

Analysis of
Price Variations in
New Hampshire Hospitals

PREPARED FOR

The New Hampshire Insurance Division

BY

Katharine London, M.S.
Michael G. Grenier, M.P.A.
Thomas N. Friedman, M.P.A.
Paul T. Swoboda, M.S.



EXECUTIVE SUMMARY

Introduction

This report was completed pursuant to New Hampshire Revised Statutes Annotated (N.H. Rev. Stat. Ann.) § 420-G: 14-a, which required the New Hampshire Insurance Department (NHID) to hold annual public hearings and evaluate the factors that contribute to rising health care costs. Specifically, the statute requires the following:

*The commissioner shall identify variations in the price that health carriers pay for health care services and shall undertake further analysis to determine whether the observed price variations correlate to the sickness or the complexity of the population served, the relative proportion of patients on Medicare or Medicaid that are served by the health care provider, the cost to the health care provider of delivering the service, or the relative proportion of free or reduced care provided to the uninsured.*¹

Key Terms

Price: The dollar amount the hospital received from the insurer plus the patient liability. Hospitals and insurers refer to this amount as the “allowed amount.”

Charge: The full, undiscounted dollar amount billed by a hospital for a specific service

Cost: The dollar amount incurred by the hospital for providing patient care services, including salaries, supplies, capital, and other items

Casemix: A measure of acuity for a given population, with higher values reflecting higher acuity and complexity

The NHID contracted with the Center for Health Law and Economics at the University of Massachusetts Medical School (UMMS) to analyze the price variations present in the New Hampshire hospital market. This report summarizes the analyses completed and presents the relevant findings.

Analysis

The UMMS team relied on a number of data sources to complete its analysis, including:

- claims data from the New Hampshire Comprehensive Health Care Information System (NHCHIS) for CY2009;
- data from the New Hampshire Hospital Discharge Dataset (HDD), calendar year 2009,
- uninsured charge data from the Medicaid Enhancement Tax (MET) forms; and
- CMS-2552 cost report data from hospital fiscal year 2009.

¹ NH RSA § 420-G: 14-a, paragraph V.

Using the source data described above, the UMMS team calculated the average prices paid to the 26 New Hampshire acute hospitals² by commercial carriers for both inpatient and outpatient services. These prices were adjusted to account for differences in patient acuity and resource use. In addition to the factors cited in the statute, the UMMS team identified other factors that might be related to differences in commercial prices. These additional factors included hospital location, designation as a Critical Access Hospital (CAH), total margin, hospital size, and occupancy rate.

To assess the relationship between commercial prices and the various factors, the UMMS team completed correlation analyses. The correlation analyses indicate which factors were most likely related to the relative level of hospital prices, whether the relationships were positive or negative, and the strength of these relationships. The payments per casemix-adjusted discharge and encounter were correlated against the various factors to determine the strength of the relationship between the price level and factor.

Key Findings

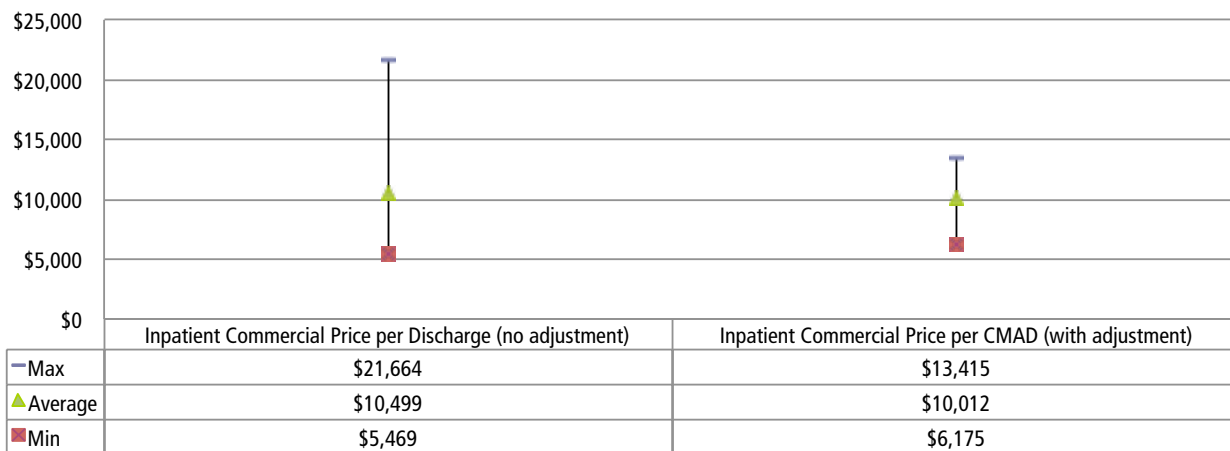
The commercial prices paid to New Hampshire hospitals varied widely, before and after adjusting for casemix. The analysis demonstrated that commercial prices tend to rise with higher hospital costs and higher patient acuity. Higher commercial prices were also related to some measures of higher Medicare payer mix. Higher Medicaid payer mix was associated with lower commercial prices for outpatient services, although no similar relationship existed for inpatient services. No significant relationships were found between commercial prices and the proportion of free or reduced fee care provided by hospitals.

Inpatient Services

- Without adjusting for casemix, average inpatient commercial prices had a percent variance of approximately 300%. After adjusting for casemix, prices varied by 117%.

Figure 1

**Ranges of Commercial Inpatient Prices,
With and Without Adjustments for Casemix**



2 Specialty and rehabilitation hospitals were excluded from the analysis.

- The analysis found statistically significant ($p < .05$) positive correlations, indicating that as inpatient commercial prices increase these variables also tend to increase, between inpatient hospital price and occupancy rate, hospital cost per commercial discharge, Medicare percent of inpatient charges, and commercial and all-payer casemix indices. Statistically significant at the $p < 0.05$ level means that there is a less than 5% chance that the correlation could have occurred by chance.

Figure 2: Results of Inpatient Correlation Analysis

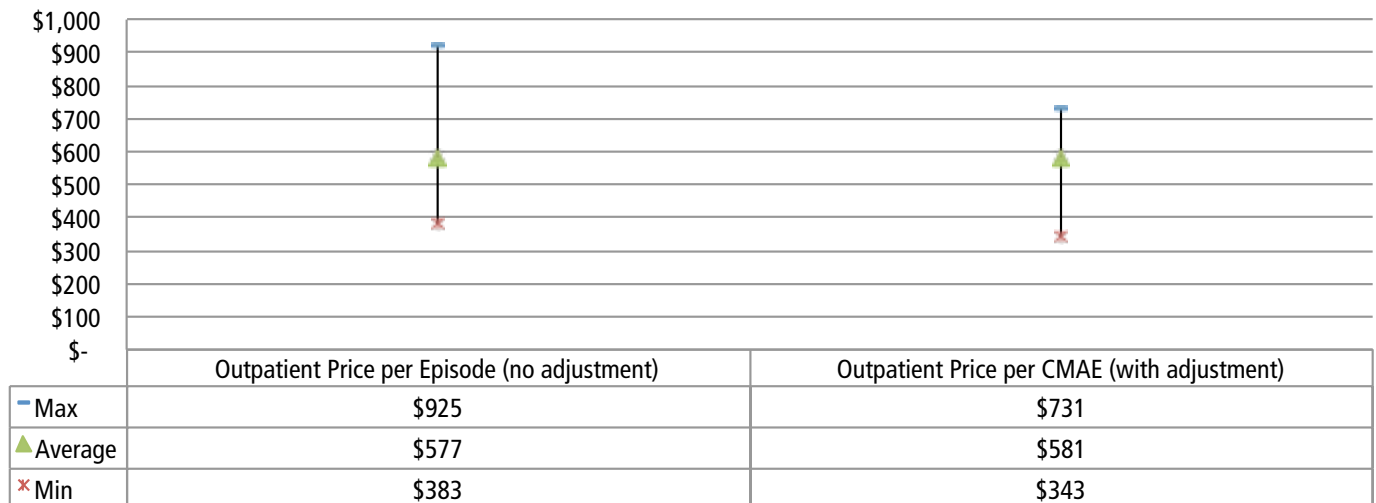
Statistically significant positive correlations found between inpatient hospital price and:	No statistically significant correlations between inpatient hospital price and:
Occupancy Rate	Commercial Cost per CMAD
Commercial Cost per Discharge	Medicaid percent of charges
Medicare percent of inpatient charges	Number of Beds
Commercial casemix Index	Total Margin
All Payer casemix Index	Medicare percent of discharges
	Uninsured percent of charges
	Medicaid percent of discharges
	Medicaid percent of days
	Hospital location
	Designation as a critical access hospital

Outpatient Services

- Prior to adjusting for casemix, outpatient commercial prices varied by 141%; after adjustment, prices varied by 113%.

Figure 3

Ranges of Commercial Outpatient Prices, With and Without Adjustments for Casemix



- The analysis found statistically significant **positive** correlations, indicating that as outpatient commercial prices increase these variables also tend to increase, between outpatient hospital price and commercial cost per casemix adjusted episode, Medicare percent of discharges, and Medicare percent of outpatient charges.
- The analysis found statistically significant **negative** correlations, indicating that as outpatient commercial prices increase these variables tend to decrease, between outpatient hospital price and Medicaid percent of inpatient days and Medicaid percent of inpatient discharges. (Inpatient utilization statistics were used as a proxy for payer mix.)

Figure 4: Results of Outpatient Correlation Analysis

Statistically significant positive correlations found between outpatient hospital price and:	No statistically significant correlations were found between outpatient hospital price and:
Commercial Cost per casemix Adjusted Episode	Commercial Cost per Episode
Medicare percent of discharges	Medicare percent of days
Medicare percent of outpatient charges	Total Margin
	Medicaid percent of charges
Statistically significant negative correlations found between outpatient hospital price and:	Number of Beds
Medicaid percent of days	Uninsured percent of charges
Medicaid percent of discharges	Outpatient casemix Index
	Total Episodes

Conclusion

In summary, the analysis indicated that there are certain factors that are correlated with a hospital's level of commercial prices. A hospital's cost and casemix are the most consistent predictor of a hospital's commercial prices for both inpatient and outpatient services. This suggests that hospitals and payers seriously consider patient acuity and service complexity when negotiating payment rates and corresponding payment models.

For inpatient services, the higher a hospital's occupancy rate, the more likely it is to have higher commercial prices. One reason for this finding may be that hospitals that have higher demand for their beds may command higher prices from insurers. Additional analysis is needed to explore this finding further.

Finally, the analysis indicated some relationship between a hospital's public payer mix and its level of commercial prices. If hospitals shift the cost of underpayments from public payers to private payers, we would expect to see higher commercial prices associated with higher public payer mix. However, the results of the analysis were mixed:

- Hospitals with higher proportions of Medicare charges were more likely to have higher commercial prices for both inpatient and outpatient services;
- Hospitals with higher proportions of Medicaid days and Medicaid discharges tended to receive lower commercial prices for outpatient services, and no relationship was found between proportion of Medicaid charges and inpatient service commercial prices.
- No significant relationships were found between proportion of uninsured charges and commercial prices for either inpatient or outpatient services.

The findings suggest a complex relationship between public payer mix and commercial prices. Hospitals with a higher public payer mix likely utilize a variety of strategies to compensate for lower public prices, including accepting reduced margins or reducing their costs. Commercial prices are more heavily influenced by the cost of care and the relative acuity of the patients being treated.

Analysis of Price Variations in New Hampshire Hospitals

INTRODUCTION

Pursuant to New Hampshire Revised Statutes Annotated (N.H. Rev. Stat. Ann.) § 420-G: 14-a, the New Hampshire Insurance Department (NHID) is required to hold annual public hearings and evaluate the factors that contribute to rising health care costs. Specifically, the statute requires the following:

The commissioner shall hold an annual public hearing concerning premium rates in the health insurance market and the factors, including health care costs and cost trends that have contributed to rate increases during the prior year. The commissioner shall evaluate claims costs, administrative loads, and health carrier profits. The commissioner shall identify the factors that contribute to cost increases affecting health insurance premiums and health care services in New Hampshire.

The commissioner shall identify variations in the price that health carriers pay for health care services and shall undertake further analysis to determine whether the observed price variations correlate to the sickness or the complexity of the population served, the relative proportion of patients on Medicare or Medicaid that are served by the health care provider, the cost to the health care provider of delivering the service, or the relative proportion of free or reduced care provided to the uninsured.³

The NHID contracted with the Center for Health Law and Economics at the University of Massachusetts Medical School (UMMS) to analyze the price variations present in the New Hampshire hospital market. This report summarizes the analyses completed and presents the relevant findings.

Scope and Objectives

The prices paid to hospitals by commercial carriers, both in New Hampshire and nationally, vary widely. While prices are set through negotiations between commercial payers and hospitals, there are some hospital characteristics that influence the level of price that a hospital is paid. Using claims and cost data from New Hampshire hospitals, this report examines the following questions:

- How much do New Hampshire hospital prices vary, both before and after adjusting for differences in patient acuity?
- Are there certain factors that are closely related to the prices paid to particular hospitals?
- What is the strength and direction of these relationships?

³ NH RSA § 420-G: 14-a, paragraph V.

- Are there certain factors that can reasonably predict the level of hospital prices and, if so, what is the amount of variation that can be explained by these factors?

As noted above, the statutory requirement identifies several factors that may be related to the level of hospital prices. These include:

- Complexity of patients served;
- Relative proportion of patients on Medicare and Medicaid;
- Costs to the provider of delivering care;
- Relative proportion of providing free or discounted care to the uninsured.

In addition to these factors, the UMMS team identified several other factors that may influence hospital prices. These include:

- Location of hospital;
- Status as a Critical Access Hospital
- Size of the hospital;
- Occupancy rate;
- Total margin of hospital

Profile of New Hampshire Hospitals

This analysis examines prices paid by commercial insurers to 26 acute care hospitals in New Hampshire. This analysis does not review prices paid to specialty and rehabilitation hospitals: HealthSouth Rehabilitation Hospital, Hampstead Hospital, New Hampshire Hospital, Northeast Rehabilitation Hospital, and the Veteran's Administration Medical Center in Manchester.

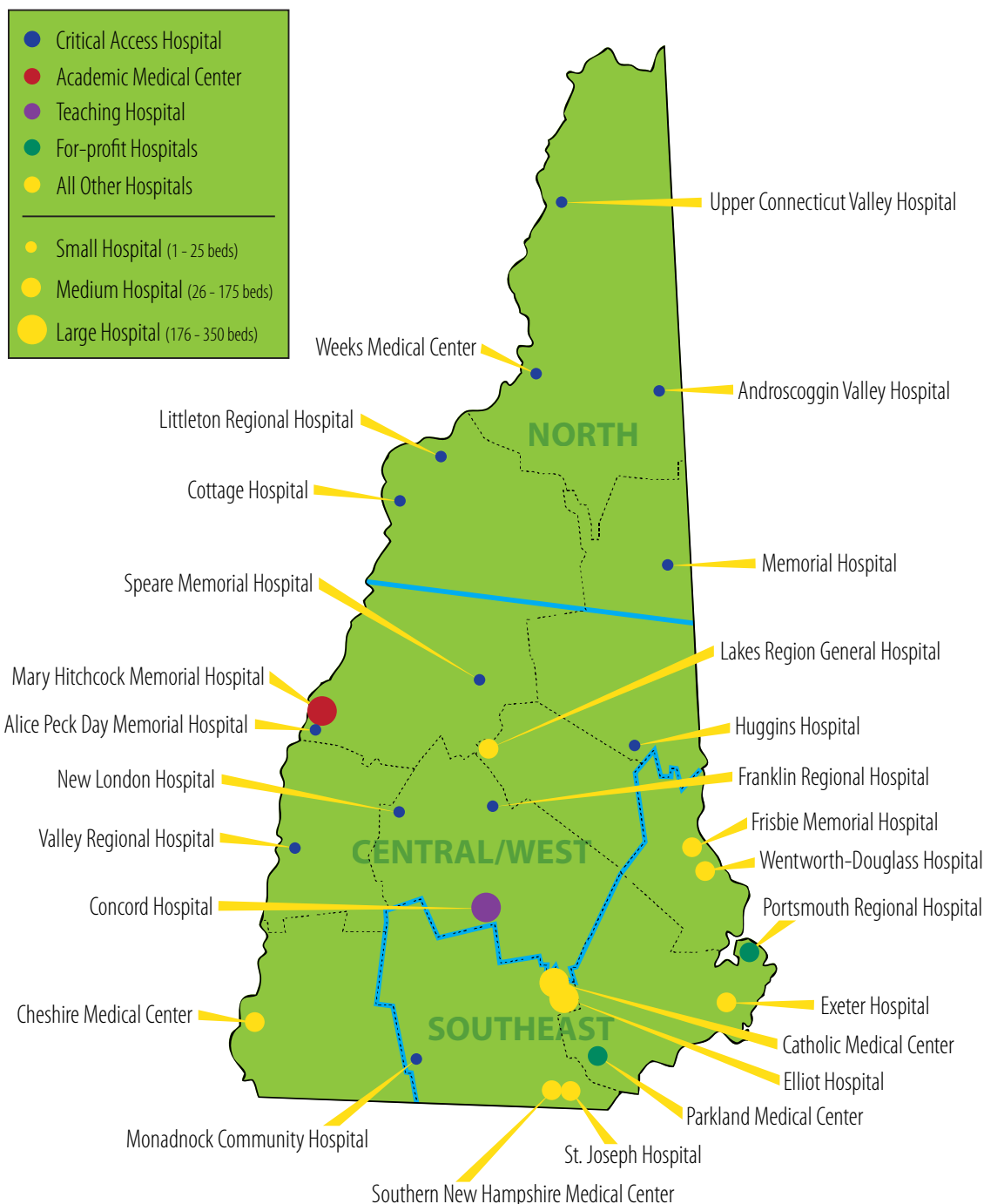
The 26 acute care hospitals differ from one another in a number of ways. Thirteen hospitals are designated as Critical Access Hospitals (CAHs). CAHs provide 24 hour coverage in areas where it is difficult to access another hospital quickly. These hospitals are limited to 25 beds and must meet other requirements established by state and federal government.

For purposes of this analysis, the 26 acute care hospitals are grouped into regions. The six Northern hospitals are geographically distant from the rest of the state. The Southeastern hospitals are located in the three counties (Hillsborough, Rockingham, and Strafford) designated by the federal Office of Management and Budget (OMB) as "metro counties." The remaining hospitals are grouped into a Central/Western region.

The six Northern hospitals are all small, rural Critical Access Hospitals. In contrast, most of the hospitals in the Southeastern metro counties are much larger, and the only two for-profit acute care hospitals in New Hampshire are in this region.

The Central/Western region is very diverse; it includes six small CAHs, two medium size hospitals and two large hospitals. Mary Hitchcock Memorial Hospital, a large Academic Medical Center that trains close to 300 interns and residents, is located in the Central/Western region, as is Concord Hospital, a large hospital with a teaching program that trains just under 30 interns and residents.

Figure 5: Map of New Hampshire Hospitals



These differences among hospitals are highlighted in Figure 6 below.

Figure 6: New Hampshire hospitals by region and size.

	Central/Western			Northern			Southeastern		
	Hospital Name	Beds ⁴	Special Status	Hospital Name	Beds ⁴	Special Status	Hospital Name	Beds ⁴	Special Status
Small	Alice Peck Day	22	CAH	Upper CT Val	16	CAH	Monadnock	25	CAH
	Franklin	25	CAH	Littleton	21	CAH			
	Huggins	25	CAH	Androscoggin Valley	25	CAH			
	New London	25	CAH	Cottage	25	CAH			
	Speare	25	CAH	Memorial	25	CAH			
	Valley	25	CAH	Weeks	25	CAH			
Medium	Cheshire	98					Frisbie	59	
	Lakes Region	104					Parkland	82	for-profit
							Exeter	100	
							Wentworth-Douglass	115	
							Portsmouth	143	for-profit
							Southern NH	151	
Large	Concord	190	teaching				Elliot	196	
	Mary Hitchcock	348	AMC				Catholic	204	

4 Note: This table lists the number of acute hospital beds. These providers may also support other types of beds, such as skilled nursing facility and rehabilitation beds.

Definition of Key Terms

The following are key terms used throughout the report to explain the data analyses:

Price: Price is the dollar amount the hospital received from the insurer plus the patient liability. Hospitals and insurers refer to this amount as the “allowed amount.” Prices may be negotiated between the insurer and the hospital. For the purposes of this analysis, the patient liability (cost sharing amounts such as copayment and deductible) was included in the price.

Charge: The full, undiscounted dollar amount billed by a hospital for a specific service. Charges are amounts set by hospitals and are uniform across payers.

Cost: Cost is the dollar amount incurred by the hospital for providing patient care services, including salaries, supplies, capital, and other items.

Casemix: Casemix is a measure of acuity for a given population, with higher values reflecting higher acuity and complexity. Comparing the casemix indices among hospitals can identify differences in the acuity of each hospital’s patient mix.

Data sources and methods

To conduct the analysis, the UMMS team used the following data sources:

- Data from the New Hampshire Comprehensive Health Care Information System (NHCHIS), calendar year 2009, was used to calculate the prices per unit. These datasets include hospital claims paid by commercial insurance plans and third party administrators for “residents of New Hampshire and for members who receive services under a policy issued in New Hampshire,” that is for “any policy that provides coverage to the employees of a New Hampshire employer that has a business location in New Hampshire.”⁵
- Data from the New Hampshire Hospital Discharge Dataset (HDD), calendar year 2009, was used to determine hospital charge per discharge and to calculate average hospital casemix.
- Data from the Medicaid Enhancement Tax (MET) forms for hospital fiscal year 2009 filed by hospitals with the New Hampshire Department of Revenue Administration was used to determine the amounts of free or reduced fee care provided by hospitals.
- Data from the Centers for Medicare and Medicaid (CMS) annual hospital cost reports, the CMS-2552, for hospital fiscal year 2009 was used to determine payer mix, hospital input costs, occupancy rates, number of beds, and total margin.

⁵ New Hampshire Administrative Rule Chapter Ins 4000: Uniform Reporting System for Health Care Claims Data Sets.

Using the source data described above, the UMMS team calculated the average prices paid to hospitals by commercial carriers for both inpatient and outpatient services. For inpatient services, prices were calculated as a payment per casemix-adjusted discharge, which adjusts for variations in the average acuity of each hospital's patient population. For outpatient services, prices were calculated as a payment per casemix-adjusted encounter, using casemix weights derived using the 3M©Enhanced Ambulatory Patient Grouping (EAPG) system.

Correlation Analyses

To assess the relationship between commercial prices and the various factors, the UMMS team completed correlation analyses. The correlation analyses indicate which factors were most likely related to the relative level of hospital prices, whether the relationships were positive or negative, and the strength of these relationships. The payments per casemix-adjusted discharge and encounter were correlated against the various factors to determine the strength of the relationship between the price level and factor.

While correlations are useful indicators, it is important to note limitations specific to these analyses. First, the analyses included only 26 hospitals. With this small number of observations, the effect of individual data points may be magnified. Second, there were inconsistencies in the time periods among the data sources. While this is a notable data limitation, the data sources had some common overlap periods, therefore the differences in time periods likely did not have a material effect on the results of the analyses.

Three key factors are presented in the correlation analysis:

1. **Strength.** Each correlation analysis produces a correlation coefficient, r , which demonstrates how strong a given relationship is. A perfect positive correlation results in a coefficient of 1, while a perfect negative correlation results in a coefficient of -1.
2. **Direction of relationship.** When they exist, correlations can be either positive or negative. Positive relationships indicate that the values of each variable tend to change in the same direction; that is when x increases, y will increase as well. Negative relationships indicate that the values of each variable tend to change in opposite directions; that is, when x increases, y will decrease.
3. **Statistical significance.** For a correlation to be found significant, each test must have been shown at the $p < 0.05$ significance level. This means that there is only a 5% chance that the correlation could have occurred by chance.

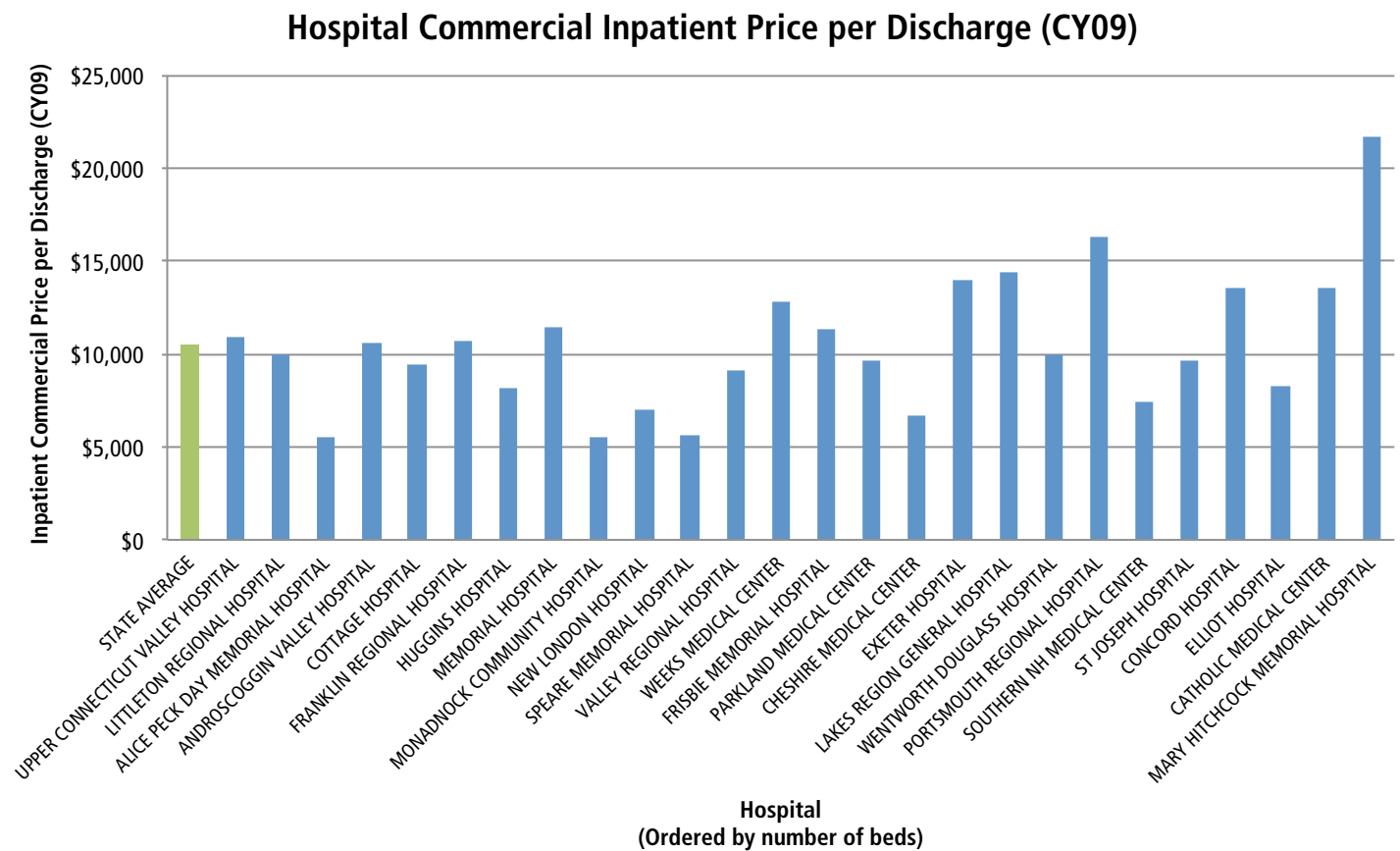
Appendix A provides the correlation coefficient coefficients and the p-values for each of the tests completed. A more detailed explanation of the methods used is also presented in Appendix B.

INPATIENT SERVICES

Overall Variation

The inpatient prices paid by commercial payers for hospital services in New Hampshire varied widely. Prior to adjusting for casemix variation, average price per discharge ranged from a low of \$5,469 at Monadnock Community Hospital to a high of \$21,664 at Mary Hitchcock Memorial Hospital—a percent variance of 296% (see figure 7).

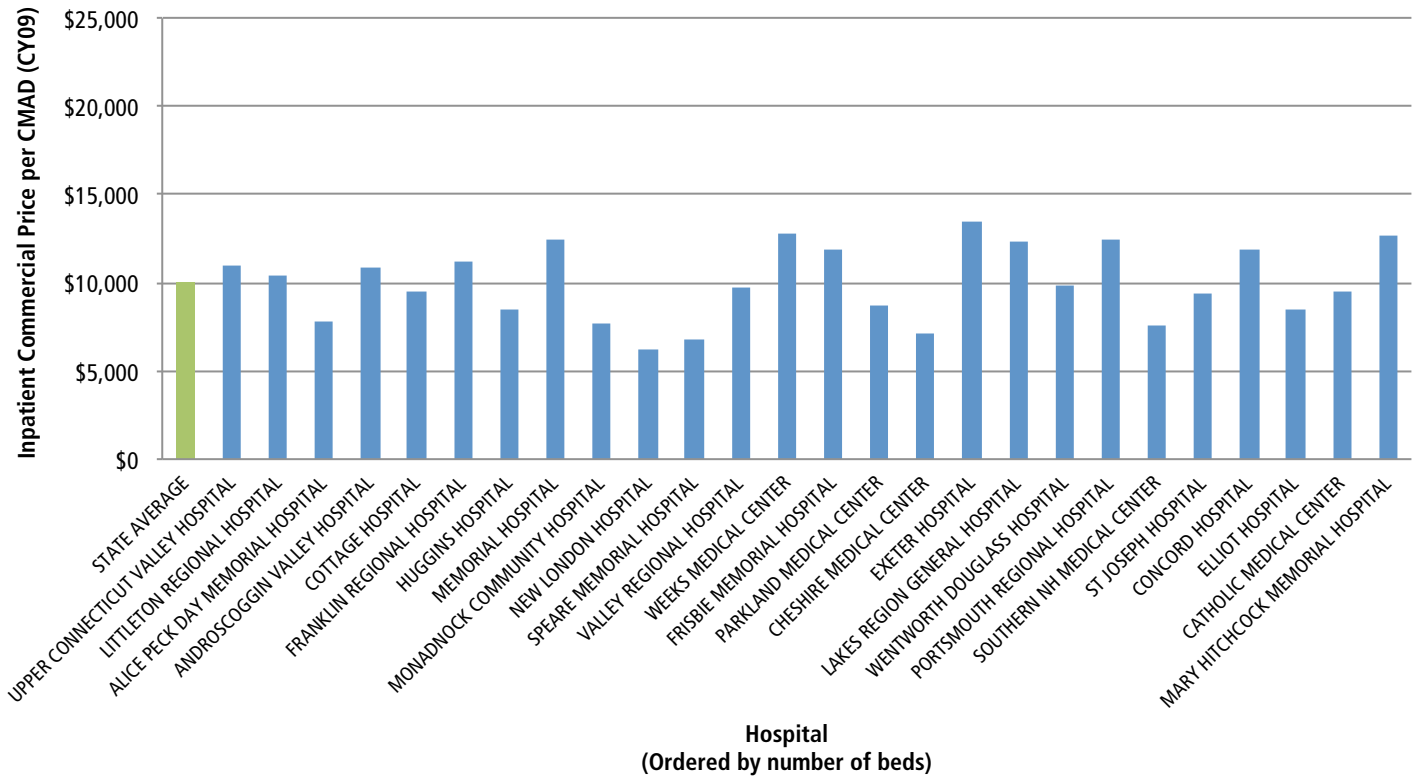
Figure 7



While the adjustment for casemix reduced the variation, large differences still remained. As shown in figure 8, average price per casemix-adjusted discharge ranged from a low of \$6,175 at New London Hospital to a high of \$13,415 at Exeter Hospital—a percent variance of 117%.

Figure 8:

Hospital Commercial Inpatient Price per Casemix Adjusted Discharge (CY09)



Required Analyses

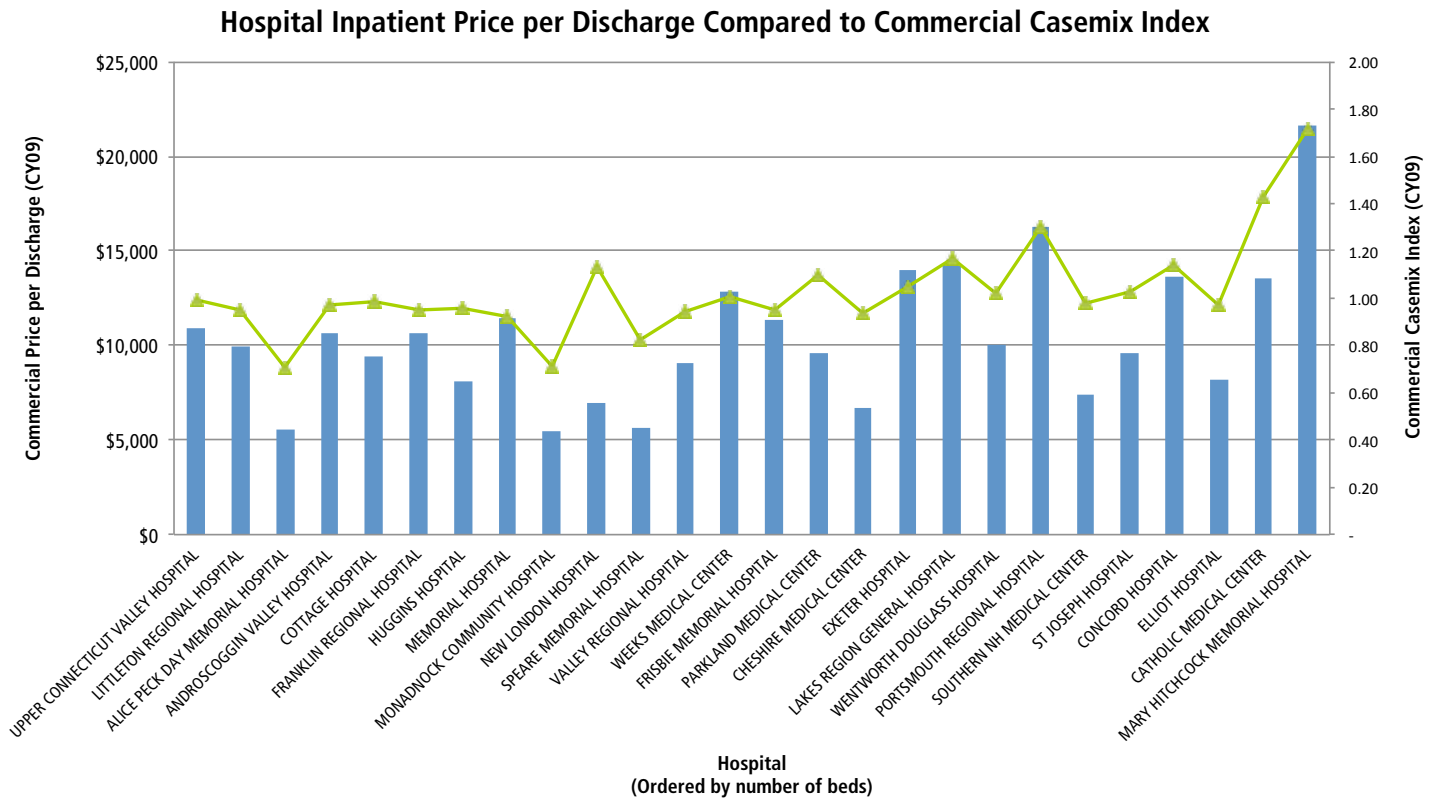
This section analyzes the four factors required by statute to determine if they are correlated with the level of hospital prices. These four factors are:

- Complexity of patients served;
- Costs to the provider of delivering care;
- Relative proportion of patients on Medicare and Medicaid;
- Relative proportion of providing free or discounted care to the uninsured.

Complexity of patients served

The prices for hospital services vary based on the complexity of patients served. This is an expected finding, since hospitals and payers typically negotiate payment arrangements that include adjustments for a patient’s level of acuity or resource use. As demonstrated by figure 9 the average price per discharge rises and falls with the hospital’s average casemix index. The correlation coefficient between the casemix index and the hospital average inpatient commercial price per discharge is 0.82 ($p < .0001$), indicating a very strong positive correlation.

Figure 9



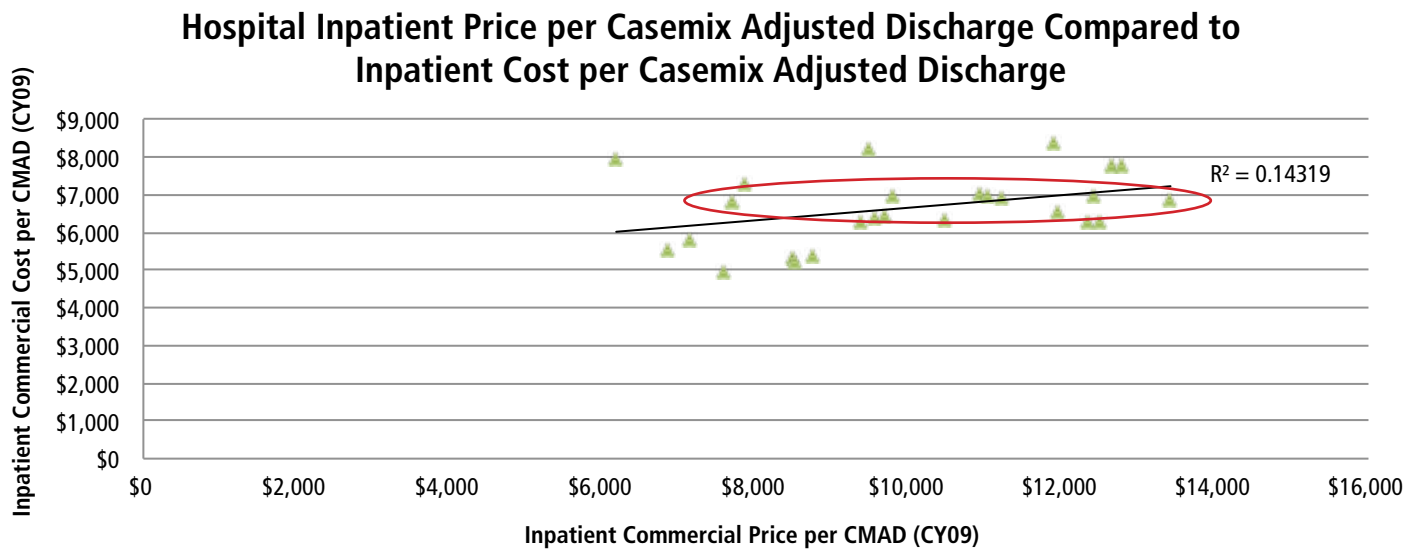
Due to the strong correlation between the casemix and the prices paid to hospitals, the remainder of the analyses presented in this report will present price data that has been adjusted to mitigate the effect of casemix. This adjustment was done by dividing the average price amount by the average casemix index, yielding a price per casemix adjusted discharge (CMAD).

Costs to the provider of delivering care

Hospital costs reflect the dollar amount incurred by the hospital for providing patient care services, including salaries, supplies, capital, and other items. As a condition of participation in the Medicare program, hospitals are required to file annual cost reports. Although these cost reports do not delineate costs by payer, they do provide total costs and total charges for the hospital. UMMS used the data submitted by each hospital on these cost reports to calculate a ratio of costs to charges, and applied this ratio to each hospital’s commercial charges to establish the cost to the hospital for providing services to commercial patients.

The cost to a hospital of delivering care is largely a function of the complexity of the cases it treats. Hospital casemix explained about 71% of the variation in CY2009 hospital cost per discharge among the NH hospitals. As stated earlier, there was a strong correlation between a hospital's casemix and the prices it receives from commercial payers. However, after adjusting for the casemix of each hospital, there was no statistically significant correlation between a hospital's average costs and the prices paid by commercial payers. That is, hospitals that incurred a similar level of cost for providing inpatient care, such as the group of hospital circled in red on figure 10, received widely disparate payment for that care.

Figure 10



Relative proportion of patients on Medicare and Medicaid

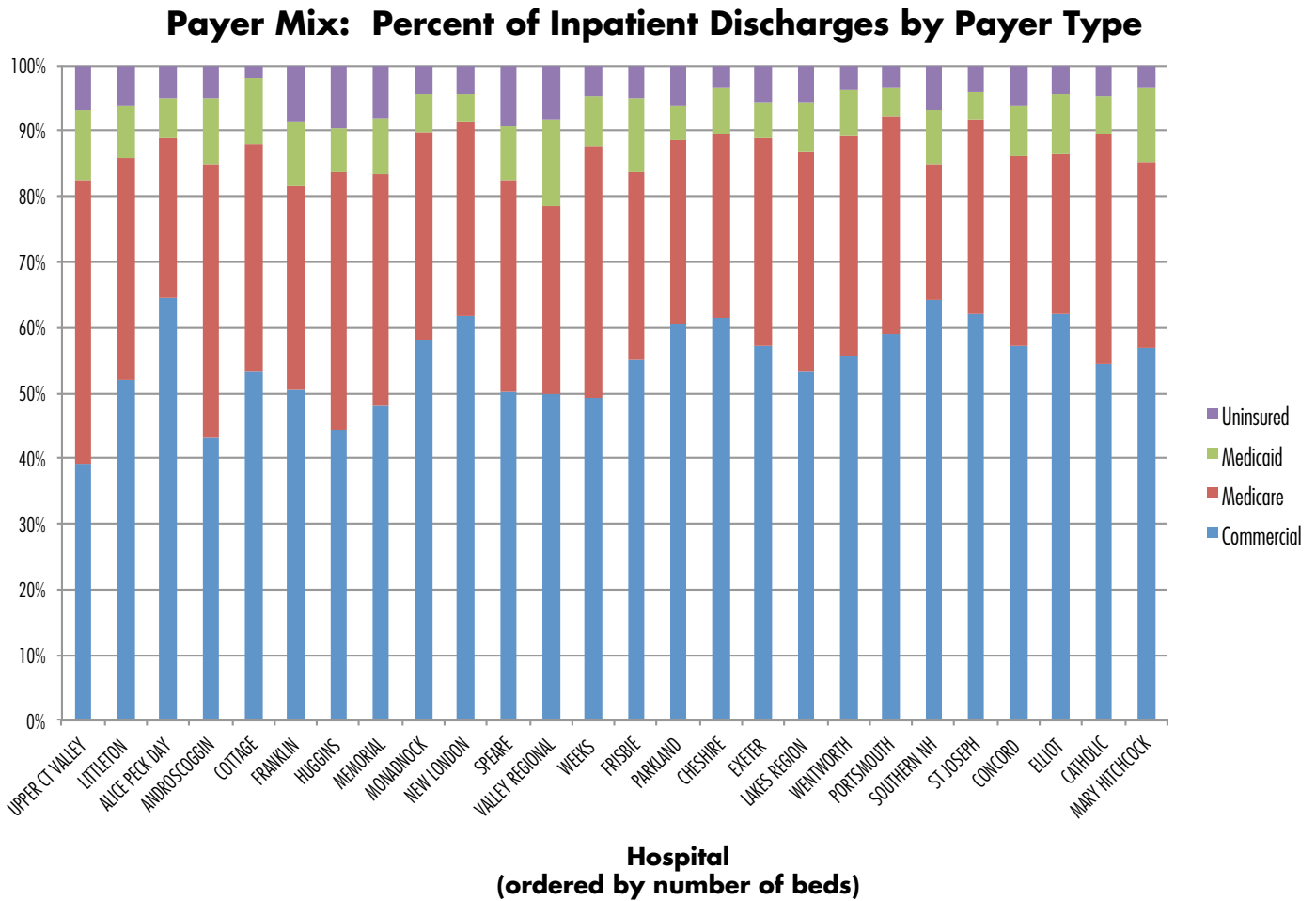
Studies have shown that public payers such as Medicare and Medicaid on average do not reimburse the full cost of care.^{6,7} To address potential public payer shortfalls, hospitals have three basic choices: reduce their costs, accept a reduced margin, or increase revenue from other sources, including commercial payers.

6 American Hospital Association. American Hospital Association 2010 annual survey of hospitals. Chicago (IL): AHA; 2010. Available at <http://www.aha.org/content/00-10/10medunderpayment.pdf>.

7 Medicare Payment Advisory Commission. Report to the Congress: Medicare Payment Policy. Washington: Government Printing Office, March 2011. Available at <http://www.medpac.gov>.

The mix of payers varies across hospitals, as shown in figure 11.

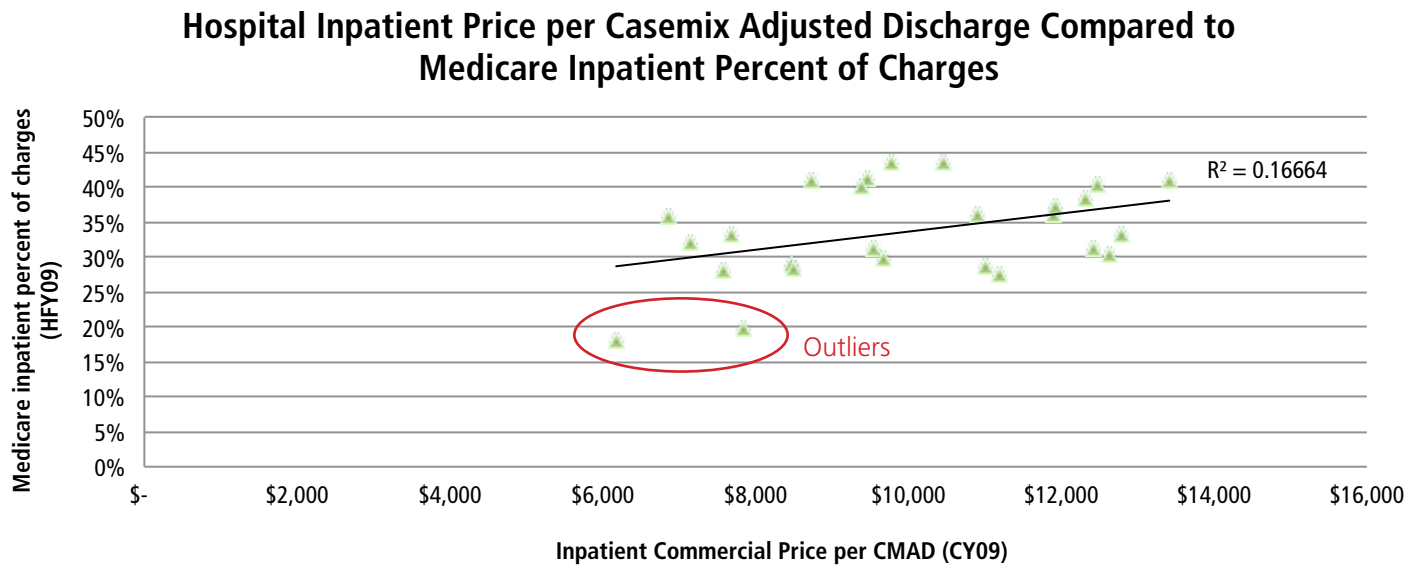
Figure 11.



For hospitals that have been able to increase revenue from commercial payers, one might reasonably expect to see a correlation between their public payer mix and their commercial price levels. Using data from each hospital’s CMS-2552 report, the UMMS team examined the correlation between inpatient commercial price per CMAD and a hospital’s percent of Medicare and Medicaid discharges, days, and charges.

There was a significant positive correlation between a hospital’s Medicare percent of inpatient charges and its commercial price per CMAD ($r=.41, p<.05$). That is, the higher a hospital’s percent of Medicare inpatient charges, the higher its commercial prices were likely to be. Notably, when the analysis was completed by excluding the two hospitals with the lowest Medicare percentages circled in red in Figure 12, no statistical significance was found. See figure 12.

Figure 12



Additional correlation analyses were completed comparing Medicare and Medicaid percent of days and discharges, as well as Medicaid percent of charges. These analyses did not show a statistically meaningful relationship between Medicare and Medicaid payer mix and inpatient commercial price per CMAD.

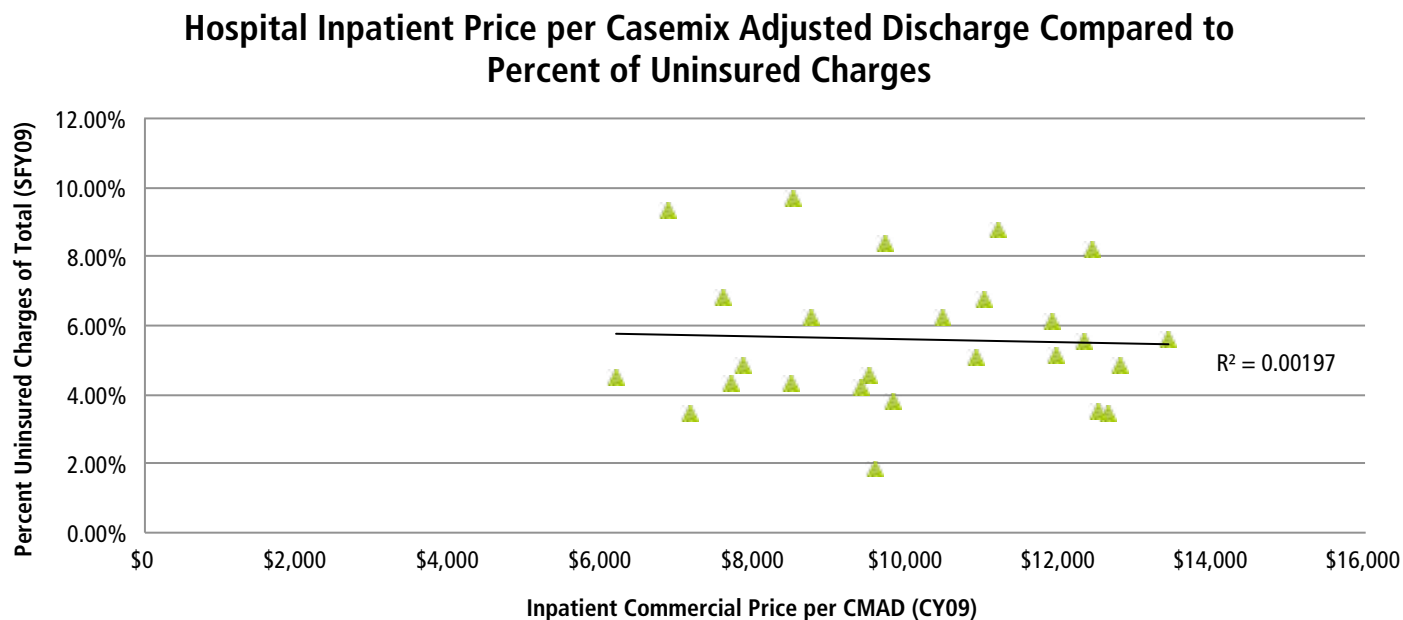
Relative proportion of providing free or reduced fee care to the uninsured

All New Hampshire hospitals provide some amount of free or reduced fee care to patients who lack insurance. In state fiscal year 2009, nearly 5% of statewide hospital charges were written off as charity care.⁸ As with public payers, the amount of charity care provided by a hospital would be expected to influence commercial prices if the hospital seeks to recover this cost from commercial payers.

As shown in figure 13, the analysis showed no correlation between the hospital inpatient price per CMAD and each hospital's percent of uninsured charges.

⁸ Medicaid Enhancement Tax data, SFY2009.

Figure 13



The mixed results of the payer mix correlations do not provide strong evidence of cost-shifting to private payers. Hospitals likely use a variety of strategies, including cost reductions and acceptance of lower margins, in response to lower public prices. One study demonstrated that hospitals with higher financial pressures tend to have lower costs than other hospitals, suggesting that cost reductions, with or without cost-shifting, are a common solution to reduced revenues.⁹ Other studies have also shown that cost-shifting is likely not as a great an influence on private payer rates than generally supposed.¹⁰ Additional factors, such as market power of health plans and hospitals, also contribute to differences in prices.

Additional Analyses

In this section we analyze a number of additional factors that could be correlated with the level of hospital prices. These factors are:

- Location of hospital;
- Status as a Critical Access Hospital;
- Size of the hospital;
- Occupancy rate;
- Total margin of hospital

9 Stensland J, Gaumer Z, Miller M. 2010. Private-Payer Profits Can Induce Negative Medicare Margins. *Health Affairs (Millwood)*. 29:5.

10 Frakt, A. 2011. How Much Do Hospitals Cost Shift: A Review of the Evidence. *Millbank Quarterly*. 89:1

Location of hospital

A hospital's location may influence commercial prices because of differences in input costs, such as labor costs, or as a result of market share. For the purposes of these analyses, the UMMS team categorized New Hampshire hospitals into three distinct regions: Central/Western, Northern, and Southeast. The Southeastern region includes the counties of Strafford, Rockingham, and Hillsborough, which have been designated as metropolitan counties by the federal Office of Management and Budget. The six hospitals in the Northern region are geographically separate from the rest of the state.

Figure 14: Hospitals by Region

Central/Western	Southeastern	Northern
Alice Peck Day Memorial Hospital	Catholic Medical Center	Androscoggin Valley Hospital
Cheshire Medical Center	Elliot Hospital	Cottage Hospital
Concord Hospital	Exeter Hospital	Littleton Regional Hospital
Franklin Regional Hospital	Frisbie Memorial Hospital	Memorial Hospital
Huggins Hospital	Monadnock Community Hospital	Upper Connecticut Valley Hospital
Lakes Region General Hospital	Parkland Medical Center	Weeks Medical Center
Mary Hitchcock Memorial Hospital	Portsmouth Regional Hospital	
New London Hospital	St. Joseph Hospital	
Speare Memorial Hospital	Southern NH Medical Center	
Valley Regional Hospital	Wentworth Douglass Hospital	

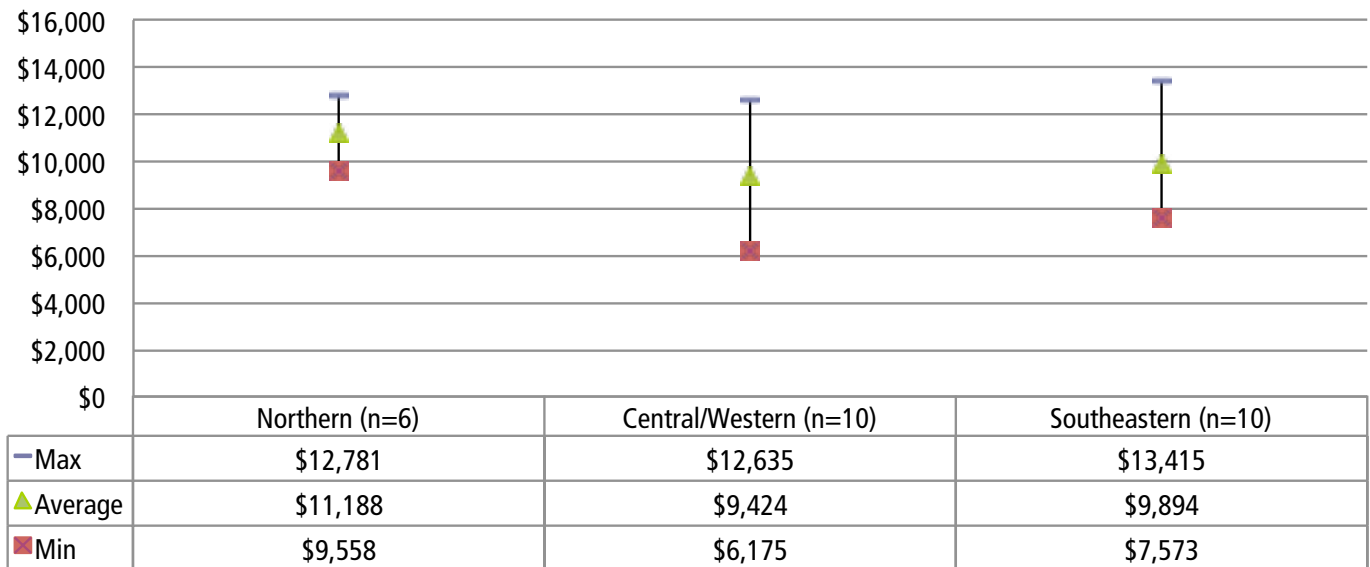
The UMMS team used analysis of variance (ANOVA) techniques to assess whether there were meaningful differences in the prices paid to hospitals based on regions. There were no statistically significant differences based on these different geographic categories.

However, when compared to other hospitals, hospitals in the Northern region had smaller differences in prices for inpatient services. The percent difference from the lowest paid hospital in the Northern region to the highest was 34%; for Central/Western hospitals this difference was 105%; and for Southeastern hospitals this difference was 77%.

Figure 15 shows the range of commercial prices per CMAD by geographic location.

Figure 15

Range of Commercial Prices per Casemix Adjusted Discharge, by Region



Status as a Critical Access Hospital

Critical Access Hospitals (CAHs) are hospitals that have received a federal designation recognizing their unique status as rural providers. Generally, to be designated as a CAH, the hospital must have no more than 25 acute beds, be located in a rural area and be more than a 35-mile drive from the nearest hospital or more than a 15-mile drive in areas with mountainous terrains or secondary roads.¹¹ Critical Access Hospitals are eligible to receive cost-based reimbursement from the Medicare program and are also eligible to receive certain incentive payments. There are thirteen Critical Access Hospitals located in New Hampshire, accounting for 50% of the state’s hospitals, but only 11% of the state’s discharges.

11 In addition, critical access hospitals include hospitals that were, prior to January 1, 2006, designated by the State as a “necessary provider” of health care services to residents in the area. There are additional requirements to be designated as a Critical Access Hospital, including length of stay requirements, staffing requirements, and other provisions. See 42 CFR 485.601-647.

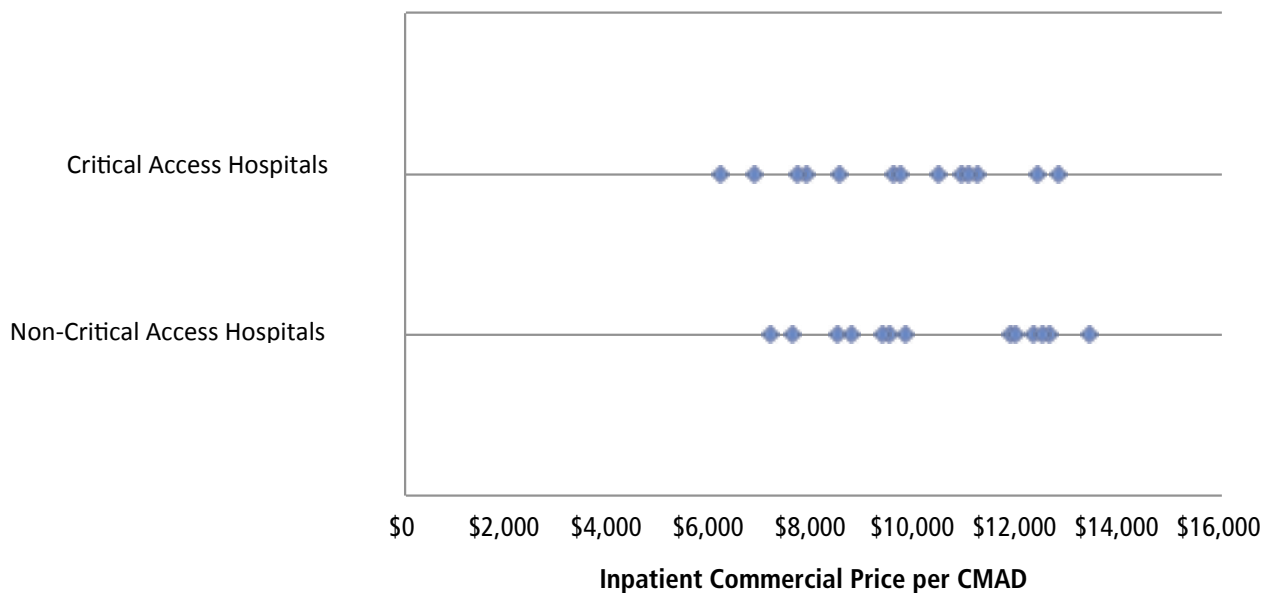
Figure 16: Critical Access Hospitals

Critical Access Hospitals
Alice Peck Day Memorial
Androscoggin Valley Hospital
Cottage Hospital
Franklin Regional Hospital
Huggins Hospital
Littleton Regional Hospital
Memorial Hospital
Monadnock Community Hospital
New London Hospital
Speare Memorial Hospital
Upper Connecticut Valley Hospital
Valley Regional Hospital
Weeks Medical Center

As shown in figure 17, Critical Access Hospitals received widely disparate payments, a similar distribution as other hospitals.

Figure 17:

Commercial Prices per Casemix Adjusted Discharge, by Critical Access Hospital Status

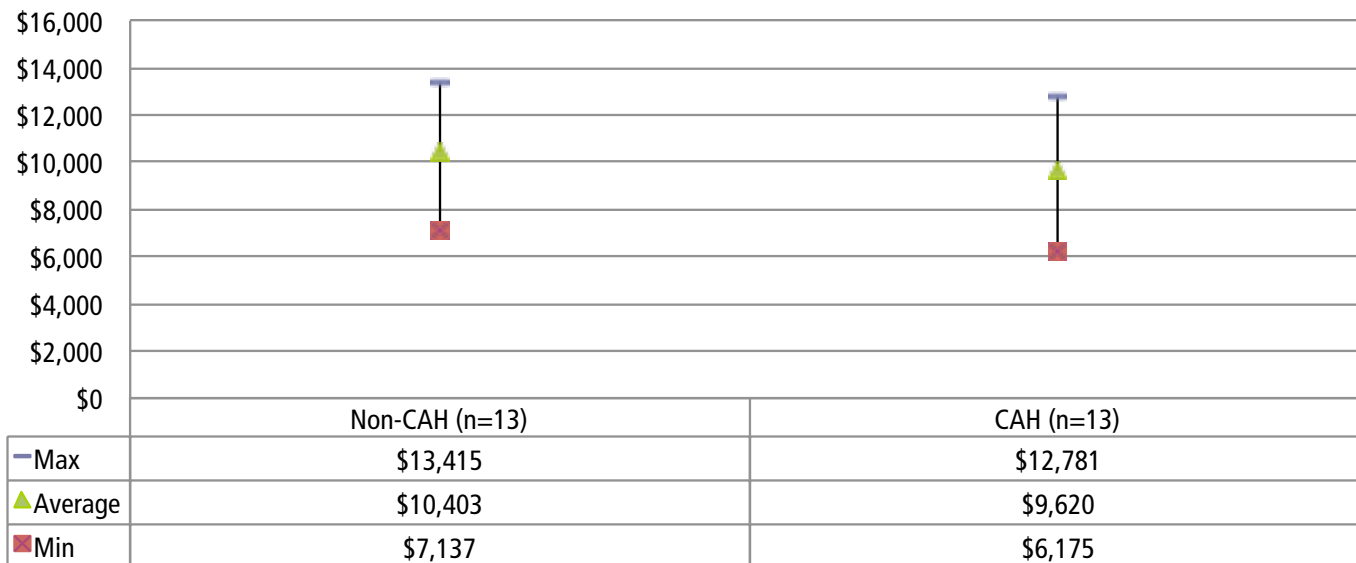


Critical Access Hospitals were paid lower prices on average per CMAD than other hospitals. The average inpatient commercial price per CMAD for CAHs was \$9,620, while the average commercial price per CMAD for all other hospitals was \$10,403. However, when analyzed using a t-test, the difference in means between the two groups was not statistically significant.

In addition, when compared to other hospitals, Critical Access Hospitals had a greater difference in prices for inpatient services. The percent difference from the lowest paid CAH to the highest was 107%; for hospitals not designated as a CAH, this difference was 88%. See figure 18.

Figure 18

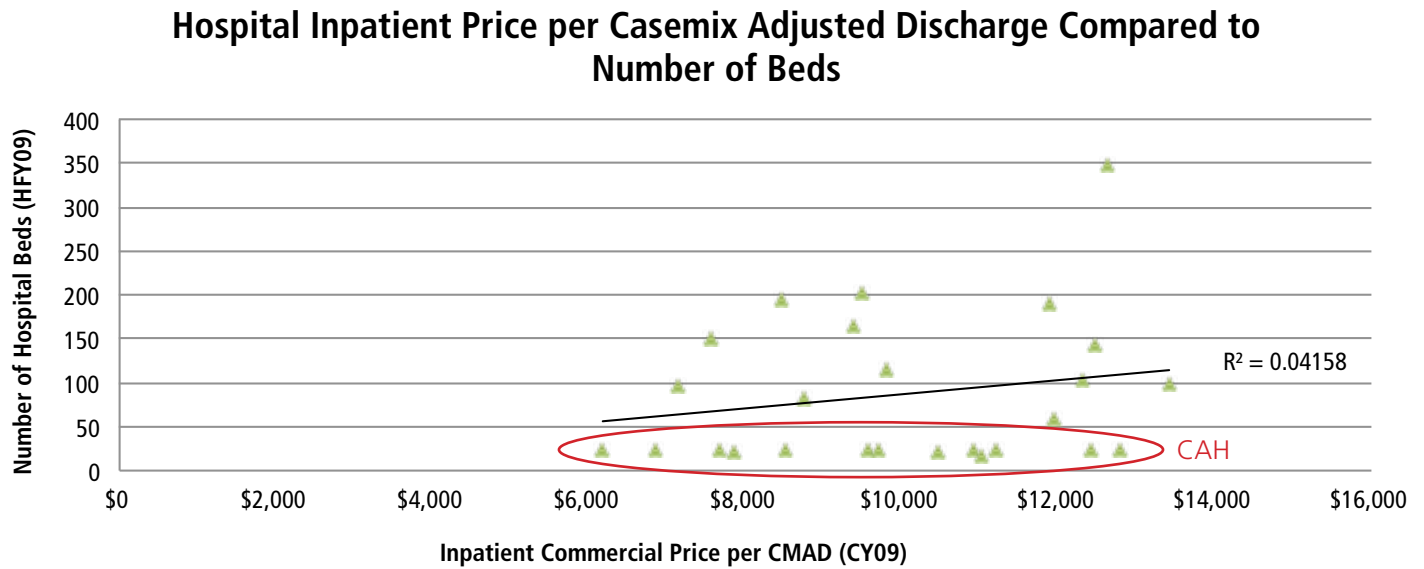
Range of Commercial Prices per Casemix Adjusted Discharge, by Critical Access Hospital Status



Size of the hospital

A common measure of a hospital’s size is the number of licensed inpatient beds. One might expect that a larger hospital would have lower unit prices because it could spread its costs over more units, realizing economies of scale. However, the analysis did not indicate any significant relationship between the number of total beds or occupied beds at a hospital and its commercial price per CMAD. Note that the Critical Access Hospitals all have a similar number of beds (circled in red on figure 19); this commonality may influence the relationship between size and price.

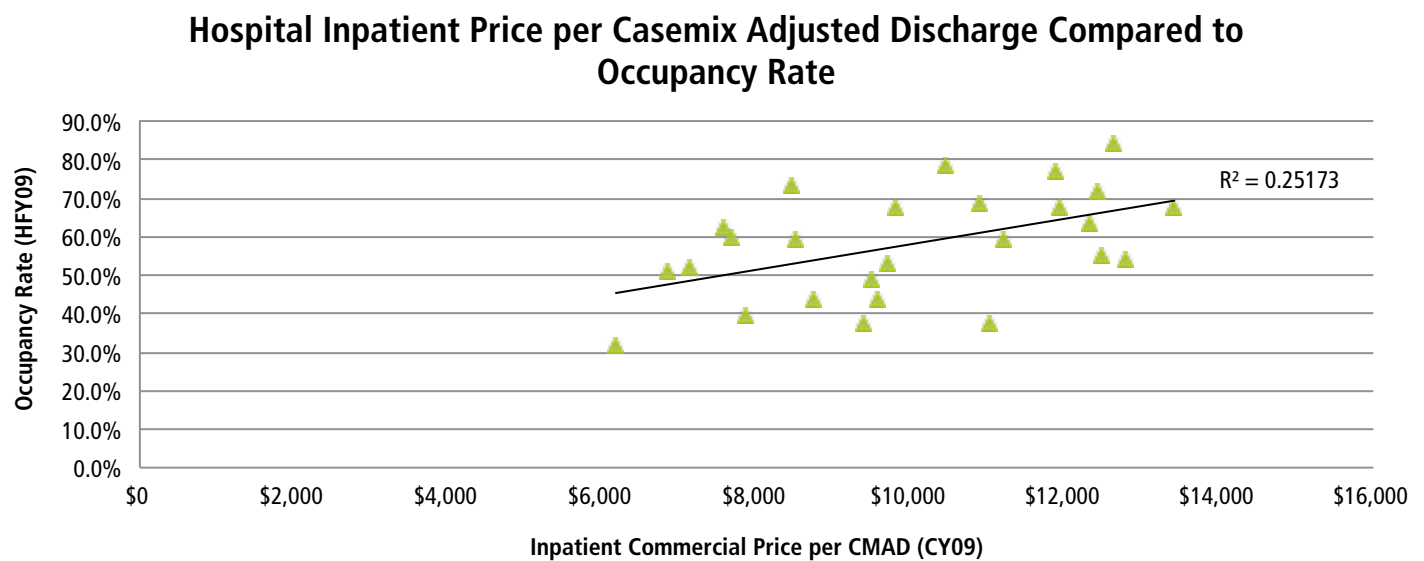
Figure 19:



Occupancy rate

A hospital's occupancy rate is the percent of beds that are occupied for a given period. In hospital fiscal year 2009, occupancy rates in New Hampshire hospitals ranged from a low of 32% to a high of 84%, with a statewide average of 75%. One might expect that a hospital with fewer occupied beds would price their services higher than a hospital that could spread its costs over more patients. However, there was a statistically significant positive correlation between occupancy rates and inpatient commercial prices per CMAD ($r=.50, p<.05$). That is, hospital prices tend to be higher for hospitals with higher occupancy rates, as shown in figure 20.

Figure 20

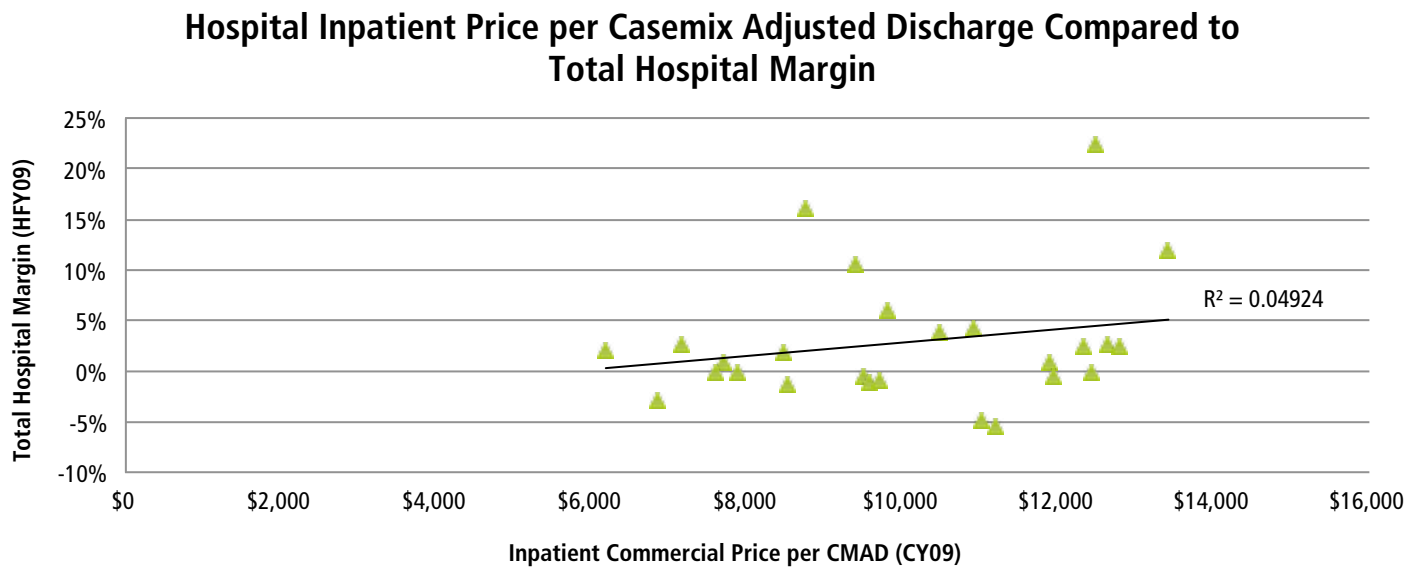


Total margin of hospital

A hospital's total margin is an indicator of its profitability. Total margin is the ratio of net income from all sources to total revenue from all sources. In hospital fiscal year 2009, the median total margin for New Hampshire hospitals was 1.35%. Of the 26 hospitals, 10 hospitals had negative total margins.

As shown in figure 21, there was no statistically significant correlation between a hospital's total margin and its hospital inpatient price per CMAD. That is, those hospitals that receive higher prices for their services did not necessarily earn a higher margin.

Figure 21



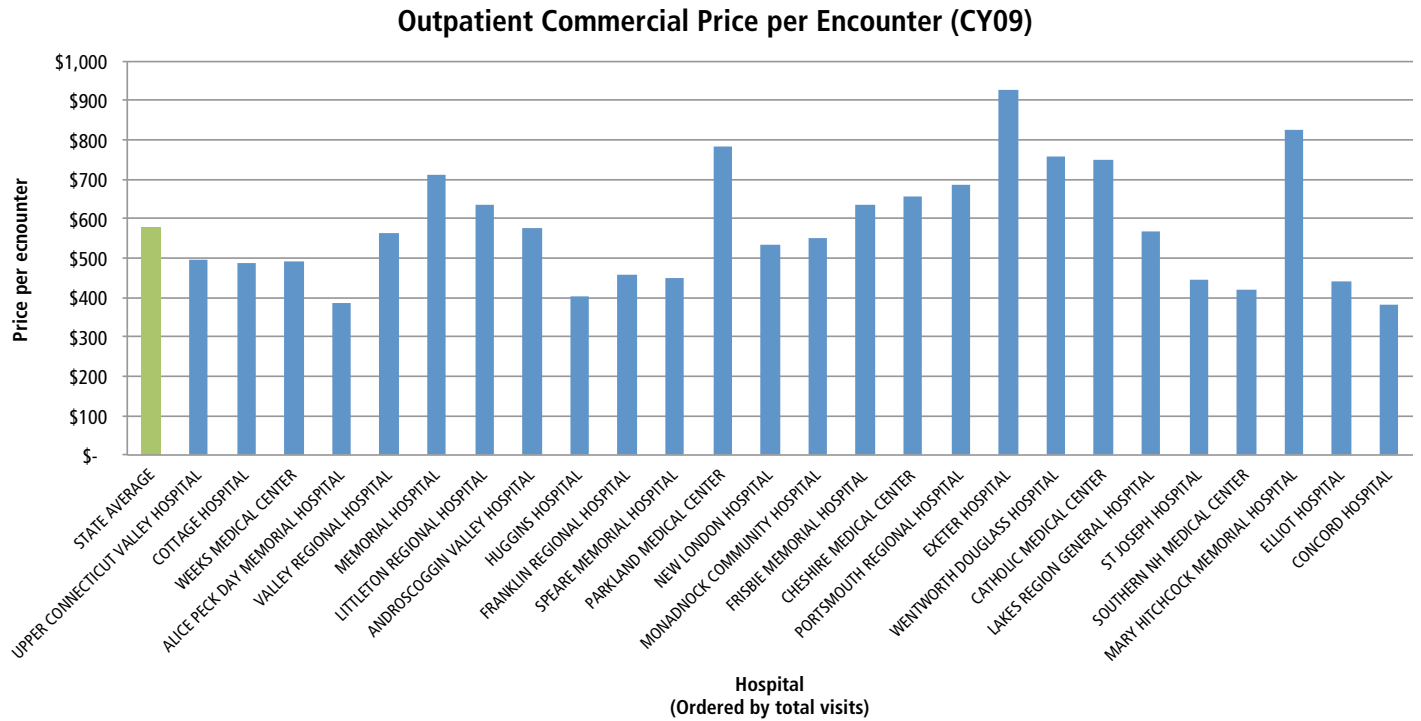
OUTPATIENT SERVICES

Overall Variation

Outpatient services encompass a wide array of services, including clinic encounters, emergency department services, and ambulatory surgeries. For the purposes of this report, the UMMS team created outpatient “encounters” as the primary unit of service. An encounter is an individual procedure or service provided to a patient associated with a single claim line; recognizing that a patient may receive a number of procedures and services on a single day. UMMS excluded outliers and data lines with missing values from the analysis (see Appendix B for a detailed description of these exclusions), but UMMS did not exclude any data because of the nature of the service provided.

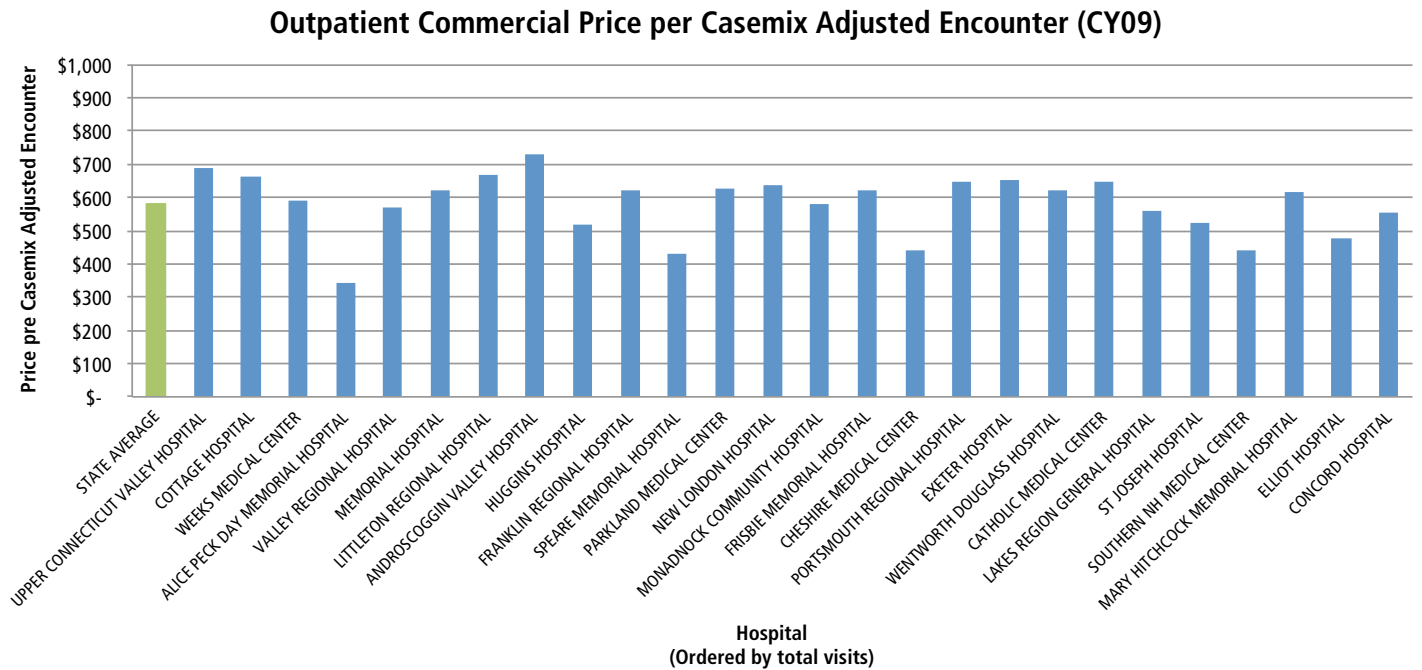
Commercial payers paid a wide range of prices for these services, from a low average price of \$383 per encounter at Concord Hospital to a high of \$925 per encounter at Exeter Hospital (see figure 22).

Figure 22



To account for the differences in resources required to provide services provided to patients, the UMMS team calculated casemix indices for outpatient services using 3M[®] Enhanced Ambulatory Patient Groups (EAPGs). Even after this adjustment, prices varied significantly among the hospitals. As shown in figure 23, the average price per casemix adjusted encounter (CMAE) averaged \$581 and ranged from a low of \$343 at Alice Peck Day Memorial Hospital to a high of \$731 at Androscoggin Valley Hospital—a percent variance of 113%.

Figure 23



Required Analyses

This section analyzes the four factors required by statute to determine if they are correlated with the level of outpatient hospital prices. These four factors are:

- Complexity of patients served;
- Costs to the provider of delivering care;
- Relative proportion of patients on Medicare and Medicaid;
- Relative proportion of providing free or discounted care to the uninsured.

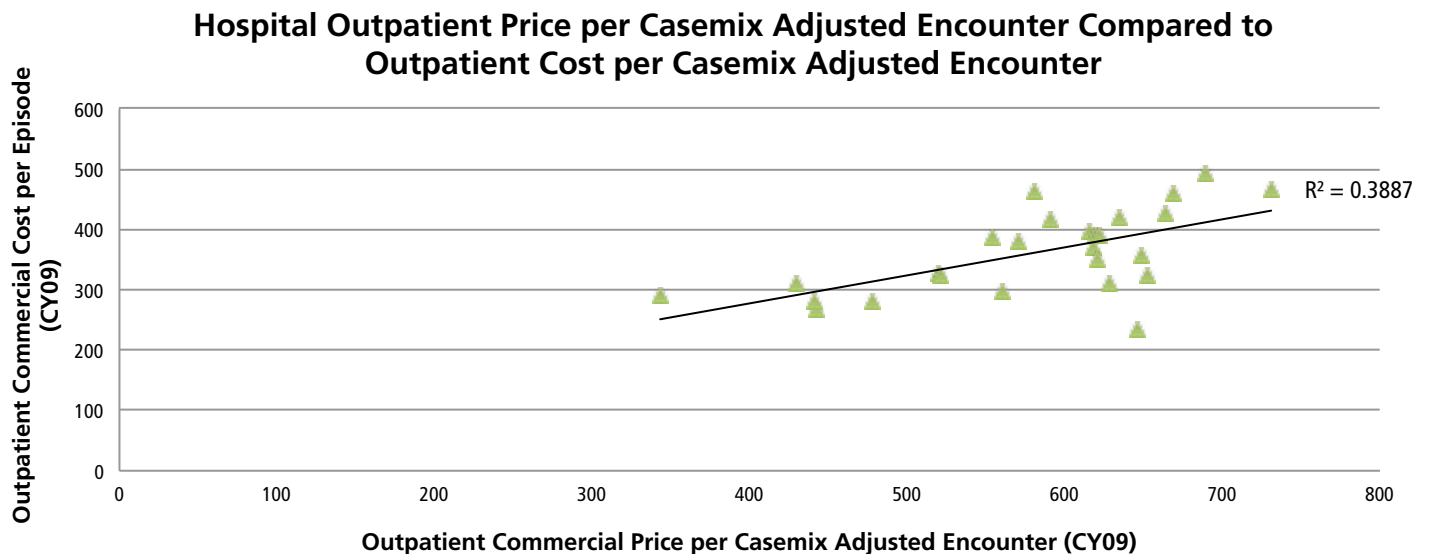
Complexity of patients served

Unlike inpatient services, there is no standard measure of outpatient acuity. However, it is reasonable to conclude that outpatient payments vary based on patient complexity. The New Hampshire all-payer claims dataset includes service categories based on 3M© Enhanced Ambulatory Patient Groups (EAPGs). For the purposes of this report, the UMMS team developed payment weights to account for the differences in patient acuity. Since the payment weights are derived from the payments, it is not possible to quantify the relationship between patient complexity and payment amount.

Costs to the provider of delivering care

Outpatient prices per encounter were positively correlated with the cost to the hospital in providing the care. This indicates that the prices, to some extent, are adjusted to recognize the variation in costs in providing different types of care. The correlation coefficient for cost per encounter was 0.62 ($p < .05$). The higher the cost of providing outpatient care, the higher the outpatient price. See figure 24.

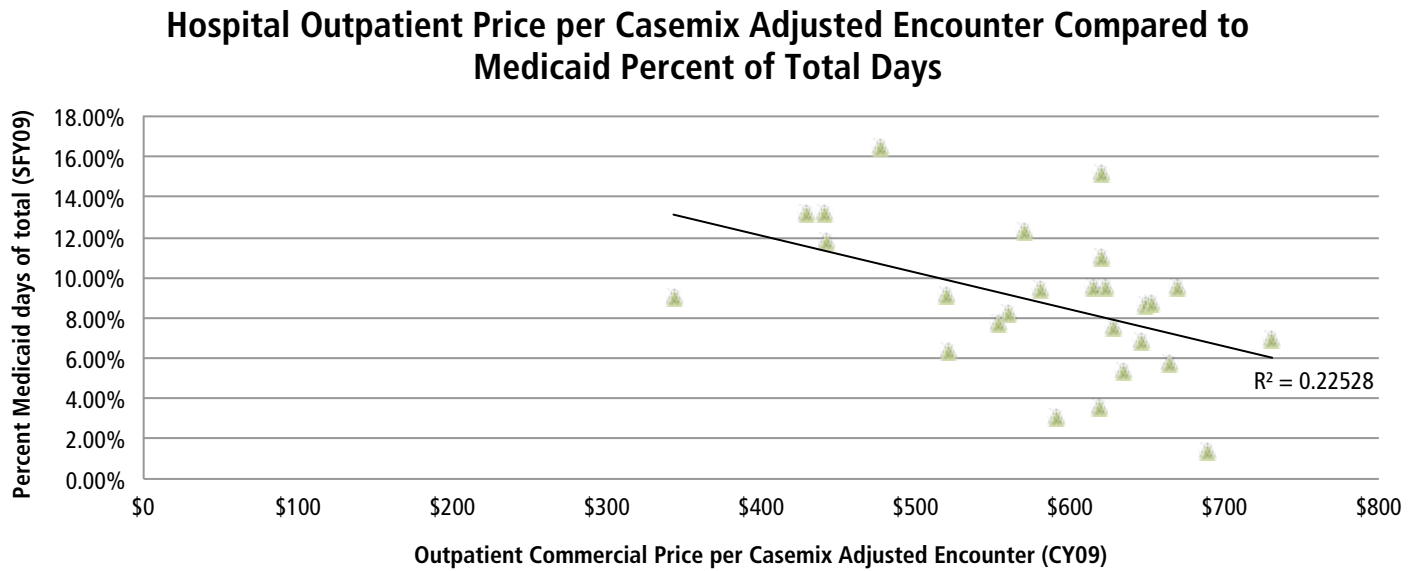
Figure 24



Relative proportion of patients on Medicare and Medicaid

The analyses comparing hospital relative proportion of public payer mix and outpatient prices produced mixed results. Data on the proportion of Medicare and Medicaid outpatient encounters of total encounters was unavailable. Therefore, as a proxy for relative volume, inpatient days and discharges were used. There was no statistically significant correlation found between a hospital's outpatient price per casemix-adjusted encounter and its Medicare percent of days or its Medicaid percent of charges. However, as shown in figure 25, there was a statistically significant negative correlation ($r = -0.48$, $p < .05$) between a hospital's percent of Medicaid days and its commercial price per CMAE. That is, the higher a hospital's percent Medicaid days, the lower its commercial prices were likely to be.

Figure 25



While this finding differs from the results for inpatient services, it is consistent with findings in one study of Massachusetts hospitals. That study found that higher proportions of public payer mix were negatively correlated with commercial prices.¹² That is, hospitals with a greater reliance on public payers had lower commercial relative prices.

In addition, a hospital's proportion of Medicare business was positively correlated with its commercial prices per CMAE, using both proportion of charges and discharges as measures. The correlation between the percent of Medicare outpatient charges and the outpatient commercial price per CMAE produced a correlation coefficient of 0.50 ($p < 0.01$). The coefficient using percent of Medicare inpatient discharges was 0.52 ($p < 0.01$). That is the higher a hospital's percent of Medicare charges and Medicare inpatient discharges, the higher its commercial prices were likely to be. See figures 26 and 27.

12 Special Commission on Provider Price Reform. Recommendations of the Special Commission on Provider Price Reform. Boston, MA. Nov 9, 2011. Available at <http://www.mass.gov/eohhs/gov/commissions-and-initiatives/provider-price-reform/special-commission-final-report.html>.

Figure 26

Hospital Outpatient Price per Casemix Adjusted Encounter Compared to Medicare Outpatient Percent of Charges

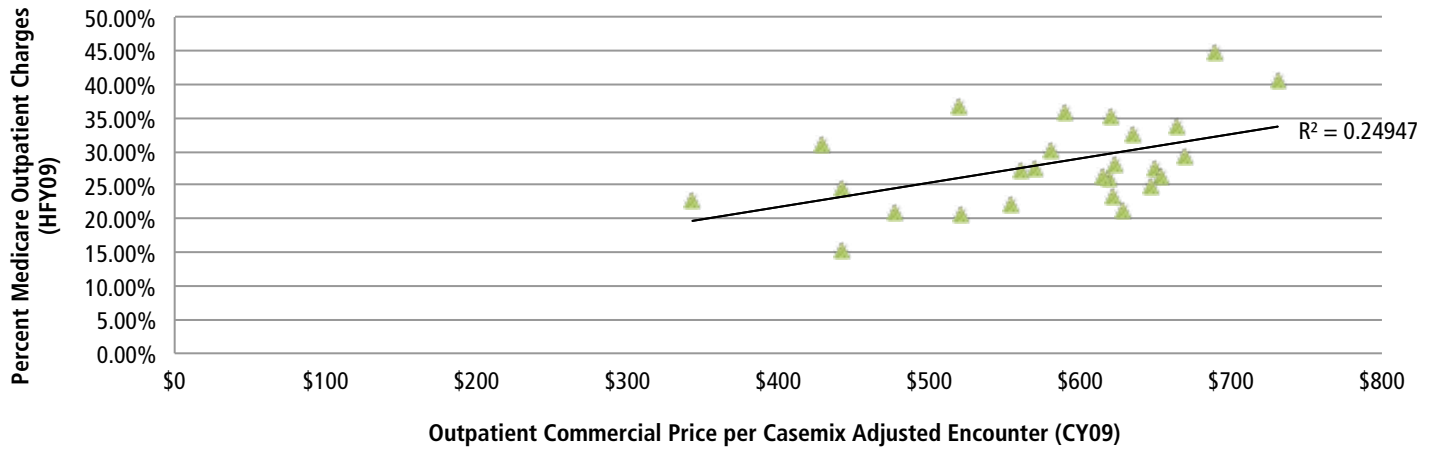
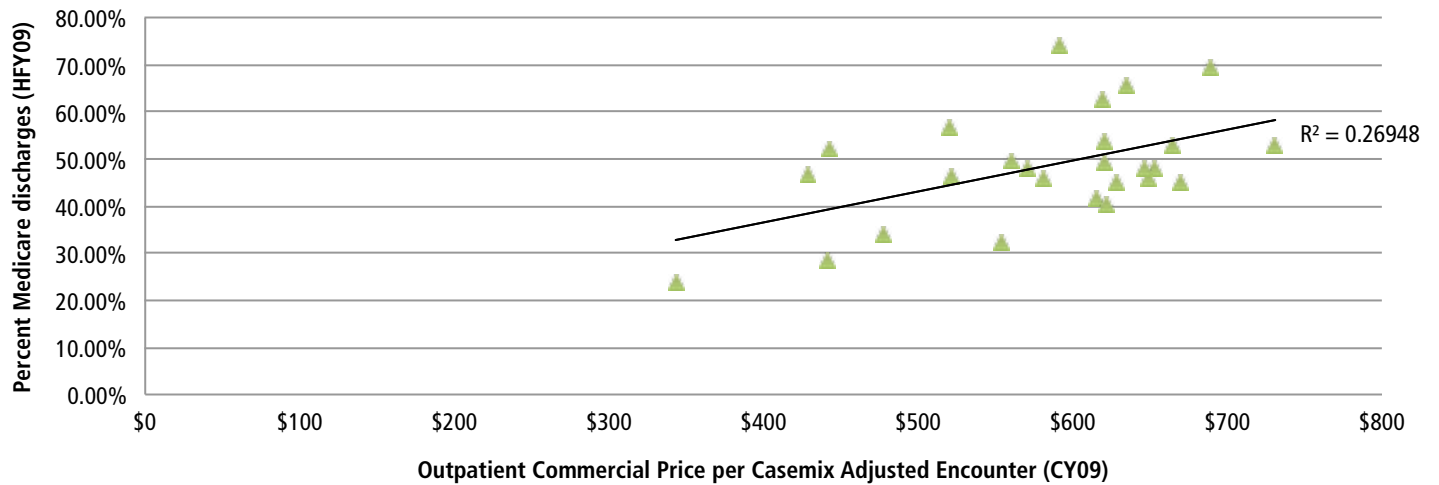


Figure 27

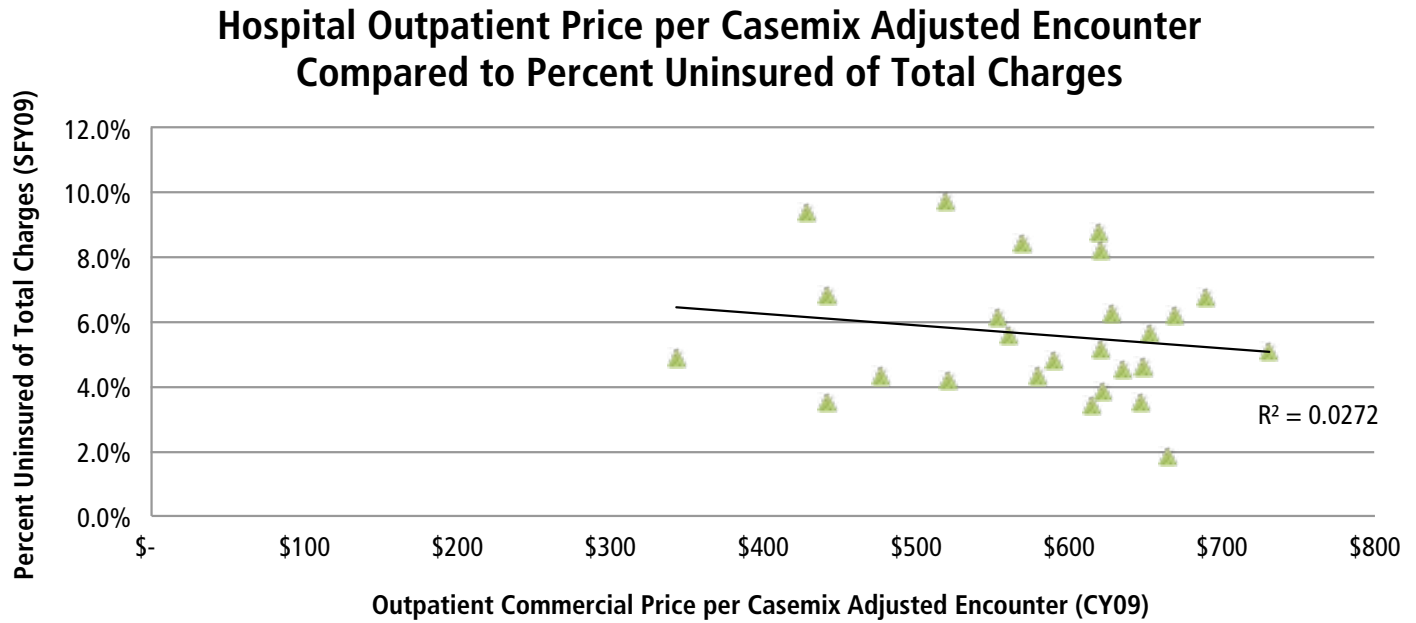
Hospital Outpatient Price per Casemix Adjusted Encounter Compared to Medicare Percent of Discharges



Relative proportion of providing free or reduced fee care to the uninsured

The analysis showed no correlation between the each hospital's percent of uninsured charges and the commercial prices per encounter. This finding was consistent with the inpatient data results, which also indicated no correlation. See figure 28.

Figure 28



Additional Analyses

In this section we analyze a number of additional factors that could be correlated with the level of hospital prices. These factors are:

- Location of hospital;
- Status as a Critical Access Hospital;
- Size of the hospital;
- Total margin of hospital

Location of hospital

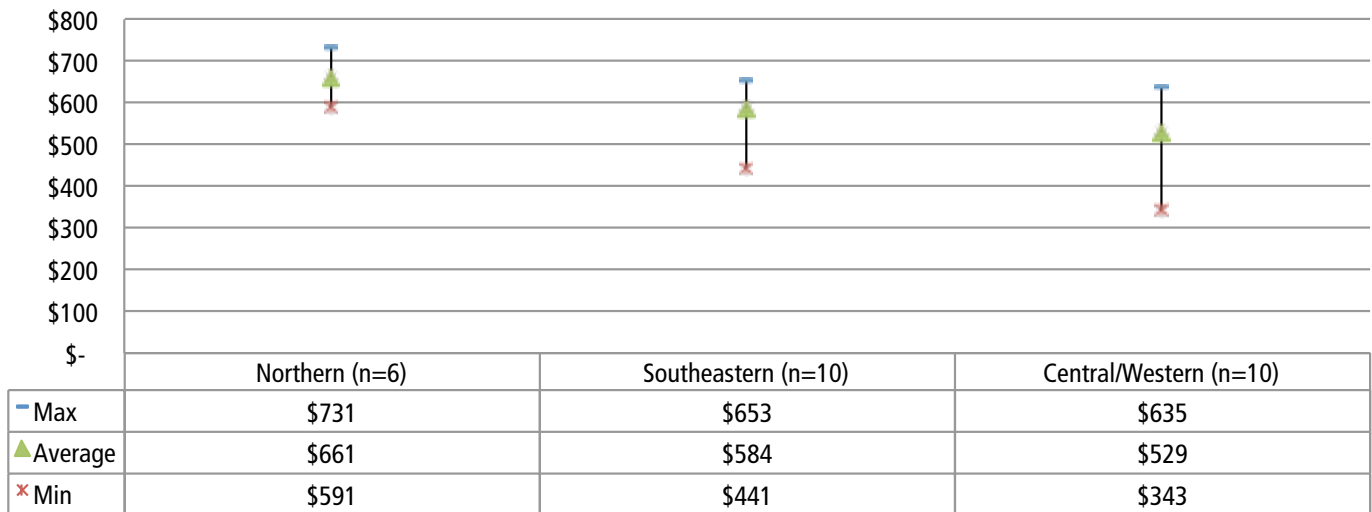
The analyses demonstrated that there were significant differences in commercial payments per casemix adjusted encounter among the hospital regions. In particular, hospitals in the northern region had an average commercial price per CMAE that was approximately 18% higher than the average for all other hospitals. Hospitals in the Central/West region had an average commercial price per CMAE that was approximately 14% lower than the average for all other hospitals. However, the Central/West region had one low outlier, Alice Peck Day Memorial, at \$343 per CMAE. Absent this outlier, there would be no significant difference for hospitals in this region. The prices for hospitals in the Southeastern region were not significantly different.

When compared to other hospitals, hospitals in the Northern region had smaller differences in prices for inpatient services. The percent difference from the lowest paid hospital in the Northern region to the highest was 24%; for Central/Western hospitals this difference was 85%; and for Southeastern hospitals this difference was 48%.

Figure 29 presents the highest, lowest, and average price per CMAE by region.

Figure 29

Range of Commercial Prices per Casemix Adjusted Encounter, by Region

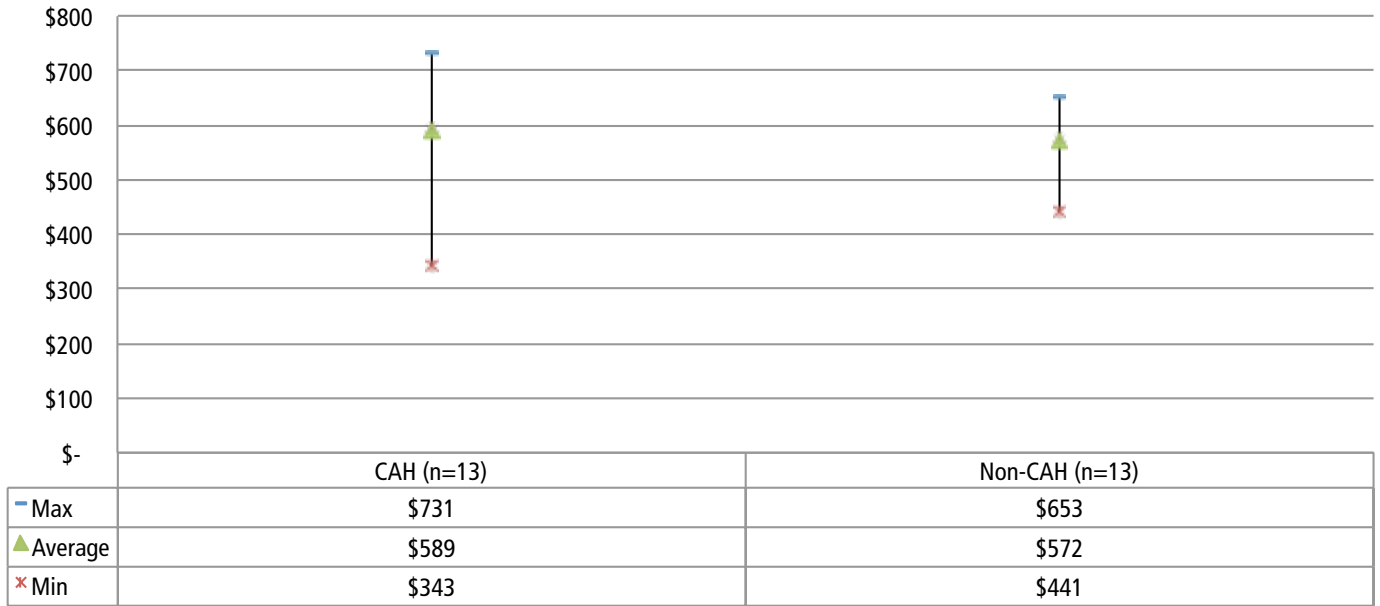


Status as a Critical Access Hospital

There were no significant differences in the average commercial prices per CMAE between Critical Access Hospitals and other hospitals. Critical Access Hospitals had a wider range in variation in commercial prices per CMAE, from a low of \$343 to a high of \$731, or a percent variation of 113%. Hospitals not designated as CAHs had a smaller range of variation, from a low of \$441 per CMAE to a high of \$653 per CMAE, or a percent variation of 48%. However, as assessed using t-tests, there was no significant difference in the averages between the two cohorts.

Figure 30

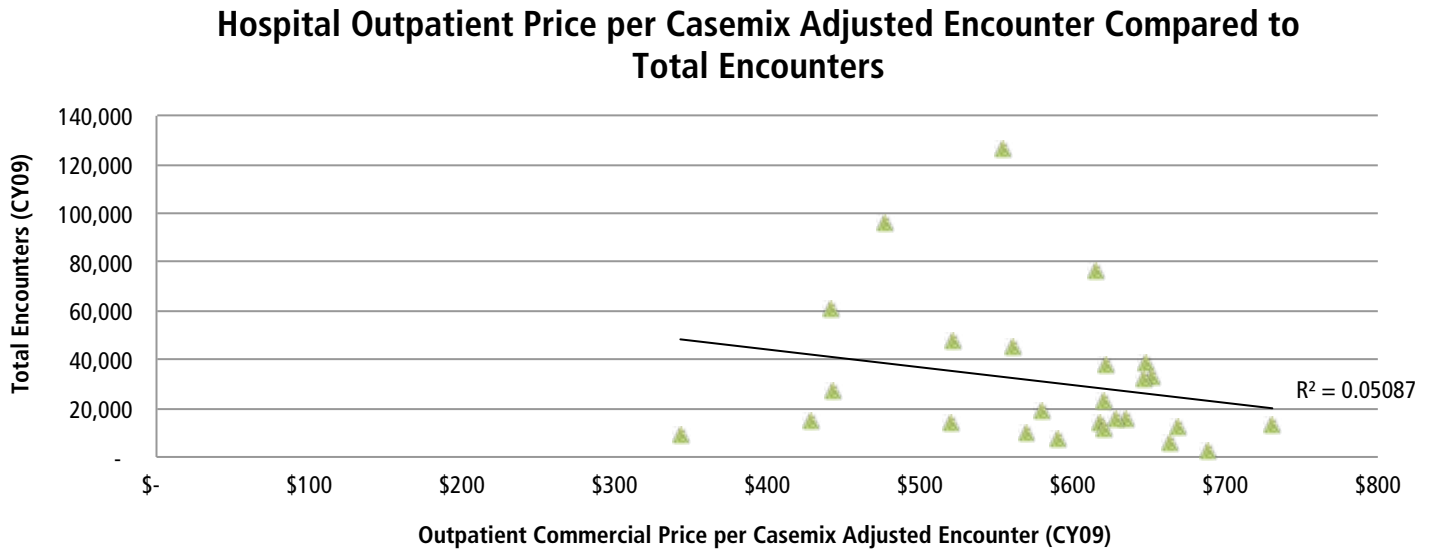
Range of Commercial Prices per Casemix Adjusted Encounter, by Critical Access Hospital Status



Size of the hospital

For outpatient services, the UMMS team ran correlation analysis to compare the total number of encounters with the commercial price per casemix adjusted encounter. As shown in figure 31, there was no statistically significant correlation between these two measures. As an alternate measure of size, correlation analysis was also completed using the number of beds, but no correlation was found using that measure either. This finding differs from the inpatient analysis, which indicated a positive correlation between number of beds and commercial price per CMAD.

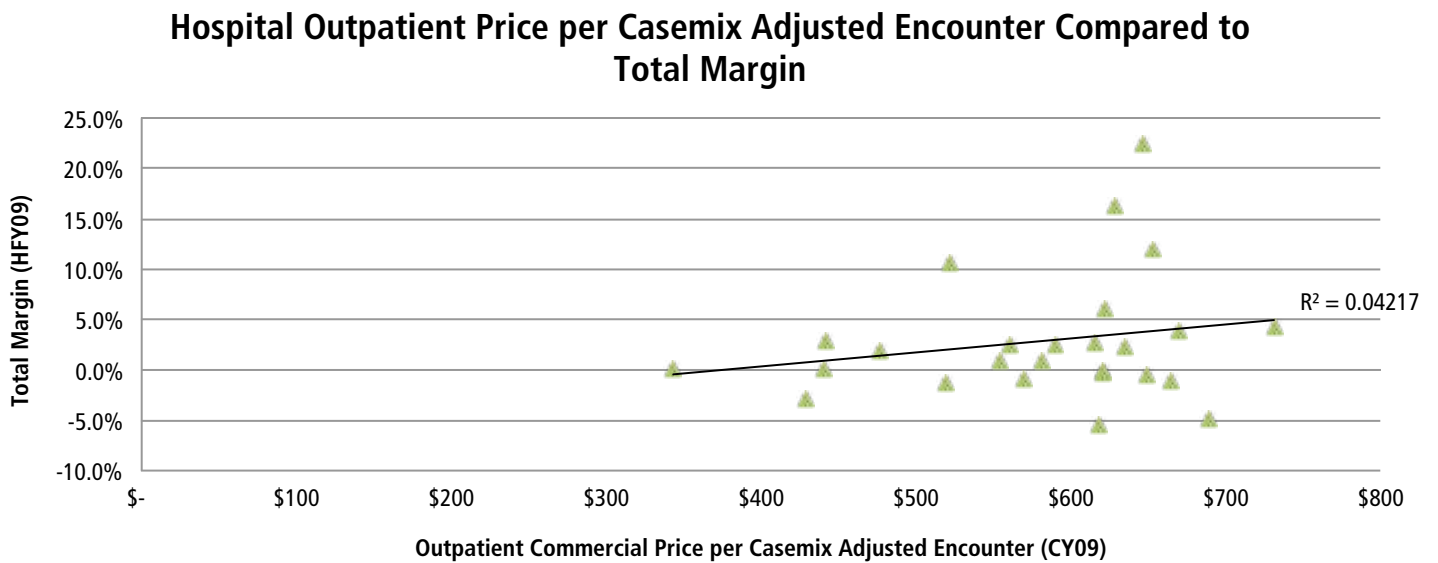
Figure 31



Total margin of hospital

As shown in figure 32, there was no statistically significant correlation between a hospital's total margin and its outpatient price per casemix adjusted encounter. This finding was consistent with the inpatient analysis, which also indicated no correlation.

Figure 32



CONCLUSION

In summary, the analysis indicated that there are certain factors that are correlated with a hospital's level of commercial prices. A hospital's cost and casemix are the most consistent predictor of a hospital's commercial prices for both inpatient and outpatient services. This suggests that hospitals and payers seriously consider patient acuity and service complexity when negotiating payment rates and corresponding payment models.

For inpatient services, the higher a hospital's occupancy rate, the more likely it is to have higher commercial prices. One reason for this finding may be that hospitals that have higher demand for their beds may command higher prices from insurers. Additional analysis is needed to explore this finding further.

Finally, the analysis indicated some relationship between a hospital's public payer mix and its level of commercial prices. If hospitals shift the cost of underpayments from public payers to private payers, we would expect to see higher commercial prices associated with higher public payer mix. However, the results of the analysis were mixed:

- Hospitals with higher proportions of Medicare charges were more likely to have higher commercial prices for both inpatient and outpatient services;
- Hospitals with higher proportions of Medicaid days and Medicaid discharges tended to receive *lower* commercial prices for outpatient services, and no relationship was found between proportion of Medicaid charges and inpatient service commercial prices.
- No significant relationships were found between proportion of uninsured charges and commercial prices for either inpatient or outpatient services.

The findings suggest a much more complex relationship between public payer mix and commercial prices than can be explained by cost-shifting alone. Hospitals with a higher public payer mix likely utilize a variety of strategies to compensate for lower public prices, including accepting reduced margins or reducing their costs. Commercial prices are more heavily influenced by the cost of care and the relative acuity of the patients being treated.

Appendix A: Correlation Results

Figure 33: Summary of inpatient correlation analyses

	Commercial Price per CMAD (CY09) (n=26)	
	Correlation coefficient r	p value
There is a statistically significant positive correlation between Inpatient Hospital Price and:		
Occupancy Rate (HFY09)	0.5017**	0.009
Commercial Cost per Discharge (CY09)	0.4434*	0.023
Medicare percent of inpatient charges (HFY09)	0.4082*	0.038
Commercial casemix Index (CY09 - CMS v26 MS-DRGs)	0.4073*	0.039
All Payer casemix Index (CY09 - CMS v26 MS-DRGs)	0.4042*	0.041
There is NO statistically significant correlation between Inpatient Hospital Price and:		
Commercial Cost per CMAD (CY09)	0.3784	0.057
Medicaid percent of charges (SFY09)	0.2628	0.195
Number of Beds (HFY09)	0.2039	0.318
Total Margin (HFY09)	0.2219	0.276
Medicare percent of discharges (HFY09)	0.2115	0.300
Medicare percent of days (HFY09)	0.0992	0.630
Uninsured percent of charges (HFY09)	-0.0444	0.830
Medicaid percent of discharges (HFY09)	-0.2412	0.236
Medicaid percent of days (HFY09)	-0.2680	0.186

* significant at $p < .05$; ** significant at $p < .01$

Figure 34: Summary of outpatient correlation analyses

Commercial Price per CMAE (CY09) (n=26)		
	Correlation coefficient r	p value
There is a statistically significant positive correlation between Outpatient Hospital Price and:		
Commercial Cost per casemix Adjusted Episode (CY09)	0.6235***	0.001
Medicare percent of discharges (HFY09)	0.5191**	0.007
Medicare percent of outpatient charges (HFY09)	0.4995**	0.009
There is a statistically significant negative correlation between Outpatient Hospital Price and:		
Medicaid percent of days (HFY09)	-0.4746*	0.014
Medicaid percent of discharges (HFY09)	-0.4104*	0.037
There is NO statistically significant correlation between Outpatient Hospital Price and:		
Commercial Cost per Episode (CY09)	0.3594	0.071
Medicare percent of days (HFY09)	0.3046	0.130
Total Margin (HFY09)	0.2054	0.314
Medicaid percent of charges (SFY09)	0.1506	0.463
Number of Beds (HFY09)	-0.0813	0.693
Uninsured percent of charges (HFY09)	-0.1649	0.421
Outpatient casemix Index (HFY09)	-0.1669	0.415
Total Episodes (CY09)	-0.2255	0.268

* significant at $p < .05$; ** significant at $p < .01$; *** significant at $p < .001$

Appendix B: Data Sources and Methods

I. DATA SOURCES

This analysis relied primarily on New Hampshire hospital data from the following publicly available datasets.

Figure 35: Data Sources

	Short name	Dataset	Year	Year-End
1	HDD	Hospital Discharge Dataset	Calendar Year	12/31/2009
2	NHCHIS	New Hampshire Comprehensive Health Care Information System: Inpatient & Outpatient Hospital Data, Commercial Claims, Age <65	Calendar Year	12/31/2009
3	2552	Medicare 2552 Hospital Cost Report	Hospital Fiscal Year	17 hosps: 9/30/09, other 9 vary
4	DSH	NH DSH Hospital Input Form	Hospital Fiscal Year	17 hosps: 9/30/09, other 9 vary

II. INPATIENT ANALYSIS

A. NHCHIS Claims data

The analytic claims dataset included claims that met the following criteria in CY 2009.

- DPCIDs identified as one of the 26 New Hampshire acute care hospitals analyzed in this report
- CLAIMTYPE=1 Inpatient Facility (excluded professional services, outpatient facility, durable medical equipment and pharmacy)
- USEFLAG=0 “ok to use” or USEFLAG=9 “non-NH zip” (Excluded Medicare members, secondary claims, duplicate claims, and denied claims. Included patients who live out-of-state and received inpatient care in a New Hampshire hospital.)
- Patient AGE less than 65

- PRODUCT equal to one of the following types of private health plans
 - EP Exclusive Provider Organization
 - HM Health Maintenance Organization (HMO)
 - IN Indemnity
 - PR Preferred Provider Organization (PPO)
 - PS Point of Service (POS)

Individual claim lines were rolled up into discharges and outliers were trimmed from the analytic dataset.

- Discharges with charges less than the 1st percentile of charges statewide (\$1212.69) and discharges with charges greater than the 99th percentile of charges statewide (\$167,986.71) were excluded from the dataset.
- Discharges with payment less than the 1st percentile of payment statewide (\$790.00) and discharges with payment greater than the 99th percentile of payment statewide (\$88,576.04) were also excluded from the dataset. “Payment” is the sum of all payments from the health plan or the patient: Plan paid amount (Tpay), Prepaid, Coinsurance, Deductible, Co-payment.

The resulting analytic dataset included 20,139 inpatient commercial discharges.

The Hospital Discharge Dataset (HDD) included a higher number of discharges for patients under age 65 and a commercial payer (48,420). These discharges have a primary payer type of HMO, Blue Cross, or Commercial Insurance (PRIPAYOR= 5, 7 or 8).

Because the NHCHIS dataset includes a smaller number of discharges, the datasets are not exactly comparable. However, we assume that the datasets are both large enough to be generally reliable.

B. Inpatient Price

The measure for analyzing the price paid by commercial insurers to hospitals for inpatient (IP) services is the payment per casemix-adjusted commercial discharge. This payment includes payment amounts paid by the health plan as well as payments (copayment, co-insurance, deductible) made by individuals.

To develop this measure, the UMMS team selected commercial discharges from the HDD, where “commercial” includes commercial insurers, HMOs, and Blue Cross Blue Shield. We determined the total charge per commercial discharge for each hospital and multiplied this amount by the hospital’s payment to charge ratio, obtained from the NHCHIS, to determine the price per discharge.

$$\frac{\text{(HDD Total Commercial IP Charges)}}{\text{(HDD Total Commercial IP Discharges)}} \times \frac{\text{(NHCHIS Commercial IP Payments)}}{\text{(NHCHIS Commercial IP Charges)}}$$

We then divided this amount by each hospital’s casemix index, obtained from the HDD, to determine the price per casemix-adjusted commercial discharge.

C. Required variables

1. Complexity of patients served

This analysis uses two measures of complexity of patients served on an inpatient basis, an all-payer casemix index and a commercial casemix index. Casemix is a measure of acuity for a given population, with higher values reflecting higher acuity and complexity. These indexes were derived by summing the casemix weights associated with the DRGs (CMS version 26 MS-DRGs) for each discharge in the HDD by hospital, and then dividing by the hospital’s total discharges.

The all-payer casemix index was calculated using discharges for all payers and represents the complexity of all patients served by the hospital on an inpatient basis. The commercial casemix index was calculated using discharges paid for by commercial insurers, HMOs and Blue Cross Blue Shield. The commercial casemix index represents the complexity of patients with commercial insurance served by the hospital on an inpatient basis.

2. Costs to the provider of delivering care

The acuity adjusted measure of cost to the provider of delivering care is the commercial cost per casemix adjusted discharge (CMAD). The UMMS team calculated a ratio of total patient care costs from the CMS-2552 cost report (Worksheet C, Part I, Column 5, Line 101) to total charges from the CMS-2552 report (Worksheet C, Part I, Column 8, Line 101) for each hospital. The product of this ratio and each hospital’s total commercial charges per discharge (including commercial, HMO, and Blue Cross Blue Shield) from the HDD produced the estimated total provider cost per discharge for commercial inpatient care.

$$\frac{\text{(HDD Total Commercial IP Charges)}}{\text{(HDD Total Commercial IP Discharges)}} \times \frac{\text{(2552 Total Patient Care Costs)}}{\text{(2552 Total Charges)}}$$

This cost per discharge figure was then divided by each hospital's casemix index from the HDD to produce the commercial cost per casemix adjusted discharge.

3. Relative proportion of patients on Medicare and Medicaid

The relative proportion of patients on Medicare and Medicaid was measured in three ways, by charges, discharges and patient days.

The *Medicare share of total charges* was developed by dividing inpatient Medicare program charges from the CMS-2552 cost report (Worksheet D Part IV or Worksheet D-4) by total inpatient charges (Worksheet C, Part I, Column 6, Line 101) for each hospital.

The *Medicare share of inpatient discharges* was developed by dividing total Medicare discharges from the CMS-2552 cost report (Worksheet S-3, Part I, Column 13, line 12) by total discharges (Worksheet S-3, Part I, Column 15, line 12) for each hospital.

The *Medicare share of inpatient patient days* was developed by dividing total Medicare patient days from the CMS-2552 cost report (Worksheet S-3, Part I, Column 4, line 12) by total patient days (Worksheet S-3, Part I, Column 6, line 12) for each hospital.

The *Medicaid share of total charges* was obtained from the Disproportionate Share (DSH) Hospital Input Form data filed by hospitals with the New Hampshire Department of Revenue Administration. The relative proportion used in these analyses is the ratio of total Medicaid charges to the total gross charges.

The *Medicaid share of inpatient discharges* was developed by dividing total Medicare discharges from the CMS-2552 cost report (Worksheet S-3, Part I, Column 14, line 12) by total discharges (Worksheet S-3, Part I, Column 15, line 12) for each hospital.

The *Medicaid share of inpatient patient days* was developed by dividing total Medicare patient days from the CMS-2552 cost report (Worksheet S-3, Part I, Column 5, line 12) by total patient days (Worksheet S-3, Part I, Column 6, line 12) for each hospital.

4. Relative proportion of providing free or discounted care to the uninsured

The relative proportion of providing free or reduced fee care to uninsured was obtained from the Disproportionate Share (DSH) Hospital Input Form data filed by hospitals with the New Hampshire Department of Revenue Administration. The relative proportion used in these analyses is the ratio of total charges for uninsured, less payments from the uninsured, to the total gross charges.

D. Optional variables

1. Location of hospital

For purposes of this analysis, the UMMS team grouped the 26 acute care hospitals into regions. The six Northern hospitals are geographically distant from the rest of the state. The Southeastern hospitals are located in the three counties (Hillsborough, Rockingham, and Strafford) designated by the federal Office of Management and Budget (OMB) as “metro counties.” The remaining hospitals are grouped into a Central/Western region.

2. Status as a Critical Access Hospital

Critical Access Hospitals (CAHs) are hospitals that have received a federal designation recognizing their unique status as rural providers. To receive CAH designation, the hospital must have no more than 25 acute beds, be located in a rural area and be more than a 35-mile drive from the nearest hospital or more than a 15-mile drive in areas with mountainous terrains or secondary roads; OR prior to January 1, 2006, were certified as a CAH based on State designation as a “necessary provider” The additional requirements for CAH designation, including length of stay requirements, staffing requirements, and other provisions are set forth in federal regulation (42 CFR 485.601-647).

3. Size of the hospital

The measure of a hospital’s size is the number of licensed inpatient beds. This data was obtained from the CMS-2552 cost report (Worksheet S-3, Part I, Column 1, line 12) for each hospital.

4. Occupancy rate

The occupancy rate is the ratio of the total patient days from the CMS-2552 cost report (Worksheet S-3, Part I, Column 6, line 12) for each hospital divided by the number of available inpatient days: $365 \times$ the number of hospital beds (Worksheet S-3, Part I, Column 1, line 12). Only acute care hospital beds were included in this analysis.

5. Total margin of hospital

Total margins were calculated by dividing net income or loss from the CMS-2552 cost report (Worksheet G-3, line 31) by the sum of net patient revenues (Worksheet G-3, line 1) and total other revenue (Worksheet G-3, line 25).

III. OUTPATIENT ANALYSIS

A. NHCHIS Claims data

The analytic claims dataset included claims that met the following criteria in CY 2009.

- DPCIDs identified as a New Hampshire hospital
- CLAIMTYPE=2 Outpatient Facility
- USEFLAG=0 “ok to use” or USEFLAG=9 “non-NH zip” (excluded Medicare members, secondary claims, duplicate claims, and denied claims)
- Patient AGE less than 65
- Charge greater than \$0
- Payment greater than \$0. Payment is the sum of all payments from the health plan or the patient: Plan paid amount (TPAY), Prepaid, Coinsurance, Deductible, Co-payment.

This selection methodology produced an analytic dataset with 1,067,300 outpatient visits comprising 2,441,489 service encounters (service lines).

CPT code and EAPG were not present for 23% of claims. These records were excluded from the analysis. The CPT and resulting EAPG codes were essential for the price analysis, so the claims that were missing CPT codes had to be excluded from the analysis. If the claims that were excluded were significantly different from the claims that were included in the analysis, the results could be skewed. Information about the excluded claims is presented in Figure 36.

Several payers did not include CPT codes in over 90% of outpatient hospital claims submitted. These payers are Cigna Behavioral Health, Cigna Healthcare of New Hampshire, Connecticut General Life Insurance Company, Gallagher Benefit Administrators, New Hampshire Health Plan, and Guardian Life Insurance Company. Payments from Connecticut General Life Insurance for claims that are missing CPT codes represent almost 11% of total statewide payments for outpatient hospital services. The other five payers together represent 1% of total statewide payments for outpatient hospital services.

Figure 36: Summary of claims excluded because CPT code and EAPG code were missing by payer.

Payer Name	1 Percentage of Payer's claims missing CPT code	2 Percentage of Payer's payments missing CPT code	3 Payer payments missing CPT codes as a % of statewide total missing CPT code (column %)
Aetna Life Insurance Company - ACAS All	13.6%	11.4%	0.0%
Aetna Life Insurance Company - HMO	9.9%	8.1%	0.0%
American Republic Insurance Company	42.1%	80.9%	0.0%
Anthem - NH	9.4%	9.7%	4.0%
CIGNA Behavioral Health, Inc.	100.0%	100.0%	0.0%
CIGNA HealthCare of New Hampshire, Inc.	95.6%	97.2%	0.6%
Connecticut General Life Insurance Company	91.5%	92.0%	10.9%
EBPA Benefits, LLC	14.0%	11.5%	0.0%
Fiserv Health Plan Administrators, Inc.	6.5%	3.7%	0.0%
Gallagher Benefit Administrators	98.4%	99.6%	0.0%
Great-West Life & Annuity Insurance Company	6.2%	6.4%	0.0%
Harvard Pilgrim Health Care	27.5%	19.9%	3.4%
Health Plans, Inc.	6.6%	23.5%	1.6%
John Alden Life Insurance Company	1.5%	0.8%	0.0%
MVP Health Plan of New Hampshire, Inc.	10.2%	9.7%	0.3%
Matthew Thornton	10.3%	10.0%	1.6%
New Hampshire Health Plan	98.6%	99.8%	0.5%
Patriot Health Insurance Company, Inc.	14.2%	18.7%	0.1%
The Guardian Life Insurance Company	99.2%	100.0%	0.0%
The MEGA Life and Health Insurance Company	34.0%	41.4%	0.1%
UltraBenefits Inc	5.5%	24.3%	0.1%
United Healthcare Insurance Company	21.5%	36.8%	0.1%
United Healthcare Insurance Company-HPJV	13.4%	NA	0.0%
TOTAL			23.6%

B. Outpatient Price

The measure for analyzing the price paid by commercial insurers to hospitals for outpatient (OP) services is the payment per casemix-adjusted commercial encounter. This payment amount includes payments made by the health plan, as well as payments (copayments, co-insurance, deductibles) made by individuals.

The UMass team excluded payments that were greater than 95% of the maximum payment statewide or less than the 105% of the minimum payment statewide in order to minimize the effect of outliers.

After excluding visits with missing values and outliers, the final analytic dataset included 773,218 outpatient visits comprising 2,201,587 service encounters (service lines).

Each hospital's average payment amount per encounter was calculated from the NHCHIS dataset and divided by the hospital's outpatient casemix index, described in section C below.

C. Required Variables

1. Complexity of patients served

The measure of complexity of patients served on an outpatient basis is an outpatient casemix index developed by the UMass team for this analysis

Onpoint Health Systems grouped the NHCHIS hospital outpatient claims encounters into Enhanced Ambulatory Patient Groups (EAPGs), using the 3M EAPG grouper version 3.1.

Because there were no publicly available EAPG weights for the EAPG version available in the NHCHIS, the UMass team developed New Hampshire specific payment weights as a proxy for complexity of patients served as hospital outpatients.

The UMass team first excluded payments within each EAPG that were greater than 95% of the maximum payment statewide or less than the 105% of the minimum payment statewide in order to minimize the effect of outliers.

The EAPG payment weight was set equal to the statewide mean payment for all encounters grouped into that EAPG divided by the statewide mean payment for all encounters, and then normalized to 1 to create an outpatient Casemix index.

Then the EAPG payment weights associated with each encounter were summed to determine each hospital's relative casemix.

As a validation measure, the UMass team compared the NH payment-based EAPG weights to the cost-based EAPG weights used by the New York Medicaid program. The NY weights could not be used directly for this analysis, as there were some differences in the EAPG versions (NY weights were based on version 3.5) and the NH data did not include all the services present in the NY weights (e.g. dental). However, where the weights overlapped, the two sets were strongly correlated ($r=.44$, $p<.0001$). This finding indicates that the NH weights reasonably approximate relative resource use among the EAPGs.

2. Relative proportion of patients on Medicare and Medicaid

Because there was no direct measure of the proportion of visits provided to Medicare and Medicaid patients, the same measures used for the inpatient analysis were used for the outpatient analysis. These measures included the proportions of Medicare days and discharges, Medicaid days and discharges, and Medicaid charges.

In addition, the *Medicare percent of outpatient charges* was developed by dividing outpatient Medicare program charges from the CMS-2552 cost report (Worksheet D Part IV or Worksheet D-4) by total outpatient charges (Worksheet C, Part I, Column 7, Line 101) for each hospital.

3. Costs to the provider of delivering care

The acuity adjusted measure of cost to the provider of delivering care is the commercial cost per casemix adjusted episode (CMAE). The UMMS team calculated a ratio of total patient care costs from the CMS-2552 cost report (Worksheet C, Part I, Column 5, Line 101) to total charges (Worksheet C, Part I, Column 8, Line 101) for each hospital. This ratio was multiplied by the total commercial charge per CMAE to determine the commercial cost per CMAE.

4. Relative proportion of providing free or discounted care to the uninsured: Same as inpatient, see above.

D. Optional Variables

1. **Size of the hospital:** The measure of a hospital's size is the number of commercial episodes derived from the NHCHIS. In addition, the number of licensed inpatient beds was used.
2. **Location of hospital:** Same as inpatient, see above.
3. **Status as a Critical Access Hospital:** Same as inpatient, see above.
4. **Total margin of hospital:** Same as inpatient, see above.

Appendix C: Inpatient Data Elements

Hospital Identification Number	Hospital Name	Data Sources:													
		Commercial Payment per Case-Mix Adjusted Discharge	Commercial Payment per Discharge (unadjusted)	Commercial Cost per Case-Mix Adjusted Discharge	Commercial Cost per Discharge (unadjusted)	Inpatient Commercial Casemix Index	Inpatient All Payer Casemix Index	Occupancy Rate	Commercial Payment per Case-Mix Adjusted Discharge	Commercial Payment per Discharge (unadjusted)	Commercial Cost per Case-Mix Adjusted Discharge	Commercial Cost per Discharge (unadjusted)	Inpatient Commercial Casemix Index	Inpatient All Payer Casemix Index	Occupancy Rate
		NHCHIS & HDD	NHCHIS	HDD & 2552	HDD & 2552	HDD	HDD	HDD	HDD	HDD	HDD	HDD	HDD	HDD	HDD
300016	ALICE PECK DAY MEMORIAL HOSPITAL	\$7,856	\$5,558	\$7,303	\$5,167	0.71	0.78	40%							
300022	ANDROSCOGGIN VALLEY HOSPITAL	\$10,903	\$10,628	\$7,044	\$6,866	0.97	1.03	69%							
300034	CATHOLIC MEDICAL CENTER	\$9,480	\$13,532	\$8,218	\$11,731	1.43	1.60	49%							
300019	CHESHIRE MEDICAL CENTER	\$7,137	\$6,682	\$5,835	\$5,463	0.94	1.07	52%							
300001	CONCORD HOSPITAL	\$11,887	\$13,593	\$8,361	\$9,561	1.14	1.26	77%							
300028	COTTAGE HOSPITAL	\$9,558	\$9,397	\$6,388	\$6,281	0.98	1.08	44%							
300012	ELLIOT HOSPITAL	\$8,463	\$8,230	\$5,357	\$5,209	0.97	1.11	73%							
300023	EXETER HOSPITAL	\$13,415	\$14,023	\$6,907	\$7,220	1.05	1.23	68%							
300013	FRANKLIN REGIONAL HOSPITAL	\$11,196	\$10,650	\$6,918	\$6,581	0.95	1.04	59%							
300014	FRISBIE MEMORIAL HOSPITAL	\$11,934	\$11,333	\$6,578	\$6,246	0.95	1.04	68%							
300006	HUGGINS HOSPITAL	\$8,499	\$8,139	\$5,227	\$5,006	0.96	1.06	59%							
300005	LAKES REGION GENERAL HOSPITAL	\$12,321	\$14,367	\$6,285	\$7,328	1.17	1.24	63%							
300008	LITTLETON REGIONAL HOSPITAL	\$10,462	\$9,908	\$6,366	\$6,029	0.95	1.05	78%							
300003	MARY HITCHCOCK MEMORIAL HOSPITAL	\$12,635	\$21,664	\$7,809	\$13,390	1.71	1.82	84%							
300015	MEMORIAL HOSPITAL	\$12,412	\$11,445	\$6,983	\$6,439	0.92	0.98	72%							
300007	MONADNOCK COMMUNITY HOSPITAL	\$7,678	\$5,469	\$6,841	\$4,873	0.71	0.90	60%							
300009	NEW LONDON HOSPITAL	\$6,175	\$6,979	\$7,957	\$8,993	1.13	1.05	32%							
300017	PARKLAND MEDICAL CENTER	\$8,746	\$9,611	\$5,389	\$5,922	1.10	1.24	44%							
300029	PORTSMOUTH REGIONAL HOSPITAL	\$12,481	\$16,262	\$6,273	\$8,173	1.30	1.59	55%							
300020	SOUTHERN NH MEDICAL CENTER	\$7,573	\$7,396	\$4,970	\$4,854	0.98	1.07	62%							
300010	SPEARE MEMORIAL HOSPITAL	\$6,842	\$5,633	\$5,530	\$4,553	0.82	0.94	51%							
300011	ST JOSEPH HOSPITAL	\$9,378	\$9,614	\$6,306	\$6,465	1.03	1.15	38%							
300033	UPPER CONNECTICUT VALLEY HOSPITAL	\$11,012	\$10,926	\$6,964	\$6,910	0.99	0.97	38%							
300024	VALLEY REGIONAL HOSPITAL	\$9,690	\$9,109	\$6,447	\$6,061	0.94	1.01	53%							
300021	WEEKS MEDICAL CENTER	\$12,781	\$12,833	\$7,792	\$7,824	1.00	1.02	54%							
300018	WENTWORTH DOUGLASS HOSPITAL	\$9,794	\$9,992	\$6,972	\$7,113	1.02	1.16	68%							

Appendix C: Inpatient Data Elements Cont.

Hospital Identification Number	Hospital Name	Number of Inpatient Beds	Total Margin	Operating Margin	Medicare Percent of Inpatient Discharges	Medicaid Percent of Inpatient Discharges	Medicare Percent of Inpatient Days	Medicaid Percent of Inpatient Days	Medicaid Percent of Total Charges	Uninsured Percent of Total Charges	Medicare Percent of Inpatient Charges	Medicare Percent of Total Charges
Data Sources:												
300016	ALICE PECK DAY MEMORIAL HOSPITAL	22	0.0%	-1.7%	24%	17%	38%	9%	6%	5%	20%	24%
300022	ANDROSCOGGIN VALLEY HOSPITAL	25	4.3%	0.0%	53%	10%	69%	7%	10%	5%	36%	42%
300034	CATHOLIC MEDICAL CENTER	204	-0.6%	3.0%	46%	12%	49%	9%	6%	5%	41%	35%
300019	CHESHIRE MEDICAL CENTER	98	2.8%	2.5%	52%	14%	56%	12%	7%	3%	32%	28%
300001	CONCORD HOSPITAL	190	0.9%	-0.2%	32%	14%	45%	8%	8%	6%	36%	29%
300028	COTTAGE HOSPITAL	25	-1.1%	-3.3%	53%	12%	65%	6%	10%	2%	31%	35%
300012	ELLIOT HOSPITAL	196	1.8%	2.6%	34%	20%	34%	16%	9%	4%	29%	24%
300023	EXETER HOSPITAL	100	12.0%	12.1%	48%	7%	51%	9%	6%	6%	41%	32%
300013	FRANKLIN REGIONAL HOSPITAL	25	-5.4%	-9.7%	63%	7%	73%	3%	10%	9%	27%	31%
300014	FRISBIE MEMORIAL HOSPITAL	59	-0.4%	11.4%	54%	15%	50%	15%	11%	5%	37%	29%
300006	HUGGINS HOSPITAL	25	-1.2%	-12.1%	57%	10%	62%	9%	7%	10%	28%	39%
300005	LAKES REGION GENERAL HOSPITAL	104	2.5%	-0.6%	50%	16%	61%	8%	8%	6%	38%	34%
300008	LITTLETON REGIONAL HOSPITAL	21	3.9%	2.7%	45%	18%	56%	9%	8%	6%	44%	34%
300003	MARY HITCHCOCK MEMORIAL HOSPITAL	348	2.7%	1.4%	41%	8%	41%	10%	11%	3%	30%	28%
300015	MEMORIAL HOSPITAL	25	-0.1%	-1.0%	49%	12%	58%	11%	8%	8%	31%	35%
300007	MONADNOCK COMMUNITY HOSPITAL	25	0.9%	-3.0%	46%	17%	52%	9%	6%	4%	33%	32%
300009	NEW LONDON HOSPITAL	25	2.2%	-4.2%	66%	5%	71%	5%	4%	5%	18%	29%
300017	PARKLAND MEDICAL CENTER	82	16.2%	15.8%	45%	10%	51%	7%	5%	6%	41%	28%
300029	PORTSMOUTH REGIONAL HOSPITAL	143	22.4%	22.3%	48%	8%	52%	7%	4%	4%	40%	33%
300020	SOUTHERN NH MEDICAL CENTER	151	0.0%	6.6%	29%	13%	37%	13%	8%	7%	28%	21%
300010	SPEARE MEMORIAL HOSPITAL	25	-2.8%	6.3%	47%	13%	52%	13%	8%	9%	36%	32%
300011	ST JOSEPH HOSPITAL	166	10.6%	8.6%	46%	7%	52%	6%	4%	4%	40%	30%
300033	UPPER CONNECTICUT VALLEY HOSPITAL	16	-4.8%	-8.7%	70%	8%	25%	1%	11%	7%	29%	43%
300024	VALLEY REGIONAL HOSPITAL	25	-0.9%	-3.5%	48%	20%	59%	12%	13%	8%	30%	29%
300021	WEEKS MEDICAL CENTER	25	2.4%	-2.1%	74%	5%	76%	3%	8%	5%	33%	38%
300018	WENTWORTH DOUGLASS HOSPITAL	115	6.1%	9.2%	40%	9%	48%	10%	7%	4%	43%	34%

Appendix C: Outpatient Data Elements

Hospital Identification Number	Hospital Name	Commercial Payment per Case-Mix Adjusted Visit	Commercial Payment per Visit (unadjusted)	Commercial Cost per Case-Mix Adjusted Visit	Commercial Cost per Visit (unadjusted)	Outpatient Commercial Casemix Index	Total Commercial Visits	Medicare Percent of Outpatient Charges
Data Sources:		NHCHIS	NHCHIS	NHCHIS & 2552	NHCHIS & 2552	NHCHIS	NHCHIS	2552
300016	ALICE PECK DAY MEMORIAL HOSPITAL	\$343	\$388	\$289	\$326	1.13	8,847	23%
300022	ANDROSCOGGIN VALLEY HOSPITAL	\$731	\$577	\$447	\$353	0.79	13,463	41%
300034	CATHOLIC MEDICAL CENTER	\$649	\$748	\$424	\$489	1.15	38,173	28%
300019	CHESHIRE MEDICAL CENTER	\$442	\$658	\$276	\$410	1.49	26,704	24%
300001	CONCORD HOSPITAL	\$554	\$383	\$336	\$232	0.69	126,164	22%
300028	COTTAGE HOSPITAL	\$665	\$489	\$473	\$348	0.74	5,443	34%
300012	ELLIOT HOSPITAL	\$477	\$441	\$260	\$240	0.92	96,031	21%
300023	EXETER HOSPITAL	\$653	\$925	\$385	\$546	1.42	32,684	26%
300013	FRANKLIN REGIONAL HOSPITAL	\$619	\$457	\$351	\$259	0.74	13,921	26%
300014	FRISBIE MEMORIAL HOSPITAL	\$621	\$637	\$367	\$376	1.02	22,651	23%
300006	HUGGINS HOSPITAL	\$520	\$401	\$291	\$225	0.77	13,799	37%
300005	LAKES REGION GENERAL HOSPITAL	\$560	\$567	\$299	\$302	1.01	44,983	27%
300008	LITTLETON REGIONAL HOSPITAL	\$669	\$633	\$412	\$390	0.95	12,146	29%
300003	MARY HITCHCOCK MEMORIAL HOSPITAL	\$615	\$825	\$344	\$461	1.34	76,270	26%
300015	MEMORIAL HOSPITAL	\$620	\$709	\$375	\$429	1.14	11,355	35%
300007	MONADNOCK COMMUNITY HOSPITAL	\$580	\$551	\$505	\$479	0.95	18,880	30%
300009	NEW LONDON HOSPITAL	\$635	\$534	\$1,073	\$901	0.84	15,862	33%
300017	PARKLAND MEDICAL CENTER	\$628	\$782	\$547	\$681	1.24	15,435	21%
300029	PORTSMOUTH REGIONAL HOSPITAL	\$647	\$686	\$318	\$337	1.06	32,216	25%
300020	SOUTHERN NH MEDICAL CENTER	\$441	\$419	\$221	\$210	0.95	60,573	15%
300010	SPEARE MEMORIAL HOSPITAL	\$429	\$448	\$357	\$373	1.04	14,584	31%
300011	ST JOSEPH HOSPITAL	\$521	\$443	\$295	\$251	0.85	47,242	21%
300033	UPPER CONNECTICUT VALLEY HOSPITAL	\$689	\$494	\$376	\$270	0.72	2,435	45%
300024	VALLEY REGIONAL HOSPITAL	\$570	\$563	\$398	\$393	0.99	9,749	27%
300021	WEEKS MEDICAL CENTER	\$591	\$493	\$365	\$305	0.83	6,976	36%
300018	WENTWORTH DOUGLASS HOSPITAL	\$623	\$758	\$403	\$491	1.22	37,789	28%



Center for Health Law and Economics

The Schrafft Center
529 Main Street, 3rd Floor
Charlestown, MA 02129
Tel. 617-886-8196
www.umassmed.edu/chle