

Chronic Disease Prevalence and Medicare Advantage Market Penetration: Findings From the Medical Expenditure Panel Survey

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Abstract

By March 2015, 30% of all Medicare beneficiaries were enrolled in Medicare Advantage (MA) plans. Research to date has not explored the impacts of MA market penetration on individual or population health outcomes. The primary objective of this study is to examine the relationships between MA market penetration and the beneficiary's portfolio of cardiometabolic diagnoses. This study uses 2004 to 2008 Medical Expenditure Panel Survey (MEPS) Household Component data to construct an aggregate index that captures multiple diagnoses in one outcome measure (Chronic Disease Severity Index [CDSI]). The MEPS data for 8089 Medicare beneficiaries are merged with MA market penetration data from Centers for Medicare and Medicaid Services (CMS). Ordinary least squares regressions are run with SAS 9.3 to model the effects of MA market penetration on CDSI. The results suggest that each percentage increase in MA market penetration is associated with a greater than 2-point decline in CDSI (lower burden of cardiometabolic chronic disease). Spill-over effects may be driving improvements in the cardiometabolic health of beneficiary populations in counties with elevated levels of MA market penetration.

Keywords

cardiometabolic conditions, diabetes, cardiovascular disease, MEPS, Medicare Advantage, market penetration, spill-over effects

Introduction

Managed care is a common insurance form. In fact, 8 in 10 individuals covered by employer-sponsored private insurance, and one-third of individuals with Medicare, are enrolled in a managed care plan.^{1,2} Given the prominence of managed care as an insurance form, understanding the extent to which growth in managed care has influenced service utilization, health outcomes, and spending is essential to strong policy development.

This is what we know. Greater managed care market penetration is associated with better *inpatient* outcomes, including lower utilization of unnecessary inpatient procedures, a reduction in inpatient complications, and lower mortality posthospital discharge.³⁻⁵ Managed care is also linked to higher rates of prevention-oriented processes of care, including vaccinations and disease screenings among the general population.⁶⁻⁸

There is less agreement on the economic spill-over effects of Medicare Advantage (MA) market penetration.⁹⁻¹² Some studies have found higher rates of Medicare managed care market penetration associated with reduced individual-level costs for

the fee-for-service Medicare program.⁹ A more recent study found increases (or no savings) in total Medicare costs as Medicare managed care market penetration increases.¹⁰⁻¹²

Little evidence exists regarding the health effects of managed care market penetration. Studies suggest that strategies implemented by health care providers that contracted with managed care organizations (MCOs) spill over to patients who

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are not members of MCOs, particularly in terms of health service use and expenditures.^{3,6,7,13} If true, patients' chronic conditions may be identified more quickly and controlled, leading to slower progression of the disease, even for those individuals not enrolled in managed care.^{6,9,10,13,14,15}

The focus of this study is the association between MA market penetration and Medicare beneficiaries' portfolio of cardiometabolic diseases. We hypothesized that greater county-level MA market penetration is associated with lower individual-level cardiometabolic disease complexity.

Methods

Data

In order to understand the associations between MA market penetration and the beneficiary's portfolio of cardiometabolic diagnoses, we merged 2004 to 2008 MA market penetration data from the Centers for Medicare and Medicaid Services (CMS) with restricted data from the Medical Expenditure Panel Survey (MEPS) Longitudinal Files for MEPS panels 9 to 12. Beneficiary state and county of residence were used as the matching indicators.

CMS calculates MA market penetration as the percentage of Medicare beneficiaries in each county that has elected to enroll in MA plans. Our analysis used the market penetration data in 2 ways. First, we used the market penetration data in a continuous variable form, with a 1% (0.01) interval. Second, MA market penetration was divided into quartiles (Q1: 0%-3.00%, Q2: 3.01%-9.69%, Q3: 9.70%-28.19%, and Q4: 28.20%-54.77%).

The MEPS Household Component (MEPS-HC) is a rich data set with many variables relating to presence of disease, insurance coverage, and sociodemographic characteristics. The MEPS is a nationally representative survey of noninstitutionalized individuals residing in households sampled from the previous year's National Health Interview Survey. Individuals surveyed in MEPS are grouped into panels, and each panel is surveyed 5 times over 2 years. A new panel begins each year, resulting in the overlapping panel design (one panel's first year is concurrent with the previous panel's second year).¹⁶

We narrowed our analysis to only those MEPS-HC respondents who were Medicare beneficiaries (*mcrevy1*=1 and *mcrevy2*=1 in panel 9 to 12 longitudinal files). Respondents aged 65 to 69 years were selected as the reference age-group. Having just aged on to Medicare, we hypothesized they would have lower chronic disease burdens than older beneficiaries. Beneficiaries younger than 65 typically have Medicare due to disability, making this a suboptimal reference group.

The MEPS-HC includes Priority Conditions questions that ask respondents about a number of prevalent conditions. We used the Priority Condition variables for cardiometabolic conditions (ie, heart attack, coronary heart disease, angina, stroke/transient ischemic attack, diabetes, high blood pressure, and high cholesterol) and additional MEPS-HC variables for diabetes-related eye or kidney problems, as well as physical limitations.

Table 1. Components of the CDSI Progression Scale.

Diagnosis CDSI	Point Value
Myocardial infarction (heart attack)	10
Coronary heart disease	8
Angina	8
Stroke/TIA	7
Diabetes mellitus	5
"Walk-limit" physical limitation ^a	3
Diabetes-related eye or kidney problem	3
Multiple diagnoses of high-blood pressure	2
High cholesterol	2
High blood pressure (first time diagnosis)	1

Abbreviations: CDSI, Chronic Disease Severity Index; TIA, transient ischemic attack or "mini-stroke."

^aAlthough not a specific diagnosis, physical limitation is included along with MEPS respondents' other self-reported conditions and health problems.

In consultation with a team of internal medicine and family physicians (D. Barrett, MD, B. Godek, MD, and P. Latta, MD, 2011), we assigned a 1 to 10 clinical severity weight to each diagnosis (Table 1). These Chronic Disease Severity Index (CDSI) weights are additive, and beneficiaries with multiple comorbidities and additional diagnoses at year 2 of the MEPS survey have higher CDSI scores than in their first year. For example, an individual may enter the MEPS survey panel with high blood pressure, high cholesterol, and type 2 diabetes and receive 1, 2, and 5 points, respectively, for a total CDSI score of 8. If that individual were to have a stroke in year 2 of the panel, 7 more points would accrue, for a total CDSI score of 15 (Table 1).

The CDSI is particularly useful for analysis of survey data where diagnosis is based on self-report, rather than biometrics or health records. Used at a population level, the CDSI provides a rich perspective on the overall chronic disease portfolio. Descriptive statistics for the variables used in this study are presented in Table 2.

Empirical Model

Ordinary least squares multivariate linear regression was used to investigate the association between the CDSI variable and the MA market penetration. In addition to the main independent variable of interest, MA market penetration, the model also includes variables that have been shown to influence health, such as income, race, ethnicity, rurality, age, and sex. Individuals surveyed in MEPS were asked a series of questions relating to their health insurance.

Many of these questions ask about managed care. We created a composite managed care variable (*MCO_y1*) from the following MEPS-HC variables: *medhmo*1 (covered by a Medicaid or Children's Health Insurance Program HMO), *prvho*1 (covered by a private HMO), or *phmonpy*1 (covered by an HMO, whether it pays nonplan doctors). If an individual responded yes to any of these 3 managed care questions, they were coded as having managed care type insurance. A Medicare managed care variable (*mcrpho*) was added in 2006 but did not exist in 2 of the 5 years used in this study (2004 and 2005).

Table 2. Descriptive Statistics.

Variable	Percentage	Variable	Percentage
Age-groups		MCO	
<50	6.48	Had MCO at end of first year ^a	14.14
50-64	12.40	Other Insurance	
65-69 ^a	24.14	Had other insurance ^a	51.27
70-74	19.27	Education	
75-79	17.07	<High school	25.86
80-84	12.40	High school	35.48
≥85	8.24	Some college	18.42
Gender		4-year college	11.40
Female ^a	56.62	>4-year college ^a	8.84
Race/ethnicity		Panel	
White ^a	84.77	Panel 9 (2004-2005) ^a	24.37
Hispanic		Panel 10 (2005-2006)	24.37
Not hispanic ^a	92.80	Panel 11 (2006-2007)	25.30
Income (% FPL)		Panel 12 (2007-2008)	25.96
<100% FPL	13.54	MA market penetration (MPen)	
100%-125%	6.84	Quartile 1: 0.00%-3.02%	24.96
126%-200%	17.27	Quartile 2: 3.02%-9.70%	25.05
201%-399%	29.02	Quartile 3: 9.70%-28.2%	25.00
≥400% FPL ^a	33.33	Quartile 4: >28.2% ^a	25.00
Urban/rural		Mean	Range
Urban ^a	79.28	Continuous MA MPen	15.6%
Marital status		CDSI scores	0%-54.77%
Married ^a	53.00	Year 1	8.73 pts.
		Year 2	0-49 pts.
			7.98 pts.

Abbreviations: CDSI, Chronic Disease Severity Index; FPL, federal poverty level; MA, Medicare Advantage; MCO, managed care organization; MPen, market penetration; pts: points.

^aReference groups.

The MEPS-HC also asks respondents about private insurance coverage. For those reporting coverage by private insurance at any time during the year in question (privatyl=1 or prvevyy1=1), we coded the private insurance dummy variable (otrins_y1) used in our models.

There are 4 sets of results that reflect the treatment of the market penetration variable and the time of measurement. Market penetration is treated as a continuous variable and then separately as a categorical variable. In addition, MA market penetration is measured at 2 different points in time, once at the end of year 1 and once at the end of year 2.

The data were analyzed using SAS 9.3, which allows for the analysis of data with complex survey sampling design. In our analyses, we used weights provided by MEPS to ensure that the data were representative of the US civilian, noninstitutionalized Medicare population at the time the data were collected.

Results

Descriptive Analysis

The population for this study included 8089 Medicare beneficiaries who participated in MEPS between 2004 and 2008 (panels 9-12). The data had roughly equal representation from each of the 4 panels. Women made up 56.6% of the sample, and

53% were married (Table 2). Nearly 85% were identified as white, and about 7% were Hispanic. Nearly 1 in 5 were younger than 65 years (18.8%), which is slightly more than the national average (17%), and 20.6% were at least 80 years of age. One-third resided in a household with income higher than 400% of the federal poverty level. Although more than 25% did not receive a high school education, almost 20% of the sample had a college education or greater. Nearly 80% of respondents lived in urban areas (as defined by the US Census Bureau). Slightly more than half had some insurance coverage besides Medicare. About 14% had coverage through MCOs. When MA market penetration is considered as a continuous variable, the county-level penetration rate ranged from 0% to 54.77%, with a mean of 15.59% (s = 0.51%). The CDSI scores at the end of year 1 ranged from 0 to 49, with a mean of 8.73. At the end of year 2, the range was 0 to 49, with a mean of 7.98.

Multivariate Regression Results

The results in Table 3 indicate a strong association between higher MA market penetration and lower burdens of cardiometabolic chronic disease (smaller CDSI scores in high-penetration counties).

For example, as indicated in Table 3, when market penetration is a continuous variable, a 1-percentage-point increase in

Table 3. CDSI Ordinary Least Squares Multivariate Regression Model.^a

Variable	End of Year 1	End of Year 2	Variable	End of Year 1	End of Year 2
^b County MA market penetration rate (MA Pen. Rate)			Demographics		
Continuous	−2.12 ^e	−2.43 ^e	Not married	0.26 ^e	0.25 ^f
^c Alternate model Using MA Pen. rate quartiles ^d			Male	1.66 ^e	1.60 ^e
Quartile 1	0.81 ^e	1.17 ^e	Nonwhite	0.00	0.11
Quartile 2	0.62 ^e	0.57 ^e	Hispanic	0.05	0.65 ^e
Quartile 3	0.38	0.37 ^e	Rural/non-MSA	−0.42 ^e	−0.44 ^e
MEPS panels ^d			Education ^d		
Panel 12	2.48 ^e	1.99 ^e	<High school	2.07 ^e	1.44 ^e
Panel 11	1.19 ^e	0.19 ^e	High school	0.72 ^e	0.25 ^e
Panel 10	1.12 ^e	0.06	Some college	1.43 ^e	1.23 ^e
Insurance			4-year college	0.11	0.19
No supplement to Medicare	0.59 ^e	0.38 ^e	Age-groups ^d		
No managed care coverage	−0.92 ^e	−0.59 ^e	<50	−3.20 ^e	−3.52 ^e
Income (%FPL) ^d			50-64	2.02 ^e	1.64 ^e
<100%	0.61 ^e	1.03 ^e	70-74	1.31 ^e	1.43 ^e
100%-125%	1.13 ^e	1.04 ^e	75-79	2.50 ^e	2.64 ^e
126%-200%	0.89 ^e	1.21 ^e	80-84	2.68 ^e	2.91 ^e
201%-399%	0.81 ^e	0.78 ^e	85+	1.92 ^e	2.52 ^e
			Intercept	3.49 ^e	5.22 ^e

Abbreviations: CDSI, Chronic Disease Severity Index; FPL, federal poverty level; MA, Medicare Advantage; MEPS, Medical Expenditure Panel Survey; MPen, market penetration; MSA, metropolitan statistical area.

^aPositive coefficients are interpreted as the increases in CDSI versus the reference group.

^bResults shown for regression model using MA market penetration continuous variable.

^cMA market penetration quartile coefficients added to this table for comparison. Other covariates did not differ, qualitatively, from the model using MA market penetration as a continuous variable.

^dReference groups for multilevel categorical variables are high MA market penetration rate (fourth quartile), panel 9, incomes $\geq 400\%$ FPL, ≥ 4 -year college, and ages 65 to 69 years.

^ep-value < 0.01 .

^fp-value < 0.05 .

MA market penetration was associated with a 2.12-point decline in CDSI at the end of year 1 and 2.43 point decline at the end of year 2 ($P = .0012$ and $P = .0017$, respectively). We reran the analysis using dummy variables for each quartile of MA market penetration, assessing significance using an α of 0.10. Compared to the fourth quartile (those living in the 25% of counties with the highest MA market penetration), quartiles 1 to 3 had higher CDSI scores, and all differences were statistically significant ($P = .001$ -.049).

Variables that had a statistically significant association with higher chronic disease scores include low income, male, single, lower education, lack of supplemental insurance, and increased age. Rural respondents and individuals without managed care type coverage had lower CDSI scores (lower burdens of chronic cardiometabolic disease). For rural residents, this may indicate a lower chronic disease burden or may reflect lower access to health care services, resulting underdiagnosis of chronic conditions. Beneficiaries without managed care had CDSI scores approximately 0.4 points lower than those reporting they had managed care. This result may be indicative of healthy individuals self-selecting into traditional Medicare and choosing either not to buy supplemental coverage or to purchase unmanaged Medigap policies.¹⁷

Discussion

This research is the first since the Medicare Modernization Act (MMA) to explore the relationships between the market penetration of MA plans and the prevalence of cardiometabolic chronic diseases among Medicare beneficiaries. A CDSI scale was constructed to represent the beneficiary's overall chronic disease portfolio for survey or claims-based data.

The results from this analysis suggest that greater county-level MA market penetration is associated with lower individual-level cardiometabolic disease complexity. The results and methods used do not allow for a causal conclusion. That said, it may be the case that the MA program, through disease management programs, prevention and wellness initiatives, or other beneficiary outreach, is producing the desired health outcomes in the counties in which it is most highly penetrated. If true, then it warrants policymakers to consider MA an important public health program.

Alternatively, MA plans may be engaging in risk selection, seeking greater market penetration in areas of lower chronic disease prevalence, and attempting to attract disproportionately healthier beneficiaries. Previous research has examined the behavior of MCOs and demonstrated their risk selection activities designed to enroll lower risk individuals.^{18,19} However,

those studies predated the MMA, which risk-adjusted CMS payments to MA plans for enrolling beneficiaries with chronic diseases (including the cardiometabolic diagnoses considered in this analysis).

As MA enrollment continues to climb, our findings support the call for more extensive research on the mechanisms that are driving lower cardiometabolic disease prevalence in higher penetration MA markets. This study was limited by the consolidation of MA plan types into 1 MA variable and by the use of a new outcome measure (CDSI). Future work includes testing the CDSI measure using multiple data sets and conducting a longitudinal study that controls for self-selection. Future work will also test different measures of chronic disease severity and will control for different MA plan types.

Declaration of Conflicting Interests

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References

- Jacobson G, Damico A, Neuman T, Gold M. KFF report: Medicare Advantage 2015 Data Spotlight: Overview of Plan Changes. Kaiser Family Foundation; 2014. Website. <http://kff.org/medicare/issue-brief/medicare-advantage-2015-data-spotlight-overview-of-plan-changes/>. Published December 10, 2014. Accessed 21 September, 2015.
- Claxton G, Rae M, Panchal N, et al. Employer Health Benefits Survey: The Kaiser Family Foundation, Health Research and Educational Trust; 2014 Website. <http://kff.org/report-section/ehbs-2014-summary-of-findings/>. Published September 10, 2014. Accessed 21 September, 2015.
- Sari N. Do competition and managed care improve quality? *Health Econ*. 2002;11(7):571-584.
- Escarce JJ, Jain AK, Rogowski J. Hospital competition, managed care, and mortality after hospitalization for medical conditions: evidence from three states. *Med Care Res Rev*. 2006;63(6 suppl): 112s-140s.
- Rogowski J, Jain AK, Escarce JJ. Hospital competition, managed care, and mortality after hospitalization for medical conditions in California. *Health Serv Res*. 2007;42(2):682-705.
- Baker LC, Phillips KA, Haas JS, Liang SY, Sonneborn D. The effect of area HMO market share on cancer screening. *Health Serv Res*. 2004;39(6 pt 1):1751-1772.
- Gillies RR, Chenok KE, Shortell SM, Pawlson G, Wimbush JJ. The impact of health plan delivery system organization on clinical quality and patient satisfaction. *Health Serv Res*. 2006;41(4 pt 1): 1181-1199.
- Scanlon DP, Swaminathan S, Chernew M, Lee W. Market and plan characteristics related to HMO quality and improvement. *Med Care Res Rev*. 2006;63(6 suppl):56s-89s.
- Chernew M, Decicca P, Town R. Managed care and medical expenditures of Medicare beneficiaries. *J Health Econ*. 2008; 27(6):1451-1461.
- Nicholas LH. *Does Managed Care Reduce Federal Spending? Evidence from Medicare*. Ann Arbor, MI: Population Studies Center, University of Michigan; 2009.
- Bundorf MK, Schulman KA, Stafford JA, Gaskin D, Jollis JG, Escarce JJ. Impact of managed care on the treatment, costs, and outcomes of fee-for-service Medicare patients with acute myocardial infarction. *Health Serv Res*. 2004;39(1):131-152.
- Nicholas LH. *Medicare Advantage? Managed Care and Medicare quality, Cost and Enrollment*. New York, NY: Columbia University; 2009.
- Meara E, Landrum MB, Ayanian JZ, McNeil BJ, Guadagnoli E. The effect of managed care market share on appropriate use of coronary angiography among traditional Medicare beneficiaries. *Inquiry*. 2004;41(2):144-158.
- Berenson RA. Medicare disadvantaged and the search for the elusive 'level playing field'. *Health Aff (Millwood)*. 2004;Suppl Web Exclusives:W4-572-585.
- Baker LC. The effect of HMOs on fee-for-service health care expenditures: evidence from Medicare. *J Health Econ*. 1997; 16(4):453-481.
- Agency for Healthcare Research and Quality. *MEPS-HC Sample Design and Collection Process*. Agency for Healthcare Research and Quality, Rockville, Md; 2013. Website. http://www.meps.ahrq.gov/survey_comp/hc_data_collection.jsp. Published June 9, 2013. Accessed 21 September, 2015.
- Cao Z, McGuire TG. Service-level selection by HMOs in Medicare. *J Health Econ*. 2003;22(6):915-931.
- Mehrotra A, McNeil BJ, Landon BE. Congestive heart failure disease management in Medicare-managed care. *Am Heart J*. 2007;154(6):1153-1159.
- Atherly A, Hebert PL, Maciejewski ML. An analysis of disenrollment from Medicare managed care plans by Medicare beneficiaries with diabetes. *Med Care*. 2005;43(5):500-506.

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