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Policy Studies in Family Medicine and Primary Care

Understanding the Impact of Medicare Advantage on Hospitalization Rates

A 12-STATE STUDY

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EXECUTIVE SUMMARY

Greater use of Medicare Advantage (MA) over traditional fee-for-service Medicare (TM) in certain populations, and even across small areas, has been associated with fewer overall hospitalizations and avoidable hospitalizations. Proponents suggest that these associations stem from successful care management, and a focus on preventive services and primary care among MA users. Detractors intimate that selection bias of healthier individuals into MA plans and other external factors may favorably influence hospitalization rates more than the structure of MA plans and the incentives this structure creates. We set out to update and advance previous analyses using the most contemporary multistate hospitalization data.

We gathered the most recently available hospital utilization data from the Healthcare Cost and Utilization Project (HCUP, 2012) for the 12 states from which complete data were available. We compared avoidable hospitalization rates of MA enrollees and TM beneficiaries to the rates of hospitalization for marker conditions (i.e., those not preventable by ambulatory care). We found that MA enrollees are significantly less likely than TM beneficiaries to have avoidable hospitalizations, with a 10% decrease in the rate of such hospitalizations. This finding persists after controlling for age, gender, race/ethnicity, region, and various proxies for health. Furthermore, the rate of referral-sensitive hospitalizations, which are a marker for better outpatient care, is slightly higher among MA enrollees compared with TM beneficiaries. Of secondary interest, we noted that the favorable effect of MA penetration varied substantially across states.

In summary:

- Despite rising MA penetration and the slow changes to TM delivery that result from changing policy and environmental conditions, users of MA plans continue to have fewer avoidable hospitalizations relative to hospitalizations for marker conditions.
- The rate of referral-sensitive hospitalizations, which are a marker for better outpatient care, seems to be higher among MA enrollees than among TM beneficiaries.
- Counties with higher MA penetration rates have lower avoidable hospitalization rates and higher referral-sensitive hospitalization rates among both TM and MA beneficiaries.

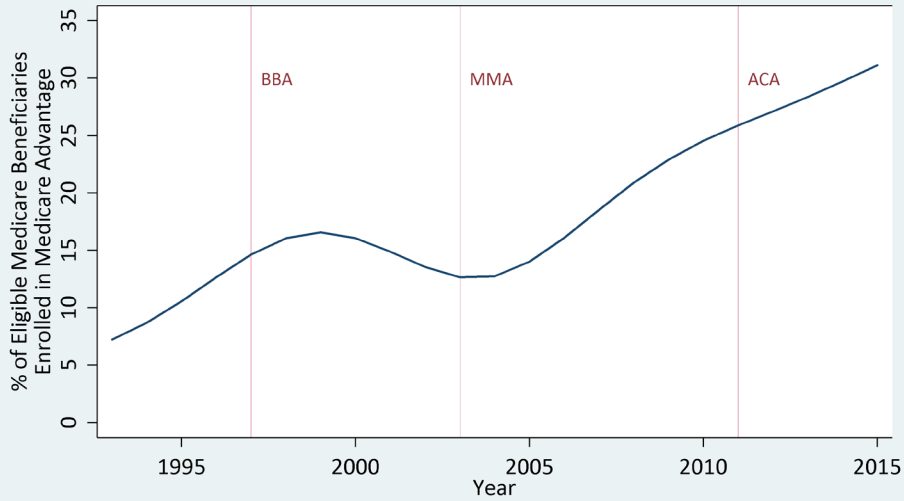
Further study is needed to definitively explain this effect and determine if it is the product of payment incentives that promote efficiency, coordination, and primary care in the treatment of MA enrollees.

BACKGROUND

Medicare Part C, now known as Medicare Advantage (MA), was first conceived in 1985 as part of the Tax Equity and Fiscal Responsibility Act of 1982 (TEFRA). TEFRA authorized Medicare to contract with private plans to provide coverage to beneficiaries, including all core benefits in traditional fee-for-service Medicare (TM), in exchange for a per-person per-month payment. Such plans were thought to offer better health care coordination and comprehensive care, allowing Medicare to enjoy the same cost savings and efficiencies as managed care in the private sector.

From the establishment of Medicare Part C to the early 1990s, growth of these plans was slow. A mere 5% of all Medicare beneficiaries enrolled in Part C in 1994 (*Figure 1*).[1] By the late 1990s, enrollment had grown to nearly 16% of all Medicare beneficiaries as a result of more generous benefits to enrollees. The initial goal of cost savings for Medicare was hampered by the fact that, in general, MA enrollees were healthier and therefore required fewer medical services. Medicare was paying more per enrollee to the private sector than it would have cost to keep these "cheaper" enrollees in TM. This finding informed the Balanced Budget Act of 1997, which tightened payments to providers and hospitals, and expanded managed care options for beneficiaries to include not only health maintenance organizations (HMOs) but also preferred provider organizations (PPOs), point of service (POS) plans, and private fee-for-service (PFFS) plans. Partly as a result of these payment cuts, fewer private plans were joining the MA marketplace. The percentage of all Medicare beneficiaries enrolled in MA declined to 12% by 2003.

Figure 1. Medicare Advantage National Penetration Over Time



BBA = Balanced Budget Act of 1997; MMA = Medicare Modernization Act; ACA = Affordable Care Act
Sources: Data from 1993-1998 are from the Centers for Medicare and Medicaid Services county-level estimates
Data from 1999-2015 are from the Kaiser Family Foundation

In 2003, Congress passed the Medicare Modernization Act (MMA). In addition to providing prescription coverage to Medicare beneficiaries (Part D), the MMA further modified reimbursement to plans, adding risk adjustment measures with the goal of more accurate payment. This legislative act also expanded MA by creating Medicare Special Needs Plans and regional (as opposed to local) PPOs, giving beneficiaries in rural areas more options from which to choose. Overall enrollment in MA grew substantially to 25% of all Medicare beneficiaries in 2011.[2]

The Patient Protection and Affordable Care Act (ACA) made a number of additional changes to MA, including aligning MA payment with fee-for-service (FFS) spending at the county level and adding a quality bonus program. Currently, MA benchmarks are set each year using county-level FFS data, and plans bid against those benchmarks to determine payment. Plans with a high quality rating receive a payment bonus in the form of a higher benchmark. If a plan bids below the benchmark, it is able to apply a portion of that amount to additional benefits, such as vision, hearing, or dental.[3] MA growth has continued after the ACA, reaching 31% in 2015.[2] Some observers attribute this growth to the impact of quality bonus payments.[4] Greater familiarity and comfort of baby boomer retirees with managed care may also contribute to the increase in MA participation. In May 2015, the Congressional Budget Office (CBO) estimated that enrollment in MA and other group health plans will grow each year over the next decade and could reach 30 million patients—roughly 40% of Medicare beneficiaries—by 2025.[5]

PREVIOUS STUDIES OF THE IMPACT OF MEDICARE ADVANTAGE

Overview

With the growth of Medicare Advantage (MA) enrollment and predictions of future growth, it is essential to understand the impact of MA on health care quality. Many of the metrics researchers could use to answer this question are not readily available for both MA patients and traditional fee-for-service Medicare (TM) patients because MA beneficiary claims data are owned by health insurance companies and are not widely available to health service researchers. Available comparative studies are often restricted to summary measures of plan performance and patient satisfaction.[6] Studies have shown that MA scores higher than TM on Healthcare Effectiveness Data and Information Set (HEDIS) measures of preventive care such as mammography rates.[7] On the other hand, multiple studies have found that MA is rated lower than TM on Consumer Assessment of Healthcare Providers and Systems (CAHPS) measures of access and quality.[8,9]

Many studies have shown a reduction in the utilization of unnecessary services among MA enrollees. Some have asserted that this may be a function of MA's healthier patient panel rather than of the inherent benefits of MA. The evidence is mixed. A large study comparing MA enrollees and TM beneficiaries found that MA enrollment was concentrated in subpopulations with poorer health.[9] Compared with TM beneficiaries, MA enrollees had lower education levels, were more likely to be African American or Hispanic, and had lower incomes. On the other hand, they reported better self-perceived health status, which may imply that they were generally healthier than TM beneficiaries. In 2012, Friedman and his colleagues used data from 2006 to examine the likelihood of hospital readmission after first discharge in MA patients compared with TM patients.[10] They found that although descriptively MA patients had a lower likelihood of readmission within 30 days of discharge, these patients actually had a higher likelihood of readmission after risk reduction and control for self-selection into MA plans.[10] By contrast, Lemieux and colleagues reached the opposite conclusion. Also using a risk-adjusted calculation, they found that the 30-day readmission rate for MA patients from 2006 to 2008 was approximately 13% to 20% lower than the rate for TM patients.[11]

The issue of selection bias is addressed in sophisticated comparative studies using Healthcare Cost and Utilization Project (HCUP) data.[12] The review below is restricted to studies that focus on avoidable hospitalizations (*Table 1*).

Table 1. Types of Hospitalizations

Many of the current studies on the benefits of Medicare Advantage have compared avoidable and referral-sensitive hospitalizations to hospitalizations for marker conditions.

- **Avoidable hospitalizations** are those hospitalizations that could be prevented by better outpatient care. In our study, we use a definition developed by the Agency for Healthcare Research and Quality (AHRQ),[13] which identified the following conditions (with qualifications): bacterial pneumonia; dehydration; urinary tract infections; perforated appendix; low birth weight; angina; congestive heart failure; hypertension; adult asthma; chronic obstructive pulmonary disease; uncontrolled diabetes; diabetes with short-term complications; diabetes with long-term complications; and lower extremity amputations among patients with diabetes.
- **Marker condition hospitalizations** are hospitalizations for conditions that are unavoidable and would not be prevented by better outpatient care.[14,15] Such hospitalizations are seen as non-deferrable and occur as frequently on weekdays as on weekends. As defined by Billings et al. (*see Figure A.3*), these include hospitalizations for conditions such as appendicitis, acute myocardial infarction, gastrointestinal obstruction, and fracture of the hip or femur.
- **Referral-sensitive hospitalizations** are hospitalizations that are referral based and "planned" in an effort to prevent worse outcomes. Our study and others use the following list of procedures developed by Billings et al.: hip/joint replacements; breast reconstruction after mastectomy; pacemaker insertions; organ and bone marrow transplant surgeries; coronary artery bypass surgery; and coronary angioplasty.

INDIVIDUAL-LEVEL STUDIES

In a 2007 study, Basu and Mobley used 2001 HCUP data from California, Florida, New York, and Pennsylvania to examine whether there was a difference between MA and TM in avoidable hospitalizations.[16] An important contribution of this study was the use of hospitalizations for marker conditions (i.e., those that would not be prevented by better outpatient care) as a comparison group for avoidable hospitalizations. This use of marker conditions (*Table 1*) is meant to control for potential selection of healthier patients into MA. The study found that after holding demographics and illness severity constant, MA patients had significantly lower odds of an avoidable hospitalization than TM patients in California, Florida, and New York, but not in Pennsylvania.[16]

In a follow-up study using data from Florida, New York, and California (minus Pennsylvania), Basu and Mobley updated their findings with more recent data (2004) and extended their analysis to also examine hospitalizations for referral-sensitive conditions (i.e., those that are "planned" in an effort to prevent worse outcomes) (*Table 1*).[17] Their findings were similar to the findings of their 2007 study, showing higher rates of avoidable hospitalizations for TM patients than for MA patients. The study found that the relative risk of hospitalization for referral-sensitive conditions was substantially higher for MA patients than for TM patients in New York (37% higher) and Florida (41% higher), but was 13% lower

in California. This mixed evidence may be due to the following factors: 1) MA hospitalization rates may be lower if plans restrict access to specialists, or the number of specialists in the network may itself be limited; or 2) MA hospitalization rates may be higher because, by improving patients' information about possible choices in their care, these plans make more specialist referrals.

County-Level Studies

Several county-level studies have compared avoidable hospitalization rates among TM and MA patients. In a study of three states (Arizona, Massachusetts, and New York), Basu found that counties with higher MA penetrations rates had fewer avoidable hospitalizations from 1995 to 2005.[18] She also found that the relationship was stronger in 1995 than in 2005. She suggests that this is because during the study period (1995 to 2005), there was a decline in the number of enrollees in MA health maintenance organizations (HMOs) and an increase of enrollees in MA private fee-for-service (PFFS) plans. The consequent reduction in care management and coordination—a central feature of managed care organizations—may have weakened the effect of MA penetration. This trend was demonstrated once again in a follow-up study looking at avoidable hospitalizations in two cross sections spanning an 11-year time interval (1995 through 2005) in Arizona, California, Massachusetts, Maryland, New Jersey, and New York.[7] As in the previous study, avoidable hospitalization rates were inversely related to MA penetration rates.

Nicholas offers one of the most rigorous attempts to examine differences between MA and TM in avoidable hospitalizations at a county level. She linked HCUP discharge data from four states (Arizona, Florida, New Jersey, and New York) from 1999 to 2005 with Medicare enrollment data.[3] To adjust for possible selection bias due to health status, she compared hospitalizations for marker conditions and for avoidable conditions, which was similar to the approach taken by Basu and her colleagues. The study found that avoidable hospitalization rates were lower for MA enrollees than for TM beneficiaries.

"Spillover Effects"

There are many situations in which care received by some patients may "spill over" and positively affect the care of others.[19,20,21] For example, an increase in MA in an area could lead to a decrease in the number of magnetic resonance imaging (MRI) machines in that area, which could result in fewer unnecessary MRIs. At the physician level, having many MA patients could influence a physician's practice style, which would, in turn, affect all patients the physician treats, not only those in MA. Finally, at the economic level, entry of a managed care plan into an area could lead to more competition, which could drive down prices.[22]

Baicker and her colleagues constructed theoretical models to estimate spillover effects. Utilizing data from the Centers for Medicare & Medicaid Services (CMS), HCUP State Inpatient Databases, and the Area Resource File (ARF), they found that higher MA penetration had a positive spillover effect.[22] A 10 percentage point increase in MA penetration yielded a 2.4% decline in hospitalization costs. Furthermore, in areas with higher MA penetration, cost per hospitalization was lower for both TM beneficiaries and commercially insured patients younger than 65 years. In a related study, a similar conclusion was reached regarding spending by TM beneficiaries.[19] A 1% increase in county-level MA penetration yielded a nearly 1% reduction in individual annual spending by TM beneficiaries.

OVERVIEW OF ANALYSIS

The following study builds on and extends previous work in several ways:

- We use more recent Healthcare Cost and Utilization Project (HCUP) data from a greater number of states to estimate differences between Medicare Advantage (MA) and traditional fee-for-service Medicare (TM) in both avoidable hospitalizations and referral-sensitive hospitalizations.
- Similar to the work of Basu and Mobley, and Nicholas (described previously), our study controls for MA selection bias by using hospitalizations for marker conditions as the reference category.
- We estimate multivariable logistic regression models that include controls for patient age, gender, race/ethnicity, rural/urban location, and number of chronic conditions (using the weighted Charlson score).
- Drawing from recent work on the MA spillover effect, we also examine the influence of county-level MA penetration rates on avoidable hospitalizations.

Healthcare Cost And Utilization Project State Inpatient Databases

We used data from the Healthcare Cost and Utilization Project (HCUP) State Inpatient Databases (SID) for 12 states that distinguished Medicare Advantage (MA) from traditional fee-for-service Medicare (TM) as the main payer (*Table 2*).[23] In these states, HCUP does not further differentiate between types of MA plans, such as health maintenance organizations (HMOs), preferred provider organizations (PPOs), or private fee-for-service (PFFS) plans. The SID contain all discharge data for in-state hospitalizations, and include diagnostic and procedure codes, as well as payer information. We obtained the most recent data available (as of September 2015). For most states, this was 2013 data. However, only 2012 data was available for Massachusetts, Maryland, and Rhode Island. Given our focus on Medicare, we restricted the sample to patients 65 years or older for whom Medicare—whether TM or MA—was the primary payer. Younger Medicare beneficiaries were excluded because they have distinct health needs commonly associated with disability or end-stage renal disease.

The unit of analysis in HCUP data is the hospital discharge; an individual patient may have multiple hospitalizations. Medicare was not the primary payer for approximately 9% of the hospitalizations for patients 65 years or older, and these cases were excluded from our analysis (*Figure A.1*). Another 3% of the hospitalizations in our data were for patients who crossed state boundaries to obtain hospital care (*Figure A.2*). These cases were also excluded from our analysis. After these exclusions, our total sample size was 3,060,427 hospital discharges. Based on the primary ICD-9 codes available in the HCUP SID data, we identified hospitalizations for 1) ambulatory care-sensitive conditions, 2) marker conditions, and 3) referral-sensitive conditions (*Table 1*).

Table 2. Number of Hospital Discharges, by State and Payer

	Year	All	Medicare Advantage	Traditional Medicare
All States		3,060,427	706,339	2,354,088
AZ	2013	213,882	53,335	160,547
FL	2013	928,641	293,259	635,382
IA	2013	117,129	12,659	104,470
KY	2013	178,217	29,825	148,392
MA	2012	263,234	49,849	213,385
MD	2012	188,714	11,023	177,691
MI	2013	429,592	83,572	346,020
NJ	2013	316,617	32,701	283,916
NV	2013	78,015	20,643	57,372
OR	2013	104,350	47,316	57,034
RI	2012	41,891	17,117	24,774
WI	2013	200,145	55,040	145,105

Source: 2012/2103 Healthcare Cost and Utilization Project State Inpatient Databases. Restricted to patients 65 or older, residing in same state as hospital, and covered by Medicare.

The HCUP data include the following basic patient demographic information: age, gender, and race/ethnicity. The data also include the patient's county of residence, which we used to classify patients by rural/urban location using the Rural-Urban Continuum Codes (RUCC).[24] Based on preliminary analyses, the nine RUCC levels were combined into six by collapsing the non-metropolitan levels by population of urban center, ignoring adjacency to metropolitan statistical areas (MSAs). We also used ICD-9 diagnostic codes associated with hospitalizations to obtain a weighted Charlson score for each

hospitalization.[25] The Charlson Comorbidity Index weights chronic conditions based on mortality rates associated with each individual chronic condition. In our analyses, these scores were collapsed into five categories: 0, 1, 2, 3, and 4+ (weighted) chronic conditions.

CMS County Plan Enrollment Files

We used monthly data from the Centers for Medicare & Medicaid Services (CMS) for 2012 and 2013 that detailed the number of beneficiaries enrolled in MA plans versus the number eligible at a county level. For all 12 states except for Florida, these data were matched with the HCUP data using the year and month of the hospital admission. For Florida, which does not include admission month in its data, we used June 2013 enrollment and eligibility counts. The CMS files also break down enrollment figures by type of plan. Plans are categorized into 10 types. We aggregated all of the separate plan types into four larger groups: 1) PPO; 2) HMO; 3) PFFS; and 4) Other. In preliminary sensitivity tests, we examined whether the spillover effect of MA plans differed by MA plan type. Using just county-level HMO penetration rates, we did not find any major difference in our main results. We also found that the ratio of PPO-to-HMO enrollees at a county level was not significantly associated with avoidable hospitalizations.

American Medical Association Physician Masterfile

Using data from the American Medical Association (AMA) Physician Masterfile, we constructed several measures of physician supply. Primary care physicians were identified as those reporting their primary specialty as family medicine, general practice, or general internal medicine. This figure was further restricted to physicians practicing primarily in direct patient care. Because there is a delay between the date on which a physician retires and the date on which that retirement is actually captured in the AMA Physician Masterfile, we discounted older physicians to account for the fact that many of them might actually have retired. This method was based on those used in earlier work to estimate the size of the primary care physician workforce.[26] We also adjusted workforce counts downward to take into account physicians who have primary care training but are not practicing in primary care, most notably general internists working as hospitalists.[27] County population estimates were obtained from the American Community Survey (*Table 3*). Primary care rates were calculated for 2012 and 2013 to match the two different years of HCUP data.

Representativeness of Selected States

As noted above, the 12 states in our analysis were selected because their Healthcare Cost and Utilization Project (HCUP) data differentiated between Medicare Advantage (MA) and traditional fee-for-service Medicare (TM) as the main payer. Selected states are home to 13.5 million Medicare beneficiaries, which is approximately one-fourth of the 50.0 million beneficiaries nationwide as of January 2013 (*Table 3*). The 12 states appear to be representative of all states in terms of racial and ethnic composition, poverty rates, and physician workforce supply. Penetration rates are nearly identical: 27.1% in the sample states compared with 27.0% in all states. However, 3.1% of all MA enrollees nationwide are in private fee-for-services (PFFS) plans compared with 1.5% of those in our sample states. Another noteworthy difference is that nearly 14% of Medicare beneficiaries in our states live in rural counties, compared with approximately 20% of Medicare beneficiaries nationwide. The 12 states in our study are from each of the four broad census regions but do not include states in the Deep South.

Table 3. Comparison of Study States with All States, Select Characteristics

	States in Study (n=12)	All States
Demographic Characteristics		
Rural (RUCC)	13.6%	18.8%
Hispanic	13.5%	14.5%
African American	10.6%	11.7%
White	79.4%	76.0%
Poor	14.1%	14.9%
Uninsured	14.0%	14.6%
Physician Workforce		
FP/100,000	25.3	26.9
PCP/100,000	67.7	65.9
MA Enrollment		
Penetration Rate	27.1%	27.0%
Number Eligible	13,425,484	50,245,632
Number Enrolled in MA	3,637,415	13,528,323
MA Plan Type		
HMO	67.8%	67.6%
PFFS	1.5%	3.1%
PPO	29.7%	28.0%
Other	0.4%	0.6%

FP = family physicians; HMO = health maintenance organization; MA = Medicare Advantage; PCP = primary care physicians; PFFS = private fee-for-service; PPO = preferred provider organization; RUCC = Rural-Urban Continuum Codes.
Source: 2012/2013 American Community Survey county data for 12 study states: AZ, FL, IA, KY, MA, MD, MI, NJ, NV, OR, RI, and WI.

Unadjusted Hospitalization Rates

In this section, unadjusted hospitalization rates are presented by type of hospitalization, payer, and state (*Table 4*). We used HCUP data to obtain counts of the number of hospitalizations and Centers for Medicare & Medicaid Services (CMS) MA penetration data to obtain counts of the number of TM and MA beneficiaries. These results illustrate the common finding that, absent controls for selection into MA, there are substantial differences between the hospitalization rates of TM beneficiaries and MA enrollees. For the 12 study states combined, there are 243.2 hospitalizations per 1,000 TM beneficiaries, which is 31% higher than the rate for MA beneficiaries (185.4 per 1,000); TM hospitalizations for marker conditions are 27% higher than those for MA beneficiaries. To the extent that the presence of marker conditions reflects the underlying health of TM and MA beneficiaries, these results are consistent with previous studies showing that MA beneficiaries are healthier than TM beneficiaries. At the same time, the difference in avoidable hospitalization rates is 40.2%, which is 9%

higher than the difference in overall hospitalization rates and 13% higher than the difference in marker condition hospitalization rates. Consistent with previous findings, there is a much smaller difference in rates of referral-sensitive hospitalizations.

Table 4. Unadjusted Hospitalization Rates (per 1,000 Medicare Beneficiaries), by Hospitalization Type and Payer (TM Compared With MA)

	All Hospitalizations			Avoidable			Marker Condition			Referral-Sensitive		
	TM	MA	Δ	TM	MA	Δ	TM	MA	Δ	TM	MA	Δ
All States	243.2	185.4	31.1	45.7	32.6	40.2	10.8	8.5	27.5	14.9	13.1	13.8
AZ	254.0	138.1	83.9	37.6	21.4	76.2	12.0	7.1	67.8	20.3	10.9	85.5
FL	273.0	218.3	25.0	49.9	39.3	27.0	12.1	9.8	24.1	15.7	13.2	19.3
IA	222.9	163.2	36.6	45.6	30.2	51.0	11.5	8.3	38.8	17.4	14.1	23.6
KY	236.3	160.7	47.1	55.0	35.9	53.3	10.5	7.4	41.5	13.0	11.8	10.5
MA	234.6	245.8	-4.5	47.6	50.3	-5.4	9.7	10.9	-10.7	13.4	15.8	-15.2
MD	233.3	153.4	52.1	43.5	28.5	52.4	9.3	6.1	51.5	13.1	6.3	108.4
MI	264.7	171.2	54.6	47.8	24.9	91.7	11.1	7.1	55.4	16.4	15.2	7.7
NJ	236.7	142.7	65.9	48.0	29.1	64.7	11.0	6.2	76.8	11.8	7.0	68.3
NV	210.0	161.3	30.2	33.3	26.8	24.3	8.8	8.3	6.0	11.8	10.0	18.1
OR	144.4	161.0	-10.3	24.1	24.2	-0.4	7.6	8.6	-11.3	12.7	14.6	-13.1
RI	202.9	255.8	-20.7	39.4	51.8	-23.8	9.3	11.2	-17.0	11.4	15.3	-25.1
WI	221.0	164.1	34.7	41.2	27.3	50.9	10.6	7.6	39.7	17.4	16.4	6.7

Δ = percentage difference between TM rate and MA rate, 100*((TM/MA)-1)
MA = Medicare Advantage; TM = Traditional Medicare.
Sources: 2012/2013 Healthcare Cost and Utilization Project State Inpatient Databases; Centers for Medicare and Medicaid Services county enrollment and penetration data.

These hospitalization rates show considerable variability across states. Several states (Rhode Island, Oregon, and Massachusetts) stand out as having higher rates of avoidable hospitalizations for MA enrollees compared with TM beneficiaries. In each of these states, other types of hospitalizations, including those for marker conditions, are also more common among MA enrollees. This suggests that MA plans attract less healthy patients in these states. In some states (Arizona, Maryland, Michigan, and New Jersey), MA hospitalization rates are substantially lower than TM rates.

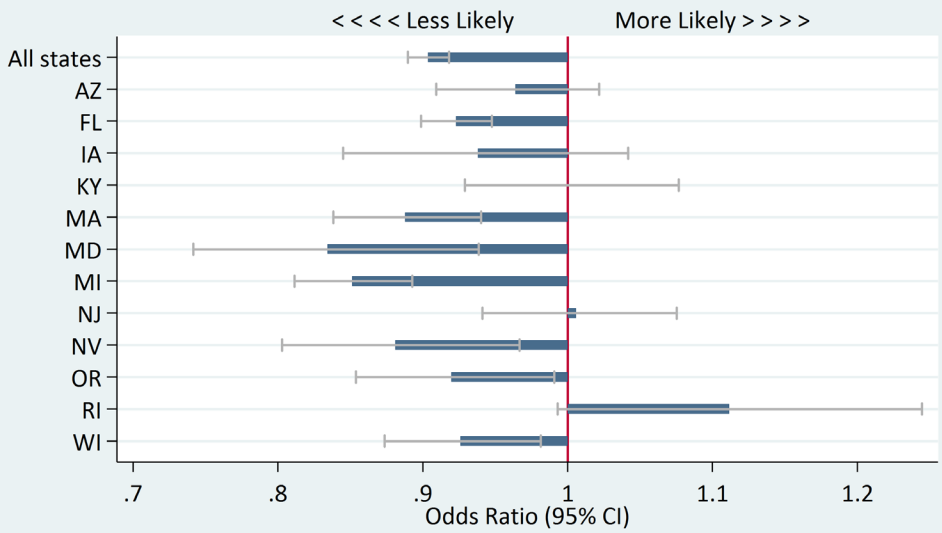
Multivariable Results: Avoidable Hospitalizations

This section examines whether observed MA-TM differences in avoidable hospitalizations persist after controlling for patient age, gender, race/ethnicity, number of chronic conditions, and rurality. Following the approach taken in other studies, the sample was restricted to avoidable and marker condition hospitalizations (n=677,601). We also restricted the analysis to Medicare beneficiaries 65 years or older who obtained care in the state where they reside. We estimated models for all 12 study states combined, as well as estimating separate models for each state (*see Table A.3 for full results*).
The results presented in *Figure 2* show that the adjusted probability of an avoidable hospitalization is approximately 10% (1-.90) lower for MA enrollees than for TM beneficiaries. Additional results show that as age increased, avoidable hospitalizations declined (*Table A.3*). Female, non-Hispanic white, and Asian/Pacific Islander beneficiaries were less likely to have an avoidable hospitalization. Patients with at least one chronic condition were substantially more likely to have an avoidable hospitalization. The impact of these individual-level characteristics generally holds across states. Such hospitalizations

were more common in both metropolitan areas with a population greater than one million (Rural-Urban Continuum Codes [RUCC] 1) and in more rural areas with an urban population less than 20,000 (RUCC 6-9).

There is variability across the 12 states in the primary MA-TM association. With the exceptions of Rhode Island and New Jersey, the odds ratios are less than one, indicating that MA patients have fewer avoidable hospitalizations than TM patients. The precision of these estimates, as indicated by the 95% confidence interval, is sensitive to the number of beneficiaries within a state. For Rhode Island, which has a small number of eligible beneficiaries, the TM-MA difference is not quite significant. TM beneficiaries in Maryland and Michigan had substantially lower rates of avoidable hospitalizations than the other states.

Figure 2. Influence of Medicare Advantage on Avoidable Hospitalizations, by State



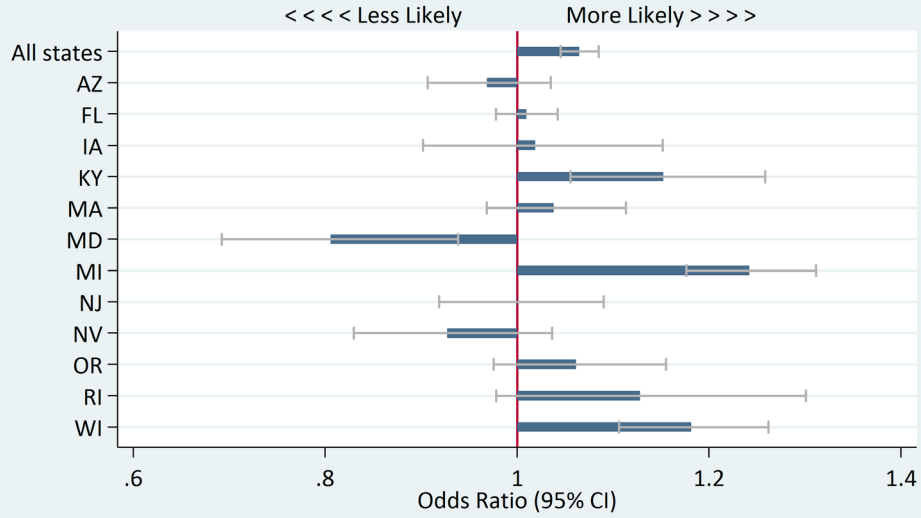
CI = confidence interval
Source: 2012/2013 Healthcare Cost and Utilization Project State Inpatient Databases. Restricted to avoidable and marker condition hospitalizations. Odds ratio is a measure of the relative likelihood of an avoidable hospitalization for Medicare Advantage (MA) and Traditional Medicare (TM) patients. Odds ratios less than one indicate that MA patients are less likely to have an avoidable hospitalization than TM patients. Models include controls for patient age, gender, race/ethnicity, number of chronic conditions, and rural location. Regression coefficients are presented in Appendix.

Multivariable Results: Referral-Sensitive Condition Hospitalizations

We extend the above analysis by considering MA-TM differences in referral-sensitive hospitalizations. For this analysis, the data are restricted to hospitalizations for referral-sensitive and marker conditions. Otherwise, the sample and covariates are the same as in our analysis for avoidable hospitalizations. Our findings show that in our sample from 12 states, MA enrollees are approximately 6% *more likely* (OR: 1.06) than TM beneficiaries to have a referral-sensitive hospitalization, holding constant patient age, gender, race/ethnicity, number of chronic conditions, and rurality (*Figure 3*). The more detailed results in the Appendix show that the rate of referral-sensitive hospitalizations declines with age. Male and non-Hispanic white beneficiaries are more likely to have a referral-sensitive hospitalization. The

odds of such a hospitalization declines as the number of chronic conditions increases. This MA-TM difference varies substantially across states. In most states, the effect of MA enrollment on referral-sensitive hospitalizations is not statistically significant. However, there is a positive and significant effect in Kentucky, Michigan, and Wisconsin (i.e., MA enrollees are significantly more likely to have a referral-sensitive hospitalization). By contrast, MA enrollees in Maryland have significantly lower odds of having a referral-sensitive hospitalization compared with TM beneficiaries.

Figure 3. Influence of Medicare Advantage on Referral-Sensitive Hospitalizations, by State



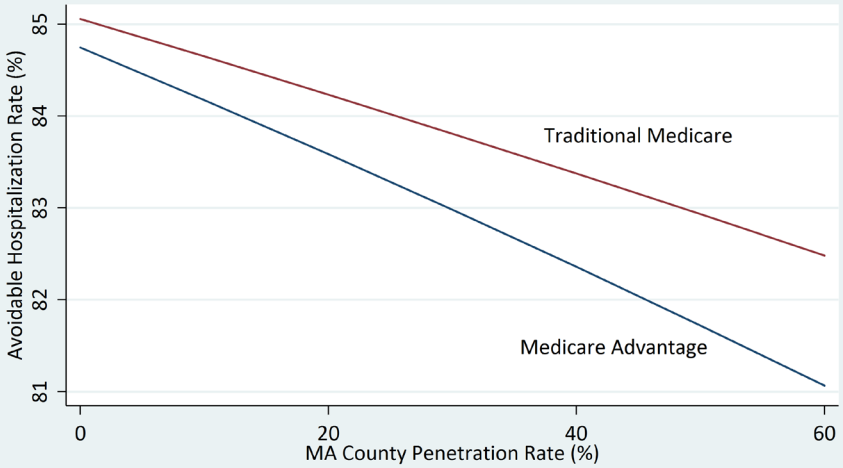
CI = confidence interval
Source: 2012/2013 Healthcare Cost and Utilization Project State Inpatient Databases. Restricted to referral-sensitive and marker condition hospitalizations. Odds ratio is a measure of the relative likelihood of a referral-sensitive hospitalization for Medicare Advantage (MA) and Traditional Medicare (TM) patients. Odds ratios less than one indicate that MA patients are less likely to have a referral-sensitive hospitalization than TM patients. Models include controls for patient age, gender, race/ethnicity, number of chronic conditions, and rural location. Regression coefficients are presented in Appendix.

"Spillover Effects:" The Association Between MA Penetration Rates and Hospitalization Rates

As discussed previously, MA may reduce avoidable hospitalizations for individual enrollees as well as for health care systems as a whole through a "spillover effect." In other words, as MA penetration increases, we would expect a decrease in avoidable hospitalization rates for both TM and MA beneficiaries. Similarly, we might expect that referral-sensitive hospitalization would increase with greater MA penetration. For each hospitalization measure, we estimated models that included 1) county-level penetration rates, and 2) an interaction term between the penetration rate and MA. These models included controls for patient age, gender, race/ethnicity, number of chronic conditions, and rurality. Furthermore, the models included several county-level characteristics: percent non-Hispanic black; percent unemployed; poverty rate; and family physicians per 100,000. In preliminary work, we also examined primary care physicians per 100,000 but found this characteristic was more weakly associated with avoidable hospitalizations than family physicians per 100,000.

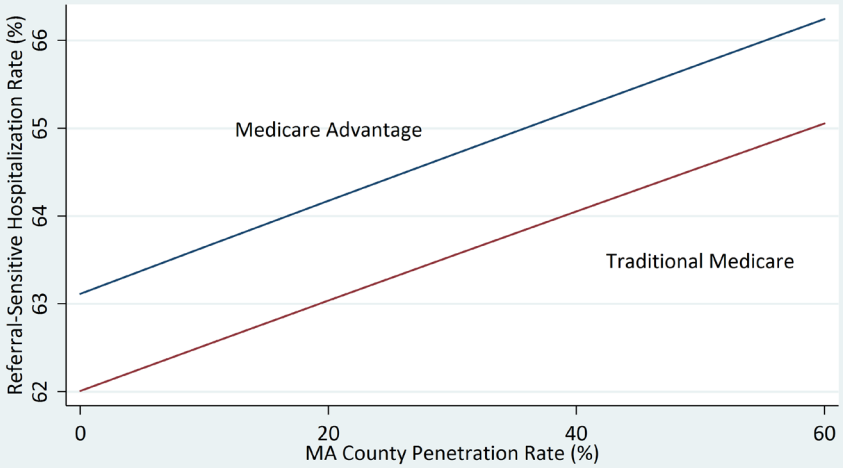
Figure 4 reports the adjusted percentage of all avoidable or marker condition hospitalizations for TM and MA beneficiaries at different levels of MA penetration. As expected, as MA county penetration rates increase, avoidable and marker condition hospitalization rates decrease for both MA and TM, effectively demonstrating that MA has a positive spillover effect on TM. Although there is an increasing gap between MA and TM hospitalization rates as MA county penetration rates increase, the difference in the two slopes is not statistically significant at conventional levels (p>.05). *Figure 5* presents parallel results for referral-sensitive conditions. The main finding is that there is a significant increase in levels of referral-sensitive hospitalizations for both MA and TM beneficiaries as MA penetration rates increase.

Figure 4. Joint Impact of MA Payer and MA Penetration Rate on Avoidable Hospitalizations



MA = Medicare Advantage
Source: 2012/2013 Healthcare Cost and Utilization Project State Inpatient Databases. Restricted to avoidable and marker condition hospitalizations. Models include controls for patient age, gender, race/ethnicity, number of chronic conditions, rural location, and county measures of percent non-Hispanic black, percent poor, percent unemployed, and family physicians per 100,000. Regression coefficients are presented in Appendix.

Figure 5. Joint Impact of MA Payer and MA Penetration Rate on Referral-Sensitive Hospitalizations



MA = Medicare Advantage
Source: 2012/2013 Healthcare Cost and Utilization Project State Inpatient Databases. Restricted to referral-sensitive and marker condition hospitalizations. Models include controls for patient age, gender, race/ethnicity, number of chronic conditions, rural location, and county measures of percent non-Hispanic black, percent poor, percent unemployed, and family physicians per 100,000. Regression coefficients are presented in Appendix.

CONCLUSION

Looking at 12 states' Medicare hospitalizations, we found that Medicare Advantage (MA) enrollees were less likely to have avoidable hospitalizations than traditional fee-for-service Medicare (TM) beneficiaries, even after indexing against marker condition (also labeled "expected" or "unavoidable") hospitalizations and controlling for differences in age, race/ethnicity, and gender. Our findings are consistent with those reported by other researchers that show MA plans reduce avoidable hospitalizations by approximately 10% after adjusting for individual and contextual factors. We also found that referral-sensitive hospitalization rates, which are a marker for better outpatient care, seem to be higher among MA enrollees than among TM beneficiaries.

Medicare Advantage was also associated with a positive "spillover effect" on TM beneficiaries. In other words, counties with higher MA penetration rates have fewer avoidable hospitalizations for both MA enrollees and TM beneficiaries, even after controlling for other explanatory factors. In addition, higher MA penetration rates increase referral-sensitive hospitalizations.

LIMITATIONS

The use of Healthcare Cost and Utilization Project (HCUP) data has several limitations. First, inpatient data for a majority of states do not include information about whether the primary payer is Medicare Advantage (MA). Most states simply indicate that Medicare was the payer. Still, data from 12 states do allow us to distinguish between MA and traditional fee-for-service Medicare (TM), and these states are fairly representative of all 50 states and the District of Columbia. However, even if information about MA is available, there is not a further distinction between types of MA (e.g., health maintenance organizations [HMOs], preferred provider organizations [PPOs], private fee-for-service [PFFS] plans, or other). The county-level plan data from the Centers for Medicare & Medicaid Services (CMS) provide a county-level proxy for this information.

An important limitation of the HCUP data is the absence of information about non-hospitalized Medicare beneficiaries. To the extent that MA may reduce both hospitalizations overall and avoidable hospitalizations in particular, we understate the potential benefits of MA. We addressed this problem by estimating multivariable models that compared MA and TM across different types of hospitalization, indexing on marker condition hospitalizations, rather than simply comparing avoidable hospitalizations to non-avoidable hospitalizations.

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APPENDIX — Overview

The additional data reported in the Appendix supplement the findings in the main report. We provide more detail about the Healthcare Cost and Utilization Project (HCUP) State Inpatient Databases (SID), as well as the Centers for Medicare & Medicaid Services (CMS) Medicare Advantage (MA) penetration data. We also present full regression results underlying the figures presented in the report.

APPENDIX — HCUP State Inpatient Databases

For the 12 states in our sample, we excluded a number of records given our focus on Medicare. Overall, the HCUP data included 9,316,032 separate discharge records; of these, Medicare was the payer for 3,940,842 (*Table A.1*). For our main analyses, we also excluded hospital discharges for Medicare beneficiaries under the age of 65. It is interesting to note that approximately 10% of hospital discharges of patients 65 years or older were not covered by Medicare, with substantial variation across states (Figure A.1). HCUP data are collected at the state level, with all hospitals within a state providing their information to a state agency. However, because some patients travel across state borders for hospital care, the state-level data might include out-of-state patients. The proportion of these patients varies by state (*Figure A.2*). Maryland, New Jersey, Rhode Island, and Iowa exclude out-of-state patients from their data at the onset. Among the other states, the percentage of out-of-state patients varies from a low of 1.0% in Michigan to 8% in Nevada. After excluding records for out-of-state patients, our sample consisted of 3,060,427 hospital discharge records.

Table A.1 HCUP Sample Selection

	All Discharges	Medicare Payer	65+	Same State
All Study States	9,316,032	3,940,842	3,159,042	3,060,427
AZ	742,813	278,472	225,214	213,882
FL	2,645,959	1,198,794	965,597	928,641
IA	299,256	136,051	117,129	117,129
KY	588,668	253,085	189,142	178,217
MA	812,696	345,627	276,725	263,234
MD	629,757	238,188	188,714	188,714
MI	1,222,069	553,106	433,939	429,592
NJ	985,286	381,525	316,617	316,617
NV	296,895	107,823	84,732	78,015
OR	355,489	136,846	110,959	104,350
RI	126,073	54,207	41,891	41,891
WI	611,071	257,118	208,383	200,145

HCUP = Healthcare Cost and Utilization Project
Source: 2012/2013 HCUP State Inpatient Databases.
"Medicare Payer" restricted sample to discharges in which Medicare (whether traditional or Medicare Advantage) was identified as the payer; "65+" restricted sample to patients 65 years or older; "Same State" restricted data to hospital discharges of patients receiving care in the same state where they live.

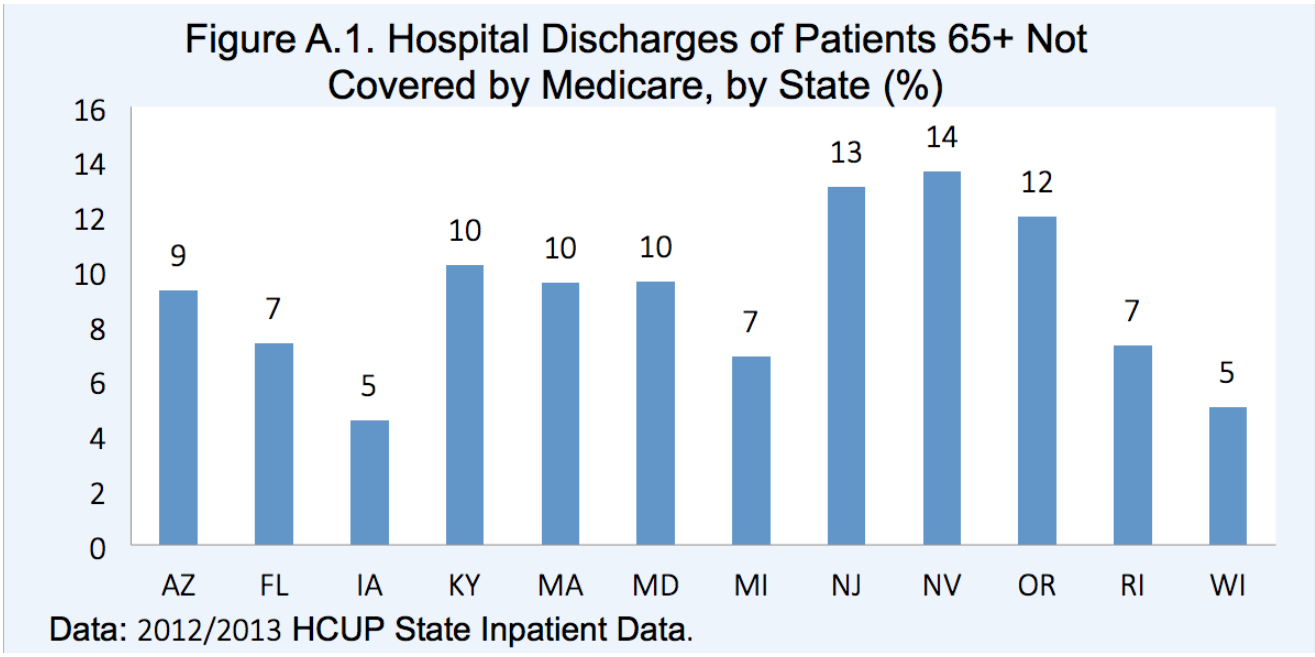


Figure A.1. Hospital Discharges of Patients 65+ Not Covered by Medicare, by State (%)
16
14
12
10
8
6
4
2
0
9
7
5
10
10
10
7
13
14
12
7
5
AZ
FL
IA
KY
MA
MD
MI
NJ
NV
OR
RI
WI
Data: 2012/2013 HCUP State Inpatient Data.

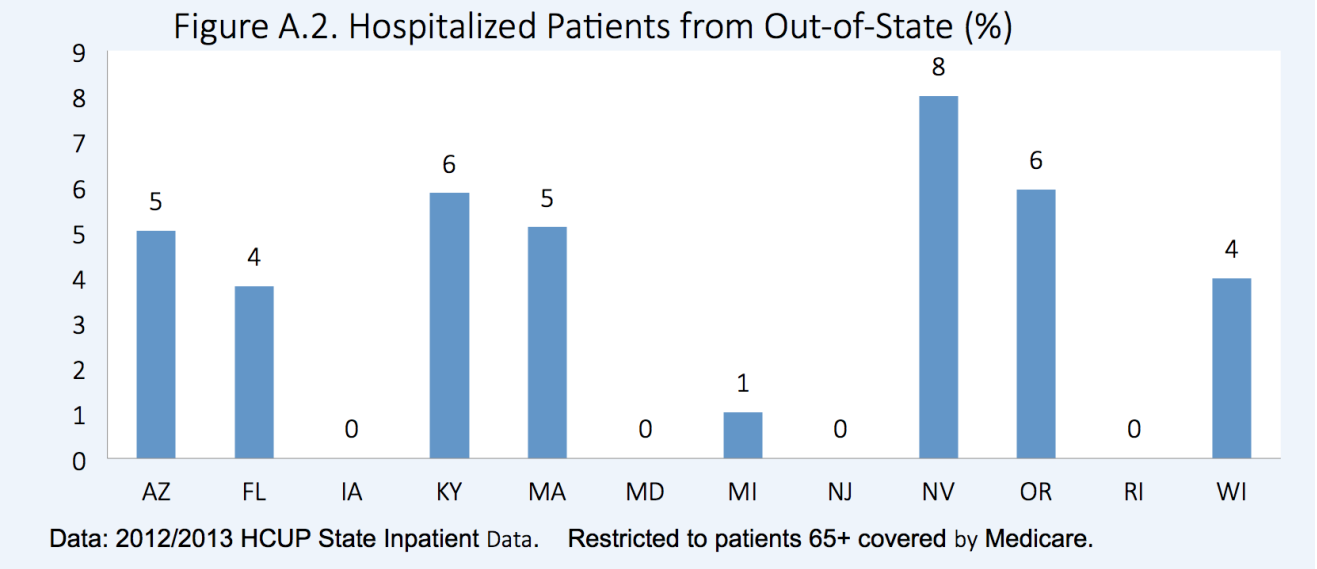


Figure A.2. Hospitalized Patients from Out-of-State (%)
9
8
7
6
5
4
3
2
1
0
5
4
0
6
5
0
1
0
8
6
0
4
AZ
FL
IA
KY
MA
MD
MI
NJ
NV
OR
RI
WI
Data: 2012/2013 HCUP State Inpatient Data. Restricted to patients 65+ covered by Medicare.

APPENDIX — CMS County Plan Medicare Data

The CMS county plan file identified the number of MA enrollees within each county by plan type. These data are used in the main report to examine the impact of MA penetration rates measured at the county level. Across states, there are not only considerable variations in penetration rates, but also considerable differences in the type of MA plans, particularly in the relative importance of health maintenance organizations (HMOs) or preferred provider organizations (PPOs). Private fee-for-service (PFFS) plans are relatively uncommon. In Arizona, nearly 90% of MA enrollees are in HMOs, compared with only 15.4% in Kentucky (Table A.2). In our preliminary analysis, we examined the impact of penetration rates of different types of MA plans on avoidable and referral-sensitive hospitalizations. We also estimated models that include the HMO-to-PPO ratio. Our findings were not substantially modified in either alternative specification.

Table A.2. Enrollment in Types of Medicare Advantage Plans, by State

			Number by MA Plan				Percent			
State	Eligible	Enrolled MA	HMO	PPO	PFFS	Other	HMO	PPO	PFFS	Other
AZ	1,032,615	390,845	351,254	31,993	5,132	301	89.9%	8.2%	1.3%	0.1%
FL	3,670,452	1,343,125	939,783	392,822	1,803	986	70.0%	29.2%	0.1%	0.1%
IA	548,091	77,934	41,116	32,821	1,963	563	52.8%	42.1%	2.5%	0.7%
KY	814,430	181,998	28,053	141,455	5,746	3,883	15.4%	77.7%	3.2%	2.1%
MA	1,112,671	202,499	166,158	32,422	22	2,695	82.1%	16.0%	0.0%	1.3%
MD	833,459	71,877	54,494	13,002	1,986	176	75.8%	18.1%	2.8%	0.2%
MI	1,801,277	494,927	209,654	272,512	9,441	883	42.4%	55.1%	1.9%	0.2%
NJ	1,427,169	228,055	204,879	20,398	-	1,066	89.8%	8.9%	0.0%	0.5%
NV	405,209	129,043	115,772	11,825	196	206	89.7%	9.2%	0.2%	0.2%
OR	687,019	292,726	149,707	139,127	702	1,376	51.1%	47.5%	0.2%	0.5%
RI	191,025	67,226	61,981	4,812	-	194	92.2%	7.2%	0.0%	0.3%
WI	987,784	331,808	206,213	103,745	19,282	698	62.1%	31.3%	5.8%	0.2%

HMO = health maintenance organization; MA = Medicare Advantage; PFFS = private fee-for-service; PPO = preferred provider organization

Source: 2012/2013 Centers for Medicare & Medicaid Services county plan MA enrollment

Full Regression Results for Analyses Presented in Report

The following section of the Appendix includes the full set of regression coefficients for the figures presented in the main report:

Table A.3. Adjusted Rates of Avoidable Hospitalizations, State-Level Estimates (for Figure 2)

Table A.4. Adjusted Rates of Referral-Sensitive Hospitalizations, State-Level Estimates (for Figure 3)

Table A.5. Examination of Impact of MA Penetration Rates on Avoidable Hospitalizations (for Figure 4)

Table A.6. Examination of Impact of MA Penetration Rates on Referral-Sensitive Hospitalizations (for Figure 5)

Table A.3. Adjusted Rates of Avoidable Hospitalizations, State Level Estimates

	All States OR [95% CI]	Arizona OR [95% CI]	Florida OR [95% CI]	Iowa OR [95% CI]	Kentucky OR [95% CI]	Mass. OR [95% CI]	Maryland OR [95% CI]
Payer Type							
Traditional Medicare (ref)							
Medicare Advantage	0.90 *** [0.89-0.92]	0.96 [0.91-1.02]	0.92 *** [0.90-0.95]	0.94 [0.84-1.04]	1.00 [0.93-1.08]	0.89 *** [0.84-0.94]	0.83 ** [0.74-0.94]
Age							
65-69 (ref)							
70-74	0.95 *** [0.93-0.97]	0.97 [0.89-1.06]	0.97 [0.93-1.01]	1.02 [0.89-1.15]	0.85 *** [0.77-0.94]	0.86 ** [0.79-0.95]	0.95 [0.86-1.06]
75-79	0.92 *** [0.90-0.95]	0.88 ** [0.81-0.96]	0.95 * [0.91-0.99]	0.99 [0.88-1.12]	0.78 *** [0.71-0.85]	0.90 * [0.83-0.99]	0.87 ** [0.78-0.96]
80-84	0.87 *** [0.85-0.89]	0.86 *** [0.79-0.94]	0.89 *** [0.86-0.93]	0.92 [0.82-1.03]	0.77 *** [0.70-0.84]	0.85 *** [0.78-0.93]	0.83 *** [0.75-0.91]
85-89	0.84 *** [0.82-0.86]	0.85 *** [0.78-0.93]	0.85 *** [0.81-0.89]	0.93 [0.83-1.05]	0.70 *** [0.63-0.77]	0.85 *** [0.78-0.92]	0.79 *** [0.71-0.87]
90+	0.81 *** [0.79-0.83]	0.79 *** [0.71-0.86]	0.84 *** [0.80-0.88]	0.95 [0.85-1.08]	0.63 *** [0.57-0.70]	0.76 *** [0.70-0.83]	0.74 *** [0.67-0.82]
Gender							
Male (ref)							
Female	0.94 *** [0.93-0.95]	0.92 ** [0.88-0.97]	0.95 *** [0.93-0.98]	0.88 *** [0.83-0.94]	1.00 [0.94-1.06]	0.92 *** [0.87-0.96]	0.97 [0.91-1.02]
Race/Ethnicity							
White, Non-Hispanic (ref)							
African American	1.42 *** [1.38-1.46]	1.42 *** [1.17-1.71]	1.45 *** [1.38-1.52]	1.21 [0.87-1.68]	1.25 ** [1.08-1.43]	1.38 *** [1.20-1.59]	1.56 *** [1.45-1.68]
Hispanic	1.19 *** [1.16-1.22]	1.09 [1.00-1.18]	1.24 *** [1.19-1.28]	1.42 [0.94-2.16]	0.65 *** [0.51-0.83]	1.31 *** [1.13-1.51]	1.06 [0.85-1.32]
Asian/Pacific Islander	0.86 *** [0.80-0.92]	1.17 [0.89-1.54]	0.86 [0.73-1.01]	0.36 *** [0.23-0.56]	0.70 [0.40-1.22]	1.04 [0.83-1.30]	0.69 ** [0.55-0.87]
Native American	1.06 [0.93-1.19]	1.16 [0.95-1.41]	0.90 [0.59-1.36]	0.64 [0.25-1.62]	1.46 [0.19-11.38]	1.38 [0.40-4.68]	0.93 [0.46-1.88]
Other Race	1.00 [0.94-1.07]	1.15 [0.57-2.33]	0.92 [0.82-1.04]	0.91 [0.11-7.80]	0.83 [0.54-1.27]	1.28 [0.95-1.74]	0.97 [0.75-1.26]
Race/Ethnicity Missing	0.80 *** [0.76-0.83]	0.80 [0.59-1.09]	0.73 *** [0.63-0.86]	0.79 ** [0.66-0.94]		0.47 *** [0.38-0.60]	0.42 *** [0.26-0.67]
# Chronic Conditions							
0 (ref)							
1	2.55 *** [2.51-2.60]	2.72 *** [2.54-2.91]	2.56 *** [2.48-2.65]	2.51 *** [2.30-2.74]	2.66 *** [2.46-2.89]	2.33 *** [2.18-2.48]	2.39 *** [2.20-2.59]
2	3.02 *** [2.96-3.08]	3.10 *** [2.87-3.34]	3.05 *** [2.94-3.17]	3.04 *** [2.76-3.34]	2.86 *** [2.63-3.12]	2.73 *** [2.55-2.92]	2.93 *** [2.69-3.20]
3	3.27 *** [3.20-3.35]	3.56 *** [3.26-3.89]	3.06 *** [2.93-3.19]	3.48 *** [3.11-3.90]	3.05 *** [2.78-3.36]	3.26 *** [3.01-3.53]	3.07 *** [2.79-3.37]
4+	2.81 *** [2.75-2.86]	3.20 *** [2.96-3.46]	2.60 *** [2.51-2.70]	3.02 *** [2.73-3.33]	2.61 *** [2.40-2.84]	2.75 *** [2.57-2.94]	2.89 *** [2.66-3.13]
Location (RUCC)							
Metro: >1,000,000 (ref)							
Metro Area: 250,000-1,000,00	0.94 *** [0.92-0.95]	0.86 *** [0.81-0.93]	0.93 *** [0.90-0.96]	0.75 *** [0.65-0.85]	1.25 *** [1.14-1.37]	0.96 [0.90-1.01]	0.91 [0.82-1.01]
Metro Area: 50,000-250,000	0.90 *** [0.88-0.92]	0.97 [0.91-1.04]	0.96 [0.92-1.01]	0.67 *** [0.59-0.77]	1.10 [1.00-1.22]	0.74 *** [0.68-0.80]	0.90 [0.79-1.03]
Non-Metro: 20,000-49,999	0.91 *** [0.89-0.95]	0.87 [0.76-1.00]	1.07 [0.98-1.17]	0.60 *** [0.52-0.69]	1.19 ** [1.07-1.32]	1.04 [0.84-1.30]	
Non-Metro: 2,500-19,999	1.12 *** [1.09-1.15]	0.93 [0.76-1.14]	1.31 *** [1.20-1.43]	0.93 [0.82-1.06]	1.45 *** [1.35-1.56]	0.55 *** [0.42-0.72]	0.99 [0.87-1.14]
Non-Metro: <2,500	1.35 *** [1.28-1.42]		1.07 [0.52-2.19]		1.65 *** [1.50-1.82]		
Constant	2.61 *** [2.54-2.67]	2.04 *** [1.87-2.22]	2.55 *** [2.43-2.66]	3.11 *** [2.65-3.64]	2.91 *** [2.61-3.25]	3.41 *** [3.13-3.71]	2.76 *** [2.49-3.06]

OR = odds ratio; CI = confidence interval; FP = family physicians; MA = Medicare Advantage; RUCC = Rural-Urban Continuum Codes
Source: 2012/2013 HCUP State Inpatient Databases. See Table A.1 for state sample sizes.

Table A3. Adjusted Rates of Avoidable Hospitalizations, State Level Estimates (cont'd)

	Michicgan OR [95% CI]	New Jersey OR [95% CI]	Nevada OR [95% CI]	Oregon OR [95% CI]	Rhodes Isl. OR [95% CI]	Wisconsin OR [95% CI]
Payer Type						
Traditional Medicare (ref)						
Medicare Advantage	0.85 *** [0.81-0.89]	1.01 [0.94-1.08]	0.88 ** [0.80-0.97]	0.92 * [0.85-0.99]	1.11 [0.99-1.24]	0.93 ** [0.87-0.98]
Age						
65-69 (ref)						
70-74	0.96 [0.89-1.02]	0.97 [0.90-1.05]	0.88 [0.77-1.01]	0.88 [0.78-1.00]	0.98 [0.78-1.24]	1.06 [0.96-1.17]
75-79	0.93 * [0.88-1.00]	0.99 [0.92-1.07]	0.92 [0.80-1.06]	0.90 [0.80-1.03]	0.86 [0.69-1.07]	0.97 [0.89-1.07]
80-84	0.86 *** [0.80-0.91]	0.88 *** [0.81-0.94]	0.77 *** [0.67-0.89]	0.88 * [0.78-0.99]	0.82 [0.67-1.01]	0.97 [0.89-1.06]
85-89	0.81 *** [0.76-0.87]	0.84 *** [0.78-0.90]	0.84 * [0.72-0.97]	0.91 [0.80-1.03]	0.76 ** [0.62-0.93]	0.93 [0.85-1.02]
90+	0.81 *** [0.75-0.86]	0.83 *** [0.77-0.89]	0.76 ** [0.64-0.90]	0.90 [0.80-1.03]	0.74 ** [0.60-0.91]	0.89 * [0.81-0.98]
Gender						
Male (ref)						
Female	0.91 *** [0.88-0.95]	0.92 *** [0.88-0.96]	0.97 [0.89-1.06]	0.88 *** [0.82-0.95]	0.89 * [0.79-1.00]	0.91 *** [0.86-0.96]
Race/Ethnicity						
White, Non-Hispanic (ref)						
African American	1.24 *** [1.16-1.32]	1.43 *** [1.33-1.53]	1.30 ** [1.10-1.55]	1.41 [0.96-2.05]	1.65 ** [1.13-2.40]	1.34 *** [1.16-1.56]
Hispanic	0.95 [0.70-1.27]	1.29 *** [1.18-1.41]	1.04 [0.85-1.26]	0.91 [0.76-1.09]	1.32 [0.92-1.89]	1.30 [0.99-1.70]
Asian/Pacific Islander	1.16 [0.85-1.58]	0.90 [0.77-1.04]	0.81 [0.66-1.01]	0.81 [0.61-1.07]	1.72 [0.68-4.38]	0.84 [0.61-1.16]
Native American	1.44 * [1.02-2.03]	1.81 [0.78-4.22]	1.20 [0.80-1.80]	1.30 [0.82-2.05]		1.65 * [1.06-2.58]
Other Race	1.00 [0.85-1.17]	1.23 ** [1.05-1.44]	0.97 [0.75-1.25]	0.81 [0.63-1.05]	1.75 [0.83-3.69]	1.15 [0.55-2.39]
Race/Ethnicity Missing	0.86 *** [0.81-0.92]	0.85 [0.71-1.02]	0.72 [0.46-1.13]	0.92 [0.70-1.21]	0.70 [0.30-1.64]	0.73 * [0.54-0.98]
# Chronic Conditions						
0 (ref)						
1	2.55 *** [2.42-2.70]	2.33 *** [2.20-2.46]	2.37 *** [2.12-2.66]	3.11 *** [2.82-3.43]	2.74 *** [2.34-3.20]	2.79 *** [2.59-3.01]
2	3.08 *** [2.90-3.26]	2.80 *** [2.63-2.98]	2.77 *** [2.43-3.14]	3.85 *** [3.46-4.29]	3.20 *** [2.70-3.78]	3.18 *** [2.94-3.45]
3	3.34 *** [3.13-3.55]	3.02 *** [2.82-3.24]	3.03 *** [2.61-3.52]	4.84 *** [4.29-5.47]	3.72 *** [3.07-4.50]	3.71 *** [3.40-4.04]
4+	2.65 *** [2.51-2.80]	2.27 *** [2.14-2.41]	2.69 *** [2.35-3.07]	4.71 *** [4.25-5.23]	3.47 *** [2.93-4.10]	3.91 *** [3.62-4.22]
Location (RUCC)						
Metro: >1,000,000 (ref)						
Metro Area: 250,000-1,000,000	0.92 *** [0.87-0.96]	1.01 [0.94-1.08]	1.15 * [1.03-1.29]	0.97 [0.88-1.07]		0.86 *** [0.79-0.93]
Metro Area: 50,000-250,000	0.97 [0.92-1.03]	1.02 [0.92-1.14]	1.19 [0.93-1.51]	1.05 [0.95-1.16]		0.83 *** [0.77-0.89]
Non-Metro: 20,000-49,999	0.87 *** [0.81-0.94]		1.31 *** [1.12-1.52]	1.02 [0.91-1.14]		0.93 [0.85-1.02]
Non-Metro: 2,500-19,999	0.88 *** [0.83-0.94]		1.37 * [1.07-1.77]	1.26 ** [1.09-1.45]		0.96 [0.89-1.03]
Non-Metro: <2,500	0.91 [0.81-1.03]		1.80 [0.89-3.64]	1.77 * [1.13-2.76]		1.20 * [1.04-1.40]
Constant	2.78 *** [2.59-2.98]	2.81 *** [2.61-3.03]	2.35 *** [2.04-2.72]	1.52 *** [1.33-1.74]	2.49 *** [2.02-3.08]	2.11 *** [1.91-2.34]

Table A.4. Adjusted Rates of Referral Sensitive Hospitalizations, State Level Estimates

	All States	Arizona	Florida	Iowa	Kentucky	Mass.	Maryland
	OR [95% CI]	OR [95% CI]	OR [95% CI]	OR [95% CI]	OR [95% CI]	OR [95% CI]	OR [95% CI]
Payer Type							
Traditional Medicare (ref)							
Medicare Advantage	1.06 *** [1.05-1.08]	0.97 [0.91-1.03]	1.01 [0.98-1.04]	1.02 [0.90-1.15]	1.15 ** [1.06-1.26]	1.04 [0.97-1.11]	0.81 ** [0.69-0.94]
Age							
65-69 (ref)							
70-74	0.86 *** [0.84-0.89]	0.88 ** [0.80-0.96]	0.91 *** [0.87-0.96]	0.82 ** [0.72-0.93]	0.74 *** [0.66-0.82]	0.84 *** [0.76-0.92]	0.85 ** [0.76-0.96]
75-79	0.67 *** [0.66-0.69]	0.62 *** [0.56-0.67]	0.74 *** [0.70-0.77]	0.63 *** [0.55-0.72]	0.54 *** [0.48-0.60]	0.70 *** [0.63-0.77]	0.65 *** [0.58-0.73]
80-84	0.43 *** [0.42-0.44]	0.40 *** [0.37-0.44]	0.47 *** [0.45-0.50]	0.37 *** [0.33-0.42]	0.41 *** [0.37-0.46]	0.45 *** [0.41-0.50]	0.43 *** [0.38-0.48]
85-89	0.26 *** [0.26-0.27]	0.24 *** [0.22-0.27]	0.29 *** [0.27-0.30]	0.22 *** [0.19-0.25]	0.26 *** [0.23-0.29]	0.31 *** [0.28-0.34]	0.27 *** [0.24-0.30]
90+	0.15 *** [0.15-0.16]	0.14 *** [0.12-0.15]	0.18 *** [0.17-0.19]	0.11 *** [0.10-0.13]	0.16 *** [0.14-0.18]	0.17 *** [0.15-0.19]	0.16 *** [0.14-0.18]
Gender							
Male (ref)							
Female	0.88 *** [0.86-0.89]	0.83 *** [0.78-0.88]	0.87 *** [0.84-0.90]	0.97 [0.90-1.05]	0.96 [0.90-1.03]	0.87 *** [0.82-0.92]	0.91 ** [0.85-0.98]
Race/Ethnicity							
White, Non-Hispanic (ref)							
African American	0.68 *** [0.65-0.70]	0.85 [0.67-1.08]	0.64 *** [0.60-0.68]	0.93 [0.62-1.38]	0.83 * [0.69-1.00]	0.94 [0.78-1.12]	0.76 *** [0.70-0.84]
Hispanic	0.65 *** [0.63-0.68]	0.69 *** [0.62-0.76]	0.70 *** [0.66-0.73]	0.68 [0.40-1.18]	0.40 *** [0.28-0.56]	0.63 *** [0.52-0.76]	0.92 [0.71-1.21]
Asian/Pacific Islander	0.71 *** [0.65-0.78]	0.84 [0.61-1.16]	0.73 ** [0.60-0.90]	0.38 ** [0.21-0.69]	0.91 [0.47-1.76]	0.75 [0.57-1.00]	0.72 * [0.54-0.95]
Native American	0.69 *** [0.59-0.80]	0.54 *** [0.42-0.69]	0.82 [0.49-1.37]	0.08 * [0.01-0.73]	1.56 [0.17-14.42]	1.02 [0.25-4.15]	0.96 [0.44-2.11]
Other Race	1.07 [0.99-1.15]	1.85 [0.92-3.72]	1.14 [1.00-1.31]	0.26 [0.02-4.12]	1.12 [0.67-1.86]	1.49 * [1.05-2.11]	1.05 [0.78-1.41]
Race/Ethnicity Missing	1.17 *** [1.11-1.23]	1.14 [0.82-1.58]	1.05 [0.88-1.25]	1.10 [0.90-1.34]		0.99 [0.76-1.29]	1.74 * [1.07-2.81]
# Chronic Conditions							
0 (ref)							
1	0.78 *** [0.77-0.80]	0.78 *** [0.73-0.84]	0.81 *** [0.78-0.84]	0.73 *** [0.66-0.80]	0.78 *** [0.71-0.85]	0.78 *** [0.73-0.84]	0.86 *** [0.79-0.94]
2	0.57 *** [0.56-0.59]	0.60 *** [0.55-0.66]	0.62 *** [0.59-0.65]	0.53 *** [0.47-0.59]	0.48 *** [0.43-0.53]	0.53 *** [0.49-0.57]	0.67 *** [0.60-0.74]
3	0.47 *** [0.46-0.49]	0.53 *** [0.48-0.59]	0.50 *** [0.48-0.53]	0.44 *** [0.38-0.51]	0.39 *** [0.35-0.44]	0.49 *** [0.44-0.54]	0.50 *** [0.44-0.56]
4+	0.24 *** [0.23-0.24]	0.25 *** [0.22-0.27]	0.27 *** [0.25-0.28]	0.21 *** [0.18-0.24]	0.22 *** [0.20-0.25]	0.22 *** [0.20-0.25]	0.27 *** [0.25-0.31]
Location (RUCC)							
Metro: >1,000,000 (ref)							
Metro Area: 250,000-1,000,00	1.13 *** [1.11-1.15]	0.98 [0.90-1.06]	1.18 *** [1.14-1.22]	1.07 [0.91-1.25]	0.99 [0.88-1.11]	1.09 * [1.01-1.16]	1.03 [0.91-1.17]
Metro Area: 50,000-250,000	1.19 *** [1.16-1.22]	0.86 *** [0.80-0.93]	1.26 *** [1.20-1.33]	1.08 [0.91-1.28]	0.92 [0.82-1.04]	1.06 [0.96-1.17]	0.85 * [0.73-1.00]
Non-Metro: 20,000-49,999	1.07 *** [1.03-1.11]	0.90 [0.77-1.05]	0.84 ** [0.75-0.94]	0.93 [0.78-1.11]	0.90 [0.79-1.02]	0.92 [0.70-1.21]	
Non-Metro: 2,500-19,999	1.01 [0.97-1.04]	0.94 [0.75-1.17]	0.83 ** [0.75-0.93]	0.95 [0.81-1.11]	0.80 *** [0.73-0.88]	0.61 ** [0.44-0.86]	0.89 [0.76-1.05]
Non-Metro: <2,500	1.06 [1.00-1.13]		0.61 [0.24-1.56]		0.74 *** [0.65-0.83]		
Constant	5.12 *** [4.99-5.26]	6.38 *** [5.86-6.95]	4.28 *** [4.07-4.49]	6.07 *** [5.07-7.27]	5.95 *** [5.28-6.71]	5.14 *** [4.69-5.63]	5.25 *** [4.71-5.85]

OR = odds ratio; CI = confidence interval; FP = family physicians; MA = Medicare Advantage; RUCC = Rural-Urban Continuum Codes
Source: 2012/2013 HCUP State Inpatient Databases. See Table A.1 for state sample sizes.

Table A.4. Adjusted Rates of Referral Sensitive Hospitalizations, State Level Estimates (continued)

	Michicgan OR [95% CI]	New Jersey OR [95% CI]	Nevada OR [95% CI]	Oregon OR [95% CI]	Rhodes Isl. OR [95% CI]	Wisconsin OR [95% CI]
Payer Type						
Traditional Medicare (ref)						
Medicare Advantage	1.24 *** [1.18-1.31]	1.00 [0.92-1.09]	0.93 [0.83-1.04]	1.06 [0.98-1.16]	1.13 [0.98-1.30]	1.18 *** [1.11-1.26]
Age						
65-69 (ref)						
70-74	0.88 *** [0.82-0.94]	0.89 * [0.82-0.97]	0.79 ** [0.68-0.92]	0.80 *** [0.71-0.91]	0.92 [0.72-1.19]	0.87 ** [0.79-0.96]
75-79	0.66 *** [0.62-0.71]	0.76 *** [0.70-0.83]	0.75 *** [0.64-0.88]	0.60 *** [0.53-0.69]	0.56 *** [0.44-0.71]	0.64 *** [0.58-0.70]
80-84	0.43 *** [0.40-0.46]	0.45 *** [0.41-0.49]	0.44 *** [0.37-0.51]	0.38 *** [0.33-0.43]	0.36 *** [0.28-0.45]	0.39 *** [0.35-0.43]
85-89	0.26 *** [0.24-0.28]	0.27 *** [0.25-0.30]	0.33 *** [0.27-0.39]	0.21 *** [0.19-0.25]	0.22 *** [0.17-0.29]	0.21 *** [0.19-0.23]
90+	0.15 *** [0.14-0.17]	0.16 *** [0.15-0.18]	0.20 *** [0.16-0.25]	0.14 *** [0.12-0.16]	0.14 *** [0.10-0.18]	0.11 *** [0.09-0.12]
Gender						
Male (ref)						
Female	0.88 *** [0.84-0.92]	0.87 *** [0.82-0.91]	0.86 ** [0.77-0.95]	0.81 *** [0.75-0.88]	0.83 * [0.72-0.97]	0.90 *** [0.85-0.96]
Race/Ethnicity						
White, Non-Hispanic (ref)						
African American	0.59 *** [0.54-0.65]	0.67 *** [0.60-0.74]	0.71 ** [0.57-0.89]	0.59 * [0.36-0.96]	0.71 [0.43-1.17]	0.78 ** [0.65-0.94]
Hispanic	0.75 [0.52-1.08]	0.76 *** [0.67-0.85]	0.91 [0.72-1.14]	0.71 ** [0.57-0.88]	0.44 ** [0.26-0.73]	0.98 [0.71-1.34]
Asian/Pacific Islander	0.87 [0.60-1.27]	0.95 [0.79-1.15]	0.69 ** [0.53-0.90]	0.57 ** [0.40-0.81]	0.31 [0.05-1.79]	0.31 *** [0.20-0.47]
Native American	1.16 [0.77-1.75]	1.23 [0.45-3.33]	0.31 *** [0.16-0.60]	0.61 [0.34-1.07]		0.63 [0.36-1.12]
Other Race	1.30 ** [1.08-1.56]	0.98 [0.80-1.19]	0.76 [0.55-1.04]	0.69 * [0.51-0.94]	1.44 [0.57-3.62]	1.07 [0.47-2.44]
Race/Ethnicity Missing	1.04 [0.97-1.11]	1.26 * [1.02-1.57]	0.89 [0.54-1.47]	0.86 [0.62-1.18]	1.32 [0.44-4.02]	1.18 [0.85-1.64]
# Chronic Conditions						
0 (ref)						
1	0.81 *** [0.76-0.86]	0.73 *** [0.69-0.78]	0.65 *** [0.58-0.74]	0.75 *** [0.68-0.83]	0.65 *** [0.55-0.78]	0.79 *** [0.73-0.85]
2	0.58 *** [0.54-0.62]	0.52 *** [0.48-0.56]	0.47 *** [0.40-0.54]	0.54 *** [0.48-0.60]	0.39 *** [0.32-0.49]	0.57 *** [0.52-0.63]
3	0.45 *** [0.41-0.48]	0.44 *** [0.40-0.48]	0.42 *** [0.35-0.51]	0.45 *** [0.39-0.52]	0.42 *** [0.32-0.54]	0.47 *** [0.42-0.52]
4+	0.20 *** [0.19-0.22]	0.20 *** [0.18-0.22]	0.24 *** [0.20-0.29]	0.22 *** [0.19-0.25]	0.18 *** [0.14-0.23]	0.25 *** [0.23-0.28]
Location (RUCC)						
Metro: >1,000,000 (ref)						
Metro Area: 250,000-1,000,000	1.19 *** [1.13-1.26]	0.99 [0.90-1.08]	1.06 [0.92-1.21]	1.11 [1.00-1.23]		1.06 [0.97-1.17]
Metro Area: 50,000-250,000	1.24 *** [1.16-1.33]	1.33 *** [1.17-1.52]	1.29 [0.97-1.72]	1.06 [0.95-1.20]		1.06 [0.98-1.15]
Non-Metro: 20,000-49,999	1.07 [0.98-1.18]		1.15 [0.97-1.37]	0.94 [0.83-1.07]		1.06 [0.96-1.18]
Non-Metro: 2,500-19,999	1.00 [0.93-1.07]		1.09 [0.80-1.49]	0.96 [0.81-1.12]		0.93 [0.85-1.02]
Non-Metro: <2,500	1.33 *** [1.16-1.52]		1.00 [0.44-2.28]	0.54 * [0.31-0.93]		1.03 [0.87-1.23]
Constant	5.64 *** [5.24-6.07]	4.44 *** [4.09-4.83]	4.68 *** [4.01-5.45]	7.08 *** [6.17-8.12]	6.16 *** [4.91-7.72]	6.80 *** [6.12-7.55]

Table A.5. Examination of Impact of MA Penetration Rates on Avoidable Hospitalizations

		(1) OR [95% CI]	(2) OR [95% CI]	(3) OR [95% CI]
Payer Type				
	Traditional Medicare (ref)			
	Medicare Advantage	0.904 [0.890-0.918]	0.936 [0.911-0.962]	0.975 [0.914-1.041]
	MA Penetration		0.700 [0.566-0.865]	0.721 [0.580-0.896]
	Medicare Advantage*MA Penetration			0.885 [0.723-1.082]
Age				
	65-69 (ref)			
	70-74	0.950 [0.927-0.974]	0.951 [0.927-0.975]	0.951 [0.927-0.975]
	75-79	0.925 [0.903-0.947]	0.925 [0.902-0.949]	0.925 [0.902-0.949]
	80-84	0.870 [0.850-0.890]	0.870 [0.847-0.894]	0.871 [0.847-0.895]
	85-89	0.840 [0.820-0.860]	0.842 [0.819-0.865]	0.842 [0.819-0.865]
	90+	0.809 [0.789-0.829]	0.812 [0.786-0.839]	0.812 [0.786-0.839]
Gender				
	Male (ref)			
	Female	0.938 [0.925-0.951]	0.936 [0.920-0.951]	0.936 [0.920-0.951]
Race/Ethnicity				
	White, Non-Hispanic (ref)			
	African American	1.417 [1.379-1.455]	1.364 [1.297-1.434]	1.364 [1.297-1.435]
	Hispanic	1.189 [1.156-1.222]	1.242 [1.150-1.342]	1.245 [1.150-1.347]
	Asian/Pacific Islander	0.859 [0.801-0.921]	0.858 [0.783-0.941]	0.858 [0.782-0.941]
	Native American	1.056 [0.934-1.194]	1.064 [0.911-1.243]	1.065 [0.912-1.243]
	Other Race	1.004 [0.939-1.074]	0.999 [0.902-1.108]	1.000 [0.902-1.108]
	Race/Ethnicity Missing	0.798 [0.763-0.834]	0.808 [0.733-0.890]	0.808 [0.733-0.890]
# Chronic Conditions				
	0 (ref)			
	1	2.553 [2.506-2.601]	2.548 [2.475-2.623]	2.547 [2.474-2.623]
	2	3.022 [2.961-3.085]	3.010 [2.921-3.102]	3.010 [2.921-3.102]
	3	3.273 [3.199-3.349]	3.260 [3.126-3.399]	3.259 [3.125-3.399]
	4+	2.805 [2.751-2.861]	2.794 [2.632-2.967]	2.794 [2.631-2.968]
Location (RUCC)				
	Metro: >1,000,000 (ref)			
	Metro Area: 250,000-1,000,000	0.936 [0.920-0.952]	0.946 [0.876-1.022]	0.946 [0.875-1.021]
	Metro Area: 50,000-250,000	0.901 [0.881-0.921]	0.895 [0.829-0.967]	0.896 [0.829-0.968]
	Non-Metro: 20,000-49,999	0.915 [0.885-0.945]	0.911 [0.829-1.001]	0.912 [0.830-1.001]
	Non-Metro: 2,500-19,999	1.120 [1.091-1.149]	1.099 [0.999-1.209]	1.101 [1.001-1.211]
	Non-Metro: <2,500	1.345 [1.275-1.419]	1.263 [1.112-1.436]	1.265 [1.113-1.438]
FP/100,000			0.997 [0.996-0.999]	0.997 [0.996-0.999]
Unemployment Rate			0.792 [0.418-1.504]	0.780 [0.407-1.493]
Percent Uninsured			0.647 [0.376-1.113]	0.655 [0.379-1.131]
Percent non-Hispanic Black			1.153 [0.855-1.554]	1.155 [0.856-1.558]
Poverty Rate			2.367 [1.206-4.648]	2.342 [1.195-4.588]
Constant		2.608 [2.545-2.672]	2.952 [2.638-3.304]	2.937 [2.625-3.285]

OR = odds ratio; CI = confidence interval; FP = family physicians; MA = Medicare Advantage; RUCC = Rural-Urban Continuum Codes

Source: 2012/2013 HCUP State Inpatient Databases. See Table A.1 for state sample sizes.

Table A.6. Examination of Impact of MA Penetration Rates on Referral Sensitive Hospitalizations

		(1) OR [95% CI]	(2) OR [95% CI]	(3) OR [95% CI]
Payer Type				
	Traditional Medicare (ref)			
	Medicare Advantage	1.065 [1.045-1.085]	1.060 [1.020-1.101]	1.056 [0.971-1.149]
	MA Penetration		1.292 [1.012-1.649]	1.288 [0.987-1.682]
	Medicare Advantage*MA Penetration			1.010 [0.763-1.339]
Age				
	65-69 (ref)			
	70-74	0.865 [0.842-0.888]	0.866 [0.842-0.890]	0.866 [0.842-0.890]
	75-79	0.673 [0.655-0.691]	0.674 [0.654-0.695]	0.674 [0.654-0.695]
	80-84	0.429 [0.418-0.441]	0.430 [0.417-0.443]	0.430 [0.417-0.443]
	85-89	0.262 [0.255-0.270]	0.262 [0.253-0.272]	0.262 [0.253-0.272]
	90+	0.154 [0.149-0.159]	0.153 [0.147-0.161]	0.153 [0.147-0.161]
Gender				
	Male (ref)			
	Female	0.879 [0.865-0.894]	0.876 [0.857-0.896]	0.876 [0.857-0.896]
Race/Ethnicity				
	White, Non-Hispanic (ref)			
	African American	0.675 [0.651-0.700]	0.700 [0.651-0.752]	0.700 [0.651-0.752]
	Hispanic	0.653 [0.630-0.677]	0.729 [0.664-0.801]	0.729 [0.664-0.801]
	Asian/Pacific Islander	0.710 [0.651-0.775]	0.722 [0.650-0.802]	0.722 [0.650-0.802]
	Native American	0.685 [0.587-0.800]	0.724 [0.557-0.942]	0.724 [0.557-0.942]
	Other Race	1.066 [0.985-1.153]	1.103 [0.988-1.232]	1.103 [0.987-1.232]
	Race/Ethnicity Missing	1.166 [1.109-1.227]	1.118 [1.043-1.200]	1.118 [1.043-1.199]
# Chronic Conditions				
	0 (ref)			
	1	0.782 [0.766-0.798]	0.781 [0.762-0.801]	0.781 [0.762-0.801]
	2	0.572 [0.558-0.586]	0.570 [0.551-0.590]	0.570 [0.551-0.590]
	3	0.473 [0.459-0.486]	0.471 [0.450-0.493]	0.471 [0.450-0.493]
	4+	0.235 [0.229-0.241]	0.234 [0.223-0.246]	0.234 [0.223-0.246]
Location (RUCC)				
	Metro: >1,000,000 (ref)			
	Metro Area: 250,000-1,000,000	1.128 [1.105-1.151]	1.115 [1.028-1.210]	1.115 [1.027-1.210]
	Metro Area: 50,000-250,000	1.188 [1.157-1.220]	1.165 [1.081-1.255]	1.165 [1.082-1.254]
	Non-Metro: 20,000-49,999	1.067 [1.027-1.109]	1.062 [0.965-1.168]	1.062 [0.966-1.168]
	Non-Metro: 2,500-19,999	1.006 [0.974-1.038]	1.000 [0.911-1.099]	1.000 [0.912-1.097]
	Non-Metro: <2,500	1.064 [0.998-1.135]	1.114 [0.969-1.280]	1.114 [0.970-1.279]
FP/100,000			1.004 [1.002-1.005]	1.004 [1.002-1.005]
Unemployment Rate			1.524 [0.729-3.186]	1.526 [0.718-3.245]
Percent Uninsured			0.242 [0.120-0.490]	0.242 [0.118-0.494]
Percent non-Hispanic Black			1.097 [0.793-1.519]	1.097 [0.794-1.516]
Poverty Rate			0.580 [0.270-1.244]	0.580 [0.273-1.233]
Constant		5.125 [4.993-5.260]	5.285 [4.746-5.885]	5.287 [4.755-5.878]

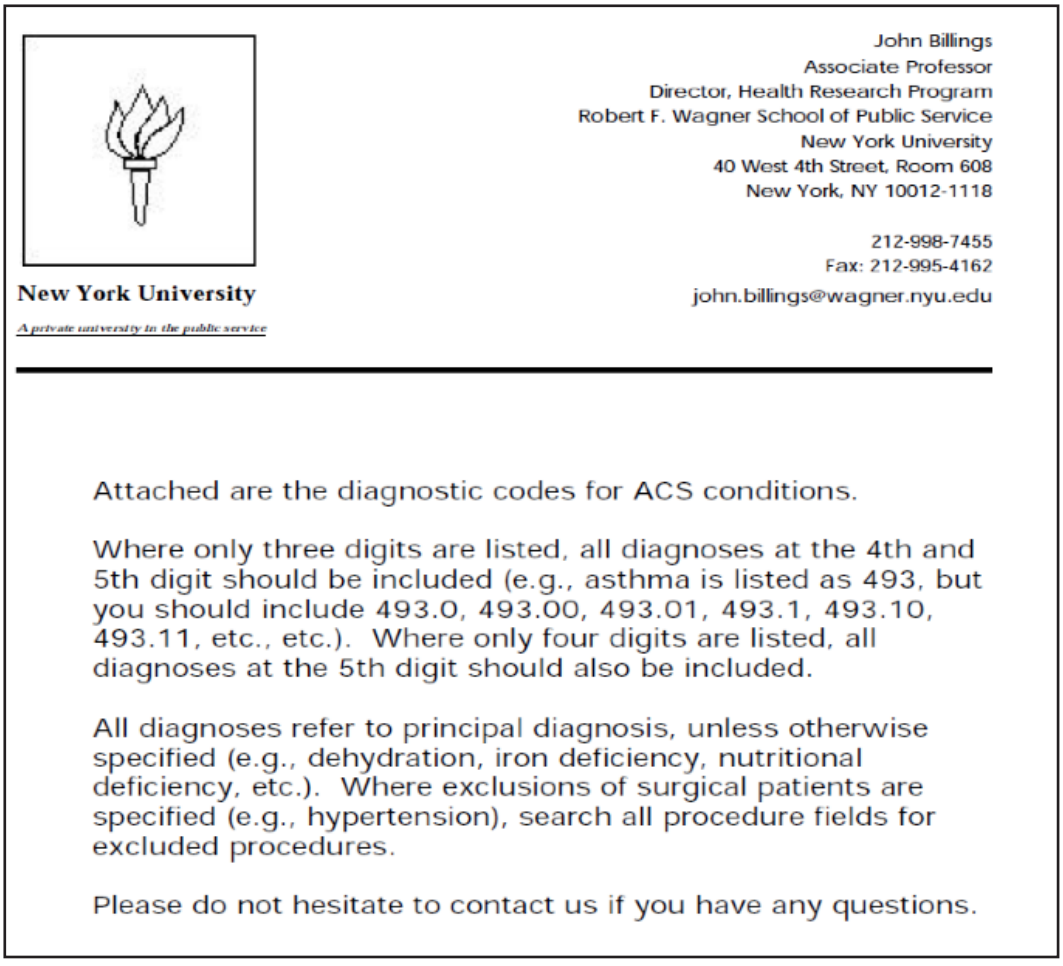
OR = odds ratio; CI = confidence interval; FP = family physicians; MA = Medicare Advantage; RUCC = Rural-Urban Continuum Codes

Source: 2012/2013 HCUP State Inpatient Databases. See Table A.1 for state sample sizes.

APPENDIX — Description of Marker and Referral-Sensitive Conditions

For our analysis, the definitions of marker and referral-sensitive conditions are based on the work of Billings et al. that is described in the 1993 article *Impact of Socioeconomic Status on Hospital Use in New York City.*[14] The exact list of ICD-9 diagnostic codes for marker conditions and ICD-9 procedure codes for referral-sensitive conditions, along with qualifications, is available from a personal communication (*Figure A.3,* from http://wagner.nyu.edu/files/admissions/acs_codes.pdf). This communication also includes the codes and qualifications for avoidable conditions (referred to as ambulatory care-sensitive [ACS] conditions). However, we used a more recent and comprehensive measure from the Agency for Healthcare Research and Quality (AHRQ).[13]

Figure A.3. Billings' List of Diagnostic Codes for Different Types of Hospitalizations



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Attached are the diagnostic codes for ACS conditions.

Where only three digits are listed, all diagnoses at the 4th and 5th digit should be included (e.g., asthma is listed as 493, but you should include 493.0, 493.00, 493.01, 493.1, 493.10, 493.11, etc., etc.). Where only four digits are listed, all diagnoses at the 5th digit should also be included.

All diagnoses refer to principal diagnosis, unless otherwise specified (e.g., dehydration, iron deficiency, nutritional deficiency, etc.). Where exclusions of surgical patients are specified (e.g., hypertension), search all procedure fields for excluded procedures.

Please do not hesitate to contact us if you have any questions.

APPENDIX — Description of Marker and Referral-Sensitive Conditions

"Ambulatory Care Sensitive" Conditions

ACS Condition and ICD-9-CM Code(s)	Comments
Congenital syphilis [090]	Secondary diagnosis for newborns only
Immunization-related and preventable conditions [033, 037, 045, 320.0, 390, 391]	Hemophilus meningitis [320.2] age 1-5 only
Grand mal status and other epileptic convulsions [345]	
Convulsions "A" [780.3]	Age 0-5
Convulsions "B" [780.3]	Age >5
Severe ENT infections [382, 462, 463, 465, 472.1]	Exclude otitis media cases [382] with myringotomy with insertion of tube [20.01]
Pulmonary tuberculosis [011]	
Other tuberculosis [012-018]	
Chronic obstructive pulmonary disease [491, 492, 494, 496, 466.0]	Acute bronchitis [466.0] only with secondary diagnosis of 491, 492, 494, 496
Bacterial pneumonia [481, 482.2, 482.3, 482.9, 483, 485, 486]	Exclude case with secondary diagnosis of sickle cell [282.6] and patients < 2 months
Asthma [493]	
Congestive heart failure [428, 402.01, 402.11, 402.91, 518.4]	Exclude cases with the following surgical procedures: 36.01, 36.02, 36.05, 36.1, 37.5, or 37.7
Hypertension [401.0, 401.9, 402.00, 402.10, 402.90]	Exclude cases with the following procedures: 36.01, 36.02, 36.05, 36.1, 37.5, or 37.7
Angina [411.1, 411.8, 413]	Exclude cases with a surgical procedure [01-86.99]
Cellulitis [681, 682, 683, 686]	Exclude cases with a surgical procedure [01-86.99], except incision of skin and subcutaneous tissue [86.0] where it is the only listed surgical procedure
Skin grafts with cellulitis [DRG 263, DRG 264]	Exclude admissions from SNF/ICF
Diabetes "A" [250.1, 250.2, 250.3]	
Diabetes "B" [250.8, 250.9]	
Diabetes "C" [250.0]	

APPENDIX — Description of Marker and Referral-Sensitive Conditions

Hypoglycemia [251.2]	
Gastroenteritis [558.9]	
Kidney/urinary infection [590, 599.0, 599.9]	
Dehydration - volume depletion [276.5]	Examine principal and secondary diagnoses separately
Iron deficiency anemia [280.1, 280.8, 280.9]	Age 0 - 5 only, and examine principal and secondary diagnoses separately
Nutritional deficiencies [260, 261, 262, 268.0, 268.1]	Examine principal and secondary diagnoses separately
Failure to thrive [783.4]	Age < 1 only
Pelvic inflammatory disease [614]	Women only denominator - exclude cases with a surgical procedure of hysterectomy [68.3-68.8]
Dental Conditions [521, 522, 523, 525, 528]	

"Marker" Conditions

Condition and ICD-9-CM Code(s)	Comments
Appendicitis with appendectomy [540, 541, 542]	With principal procedure of 47.0 or 47.1
Acute myocardial infarction [410]	Only cases with LOS > 5 days or disposition of death
Gastrointestinal Obstruction [560]	
Fracture hip/femur [820]	Age 45+ only

"Referral Sensitive" Surgeries

Condition and ICD-9-CM Code(s)	Comments
Hip/joint replacement [81.41, 81.48, 81.5, 81.6]	
Breast reconstruction after mastectomy [85.7, 85.95]	Women only
Pacemaker insertion [37.7]	
Organ and bone marrow transplant surgeries [37.5, 50.5, 55.6, 41.0]	
Coronary artery bypass surgery [36.1]	
Coronary angioplasty [36.01, 36.02, 36.05]	