: Massachusetts HRR to Average of Matched HRRs

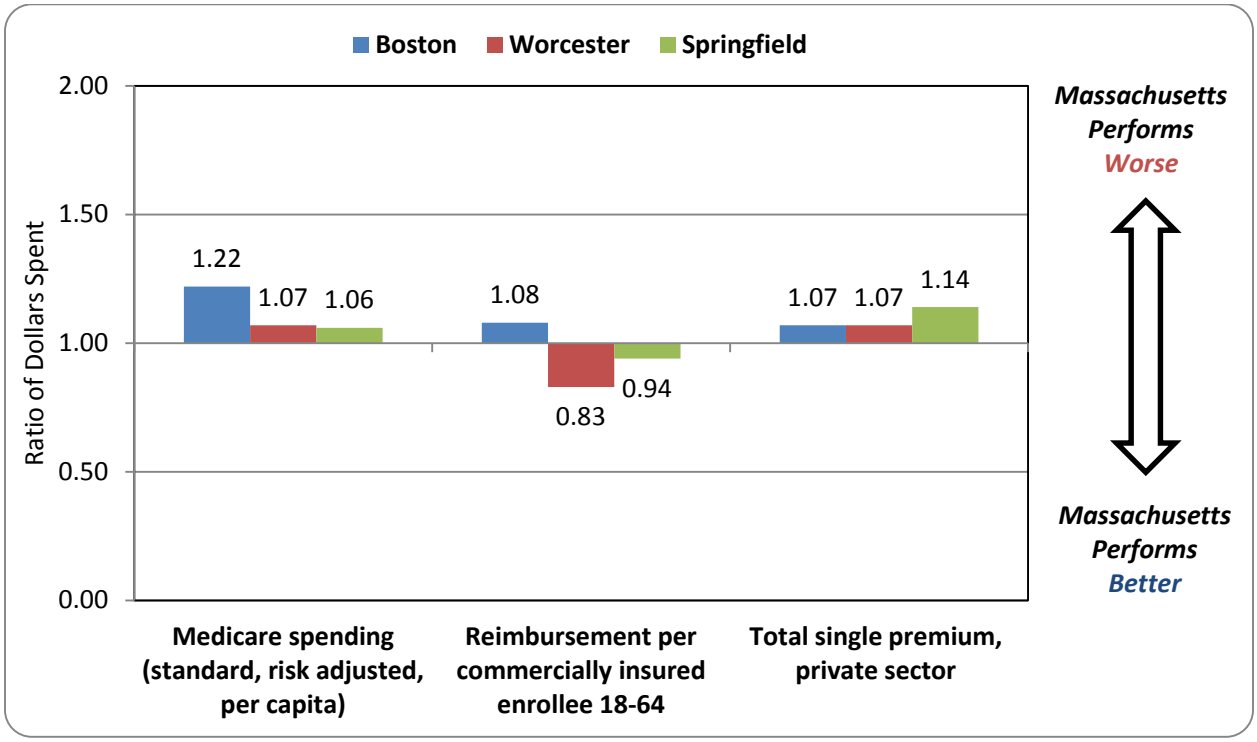


Table 4: Health Care Spending in Massachusetts HRRs and Matched High-Performing Comparison HRRs

Measure	Region					
	Boston		Worcester		Springfield	
	Mass.	Matched*	Mass.	Matched*	Mass.	Matched*
1. Medicare spending (standard, risk-adjusted, per capita)	$9,248	$7,597	$8,735	$8,161	$8,305	$7,860
2. Reimbursement per commercially insured enrollee ages 18-64	$3,243	$3,009	$2,961	$3,561	$2,694	$2,872
3. Total single premium, private sector	$5,837	$5,470	$5,777	$5,412	$5,777	$5,058

*Simple average of matched comparison HRRs.

Potentially Avoidable Health Care Utilization

An important marker of health system efficiency and quality is the extent of utilization of expensive health services that could have been avoided with adequate access to high-quality primary care and other ambulatory care services.

We draw on established metrics of potentially avoidable hospital utilization to compare the three Massachusetts HRRs to their matched high-performing HRRs. We use several additional focused metrics for a more in-depth examination of the observed performance differences.

Figure 6 (and Table 5) shows that Massachusetts HRRs perform below their matched comparison markets on each of the four main measures of avoidable hospital use. The performance gap is largest for broad measures of preventable hospital utilization for adults and children, particularly for the Boston and Worcester HRRs. Smaller gaps are evident for the Springfield HRR across all four measures and for use of avoidable emergency department (ED) visits and Medicare 30-day inpatient readmissions across all three HRRs.

Figure 6: Potentially Avoidable Hospital Admissions

Ratio of Rates: Massachusetts HRR to Average of Matched HRRs

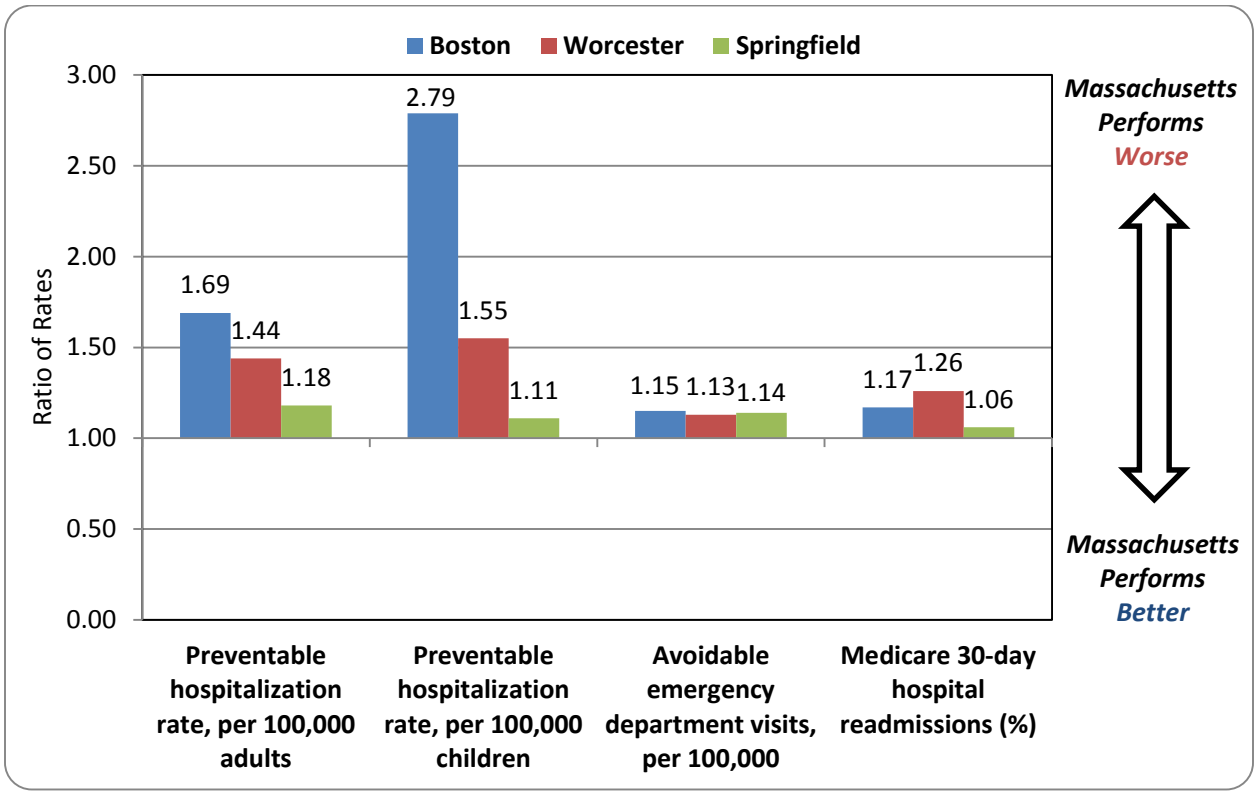


Figure 7 (and Table 5) further illustrates patterns of preventable inpatient admissions for specific conditions that are amenable to hospitalization in the absence of high-quality care in the community. Hospitalizations for asthma and Chronic Obstructive Pulmonary Disease (COPD) occur at 1.3 times (Springfield), 1.7 times (Worcester), and 1.9 times (Boston) the rate of the matched HRRs. MA HRRs evince much smaller performance gaps for another common condition, diabetes.

Figure 7: Potentially Avoidable Asthma/COPD and Diabetes Hospital Admissions Per 100,000 Adults (age-sex adjusted)

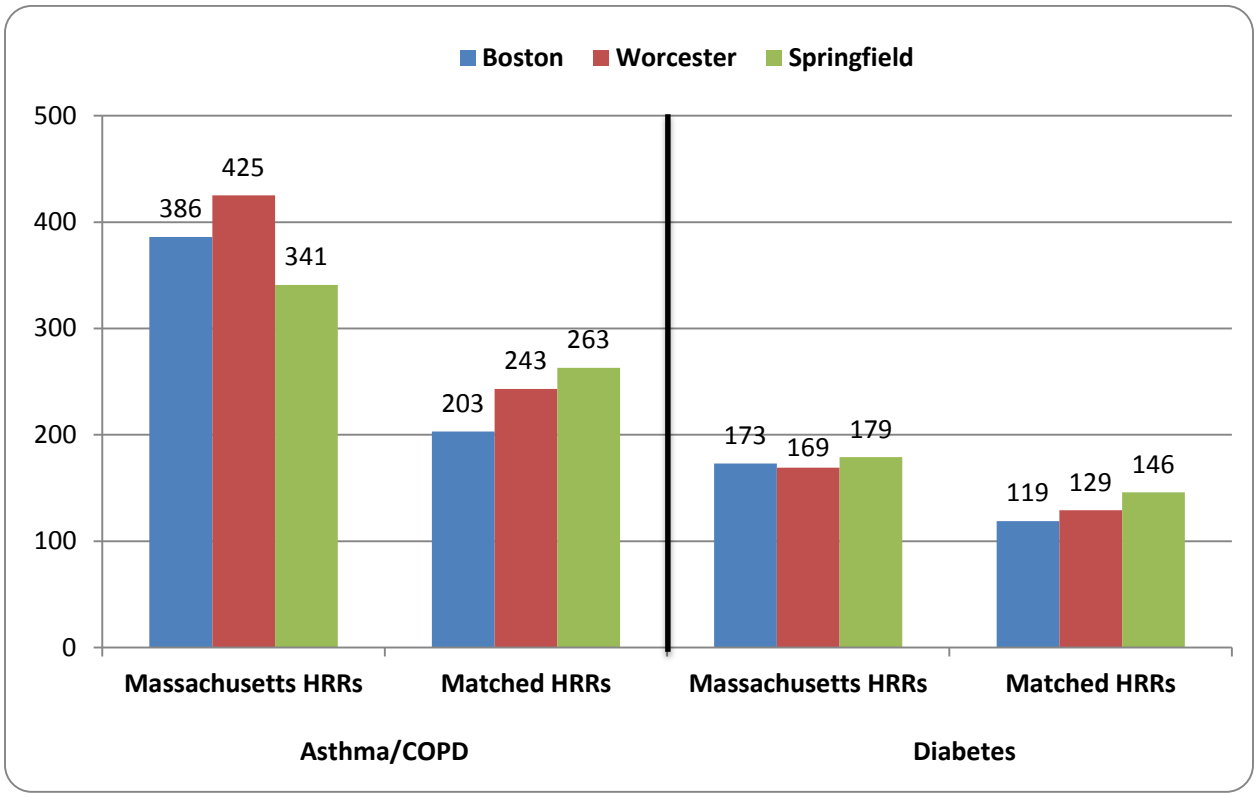


Table 5: Potentially Avoidable Hospital Use in Massachusetts HRRs and Matched High-Performing Comparison HRRs (measures 4-9)

Measure	Region					
	Boston		Worcester		Springfield	
	Mass.	Matched*	Mass.	Matched*	Mass.	Matched*
4. Adult preventable hospitalization rate, per 100,000	1,717	1,015	1,699	1,184	1,536	1,298
5. Pediatric preventable hospitalization rate, per 100,000	198	71	140	90	101	91
6. Avoidable ED visit rate per 100,000	15,847	13,767	15,352	13,557	18,815	16,551
7. Medicare 30-day hospital readmissions	20.4%	17.4%	22.0%	17.4%	18.7%	17.6%
8. Adult asthma/COPD hospital admissions per 100,000	386	203	425	243	341	263
9. Adult diabetes hospital admissions per 100,000	173	119	169	129	179	146

*Simple average of matched comparison HRRs.

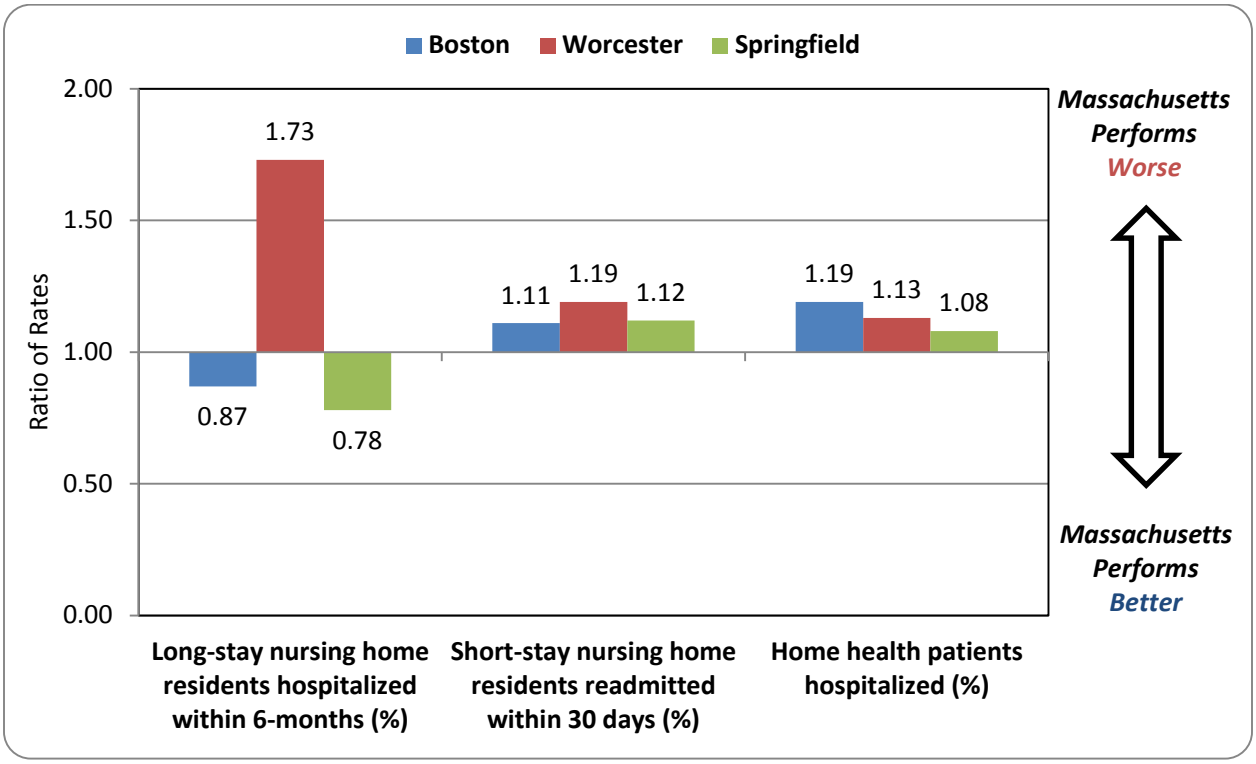
Extrapolating from the difference in population rates shown in Table 5 and multiplying them by the population in each Massachusetts HRR gives us an estimate of the number of hospital events that could be prevented if the Massachusetts HRRs were to perform at the level of their average comparison HRRs.[47] Table 6 shows these estimates. The Boston HRR has the largest number of reductions because it has the largest population. In each Massachusetts HRR, the largest potential reduction in hospital events comes in the area of avoidable emergency department visits for residents of all ages, followed by overall preventable hospitalizations for those 18 and over, hospital admissions for asthma/COPD in those 18 or over, 30 day hospital readmissions in the Medicare population (people over 65 or younger people with disabilities), and diabetes admissions for those 18 and over.

Table 6: Reduction in Hospital Events if Massachusetts HRRs Performed at the Average Comparison HRR Level

Hospital Event	Boston HRR	Worcester HRR	Springfield HRR	Total Massachusetts
Adult preventable hospitalizations	26,666	3,207	1,386	31,259
Adult diabetes admissions	2,058	253	194	2,505
Adult asthma/COPD admissions (age 18+)	6,980	1,135	458	8,573
Avoidable emergency department visits (all ages)	100,407	14,546	16,824	131,777
Medicare hospital 30-day readmissions	5,911	1,106	315	7,332

The picture of avoidable use among long-term care and post-acute populations is somewhat more mixed than performance for the broader measures discussed earlier, as shown in Figure 8 (and Table 7). The rate of acute care hospitalization of long-stay nursing home patients (i.e., residing in the facility for at least 90 consecutive days) within six months of their baseline health assessment is more favorable in Boston and Springfield compared to their matched HRRs, while performance in the Worcester HRR falls short of its matched comparisons on this metric. Re-hospitalization rates of patients initially discharged to a nursing home for a short stay and hospitalization rates for home health care patients are slightly worse across all three Massachusetts HRRs compared to their respective matched regions.

Figure 8: Potentially Avoidable Utilization among Long-Term Care Populations
Ratio of Rates: Massachusetts HRR to Average of Matched HRRs



Like the overall Medicare 30-day readmission rate (Figure 6), Figure 9 (and Table 7) shows that readmissions for any cause following an initial discharge for heart attack (acute myocardial infarction) are higher in all three Massachusetts HRRs compared to their matched regions. The comparable statistics for heart failure show comparatively low performance in Worcester, while Springfield and Boston show somewhat better performance than their matched regions. Pneumonia readmissions rates fall short in Boston and Worcester relative to their respective matched regions, while Springfield performs better than its matched regions.

Figure 9 also shows that receiving timely ambulatory care follow-up (i.e., within two weeks of discharge) does not explain readmission rate performance, as most Massachusetts HRRs out-perform their respective matched comparison regions. These findings indicate that care improvement strategies should focus on the quality of the transition from hospital, e.g., conducting effective patient education or providing in-home support, rather than simply assuring that patients complete appointments with their community physicians. Regionalized health information technology, where community physicians are notified of their patients' hospitalization status, can be helpful in assuring high quality transitions after hospitalization.[48] In 2012, Massachusetts created the first statewide electronic health information exchange funded by CMS.[49]

Figure 9: Medicare Hospital Readmissions and Ambulatory Follow-Up after Discharge for Three Conditions

Based on Ratio of Rates: Massachusetts HRR versus Average Comparison HRR

Measure	Region		
	Boston	Worcester	Springfield
30-Day Hospital Readmissions			
Heart attack			
Heart failure			
Pneumonia			
No Ambulatory Follow-Up within 14 Days			
Heart attack			
Heart failure			
Pneumonia			

Key

MA HRR performs worse than matched HRRs by…				MA HRR performs better than matched HRRs by…		
>15%	>10% - 15%	>5% - 10%	+/- 5%	>5% - 10%	>10% - 15%	>15%

Table 7: Potentially Avoidable Hospital Use in Massachusetts HRRs and Matched High-Performing Comparison HRRs (measures 10-13)

Measure	Region					
	Boston		Worcester		Springfield	
	Mass.	Matched*	Mass.	Matched*	Mass.	Matched*
10. Long-stay nursing home residents hospitalized	13.4%	15.3%	19.8%	11.4%	13.7%	17.6%
11. Short-stay nursing home residents readmitted	19.2%	17.4%	19.4%	16.3%	17.9%	16.0%
12. Home health patients hospitalized	29.3%	24.7%	31.9%	28.3%	31.7%	29.3%
Medicare, 30 Day Readmission Rate:						
13a. Heart attack (AMI)	20.9%	16.8%	18.6%	16.4%	20.5%	17.1%
13b. Heart failure (CHF)	21.8%	21.1%	24.7%	20.4%	16.5%	19.3%
13c. Pneumonia	16.0%	14.2%	15.8%	13.8%	14.2%	15.1%
Medicare, No Ambulatory Visit within 14 Days:						
13d. Heart attack (AMI)	34.1%	33.3%	29.4%	34.9%	25.9%	33.1%
13e. Heart failure (CHF)	35.8%	33.2%	32.3%	30.9%	28.3%	31.3%
13f. Pneumonia	37.0%	36.2%	30.0%	35.3%	26.2%	33.5%

*Simple average of matched comparison HRRs.

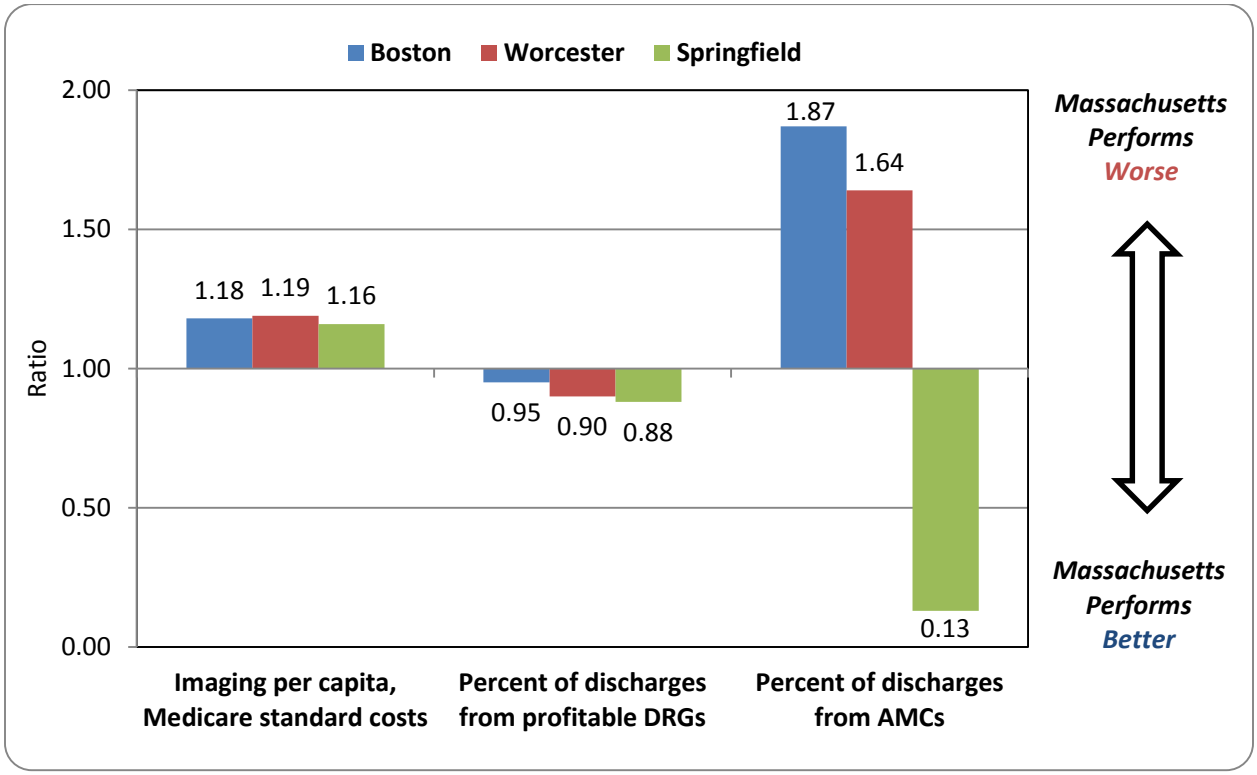
Service Intensity and Setting

Even when care is necessary and not preventable, the setting in which it is delivered can be an important determinant of cost and quality of care. There are well documented volume-outcome relationships for some services, suggesting that it is appropriate for some types of care to be concentrated in high volume centers of excellence. But many services can be appropriately delivered with good outcomes in a variety of settings, and the concentration of these services in high-cost facilities may unnecessarily increase cost.

Findings about the intensity and setting of care in Massachusetts are mixed. Massachusetts standard per capita imaging costs are 21 percent below the national average, but standard per capita Medicare imaging costs are higher in all Massachusetts HRRs relative to their comparisons, as shown in Figure 10 and Table 8.[50] Table 8 also shows that each Massachusetts HRR has higher than average imaging events for Medicare enrollees compared to their comparison HRRs, so the higher costs are most likely due to more use of imaging rather than higher cost imaging (e.g., MRI instead of x-ray). The percent of hospital discharges from profitable DRGs is lower for all Massachusetts HRRs than their comparisons. The Springfield HRR is much lower than its comparisons with respect to the percent of discharges from AMCs while the Boston and Worcester HRRs are much higher. The Springfield HRR does not contain an AMC, so residents from this area have to travel to use one, which probably explains the low rate.

Figure 10: Service Intensity and Setting

Ratio: Massachusetts HRR to Average of Matched HRRs



All Massachusetts HRRs deliver a somewhat higher intensity of hospital care than their comparison averages, as shown in Figure 11 and Table 8. The Boston HRR had slightly higher hospice use among Medicare cancer decedents than its comparisons; the other Massachusetts HRRs, however, had lower hospice use than their comparisons (see Figure 11 and Table 8).

Figure 11: Service Intensity and Setting
Ratio: Massachusetts HRR to Average of Matched HRRs

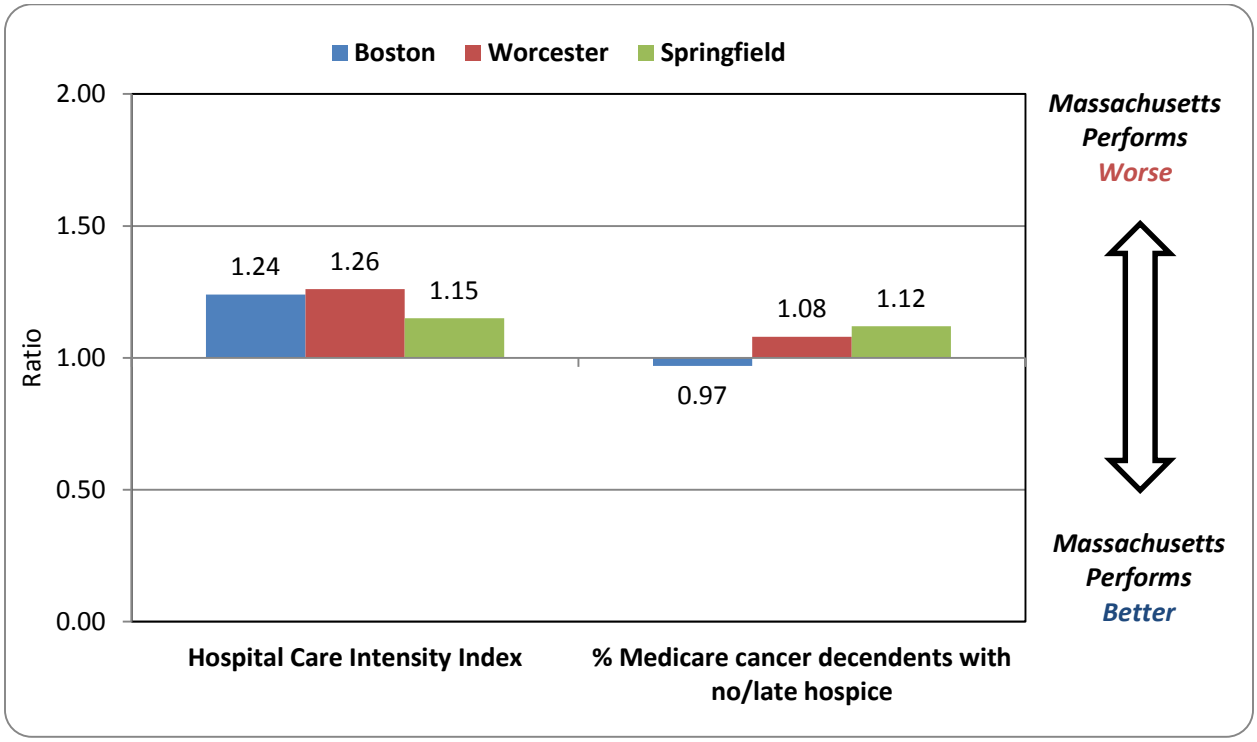


Table 8: Service Intensity and Setting in Massachusetts HRRs and Matched High-Performing Comparison HRRs

Measure	Region					
	Boston		Worcester		Springfield	
	Mass.	Matched*	Mass.	Matched*	Mass.	Matched*
14. Imaging per capita, Medicare standard costs	$199	$168	$176	$149	$187	$161
14a. Imaging events per 1,000 Medicare beneficiaries	4,254	3,139	3,903	3,258	3,768	3,315
15. Percent of discharges from profitable DRGs	11.8%	12.4%	12.0%	13.3%	11.8%	13.4%
16. Percent of discharges from AMCs	28.2%	15.1%	25.2%	15.4%	3.1%	23.7%
17. Hospital Care Intensity Index	1.00	0.81	0.87	0.69	0.83	0.72
18. Percent Medicare cancer decedents with no or late hospice	60.8%	62.8%	60.1%	55.6%	62.0%	55.4%

*Simple average of matched comparison HRRs.

Summary and Conclusions

Health care in Massachusetts is highly accessible but it is expensive and shows high levels of preventable hospital utilization. To investigate opportunities for Massachusetts to improve its delivery system, this report compares each of the three Massachusetts hospital referral regions (HRRs) to four socio-demographically similar HRRs around the country that offer better performance with respect to avoidable hospital use.[51] **Overall, we find that while health care spending does not appear dramatically higher in Massachusetts than its comparison regions – based on limited available measures – our analyses reveal significant opportunities to improve health care delivery in the Commonwealth**. Our comparisons also reveal some bright spots where Massachusetts performs well compared to the matched high-performing HRRs.

Massachusetts has high levels of preventable hospital care utilization. We find that if the Massachusetts HRRs reduced their hospital events to the average level of their comparison group, they could collectively have nearly 132,000 fewer avoidable emergency department visits, about 31,000 fewer preventable adult hospitalizations (about 8,500 due to asthma or related chronic lung conditions and about 2,500 due to diabetes), and about 7,300 fewer Medicare hospital readmissions.

All three Massachusetts regions appear to be delivering a higher intensity of hospital care at the end of life than their matched high-performing regions. They also spend more on imaging than comparable regions (primarily because of more use of imaging, rather than simply

using more expensive imaging). Conversely, Massachusetts HRRs were less likely to show use of hospice for Medicare decedents with a cancer diagnosis in 2007.

The 2014 Commonwealth Fund State Scorecard on Health System Performance showed that the state improved in many areas of preventable hospital utilization in recent years, though there is still room for more improvement, and hospital admissions for pediatric asthma worsened between 2004 and 2010.[52] Similarly, our HRR level analysis shows a high level of preventable pediatric admissions in 2011 for Massachusetts HRRs compared to an average of higher-performing similar HRRs.

In addition to the aforementioned areas of potential improvement, there are some areas where Massachusetts HRRs outperform their comparisons. The Boston and Springfield HRRs have fewer hospitalizations among long-stay nursing home residents than their comparison HRRs. Among Medicare patients having hospital discharges for heart attacks, heart failure and pneumonia, nearly all Massachusetts HRRs show more follow-up appointments within 14 days than their comparisons though this is not fully reflected in hospital readmission rates. In addition, the Springfield HRR shows fewer readmissions than its comparisons for Medicare patients discharged with heart failure or pneumonia, as does the Boston HRR for Medicare patients discharged with heart failure.

The Massachusetts Health Policy Commission is carefully monitoring costs, finding that from 2012 to 2013, growth in total health care expenditures was below the growth benchmark (though larger than inflation). However, there are other trends to monitor—they also found that the largest insurer and physician group reported some of the largest spending increases. They further found that commercial enrollment with primary care providers paid under alternative payment methodologies (widely cited as a way to reduce costs) declined slightly in 2013, and that there was a decrease in HMO enrollment.[53] The Massachusetts Attorney General has expressed concern about provider consolidation in the state potentially driving up costs.[54] Moving forward, an approach like the one in this report, comparing Massachusetts HRRs with sociodemographically similar but higher performing comparison HRRs around the country, could provide reasonable target benchmarks for the utilization of health services in Massachusetts regions.

Appendix A: Information Sheet and Interview Protocol

Information Sheet

Blue Cross Blue Shield of Massachusetts Foundation Health Care System Study

You are invited to participate in a research study that is being conducted by Joel Cantor, who is Director of the Center for State Health Policy at Rutgers University, in collaboration with the Blue Cross Blue Shield of Massachusetts Foundation. Your participation will consist of a telephone interview for about 30 minutes.

The purpose of this research is to gather information which will be used to illustrate the main causes of rising health care costs in Massachusetts. Our research group is holding interviews with about seven others who have knowledge of this topic. We would like to ask you about your thoughts on the main drivers of rising health care spending in Massachusetts and measures and data sources that highlight these drivers.

Voluntary; Not Confidential: Participating in this interview is completely voluntary. You do not have to participate if you do not want to, and you may stop at any time. Also, please let us know if you would prefer not to answer any particular question. These are no foreseeable risks to participation in this study. Your responses will help to improve the quality of the research; however, you may receive no direct benefit from taking part in this study.

This research is <u>not</u> confidential. We will not quote individual respondents in our reports or presentations, but we will list the names of interview subjects as an appendix to our report.

We will take notes during this interview, but will not be audiotaping the discussion. The research team and the Institutional Review Board (a committee that reviews research studies in order to protect research participants) at Rutgers University are the only parties that will be allowed to see our notes, except as may be required by law. We will keep our notes in a secure location in locked file cabinets and on a secure location in our computer system which is only available to members of the project team. All study data will be kept for 3 years after the research ends.

Contact Information: If you have any questions about this interview, or the study we are conducting, you may contact Jennifer Farnham at (848) 932-4675 or jfarnham@ifh.rutgers.edu. Her mailing address is 112 Paterson Street, New Brunswick, NJ 08901. If you have any question about your rights as a research participant, please contact the IRB Administrator at Rutgers University at 848-932-4058 or humansubjects@orsp.rutgers.edu. The mailing address is Rutgers University Institutional Review Board for the Protection of Human Subjects, Office of Research and Sponsored Programs, 3 Rutgers Plaza, New Brunswick, NJ 08901-8559.

Revised July 10, 2012

This informed consent document was approved by the Rutgers University Institutional Review Board for the Protection of Human Subjects on July 13, 2012.

Interview Protocol

[Intro & consent]

1. To start, we would like to know what you think are the most important drivers reasons health care costs in Massachusetts are higher than other parts of the US and why they have been rising so fast (if unfamiliar with MA, address level/trends in states that are similar to MA)?
2. Our work for the Blue Cross Blue Shield of Massachusetts Foundation focuses on opportunities to address high and rising costs through *delivery system changes* – [in addition to what you just mentioned] to what extent and how do you believe the organization of the delivery system contributes to high or rising costs?
    a. If necessary add: what about delivery of care to patients who also are receiving long-term care such as the nursing home or home health care population?
3. Of the major cost drivers you mentioned, which do you think offer the *greatest opportunity* to slow cost growth in Massachusetts in the next 12-24 months? What about the next decade?
    a. If necessary add: we are interested opportunities that would be technically as well as politically feasible.
4. Chapter 224 and national health reform (the Affordable Care Act) puts in place a number of strategies intended to slow cost growth and improve care delivery. Which of these do you believe holds the greatest opportunity for Massachusetts in the next few years?
    a. Probe if not mentioned: you didn't mention {fill from list below}, do you think this/these strategies offer opportunities for savings in Massachusetts?
    [Medicare Shared Savings Program (Medicare ACOs); payment adjustments for hospital acquired conditions or unplanned readmissions; primary care initiatives like medical home models and workforce enhancements; care coordination and care transition initiatives; and measuring/sharing quality data]
    For 224 – adoption of global payments, especially for public purchasers, medical malpractice reforms, HIT implementation/HIE, changes to scope of practice for PAs/NPs
5. Are there states or health care markets that are similar to Massachusetts in terms of demographics and socio-economic status that achieve better value for their health spending? In other words, if you were to compare Massachusetts health care markets to other places with a better cost-outcome profile, what places would you select? What factors do you think contribute to the better value achieved in [state(s)] compared to Massachusetts?
6. Our goal for this project is to assemble *specific measures* that describe the health care delivery system in Massachusetts and can be compared to other states or health care markets. These measures will be used to illustrate opportunities for improved cost and value. Please tell me what measures you would recommend that we explore to meet this goal.
    a. Probe for specific measures, data sources (even if not publically available), who has data, what comparisons are possible/recommended (e.g., other states, sub-state markets, etc.).
    b. Probe for measures reflecting care for complex patients, including LTC population, those with multiple conditions, socially complex/low SES.

Appendix B: Measure Details

Indicator	Description (quotes are from source descriptions below)
Health Care Spending	
1) Medicare spending, standardized risk adjusted per capita, 2011 (CMS 2013)	*Standardized* means removing "geographic differences in payment rates for individual services as a source of variation. To standardize spending, we examined Medicare's various FFS payment systems and identified the factors that lead to different payment rates for the same service. In general, those factors are adjustments that Medicare makes to account for local wages or input prices, and extra payments that Medicare makes to advance other program goals, such as compensating certain hospitals for the cost of training doctors. We then estimated what Medicare would have paid for each claim without those adjustments." *Risk adjustment* is done by way of a model developed by CMS "that uses HCCs (hierarchical condition categories) to assign risk scores. Those scores estimate how beneficiaries' FFS spending will compare to the overall average for the entire Medicare population. The risk score for the overall average is set at 1.0; beneficiaries with scores greater than that are expected to have above-average spending, and vice versa. Risk scores are based on a beneficiary's age and sex; whether the beneficiary is eligible for Medicaid, first qualified for Medicare on the basis of disability, or lives in an institution (usually a nursing home); and the beneficiary's diagnoses from the previous year. We used total risk scores to adjust spending data at the geographic level. We used the risk scores to adjust spending data at the beneficiary level rather than in aggregate. As a result, the aggregate standardized, risk-adjusted spending in a region does not equal the aggregate standardized costs divided by the average HCC risk score. In addition, the HCC model was not designed to risk adjust spending at the service level and therefore is not applied to service-level spending."
2) Reimbursement per commercially insured enrollee ages 18-64, 2009 (CMWF)†	"M. Chernew, Harvard Medical School Department of Health Care Policy, analysis of the Thomson Reuters MarketScan Database. Total per enrollee spending estimates from a sophisticated regression model include reimbursed costs for health care services from all sources of payment including the health plan, enrollee and any third party payers incurred during 2009. Outpatient prescription drug charges are excluded. Enrollees with capitated plans (6.3% of enrollees) and their associated claims are also excluded. Estimates for each HRR were adjusted for enrollees' age and sex, the interaction of age and sex, partial year enrollment, and regional wage differences."

Indicator	Description (quotes are from source descriptions below)
3) Total single premium, private sector, 2011 (AHRQ)	Average total premiums and employee contributions (in dollars) for private-sector establishments is collected through the Insurance Component of the Medical Expenditure Panel Survey, conducted by AHRQ. The sample is drawn from the U.S. Census Bureau's Business Register. In 2011, there were 39,351 private sector establishments included with a response rate of 81.7%.
Potentially Avoidable Hospital Use	
4) Adult preventable hospitalizations overall (PQI#90) per 100,000 population (age 18+, age-sex adjusted)	Prevention Quality Indicators (PQI) overall composite per 100,000 population, ages 18 years and older. Includes admissions for one of the following conditions: diabetes with short-term complications, diabetes with long-term complications, uncontrolled diabetes without complications, diabetes with lower-extremity amputation, chronic obstructive pulmonary disease, asthma, hypertension, heart failure, angina without a cardiac procedure, dehydration, bacterial pneumonia, or urinary tract infection, with age-sex adjustment.
5) Pediatric preventable hospitalizations overall (PDI#90), per 100,000 ages 6-17, observed	Pediatric Quality Indicators (PDI) overall composite per 100,000 population, ages 6 to 17 years. Includes admissions for one of the following conditions: asthma, diabetes with short-term complications, gastroenteritis, or urinary tract infection.
6) Avoidable emergency department visits per 100,000 population (all ages, age-sex adjusted)	Based on the algorithm by John Billings (New York University), includes nonemergent ("patient's initial complaint, presenting symptoms, vital signs, medical history, and age indicated that immediate medical care was not required within 12 hours"), primary care treatable ("treatment was required within 12 hours, but care could have been provided effectively and safely in a primary care setting. The complaint did not require continuous observation, and no procedures were performed or resources used that are not available in a primary care setting") and preventable/avoidable ("Emergency department care was required based on the complaint or procedures performed/resources used, but the emergent nature of the condition was potentially preventable/avoidable if timely and effective ambulatory care had been received during the episode of illness"). Per 100,000 with age-sex adjustment.
7) Medicare hospital 30-day readmission rate, 2010 (CMS)	"Percent of inpatient readmissions within 30 days of an acute hospital stay during reference period."
8) Asthma/COPD admissions per 100,000 population (age 18+, age-sex adjusted)	PQI#5: Admissions with a principal diagnosis of chronic obstructive pulmonary disease (COPD) or asthma per 100,000 population, ages 40 years and older; and PQI#15: Admissions for a principal diagnosis of asthma per 100,000 population, ages 18 to 39 years, with age-sex adjustment.

Indicator	Description (quotes are from source descriptions below)
9) Diabetes admissions per 100,000 population (age 18+, age-sex adjusted)	PQI#1 Admissions for a principal diagnosis of diabetes with short-term complications (ketoacidosis, hyperosmolarity, or coma); PQI#3 Admissions for a principal diagnosis of diabetes with long-term complications (renal, eye, neurological, circulatory, or complications not otherwise specified); PQI#14 Uncontrolled diabetes (Admissions for a principal diagnosis of diabetes without mention of short-term or long-term complications; PQI#16 Admissions for any-listed diagnosis of diabetes and any-listed procedure of lower-extremity amputation (excludes any-listed diagnosis of traumatic lower-extremity amputation admissions, toe amputation admission (likely to be traumatic)). All per 100,000 population, ages 18 years and older, with age-sex adjustment.
10) Percent of long-stay NH residents hospitalized within 6 month period, 2010 (CMWF1)	"Percent of long-stay residents (residing in a nursing home for at least 90 consecutive days) who were ever hospitalized within six months of baseline assessment. V. Mor, Brown University, analysis of 2008 Medicare enrollment data and Medicare Provider and Analysis Review File (CMS, MEDPAR 2008)."
11) Percent of first time NH residents readmitted within 30 days of discharge to NH, 2010 (CMWF1)	"Percent of newly admitted nursing home residents (never been in a facility before) who are rehospitalized within 30 days of being discharged to nursing home. V. Mor, Brown University, analysis of 2008 Medicare enrollment data and Medicare Provider and Analysis Review (CMS, MEDPAR 2008)."
12) Percent of home health patients with hospitalization, 4/2010 to 3/2011 (CMWF)	"Percent of acute care hospitalization for home health episodes. Authors' analysis of 4/2010–3/2011 Outcome and Assessment Information Set data as reported by CMS Nursing Home Health Compare (DHHS n.d.)."
13a) Medicare AMI 30-day readmission rate, 2010 (DAP)	30-day readmissions (any claims from short-term acute or critical access hospitals) for people with a hospitalization with diagnosis of acute myocardial infarction (ICD-9 codes 410.00, 410.01, 410.10, 410.11, 410.20, 410.21, 410.30, 410.31, 410.40, 410.41, 410.50, 410.51, 410.60, 410.61, 410.70, 410.71, 410.80, 410.81, 410.90, and 410.91) among "100% of fee-for-service Medicare beneficiaries who resided in the 306 Dartmouth Atlas hospital referral regions and had full Part A (acute care in facilities, including hospitals) and Part B (clinician services) coverage during the study periods. Beneficiaries had to be age 65 or older on … July 1, 2008." Utilization information from Medicare Provider Analysis and Review (MedPAR) files.

Indicator	Description (quotes are from source descriptions below)
13b) Medicare CHF 30-day readmission rate, 2010 (DAP)	30-day readmissions (any claims from short-term acute or critical access hospitals) for people with a hospitalization with diagnosis of congestive heart failure (ICD-9 codes 402.01, 402.11, 402.91, 404.01, 404.03, 404.11, 404.13, 404.91, 404.93, 428.0, 428.1, 428.20, 428.21, 428.22, 428.23, 428.30, 428.31, 428.32, 428.33, 428.40, 428.41, 428.42, 428.43, and 428.9) among "100% of fee-for-service Medicare beneficiaries who resided in the 306 Dartmouth Atlas hospital referral regions and had full Part A (acute care in facilities, including hospitals) and Part B (clinician services) coverage during the study periods. Beneficiaries had to be age 65 or older on … July 1, 2008." Utilization information from Medicare Provider Analysis and Review (MedPAR) files.
13c) Medicare Pneumonia 30-day readmission rate, 2010 (DAP)	30-day readmissions (any claims from short-term acute or critical access hospitals) for people with a hospitalization with diagnosis of pneumonia (ICD-9 codes 480.0, 480.1, 480.2, 480.3, 480.8, 480.9, 481, 482.0, 482.1, 482.2, 482.30, 482.31, 482.32, 482.39, 482.40, 482.41, 482.49, 482.81, 482.82, 482.83, 482.84, 482.89, 482.9, 483.0, 483.1, 483.8, 485, 486, and 487.0) among "100% of fee-for-service Medicare beneficiaries who resided in the 306 Dartmouth Atlas hospital referral regions and had full Part A (acute care in facilities, including hospitals) and Part B (clinician services) coverage during the study periods. Beneficiaries had to be age 65 or older on … July 1, 2008." Utilization information from Medicare Provider Analysis and Review (MedPAR) files.
13d) Medicare AMI, no ambulatory visit within 14 days, 2010 (DAP*)	People without an ambulatory care visit within 14 days of discharge to any clinician for people with a hospitalization with diagnosis of acute myocardial infarction (ICD-9 codes 410.00, 410.01, 410.10, 410.11, 410.20, 410.21, 410.30, 410.31, 410.40, 410.41, 410.50, 410.51, 410.60, 410.61, 410.70, 410.71, 410.80, 410.81, 410.90, and 410.91) among "100% of fee-for-service Medicare beneficiaries who resided in the 306 Dartmouth Atlas hospital referral regions and had full Part A (acute care in facilities, including hospitals) and Part B (clinician services) coverage during the study periods. Beneficiaries had to be age 65 or older on … July 1, 2008." Utilization information from Medicare Provider Analysis and Review (MedPAR) files.

Indicator	Description (quotes are from source descriptions below)
13e) Medicare CHF, no ambulatory visit within 14 days, 2010 (DAP*)	People without an ambulatory care visit within 14 days of discharge to any clinician for people with a hospitalization with diagnosis of congestive heart failure (ICD-9 codes 402.01, 402.11, 402.91, 404.01, 404.03, 404.11, 404.13, 404.91, 404.93, 428.0, 428.1, 428.20, 428.21, 428.22, 428.23, 428.30, 428.31, 428.32, 428.33, 428.40, 428.41, 428.42, 428.43, and 428.9) among "100% of fee-for-service Medicare beneficiaries who resided in the 306 Dartmouth Atlas hospital referral regions and had full Part A (acute care in facilities, including hospitals) and Part B (clinician services) coverage during the study periods. Beneficiaries had to be age 65 or older on … July 1, 2008." Utilization information from Medicare Provider Analysis and Review (MedPAR) files.
13f) Medicare Pneumonia, no ambulatory visit within 14 days, 2010 (DAP*)	People without an ambulatory care visit within 14 days of discharge to any clinician for people with a hospitalization with diagnosis of pneumonia (ICD-9 codes 480.0, 480.1, 480.2, 480.3, 480.8, 480.9, 481, 482.0, 482.1, 482.2, 482.30, 482.31, 482.32, 482.39, 482.40, 482.41, 482.49, 482.81, 482.82, 482.83, 482.84, 482.89, 482.9, 483.0, 483.1, 483.8, 485, 486, and 487.0) among "100% of fee-for-service Medicare beneficiaries who resided in the 306 Dartmouth Atlas hospital referral regions and had full Part A (acute care in facilities, including hospitals) and Part B (clinician services) coverage during the study periods. Beneficiaries had to be age 65 or older on … July 1, 2008." Utilization information from Medicare Provider Analysis and Review (MedPAR) files.
Service Intensity and Setting	
14) Imaging per capita standardized Medicare costs, 2011 (IOM)	Imaging (IMG) standardized per capita Medicare costs (see standardized per capita definition in 1).)
14a) Imaging events per 1,000 Medicare beneficiaries, 2011 (IOM)	Imaging (IMG) events per 1,000 Medicare beneficiaries.
14b) Imaging actual costs as a percent of total actual costs, Medicare, 2011 (IOM)	Imaging (IMG) actual Medicare costs as a percent of total actual Medicare costs.

Indicator	Description (quotes are from source descriptions below)
15) Percent of discharges from profitable DRG groups	Utilizing DRG versions 27, 28 and 29 and ICD 9 codes, based on a review of the literature and clinical knowledge, we selected DRG groups on inpatient procedures (those involving at least an overnight stay) comprising the six highest 2005 Medicare markup categories discussed in Lindrooth (2013)-- invasive cardiology, thoracic surgery, cardiovascular surgery, general surgery (including all subspecialties, but not vascular, cardiovascular, thoracic, ENT, plastic, neurosurgery, or orthopedics), neurosurgery, vascular surgery--and adding several orthopedic procedures (knee and hip replacements and spinal surgeries) discussed in Robinson 2011 based on profit margins among private payers in 2008.
16) Percent of discharges from Academic Medical Centers	For each HRR, we calculated the percentage of discharges coming from hospitals designated by the Dartmouth Atlas Project as Academic Medical Centers.
17) Hospital Care Intensity Index, 2010 (DAP)	"The HCI is based on two variables: the number of days patients spent in the hospital and the number of physician encounters (visits) they experienced as inpatients. It is computed as the age-sex-race-illness standardized ratio of patient days and visits. For each variable, the ratio of a given hospital's utilization rate to the national average was calculated, and these two ratios were averaged to create the index. The study population includes beneficiaries with one of nine chronic conditions who were enrolled in traditional (fee-for-service) Medicare and died during the measurement period. To allow for two years of follow-back for all patients, the population is restricted to those whose age on the date of death was 67 to 99 years, and to those having full Part A and Part B entitlement throughout the last two years of life. Persons enrolled in managed care organizations were excluded from the analysis. For the hospital-specific analyses, patients had to be hospitalized for chronic illness at least once during their last two years of life to be included. For regional analyses, all patients diagnosed with a chronic illness were included. Rates are adjusted for age, sex, race, primary chronic condition, and the presence of more than one chronic condition using ordinary least squares regression."
18) Percent of Medicare decedents w/ cancer diagnosis w/o hospice or enrolled during last 3 days of life, 2007 (CMWF)	"V. Mor analysis of 2007 Medicare enrollment and Medicare Provider and Analysis Review File data (CMS, MEDPAR 2007)."

Source Descriptions

- 1) and 1a): Massachusetts state data from CMS Public Use file accessed December 17, 2013 from http://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/Medicare-Geographic-Variation/GV_PUF.html (State/County table of all beneficiaries, year 2011). National average and HRR data from IOM data request to CMS on geographic variation, accessed February 14, 2013 from http://iom.edu/Activities/HealthServices/GeographicVariation/Data-Resources.aspx (HRR table, all beneficiaries, year 2011).
- 2): Commonwealth Fund Scorecard on Local Health System Performance, 2012 (data file provided March 8, 2013 by David Radley).
- 3): AHRQ Medical Expenditure Panel Survey, Massachusetts and national average from Table II.C.1 "Average total single premium (in dollars) per enrolled employee at private-sector establishments that offer health insurance by firm size and State: United States, 2011" (Total), accessed December 16, 2013 from http://meps.ahrq.gov/mepsweb/data_stats/summ_tables/insr/state/series_2/2011/tiic1.pdf; HRR data from Table IX.A.2, "Average total premiums and employee contributions (in dollars) for private-sector establishments for areas within States: United States, 2011" (Single premium), accessed October 2, 2013 from http://meps.ahrq.gov/mepsweb/data_stats/summ_tables/insr/state/series_9/2011/tixa2.pdf. For more information, see Davis, K. Sample Design of the 2011 Medical Expenditure Panel Survey Insurance Component. Methodology Report #27. March 2013. Agency for Healthcare Research and Quality, Rockville, MD. http://www.meps.ahrq.gov/mepsweb/data files/publications/mr27/mr27.pdf (accessed June 3, 2014).
- 4) through 6), 8) and 9):
    - Prevention Quality Indicators Technical Specifications can be found at http://www.qualityindicators.ahrq.gov/Modules/PQI_TechSpec.aspx.
    - Pediatric Quality Indicators Technical Specifications can be found at http://www.qualityindicators.ahrq.gov/Modules/PDI_TechSpec.aspx.
    - Avoidable emergency department visits are based on the Billings algorithm, which can be found at http://wagner.nyu.edu/faculty/billings/nyued-background.
    - Hospitalization and ED data are from AHRQ HCUP State Inpatient Databases, 2011 (IA, NY, VT, WA, WI) and State Emergency Department Databases, 2011 (IA, NY, VT, WI), California Office of Statewide Health Planning and Development (CA, 2011), Massachusetts Division of HealthCare Finance and Policy (MA, 4th Quarter 2010 through 3rd Quarter 2011), Minnesota Hospital Association (MN, 2011).
    - Population data are based on 2010 zip code tabulated U.S. Census data, accessed October 22, 2013 from http://www.census.gov/geo/reference/zctas.html.
    - PQI rates in the comparison HRRs were age-sex adjusted based on the percent of the population in that age-sex category in the corresponding Massachusetts HRR (for men and women separately, the age categories are 18-39, 40-64, 65-74 and 75 and higher).

- 7): Massachusetts state data from CMS Public Use file accessed December 17, 2013 from http://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/Medicare-Geographic-Variation/GV_PUF.html (State/County table of all beneficiaries, year 2010). National average and HRR data from IOM data request to CMS on geographic variation, accessed February 14, 2013 from http://iom.edu/Activities/HealthServices/GeographicVariation/Data-Resources.aspx (HRR table, all beneficiaries, year 2010).
- 8) and 9): see 4) through 6), 8) and 9) above.
- 10) and 11): Commonwealth Fund Scorecard on Local Health System Performance, 2012 (updated measure, data file provided March 8, 2013 by David Radley).
- 12): Commonwealth Fund Scorecard on Local Health System Performance, 2012 (data file provided March 8, 2013 by David Radley) for HRRs and Massachusetts state data. National average from http://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/OASIS/09aa_hhareports.html (accessed December 16, 2013).
- 13a) through 13f): Massachusetts state data from Dartmouth Atlas, accessed December 23, 2013 from http://www.dartmouthatlas.org/downloads/tables/post_discharge_events_state_10.xls; national average and HRR data from Dartmouth Atlas, accessed February 11, 2013 from http://www.dartmouthatlas.org/downloads/tables/post_discharge_events_hrr_10.xls. For detailed information, see Goodman, DC et al. "After Hospitalization: A Dartmouth Atlas Report on Post-Acute Care for Medicare Beneficiaries" September 28, 2011.
- 14 and 14a): Massachusetts state data from CMS Public Use file accessed December 17, 2013 from http://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/Medicare-Geographic-Variation/GV_PUF.html (State/County table of all beneficiaries, year 2011). National average and HRR data from IOM data request to CMS on geographic variation, accessed February 14, 2013 from http://iom.edu/Activities/HealthServices/GeographicVariation/Data-Resources.aspx (HRR table, all beneficiaries, year 2011).
- 15): Hospitalization data are from AHRQ HCUP State Inpatient Databases, 2011 (IA, NY, VT, WA, WI), California Office of Statewide Health Planning and Development (CA, 2011), Massachusetts Division of HealthCare Finance and Policy (MA, 4th Quarter 2010 through 3rd Quarter 2011), Minnesota Hospital Association (MN, 2011). Coding of DRG groups was done in May, 2013 on DRG27 and utilizing information from http://www.cms.gov/icd10manual/fullcode_cms/P0001.html, based on a review of the literature and clinical knowledge. Subsequent coding of DRG28 and 29 were done by medically trained staff at Rutgers Center for State Health Policy. We based our selection of DRG groups on inpatient procedures (those involving at least an overnight stay) comprising the six highest 2005 Medicare markup categories discussed in Lindrooth (2013)[55] -- invasive cardiology, thoracic surgery, cardiovascular surgery, general surgery (including all subspecialties, but not vascular, cardiovascular, thoracic, ENT, plastic, neurosurgery, or orthopedics), neurosurgery, vascular surgery--and adding several orthopedic procedures (knee and hip replacements and spinal surgeries) discussed in Robinson (2011)[56] based on profit margins among private payers in 2008.

- 16): Hospitalization data are from AHRQ HCUP State Inpatient Databases, 2011 (IA, NY, VT, WA, WI), California Office of Statewide Health Planning and Development (CA, 2011), Massachusetts Division of HealthCare Finance and Policy (MA, 4th Quarter 2010 through 3rd Quarter 2011), Minnesota Hospital Association (MN, 2011). We used academic medical centers as defined by the Dartmouth Atlas in "After Hospitalization: A Dartmouth Atlas Report on Post-Acute Care for Medicare Beneficiaries," data downloaded February 11, 2013 from http://www.dartmouthatlas.org/downloads/tables/post_discharge_events_amc_10.xls.
- 17): Massachusetts state data from Dartmouth Atlas, accessed December 23, 2013 from http://www.dartmouthatlas.org/downloads/tables/DAP_state_data_2010.xls; national average and HRR data from Dartmouth Atlas, accessed August 7, 2013 from http://www.dartmouthatlas.org/downloads/tables/DAP_hrr_data_2010.xls. For detailed information, see Goodman DC et al. "Trends and Variation in End-of-Life Care for Medicare Beneficiaries with Severe Chronic Illness" April 12, 2011 (A Report of the Dartmouth Atlas Project).
- 18): Commonwealth Fund Scorecard on Local Health System Performance, 2012 (data file provided March 8, 2013 by David Radley). National average provided in personal communication from David Radley to authors on December 16, 2013.

Appendix C: Detailed Data Tables

Table C1: Massachusetts and National Average

	Massachusetts State Average	National Average or Median HRR^	MA Performance Relative to U.S.
Health Care Spending			
1) Medicare spending, standardized risk adjusted per capita, 2011 (CMS 2013)	**$9,087**	$9,177	**+**
2) Reimbursement per commercially insured enrollee ages 18-64, 2009 (CMWF)†	**$3,158**	$3,314^	**+**
3) Total single premium, private sector, 2011 (AHRQ)	**$5,823**	$5,222	**-**
Potentially Avoidable Hospital Use			
4) Adult preventable hospitalizations overall (PQI#90) per 100,000 population (age 18+, age-sex adj)	**n/a**	n/a	
5) Pediatric preventable hospitalization overall (PDI#90), age 6-17, observed	**n/a**	n/a	
6) Avoidable emergency department visits per 100,000 population (all ages, age-sex adjusted)	**n/a**	n/a	
7) Medicare hospital 30-day readmission rate, 2010 (CMS)	**20.4%**	19.3%	**-**
8) Adult asthma/COPD admissions per 100,000 population (age 18+, age-sex adjusted)	**n/a**	n/a	
9) Adult diabetes admissions per 100,000 population (age 18+, age-sex adjusted)	**n/a**	n/a	
10) Long-stay nursing home residents hospitalized, 2010 (CMWF1)	**16.7**	19.4^	**+**
11) Short stay nursing home residents readmitted within 30 days, 2010 (CMWF1)	**19.0**	19.7^	**+**
12) Home health patients hospitalized, 4/2010 to 3/2011 (CMWF)	**29.9**	26.0	**-**
13a) Medicare AMI 30-day readmission rate, 2010 (DAP)	**20.8**	18.1	**-**
13b) Medicare CHF 30-day readmission rate, 2010 (DAP)	**21.7**	21.1	-
13c) Medicare Pneumonia 30-day readmission rate, 2010 (DAP)	**15.7**	15.3	-

	Massachusetts State Average	National Average or Median HRR^	MA Performance Relative to U.S.
13d) Medicare AMI, no ambulatory visit within 14 days, 2010 (DAP*)	**32.5**	39.3	+
13e) Medicare CHF, no ambulatory visit within 14 days, 2010 (DAP*)	**34.4**	36.4	+
13f) Medicare Pneumonia, no ambulatory visit within 14 days, 2010 (DAP*)	**34.5**	35.0	+
Service Intensity and Setting			
14) Imaging per capita Medicare standardized costs, 2011 (IOM)	**$194**	$246	+
14a) Imaging events Per 1,000 Medicare beneficiaries, 2011 (IOM)	**4,153**	4,157	+
14b) Imaging actual costs as % of total actual costs, Medicare, 2011 (IOM)	**2.0%**	2.6%	+
15) Percent of discharges from profitable DRG groups	**n/a**	n/a	
16) Percent of discharges from Academic Medical Centers	**n/a**	n/a	
17) Hospital Care Intensity Index, 2010 (DAP)	**0.97**	1.00	+
18) Percent of Medicare decedents w/ cancer diagnosis w/o hospice or enrolled during last 3 days of life, 2007 (CMWF)	**60.6**	56.7	-

Key:
+ Massachusetts (or MA HRR) outperformed national average (or comparison HRR, shown for each MA HRR).
- National average (or comparison HRR) outperformed Massachusetts (or MA HRR, shown for each MA HRR).

Sources:
Where not noted, the source is AHRQ's State Inpatient Databases (IA, NY, VT, WA, WI) and State Emergency Department Databases (IA, NY, VT, WI) or hospital utilization data provided by the state (MA, MN).
(CMWF1) updated data provided by Commonwealth Fund.
(CMWF) Commonwealth Fund Local Scorecard 2012.
(CMS) Centers for Medicare & Medicaid Services.
(DAP) Dartmouth Atlas Project.
(DAP*) Dartmouth Atlas Project, authors transformed measure from percent having follow-up to percent not having follow-up.
(IOM) Institute of Medicine.

Notes:

^Cases where the median HRR was used.

†"Commercial spending estimates, generated from a sophisticated regression model, include reimbursed costs for health care services from all sources of payment, including the health plan, enrollee, and any third-party payers, incurred during 2009. Outpatient prescription drug charges are excluded, as were enrollees with capitated plans and their associated claims. Commercial spending estimates were adjusted for enrollee age and sex, the interaction of age and sex, partial-year enrollment, and regional wage differences." Page 93, footnote 6, CMWF 2012 Local Scorecard. Data were from the 2009 Thomson Reuters MarketScan Database and analyzed by M. Chernew at Harvard.

Table C2: Boston and Comparison HRRs

	Boston HRR	***Average, Comparison HRRs***	*San Mateo County*	*Seattle*	*San Francisco*	*Burlington*
Health Care Spending						
1) Medicare spending, standardized risk adjusted per capita, 2011 (CMS 2013)	**$9,248** - - - -	***$7,597***	$7,539 -	$7,931 -	$7,037 -	$7,883 -
2) Reimbursement per commercially insured enrollee ages 18-64, 2009 (CMWF)†	**$3,243** - - - -	***$3,009***	$3,218 -	$3,183 -	$2,683 -	$2,950 -
3) Total single premium, private sector, 2011 (AHRQ)	**$5,837** - - - -	***$5,470***	$5,594 -	$5,273 -	$5,698 -	$5,313 -
Potentially Avoidable Hospital Use						
4) Adult preventable hospitalizations overall (PQI#90) per 100,000 population (age 18+, age-sex adj)	**1,717** - - - -	***1,015***	763 -	898 -	994 -	1,404 -
5) Pediatric preventable hospitalization overall (PDI#90), age 6-17, observed	**198** - - - -	***71***	44 -	93 -	62 -	86 -
6) Avoidable emergency department visits per 100,000 population (all ages, age-sex adjusted)	**15,847** - - +	***13,767***	10,785 -	n/a	12,635 -	17,882 +
7) Medicare hospital 30-day readmission rate, 2010 (CMS)	**20.4%** - - - -	***17.4%***	16.9% -	17.0% -	18.9% -	16.9% -
8) Adult asthma/COPD admissions per 100,000 population (age 18+, age-sex adjusted)	**386** - - - -	***203***	117 -	145 -	195 -	353 -
9) Adult diabetes admissions per 100,000 population (age 18+, age-sex adjusted)	**173** - - - -	***119***	100 -	110 -	129 -	138 -
10) Long-stay nursing home residents hospitalized, 2010 (CMWF1)	**13.4** + + + +	***15.3***	13.8 +	13.6 +	16.2 +	17.7 +
11) Short stay nursing home residents readmitted within 30 days, 2010 (CMWF1)	**19.2** - - + -	***17.4***	17.3 -	16.3 -	19.6 +	16.3 -
12) Home health patients hospitalized, 4/2010 to 3/2011 (CMWF)	**29.3** - - - -	***24.7***	23.4 -	23.1 -	23.1 -	29.3 -

	Boston HRR	***Average, Comparison HRRs***	*San Mateo County*	*Seattle*	*San Francisco*	*Burlington*
13a) Medicare AMI 30-day readmission rate, 2010 (DAP)	**20.9** - - -	***16.8***		15.1 -	17.9 -	17.3 -
13b) Medicare CHF 30-day readmission rate, 2010 (DAP)	**21.8** + - - -	***21.1***	24.1 +	18.7 -	20.6 -	21.1 -
13c) Medicare Pneumonia 30-day readmission rate, 2010 (DAP)	**16.0** - - - -	***14.2***	14.7 -	14.2 -	14.0 -	14.1 -
13d) Medicare AMI, no ambulatory visit within 14 days, 2010 (DAP*)	**34.1** - - + +	***33.3***	32.7 -	25.3 -	37.1 +	37.9 +
13e) Medicare CHF, no ambulatory visit within 14 days, 2010 (DAP*)	**35.8** - - + -	***33.2***	32.1 -	27.3 -	37.5 +	35.7 -
13f) Medicare Pneumonia, no ambulatory visit within 14 days, 2010 (DAP*)	**37.0** + - + +	***36.2***	39.4 +	25.7 -	40.8 +	38.8 +
Service Intensity and Setting						
14) Imaging per capita Medicare standardized costs, 2011 (IOM)	**$199** + + - -	***$168***	$201 +	$206 +	$150 -	$114 -
14a) Imaging events Per 1,000 Medicare beneficiaries, 2011 (IOM)	**4,254** - - - -	***3,139***	3,023 -	3,425 -	2,914 -	3,195 -
14b) Imaging actual costs as % of total actual costs, Medicare, 2011 (IOM)	**2.0%** + + - -	***2.2%***	2.7% +	2.7% +	1.8% -	1.4% -
15) Percent of discharges from profitable DRG groups	**11.8%** + + - +	***12.4%***	12.3% +	13.5% +	10.8% -	12.9% +
16) Percent of discharges from Academic Medical Centers	**28.2%** - - - +	***15.1%***	13.1% -	4.9% -	9.5% -	32.7% +
17) Hospital Care Intensity Index, 2010 (DAP)	**1.00** - - - -	***0.81***	0.94 -	0.66 -	0.94 -	0.70 -
18) Percent of Medicare decedents w/ cancer diagnosis w/o hospice or enrolled during last 3 days of life, 2007 (CMWF)	**60.8** + - + -	***62.8***	60.9 +	60.4 -	69.6 +	60.2 -

Key:
+ Massachusetts (or MA HRR) outperformed national average (or comparison HRR, shown for each MA HRR).
- National average (or comparison HRR) outperformed Massachusetts (or MA HRR, shown for each MA HRR).

Sources:
Where not noted, the source is AHRQ's State Inpatient Databases (IA, NY, VT, WA, WI) and State Emergency Department Databases (IA, NY, VT, WI) or hospital utilization data provided by the state (MA, MN).
(CMWF1) updated data provided by Commonwealth Fund.
(CMWF) Commonwealth Fund Local Scorecard 2012.
(CMS) Centers for Medicare & Medicaid Services.
(DAP) Dartmouth Atlas Project.
(DAP*) Dartmouth Atlas Project, authors transformed measure from percent having follow-up to percent not having follow-up.
(IOM) Institute of Medicine.

Notes:
†"Commercial spending estimates, generated from a sophisticated regression model, include reimbursed costs for health care services from all sources of payment, including the health plan, enrollee, and any third-party payers, incurred during 2009. Outpatient prescription drug charges are excluded, as were enrollees with capitated plans and their associated claims. Commercial spending estimates were adjusted for enrollee age and sex, the interaction of age and sex, partial-year enrollment, and regional wage differences." Page 93, footnote 6, CMWF 2012 Local Scorecard. Data were from the 2009 Thomson Reuters MarketScan Database and analyzed by M. Chernew at Harvard.

Table C3: Worcester and Comparison HRRs

	Worcester HRR	***Average, Comparison HRRs***	*Minn-eapolis*	*St. Paul*	*Madison*	*Burlington*
Health Care Spending						
1) Medicare spending, standardized risk adjusted per capita, 2011 (CMS 2013)	**$8,735** - - - -	***$8,161***	$8,510 -	$8,402 -	$7,850 -	$7,883 -
2) Reimbursement per commercially insured enrollee ages 18-64, 2009 (CMWF)†	**$2,961** + + + -	***$3,561***	$3,565 +	$3,496 +	$4,232 +	$2,950 -
3) Total single premium, private sector, 2011 (AHRQ)	**$5,777** - - - -	***$5,412***	$5,435 -	$5,435 -	$5,466 -	$5,313 -
Potentially Avoidable Hospital Use						
4) Adult preventable hospitalizations overall (PQI#90) per 100,000 population (age 18+, age-sex adj)	**1,699** - - - -	***1,184***	1,122 -	1,026 -	1,214 -	1,373 -
5) Pediatric preventable hospitalization overall (PDI#90), age 6-17, observed	**140** - - - -	***90***	103 -	86 -	86 -	86 -
6) Avoidable emergency department visits per 100,000 population (all ages, age-sex adjusted)	**15,352** - - - +	***13,557***	12,433 -	11,946 -	12,225 -	17,622 +
7) Medicare hospital 30-day readmission rate, 2010 (CMS)	**22.0%** - - - -	***17.4%***	17.7% -	19.0% -	16.1% -	16.9% -
8) Adult asthma/COPD admissions per 100,000 population (age 18+, age-sex adjusted)	**425** - - - -	***243***	203 -	190 -	235 -	343 -
9) Adult diabetes admissions per 100,000 population (age 18+, age-sex adjusted)	**169** - - - -	***129***	116 -	134 -	128 -	137 -
10) Long-stay nursing home residents hospitalized, 2010 (CMWF1)	**19.8** - - - -	***11.4***	7.8 -	10.4 -	9.9 -	17.7 -
11) Short stay nursing home residents readmitted within 30 days, 2010 (CMWF1)	**19.4** - - - -	***16.3***	16.2 -	17.8 -	14.9 -	16.3 -
12) Home health patients hospitalized, 4/2010 to 3/2011 (CMWF)	**31.9** - - - -	***28.3***	28.3 -	29.8 -	25.7 -	29.3 -

	Worcester HRR	***Average, Comparison HRRs***	*Minn-eapolis*	*St. Paul*	*Madison*	*Burlington*
13a) Medicare AMI 30-day readmission rate, 2010 (DAP)	**18.6** - - - -	***16.4***	16.7 -	16.4 -	15.1 -	17.3 -
13b) Medicare CHF 30-day readmission rate, 2010 (DAP)	**24.7** - - - -	***20.4***	20.1 -	20.1 -	20.5 -	21.1 -
13c) Medicare Pneumonia 30-day readmission rate, 2010 (DAP)	**15.8** - - - -	***13.8***	14.2 -	14.2 -	12.5 -	14.1 -
13d) Medicare AMI, no ambulatory visit within 14 days, 2010 (DAP*)	**29.4** + - + +	***34.9***	34.5 +	26.9 -	40.5 +	37.9 +
13e) Medicare CHF, no ambulatory visit within 14 days, 2010 (DAP*)	**32.3** - - - +	***30.9***	31.5 -	28.2 -	28.2 -	35.7 +
13f) Medicare Pneumonia, no ambulatory visit within 14 days, 2010 (DAP*)	**30.0** + + - +	***35.3***	36.0 +	40.8 +	25.6 -	38.8 +
Service Intensity and Setting						
14) Imaging per capita Medicare standardized costs, 2011 (IOM)	**$176** - - - -	***$149***	$169 -	$172 -	$139 -	$114 -
14a) Imaging events Per 1,000 Medicare beneficiaries, 2011 (IOM)	**3,903** - - - -	***3,258***	3,344 -	3,313 -	3,180 -	3,195 -
14b) Imaging actual costs as % of total actual costs, Medicare, 2011 (IOM)	**1.8%** + + + -	***1.8%***	2.0% +	2.0% +	1.8% +	1.4% -
15) Percent of discharges from profitable DRG groups	**12.0%** + + + +	**13.3%**	13.3% +	12.7% +	14.3% +	12.9% +
16) Percent of discharges from Academic Medical Centers	**25.2%** - - - +	**15.4%**	6.4% -	5.6% -	16.8% -	32.7% +
17) Hospital Care Intensity Index, 2010 (DAP)	**0.87** - - - -	***0.69***	0.70 -	0.70 -	0.64 -	0.70 -
18) Percent of Medicare decedents w/ cancer diagnosis w/o hospice or enrolled during last 3 days of life, 2007 (CMWF)	**60.1** - - - +	***55.6***	55.0 -	56.5 -	50.7 -	60.2 +

Key:
+ Massachusetts (or MA HRR) outperformed national average (or comparison HRR, shown for each MA HRR).
- National average (or comparison HRR) outperformed Massachusetts (or MA HRR, shown for each MA HRR).

Sources:
Where not noted, the source is AHRQ's State Inpatient Databases (IA, NY, VT, WA, WI) and State Emergency Department Databases (IA, NY, VT, WI) or hospital utilization data provided by the state (MA, MN).
(CMWF1) updated data provided by Commonwealth Fund.
(CMWF) Commonwealth Fund Local Scorecard 2012.
(CMS) Centers for Medicare & Medicaid Services.
(DAP) Dartmouth Atlas Project.
(DAP*) Dartmouth Atlas Project, authors transformed measure from percent having follow-up to percent not having follow-up.
(IOM) Institute of Medicine.

Notes:
†"Commercial spending estimates, generated from a sophisticated regression model, include reimbursed costs for health care services from all sources of payment, including the health plan, enrollee, and any third-party payers, incurred during 2009. Outpatient prescription drug charges are excluded, as were enrollees with capitated plans and their associated claims. Commercial spending estimates were adjusted for enrollee age and sex, the interaction of age and sex, partial-year enrollment, and regional wage differences." Page 93, footnote 6, CMWF 2012 Local Scorecard. Data were from the 2009 Thomson Reuters MarketScan Database and analyzed by M. Chernew at Harvard.

Table C4: Springfield and Comparison HRRs

	Springfield HRR	***Average, Comparison HRRs***	*Seattle*	*Burlington*	*Iowa City*	*Rochester*
Health Care Spending						
1) Medicare spending, standardized risk adjusted per capita, 2011 (CMS 2013)	**$8,305** **- - + -**	***$7,860***	$7,931 -	$7,883 -	$8,370 +	$7,256 -
2) Reimbursement per commercially insured enrollee ages 18-64, 2009 (CMWF)†	**$2,694** **+ + + -**	***$2,872***	$3,183 +	$2,950 +	$3,035 +	$2,319 -
3) Total single premium, private sector, 2011 (AHRQ)	**$5,777** **- - - -**	***$5,058***	$5,273 -	$5,313 -	$4,607 -	$5,037 -
Potentially Avoidable Hospital Use						
4) Adult preventable hospitalizations overall (PQI#90) per 100,000 population (age 18+, age-sex adj)	**1,536** **- - - -**	***1,298***	926 -	1,443 -	1,435 -	1,390 -
5) Pediatric preventable hospitalization overall (PDI#90), age 6-17, observed	**101** **- - - -**	***91***	93 -	86 -	75 -	110 -
6) Avoidable emergency department visits per 100,000 population (all ages, age-sex adjusted)	**18,815** **- - -**	***16,551***	n/a	17,907 -	18,264 -	13,483 -
7) Medicare hospital 30-day readmission rate, 2010 (CMS)	**18.7%** **- - - +**	***17.6%***	17.0% -	16.9% -	16.8% -	19.8% +
8) Adult asthma/COPD admissions per 100,000 population (age 18+, age-sex adjusted)	**341** **- + - -**	***263***	148 -	360 +	290 -	254 -
9) Adult diabetes admissions per 100,000 population (age 18+, age-sex adjusted)	**179** **- - - +**	***146***	110 -	139 -	153 -	180 +
10) Long-stay nursing home residents hospitalized, 2010 (CMWF1)	**13.7** **- + + -**	***17.6***	13.6 -	17.7 +	30.4 +	8.9 -
11) Short stay nursing home residents readmitted within 30 days, 2010 (CMWF1)	**17.9** **- - - -**	***16.0***	16.3 -	16.3 -	14.6 -	17.0 -
12) Home health patients hospitalized, 4/2010 to 3/2011 (CMWF)	**31.7** **- - + +**	***29.3***	23.1 -	29.3 -	32.1 +	32.6 +

	Springfield HRR	***Average, Comparison HRRs***	*Seattle*	*Burlington*	*Iowa City*	*Rochester*
13a) Medicare AMI 30-day readmission rate, 2010 (DAP)	**20.5** **- - - -**	***17.1***	15.1 -	17.3 -	16.9 -	18.9 -
13b) Medicare CHF 30-day readmission rate, 2010 (DAP)	**16.5** **+ + - +**	***19.3***	18.7 +	21.1 +	16.2 -	21.2 +
13c) Medicare Pneumonia 30-day readmission rate, 2010 (DAP)	**14.2** **+ - + +**	***15.1***	14.2 +	14.1 -	16.2 +	16.0 +
13d) Medicare AMI, no ambulatory visit within 14 days, 2010 (DAP*)	**25.9** **- + + +**	***33.1***	25.3 -	37.9 +	40.0 +	29.2 +
13e) Medicare CHF, no ambulatory visit within 14 days, 2010 (DAP*)	**28.3** **- + + +**	***31.3***	27.3 -	35.7 +	32.6 +	29.5 +
13f) Medicare Pneumonia, no ambulatory visit within 14 days, 2010 (DAP*)	**26.2** **- + + +**	***33.5***	25.7 -	38.8 +	35.4 +	34.2 +
Service Intensity and Setting						
14) Imaging per capita Medicare standardized costs, 2011 (IOM)	**$187** **+ - - +**	***$161***	$206 +	$114 -	$132 -	$190 +
14a) Imaging events Per 1,000 Medicare beneficiaries, 2011 (IOM)	**3,768** **- - - -**	***3,315***	3,425 -	3,195 -	3,200 -	3,439 -
14b) Imaging actual costs as % of total actual costs, Medicare, 2011 (IOM)	**2.2%** **+ - - +**	***2.1%***	2.7% +	1.4% -	1.7% -	2.5% +
15) Percent of discharges from profitable DRG groups	**11.8%** **+ + + +**	**13.4%**	13.5% +	12.9% +	13.4% +	13.7% +
16) Percent of discharges from Academic Medical Centers	**3.1%** **+ + + +**	**23.7%**	4.9% +	32.7% +	32.9% +	24.3% +
17) Hospital Care Intensity Index, 2010 (DAP)	**0.83** **- - - +**	***0.72***	0.66 -	0.70 -	0.67 -	0.83 +
18) Percent of Medicare decedents w/ cancer diagnosis w/o hospice or enrolled during last 3 days of life, 2007 (CMWF)	**62.0** **- - - -**	***55.4***	60.4 -	60.2 -	44.9 -	56.0 -

Key:
+ Massachusetts (or MA HRR) outperformed national average (or comparison HRR, shown for each MA HRR).
- National average (or comparison HRR) outperformed Massachusetts (or MA HRR, shown for each MA HRR).

Sources:
Where not noted, the source is AHRQ's State Inpatient Databases (IA, NY, VT, WA, WI) and State Emergency Department Databases (IA, NY, VT, WI) or hospital utilization data provided by the state (MA, MN).
(CMWF1) updated data provided by Commonwealth Fund.
(CMWF) Commonwealth Fund Local Scorecard 2012.
(CMS) Centers for Medicare & Medicaid Services.
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(DAP*) Dartmouth Atlas Project, authors transformed measure from percent having follow-up to percent not having follow-up.
(IOM) Institute of Medicine.

Notes:
†"Commercial spending estimates, generated from a sophisticated regression model, include reimbursed costs for health care services from all sources of payment, including the health plan, enrollee, and any third-party payers, incurred during 2009. Outpatient prescription drug charges are excluded, as were enrollees with capitated plans and their associated claims. Commercial spending estimates were adjusted for enrollee age and sex, the interaction of age and sex, partial-year enrollment, and regional wage differences." Page 93, footnote 6, CMWF 2012 Local Scorecard. Data were from the 2009 Thomson Reuters MarketScan Database and analyzed by M. Chernew at Harvard.

Endnotes

[1] Christine E. Eibner, Peter S. Hussey, M. Susan Ridgely, & Elizabeth A. McGlynn. Controlling Health Care Spending in Massachusetts: An Analysis of Options. August, 2009. RAND Corporation.

[2] Zirui Song, Dana Gelb Safran, Bruce E. Landon, Mary Beth Landrum, Yulei He, Robert E. Mechanic, Matthew P. Day, and Michael E. Chernew. The 'Alternative Quality Contract,' Based On A Global Budget, Lowered Medical Spending And Improved Quality. HEALTH AFFAIRS 31, NO. 8 (August 2012).

[3] Selective network means that not all providers are included, and tiered network means that consumers have higher cost sharing for some providers.

[4] See http://www.mass.gov/hpc.

[5] Robert E. Mechanic, Stuart H. Altman, and John E. McDonough. The New Era Of Payment Reform, Spending Targets, And Cost Containment In Massachusetts: Early Lessons For The Nation. HEALTH AFFAIRS 31, NO. 10 (October 2012).

[6] Zirui Song, Dana Gelb Safran, Bruce E. Landon, Mary Beth Landrum, Yulei He, Robert E. Mechanic, Matthew P. Day, and Michael E. Chernew. The 'Alternative Quality Contract,' Based On A Global Budget, Lowered Medical Spending And Improved Quality. HEALTH AFFAIRS 31, NO. 8 (August 2012).

[7] Blue Cross Blue Shield of Massachusetts Foundation. Chapter 224 Tracking Tool. September, 2014. Anna Gosline and Elizabeth Rodman. Summary of Chapter 224 of the Acts of 2012, Blue Cross Blue Shield of Massachusetts Foundation, September 2012.

[8] Blue Cross Blue Shield of Massachusetts Foundation. Health Care Costs and Spending in Massachusetts: A Review of the Evidence. March, 2012.

[9] Accessed December 16, 2014 at http://www.cms.gov/NationalHealthExpendData/downloads/resident-state-estimates.zip.

[10] Commonwealth of Massachusetts. Health Policy Commission. 2013 Cost Trends Report. Boston, MA, 2014.

[11] Blue Cross Blue Shield of Massachusetts Foundation. Health Care Costs and Spending in Massachusetts: A Review of the Evidence. March, 2012.

[12] Massachusetts Division of Health Care Finance and Policy. Massachusetts Health Care Cost Trends: Premiums and Expenditures. May, 2012.

[13] Commonwealth of Massachusetts. Health Policy Commission. 2013 Cost Trends Report. Boston, MA, 2014.

[14] See Health Care Cost and Utilization Reports, available from http://www.healthcostinstitute.org/publications-and-research.

[15] Blue Cross Blue Shield of Massachusetts Foundation. Health Care Costs and Spending in Massachusetts: A Review of the Evidence. March, 2012.

[16] Anna Gosline and Elizabeth Rodman. Summary of Chapter 224 of the Acts of 2012, Blue Cross Blue Shield of Massachusetts Foundation, September 2012.

[17] Commonwealth of Massachusetts. Health Policy Commission. 2013 Cost Trends Report. Boston, MA, 2014.

[18] David C. Radley, Douglas McCarthy, Jacob A. Lippa, Susan L. Hayes, and Cathy Schoen. Aiming Higher: Results from a State Scorecard on Health System Performance, 2014. Commonwealth Fund Commission on a High Performance Health System. Massachusetts State Profile. May, 2014. Douglas McCarthy, Sabrina K. H. How, Cathy Schoen, Joel C. Cantor, and Dina Belloff. Aiming Higher: Results from a State Scorecard on Health System Performance, 2009. Commonwealth Fund Commission on a High Performance Health System. October, 2009.

[19] Massachusetts Division of Health Care Finance and Policy. Massachusetts Health Care Cost Trends: Efficiency of Emergency Department Utilization in Massachusetts. August, 2012.

[20] Massachusetts Division of Health Care Finance and Policy. Massachusetts Health Care Cost Trends: Preventable Hospitalizations. August, 2012.

[21] Stacy Eccleston. Challenges in Coordination of Health Care Services. Massachusetts Division of Health Care Finance and Policy, June, 2011.

[22] Diana Farrell, Eric Jensen, Bob Kocher, Nick Lovegrove, Fareed Melhem, Lenny Mendonca, Beth Parish. Accounting for the cost of US health care: A new look at why Americans spend more. McKinsey Global Institute, December 2008.

[23] Douglas McCarthy, Sabrina K.H. How, Ashley-Kay Fryer, David C. Radley & Cathy Schoen. Why Not the Best? Results from the National Scorecard on U.S. Health System Performance, 2011. Commonwealth Fund.

[24] Paul B. Ginsburg. High and rising health care costs: Demystifying U.S. health care spending. Research Synthesis Report No. 16, Robert Wood Johnson Foundation, October 2008.

[25] James C. Robinson. "More Evidence of the Association Between Hospital market Concentration and Higher Prices and Profits." Expert Voices in Health Care Policy, National Institute for Health Care Management Foundation. November, 2011.

[26] Blue Cross Blue Shield of Massachusetts Foundation. Health Care Costs and Spending in Massachusetts: A Review of the Evidence. March, 2012.

[27] Diana Farrell, Eric Jensen, Bob Kocher, Nick Lovegrove, Fareed Melhem, Lenny Mendonca, Beth Parish. Accounting for the cost of US health care: A new look at why Americans spend more. McKinsey Global Institute, December 2008. (p.39 on outpatient procedures, p.46 on physician compensation, p.50 on diagnostics).

[28] IOM (Institute of Medicine). 2012. Best care at lower cost: The path to continuously learning health care in America. Washington, DC: The National Academies Press; B. James, and K. B. Bayley. 2006. Cost of poor quality or waste in integrated delivery system settings. Final report. Rockville, MD: Agency for Healthcare Research and Quality; Fisher, et al. 2003. The implications of regional variations in medicare spending. Annals of Internal Medicine 138(4):273- 298; Institute of Medicine. 2010. The healthcare imperative: Lowering costs and improving outcomes. Washington, DC: The National Academies Press.

[29] Steven B. Cohen and William Yu. The Concentration and Persistence in the Level of Health Expenditures over Time: Estimates for the U.S. Population, 2008-2009. Statistical Brief #354. January 2012. Agency for Healthcare Research and Quality, Rockville, MD.

[30] See "Commission on a High Performance Health System", accessed December 10, 2012 from http://www.commonwealthfund.org/Program-Areas/Health-Reform-Policy/Commission-on-a-High-Performance-Health-System.aspx.

[31] See "Health System Scorecards," accessed October 7, 2014 from http://www.commonwealthfund.org/Publications/Health-System-Scorecards.aspx.

[32] Two to three members of the research team participated in each interview. Appendix A contains our interview questions and informed consent document.

[33] Dartmouth Atlas, 2006 Hospital Referral Regions, Selected hospital and physician capacity measures, accessed November 27, 2012 from http://www.dartmouthatlas.org/tools/downloads.aspx.

[34] There are 306 HRRs in the U.S.—and each has at least one site performing major cardiovascular surgery and neurosurgery. See http://www.dartmouthatlas.org/data/region/, accessed October 7, 2014.

[35] Various reports on this topic from the Center for Health Information and Analysis are available at http://www.mass.gov/chia/researcher/chia-publications.html#relative_price.

[36] In 2011, the year of most of our measures, Medicare Advantage enrollment was 18% in Massachusetts. States containing comparison HRRs were both above and below Massachusetts—enrollment was 36% in California, 12% in Iowa, 44% in Minnesota, 30% in New York, 24% in Washington, 30% in Wisconsin, and 5% in Vermont. Marsha Gold, Gretchen Jacobson, Anthony Damico, and Tricia Neuman, "Medicare Advantage Enrollment Market Update." Kaiser Family Foundation, September 2011.

[37] See the Commonwealth Scorecards on State Health System Performance, various years, available at http://www.commonwealthfund.org/publications/health-system-scorecards.

[38] We looked at chronic versus acute PQI indicators and didn't find a difference for our regions. We attempted to adjust asthma and diabetes admissions with prevalence-based population denominators from the CDC's Behavioral Risk Factors Surveillance Survey, but the estimates for our regions were too uncertain to include.

[39] To create hospital service areas, zip codes are assigned each hospital based on where the greatest proportion of Medicare residents are hospitalized—see http://www.dartmouthatlas.org/data/region/, accessed October 7, 2014.

[40] See http://www.dartmouthatlas.org/data/region/, accessed October 7, 2014.

[41] Accessed November 11, 2014 from http://www.dartmouthatlas.org/data/region/.

[42] See Appendix A3, p.86 of the Local Scorecard for these rankings. David C. Radley, Sabrina K. H. How, Ashley-Kay Fryer, Douglas McCarthy, and Cathy Schoen. Rising to the Challenge: Results from a Scorecard on Local Health System Performance, 2012. Commonwealth Fund Commission on a High Performance Health System. March, 2012.

[43] See Appendix A3, p.86 of the Local Scorecard for these rankings. David C. Radley, Sabrina K. H. How, Ashley-Kay Fryer, Douglas McCarthy, and Cathy Schoen. Rising to the Challenge: Results from a Scorecard on Local Health

System Performance, 2012. Commonwealth Fund Commission on a High Performance Health System. March, 2012.

[44] State-specific requests were necessary in California and Minnesota.

[45] The Lebanon, New Hampshire was the top match for the Springfield HRR, but New Hampshire did not have data availability for a comparable time period as the other comparison regions. The next three matches we were able to obtain. The fifth and sixth-highest matches were in Maine, which only releases three digit zip codes, not sufficient to generate HRR-level estimates.

[46] See http://www.dartmouthatlas.org/data/region/, accessed October 9, 2014.

[47] In the case of readmissions, we calculated the potential change in readmission rates and applied that to the number of Medicare admissions (from the same data source).

[48] Daniel Kazzaz. Preventable readmissions and physician notification. Journal of Hospital Administration, 2014, Vol. 3, No. 1.

[49] See "The Massachusetts Health Information Highway (The HIway)," accessed October 31, 2014 from http://www.mass.gov/eohhs/gov/commissions-and-initiatives/masshiway/.

[50] Examining additional measures from the same data source also showed that imaging costs as a percent of total costs were similar to comparison HRRs (ten percent lower in the Boston HRR), suggesting that more use of imaging is part of a larger picture of higher care intensity in Massachusetts as opposed to an unusual focus on imaging.

[51] Pittsfield, Massachusetts and its Berkshire Medical Center are part of the Albany, NY HRR and are not included in our analysis.

[52] David C. Radley, Douglas McCarthy, Jacob A. Lippa, Susan L. Hayes, and Cathy Schoen. Aiming Higher: Results from a State Scorecard on Health System Performance, 2014. Commonwealth Fund Commission on a High Performance Health System. May, 2014.

[53] Center for Health Information and Analysis. Annual Report on the Performance of the Massachusetts Health Care System. September, 2014.

[54] Liz Kowalczyk. 3-hospital takeover by Partners OK'd. Boston Globe, May 20, 2014. Accessed May 23, 2014 from http://www.bostonglobe.com/...9/court-appointed-monitor-will-oversee-partners-healthcare-for-years/Eqqhh248xtbVf8DiCnjl8M/story.html.

[55] Lindrooth, R. C., Konetzka, R. T., Navathe, A. S., Zhu, J., Chen, W. and Volpp, K. (2013), The Impact of Profitability of Hospital Admissions on Mortality. Health Services Research, 48(2): 792–809.

[56] Robinson, J.C. (2011), Hospital Market Concentration, Pricing, and Profitability in Orthopedic Surgery and Interventional Cardiology. American Journal of Managed Care, 17(6): e241-e248.

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