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# Geographic variation in commercial medical-care expenditures: A framework for decomposing price and utilization☆

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ABSTRACT

This study introduces a new framework for measuring and analyzing medical-care expenditures. The framework focuses on expenditures at the disease level that are decomposed between price and utilization. We find that both price and utilization differences are important contributors to expenditure differences across commercial markets. Further examination shows that for some diseases utilization drives variation while for others price is more important. Finally, when disease-specific measures are aggregated across diseases, much of the important disease-specific variation is masked, leading to much smaller measures of aggregate variation.

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## 1. Introduction

Relatively little is known about geographic variation in commercial-market expenditures in the United States. Although there has been a considerable amount of research assessing Medicare expenditures, the commercial market (that is, the privately insured medical-care market) accounts for 60 percent more spending.[1] This dearth of research in this area is a large hole in our understanding of the overall health care market. In this study, we provide a new framework for analyzing medical-care expenditure variation applied to the commercial market. As a central part of our framework, we construct a medical-care expenditure index (MCE) designed to track the expenditure of treating an episode of a disease. Focusing on an MCE recognizes that both differences in service prices and the utilization of different services may affect the total cost of treatment across geographic markets.

Constructing disease-based price indexes has been widely advocated by health economists (see Berndt et al., 2000) and has led to proposals to incorporate MCEs in official statistics (see National Research Council, 2010). In response, there have been several studies examining the cost of treating disease episodes over time (e.g., Aizcorbe and Nestoriak, 2011; Dunn et al., 2012a,b; and Bradley, 2013).[2] Our study differs from these papers along

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[1] Private-insurer and Medicare markets are fundamentally different. Unlike the Medicare markets where payments to providers are fixed, prices in the private sector are set through negotiations between insurers and providers. Moreover, empirical evidence suggests that commercial and Medicare markets may be quite distinct, even within the same geographic area (see Chernew et al., 2010).

[2] Disease price changes over time have also been documented in specific case studies such as heart attacks (Cutler et al., 1998), cataracts (Shapiro et al., 2001), and depression (Berndt et al., 2002).

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two dimensions: (1) we track geographic variation in the MCE as opposed to time-series variation; and (2) we introduce a methodology for decomposing the MCE between its two key components, a service price index (SPI) and a service utilization index (SUI). The SPI isolates the variation in underlying service prices (for example, the price of a 15-minute office visit to a doctor to manage a pregnancy), but holding service utilization constant (for example, fixing the number of 15-minute visits to the doctor across markets for each pregnancy). By contrast, the SUI isolates the variation in medical-care expenditures attributable to the quantity of services provided per episode of care. Specifically, the SUI holds the prices of the underlying services constant but allows the number of services to vary.

Using our medical-care expenditure decomposition, we present a descriptive analysis of how spending for a specific disease and its components, service price and service utilization, vary across the 85 MSAs that we study in this paper. There are measurable differences across aggregate MSA indexes. We find that the MSA with the 90th percentile MCE has an MCE that is 28 percent larger than the 10th percentile. We also find that the MCE, SPI and SUI produce vastly different pictures of variation across the country. For example, of the 85 MSAs analyzed in this study, Memphis, TN, ranks 37th in terms of its SPI. However, in terms of its MCE it ranks 76th. The relatively low level of medical-care spending per episode in Memphis is due to its relatively low utilization of services per episode—its SUI is ranked 82nd.

Looking at variation at the disease-level, we find that there exists a large degree of variation in spending across markets. The "typical" disease, as measured by a weighted average across diseases, has coefficients of variation for MCE, SPI, and SUI of 0.22, 0.16 and 0.17, respectively. Importantly, the source of the variation in spending depends on the particular disease being assessed. For example, the variation in service price is relatively large for pregnancy, while the variation in utilization is relatively large for depression.

Using the constructed indexes at the disease-level, we explore whether there are common price and utilization components that affect all diseases in an MSA. That is, can some MSAs be characterized as high utilization or low price areas across all diseases? Interestingly, MSA-specific factors explain only a small portion of the variation in spending patterns across disease categories—16 percent of the observed variation in utilization and 37 percent of the variation in prices. We find that differences in disease-specific variation within an MSA appear to cancel out when aggregating across diseases, leading to considerably smaller variation statistics for aggregate indexes. Specifically, we find that the coefficient of variation for the aggregate MCE index is 0.10 while the utilization index is just 0.06. Thus, it appears that averaging over diseases masks the underlying geographic variation in spending for specific diseases. This suggests that focusing on more aggregate measures may understate the actual variation in medical care practices across markets.

There are a few additional findings in this paper. First, whether one looks at service prices in the aggregate or at the disease level, the estimates reveal that variation in service price is particularly important in commercial markets, which contrasts with Medicare markets where researchers have concluded that variation is primarily driven by differences in utilization (see Gottlieb et al., 2010). Second, we find a negative correlation between price and utilization, so that low utilization areas tend to be higher priced areas. Third, we demonstrate that the variation across markets is considerably larger when examining disease expenditures per capita without controlling for the treated prevalence of patients across areas.

## 2. Literature review

There are many approaches to analyzing geographic differences in spending and utilization across markets.[3] Some research focuses on differences in treatment for certain diseases,[4] while other studies examine aggregate differences in overall medical-care expenditures.[5] This paper combines aspects of both these approaches because it focuses on aggregate medical-care expenditures in a geographic area, but we break these aggregate expenditures into disease-level components. The key advantage is that this allows us to analyze the sources of expenditure differences in greater detail. For instance, the treatment of heart disease in an area may involve intense utilization, but lower prices; while treating lower back pain in the same location may involve low levels of intensity and high prices.

Previous studies also differ in the unit at which expenditures are measured. Some studies track expenditures on a per capita basis,[6] while other studies look at expenditures per episode-of-care.[7] The decision to assess one or the other depends on the goal of the researchers. For instance, an aggregate measure of per-capita spending can shed light on the general health of the population—as this measure will be lower if a smaller proportion of the population needs medical treatment—while an aggregate measure of per-episode spending may be more informative about the efficiency of the providers in an area. Unlike the per-capita spending measure, the per-episode measure accounts for the health status or the likelihood of treatment and diagnosis across areas. Table 1 lists the MSAs with the five highest and lowest medical-care spending per person in our data set. This table shows that there can indeed be considerable differences between per-capita and per-episode spending measures. For instance, out of the 85 cities that we study, Birmingham has the 4th highest spending per capita, but ranks 17th in terms of spending per episode-of-care. Given that Alabama has one of the highest obesity rates in the country, it is quite possible that Birmingham's population-based measure is large relative to the episode-based measure because the population is less healthy.[8] As can be seen by the standard errors reported in Table 1, the variation in expenditures within each MSA is substantial; however, as with most other papers in this literature, this paper compares average expenditures across markets in order to focus on systematic differences in spending.[9]

Similar to our work, Aizcorbe and Nestoriak (2011) track the "price" of treating a disease, or what we call the expenditure for an episode of care. Specifically, they compare an MCE index that allows expenditures to shift across providers to an index that holds the basket of services fixed (an SPI). Looking over time, they document several important shifts in utilization across provider types that drive a wedge between the two indexes. The existence of these observed shifts over time suggest that there may also be different allocations of services across geographic markets. Indeed, this

[3] Recent reviews of the literature on geographic variation in health care spending are in Congressional Budget Office (CBO) (2008) and Skinner (2012).

[4] For example, Chandra and Staiger (2007) look at different types of treatments for heart attack patients across markets.

[5] For example, Cutler and Sheiner (1999), MedPac (2003), Fuchs et al. (2004), and Sheiner (2012).

[6] These studies include Cutler and Sheiner (1999), Gage et al. (1999), Zuckerman et al. (2010), and Sheiner (2012).

[7] Many of the studies that look at expenditures per episode of care have focused on growth rates (e.g., Thorpe et al., 2004; Aizcorbe and Nestoriak, 2011; Roehrig and Rousseau, 2011; Dunn et al., 2012a,b; and Bradley, 2013).

[8] See statistics reported by the Center for Disease Control and Prevention (http://www.cdc.gov/obesity/data/adult.html).

[9] The per capita and per episode estimates reported in Table 1 are averages over thousands of individuals in each MSA and are precisely estimated.