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HMO Coverage Reduces Variations In The Use Of Health Care Among Patients Under Age Sixty-Five

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Abstract

Variation in the use of hospital and physician services among Medicare beneficiaries is well documented. However, less is known about the younger, commercially insured population. Using data from the Community Tracking Study to investigate this issue, we found significant variation in the use of both inpatient and outpatient services across twelve metropolitan areas. HMO insurance reduces, but does not eliminate, the extent of this variation. Our results suggest that health plan spending to better organize delivery systems and manage care may be efficient, and regulations that arbitrarily cap plans' spending on administration, such as minimum medical loss ratios, could undermine efforts to achieve better value in health care.

For more than twenty years, the *Dartmouth Atlas of Health Care* has documented two striking facts. First, Medicare spending and treatment decisions vary greatly across geographic areas, even after differences in beneficiaries' age, health status, and cost of living are adjusted for.¹ Second, this variation in the use of health care resources is not always positively correlated with variation in quality or health outcomes.^{2,3} This body of work forms the basis for the view that there are major inefficiencies in health care delivery.⁴

Unanswered Questions

Despite the importance of this research to health policy, it has left several questions unanswered.

STUDYING BROADER POPULATIONS

First, almost all of the *Dartmouth Atlas* work has examined health care resource use by people age sixty-five and older, and a substantial portion focuses further on chronically ill older adults. Much less attention has been paid to the care of relatively healthy, younger people. As Laurence Baker and colleagues have observed, evidence of variations in treatment in a broader population of patients imply that the opportunities for improving efficiency are even greater than the *Dartmouth Atlas* and associated research suggest.⁵

IMPROVING EFFICIENCY

Second, although existing work highlights which geographic areas offer opportunities for efficiency improvement, it generally does not identify a mechanism for obtaining such improvements. Knowing which areas are high-use is necessary, but not sufficient, for reducing use in high-use areas. Two recent papers suggest that managed care might serve this role.^{5,6} However, neither explicitly quantifies or tests the extent of the effect of managed care on area variation.

PURPOSE OF PAPER

This paper seeks to fill these gaps. We used data from the Community Tracking Study (CTS) to estimate the extent of area variation in inpatient and outpatient services in twelve US metropolitan areas.

We found that health maintenance organization (HMO) insurance is associated with reductions in variation in medical but not surgical hospital admissions, and in emergency department but not ordinary physician visits. Interestingly, we also found that HMO insurance reduces variation among people under age 45, but not among people ages 45–64.⁷ As we explain below, these findings provide insight into how HMO coverage might affect variation.

This paper also contributes to the literature on how managed care affects the efficiency of care delivery. Most existing work quantifies the effect of such coverage by estimating its effects on measures of resource use and health outcomes.⁸ Investigating how managed care affects area variations is an alternative approach.

Study Data And Methods

DATA

We used data from the CTS, a large-scale longitudinal survey designed to track health insurance coverage and use of health services by individual households in sixty US communities. Twelve large metropolitan areas, with populations greater than 200,000 and with representative survey samples large enough to draw conclusions about each area, were randomly selected to be studied in depth.^{9,10}

We used the 1997–98 and 1998–99 waves of the Community Tracking Survey, which included a Followback Survey that provided details about the surveyed population's private health insurance policies.¹¹ We used these early waves because the data, although more than a decade old, have several unique features that make them ideally suited to examining the question of area variation. Later waves either do not include a Followback Survey or do not support community-level analyses, or both, and we are not aware of any other, more recent data that do.

The survey distinguished among four types of insurance: HMO, preferred provider organization, point-of-service, and fee-for-service. We grouped the latter three together as “unmanaged” insurance. Our pooled 1997–98/1998–99 analysis sample contains 26,766 people younger than age sixty-five with private insurance, of whom 10,857 have HMO insurance and 15,909 have unmanaged insurance.

ANALYSIS

We began our analysis by comparing hospital admission rates among people age sixty-five and older in the Community Tracking Survey, where data are self-reported, and perhaps underreported, to similar estimates from the *Dartmouth Atlas*, which is based on Medicare

claims data. The *Dartmouth Atlas* therefore provides a useful validity check of the CTS data, at least for elderly beneficiaries.

We found that the correlation between the number of hospital admissions per elderly Medicare beneficiary—excluding those in Medicare Advantage plans—in the twelve CTS communities and the number of admissions per person for these twelve areas reported in the *Dartmouth Atlas* for 1999 is high (correlation coefficient $\rho = 0.79$).¹² The means of the two series are also very close: Weighted by population, the mean rate of hospitalization is 0.377 in the CTS data and 0.340 from the *Dartmouth Atlas* data.

The remainder of our analysis focused on privately insured people younger than age sixty-five. We measured area variation with the coefficient of variation—the ratio of the standard deviation across areas of the use of a health service, such as hospital admissions per capita, to the mean. Higher values of the coefficient of variation imply more variation.

One important feature of the coefficient of variation is that it measures the spread of a distribution without regard to the units in which the distribution is denominated (for example, days in the hospital, number of physician visits). For this reason, it is comparable across different types of services. We calculated the coefficient of variation of four types of services: surgical hospital admissions (admissions for a surgical procedure), medical hospital admissions (admissions for reasons other than a surgical procedure), physician office visits, and emergency department (ED) visits.

For each type of service, we compared the coefficient of variation for people with HMO insurance to that of people with unmanaged insurance. For all four services, the coefficient of variation for people with HMO insurance was lower than that for people with unmanaged insurance. Then, we formally tested whether variation in use across areas differed between the two groups. For two of the four services, we found the difference in coefficients of variation to be statistically significant.

Study Results

Exhibits 1–3 present the extent to which area variation in four measures of utilization differs for people younger than age sixty-five who have unmanaged versus HMO insurance.¹³ Each point on each exhibit represents the average number of admissions or visits per person in one study area, adjusted for differences across areas in race, sex, age, and household income.¹⁴

In exhibit Notes, we report the coefficient of variation across areas and the mean level of use for people with each type of insurance. Because the CTS is only a sample, estimates of the coefficient of variation for people with unmanaged versus HMO insurance may differ as a result of chance variation rather than of true differences in the underlying populations. To enable readers to evaluate whether estimated differences are statistically significant—that is, not due to chance—we report *p* values from hypothesis tests of the equality of coefficients of variation between people with each type of insurance.¹⁵

MEDICAL AND SURGICAL ADMISSIONS

Exhibits 1 and 2 show the average level and the extent of variation across areas in the number of medical and surgical hospital admissions per person, respectively, for people with different types of insurance. The exhibits show that more area variation exists among people with unmanaged than HMO insurance in both medical and surgical admissions.

The coefficient of variation of the rate of medical hospital admissions for people with unmanaged insurance is 0.294; for those with HMO insurance, it is less than half as great (0.142). The coefficients of variation of the rate of surgical admissions are closer together (Exhibit 2 Notes).

We rejected the hypothesis of equality of coefficients of variation across insurance types at conventional significance levels for medical admissions ($p = 0.027$), but not surgical admissions ($p = 0.216$).

EMERGENCY DEPARTMENT VISITS

Exhibit 3 shows the analogous statistics for the number of emergency department visits. Among people with unmanaged insurance, there is significantly greater variation across areas in outpatient services use. As above, we rejected the hypothesis of equality of coefficients of variation across insurance types at conventional levels ($p = 0.016$).

INTERESTING REGULARITIES

Although the systematic differences in area variation across insurance status are striking, Exhibits 1–3 also reveal other interesting regularities in the sources and types of area differences in patterns of care. First is the extent to which the Miami metropolitan area is an outlier in hospital use (Exhibit 1). Indeed, for people with unmanaged private insurance, the per capita medical hospital admission rate in Miami (0.139) is almost twice as great as the next-highest area, Cincinnati (0.080).

Second, even though HMO coverage does reduce variation in the use of services across areas, it does not come close to eliminating it. For example, among people with unmanaged insurance, the number of ED visits per person in the highest-use community, Boston, is almost double the number in the lowest-use community, Seattle. But even among people with HMO insurance, the number of ED visits in the highest-use community, again Boston, is still 69 percent larger than the number in the lowest-use community, Syracuse.

Third, although areas that are high-use on one dimension are in some cases high-use on others—such as Boston, which ranks persistently high on the use of all four services—overall, the ordering of areas by utilization rates is not very consistent across measures. For example, the correlation between the area rankings of medical and surgical admissions among people with unmanaged insurance is actually negative ($\rho = -0.385$). The correlation between the area rankings of physician and ED visits among people with unmanaged insurance is weakly positive ($\rho = 0.021$). Correlations between area rankings of service use for people with HMO insurance show a similar pattern.

PHYSICIAN VISITS

We also analyzed the extent of variation across areas in the number and level of physician visits (results available in the Online Appendix).¹⁶ We found that people with unmanaged insurance had greater variation in physician visits across areas (coefficient of variation for unmanaged, 0.078, versus HMO, 0.061). The difference between those with unmanaged and HMO insurance was not statistically significant ($p = 0.139$). However, people with HMO insurance had higher levels of visits that were statistically significant (3.731 versus 3.584 visits, p value of the difference = 0.016). For the other three measures, average use was statistically indistinguishable by insurance type.

This finding is consistent with previous analyses of data from the Community Tracking Study¹⁷ and with comparisons between HMO and unmanaged insurance more generally.¹⁸

There are at most modest differences in the use of broad categories of services by insurance type.

ADDITIONAL EVIDENCE

Exhibit 4 provides further evidence that type of insurance affects area variations. It plots hospital admissions per elderly Medicare beneficiary, excluding those enrolled in Medicare Advantage, in each of the twelve areas against admissions per person under age sixty-five with HMO insurance (denoted by red circles) and unmanaged insurance (denoted by blue squares).

The exhibit shows that Medicare admission rates are negatively correlated, albeit weakly, with admission rates for people younger than age sixty-five with HMO insurance ($\rho = -0.03$). Medicare admission rates are positively correlated, and more strongly, with admission rates for people under age sixty-five with unmanaged insurance ($\rho = 0.40$). These relationships are consistent with HMO coverage having a causal effect on the extent of variation. The area variation of younger people with unmanaged insurance—that is, insurance resembling fee-for-service Medicare—looks like the area variation for Medicare beneficiaries. In contrast, the area variation of younger people with HMO insurance does not.

Exhibit 5 presents results that suggest how HMO coverage reduces area variation. It presents coefficients of variation for each of the four measures of use that we studied, by patient age group and insurance type. Reductions in area variation associated with managed care are concentrated mainly among younger people. For three of the four measures, people younger than age forty-five with HMO insurance have statistically significant lower coefficients of variation across areas ($p < 0.10$) than the same age group with unmanaged insurance. In contrast, there are no statistically significant differences among people ages 45–64.

Discussion

Prior research has documented dramatic differences across geographic areas in the intensity of medical treatment received.¹ This work, however, has focused on the aged Medicare population and people with chronic illnesses. It has also not explicitly evaluated whether and how managed care affects geographic variations.

NEW FINDINGS

We present three new findings. First, there is significant variation across areas, even among a relatively healthy commercially insured population under age sixty-five. Second, HMO insurance reduces the extent of this variation but does not eliminate it. Third, the effect of managed care on variation seems to come through the younger segment of this population. This is important because younger people tend to be in better—and less variable—health than their older peers,¹⁹ so variation in the younger subpopulation is less likely to be attributable to their underlying medical conditions.

LIMITATIONS

Our study has two important limitations. First, the data that we used are more than a decade old. Second, those data did not allow us to identify the consequences of area variation for health outcomes. If the greater health services intensity in high-use areas leads to better health or to greater benefits for patients through some other path, then reduction in variation—and, by implication, the role of managed care—might not be socially beneficial.

However, as other researchers have observed, finding significant geographic area variation in medical care invites closer scrutiny of what is causing the variation. Differences across areas in utilization that are not associated with population characteristics or quality of care are likely to be hallmarks of an inefficient health care system. The fact that the reduction in variation that we observed came through the effects of HMO coverage on patients under age forty-five further reinforces this conclusion.

In this population, the hypothesis that managed care reduces inappropriate use, and therefore improves efficiency, is especially plausible. HMO coverage may also encourage more preventive activities in this relatively healthy group.

POLICY IMPLICATIONS

Our results have important implications for health policy. They suggest that health plans' expenditure of resources to better organize delivery systems and manage care may be efficient; this is consistent with the findings from other recent work on area variations.²⁰

To the extent that this is true, regulations that arbitrarily cap plans' spending on administration, such as minimum medical loss ratios,²¹ could end up being socially harmful if they have the effect of restricting beneficial management and administration activities. (Editors' note: As of publication of this article, however, the National Association of Insurance Commissioners, at the request of the secretary of health and human services, has proposed language in the forthcoming federal regulation governing medical loss ratios that would classify such activities as "expenses to improve health care quality," and therefore not administrative. It is unknown whether or not this classification will govern the final regulation, or whether there may still be ongoing uncertainty as to the appropriate classification of such activities.)

Our results also suggest that the managed care backlash of the 1990s, and the subsequent shift toward more unmanaged insurance in the private sector, may inadvertently have perpetuated the problem of inefficient area variation. Although our results do not imply that HMO coverage alone is the answer—we did still observe variation even for patients with HMO coverage—policy reforms that support the use of highly managed care may be an important part of the solution to the area-variation puzzle.

Acknowledgments

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NOTES

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7. Age 45 is a standard cutoff for comparisons in health services research. See Note 14 below.
8. Cutler DM, McClellan MB, Newhouse JP. How does managed care do it? *RAND J Econ*. 2000; 31(3):526–48. [PubMed: 11503704]
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10. The twelve areas are Boston, MA; Cleveland, OH; Greenville, SC; Indianapolis, IN; Lansing, MI; Little Rock, AR; Miami, FL; Newark, NJ; Orange County, CA; Phoenix, AZ; Seattle, WA; and Syracuse, NY.
11. This survey design provides more accurate information about the details of people's insurance than respondent self-reports. Analyses of the responses by enrollees and plan representatives to questions about plan characteristics indicate that enrollees often do not know basic information about their plans Cunningham PJ, Denk C, Sinclair M. Do consumers know how their health plan works? *Health Aff (Millwood)*. 2001; 20(2):159–66. [PubMed: 11260939]
12. A plot of the two series can be found in the Online Appendix. To access this document, click on the Online Appendix link in the box to the right of the article online. We excluded Medicare Advantage enrollees from the CTS analysis because they are excluded from the *Dartmouth Atlas* statistics.
13. We present the data underlying Exhibits 1–3 in tabular form in the Online Appendix, as in Note 12.
14. For our comparisons of people with unmanaged and HMO insurance, we risk-adjusted the area-level measures of utilization for differences across areas in the race, sex, age, and income of the population. This risk-adjustment method had three steps. First, we ran individual-level regressions, separately for people with HMO and unmanaged insurance, of utilization on race, sex, area fixed effects, and categorical variables for age and household income. Second, we calculated what each area's regression-adjusted utilization would be if it had the national average race, sex, age, and income distribution. Third, we calculated the coefficient of variation of this regression-adjusted utilization across areas.
15. To calculate the p values, we used the following two-step method. First, we replaced each person's actual utilization with his or her predicted utilization from the regression in step 1 in Note 14 plus a bootstrapped residual from this regression, drawn with replacement separately for each of the twelve geographic areas. Second, we repeated steps 1–3 two thousand times, which generated a distribution of differences in the coefficients of variation for people with unmanaged and HMO insurance. The p -value we report is based on the standard error of this distribution.
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21. The medical loss ratio measures the fraction of total premium revenue that health plans devote to clinical services, as distinct from administration and profit.

Biographies



Laurence C. Baker is a professor of health research and policy at the Stanford University School of Medicine.

Laurence Baker, Kate Bundorf, and Daniel Kessler, colleagues at Stanford, write in this issue about the impact that managed care arrangements, such as health maintenance organizations (HMOs), have on reducing variations in health care.

Baker is a health economist and professor of health research and policy at Stanford University. His research examines a variety of health care economics and policy questions. He is the author of numerous works on the effects of financial incentives and organizational structures on the delivery of health care and health care spending, including extensive work on technological change in medicine and work on managed care and its effects.

Baker serves as chief of health services research at Stanford's School of Medicine. He has been appointed Fellow of the Center for Health Policy at Stanford and is a research associate at the National Bureau of Economic Research. He also holds a courtesy appointment in the Stanford Department of Economics. Baker received a doctorate in economics from Princeton University.



M. Kate Bundorf is an associate professor of health research and policy at the Stanford School of Medicine.

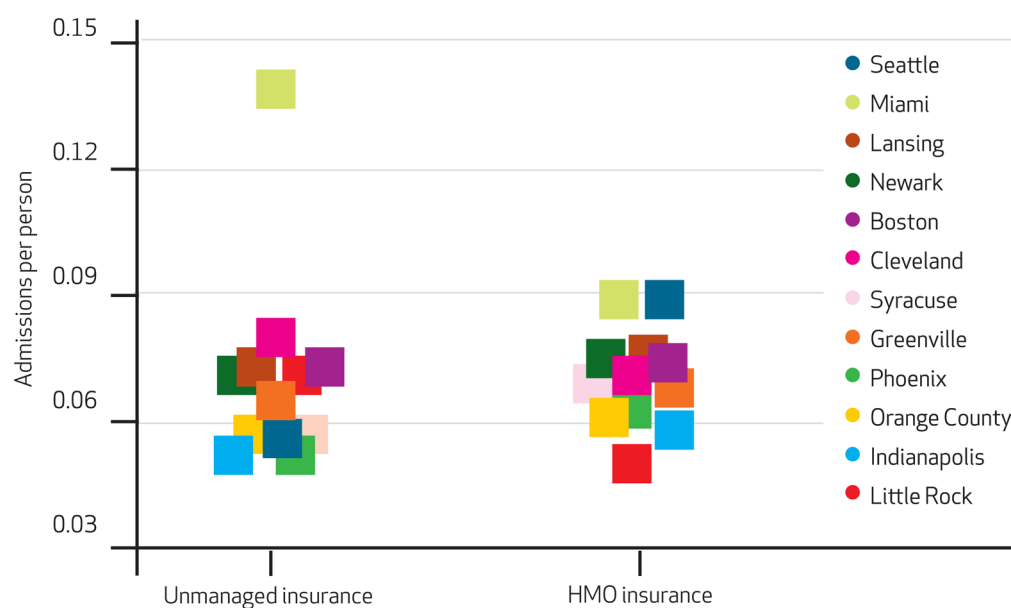
Bundorf is an associate professor of health research and policy at the Stanford School of Medicine and an associate professor, by courtesy, at the Stanford Graduate School of Business. She is also a faculty research fellow at the National Bureau of Economic Research.

Bundorf was a Fulbright Lecturer at Fudan School of Public Health in Shanghai, China, during the 2009–10 academic year. Her research focuses on health insurance, including the determinants and effects of individuals' and purchasers' health insurance choices, the effects of regulation in health insurance markets, the interaction of public and private systems of health insurance, and the effects of insurance on the delivery of health care.

Bundorf received master's degrees in business administration and public health from the University of California, Berkeley, and a doctorate from the Wharton School, University of Pennsylvania.

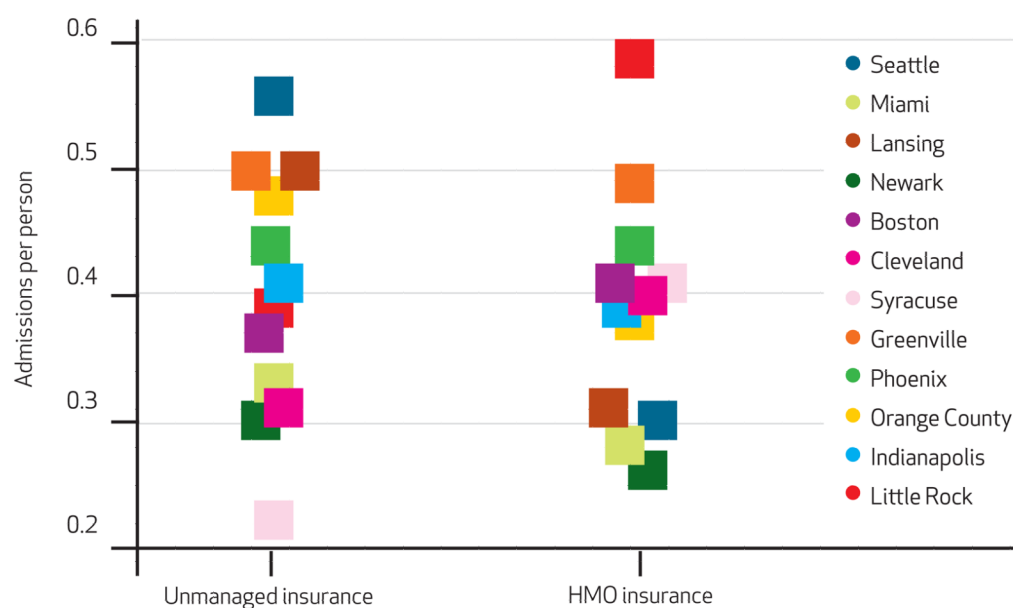
Daniel Kessler is a professor at Stanford's Graduate School of Business and law school, where he teaches courses on economics, public policy, and the health care industry. He is also a research associate at the National Bureau of Economic Research, a senior fellow at Stanford's Hoover Institution, and a professor, by courtesy, of health research and policy in the School of Medicine.

Kessler coauthored the book, *Healthy, Wealthy, and Wise: Five Steps to a Better Health Care System*, with John F. Cogan and R. Glenn Hubbard, which shows how market-based health care reform in the United States can help repair the system's problems. He earned a doctorate in economics from the Massachusetts Institute of Technology and a juris doctor degree from the Stanford Law School.

**Exhibit 1.**

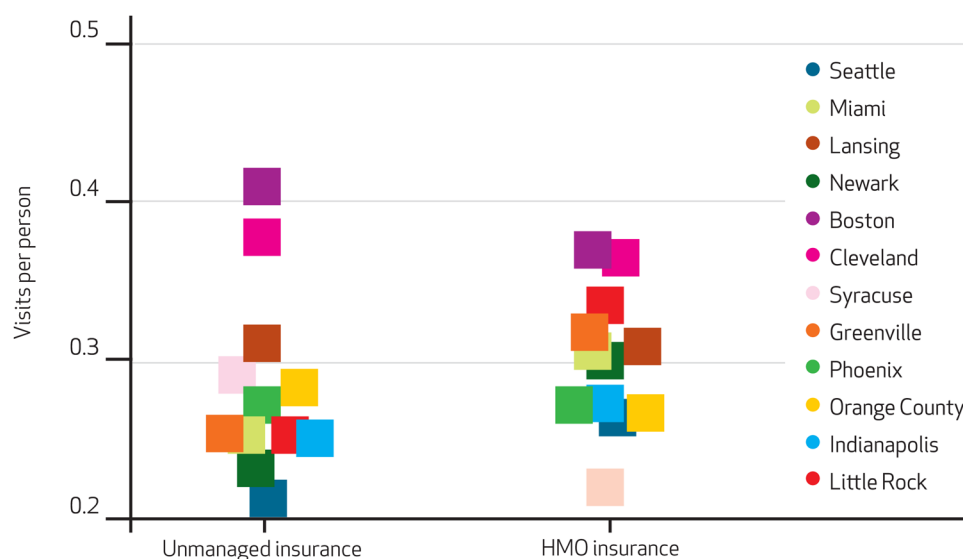
Medical (Non-Surgical) Hospital Admissions Per Person Under Age 65 For People With Unmanaged And HMO Insurance In 12 US Communities

SOURCE Authors' calculations based on data from the Community Tracking Study 1997–98 and 1998–99 Household Surveys and Followback Surveys. **NOTES** For unmanaged insurance, the coefficient of variation is 0.294, and the mean is 0.067. For health maintenance organization (HMO) insurance, the coefficient of variation is 0.142, and the mean is 0.072. The coefficient of variation is equal to the standard deviation divided by the mean. Higher values imply more variation.

**Exhibit 2.**

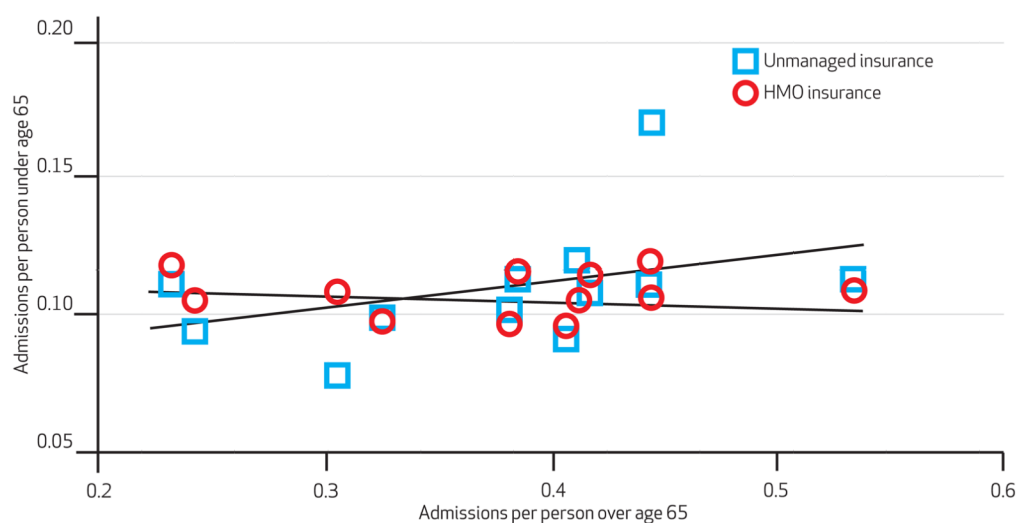
Surgical Hospital Admissions Per Person Under Age 65 For People With Unmanaged And HMO Insurance In 12 US Communities

SOURCE Authors' calculations based on data from the Community Tracking Study 1997–98 and 1998–99 Household Surveys and Followback Surveys. **NOTES** For unmanaged insurance, the coefficient of variation is 0.242, and the mean is 0.041. For health maintenance organization (HMO) insurance, the coefficient of variation is 0.186, and the mean is 0.038. The coefficient of variation is equal to the standard deviation divided by the mean. Higher values imply more variation.

**Exhibit 3.**

Emergency Department Visits Per Person Under Age 65 For People With Unmanaged And HMO Insurance In 12 US Communities

SOURCE Authors' calculations based on data from the Community Tracking Study 1997–98 and 1998–99 Household Surveys and Followback Surveys. **NOTES** For unmanaged insurance, the coefficient of variation is 0.245, and the mean is 0.286. For health maintenance organization (HMO) insurance, the coefficient of variation is 0.155, and the mean is 0.309. The coefficient of variation is equal to the standard deviation divided by the mean. Higher values imply more variation.

**Exhibit 4.**

Comparison Of Hospital Admissions Per Medicare Beneficiary Over Age 65 Versus Admissions Per Person Under Age 65 With HMO And Unmanaged Insurance

SOURCE Authors' calculations based on data from the Community Tracking Study 1997–98 and 1998–99 Household Surveys and Followback Surveys. **NOTES** For people under age 65 with unmanaged insurance, the correlation coefficient is 0.40. For people under age 65 with health maintenance organization (HMO) insurance, the correlation coefficient is 0.03.

Exhibit 5

Variation In Use Of Four Types Of Health Services Among People Younger Than Age 45 And Ages 45–64 With Unmanaged And HMO Insurance

Younger than age 45 (coefficient of variation)		Ages 45–64 (coefficient of variation)	
Unmanaged	HMO	Unmanaged	HMO
p value of difference			
p value of difference			
MEDICAL (NON-SURGICAL) HOSPITAL ADMISSIONS			
0.393	0.184	0.016	0.260
			0.326
			0.284
SURGICAL HOSPITAL ADMISSIONS			
0.260	0.291	0.374	0.340
			0.317
			0.412
PHYSICIAN OFFICE VISITS			
0.090	0.061	0.063	0.097
			0.083
			0.382
EMERGENCY DEPARTMENT VISITS			
0.285	0.166	0.004	0.197
			0.257
			0.173

SOURCE Authors' calculations based on data from the Community Tracking Study 1997–98 and 1998–99 Household Surveys and Followback Surveys. **NOTES** Coefficient of variation is equal to the standard deviation divided by the mean. Higher values imply more variation. HMO is health maintenance organization.