

# Geographic Variation in Medicare and the Military Healthcare System

Taiwo Adesoye, MD, MPH; Linda G. Kimsey, PhD, MSc; Stuart R. Lipsitz, SCD; Louis L. Nguyen, MD, MBA, MPH; Philip Goodney, MD; Samuel Olaiya, PhD; and Joel S. Weissman, PhD

**G**eographic variation in per capita healthcare spending is a well-documented phenomenon; however, its causes are less defined.<sup>1-5</sup> Many have argued that such variation is unwarranted, especially in light of research showing that spending may be negatively correlated with quality of care and does not result in improved health outcomes or patient satisfaction.<sup>3,6</sup>

A number of possible explanations for geographic variation have been studied. In a price-adjusted analysis of geographic variation in spending, Gottlieb et al found that administered prices set by Medicare in different regions accounted for only a small fraction of the variation observed. They attributed the high variation in spending to differences in utilization across regions.<sup>7</sup>

Differences in the underlying health status of populations may be another justifiable cause of variation. Although some researchers did not find that higher-spending regions cared for sicker patients,<sup>2,8,9</sup> others suggest that regions with sicker patients exhibit higher spending.<sup>10,11</sup> Such approaches are limited; however, higher-spending regions may be more likely to perform tests that diagnose illnesses that would otherwise not have been diagnosed.<sup>12</sup> Others believe that local culture is the predominant source of regional variation, perhaps due to a “specialist-oriented” practice pattern in high-spending regions,<sup>2,3</sup> or hypothesize that regional differences result from increased utilization related to supply of physicians and hospital resources. For instance, physicians have been shown to modify admission and discharge of their patients based on the availability of intensive care unit beds by admitting patients with less-severe illnesses or extending length of stay when more beds are available.<sup>13</sup>

Although the majority of geographic variation research has relied on Medicare data, 64.2% of the population is covered by private insurance compared with only 15.6% covered by Medicare.<sup>14</sup> An avenue to better understanding the factors influencing geographic variation in healthcare spending is to compare these findings with other payers or providers. Such elucidation is important in defining policy and allocating national financial resources. If similar variation occurs in other health systems and in the same areas, it

## ABSTRACT

**OBJECTIVES:** To compare geographic variation in healthcare spending and utilization between the Military Health System (MHS) and Medicare across hospital referral regions (HRRs).

**STUDY DESIGN:** Retrospective analysis.

**METHODS:** Data on age-, sex-, and race-adjusted Medicare per capita expenditure and utilization measures by HRR were obtained from the Dartmouth Atlas for 2007 to 2010. Similarly, adjusted data from 2007 and 2010 were obtained from the MHS Data Repository and patients assigned to HRRs. We compared high- and low-spending regions, and computed coefficient of variation (CoV) and correlation coefficients for healthcare spending, hospital inpatient days, hip surgery, and back surgery between MHS and Medicare patients.

**RESULTS:** We found significant variation in spending and utilization across HRRs in both the MHS and Medicare. CoV for spending was higher in the MHS compared with Medicare, (0.24 vs 0.15, respectively) and CoV for inpatient days was 0.36 in the MHS versus 0.19 in Medicare. The CoV for back surgery was also greater in the MHS compared with Medicare (0.47 vs 0.29, respectively). Per capita Medicare spending per HRR was significantly correlated to adjusted MHS spending ( $r = 0.3$ ;  $P < .0001$ ). Correlation in inpatient days ( $r = 0.29$ ;  $P < .0001$ ) and back surgery ( $r = 0.52$ ;  $P < .0001$ ) was also significant. Higher spending markets in both systems were not comparable; lower spending markets were located mostly in the Midwest.

**CONCLUSIONS:** In comparing 2 systems with similar pricing schemes, differences in spending likely reflect variation in utilization and the influence of local provider culture.

*Am J Manag Care.* 2017;23(8):e259-e264

## TAKEAWAY POINTS

- ▶ Geographic variation in healthcare spending and utilization within the Military Health System (MHS) is higher and significantly correlated with Medicare across hospital referral regions.
- ▶ Results contrast the negative correlation in spending between Medicare and the commercial sector.
- ▶ Higher variation in the MHS may reflect inherent variability in the health status of the MHS population.
- ▶ Positive correlation between spending and certain measures of utilization may suggest a strong impact of local provider culture on utilization.
- ▶ Our findings inform research that explores the impact of pricing schemes and local provider culture on unwarranted variation in utilization and spending.

would suggest that a strong local provider culture may play a role in driving health spending, regardless of the payer. A few studies have examined variation in commercial healthcare systems to identify patterns and drivers of spending variation.<sup>15-17</sup>

Chernew et al explored spending patterns by comparing Medicare spending with large commercial firm healthcare spending by hospital referral region (HRR).<sup>15</sup> They found a higher degree of regional variation within the commercial insurance market compared with Medicare. Their results showed a negative correlation in per capita spending between payers both before and after adjusting for age and sex differences; however, their measure of utilization, inpatient days per capita, was significantly correlated due to the potential effect of local provider culture in both systems. In the US Department of Veterans Affairs (VA) healthcare system, the Congressional Budget Office initially found that geographic variation in per capita spending was lower compared with Medicare. However, while the variation in spending within the VA increased from 2001 to 2007, it fell in the Medicare program from 2001 to 2005.<sup>18</sup> It appeared that the VA's centrally funded system and systemwide evidence-based practice guidelines may not have been sufficient to minimize variation, which, again, was perhaps influenced by local practice patterns.

Another federal system worthy of analysis is the Military Health System (MHS). TRICARE, the healthcare benefit program for MHS beneficiaries, serves approximately 9.5 million active duty and retired military personnel and their dependents.<sup>19</sup> Approximately 15% of beneficiaries are active duty service members; the remaining beneficiaries are predominantly spouses, children, and retirees.<sup>19</sup> TRICARE is separate from the VA, which primarily caters to veterans; its beneficiaries are surprisingly comparable to the privately insured population in terms of sociodemographics.

Our analysis focused on TRICARE Prime (a health maintenance organization [HMO]-like system) enrollees who were assigned a primary care manager to oversee their total care, making it more likely that complete episodes of care occurred within the purview of TRICARE. In addition, these beneficiaries had either very low or no out-of-pocket costs. Compared with the VA, whose beneficiaries receive care through a network of VA facilities, these enrollees

can receive care in both the budget-based direct care system (in Military Treatment Facilities [MTFs]) and the fee-for-service (FFS) purchased care system (managed by civilian providers).<sup>18</sup> Because Prime enrollees tend to be concentrated near military facilities, the percentage of direct care provision varies significantly. TRICARE therefore offers a unique perspective on variation given its centrally managed dual system of care and its use of administrative pricing in the community setting. Taken together, these characteristics

suggest lower geographic variation in costs and utilization than for other payers, although local market factors and practice styles may still play a role.

We had 2 analytic goals: 1) to investigate variation by HRR in the MHS and 2) to compare the variation in the MHS with Medicare as documented in the Dartmouth Atlas, which compiles data from the American Medical Association's master file and the American Hospital Association's annual survey.<sup>20</sup> We analyzed per capita costs and 3 utilization measures—hospital inpatient days, back surgery, and hip replacement surgery—to explore the possible effects of discretion on variation. We hypothesized that, given the centralized system of care within the MHS, geographic variation in healthcare spending and utilization within the MHS would be lower compared with Medicare.

## METHODS

### Data Sources

Data were obtained from 2 sources: Medicare age-, sex-, and race-adjusted Part A and Part B per capita spending and utilization for 306 HRRs were obtained from the Dartmouth Atlas for the years 2007 to 2010.<sup>20</sup> These estimates represented 20% of the FFS population and relied on Medicare claim files.<sup>20</sup> We included Medicare beneficiaries 65 years or older and total spending (including fees for physicians, hospital and skilled nursing facilities, outpatient facilities, home health agencies, hospice care, and durable medical equipment). Spending rates, as documented in the Dartmouth Atlas, were calculated from Medicare claims; patients enrolled in HMOs were excluded.

The total MHS per capita spending and utilization data for 2007 and 2010 were obtained from the MHS Data Repository. Spending data for purchased care, which used administered pricing similar to Medicare, were obtained from claims using variables representing total payments made. Direct care costs were patient-level cost allocations of the total costs of an MTF, based on clinic-reported workload and expenses. Total costs from the direct care sector and payments from the purchased care sector thus represent the

overall cost to TRICARE. In 2016, approximately 4.9 million beneficiaries were enrolled in TRICARE prime, and of those, 32% (1.58 million) were on active duty.<sup>19</sup> Beneficiaries included active duty military personnel, retirees, and dependents older than 18 years residing within the United States and enrolled in a TRICARE Prime region within the United States. Overseas enrollees, wards, foster children, step children, step parents, and former spouses were excluded from the analysis, in addition to beneficiaries with missing or inconsistent sponsor information (2.8% to 3% of enrollees), resulting in a study population of approximately 3.2 million. This study was approved by the Partners Institutional Review Board (Protocol #2011P002080).

### Analysis

Patients in the MHS were assigned to 1 of 306 HRRs based on residence zip codes, using the zip code crosswalk obtained from the Dartmouth Atlas.<sup>20</sup> Adjustments for age, race, and gender within the MHS were performed using the indirect method according to the Dartmouth Atlas methodology.<sup>20</sup> In this process, missing race was imputed for dependents using the sponsor's race (40.3%), following the methods of Stewart et al.<sup>21</sup>

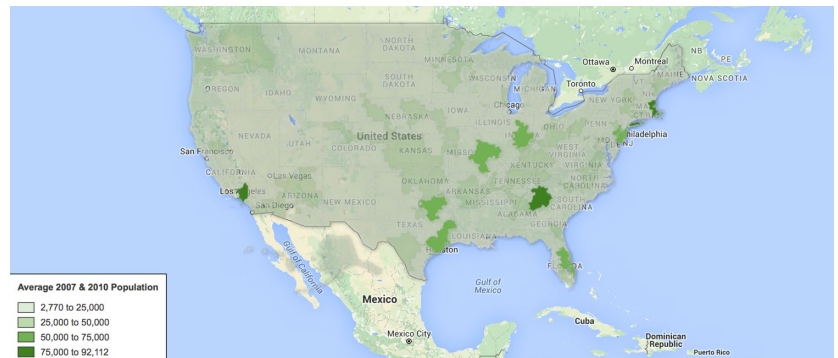
Mean per capita spending and utilization rates were determined across all 4 years for each HRR in both healthcare systems. Coefficients of variation (CoVs) and interquartile ranges (IQRs) were calculated for spending and utilization measures. We calculated the correlation for MHS versus Medicare spending and utilization and examined high- and low-spending HRRs for each. The threshold for statistical significance was  $P < .05$ . We also examined market characteristics, including physician and hospital resources of the high- and low-spending MHS and Medicare HRRs for the year 2006. These were also obtained from the Dartmouth Atlas.

## RESULTS

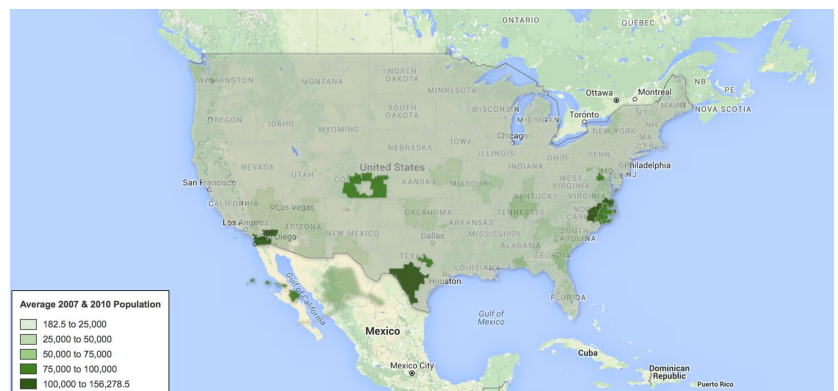
The average number of enrollees per year was 3.2 and 5.1 million within the MHS and Medicare groups, respectively. The populations differed demographically. Approximately 34% of the Medicare cohort was 80 years or older, the average proportion of females was 57.6%, and the highest proportion of black beneficiaries was 6.3%. Within our MHS Prime population, 4.4% of beneficiaries were 65

**FIGURE.** Geographic Distribution of Beneficiaries by Hospital Referral Region (2007 and 2010)<sup>a</sup>

### A. Military Health System Beneficiaries



### B. Medicare Beneficiaries



MHS indicates military hospital system.

<sup>a</sup>Data for 2007 and 2010 were combined for MHS. Only data for 2007 and 2010 were included for the Medicare graph.

years or older. Females represented 45% of beneficiaries, of whom approximately 17% were African American. Medicare patients were more geographically dispersed within the United States, with a few highly populated HRRs located on the East Coast. The MHS beneficiaries were mostly located in the Midwest and southern United States (Figure). Per capita Medicare spending per HRR from 2007 to 2010 averaged \$8752 (range = \$6300-\$15,000). As expected, this was more than 3 times higher than the MHS, with an average per capita spending of \$2504 (range = \$1223-\$5221). About utilization, Medicare beneficiaries averaged 1.62 hospital inpatient days per year, which is greater in frequency than that of MHS beneficiaries, at 0.49. In addition, Medicare patients underwent more hip and back surgeries per 1000 patients than MHS beneficiaries, as would be expected in an older population (Table 1).

There was also significant variation in spending and utilization across HRRs in both the MHS and Medicare populations. The CoV

**TABLE 1.** Hospital Referral Region Characteristics of Medicare (2007-2010) and the Military Healthcare System (2007 and 2010)<sup>a</sup>

Health System	Mean Enrolled	Mean per capita Spending (SD)	Mean Inpatient Days <sup>b</sup> (SD)	Mean Back Surgery <sup>c</sup> (SD)	Mean Hip Surgery <sup>c</sup> (SD)
Medicare	16,529	8752 (1329.88)	1.62 (0.32)	4.92 (1.43)	3.71 (0.85)
MHS	10,493	2504 (608.61)	0.49 (0.18)	2.92 (1.37)	0.51 (0.35)

MHS indicates military health system; SD, standard deviation.

<sup>a</sup>A total of 306 hospital referral regions.

<sup>b</sup>Per enrollee.

<sup>c</sup>Per 1000 enrollees.

**TABLE 2.** Variation in Spending and Utilization in Medicare and the Military Healthcare System

Healthcare System	Mean Total Spending		Inpatient Days		Back Surgery		Hip Surgery	
	CoV	IQR (75th/25th)	CoV	IQR (75th/25th)	CoV	IQR (75th/25th)	CoV	IQR (75th/25th)
Medicare	0.15	1.21	0.19	1.33	0.29	1.5	0.23	1.41
MHS	0.24	1.41	0.36	1.54	0.47	1.92	0.69	2.53

CoV indicates coefficient of variation; IQR, interquartile range; MHS, military healthcare system.

**TABLE 3.** Highest and Lowest Spending Markets in Medicare and the Military Healthcare System

Top Medicare Spenders	MHS Rank	Top MHS Spenders	Medicare Rank
Miami, FL	141	Takoma Park, MD	99
McAllen, TX	272	Washington, DC	118
Manhattan, NY	276	Lake Charles, LA	85
Bronx, NY	296	Contra Costa County, CA	32
Harlingen, TX	118	San Antonio, TX	92

Bottom Medicare Spenders	MHS Rank	Bottom MHS Spenders	Medicare Rank
La Crosse, WI	236	Madison, WI	270
Rapid City, WI	34	Cedar Rapids, IA	280
Minot, ND	103	Sioux City, IA	278
Dubuque, IA	307	Appleton, WI	288
Bismarck, ND	301	Dubuque, IA	305

MHS, military healthcare system.

for spending was higher in the MHS compared with Medicare (0.24 vs 0.15, respectively), and the IQR (75%/25%) was also higher in the MHS (1.41 vs 1.21, respectively) (Table 2).

Similarly, measures of utilization showed greater variation within the MHS: the CoV for inpatient days was 0.36 in the MHS compared with 0.19 in Medicare; the CoV for back surgery was 0.47 versus 0.29, respectively; and the CoV for hip surgery was 0.69 versus 0.23.

Adjusted per capita Medicare spending per HRR was moderately, but significantly, correlated with adjusted MHS spending ( $r = 0.3$ ;  $P < .0001$ ). Similarly, correlation in hospital inpatient days between both systems was significant ( $r = 0.29$ ;  $P < .0001$ ). Back surgery

was highly correlated between both systems ( $r = 0.52$ ;  $P < .0001$ ); however, hip surgery was not significantly related.

The highest spending Medicare markets were spread out geographically and included Miami, Florida, and McAllen, Texas (Table 3). These markets did not rank highly in spending within the MHS. For instance, Manhattan was the third highest-spending HRR within Medicare, but ranked 276th (of 306 HRRs) within the MHS (Table 3). High-spending HRRs within the MHS included Washington, DC, and San Antonio, Texas—areas with a significant direct care footprint but lower Medicare rank (Table 3). Notably, there was greater similarity in low-spending HRRs. For instance, Dubuque, Iowa, ranked 305th in Medicare spending and 307th in the MHS. Lower-spending markets in both systems were located mostly in the Midwest (Table 3).

An examination of healthcare resources between top- and bottom-spenders in both systems revealed consistent and anticipated patterns. In both systems, the top-spending HRRs were more heavily populated and had a comparable number of acute care beds per capita and a smaller ratio of primary care providers to specialty providers per capita. The relationship of this ratio between top and bottom spenders was consistent with the documented positive correlation between the number of specialists and more costly care (Table 4).<sup>5</sup>

## DISCUSSION

Geographic variation in healthcare spending and utilization has gained a renewed focus in the climate of healthcare reform.<sup>1-10,12,15,16,22,23</sup> In an attempt to elicit underlying causes for the unexplained variation, prior studies have compared Medicare spending with commercial healthcare markets<sup>15,16,23</sup> and the

VA.<sup>18</sup> Our study compared Medicare with the MHS, with a similar pricing scheme, in order to focus on the impact of utilization on healthcare costs.

Using age-, gender-, and race-adjusted data, we showed that variation of spending and utilization were higher in the MHS than Medicare. Higher variation in the MHS may have reflected inherent variability in the health status of the more demographically diverse MHS population. Additionally, the higher variation in the MHS may be partially explained by unobservable differences in patterns of care between the direct- and purchased-care sectors. In the Medicare cohort, the CoV for hip surgery was lower than that of back surgery, which is consistent with the fact that lower variation procedures typically tend to be nondiscretionary and physicians generally agree on the best treatment strategy.<sup>1</sup> In the MHS population, however, the CoV for hip surgery was higher than that of back surgery, which is likely due in part to the very low rate of hip surgery in this population (approaching 0), which can drive up CoV values.

Medicare sets prices for hospital reimbursement; however, in the commercial sector, prices are derived from negotiations between insurers and providers in a process influenced by competition between these 2 groups. Like Medicare, administrative pricing is also utilized in MHS for purchased care and is related by law.<sup>24,25</sup> Therefore, price is less likely to explain the higher spending in Medicare compared with MHS, which is also supported by the higher degree of variation in utilization in both systems compared with the degree of variation in spending. Although the pricing schemes in the 2 systems are related, justifiable deviation from standardized indices is permitted.<sup>24,25</sup> This may have resulted in subtle differences in how prices were set that may have allowed the MHS to take advantage of provider competition more effectively than Medicare and, consequently, reduced overall spending. These differences may stem from the difficulty in determining the appropriate price when actual costs are unknown, fluctuate over time, reflect discretionary provider culture, or are manipulated to benefit certain areas.<sup>15</sup> For instance, if the MHS is more competitive in certain regions, the impact of provider market power on how prices are set in that region may be limited, potentially contributing to lower prices and decreased spending.

The lack of positive correlation between commercial and Medicare spending across the United States has been partially attributed to administrative pricing by Medicare that is absent from the commercial healthcare market.<sup>15,26</sup> This would imply that although variation in quantity of care is the main driver of spending in Medicare, variation in the privately insured market is largely driven by variation in provider prices, which is associated with hospital market power.<sup>17</sup> We demonstrated a moderate direct correlation between Medicare and MHS spending after adjusting for age, gender,

and race in both populations. This likely reflects similarity in pricing schemes between both systems. Likewise, utilization measures of inpatient days and back surgery were moderately significantly correlated; however, the hip surgery measure was not. The positive correlation between spending and certain measures of utilization may suggest the strong impact of local provider culture on utilization. Spending and hospital inpatient days have the same degree of correlation between both systems (0.3 and 0.29, respectively), likely reflecting the significant contribution of inpatient hospital care to total healthcare costs, which is supported by an intra-system assessment showing that correlation of spending and inpatient days within both systems was highly correlated (MHS: 0.5; Medicare: 0.6).

Despite moderate correlation in spending and utilization, we did not find a strong geographic pattern when we examined top-spending HRRs in Medicare and the MHS. McAllen, Texas—well known for high healthcare spending<sup>7</sup>—appeared as a top spender in our Medicare analysis. It ranked 141st of the 306 HRRs in the MHS. Similarly, although Takoma Park, Maryland, ranked high in the MHS population, it ranked 99th in Medicare. A simple explanation could be that high utilizers in each system tended to be located in different geographic areas and that local practice culture varied with the insurance market, forcing providers to adjust levels of utilization based on the predominant insurer in the region. Lower spending markets in both health systems appeared to be concentrated in the Midwest, suggesting that the local culture of utilization by providers had a larger impact in that region regardless of the insurer. The composition of the physician workforce may also impact the degree of spending, regardless of the insurer, as shown by the larger number of specialists located in top-spending MHS and Medicare markets compared with lower-spending markets. Although this finding was demonstrated previously in the Medicare population, the association between population concentration and quality of care delivery was less certain.<sup>5,18</sup>

**Limitations**

We showed higher variation within the MHS compared with Medicare, using HRRs as the unit of analysis. Although this

**TABLE 4.** Hospital and Physician Resources in the Top and Bottom 5 Spending HRRs Within Medicare and the Military Healthcare System

Health System <sup>a</sup>	Resident Population (average)	Acute Care Hospital Beds per 1000 Residents (average)	Ratio of Average Primary Care to Specialty Providers (per 100,000 residents)
Top 5 Medicare	2,114,917	3.0	0.57
Bottom 5 Medicare	205,269	3.2	0.67
Top 5 MHS	1,433,199	2.2	0.55
Bottom 5 MHS	416,143	2.5	0.68

HRR indicates hospital referral region; MHS, military healthcare system.  
<sup>a</sup>Available data from 2006.



examination of the MHS was novel, there were limitations to our study. Following the Dartmouth Atlas methodology, we did not adjust for health status, which may explain some of the variability in our study. Future studies should compare spending and utilization within the MHS to commercial healthcare, given the similar health profiles in these populations. We also did not assess price directly; however, TRICARE generally follows Medicare reimbursement levels and methods for purchased care.<sup>24,25</sup> In addition, we did not assess market resources, such as physician and hospital capacity, which may impact administrative pricing, or study outcomes of care, which could justify higher spending in certain locations. Although we combined spending from the direct and purchased sectors of care within the MHS to calculate total costs, the individual costs for these 2 sectors were derived differently. Direct sector costs are patient-level cost allocations, and purchased sector costs are claims-based reimbursements. Thus, although purchased-care sector costs generally follow Medicare rules, direct-care sector costs do not, and this may impact comparisons of cost between the MHS and Medicare. Finally, we assessed differences in variation using correlation, preventing our ability to comment directly on causal relationships.

## CONCLUSIONS

In comparing 2 systems with similar pricing schemes, differences in spending likely reflected variations in utilization and the influence of local provider culture. Our analysis found greater variation in the MHS compared with Medicare. It seems that unwarranted variation, largely attributable to utilization, is an issue deserving of further research to improve system performance through enhanced coordination and integration and to inform future managed care support contract negotiations. Research exploring the MHS compared with a more similar beneficiary demographic, such as the commercial insurance market, may be useful in this endeavor. ■

**Author Affiliations:** Center for Surgery and Public Health, Department of Surgery, Brigham and Women's Hospital (TA, SRL, LLN, JSW), Boston, MA; Uniformed Services University of the Health Sciences (LGK, SO), Washington, DC; The Dartmouth Institute (PG), Hanover, NH.

**Source of Funding:** Department of Defense, Uniformed Services University, Grant HU001-11-1-0023. The Henry Jackson Foundation grant funds this research.

**Author Disclosures:** Dr Kimsey is an employee of the Department of Defense and is on active duty. The remaining authors report no relationship or financial interest with any entity that would pose a conflict of interest with the subject matter of this article.

**Authorship Information:** Concept and design (TA, LGK, JSW, SRL); acquisition of data (TA, LGK, PG, JSW); analysis and interpretation of data (TA, LGK, LLN, PG, JSW, SRL); drafting of the manuscript (TA, LGK, JSW, SRL); critical revision of the manuscript for important intellectual content (TA, LGK, LLN, PG, SO, SRL); statistical analysis (TA, LGK, SRL); obtaining funding (LGK, LLN, SO); and supervision (JSW).

**Address Correspondence to:** Taiwo Adesoye, MD, MPH, Brigham and Women's Hospital, 1620 Tremont St, 4-020, Boston, MA 02120. E-mail: taiwo.adesoye@gmail.com.

## REFERENCES

- Skinner J, Fisher ES. Reflections on geographic variations in U.S. health care. The Dartmouth Atlas of Health Care website. [http://www.dartmouthatlas.org/downloads/press/Skinner\\_Fisher\\_DA\\_05\\_10.pdf](http://www.dartmouthatlas.org/downloads/press/Skinner_Fisher_DA_05_10.pdf). Published March 31, 2010. Updated May 12, 2010. Accessed December 17, 2015.
- Fisher ES, Wennberg DE, Stukel TA, Gottlieb DJ, Lucas FL, Pinder EL. The implications of regional variations in Medicare spending. part 1: the content, quality, and accessibility of care. *Ann Intern Med*. 2003;138(4):273-287.
- Fisher ES, Wennberg DE, Stukel TA, Gottlieb DJ, Lucas FL, Pinder EL. The implications of regional variations in Medicare spending. part 2: health outcomes and satisfaction with care. *Ann Intern Med*. 2003;138(4):288-298.
- Report to the Congress: regional variation in Medicare service use. Medicare Payment Advisory Commission website. [http://www.medpac.gov/docs/default-source/reports/Jan11\\_RegionalVariation\\_report.pdf?sfvrsn=0](http://www.medpac.gov/docs/default-source/reports/Jan11_RegionalVariation_report.pdf?sfvrsn=0). Published January 2011. Accessed December 17, 2015.
- Baicker K, Chandra A. Medicare spending, the physician workforce, and beneficiaries' quality of care. *Health Aff (Millwood)*. 2004;(suppl, web exclusives):W4-184-197.
- Skinner J, Chandra A, Goodman D, Fisher ES. The elusive connection between health care spending and quality. *Health Aff (Millwood)*. 2009;28(1):w119-w123. doi:10.1377/hlthaff.28.1.w119.
- Gottlieb DJ, Zhou W, Song Y, Andrews KG, Skinner JS, Sutherland JM. Prices don't drive regional Medicare spending variations. *Health Aff (Millwood)*. 2010;29(3):537-543. doi:10.1377/hlthaff.2009.0609.
- Zuckerman S, Waidmann T, Berenson R, Hadley J. Clarifying sources of geographic differences in Medicare spending. *N Engl J Med*. 2010;363(1):54-62. doi: 10.1056/NEJMs0909253.
- Wennberg JE, Staiger DO, Sharp SM, et al. Observational intensity bias associated with illness adjustment: cross sectional analysis of insurance claims. *BMJ*. 2013;346:f549. doi: 10.1136/bmj.f549.
- Strauss MJ, LoGerfo JP, Yeltatzie JA, Temkin N, Hudson LD. Rationing of intensive care unit services: an everyday occurrence. *JAMA*. 1986;255(9):1143-1146.
- Smith JC, Medalia C. Health insurance coverage in the United States: 2013. The National Bureau of Economic Research website. <http://www.nber.org/cps/hi/2014redesign/p60-250.pdf>. Published September 2014. Accessed December 20, 2015.
- Chernew ME, Sabik LM, Chandra A, Gibson TB, Newhouse JP. Geographic correlation between large-firm commercial spending and Medicare spending. *Am J Manag Care*. 2010;16(2):131-138.
- Philipson TJ, Seabury SA, Lockwood LM, Goldman DP, Lakdawalla DN. Geographic variation in health care: the role of private markets. *Brookings Pap Econ Act*. 2010;(1):325-355. doi: 10.1353/eca.2010.0006.
- Cooper Z, Craig SV, Gaynor M, Van Reenen J. The price ain't right? hospital prices and health spending on the privately insured. The National Bureau of Economic Research website. <http://www.nber.org/papers/w1815.pdf>. Published December 2015. Accessed December 17, 2015.
- Geographic variation in health care spending. Congressional Budget Office website. <https://www.cbo.gov/sites/default/files/cbofiles/ftpdocs/89xx/doc8972/02-15-geoghealth.pdf>. Published February 2008. Accessed December 17, 2015.
- Evaluation of the Tricare program: fiscal year 2010 report to Congress. Military Health System website. <https://health.mil/Reference-Center/Reports/2010/02/28/Evaluation-of-the-TRICARE-Program-2010>. Accessed December 17, 2015.
- Dartmouth Atlas of Health Care. Dartmouth Atlas website. <http://www.dartmouthatlas.org/tools/downloads.aspx>. Accessed December 17, 2015.
- Stewart KA, Higgins PC, McLaughlin CG, Williams TV, Granger E, Croghan TW. Differences in prevalence, treatment, and outcomes of asthma among a diverse population of children with equal access to care: findings from a study in the military health system. *Arch Pediatr Adolesc Med*. 2010;164(8):720-726. doi: 10.1001/archpediatrics.2010.100.
- Report to the Congress: Medicare payment policy. Medicare Payment Advisory Commission website. <http://www.medpac.gov/docs/default-source/reports/march-2009-report-to-congress-medicare-payment-policy.pdf?sfvrsn=0>. Published March 2009. Accessed December 17, 2015.
- McKellar MR, Naimer S, Landrum MB, Gibson TB, Chandra A, Chernew M. Insurer market structure and variation in commercial health care spending. *Health Serv Res*. 2014;49(3):878-892. doi: 10.1111/1475-6773.12131.
- What TRICARE pays to providers. Defense Health Agency website. <https://tricare.mil/Providers/WhatTRI-CAREPays>. Accessed December 18, 2015.
- TRICARE provider handbook. UnitedHealthcare website. [https://www.unitedhealthcareonline.com/ccmcontent/Provider/UHC/en-US/Assets/ProviderStaticFiles/ProviderStaticFilesPdf/Tools%20and%20Resources/Policies%20and%20Protocols/TRICARE\\_Provider\\_Handbook\\_2013.pdf](https://www.unitedhealthcareonline.com/ccmcontent/Provider/UHC/en-US/Assets/ProviderStaticFiles/ProviderStaticFilesPdf/Tools%20and%20Resources/Policies%20and%20Protocols/TRICARE_Provider_Handbook_2013.pdf). Published October 2013. Accessed December 16, 2015.
- Romley JA, Axaen S, Lakdawalla DN, Chernew ME, Bhattacharya J, Goldman DP. The relationship between commercial health care prices and Medicare spending and utilization. *Health Serv Res*. 2015;50(3):883-896. doi: 10.1111/1475-6773.12262.

Full text and PDF at [www.ajmc.com](http://www.ajmc.com)