



Commercial Cost Variation by Hospital Referral Region

Actuarial Analysis of Commercial Claims Databases

Prepared for the Institute for Healthcare Improvement

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Executive Summary

The wide regional variation in Medicare cost and Medicare utilization has been extensively documented.^{1 2} The observation that low cost areas do not appear to offer lower quality than high cost areas has led to widespread recognition that there are large opportunities to better manage costs, and that quality need not suffer when resources are used efficiently. Comprehensive Medicare paid claims and enrollment data are readily available, which explains why these data have been used for much research, including identifying regions that appear to offer excellent value to Medicare. Previous work has also shown that regions offering low cost to Medicare might not offer low cost to commercial payers, and two of this paper's authors have provided supporting evidence for that concern.³

However, organizations and individuals focusing on large scale health system improvement have been curious about how our understanding of regional cost-effectiveness might be improved by analyzing commercial health plans as well as Medicare. Ideally there would be reliable publicly available sources to understand per capita cost, by city or region, based on all-payer data, but for now, this is not a realistic option in most parts of the country. As a first step in understanding patterns of regional cost, this report provides cost relativities for claims paid by commercial payers for particular hospital referral regions. We hope this commercial payer information helps provide additional insight into how costs vary by region.

In this paper, we present results for selected hospital referral regions (HRRs) as defined in the Dartmouth Atlas⁴, and these results show very large variations in commercial cost and commercial utilization. We describe how we calculated this summary information for the 306 HRRs defined in the Dartmouth Atlas for the United States. This work contributes to a broader effort by the Institute for Healthcare Improvement (IHI), the Dartmouth Institute for Health Policy and Clinical Practice, the Harvard School of Public Health, and the Engelberg Center for Health Care Reform at The Brookings Institution and has been supported by the Fannie E. Rippel Foundation and the Peter G. Peterson Foundation. The IHI is combining our data with other sources of information by HRR, including Medicare costs, health status, mortality rates, income, and educational levels. IHI's goal in this effort is to help understand the local drivers of cost and other health care outcomes with the intent of informing regional improvement initiatives.

Because the landmark work on Medicare cost variation has been performed by the Dartmouth Atlas, we attempted to follow their structure. In particular, Dartmouth Atlas has defined regions through its Hospital Referral Regions (HRR) methodology. We attempted to use that methodology, although, as explained in the Methodology section, we could not precisely repeat their structure.

Unlike Medicare data, there is no comprehensive source for commercial data. For this study we used a combination of databases that contains the 2007 claims for over 35 million commercially insured Americans with comprehensive health benefits. While the source data reflects a very large population, it does not necessarily reflect an average of payers. Our data should be interpreted to represent what some commercial payers pay, not what all payers pay. Our figures should not be used for area factors to set insurance rates or similar purposes.

We note that the Milliman team that produced this work had earlier published similar information for the National Business Group on Health. That work focused on inpatient facility services only and used somewhat different methodology and data. Those differences explain some of the different results obtained.

Readers unfamiliar with large commercial claims databases may find this study to be particularly useful. Private insurers have maintained and used these databases for decades, and they are a cornerstone of insurer business operations. Commercial health insurance is, in many ways, more complex than Medicare, and this complexity is reflected in the claims databases. For example, the Medicare program has well-defined and uniform rules for coverage, eligibility, and provider reimbursement rates. However, for insurers, these items are negotiated between the insurer and

the buyer (for coverage and eligibility), negotiated between the insurer and provider (reimbursement rates) or set by state regulation (eligibility). Insurers routinely evaluate these factors in the data to set premium rates or reserves, and to make forecasts and business decisions. However, the use of these data to inform public policy is not as well developed as for Medicare data.

The authors would like to highlight the importance of negotiated provider reimbursement as a factor in the nation's healthcare cost. While Medicare sets provider reimbursement rates based on formulas and rules, commercial provider reimbursement is set by negotiation between the insurer and the provider. This means, among other things, that regions with low Medicare costs could have high commercial costs. This example highlights the importance for public policy of understanding commercial data.

The authors were commissioned by IHI. Individuals affiliated with IHI contributed to the design and review of our work but all errors or omissions are the authors' alone. The material in this paper reflects the findings of the authors and does not represent the endorsement of any policy or position by Milliman. Any economic forecast cannot capture all important factors, and some factors that will be important in the future are certainly unknown. If this report is distributed it must be distributed in its entirety, as material taken out of context could miss important information.

Two of the authors (Pyenson and Goldberg) are members of the American Academy of Actuaries and meet its qualifications to render this opinion.

Summary of Results

IHI selected 33 hospital referral regions, which exhibited data characteristics that IHI wishes to highlight. The IHI criteria, which included many items in addition to the statistics we provided, will be identified in a separate publication. The data we provided for these regions is summarized here.

	Inpatient Facility				Outpatient Facility			Physician				
	Excluding Maternity			Incl. Mat.	Tot OP Facility	Emergency Room		Total Physician	Evaluation & Management			
	Admits	Days	PMPM	PMPM	PMPM	PMPM	Cases	PMPM	PMPM	Cases	Cost-Sharing	
	44	198	\$51.38	\$57.12	\$62.67	\$12.72	153	\$103.07	\$23.95	3,408	71.7%	
United States Average												
HRR	Indices by HRR											
Asheville, NC	0.85	0.89	0.85	0.85	1.15	1.08	1.14	0.94	0.96	1.04	0.93	
Bend, OR*	0.86	0.89	1.11	1.13	0.99	1.01	0.89	1.19	1.19	0.85	1.03	
Buffalo, NY	0.97	0.93	0.76	0.77	0.62	0.53	1.03	0.77	0.76	0.92	0.91	
Camden, NJ*	1.10	1.10	1.02	1.06	0.92	0.90	1.06	1.13	1.01	1.17	1.00	
Cedar Rapids, IA*	0.91	0.98	0.85	0.87	1.20	1.12	1.11	1.09	1.07	1.03	1.06	
Chicago, IL	1.14	1.18	0.97	0.98	1.12	1.00	1.08	1.11	1.09	0.97	1.05	
Denver, CO	0.86	0.88	1.09	1.09	1.03	1.28	1.04	1.09	1.07	1.00	1.02	
Everett, WA	0.86	1.06	1.07	1.08	0.70	0.82	0.81	1.13	1.36	1.01	1.09	
Fargo, ND/Moorhead, MN*	1.01	1.05	0.97	0.96	0.75	0.62	0.92	0.92	0.91	0.82	0.95	
Grand Junction, CO*	0.97	0.74	1.15	1.20	1.45	1.29	1.12	0.87	0.95	0.85	1.01	
Grand Rapids, MI	0.88	0.80	0.77	0.79	0.94	0.75	1.06	1.00	0.93	0.95	1.11	
Green Bay, WI*	0.97	0.82	1.06	1.04	1.39	1.01	1.05	1.40	1.09	0.85	1.07	
Indianapolis, IN	0.91	0.90	1.10	1.11	1.64	1.40	1.17	0.86	0.85	0.96	0.90	
La Crosse, WI*	0.99	0.90	1.31	1.35	1.26	0.98	0.94	1.81	1.32	0.85	1.02	
Louisville, KY*	1.01	1.03	0.77	0.77	1.04	0.92	0.95	0.78	0.80	0.95	0.93	
Madison, WI*	0.96	0.86	1.06	1.09	1.30	1.02	1.04	1.32	1.16	0.88	1.04	
Manchester, NH	0.81	0.85	0.86	0.88	1.46	1.26	1.22	0.99	1.27	1.02	1.10	
McAllen, TX*	1.07	0.99	0.89	0.87	0.75	0.77	0.58	0.81	0.88	1.02	0.94	
Newark, NJ*	1.11	1.19	0.88	0.92	0.89	0.60	0.95	1.26	1.11	1.16	1.02	
Pittsburgh, PA*	1.06	0.99	0.81	0.80	1.00	0.79	1.26	0.84	0.82	0.92	0.98	
Portland, ME*	0.86	0.85	0.97	0.97	1.42	1.22	1.33	0.85	1.06	0.94	1.08	
Portland, OR*	0.82	0.94	0.91	0.94	0.98	0.96	0.89	1.08	1.24	0.86	1.07	
Richmond, VA	0.97	1.00	1.02	1.02	1.07	1.12	1.09	0.92	1.09	1.07	1.05	
Roanoke, VA	1.06	1.13	0.99	0.98	1.27	1.32	1.33	0.86	1.00	1.05	0.97	
Rochester, NY	0.74	0.82	0.60	0.63	0.77	0.67	0.94	0.85	0.94	0.96	0.97	
Sacramento, CA*	0.76	0.72	1.30	1.32	0.88	1.39	0.74	0.82	0.96	0.93	1.16	
Sayre, PA*	0.89	0.92	0.74	0.75	1.35	0.66	0.99	0.81	0.85	0.92	1.04	
Seattle, WA	0.82	0.98	1.03	1.03	0.84	0.93	0.84	1.08	1.29	1.01	1.08	
Takoma Park, MD*	0.99	1.09	0.87	0.90	0.65	0.62	1.16	1.00	1.02	0.99	1.04	
Tallahassee, FL	1.20	1.05	1.18	1.16	1.54	0.97	0.98	1.01	1.03	0.99	0.96	
Temple, TX*	1.11	0.96	0.86	0.83	1.13	1.28	1.17	0.84	0.85	0.93	0.97	

	Inpatient Facility				Outpatient Facility			Physician			
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United States Average	44	198	\$51.38	\$57.12	\$62.67	\$12.72	153	\$103.07	\$23.95	3,408	71.7%
HRR	Indices by HRR										
Traverse City, MI*	0.87	0.79	0.76	0.77	1.05	0.82	1.14	0.96	0.98	1.01	1.11
Tucson, AZ*	1.00	1.02	0.75	0.74	0.58	0.75	1.04	0.85	0.86	0.87	1.00

* The cities with asterisks exhibit more variation in some of the factors. Please see section on Stability Considerations on page 7.

We note that the Milliman team that produced this work had earlier published similar information for the National Business Group on Health.⁵ That work focused on inpatient facility services only and used somewhat different methodology and data. Those differences explain some of the different results obtained.

Glossary of Terms

We provide definitions of the terms used in the Summary of Results table. The figures shown for individual HRRs are indexes – they are the value for the HRR divided by the national average. The figures shown are demographically adjusted, as described in the Methodology section.

Inpatient: Hospital admissions coded as hospital inpatient and requiring an overnight hospital stay. This does not include Skilled Nursing Facility or same-day surgery. Physician services provided in an inpatient setting are not included in this category for this report.

Admits: Hospital inpatient admits per 1,000 lives. These figures do not include normal newborns.

Days: Hospital inpatient days per 1,000 lives. These are defined as the discharge date minus the admission date.

PMPM: Per Member Per Month cost. For each type of service, the total allowed cost (costs for which the payer bases its reimbursement) in an HRR divided by the number of member months in that HRR.

Outpatient: Referring to services provided in a hospital-based or freestanding facility that are not associated with an overnight hospital stay. For this report, this does not include professional services,

Maternity: A subset of inpatient services; referring to services for delivery of a baby.

Emergency Room: A subset of outpatient services; referring to services provided in an emergency room, not including professional services. If the patient is admitted as an inpatient, these services are bundled into the inpatient category and not included here.

Physician: Referring to all professional services billed by a physician or other professional, including technical and professional components, for any site of service. For this report, this does not include any facility charges.

Evaluation and Management (E&M). A subset of physician services; referring to professional services which are precisely defined by 5-digit CPT™ code, but, in general terms describe a service where a physician conducts a physical exam, takes a patient history, and/or makes clinical decisions. These services mostly occur during office visits, but they can occur in other settings. Surgical, laboratory, or radiology procedures are not included.

Cost sharing. We report the percent of E&M allowed amounts that is the patient liability based on the allowed amount. Patient liability includes [co-payment/co-insurance and deductibles]. Cost sharing can strongly affect the utilization of E&M services.

Allowed: The insurance industry term for the amount upon which the insurer determines what it will pay. Generally, the insurer paid amount plus the amount the patient pays toward the covered claim plus any coordination of benefits amount equals the allowed amount.

Paid: The insurance industry term for the amount the insurer pays toward the claim. This is equal to the allowed amount less the patient's payment and any collections from coordination of benefits.

Data Sources and Methodology

DATABASES

We merged two large commercial databases, both of which have similar structure and detail and under 1% duplication of members.

Thompson Reuters MedStat database. This dataset contains all paid claims generated by over 20 million commercially insured lives, which include claims from self-insured employers and insurers. MedStat is widely used by health services researchers. Contributors are mostly from large, self-insured employers. Member identification codes are consistent from year-to-year and allow for multi-year longitudinal studies. Information includes diagnosis codes, procedure codes and DRG codes, NDC codes along with site of service information, and the amounts paid by commercial payers. For the figures reported in this study, we used MedStat 2007 and excluded the over-65 population and high-deductible health plans. We examined MedStat 2008 to assess the stability of summary data by HRR between 2007 and 2008.

Milliman Consolidated Health Sources Database. This dataset contains all paid claims generated by over 10 million commercially insured lives, with contributors from lives administered by insurers' insured and self-insured lines of business. For this study, we used 2007 data and excluded the over-65 population and high-deductible health plans.

We used these databases to generate commercial utilization (number of inpatient admits, patient days, emergency room cases, and examination and management utilization) and PMPM (cost) information.

METHODOLOGY

Here are highlights of our methodology:

- We excluded individuals covered through high deductible health plans⁶, as these could be concentrated in some cities and produce low costs because of benefit design. We tabulated the allowed costs displayed in the data.
- We removed anyone over age 65, including those actively employed and not covered by Medicare. Although those individuals are part of the commercially-insured population; some employers, industries and locales tend to have more of these sometimes expensive, working aged, possibly affecting the data in those regions. We felt that excluding them would remove a source of differences among HRRs and between years.
- We excluded seasonal and part-time workers, and those on COBRA.
- We removed normal newborn discharges from inpatient utilization counts but kept the costs. This is in keeping with standard insurance practices.
- We analyzed maternity- and non-maternity- inpatient admits, days, and costs separately. Maternity admits in particular may show more socioeconomic and lifestyle characteristics but less about health, management, or other factors.
- The summaries are demographically adjusted for all cities. We stratified utilization and PMPMs into 26 buckets based on hospitalized patients' age and sex. We reweighted the figures in each HRR using the Milliman *Health Cost Guidelines* standard demographics to produce the demographically adjusted figures.

- The source data contains 3-digit zip codes, while the Hospital Referral Regions are defined by 5-digit zip codes. We allocated the 3-digit zip codes to the HRR based on the population in each 5-digit zip code. For a hypothetical example,

	5-digit zip, where the HRR is defined as zip codes 12301-12305					
	12301	12302	12303	12304	12305	All others
Distribution of Population	5%	10%	15%	20%	25%	25%
Allocation of 123 data	75%					25%

In the above hypothetical example, we allocated 75% of the population, utilization and cost data from the 3-digit zip code to the HRR. The included parts are shaded light green, while the excluded are shaded red. For many HRRs, we allocated several 3-digit zip codes into one HRR.

STABILITY CONSIDERATIONS

This section describes the tests for statistical stability that we performed on the data. While we produced data for all 306 hospital referral regions, some do not have credible volume or have shown significant fluctuation from year to year or from database to database. None of our databases is intended to be a statistically representative sample, and thus variation from year to year or from database to database could result from the nature of the organizations contributing data in a year or to a database. Changes in payer reimbursement, (e.g., a result of contract negotiations) could produce significant changes in cost levels from one year to the next. We considered HRRs that met all of the following criteria as having more credibility than HRRs that did not meet all criteria:

- More than 30,000 combined lives in our combined dataset
- A fluctuation of less than +/- 10% in the inpatient admits (excluding maternity) per 1,000 from MedStat 2007 to 2008
- A fluctuation of less than +/- 10% in any utilization-based index from MedStat-only results to combined results
- A fluctuation of less than +/- 15% in any cost-based index from MedStat-only results to combined results

In the "Summary of Results" table, the cities indicated with an asterisk did not meet all the above criteria. This does not mean the factors are incorrect – it suggests that the relativities could change from year to year or could be different if examined using other data samples.

References

¹ Hospital Care Intensity Index (HCI) reflects both the amount of time spent in hospital and the intensity of physician services delivered in the hospital. The HCI figures we use were developed by the Dartmouth Atlas from Medicare data and are based on care given during the last two years of life. http://cecsweb.dartmouth.edu/atlas08/datatools/hci_s1.php

² Fisher E, Goodman D, Skinner J, et al. Health Care Spending, Quality, and Outcomes: More Isn't Always Better. Feb 27, 2009. Available at http://www.dartmouthatlas.org/atlas/atlas_series.shtm

³ Goldberg S, Iwasaki K, Pyenson B. High Value for Hospital Care:: High Value for All? Milliman Client Report. March 18, 2010. <http://www.milliman.com/expertise/healthcare/publications/rr/high-value-hospital-care.php>

⁴ Hospital Referral Regions (HRRs) are geographic regions defined by 5-digit zip codes. They were developed by the Dartmouth Atlas to define areas within which people seek tertiary hospital care. www.dartmouthatlas.org/data/download.shtm

⁵ Goldberg op cit.

⁶ Burke J, Pipich R, Consumer-driven impact study, April 2008. Available at, <http://www.milliman.com/expertise/healthcare/publications/rr/pdfs/consumer-driven-impact-studyRR-04-01-08.pdf>