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Medicare Advantage?

The Effects of Managed Care on Quality of Care

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Abstract

Recent policy reforms have sought to expand the role of managed care in Medicare, despite limited information about quality of care provided by Medicare managed care (MMC) plans. This paper uses a unique inpatient hospitalization dataset containing over 9 million records to analyze outpatient quality and access to care in MMC in four states from 1999 - 2004. Several econometric strategies are used to address positive selection, which explains most of the observed differences in hospitalization rates. I find little evidence that plans improve outpatient management of chronic conditions or restrict access to elective procedures, though MMC plans respond to incentives to cream-skim and to prevent acute illness, reducing rates of preventable hospitalization for acute illness by 5 to 10 admissions per 1,000 enrollees. During the study period, MMC plans in included counties on average were paid $300 per enrollee per year more than Medicare spent on the average Fee-for-Service enrollee in the county, though these additional payments do not appear to have affected quality of care or targeted sicker Medicare enrollees.

INTRODUCTION

Policymakers have long attempted to increase the role of managed care in Medicare because it is believed to be a way to provide additional benefits to beneficiaries while limiting Federal expenditures on Medicare. Recent policy changes under the 2003 Medicare Modernization Act encouraged enrollment in managed care plans, causing an increase in program participation from 12 percent of Medicare beneficiaries in 2003. The program currently enrolls 20 percent of seniors and is projected to cover nearly a third of Medicare beneficiaries by 2017 (CBO, 2007). Although Medicare beneficiaries are increasingly choosing managed care plans, little is known about the quality of care provided under this option, the Medicare Advantage program. The theoretical effects of managed care on quality of care are ambiguous, few studies provide current empirical evidence about the quality of care provided to beneficiaries currently enrolled in Medicare managed care (MMC) or the implications of increasing managed care enrollment for those who remain in "Traditional" or Fee-for-service (FFS) Medicare.

Arguments in support of MMC, as articulated in President Bush's *Framework to Modernize and Improve Medicare* are based on the idea that managed care can create a competitive marketplace that will reduce inefficiency to improve quality of care and lower costs. Plans will compete on price and quality, generating savings that plans will use to offer additional benefits or reduced cost-sharing to enrollees (White House, 2003). Efficient practice styles may cause beneficial spillovers to the care of Fee-for-Service enrollees.

Others argue that the voluntary MMC program allows plans to engage in "cream-skimming," attracting enrollment from only the healthiest Medicare beneficiaries who will have limited health care use. Quality could be lower in MMC in this case if plans restrict access to services to reduce costs or to discourage enrollment by sick beneficiaries. When it is more profitable for plans to engage in cream-skimming than other forms of cost-cutting, competition between plans may reduce overall quality of care if the plans that manage care are driven out of the market by those that are able to enroll the healthiest risks (van de Ven and van Vliet, 1992). Physicians may alter the way they treat FFS patients to encourage them to use higher intensity services to increase revenue (McGuire and Pauly, 1991).

The increasing enrollment and availability of MMC raises the question of whether this increased spending on MMC plans improves quality of care either for those who select MMC or those remaining in FFS. Existing research relies on older data which predates several changes to the program. Findings indicates quality problems in MMC on a variety of dimensions

including beneficiary satisfaction with care and receipt of appropriate services in the inpatient, outpatient and rehabilitative setting (Landon et al., 2004; Guadagnoli et al., 2000; Retchin et al., 1997; Experton et al., 2000). However, MMC plans have been shown to outperform FFS on some measures of preventative services use and do reduce out-of-pocket spending for enrollees (Morales et al., 2004; Landon et al., 2004; Gold et al., 2004).

The MMC literature suffers from many limitations including a reliance on data from the early 1990s, survey data or samples from only one or two plans or states. Most studies have been unable to address the adverse selection problem which arises because sicker people are less likely to enroll in managed care, making it difficult to determine whether managed care improves health or simply attracts the healthy. This paper uses the Healthcare Cost and Utilization Project State Inpatient Databases from Arizona, Florida, New Jersey and New York from 1999 through 2004 to compare quality of care provided to MMC and FFS enrollees, overcoming several limitations faced by earlier studies. These data include over 9 million observations on all in-state hospitalizations for MMC and FFS enrollees. Nearly a quarter of all MMC enrollees reside in one of these four states during the study period.

Few papers use administrative data to examine quality of care under MMC after the 1997 reforms as it is largely unavailable.[1] Inpatient hospitalization data allows me to combine innovative methodology from health services research to classify certain inpatient admissions as quality indicators with econometric strategies to correct for selection bias. Quality is assessed using (1) admissions for conditions that could be prevented through timely and effective outpatient care, and (2) access to costly elective procedures which require a specialist's referral.[2] Several strategies are used to identify the effect of managed care enrollment including correcting for typically unobserved indicators of enrollee health status and instrumenting for MMC status using variation in Federal payments to managed care plans over time.

During the study period, payments to managed care plans are only partially risk-adjusted and beneficiaries can disenroll at the end of every calendar month. These program features provide incentives for plans to compete for healthier enrollees and focus preventative service provision on avoiding acute illness in the short-term rather than managing chronic conditions. I show that plans respond to these incentives; MMC plans reduce annual rates of potentially

[1] An exception is the HEDIS dataset, which focuses on a small number of quality indicators.

[2] Considerable research has been done to validate these hospitalizations as quality indicators (UCSF-Stanford, 2001; Billings, 2003). These indicators have been widely used to assess quality of care in FFS Medicare and for the under-65 population

preventable hospitalizations for acute conditions which can be avoided with timely antibiotic or vaccination use by 5 to 10 admissions per 1,000 beneficiaries, but do not effect rates of preventable hospitalizations resulting from chronic conditions or elective procedures. Findings suggest that plans primarily rely on positive selection rather than rationing or managing care to reduce costs. Medicare managed care has little effect on quality of care for beneficiaries in Arizona, Florida, New Jersey and New York. However, payments to plans exceeded average FFS spending during the period. MMC payment policy caused the government to direct additional resources to healthier seniors without significantly improving the quality of their care of or those who remain in FFS. Findings differ from some previous studies in that I do not find major quality problems in MMC. This may be due to improvements in MMC quality relative to the early 1990s.

MEDICARE MANAGED CARE AND QUALITY

The Medicare Managed Care Program

Managed care plans have provided services to some Medicare beneficiaries since the 1980s. This paper focuses on the program from 1999 through 2004, when it was known first as Medicare+Choice and later as Medicare Advantage. During this period, MMC enrollment was concentrated in Health Maintenance Organizations (HMOs), a fairly restrictive form of managed care typified by tight provider networks and restrictions on access to specialists.[3] Participation in MMC is voluntary for health plans and Medicare beneficiaries. Beneficiaries who choose to enroll in the Medicare managed care (MMC) option accept restrictions on provider networks and utilization in return for additional benefits not covered by FFS Medicare. These can include reduced out-of-pocket spending on cost-sharing and premiums, and benefits for services not covered under FFS Medicare including some preventative services, dental care, gym memberships and prescription drug coverage.[4]

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[3] Availability of private Fee-for-Service and Preferred Provider Organizations in the MMC program is very limited during the study period. Thus, these data provide an opportunity to compare a more restrictive form of managed care to the unrestricted FFS program.

[4] Prior to the introduction of the drug benefit, there was little coverage for outpatient prescription drugs. Following the recent introduction of the Medicare prescription drug benefit, beneficiaries enrolled in MMC plans have had access to drug benefits with lower monthly premiums and less cost sharing on average than the stand-alone drug benefits available to those in FFS Medicare (Carino, 2006). Following Congressional review, CMS has changed marketing materials to indicate that enrollees ***may*** gain additional benefits or lower cost-sharing in MMC.

Prior to the passage of the 1997 Balanced Budget Act, plans received capitated per-enrollee payments set at 95 percent of expected FFS spending in the beneficiaries' county. Though payments exceeding expected costs and profit were slated to be used for additional benefits, the government lost money under this program since plans attracted enrollees who were considerably healthier than the average Medicare enrollee (Berenson, 2004; CMS, 1999). To reduce overpayments to plans and geographic disparities in payment rates and make MMC enrollment more attractive to less healthy Medicare beneficiaries, the 1997 Balanced Budget Act introduced a new payment regime which divorced county payment rates from the actual cost of care in the county. Starting in 1998, plans received the highest of three annual rates paid per beneficiary per month: a minimum floor payment which is uniform across the country through 2001, when a higher floor for urban counties with at least 250,000 residents was added; a minimum update of the previous year's rate inflated by at least 2 percent (temporarily increased to 3 percent for 2001 and 6.3 percent for 2004);[5] and a blend of county-specific and national average rates, which was only implemented in 2000, when it was deemed to be revenue-neutral (Gold et al., 2004).

Payments to plans are adjusted for enrollee age, sex, Medicaid eligibility and institutional status. Between 2001 and 2003, 10% of the payment amount is adjusted to account for prior hospitalization. In 2004, a phased adjustment to more fully risk-adjusted premiums begins with 30% of the payment adjusted based on demographic and utilization characteristics.[6] Incomplete risk adjustment during the study period provides incentives for plans to engage in cream-skimming since Medicare beneficiaries have heterogeneous health spending patterns and it is difficult to identify high cost beneficiaries from typically observable characteristics (CBO, 2005). In 2001, 5% of Medicare enrollees accounted for 43% of FFS spending, while the 50% of beneficiaries with lowest utilization together contributed only 4% of program expenditures. Plans may find it more profitable to discourage the highest-cost beneficiaries from enrolling than to find ways of reducing the cost of their care. During the study period, beneficiaries can also

[5] The minimum update rate introduced in 1998 was based on estimated 1995 FFS spending trended forward using national and local factors, but not true county costs. Correspondence with the Centers for Medicare and Medicaid Services provides assurances that the use of these formulas results in county rates that do not accurately track trends in local FFS spending.

[6] This phase-in, however, was designed to be revenue-neutral for plans. CMS provided additional plan-specific payments that reflected the average risk of each plan's enrollee population so that plans with sicker enrollees on average received larger payments (MedPAC, 2004).

disenroll at the end of every month, providing a disincentive for plans to invest in improving enrollees' health for the long-term.

Reforms to encourage plan participation in MMC sharply reduced the amount of encounter data plans are required to report. Consequently, little is known about quality of care currently provided to MMC enrollees. Quality initiatives from Medicare and the commercial market combined with the introduction of less restrictive managed care products are likely to have caused improvements in MMC quality since the mid-1990s (Draper et al., 2002). MMC plans are required to participate in HEDIS and CAHPS, two quality monitoring initiatives that also cover the commercial managed care sector (MedPAC, 2002). CAHPS is a consumer survey about the quality of care received. The HEDIS effort collects data on a set of quality indicators, such as blood sugar level for diabetics and screenings for certain cancers.[7] No comparable assessment tool is used for FFS. This monitoring provides greater incentives for MMC plans, relative to FFS, to influence physicians to improve quality, at least on measured domains (Scanlon et al., 2006). However, a recent assessment found that many MMC enrollees do not receive the recommended services through 2004 despite ongoing HEDIS reporting (MedPAC, 2006).

Possible Effects of Medicare Managed Care on Quality

Medicare managed care plans are expected to maximize profits by reducing spending on health care. This can be achieved by improving beneficiary health; by reducing service use or emphasizing low-cost providers; or by enrolling beneficiaries who require little care. Theoretically, these strategies may either improve or reduce quality depending on how plans interact with providers and beneficiaries.

Improving Health

Managed care plans, which receive capitated payments per enrollee, have incentives to keep enrollees healthy since healthier patients will require fewer health care services. Managed care plans can directly influence demand for certain medical services by encouraging members to use preventative services or other types of care (Landon et al., 1998). Plans face particular

[7] MMC plans report the following 17 HEDIS measures: Advising smokers to quit, beta-blockers following heart attack, breast cancer screening, cholesterol management (2), controlling high blood pressure, comprehensive diabetes care (6), antidepressant medication management (3), and follow-up after mental illness hospitalization (2).

incentives to engage in short-term preventative efforts, such as encouraging influenza vaccination, since short enrollment periods increase the risk that a beneficiary leaves the plan before cost savings from investments in long-term health improvements are realized. Plans may choose to contract only with high quality physicians and providers who provide better care (Landon et al., 1998). However, tight provider networks can adversely affect quality of care if patients face long wait times to access physicians and services. Quality outcomes for FFS enrollees may be better (worse) to the extent that managed care patients monopolize services of lower (higher) quality providers.

Reducing Service Use

Plans can influence the services a patient uses by altering physician behavior through financial incentives, treatment guidelines and utilization review, denying payments for services that are deemed unnecessary or inappropriate (Landon et al, 1998). These strategies can improve quality of care by reducing overprovision of profitable elective procedures and excessive diagnostic testing or reduce quality of care by denying treatment to patients who would benefit from service receipt. The influence of managed care on physician behavior is expected to have a direct effect on quality of care provided to MMC enrollees. Similarly, there may be spillover effects on the quality of care provided to FFS enrollees in the same markets if physicians alter the ways in which they treat all patients or pass managed care practice guidelines to their peers (Baker, 1999).

Cream-Skimming

Plans can avoid most care management activities by attracting only healthy beneficiaries, who will use few services. In this case, managed care may not have a direct effect on quality of care unless firms attracting enrollees also provide lower quality of care or make it difficult for high quality plans to remain competitive in the market (van de Ven and van Vliet, 1992). Plans may use benefit package design to influence cream-skimming, for example through cost-sharing requirements for chronic condition management. Low-income, healthier beneficiaries may be attracted to plans with free or low-cost preventative services, while prescription drug coverage and vision benefits attract high-cost beneficiaries (Atherly et al., 2003).

Empirical Evidence: MMC Quality

A large body of work has considered the effects of commercial health maintenance organizations on health care spending, access to preventative services, quality and satisfaction with care received using both aggregate and individual-level data. Most of the commercially insured population is currently enrolled in some form of managed care, creating interest in evaluating the effects of managed care on health outcomes (Glied, 2000). In a series of literature reviews synthesizing two decades of research on managed care, Miller and Luft (1994; 1997; 2002) consistently find mixed evidence of the effects of managed care on many dimensions. Managed care patients consistently outperform comparison groups on measures of preventative service use. Studies of Medicare managed care comprise a relatively small area of the managed care literature, but are more likely to find negative effects of HMOs on quality than the commercial HMO literature (Miller and Luft, 2002).

MMC enrollees are less likely to receive coronary angioplasty when it is appropriate following a heart attack (Guadagnoli et al., 2000), and more likely to have a preventable hospital readmission (Experton et al., 1999). MMC enrollees were more likely to be sent to a nursing home than a rehabilitative facility following hospitalization for a stroke (Retchin et al., 1997). These studies raise concerns about MMC quality, though they are based on limited samples. Several recent papers have evaluated survey data collected by CMS to monitor quality in MMC and FFS. Nationally, MMC enrollees on average are less satisfied with overall care received, physician and specialty services than FFS beneficiaries (Landon et al., 2004). For-profit Medicare managed care plans (which enroll the majority of MMC beneficiaries) have lower quality scores than non-profit plans on measures including breast cancer screening, diabetic eye examination, beta-blocker medication after heart attack, and follow-up after hospitalization for mental illness (Schneider et al., 2005).

MMC plans typically outperform FFS on measures of preventative care. MMC beneficiaries are more likely to receive pneumonia and influenza vaccinations and advice to quit smoking than those in FFS (Landon et al., 2004). Some studies suggest that MMC enrollment mitigates racial and socioeconomic disparities in rates of preventative service use and access to care (Morales et al., 2004; Balsa et al., 2007).

DATA

Data Sources

State Inpatient Database (SID) hospitalization records collected in Arizona, Florida, New Jersey and New York as part of the Agency for Healthcare Research and Quality's Health Care Utilization Project (HCUP) provides a unique way to observe quality of care provided to MMC and FFS enrollees. I use hospitalizations from Arizona and Florida from 1999 through 2004, from New York from 1999 through 2003 and New Jersey from 2003and 2004. These are the only state years that participate in the HCUP, have significant MMC enrollment and report all necessary variables including MMC status.[8] However, nearly 25 percent of MMC enrollees reside in one of the 165 included counties during the study period. Compared to FFS enrollees, MMC enrollees in SID states are more likely to be Black or Hispanic, male, Medicaid-eligible, and disabled prior to age 65 than those in other states. To the extent that these states are non-representative of overall MMC enrollment, these characteristics should bias results away from finding a difference between MMC and FFS enrollment. MMC enrollees in SID states are also younger on average, which may counteract some of this potential bias.

SID records include patient demographics, diagnostic and procedure codes, and payment source. Some types of inpatient hospitalizations are likely to result from access to (absence of) quality care in the outpatient setting. I focus on two types of admissions that have been identified and validated as indicators of quality and access to care prior to hospitalization and one that provides information about underlying health status (UCSF-Stanford, 2001; Billings, 2003).

1. Ambulatory care sensitive (ACS) admissions are potentially avoidable hospitalizations for conditions that can be managed or prevented through effective primary care, such as complications of diabetes or high blood pressure. ACS admissions often signify lack of access to primary care or receipt of low-quality services (Billings et al., 1996). Lower rates of ACS admissions per 1,000 enrollees indicate higher quality of care. MMC plans should be better able to coordinate outpatient care to avoid this type of hospitalization, and face financial incentives to emphasize inexpensive primary care. I examine rates of ACS hospitalizations for acute and chronic conditions separately since they represent different dimensions of outpatient care. Acute

[8] California and Pennsylvania also collect necessary variables, but do not release data through the HCUP Central distributor and data could not be obtained from these states in time for project completion.

admissions are potentially preventable through timely outpatient intervention or vaccination, while chronic conditions may require ongoing monitoring and patient compliance.

2. Referral sensitive admissions (RS) include elective surgical procedures, such as total hip replacement. These are high-cost procedures that can improve patient well-being and generally require a referring physician, indicating that the patient received necessary outpatient services prior to the admission (Billings, 2003; Billings et al., 1993). From an efficiency standpoint, it is unclear whether higher or lower rates of these admissions are desirable. These procedures should be performed in accordance with patient preferences (Wennberg, 2007). Very high (low) rates may indicate overprovision (barriers to access).

3. Marker, or reference admissions are inpatient hospitalizations for acute conditions such as severe heart attacks and hip fractures which are unlikely to be affected by recent primary care. There are clear practice guidelines and agreements across providers that patients with one of these conditions should be hospitalized (Billings, 2003). These conditions provide information about underlying health status and should not be affected by Medicare managed care status.

Figure 1 details the ambulatory care sensitive, referral-sensitive, and reference procedures included in the study.[9]

The SID data contain the universe of hospitalizations in participating states. I use hospitalization records for elderly Medicare beneficiaries (aged 65 and above) who have either traditional FFS or managed Medicare as their primary source of payment for the hospitalization. Beneficiaries hospitalized in sample states who reside out-of-state are dropped to avoid selection issues related to generalizing from the population that crosses state lines for medical care. The analysis sample is restricted to observations from the 415 county-years with non-trivial Medicare managed care enrollment.

Diagnostic and procedure codes on each discharge record are used to identify ACS, referral-sensitive, and marker hospitalizations. I examine rates of hospitalization since the SID data only include those beneficiaries who experience a hospitalization in a given year and individual identifiers are not available. Data is aggregated to the county-year-insurance status level to consider rates of hospitalization per 1,000 enrollees. Demographic characteristics of MMC and FFS enrollees are taken from the Medicare denominator (enrollment) file to include all beneficiaries at risk of each type of hospitalization and not just those who are hospitalized

[9] Hospitalizations are classified using International Classification for Disease, 9th Revision, Clinical Modification Codes. ACS admissions are identified using the AHRQ Prevention Quality Indicators module, diagnostic and procedure codes identified by Billings (2003) are used to classify referral-sensitive and marker hospitalizations.

each year. These include beneficiary age, race, sex and total enrollment. CMS Medicare State, County plan files and Medicare Advantage rate files provide monthly payment rates to MMC plans.

The MMC market is dominated by a small number of national firms and local, independent Blue Cross Blue Shield plans. My sample includes markets served by all of the seven major MMC firms except for Kaiser Permanente (Draper et al., 2002b).[10] This is an unavoidable limitation because states with Kaiser MMC plans do not report necessary variables. Results may not generalize to states where MMC enrollment is concentrated in Kaiser plans, particularly California and the Pacific Northwest. MMC beneficiaries living in these states rate the quality of care received in MMC more highly than beneficiaries in other parts of the country (Zaslavsky et al; 2004). Estimates should be viewed as lower bounds on the nationwide average effect of MMC on quality of care, since inclusion of higher-quality markets will raise the average quality level observed in MMC.

Sample Characteristics

Nearly 18 percent of Medicare beneficiaries in the four states are enrolled in MMC during the study period. This paper includes observations from 415 county years where MMC plans are offered. 28 percent of beneficiaries in these counties enroll in MMC. Summary statistics reveal slight differences in observable characteristics between MMC and FFS enrollees. MMC enrollees are about 1 year younger than those in FFS on average, consistent with positive selection into MMC (Table 1). Consistent with adverse selection, they are also more likely to be Black or Hispanic and to be male. These characteristics are consistent with those reported in earlier studies, which have suggested that unobserved characteristics play a large role in explaining the differences in explaining the net positive selection previously observed in the MMC program (Greenwald, et al., 2000; Mello et al., 2003).

MMC enrollees experience significantly fewer hospitalizations than FFS enrollees during the study period (Figure 2). MMC enrollees account for only 13 to 15 percent of each type of hospitalization examined (Table 1b). Rates are lower all for 23 conditions examined (Table 2), including the marker hospitalizations, where most of the variation should be driven by

[10] Kaiser is a non-profit plan primarily available in the Pacific Northwest which enrolled 13 percent of MMC beneficiaries nationwide in 2001.

underlying health status. The differences in marker hospitalization rates provide suggestive evidence of positive selection into MMC.

In earlier work I show that conditional on hospitalization for marker conditions and accidents, types of hospitalizations which produce an arguably random sample of Medicare beneficiaries whose hospitalizations are not driven by underlying health status, MMC enrollees in sample state years consistently have lower rates of congestive heart failure and chronic obstructive pulmonary disorder, the leading causes of potentially preventable hospitalizations for the elderly. MMC enrollees have higher rates of diabetes across all types of admissions, although those with chronic diabetic complications are more likely to be in FFS. MMC enrollees also have higher rates of hypertension (Nicholas, 2008). The higher rates of hypertension may indicate either that MMC enrollees are less likely to have blood pressure adequately monitored and treated, or that MMC enrollment is more attractive to beneficiaries with certain chronic conditions.

Appendix Table 1 shows that these trends persist across all types of hospitalizations considered. Many of the potentially preventable and elective hospitalizations considered in this paper result from complications of these comorbid conditions. If MMC enrollees do not suffer from the underlying conditions, they will not experience the resulting hospitalizations regardless of the quality of care provided by their managed care plan. MMC enrollees are 1 percent less likely to have congestive heart failure and 1.3 percent less likely to have peripheral vascular disease, putting them at lower risk for preventable or elective hospitalizations for angina, heart failure, angioplasty and heart bypass regardless of the quality of care provided by their MMC plans.

Trends in Quality

During the study period, MMC plans are mandated to engage in quality improvement activities and demonstrate improvement. Plans are left to choose their own target areas and projects are given a multi-year timespan, so quality may improve during the study period although not necessarily on dimensions measured in this study. FFS providers are not subject to similar quality reporting or improvement projects, so we may expect to see different trends in quality in the two coverage alternatives over time. Figure 3 provides evidence that quality in MMC, as measured by rates of ACS admissions per 1,000 enrollees is not improving during this

period. Rates of preventable hospitalizations increase between 1999 and 2001 and then remain stable through 2004. FFS enrollees consistently experience more preventable hospitalizations and show no evidence of improving or deteriorating quality over the study period.[11] During the study period, 25 percent of all hospitalizations in my sample are classified as ACS, or potentially preventable admissions. There are many challenges associated with providing care to the elderly population including multiple chronic conditions, disability and cognitive limitations. Consequently, it is unrealistic to expect to eliminate these types of admissions completely, even in a high quality health care system. However, the large volume of these admissions indicates a potential quality problem in the Medicare program across all payers.

METHODS

Empirical Strategy

Controlling for observable beneficiary characteristics, the difference in rates of hospitalization between managed care and Fee-for-Service enrollees reflects any differences in quality of care between the two groups as well as unobserved health characteristics that influence the decision to enroll in managed care and health outcomes. The equation of interest is

$$H_{i,c,t} = \beta_0 + \beta_1 MMC_{i,c,t} + \beta_2 X_{i,c,t} + \beta_3 C + \beta_4 Y + \beta 5 C*Y + \varepsilon_{i,c,t} \qquad \textbf{(1)}$$

where $MMC_{i,c,t}$ is an indicator variable for managed care status; $X_{i,c,t}$ is a vector of average demographic characteristics including age, the proportion female, Black, Hispanic, other and missing race, dually-eligible for Medicaid, qualifying for Medicare prior to age 65 due to disability, and with end-stage renal disease; C is a vector of county fixed effects and Y is a vector of year fixed effects. County by year fixed effects capture any county-year specific shocks affecting both MMC and FFS account for health systems characteristics affecting care of both groups. County-insurance status-year level cells are weighted by enrollment.

Marker hospitalizations occur independently of outpatient health care utilization, particularly in the short-term. Thus, these types of hospitalizations can be used to isolate the true effect of managed care on hospitalization outcomes from the selection effect. The following assumptions allow me to calculate a correction factor, Δ_z that purges the unobserved health status

[11] New Jersey is added to the sample in 2003. This change in composition explains the slight increase in FFS hospitalizations.

bias from estimates of the effect of managed care on rates of potentially preventable and elective hospitalizations.

A1: There should be no difference in rates of marker hospitalizations between managed care and FFS enrollees after controlling for observable and unobservable characteristics.

A2: Unobserved health status represents a constant percentage of the standard deviation in rates across ACS, referral-sensitive and marker hospitalizations.

A3: Unobserved health status only biases the MMC term in Equation **(1).**

Assumption A1 may be incorrect if MMC enrollees are more likely to have preventative services that reduce their risk for marker hospitalizations such as hip fractures. However, risk factors for these conditions reflect lifetime health behaviors such as smoking and body mass index rather than recent medical care. Earlier studies have found that rates of marker hospitalizations are stable across socioeconomic differences at the zip code level and across national variation in practice patterns (Weineck and Billings, 2003; Dartmouth Atlas Project, 2006).

Assumptions A2 and A3 are identifying assumptions about the unobserved health status term. Although these cannot be directly tested, several methodological approaches will be employed to test the robustness of these results to alternative identifying assumptions.

Based on Assumption A3, the correction factor is derived from the univariate omitted variables bias framework given in Greene (2003) where z denotes unobserved underlying health status:

$$E[\hat{\beta}_{MMC}] = \beta_{MMC} + \beta_z(MMC'MMC)^{-1}MMC'Z \qquad \textbf{(2)}$$

From assumption A1 and A3, I conservatively estimate β_{MMC} as a value that is indistinguishable from 0 but consistent in sign with the initial point estimate, -1.94(se$\hat{\beta}_{MMC}$mark), which provides an estimate of $\beta_z(X'X)^{-1}X'Z$. Under assumption A2, I express this as a percentage of the standard deviation of marker hospitalizations. This is analogous to an effect size calculation

$$\Delta_z = \%_{\text{uncorrected}} = (\hat{\beta}_{MMC}\text{mark} - B_{MMC})/\ \sigma_{\text{mark}} \qquad \textbf{(3)}$$

This correction factor Δ_z based on the marker hospitalizations is applied to estimated coefficients for the other types of hospitalization rates. Initial models are estimated with robust standard errors clustered at the county level to correct for arbitrary heteroskedasticity and intra-county correlations. Corrected coefficients and standard errors are calculated using Stata's lincom command to adjust $\beta_{MMC} = \hat{\beta}_{MMC} - (\Delta_z * \sigma_H)$.

Robustness

Instrumental variables estimates of Equation **(1)** provide a robustness check of the marker corrections. I use the county-level payment rate to instrument for managed care status. The exclusion restriction requires that the payment rate is uncorrelated with the error term in Equation **(1)**, that there is no effect of the payment rate on quality of care except through its effect on enrollment. A large literature has shown that areas with higher spending do not have better health outcomes.[12] Rates of Medicare spending are not associated with higher levels of effective services or perceptions of quality of care received (Wennberg et al., 2002a, b). MMC plan payments cover not only the cost of providing health care to enrollees, but profits, advertising and administrative costs (MedPAC, 2001). The payment rate varies annually at the county level, although there is insufficient variation to also include county fixed effects or county-level characteristics and identify MMC enrollment. Thus, the system of equations includes only state and year fixed effects.

Spillovers and Total Effects

Managed care enrollment may have spillover effects that also influence outcomes for Fee-for-Service enrollees. Thus, comparing managed care and FFS enrollees may overstate or understate the total effects of managed care on quality depending on the spillover direction. Earlier papers have found some beneficial spillovers from managed care to FFS (Bundorf et al., 2004; Baker, 1997, 1999). Policymakers evaluating the Medicare Advantage program should consider the total effect of the managed care program on quality outcomes for all Medicare beneficiaries. The final specification examines county level rates of hospitalization, which are weighted averages of MMC and FFS outcomes

$$H_{c,t} = \gamma H_{mmc,t} + (1-\gamma) H_{ffs,t} \qquad \textbf{(4)}$$

where γ is the rate of MMC penetration and H is the rate of hospitalization for each group. Variation over time and across counties identifies the effect of MMC penetration, which will

$$H_{c,t} = \beta_0 + \beta_1 \gamma_{c,t} + \beta_2 X_{c,t} + \beta_3 C + \beta_4 Y + \varepsilon_{i,c,t} \qquad \textbf{(5)}$$

[12] The Dartmouth Atlas project in particular has documented regional variations in spending and practice patterns which do not improve patient outcomes.

$H_{c,t}$ should be lower in counties with higher MMC penetration if there is a direct effect of MMC on quality, regardless of whether this effect spills over to also improve quality of care for FFS enrollees. If the differences are entirely driven by selection, MMC penetration will have no overall effect on county-level hospitalization rates. Since managed care enrollees are a minority of enrollees (28 percent), the total MMC effect will be small absent spillovers to FFS.

RESULTS

Differences between Managed Care and Fee-for-Service

Unadjusted fixed effects models indicate that managed care enrollment reduces rates of acute and chronic ACS admissions as well as elective and marker rates. Though we expect no difference in the marker equation, managed care reduces rates of hospitalization by 8.5 admissions per 1,000 enrollees, 5.4 more than we should see under assumption A1. I calculate $\Delta_z = 5.4/5.5 = 0.971$. Table 3 presents unadjusted estimates of Equation **(1)** and marker-corrected coefficients. After adjusting for unobserved selection, I find that managed care causes a reduction of 5 potentially preventable acute hospitalizations per 1,000 enrollees but does not affect ACS admissions related to chronic conditions or elective procedures. Table 4 examines individual conditions, showing that the protective effects of managed care are concentrated in reductions in hospitalizations from pneumonia and urinary tract/kidney infections. Both of these conditions can typically be successfully treated with antibiotics in the outpatient setting. MMC plans may improve access to treatment by reducing the cost of care or antibiotics for enrollees relative to Fee-for-Service Medicare.

Although the managed care coefficient is consistent with a small reduction in preventable admissions for chronic conditions, MMC causes an increase in hospitalization rates for uncontrolled diabetes and hypertension. Rates for other complications of chronic conditions do not differ for managed care and FFS enrollees. Managed care plans appear to do little chronic care management, or derive no discernable quality benefit from these activities, despite claims from the policy community that this may be an area for significant cost savings.[13] Recall that during the study period, risk adjustment is limited and beneficiaries can enroll monthly, features which remove most of the incentive for plans to specialize in chronic condition management. Plans instead face incentives to attract healthier patients and may provide lower quality care for beneficiaries with costly chronic conditions to discourage them from remaining in the plan.

[13] As we do not observe process of care, it is unknown whether plans actually engage in care management.

In the unadjusted model, managed care enrollees on average receive 39 fewer elective hospitalizations than those in FFS, which would be consistent with managed care restricting access and potentially improving efficiency. However, this difference is completely eliminated by the marker correction, suggesting that managed care plans may rely more on positive selection than care management to control rates of elective procedures.

Instrumental variables estimates use the variation in legislated county payment rates to MMC plans as a natural experiment to identify managed care status. Variation in rates makes MMC enrollment more attractive to beneficiaries in some counties and years than others. The likelihood of enrollment increases by 1.5% for every additional hundred dollars per enrollee per year in MMC plan payment rates. This effect is statistically significant, and diagnostic tests support use of the payment rate as an instrument. The partial R^2 of the instrument is 0.08 with a corresponding F-statistic of 12.7.[14,15] IV estimates are consistent with the marker-corrected results, again indicating that managed care causes a modest reduction in acute ACS admissions (10.5 hospitalizations per 1,000 enrollees) but does not affect rates of chronic ACS or elective admissions. However, the IV estimate for marker hospitalizations, a reduction of 5.4 per 1,000 remains statistically significant, raising some questions about proper interpretation of the IV. We expect an insignificant result close to 0 in magnitude if this strategy is fully purging the selection bias into managed care. The marker result suggests that the IV estimates, a local average treatment effect for those induced to join managed care by county payment rates, reflect a group that is healthier than those who cannot be induced to join.

IV estimates for individual conditions are somewhat noisier, but also broadly consistent with the marker estimates. There is a protective effect of MMC in reducing potentially preventable admissions for pneumonia and urinary tract infections. Unlike the marker corrected admissions, the IV results also indicate a small (0.6 per 1,000) reduction in diabetic amputations and larger (12 per 1,000) reduction in hip replacements for MMC enrollees.

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[14] The hetroskedasticity-robust Kleibergen-Paap (2006) rk statistic tests whether the equation is underidentified, i.e. that the payment rate does not independently identify MMC enrollment. This is a Lagrange multiplier test; I reject the null hypothesis of underidentification with $\chi^2 = 8.6$, $p < 0.01$.

[15] The Kleibergen-Paap Wald rk Fstatistic provides a heteroskedasticity-robust test for weak instruments; the F=10.4 exceeds minimum values recommended by Stock and Yogo (2005) to reject the null of weak instruments with a 15% maximal IV bias. This equation is just-identified, however others have entered the Part A and Part B components of the rate separately in order to test overidentifying restrictions, though these two components do not separately effect enrollment.

Total Effects of Managed Care

I find no global evidence of MMC penetration on county-level rates of hospitalization in the four study states. Table 5 presents regression results. Point estimates suggest that a 10 percentage point increase in managed care penetration would decrease rates of preventable hospitalizations for acute conditions by 12 per 1,000 Medicare beneficiaries and reduce elective procedures by 39 per 1,000 beneficiaries, but these results are very imprecisely estimated and not significantly different from zero. The null finding is robust to numerous alternative specifications including categorical measures of penetration, inclusion of market competition measures, and restricting the sample to counties with at least 10 percent MMC penetration. These findings are consistent with several theoretical and empirical findings including positive selection into MMC and Cutler et al.'s result that HMOs pay lower prices than other payers but do not provide different services (2000).

In the first part of this analysis, I showed that positive selection explains a large portion of the differences in rates of hospitalization rates between Medicare managed care and Fee-for-Service enrollees. The exception is hospitalizations for acute conditions, where managed care prevents between 5 and 10 hospitalizations per 1,000 enrollees. In the county-level regressions, where managed care penetration averages 28 percent, the overall effect is likely to be quite small if there are no spillovers from managed care penetration. The mechanism underlying the reduction in acute ACS admissions appears to be improving access to emergency outpatient care and or vaccination and antibiotics. It is most plausible that this reflects MMC plans reducing the cost to individual beneficiaries of seeking this care rather than that plans are altering provider behavior in ways that would improve outcomes for all beneficiaries. There does not appear to be a difference in treatment for conditions requiring ongoing monitoring.

CONCLUSION

Three methods are used to examine the effects of Medicare managed care on quality of care for Medicare beneficiaries in Arizona, Florida, New Jersey and New York between 1999 and 2004. I find little evidence that MMC affects quality of care or access to elective procedures for beneficiaries. However, managed care does cause a modest reduction in rates of avoidable hospitalization for acute illness; potentially by improving access to vaccines or antibiotics. Observed differences in hospitalization rates appear to be largely caused by positive selection

into managed care, underscoring the need to correct for positive selection into managed care when comparing the two programs. Conditional on being hospitalized, MMC enrollees have fewer chronic conditions and comorbidities than FFS enrollees.

I do not find evidence of the quality problems in MMC reported in the early 1990s. Rates of potentially preventable hospitalizations are consistently lower for MMC enrollees, though I find no evidence of improvement over time in either FFS or MMC between 1999 and 2004. One-quarter of the hospitalizations in my sample are classified as potentially preventable, suggesting a need for further quality improvement. It would be difficult to completely eliminate these admissions in an elderly population with multiple comorbidities, although reducing rates of this type of admission is one way to reduce Medicare spending while improving beneficiary quality of life. Congress has recently passed legislation allowing the Medicare program to expand benefits for preventative services. Under this authority, the program should consider following managed care's lead to improve access to antibiotics or aggressively promote preventative services such as flu shots to reduce acute potentially preventable admissions. Urinary tract infections detected early on can be treated with a course of antibiotics priced between $35 and $70, orders of magnitude less than the $17,741 in hospital charges averaged by UTI admissions in the sample.

This study is limited by data availability. MMC hospitalizations are only identifiable in four states, none of which report the highest levels of enrollee satisfaction with MMC in national surveys. Although quality across plans and across states is likely to be heterogeneous, available data only facilitates analysis of the average MMC treatment effect. Results suggest that on average beneficiaries will have similar quality and access to care in either FFS or MMC, but findings may not generalize to the specific plan or county-level choices faced by individual beneficiaries. Reliance on administrative inpatient data limits my focus to a few dimensions of quality.

My findings are not surprising given several characteristics of the MMC market which discourage perfect competition, particularly the inadequate payment risk adjusters and absence of a lock-in period that ties a beneficiary to an insurer for more than a month at a time.[16] These provide incentive for plans to engage in cream-skimming. I show that managed care plans

[16] There are many arguments against a lock-in period, mostly raising the concern that being stuck in a low-quality plan can have adverse health effects for beneficiaries.

respond to these incentives by engaging in positive selection and providing little additional care management for chronic conditions or to limit access to elective procedures relative to what Fee-for-Service. There is a protective effect of MMC enrollment in reducing ACS admissions related to acute illnesses consistent with incentives; MMC plans are likely to realize short-term gains from these investments in outpatient care. Beneficiaries, providers and managed care plans all appear to respond to the incentives created by the MMC program, which is encouraging given policymakers' interest in using pay-for-performance and other incentive programs to improve quality of care. Findings underscore the need to match incentives to the desired set of outcomes.

Medicare managed care was originally designed to save money, though payments to plans currently exceed fee-for-service spending. On average, MMC plans were paid $300 per beneficiary per year more than average FFS spending in each enrollee's county.[17] I am unable to directly test whether these additional payments were used to reduce out of pocket spending for plan enrollees rather than impact quality or access, or increase profits. However, other papers find that MMC enrollees saw large increases in out-of-pocket spending during the study period. Median out-of-pocket healthcare spending for MMC enrollees increased from 8 percent of total income to 14 percent of income between 1997 and 2003, a larger increase than for seniors with other forms of coverage (Neuman et al., 2007).

As Medicare costs rapidly increase and policymakers look for ways to reduce spending and improve benefits, they may be well-served to consider reforming MMC payment policy. The MMC program provides a transfer to healthier enrollees (and private plans), arguably a group less in need of policy intervention. Most government intervention to correct failures in the healthcare market seeks to improve access and affordability for those in poor health, i.e. through medically needy programs, mandated benefits and state-sponsored high risk pools. To the extent that MMC plans provide additional benefits and reduce out-of-pocket spending, these gains are concentrated amongst a group that experiences fewer chronic conditions, comorbidities and hospitalizations than demographically similar FFS enrollees. Further research should consider whether it would be more cost-effective to target these benefits to other users.

Results indicate that higher payment rates do lead more Medicare beneficiaries to join MMC and that MMC can reduce rates of ACS admissions for acute illness. If sicker patients

[17] Calculations based on county payment rates and average FFS spending at the county level based on enrollees with average risk scores.

could be enticed to enroll in MMC, we might expect further declines in acute ACS admissions rates amongst Medicare beneficiaries. However, this would be an expensive way to improve quality outcomes. By directly regressing ACS admissions rates on payment rates and control variables, I calculate that payment rates would have to be increased by $294 per enrollee per year to reduce ACS admissions rates by 1 hospitalization per 1,000 enrollees, or $294,000 per avoided hospitalization. By encouraging enrollment in the current MMC program, policymakers and practitioners motivate a group with fewer chronic conditions and hospitalizations on average to join a program that does not cause major improvements in quality.

REFERENCES

Atherly, A., B.E. Dowd, and R. Feldman (2003). "The effect of benefits, premiums, and health risk on health plan choice in the Medicare program," *Health Care Financing Review*, 39, 4, 847-864.

Baker, L. C. (1997). "The effect of HMOs on fee-for-service health care expenditures: Evidence from Medicare," *Journal of Health Economics*, 16, 453-481.

Baker, L. C. (1999). "Association of managed care market share and health expenditures for Fee-for-Service Medicare patients." *JAMA* 281,5: 432-437.

Balsa, A. I., Z. Cao, et al. (2007). "Does managed health care reduce health care disparities between minorities and Whites?" *Journal of Health Economics* 26,1: 101-121.

Berenson, R. A. (2004). "Medicare disadvantaged and the search for the elusive 'level playing field'," *Health Affairs*, W4-572 – W4-585.

Biles, B., G. Dallek, and L. Nicholas (2004a). "Medicare Advantage: déjà vu all over again? *Health Affairs*, W4-586 – W4-597.

Biles, B., L. H. Nicholas, and B. Cooper. (2004b). "The cost of privatization: extra payments to Medicare Advantage plans: 2005 Update." New York: The Commonwealth Fund.

Biles, B., L.H. Nicholas, and S. Guterman. (2006). Medicare beneficiary out-of-pocket costs: are Medicare Advantage plans a better deal? New York: The Commonwealth Fund.

Billings J.(2003). "Using administrative data to monitor access, identify disparities, and assess performance of the safety net," in Tools for Monitoring the Health Care Safety Net. Rockville, MD: Agency for Health care Research and Quality.

Billings J., G. Anderson, and L.Newman (1996). "Recent findings on preventable hospitalizations," *Health Affairs*, 15, 3, 239-49.

Billings J., L. Zeitel, J. Lukomnik (1993). "Impact of socioeconomic status on hospital use in New York City," *Health Affairs*, 12,1, 162-73.

Bundorf, M. K., K. A. Schulman, J. A. Stafford, D. Gaskin, J. G. Jollis, and J. J. Escare (2004). "Impact of Medicare managed care on the treatment, costs, and outcomes of Fee-for- Service Medicare patients with acute myocardial infarction," *Health Services Research*, 39, 1, 131-152.

Carino, T. (2006). "The potential impact of the new prescription drug benefit on Medicare beneficiaries," Presentation at the AcademyHealth Annual Research Meeting 27 June 2006.

Cawley, J., M. Chernew, and C. McLaughlin (2005). "HMO participation in Medicare + Choice," *Journal of Economics and Management Strategy,* 14, 3, 543-574.

Center for the Evaluative Clinical Sciences (2005). *Effective care.* Dartmouth Atlas Project Topic Brief. Hanover: Dartmouth Atlas Project.

Centers for Medicare and Medicaid Services Office of Public Affairs (1999). Fact Sheet: Managed care and Medicare, Accessed 5 May 2006.

Centers for Medicare and Medicaid Services Office of Public Affairs (2005). Media Release: Medicare beneficiaries to have more health plan choices and greater savings with Medicare Advantage Plans than ever before. Available at http://www.cms.hhs.gov/apps/media/press/release.asp?Counter=1497.

Centers for Medicare and Medicaid Services Office of Public Affairs (2005b). Fact sheet: Health status of beneficiaries enrolled in Medicare Advantage plans appears more similar to beneficiaries in Fee-for-Service. Available at http://www.cms.hhs.gov/apps/media/press/factsheet.asp?Counter=1544&intNumPerPage=10&checkDate=&checkKey=2&srchType=&numDays=0&srchOpt=0&srchData=medicare%20advantage&keywordType=All&chkNewsType=6&intPage=&showAll=1&pYear=&year=0&desc=&cboOrder=date. Accessed 3 April 2, 2007.

Congressional Budget Office (2005). High-cost Medicare beneficiaries. Washington, DC: CBO.

Cutler, D. M., M. McClellan and J. P. Newhouse (2000). "How does managed care do it?" *RAND Journal of Economics,* 31, 3, 526-548.

Dartmouth Atlas Project (2006). "The care of patients with severe chronic illness: An online report on the Medicare program," Available athttp://www.dartmouthatlas.org/atlases/2006_Chronic_Care_Atlas.pdf.

Draper, D., R. E. Hurley, C.S. Lesser, and B.C. Strunk. (2002). "The changing face of managed care," *Health Affairs*, 21, 1, 11-23.

Draper, D., M. Gold and J. McCoy. (2003). *The role of national firms in Medicare+Choice.* Washington, DC: The Henry J. Kaiser Foundation.

Experton, B., R. Ozminkowski, D.N. Pearlman, Z. Li and S. Thompson (1999). "How does managed care manage the frail elderly? The case of hospital readmissions in fee-for- service versus HMO systems," *American Journal of Preventive Medicine*, 16, 3, 163-172.

Fisher, E., S., D. Wennberg, E. Stukel, T. A. Gottlieb, D. J. Lucas, F L. Pinder, and L. Etoile (2003a). "Implications of regional variations in Medicare spending. Part 1: The content, quality, and accessibility of care," *Annals of Internal Medicine*, 138, 4, 273-287.

Fisher, E., S., D. Wennberg, E. Stukel, T. A. Gottlieb, D. J. Lucas, F L. Pinder, and L. Etoile (2003b). "The implications of regional variations in Medicare spending. Part 2: Health outcomes and satisfaction with care," *Annals of Internal Medicine*, 138, 4, 288-298.

Glied, S. (2000). "Managed care," Handbook of Health Economics, Amsterdam: Elesvier.
Gold, M., L. Achman, J. Mittler and B. Stevens (2004). "Monitoring Medicare + Choice: What have we learned? Findings and operational insights for Medicare Advantage." Washington, DC: Mathematica Policy Research.

Greene, W. H. (1997). Econometric Analysis. New York: Prentice Hall.

Greenwald, L.M. (2000). "Medicare risk-adjusted capitation payments: From research to implementation," *Health Care Financing Review*, 21, 3, 1-5.

Guadagnoli, E., M.B. Landrum, E. A. Peterson, M. T. Gahart, T. J. Ryan, and B. J. McNeil (2000). "Appropriateness of coronary angiography after myocardial infarction among Medicare beneficiaries — managed care versus fee for service," *New England Journal of Medicine*, 343, 30, 1460-1466.

Institute of Medicine (2001). *Crossing the Quality Chasm.* Washington, DC: IOM.

Kaiser Family Foundation (2005). Medicare spending and financing fact sheet -- April 2005. Washington, DC: KFF.

Kruzikas D.T., Jiang H.J., Remus D. (2000). *Preventable hospitalizations: Window into primary and preventive care*. HCUP Fact Book No. 5. Rockville, MD: Agency for Health care Research and Quality.

Landon, B.E., I.B. Wilson, and P. Cleary. (1998). "A conceptual model of the effects of health care organizations on the quality of medical care," *Journal of the American Medical Association,* 279, 17, 1377-1382.

Landon, B.E., A. M. Zaslavsky, S. L. Bernard, M. J. Cioffi, and P. D. Cleary (2004). "Comparison of performance of traditional Medicare versus Medicare managed care," *Journal of the American Medical Association,* 291, 14, 1744-1752.

McGuire, T. G. and M. V. Pauly. (1991). "Physician response to fee schedules with multiple payers," *Journal of Health Economics,* 10, 4, 385 – 410.

Medicare Payment Advisory Commission (1999). Report to the Congress: Medicare payment policy (March 1999). Washington, DC: MedPAC.

Medicare Payment Advisory Commission (2001). Report to the Congress: Medicare payment policy (March 2001). Washington, DC: MedPAC.

Medicare Payment Advisory Commission (2002). Report to the Congress: Medicare payment policy (March 2002). Washington, DC: MedPAC.

Medicare Payment Advisory Commission (2004). Report to the Congress: Medicare payment policy (March 2004). Washington, DC: MedPAC.

Medicare Payment Advisory Commission (2006). A Data Book: Health care spending and the edicare Program (June 2006). Washington, DC: MedPAC.

Mello, M.M., S. C. Stearns, E. C. Norton and T. C. Ricketts (2003). "Understanding biased selection in Medicare HMOs," *Health Services Research,* 38, 3, 961-992.

Miller, R. H. and H. S. Luft (2002). "HMO plan performance update: An analysis of the literature" *Health Affairs*, 21, 4, 63-86.

Miller, R. H. and H. S. Luft (1997). "Does managed care lead to better or worse quality of care?" *Health Affairs*, 16, 5, 7-25.

Morales L.S., J. Rogowski, V.A. Freedman, S.L. Wickstrom, J.L. Adams ,J.J. Escarce (2004). "Use of preventive services by men enrolled in Medicare+Choice plans", *American Journal of Public Health*, 94, 5, 796-802.

Neuman, P., J. Cubanski, K. A. Desmond and T. H. Rice. (2007). "How much 'skin in the game' do Medicare beneficiaries have? The increasing financial burden of health care spending, 1997–2003," *Health Affairs*, 26, 6, 1692-1701.

Nicholas, L. H. (2008). "Who joins Medicare managed care? Positive selection and the effect of payment policy on enrollment." Columbia University, mimeo.

Office of the Actuary (2006). The 2006 OASDI Trustees Report. Washington, DC: OACT.

Retchin, S.M., R.S. Brown, C. Yeh, D. Chu and L. Moreno. (1997). "Outcomes of stroke patients in Medicare fee for service and managed care," *Journal of the American Medical Association,* 278, 2, 119-124.

Riley, G.F., A.L. Potosky, C.N. Klabunde, J.L. Warren, R. Ballard-Barbash (1999). "Stage at diagnosis and treatment patterns among older women with breast cancer: An HMO and Fee-for-Service comparison," *Journal of the American Medical Association*, 281, 8, 720-726.

Scanlon, D.S., M. Chernew, S. Swaminathan, W. Lee. (2006). "Competition in health insurance markets: Limitations of current measures for policy analysis . *Medical Care Research and Review*, Volume 63, Supplement 6, 37S-55S

Schneider, E.C. A. M. Zaslavsky, and A. M. Epstein (2005). "Quality of care in for-profit and not-for-profit health plans enrolling Medicare beneficiaries," *American Journal of Medicine*, 118, 12, 1392–1400.

Stock, J. H. and M. Yogo. (2005). "Testing for weak instruments in linear IV regression," in D.W.K. Andrews and J.H. Stock, eds. *Identification and Inference for Econometric Models,* New York: Cambridge University Press.

UCSF-Stanford Evidence-based Practice Center. Refinement of the HCUP quality indicators. Rockville, MD: Agency for Health care Research and Quality; 2001.

United States Administration on Aging. (2004). Statistics: Aging into the 21st century.

Weineck, R.A. and J. Billings, eds. (2003). *Tools for monitoring the health care safety net*. AHRQ Publication No. 03-0027, Rockville, MD: AHRQ.

Wennberg, J. E., E. S. Fisher, et al. (2002). "Geography and the debate over Medicare reform." *Health Affairs* Web Exclusive: hlthaff.w2.96.

Wennberg, J. E., A. M. O'Connor, E. D. Collins and J. N. Weinstein (2007). "Extending the P4P agenda Part 1: How Medicare can improve patient decision making and reduce unnecessary care," *Health Affairs,* 26, 6, 1564 – 1574.

White House: President George W. Bush (2003). *Fact Sheet: Framework to modernize and improve Medicare,* Washington: DC. Available at http://www.whitehouse.gov/news/releases/2003/03/print/20030304-1.html. Accessed 20 November 2007.

Zaslavsky, A.M., L.B. Zaborski and P.D. Cleary (2004). "Plan, geographical, and temporal variation of consumer assessments of ambulatory health care," *Health Services Research,* 39, 5, 1467-1486.

Zhan, C., M.R. Miller, H. Wong and G.S. Meyer (2004). "The effects of HMO penetration on preventable hospitalizations," *Health Services Research,* 39, 2, 345-361.

Figure 1: Types of Hospitalizations used as Quality Indicators

Ambulatory Care Sensitive	Referral-Sensitive	Marker
Chronic Conditions		
Angina	Angioplasty	Acute Mycardial Infarction
Asthma	Breast Reconstruction	Appendicitis
Chronic Obstructive Pulmonary Disease	Heart Bypass	Gastrointestinal Obstruction
Congestive Heart Failure	Hip Replacement	Hip Fracture
Diabetes: Short-Term Complication	Pacemaker Insertion	
Diabetes: Long-Term Complication	Transplant	
Diabetes: Uncontrolled		
Diabetes: Extremity Amputation		
Hypertension		
Acute Conditions/Illnesses		
Bacterial Pneumonia		
Bronchitis		
Dehydration		
Urinary Tract Infection		
Ruptured Appendix		

Figure 2: Rates of Hospitalization for Managed Care and Fee-for-Service Medicare Beneficiaries, 1999-2004

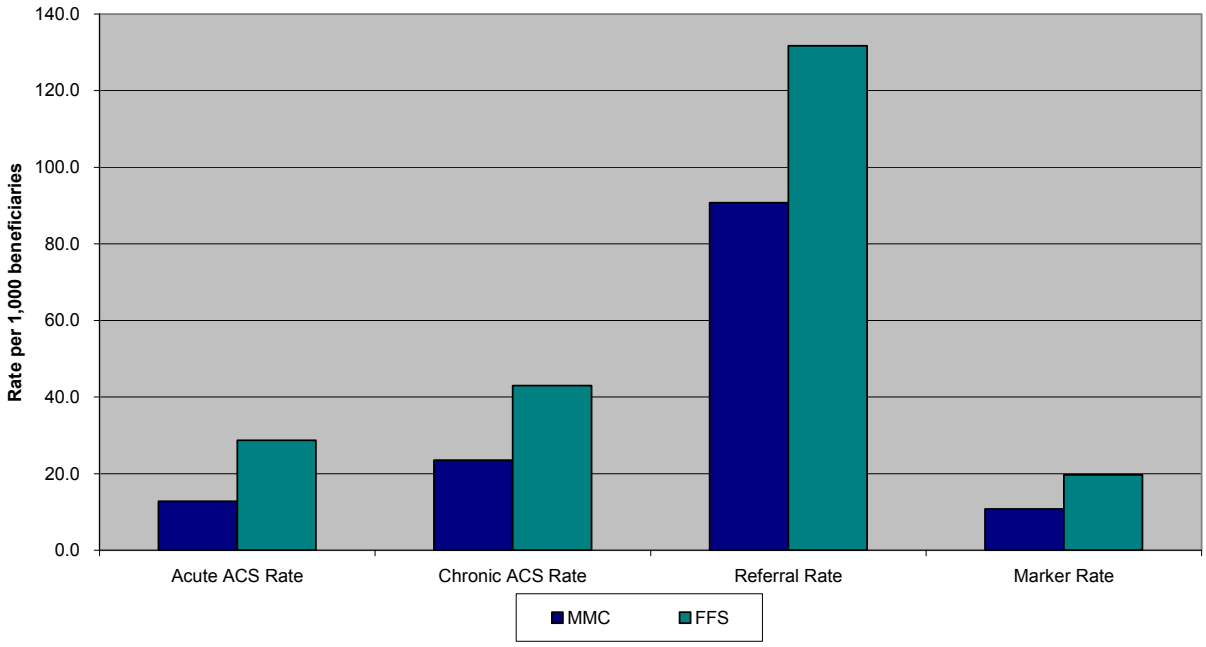
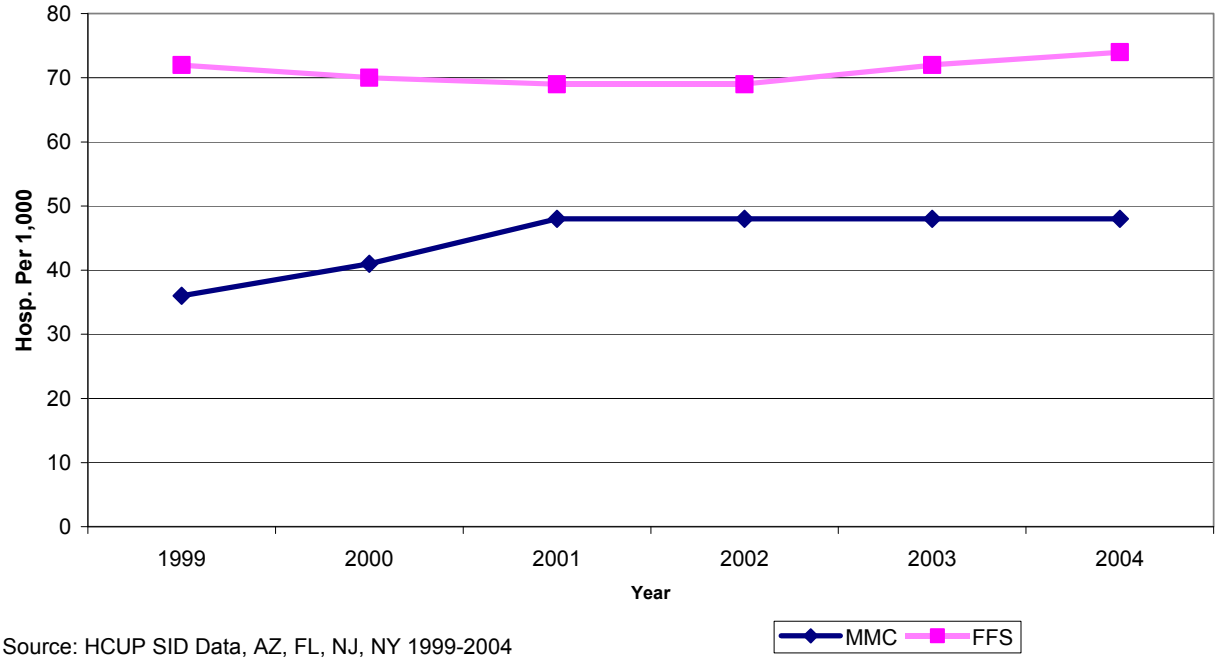


Figure 3: Trends in Rates of Ambulatory Care Sensitive Admissions: FFS and MMC, 1999 - 2004



Source: HCUP SID Data, AZ, FL, NJ, NY 1999-2004

Table 1: Descriptive Statistics, County and County-Insurance Status Level Cells
AZ, FL, NJ, NY, 1999 - 2004

Variable	MMC	FFS	Pooled
MMC Enrollment	1	0	0.28
	0	0	(0.45)
Age	74.63	75.71	75.4
	(0.74)	(0.69)	(0.9)
Female	0.57	0.59	0.59
	(0.03)	(0.03)	(0.03)
White	0.83	0.86	0.85
	(0.15)	(0.13)	(0.13)
Black	0.10	0.077	0.083
	(0.09)	(0.07)	(0.08)
Hispanic	0.05	0.03	0.04
	(0.07)	(0.06)	(0.06)
Other Race	0.02	0.03	0.03
	(0.03)	(0.03)	(0.03)
Missing Race	0.002	0.003	0.003
	(0.002)	(0.003)	(0.003)
Acute ACS Rate	12.8	28.7	24.3
	(4.4)	(6.4)	(9.2)
Chronic ACS Rate	23.5	43.0	37.6
	(9.4)	(10.8)	(13.6)
Referral Rate	90.7	131.7	120.6
	(40.6)	(39.6)	(43.7)
Marker Rate	10.8	19.7	17.2
	(4.1)	(3.7)	(5.5)
Enrollees	7,701,902	31,959,075	39,660,977
Observations	415	415	830

Table 1b: Descriptive Statistics by Type of Hospitalization

	Acute ACS	Chronic ACS	Referral-Sen	Marker	Medicare Pop.
% of Admits	8	12	44	5	100
MMC	0.15	0.17	0.15	0.15	0.28
Black	0.09	0.12	0.07	0.05	0.08
Hispanic	0.09	0.11	0.09	0.07	0.04
Other Race	0.03	0.03	0.01	0.001	0.003
Missing Race	0.02	0.02	0.02	0.03	0.003
N (in 1,000s)	655	1,015	4,735	482	27,010

Notes: These tables present summary statistics from the State Inpatient Databases from Arizona, Florida, New Jersey and New York and the Medicare Limited Dataset Enrollment Files from 1999 - 2004. 165 counties are included in this study. Counties are observed for 1-6 years. Nearly half of those had sufficient MMC enrollment to be used in the county-insurance status models. Number of enrollees and hospitalizations are cumulative over the 6 year period. Standard deviations in parentheses.

Table 2: Rates of Hospitalization, AZ, FL, NJ, NY, 1999 - 2004

Preventable Hospitalizations	**MMC**	**FFS**	**Pooled**
Acute Conditions/Illnesses			
Bacterial Pneumonia	7.1	16.0	13.5
	(2.50)	(3.85)	(5.31)
Bronchitis	0.02	0.04	0.03
	(0.03)	(0.05)	(0.05)
Dehydration	2.3	5.6	4.7
	(1.0)	(1.6)	(2.0)
Ruptured Appendix	0.33	0.53	0.47
	(0.17)	(0.15)	(0.18)
Urinary Tract Infection	3.0	6.5	5.5
	(1.3)	(2.0)	(2.4)
Chronic Conditions			
Angina	0.9	1.6	1.4
	(0.7)	(1.0)	(0.97)
Asthma	1.2	2.3	2.0
	(0.74)	(1.3)	(1.3)
Chronic Obstructive Pulmonary Dis.	5.6	10.1	8.9
	(2.4)	(3.5)	(3.8)
Congestive Heart Failure	12.1	22.9	19.9
	(4.90)	(5.33)	(7.09)
Diabetes: Short-Term Complication	0.27	0.46	0.41
	(0.17)	(0.23)	(0.23)
Diabetes: Long-Term Complication	2.0	3.7	3.2
	(1.1)	(1.5)	(1.6)
Diabetes: Uncontrolled	0.31	0.62	0.53
	(0.25)	(0.46)	(0.44)
Diabetes: Lower Extremity Amputation	0.70	1.27	1.11
	(0.36)	(0.47)	(0.51)
Hypertension	0.63	0.71	0.68
	(0.64)	(0.80)	(0.76)
Referral-Sensitive			
Angioplasty	5.9	8.8	8.0
	(2.8)	(3.7)	(3.7)
Breast Reconstruction	0.005	0.01	0.01
	(0.01)	(0.01)	(0.01)
Heart Bypass	3.07	3.91	3.68
	(1.46)	(1.43)	(1.49)
Hip Replacement	6.2	11.4	10.0
	(2.9)	(3.9)	(4.3)
Pacemaker Insertion	78.2	138.5	121.8
	(36.2)	(44.9)	(50.5)
Transplant	0.35	0.46	0.43
	(1.03)	(1.19)	(1.15)
Marker			
Acute Mycardial Infarction	4.5	7.5	6.7
	(1.9)	(2.1)	(2.4)
Appendicitis	0.12	0.18	0.16
	(0.08)	(0.08)	(0.09)
Gastrointestinal Obstruction	2.3	4.4	3.8
	(0.9)	(0.9)	(1.3)
Hip Fracture	3.9	7.6	6.6
	(1.7)	(1.7)	(2.4)

Notes: Rates of hospitalization per 1,000 enrollees. Standard deviations in parentheses. See Table 1 notes for descriptions of included counties.

Table 3: The Effect of Medicare Managed Care Enrollment on Hospitalization Rates, AZ, FL, NJ, NY, 1999 - 2004

	Acute Ambulatory Care Sensitive			Chronic Ambulatory Care Sensitive			Referral-Sensitive			Marker	
	FE	Marker FE	IV	FE	Marker FE	IV	FE	Marker FE	IV	FE	IV
MMC	-14.0**	-4.99**	-10.5*	-16.1**	-2.87	3.04	-39.4**	3.03	-9.38	-8.5**	-5.4*
	(2.0)	(2.0)	(4.1)	(3.5)	(3.5)	(7.2)	(12.7)	(12.6)	(22.1)	(1.6)	(2.7)
Average Age	1.9		1.4	3.9*		6.3**	12.9*		13.9*	2.5**	2.5**
	(1.1)		(1.0)	(1.6)		(2.0)	(5.8)		(5.6)	(0.7)	(0.7)
% Female	0.5		33.2	28.2		(43.3)	213.4		50.2	6.9	14.7
	(27.5)		(34.5)	(48.2)		(64.8)	(185.5)		(173.8)	(17.4)	(14.7)
% Black	51.0		(9.3)	121.9**		(11.7)	344.7*		-106.8*	46.85*	(8.8)
	(33.2)		(9.4)	(45.8)		(15.2)	(162.0)		(47.8)	(22.4)	(4.9)
% Hispanic	33.4		5.9	60.7		-47.85	-59.0		77.21	-12.3	7.9
	(55.0)		(24.8)	(93.6)		(42.7)	(350.4)		(125.5)	(29.2)	(10.8)
% Other Race	75.31		-10.98	44.50		-101.2**	-11.93		-112.2	27.22	-28.9
	(85.7)		(21.1)	(84.4)		(34.1)	(288.5)		(151.3)	(33.7)	(15.6)
%Missing Race	-242.4		-257.0	-262.8		-443.7	-2418.4		-1771.7	-271.4	-351.9**
	(329.2)		(227.4)	(418.8)		(398.0)	(2033.8)		(1348.5)	(159.1)	(126.3)
% Medicaid Dual	36.4		26.85	54.9		103.1*	72.5		25.04	12.4	2.55
	(19.0)		(24.0)	(33.4)		(40.5)	(149.3)		(126.0)	(12.2)	(9.6)
% ESRD	84.8		437.9*	250.1		1473.4**	1148.0		3036.5*	105.4	305.9*
	(171.7)		(216.5)	(344.6)		(441.6)	(1388.9)		(1245.9)	(117.1)	(146.6)
% Disabled Pre 65	106.0		98.74*	69.2		83.5	141.1		11.9	70.1	51.5
	(63.3)		(44.7)	(103.5)		(69.1)	(337.7)		(205.1)	(54.7)	(27.3)
First-Stage F Stat.			10.4			10.4					10.4

Notes: This table estimates fixed-effect and instrumental variables models regressing cell-level hospitalization rates on Medicare managed care status and control variables. 830 cells from 415 county-years defined at the county-insurance status-year level are weighted by enrollment. The first column shows county*year fixed models which do not correct for unobserved positive selection into MMC. The second column corrects these estimates using a correction factor derived from the marker hospitalization regression assuming that only the MMC coefficient changes relative to column 1. The final column presents instrumental variables estimates using county-level payment rates to instrument for managed care status. The latter specification includes only state and year fixed effects. Clustered standard errors in parentheses. State Inpatient Databases from Arizona, Florida, New Jersey and New York and the Medicare Limited Dataset Enrollment Files from 1999 - 2004. * Significant at 5%, ** Significant at 1%

Table 4: Marker-hospitalization Corrected County*Year Fixed Effects and Instrumental Variables Estimates
The Effect of Medicare Managed Care on Rates of Hospitalization; AZ, FL, NJ, NY 1999-2004

	Marker Corrected	IV
Acute ACS Admissions		
Bacterial Pneumonia	-2.4	-6.15*
	(1.20)	(2.60)
Bronchitis	0.04**	0.01
	(0.01)	(0.02)
Dehydration	-0.78	-1.76
	(0.41)	(1.0)
Urinary Tract/Kidney Infection	-3.0**	-2.44*
	(0.54)	(1.03)
Ruptured Appendix	-0.08*	-0.19
	(0.05)	(0.11)
Chronic ACS Admissions		
Angina	0.47	1.24
	(0.20)	(0.79)
Asthma	0.13	1.05
	(0.24)	(0.62)
Chronic Obstructive Pulmonary Dis.	0.66	-0.36
	(1.10)	(2.85)
Congestive Heart Failure	-2.6	-0.27
	(1.80)	(2.93)
Diabetes: Short-Term Complication	0.05	-0.15
	(0.4)	(0.1)
Diabetes: Long-Term Complication	0.1	1.3
	(0.30)	(0.96)
Diabetes: Uncontrolled	.34**	0.09
	(0.08)	(0.19)
Diabetes: Lower Extremity Amp.	0.01	-0.60*
	(0.12)	(0.26)
Hypertension	0.5**	0.26
	(0.12)	(0.28)
Referral-Sensitive Admissions		
Angioplasty	-0.23	0.4
	(1.10)	(3.09)
Breast Reconstruction	0.006*	-0.01
	(0.00)	(0.01)
Heart Bypass	0.31	0.13
	(0.44)	(0.93)
Hip Replacement	-1.8	-12.0**
	(1.20)	(2.85)
Pacemaker Insertion	-15.5	-25.4

Notes: Medicare managed care status coefficients from county*year fixed effects models adjusted using a correction factor derived from the marker hospitalization equation and instrumental variables models using the county-level payment rate to instrument for MMC enrollment. Clustered standard errors in parentheses. 830 county-insurance status-year cells. State Inpatient Databases from Arizona, Florida, New Jersey and New York and the Medicare Limited Dataset Enrollment Files from 1999 - 2004. * Significant at 5%, ** Significant at 1%.

Table 5: The Effect of Medicare Managed Care Penetration on County-level Hospitalization Rates
AZ, FL, NJ, NY, 1999 - 2004

	Acute ACS	Chronic ACS	Referral-Sensitive	Marker
MMC Penetration Rate	-1.2	-0.25	-3.8	-0.37
	(2.5)	(2.7)	(15.3)	(1.4)

Notes: This table estimates fixed-effect specifications regressing county-level hospitalization rates on Medicare managed care penetration rates and Medicare beneficiary demographic characteristics. 415 county-year cells are weighted by enrollment. Clustered standard errors in parentheses. State Inpatient Databases from Arizona, Florida, New Jersey and New York and the Medicare Limited Dataset Enrollment Files from 1999 - 2004. * Significant at 5%, ** Significant at 1%

Appendix Table 1: Regression Adjusted Differences Likelihood of Comorbidities by Insurance Status
Managed Care Enrollees relative to Fee-for-Service: AZ, FL, NJ, NY, 1999 - 2004

	ACS	Referral	Marker
Congestive Heart Failure	-0.02**	-0.01**	-0.01**
	(0.003)	(0.003)	(0.002)
Valvular Disease	-0.011*	-0.016**	-0.013**
	(0.005)	(0.005)	(0.003)
Peripheral Vascular Disease	-0.002	-0.0013*	-0.0004
	(0.0011)	(0.0005)	(0.0004)
Chronic Pulmonary Disease	-0.008**	-0.006**	-0.02**
	(0.002)	(0.002)	(0.007)
Diabetes w/o chronic complication	0.006*	0.012**	0.01**
	(0.003)	(0.003)	(0.004)
Diabetes w/ chronic complication	-0.01**	-0.007**	-0.006**
	(0.002)	(0.0015)	(0.001)
Hypothyroidism	-0.004**	-0.003	-0.001
	(0.001)	(0.001)	(0.001)
Obesity	0.0003	0.0004	0.0025*
	(0.001)	(0.001)	(0.001)
Metastatic Cancer	-0.0013*	-0.002**	-0.003**
	(0.0007)	(0.0007)	(0.001)
Solid tumor w/out metastasis	0.0006	0.0001	-0.0002
	(0.0006)	(0.0006)	(0.0007)
Fluid and Electrolyte Disorders	-0.022**	-0.02**	-0.021**
	(0.003)	(0.003)	(0.005)
Deficiency Anemias	-0.016**	-0.015**	-0.01**
	(0.003)	(0.003)	(0.003)
Hypertension	0.027**	0.0334**	0.035**
	(0.003)	(0.003)	(0.003)
Total Comorbid Conditions	-0.10**	-0.07**	-0.04*
	(0.014)	(0.01)	(0.02)

Notes: Table reports coefficients on the Medicare managed care status variable from linear probability models of likelihood of each condition as cause of admission or comorbid diagnosis. Comorbidities are oberved conditional on hospitalization only. All models include controls for age, female, black, Hispanic, other and missing race, county and year fixed effects. Clustered standard errors in parentheses. State Inpatient Databases from Arizona, Florida, New Jersey and New York from 1999 - 2004.
* Significant at 5%, ** Significant at 1%

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