

**Personal Healthcare Spending:
Potential Impacts of Income and Population Growth
in Eight U.S. Economic Regions**

Cassandra R. Henson, Dr.P.A. M.B.A.
Assistant Professor of Healthcare Management
Towson University

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ABSTRACT

Per capita income has been used as a key component in the analysis of healthcare spending and the focus for key elements within healthcare policy. The purpose of this article is to analyze the changes in personal healthcare spending and population growth, in response to changes in per capita income, providing some insight as to whether this key indicator should be used singularly or in conjunction with other key indicators. Four secondary data sources were used for this research: U.S. Bureau of Economic Analysis personal income summary, U.S. Census Bureau state population estimates, Centers for Medicare & Medicaid Services (CMS) personal healthcare dollars summary and American Medical Association (AMA) Herfindahl-Hirschman Index (HHI) calculations. State level data sources for income, spending and population growth reported data for 1991 to 2014. HHI data as sourced from the AMA includes data for 2012 to 2017. The method used was a retrospective longitudinal study, using multiple regression methodology to analyze U.S. per capita personal healthcare spending by region. Key findings indicate strong correlation between per capita income and healthcare spending, while the relationship between population growth and healthcare spending is limited.

Our nation's health and associated medical costs have been the focus of political and social agendas for centuries. From the creation of United States Public Health Service Commissioned Corps in 1889, to the adoption of the U.S. Public Health Service Act of 1944, to the creation and implementation of the Patient Protection and Affordable Care Act in 2010, the avenues used to mandate and deliver some type of healthcare to our population has been and will continue to be ever-changing. Prior to the introduction of the Medicare Act of 1965 and managed care organizations, approximately 80% of healthcare expenses were paid out-of-pocket by the individual (Feldstein, 2011). Today, no matter the health coverage method, those seeking care want it timely, and at minimal cost to them. We've become a society of 'instant gratification', demanding that everything is done perfectly and immediately. Healthcare policies and lawmakers are charged with finding the balance, satisfying individual healthcare preferences as well as the over-arching needs of the public, but this all comes at a cost.

Rise in Medical Expenses – Contributing Factors

Several factors contribute to the rising costs of healthcare, some of which are unfortunately par for the course. People are living and working longer (delaying retirement), shifting medical expense from traditional senior care payers (such as Medicare) to private, commercial and personal payment methods (Thornton & Rice, 2008; Martin et al, 2016). An aging U.S. workforce will create significant challenges for the healthcare industry, as the number of working individuals over the age of 65 is expected to increase substantially (Harrington & Heidkamp, 2013). Currently, there are 9.8 million workers aged 65 and over, with an expected increase to 13 million by 2024 (BLS, 2018). Healthcare for this aging population will need to address specific health concerns,

including obesity and hypertension, which represent 39% and 64% respectively. Long term care services for those over the age of 65 is approximately 84%, which in most cases comes directly from private plans or out of pocket. Healthcare costs are expected to continuously increase, surpassing national income growth (Beifuss & Thornton, 2016; Catlin & Cowan, 2015).

Chronic disease is another major contributor to rising healthcare costs. Approximately 86 percent of the nation's total healthcare spending is attributable to this category of care (CDC, 2018). Programs/initiatives such as 'Healthy People' (administered by CDC) are specifically geared toward preventive actions, early detection and treatment of the health conditions that contribute the most to the nation's health expenditures, all made possible by new and emerging technologies. The underlying goals of such initiatives, is to focus on proactive lifestyle changes and early disease detection to ultimately reduce the number of people affected as well as the associated costs of care.

Advancements in technology identify previously undetected (or sometimes new) illnesses/conditions as well as provide preventive/maintenance care, basically introducing additional costs to the already over-extended industry. The adoption of new technology is geared toward what's best for the patient, but also what's the most efficient and cost effective for the providers of care. Increased efficiencies reduce the overall cost of providing the service, which may inherently reduce the market price of care. This effect is often a long-term goal, since the initial cost/outlay of the new process or equipment has to be settled first. Top competitors have this down to a science and can often absorb changes such as increased demand effortlessly. The health care industry is plagued with extremely large supply and indirect costs, with competition being quite expensive. Winning the market is based on incentives to both the consumer and the provider, all while maintaining quality standards, choices/options and provisions for the less fortunate (Feldstein, 2011).

All of the contributors to increasing healthcare expense present growing concerns not just for the providers of the services but for the consumers as well. This supply and demand relationship plays out in every industry, with healthcare being no exception. As health policies change or create coverage, and as expenditures continue to increase much faster than income, providers on the supply side must continue to improve health outcomes and lower costs for all (Kaplan et al, 2014, Labiris & Niakas, 2005). Health options at many levels offer the patient independence and informed choice regarding personal care, making efficient management of the market and quality care more important than ever. Crafty budgeting and price regulation efforts are not enough to curtail the upward trend in healthcare expense, but continued in-depth analysis may uncover tangible focal points for discussion.

The Big Picture

Cost analysis surely leads to questions of efficiency and equitable resource allocation (Labiris & Niakas, 2005). Numbers are black and white, very little ambiguity, but when risk or quality of care steps in, things begin to change. Health care expenditures for our country are increasing at an alarming rate, due to a myriad of controllable and unanticipated costs (Reinhardt 2004). We've seen our national health expenditure rise from 14% of GDP in 2004 to approximately 18% GDP today, translating to \$3.3 Trillion in total expense. The health status of Americans is a major cause of this increase, as is drastic increases in providing service, associated supplies and pharmaceuticals. Coverage expansion under the PPACA added 9 million consumers to the healthcare system, with per capita healthcare spending averaging 3.1 percent nationally.

More people are now covered by an increasing number of services, some more affordable while some are now more available due to expanded networks. While some believe healthcare utilization is primarily associated with the availability of services and the subsequent rise in enrollment for government programs such as Medicare (Abasolo, 2017; Henke et al, 2018; Galbraith et al, 2018), others strongly support the theory of income as a basis for healthcare spending trends (Hatfield et al, 2018; Chen & Escarce, 2004; Schoen et al, 2000). As income in various states and regions change, is the purchase of healthcare and related services also changing in response? This question leads us to this present study and the anticipated outcomes. Previous analyses included state-level data, which produced varying results for the relationship of income, spending and healthcare goods and services (Wang, 2009; Freeman, 2003; Matteo, 2003). This study examines the data on a regional-level, in hopes of clarifying the relationship between these contributing factors.

The purpose of this research is to examine the changes of per capita personal healthcare spending in response to fluctuations in population growth and income. All 50 U.S. states and the District of Columbia (eight total regions) are included in the analysis. Specific hypotheses to be tested are:

- H₀: There is no relationship between personal income and personal healthcare spending.
- H₁: There is no relationship between population growth and personal healthcare spending.
- H₂: Increased/higher income will result in higher levels of personal healthcare spending.
- H₃: Increased populations will result in higher levels of personal healthcare spending.

METHODS

Study Design and Variables

A (retrospective) longitudinal design was used to analyze historical healthcare spending, population growth and income on a per capita level, for all 50 states and the District of Columbia. Income, population growth and personal healthcare spending panel data were gathered from the U.S. Bureau of Economic Analysis, the U.S. Census Bureau and the Centers for Medicare & Medicaid Services (CMS), for the years 1991 through 2014. Population figures are mid-year estimates as noted by the Census Bureau. These data were merged to show annual figures for each state, and to represent a complete figure for inclusion into the predictor variable categories.

Healthcare market concentration figures used in this research were calculated using the Herfindahl-Hirschman Index (HHI) technique for each state. This data was provided by the American Medical Association (AMA) at the metropolitan statistical area (MSA) levels identified by the U.S. Census Bureau. The original data presented by the AMA listed each state's MSAs. For the purposes of this analysis, the data were clustered according to U.S. Census Bureau regions and averaged for the eight-region nationwide analysis.

The outcome (dependent) variable in this analysis is personal healthcare spending per capita. The predictor (independent) variables are population, total income and personal income per capita. The data were organized to reflect the eight U.S. geographic regions identified by the U.S. Bureau of

Economic Analysis: Far West, Great Lakes, Mideast, New England, Plains, Rocky Mountains, Southeast and Southwest.

Statistical Analysis Approach

Correlation and multiple regression analysis techniques were conducted to examine the impact of increased per capita income and changes in population growth on personal healthcare spending. SPSS statistical software was used for the initial analysis, with a second regression analysis performed in Microsoft Excel software for validation of the results. The predictor variables were entered using a forced entry method, with all variables being equally weighted. Once entered into the model the data were grouped by region (and chronologically) prior to performing the regression, allowing for later analysis at state and regional levels. Region grouping was used to be congruent with the data collected from the U.S. Census Bureau.

Population analysis was performed within the established framework of the Herfindahl-Hirschman Index (HHI). For healthcare, this means an analysis of the full-service healthcare organizations in a given state and region. The regional HHI was then compared to the population changes and spending data, to determine relationships and uncover assumptions about utilization and resource availability.

RESEARCH RESULTS

The identification of the regions and included states are those utilized by the U.S. Bureau of Economic Analysis. The regions and relative states are: Far West (Alaska, California, Hawaii, Nevada, Oregon and Washington), Great Lakes (Illinois, Indiana, Michigan, Ohio, Wisconsin), Mideast (Delaware, District of Columbia, Maryland, New Jersey, New York, Pennsylvania), New England (Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont), Plains (Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Dakota), Rocky Mountains (Colorado, Idaho, Montana, Utah, Wyoming), Southeast (Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, West Virginia), and Southwest (Arizona, New Mexico, Oklahoma, Texas). For the eight regions analyzed in this study, the number of observations ranged from 96 to 288, which is a function of the numbers of states in each region and the number of years included in the data set (calendar years 1991 to 2014). Correlation coefficients for each region show a strong positive relationship among variables as they approach +1, with an average of 88.4% of the variation in per capita healthcare spending explained by changes in total personal income, population growth and per capita income. The per capita healthcare spending in the Plains Regions appears to be the most reactive to variations in the predictor variables, with the Southwest and Far West Regions following closely. (See Table 1 below for correlation details per region).

	#States	Correlation Coeff R	R ²	Adjusted R ²
Far West	6	0.959	0.919	0.917
Great Lakes	5	0.955	0.911	0.909
Mideast	6	0.926	0.857	0.854
New England	6	0.895	0.802	0.797
Plains	7	0.978	0.957	0.956
Rocky Mountains	5	0.940	0.883	0.880
Southeast	12	0.891	0.793	0.791
Southwest	4	0.974	0.950	0.948

Total personal income and total population vary by region, ranging from \$89.6M (Plains) to \$298M (Mideast) in total personal income, and 1.9M (Rocky Mountains) to 9.1M (Great Lakes) in population. The regional average for per capita income and per capita healthcare spending were \$32,172 and \$5,198 respectively. The individual national average for per capita healthcare spending ranged from \$5,982 to \$11,064, with the national average of \$8,045 (CMS, 2018). Total personal income and population change impact varies by region, while per capita income impacts every region in the study.

While the number of states and their respective populations vary by region, overall range for changes in income and spending proves to be narrow. Regions with the largest populations did not have the largest average per capita personal healthcare spending. The regions with the largest and smallest number of states are relatively comparable with regard to the average income per capita and the average per capita healthcare spending. Larger regions with the most states did not always have the largest total personal incomes either, falling in line with what was shown for the per capita figures. On average, annual total personal incomes were: Far West - \$286.7M, Great Lakes - \$288.1M, Mideast - \$298.0M, New England - \$94.7M, Plains - \$89.6M, Rocky Mountains - \$60.9M, Southeast - \$180.4M and Southwest - \$252.0M. There are undoubtedly several socioeconomic factors that impact the size of the populations in the regions as well as the total personal income levels (education, industry mix and job availability, race/ethnic background), but in theory the availability of healthcare resources should steadily increase the area's population as well as healthcare spending. This is further examined in the HHI discussion. (Per Capita Results - See Table 2 below).

Table 2: Income and Spending Comparison					
Region	Population (millions)	Per Capita Income	Per Capita Personal Healthcare Spending	Average Annual Income Change	Average Annual Spending Change
Far West	8.1	33,930	4,925	3.55%	5.20%
Great Lakes	9.1	31,339	5,207	3.61%	5.19%
Mideast	7.8	39,315	6,225	3.75%	4.99%
New England	2.3	36,781	6,048	4.01%	5.67%
Plains	2.8	31,673	5,294	4.29%	5.41%
Rocky Mountains	1.9	29,956	4,471	4.16%	5.25%
Southeast	6	28,251	4,881	3.75%	5.07%
Southwest	8.2	28,348	4,478	4.00%	4.92%
Average	5.8	32,449	5,191	3.88%	5.21%

Initial hypotheses anticipated an increase in personal healthcare spending as per capita income and population increased. Results of this research show that all regions reflect steady significance in healthcare spending relative to per capita income, thus rejecting the null (H_0) and accepting the second hypothesis (H_2) as true. Significance of the effect of population on per capita healthcare spending is only true for three of the eight analyzed regions, meaning a partial correlation between variables. The null hypothesis is rejected, as 37.5% of the regions reflect significant effects of population on per capita healthcare spending, a rejection for the first hypothesis (H_1) and acceptance of the third (H_3). The results also show that average annual income change is considerably less than the average annual spending change, meaning consumers are spending more but are not necessarily making more money or reporting more disposable income.

Again, this tells us that larger populations (in total or by number of states per region) do not necessarily translate into greater personal healthcare spending patterns. Although all are significant, greater changes in per capita income are not paired with the regions with the larger shifts in per capita healthcare spending. This study definitely supports the idea that financial and economic characteristics of the healthcare industry varies geographically (Healthcare Cost Institute, 2015). Where this may be helpful is identifying the populations that may most benefit from resource allocation and healthcare spending policies. Socioeconomic factors are key to the argument, but the location of those in need may not be accurately reflected if looking at income or population size alone. Existing studies suggest healthcare to be a necessity based on factors such as income elasticity and income levels (Newhouse, 1977, 1987; Wang, 2009; Costa-Font & Gemmill, 2011). These items must be analyzed collectively to get the resources to those that need them as well as those that can afford them. Table 3 below shows the significance results of income and population size on personal per capita healthcare spending.

Table 3: Regression Analysis Results - Per Capita Healthcare Spending as Outcome Variable

Region/Predictor	Std. Err.	CI (95%)	p-value
Far West			
Per Capita Income	0.007	(.219-.245)	0.000
Total Personal Income	0.000	(.000-.000)	0.000
Population	0.000	(.000-.000)	0.014
Great Lakes			
Per Capita Income	0.023	(.266-.356)	0.000
Total Personal Income	0.000	(.000-.000)	0.002
Population	0.000	(.000-.000)	0.063
Midwest			
Per Capita Income	0.009	(.165-.201)	0.000
Total Income	0.000	(.000-.000)	0.723
Population	0.000	(.000-.000)	0.755
New England			
Per Capita Income	0.014	(.178-.232)	0.000
Total Personal Income	0.000	(.000-.000)	0.158
Population	0.000	(.000-.000)	0.879
Plains			
Per Capita Income	0.006	(.176-.198)	0.000
Total Personal Income	0.000	(.000-.000)	0.000
Population	0.000	(.000-.000)	0.000
Rocky Mountains			
Per Capita Income	0.009	(.157-.193)	0.000
Total Personal Income	0.000	(.000-.000)	0.753
Population	0.000	(-.001-.000)	0.059
Southeast			
Per Capita Income	0.011	(.180-.224)	0.000
Total Personal Income	0.000	(.000-.000)	0.294
Population	0.000	(.000-.000)	0.003
Southwest			
Per Capita Income	0.007	(.200-.227)	0.000
Total Personal Income	0.000	(.000-.000)	0.048
Population	0.000	(.000-.000)	0.859

DISCUSSION

This article adds to the existing literature on healthcare spending by examining the effects of increased income and population on both a regional and nationwide scale. Existing studies examine income-spending relationships on the state-level, with few regional-level impacts considered. Benefits of a market concentration regional analysis may include: economies of scale, capture of regional coalitions (sharing of resources, integrated services, clinical expertise, etc.) and boundary spanning patient populations (those close to state borders that may cross for medical care). Although both income and population growth have impact on spending, the availability of healthcare resources in a given area also effects the amounts of healthcare spending and may help explain some of the patterns reflected in the study results (Capps & Dranove, 2004; Fulton, 2017). For a resource analysis, the Herfindahl-Hirschman Index (HHI) can be used to examine the available resources in the eight identified U.S. regions. HHI measures the concentration of healthcare providers in a given healthcare market by squaring the market share for each provider, then summing the squares.

Theoretically, the higher the provider and healthcare service density, the greater the utilization is for those providers (less competition). To examine our regional concentrations, the annual American Medical Association (AMA) competition study was used, for the most recent six analysis years (available to the public) with states then being grouped by region for purposes of this study. The following HHI ranges are identified as parameters for the market concentration analysis (AMA, 2017):

- unconcentrated, more competitive market: $HHI < 2,500$
- moderately concentrated market: $HHI 1,500$ to $2,500$
- highly concentrated, less competitive market: $HHI > 2,500$

Lower HHIs have more providers with smaller market shares, with the opposite holding true for highly concentrated areas (fewer providers with larger market shares and billed services). Our concentration analysis shows that all regions are highly concentrated with fewer choices in service, with no direct correlation between HHI concentration and per capita healthcare spending. When compared to the average annual spending change per region above (Table 2), the fluctuations in HHI market concentration has little effect on the levels of per capita spending.

Region	AMA Update Year						Avg HHI	6-Yr % Change
	2012	2013	2014	2015	2016	2017		
Far West	2,920	2,750	2,724	2,812	2,602	2,764	2,762	-5.35%
Great Lakes	2,979	2,808	3,136	3,049	3,074	2,991	3,006	0.40%
Mideast	3,208	2,689	2,708	2,783	2,627	2,718	2,789	-15.27%
New England	3,297	3,081	3,180	2,993	3,034	2,761	3,058	-16.28%
Plains	2,985	2,937	2,924	2,944	2,919	2,823	2,922	-5.44%
Rocky Mts	2,720	2,700	2,838	2,907	2,678	2,548	2,732	-6.31%
Southeast	3,198	3,223	3,258	3,294	3,394	3,639	3,334	13.79%
Southwest	2,420	2,560	2,532	2,588	2,542	2,687	2,555	11.02%

Although there was some state-level variation presented in the AMA study, Table 4 shows no significant outliers with regard to HHI and healthcare spending patterns on the regional-level.

These highly concentrated regions offer more billed services, more types of available care but the relative spending does not increase because of it. Changes in concentration may be due to vertical or horizontal mergers and reduced numbers of independent practices (Fulton, 2017). Some suggest lower income levels would reflect higher healthcare spending and utilization, as well as the opposite (Matteo, 2003; Freeman, 2003) but at the regional level there appears to be less fluctuation in the income and spending relationship. As an industry then, are we approaching this incorrectly? Are our expectations for spending in certain types of healthcare markets due for an overhaul? Much of what this research uncovers is the nontraditional patterns we see in healthcare spending, in some cases, veering away from typical economic theory.

Existing research on the impacts of market concentration are as varies as the study results of this research. Some state that the best care and the most value of services does not equate to more choices (unconcentrated market) or the highest priced (Kaplan & Porter, 2011). Others note that while higher concentrations (fewer providers with larger market shares and system mergers) save costs on the provider side of things, costs increase on average between 10% - 40% for consumers (Cutler & Scott-Morton, 2013; Gaynor, et al, 2017). Perhaps future analysis on core-based statistical areas (CBSA) would reveal greater variation, as it is based on localized system analyses instead of aggregate state systems.

CONCLUSION

This study examined the effects of changes in per capita income and population growth on personal healthcare spending. The results indicated solid associations between income and healthcare spending, with the growth rates of healthcare spending outpacing that of income. The results also reflect a great deal of variation among regional spending patterns relative to population changes, but a very narrow range for HHI and market concentration. As costs continue to rise in the United States and as policies continue to change, further expense, utilization and spending patterns must be analyzed. As health systems continue the quest for increased efficiencies, we may see more mergers and consolidated services without significant cost savings for the consumer and no substantial improvements in quality of care (Fulton, 2017; Capps & Dranove, 2004). The eight regions examined are highly concentrated, with multiple options and substitutes available for care, which unfortunately have not impacted rising healthcare prices. Further study is definitely needed in the realm of healthcare spending and income, as we must continue to evaluate the need for resources to specific populations in specific areas. Proper need identification and resource allocation is crucial to the task of improving our healthcare delivery system and containing its costs.

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