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Medi-Cal Managed Care and Preventable Hospitalizations:
Interactions with Race & Ethnicity

by

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Spring 2003

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Abstract

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Background: Despite their rapid and mandatory enrollment into managed care plans across the country, evidence regarding the impact of managed care on access and health of Medicaid beneficiaries is inconclusive. How managed care interacts with the complexities of race and ethnicity within this population also remains unknown. Preventable hospitalization rates have emerged as valuable indicators of access to care and offer the potential to shed some light on these difficult questions.

Objectives: To determine the impact of Medicaid managed care on access to care, and to establish whether the effect was similar for different racial/ethnic groups.

Setting and Population: Non-elderly AFDC/TANF-eligible Medicaid beneficiaries in California enrolled in fee-for-service or managed care from 1994 to 1999.

Main Outcome Measures: Multivariate analyses of preventable hospitalization rates – or hospitalizations for ambulatory care sensitive conditions – for Medicaid beneficiaries in fee-for-service and managed care.

Results: Medicaid managed care was associated with significantly lower preventable hospitalization rates compared to traditional fee-for-service Medicaid (6.0 vs. 9.5 per 10,000 person months; rate ratio 0.63, $p < .001$). The reductions associated with managed care were significantly larger for Asians (RR = .64), blacks (RR = .63), and especially Hispanics (RR = .56), when compared to whites (RR = .77). These differences remained significant in multivariate analyses that controlled for important confounding factors, and when voluntary enrollees and readmissions were excluded. Similar findings were not observed for conditions that cannot be avoided with improved access to primary care.

Conclusions: Medicaid managed care was associated with lower preventable hospitalizations rates, and the largest changes appeared to occur among minority populations that faced the greatest barriers to care in traditional fee-for-service Medicaid. Medicaid managed care may have improved access to care and reduced the likelihood of preventable hospitalization by facilitating access to continuous and comprehensive care from a primary care provider.

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INTRODUCTION

Americans have never enjoyed a constitutional right to health care. However, concerns about access to timely and effective health care are not limited to the uninsured. As health plans and payors have adopted mechanisms to contain costs and utilization, they have struggled to balance these efforts with ensuring access for the prevention and management of disease. Moreover, it has become clear that there is significant variation in access to care even among the insured, and that variation may be attributable to differences in the financing and organization of health systems, the delivery of care by providers, and even the inter-personal relationships between providers and patients.

Researchers and policymakers have sought analytical tools to identify and understand the extent of potential barriers to access. With the growing movement to measure health care quality – which incorporates both the accessibility and the effectiveness of health services – the development of these measures has accelerated.

Analyzing hospitalizations for ambulatory care sensitive conditions – also known as preventable hospitalizations – has become an increasingly popular method for assessing and tracking potential problems in access to care. Paper One, entitled *Hospitalizations for Ambulatory Care Sensitive Conditions: A Review of the Literature*, reviews the growing body of preventable hospitalization literature and discusses the conceptual strengths and challenges of using this indicator.

Paper Two, entitled *Medi-Cal Managed Care and Preventable Hospitalizations: Interactions with Race and Ethnicity*, applies the concept of preventable hospitalizations to the nexus of three critical issues: access to care in Medicaid, the implementation of Medicaid managed care, and the differential experiences of racial and ethnic groups.

HOSPITALIZATIONS FOR AMBULATORY CARE SENSITIVE CONDITIONS:

A REVIEW OF THE LITERATURE

More than a decade has passed since the Institute of Medicine (IOM) proposed that hospitalization rates for ambulatory care sensitive (ACS) conditions might serve as useful indicators for barriers in access to health care. Rates of ACS hospitalizations, defined as hospitalizations for conditions that can often be prevented with timely and effective treatment in an outpatient setting, were proposed as one component of a framework for quantifying, tracking and understanding the complex barriers that Americans face in obtaining health care. The IOM recommendations were an important first step, but further research has been necessary to clarify the linkages between access to care and outcome measures like ACS hospitalizations. ACS hospitalization rates have been the focus of scores of research studies, tracked by numerous state and local health departments, and even proposed as indicators for comparing health system quality and performance.

The body of knowledge regarding ACS hospitalizations has grown and evolved as the demand for quantifying health care access and quality has increased. This review explores what the last ten years of research has demonstrated about the potential applications and drawbacks for ACS hospitalization rates. In many respects, the challenges that researchers have raised in developing the ACS indicator are common to those questions facing any attempt to quantify health outcomes related to access and quality in health care. A technical guide for the analysis of ACS hospitalization rates remains beyond the scope of this paper (and has been presented to some extent

elsewhere¹), but this review does discuss many of the conceptual considerations for using this access to care indicator.

What is an ACS hospitalization?

Hospitalizations for ambulatory care sensitive conditions – also known as preventable hospitalizations – have been defined as hospitalizations for a subset of medical conditions such as asthma, diabetes or ruptured appendicitis, which may have a decreased likelihood of occurring with effective and timely ambulatory care. More specifically, the receipt of timely and appropriate outpatient care may help to avoid hospitalization by 1) preventing the onset of an avoidable illness, 2) controlling the severity of an acute episodic illness, or 3) improving the management of a chronic disease.² This subset of hospital conditions is defined by ICD-9 (International Classification of Disease, version 9) hospital discharge codes and can be readily analyzed using data that is routinely collected by state health departments.

The development of ACS hospitalization rates as a health care indicator builds on the concept of “sentinel” health conditions, which have been defined as important episodes of unnecessary disease and disability that may signal one or more failures in quality of care.³ ACS hospitalizations are considered indicators of potential problems in health care, since the provision and receipt of ambulatory care services are not observed directly. Instead, as reliably calculated adverse outcomes that may be related to the ambulatory care process, higher ACS hospitalization rates serve as indirect warning signals for the presence of possible barriers in access to effective ambulatory care. Hospitalization is generally considered necessary and appropriate by the time a patient is admitted, but the deterioration of a patient’s health to the point of requiring an ACS

hospitalization may warrant further investigation of the events leading up to the adverse health outcome.

Why ACS Hospitalizations?

Preventable hospitalizations offer the potential to improve our understanding of the impact that barriers to primary care have on the health of individuals and communities. Although equity in access to care is an often-stated public goal, existing definitions and measurements of access have been inadequate. The IOM has defined access as “the timely use of personal health services to achieve the best possible health outcomes.”⁴ This definition emphasizes that traditional concepts of access to care measured in terms of *structure* (e.g. the number of physicians) or *utilization* (e.g. the number of visits) generally do not indicate what individuals care about most – the *health outcome* of care. Measures of structure and utilization capture important pieces of a complex picture, but the product of these interacting events can be judged by the outcome.

Developing reliable and useful measures of health *outcomes* associated with access to care has been considerably more difficult. Mortality and life expectancy are commonly measured outcomes, but do not provide a complete picture of ambulatory care and intermediate stages of illness. Patient surveys, such as the National Health Interview Survey and the Medicare Beneficiary Survey, are often used to assess perceptions of access and health on a national level, but are costly and generally not useful for analyses of smaller areas or populations.

Monitoring access to care in the ambulatory care setting has been especially challenging. Compared to monitoring in the hospital industry, similar systems for

ambulatory care are impeded by the increased number of ambulatory care providers to monitor, the extensive number of outpatient visits that occur each year, the diversity of practice settings, the lack of common reporting methods, and the administrative costs of reporting useful information. Furthermore, although encounter data is commonly collected for enrollees and providers within health plans, it is difficult to achieve an integrated picture of ambulatory care within communities and demographic populations.

The preventable hospitalization has therefore drawn particular attention because of its unique potential to measure primary care access and quality and their impact on patient health in a cost-effective and comprehensible manner. However, researchers have sought a better understanding of the linkages between access to care and ACS hospitalizations as well as the relative contribution of other important factors. The remainder of this paper discusses five propositions put forth in the literature concerning preventable hospitalizations.

- Proposition 1: An identifiable subset of hospitalizations are potentially preventable. (Face Validity)
- Proposition 2: Populations with decreased access generally experience higher ACS hospitalization rates. (Construct Validity)
- Proposition 3: ACS hospitalization rates are independently associated with access to care. (Access to Care and Bias)
- Proposition 4: Improvements in access to primary care result in fewer ACS hospitalizations. (Applications)
- Proposition 5: Preventable hospitalization can be used as health care quality performance indicators (Performance Indicator and Risk Adjustment)

Proposition 1: An identifiable subset of hospitalizations are potentially preventable.

That subsets of hospitalizations are potentially preventable with timely and appropriate ambulatory care is intuitively and clinically appealing. Early hospital case record reviews demonstrated that a significant number of hospitalizations may have been due to lack of primary care access or quality in the outpatient setting.^{5,6} To assess and track potential problems routinely and efficiently, researchers have sought to identify categories of illness that are both potentially preventable and accurately measured.

Despite considerable interest, there remains no consensus on which specific conditions should be included in a standard definition of ACS conditions, or which conditions may be more preventable than others. At least three definitions of ACS hospitalizations have been identified through professional opinion, and generally include a number of avoidable, acute and chronic conditions (Table 1):

- Billings et al defined 28 ambulatory care sensitive conditions using a modified Delphi approach with a medical advisory panel of six internists and pediatricians.² The conditions are identified by principal diagnosis codes, with some exclusions based on secondary diagnoses and age considerations.
- The IOM committee included 22 of these conditions as potential indicators of acute and chronic ambulatory care in its 1993 report.⁴
- In a study by Weissman et al, a panel of internists, expert clinical consultants and anonymous reviewers identified a list of 12 avoidable hospital conditions based on four selection criteria: consensus, importance, clinical face validity and data clarity.⁷

Table 1: Defining Preventable or Avoidable Hospitalizations			
Billings 1993			IOM, 1993
<i>Condition</i>	<i>ICD-9 Code</i>	<i>Notes</i>	<i>Adopted from Billings</i>
Congenital Syphilis	90	Secondary dx 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 TB	11		
Other Tuberculosis	012-018		
COPD	491, 492, 494, 496, 466	Acute bronchitis only with secondary dx of 491, 492, 494, 496	✓
Bacterial Pneumonia	481, 482.2, 482.3, 482.9, 483, 485, 486	Exclude case with secondary dx of sickle cell and patients <2 months	✓
Asthma	493		✓
CHF	428, 402.01, 402.11, 402.90, 518.4	Exclude cases with surgical procedures (36.01, 36.02, 36.05, 36.1, 37.5, 37.7)	✓
Hypertension	401.0, 401.9, 402.00, 402.10, 402.90	Exclude cases with surgical procedures (36.01, 36.02, 36.05, 36.1, 37.5, 37.7)	✓
Angina	411.1, 411.8, 413	Exclude surgery (01-86.99)	✓
Cellulitis	681, 682, 683, 686		✓
Skin grafts with cellulitis	DRG 263, 264	Exclude admissions from SNF/ICF	✓
Diabetes A	250.1, 250.2, 250.3		✓
Diabetes B	250.8, 250.9		✓
Diabetes C	250		✓
Hypoglycemia	251.2		✓
Gastroenteritis	558.9		✓
Kidney/UTI	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 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 surgical procedure of hysterectomy	
Dental Conditions	521, 522, 523, 525, 528		✓
Weissman et al.			
<i>Condition</i>	<i>ICD-9 Code</i>		
<i>Immunizable Conditions</i>	032, 033, 037, 072, 045, 055		
<i>Pneumonia</i>	481, 482, 483, 485, 486		
<i>Asthma</i>	493		
<i>Congestive Heart Failure</i>	428, 402.01, 402.11, 402.91		
<i>Malignant Hypertension</i>	401.0, 402.0, 403.0, 404.0, 405.0, 437.2		
<i>Cellulitis</i>	681, 682		
<i>Diabetes</i>	250.1, 250.2, 250.3, 231.0		
<i>Pyelonephritis</i>	590.0, 590.1, 590.8		
<i>Ruptured appendix</i>	540.0, 540.1		
<i>Gangrene</i>	785.4		
<i>Hypokalemia</i>	276.8		
<i>Perforated or Bleeding Ulcer</i>	531.0, 531.2, 531.4, 531.6, 532.0, 532.2, 532.4, 532.6, 533.0, 533.1, 533.2, 533.4, 533.5, 533.6		

Most subsequent studies have applied one of these three definitions of ACS hospitalizations, while others have chosen to measure the intersection of these definitions or a subset of chronic or pediatric conditions suitable to a study population. Physician panels in Spain, the United Kingdom and Canada have arrived at similar but distinct definitions of ACS conditions.⁸⁻¹⁰

A growing body of evidence-based practice guidelines and intervention studies in the last decade have formalized the clinical assumption that access to outpatient care is valuable in the prevention and management of certain diseases. Clinical guidelines commonly emphasize careful outpatient management for chronic conditions such as asthma, COPD, and angina while indicating early prevention and treatment for acute conditions like pneumonia, gastroenteritis and dehydration.¹¹⁻¹⁶ Furthermore, clinical interventions are often designed to reduce hospitalization through improvements in ambulatory care. In asthma, for example, interventions that have provided access to corticosteroids¹⁷, patient self-management training¹⁸, or case management nurses¹⁹ have each demonstrated reductions in hospitalizations.

In addition to demonstrating the clinical importance and rationale – known as face validity – for a set of ACS conditions, definitions of ACS hospitalizations have undergone scrutiny for statistical factors as well.

- Precision – It is necessary for hospitalizations to occur with sufficient frequency and variation among comparison groups to permit reliable estimates of differences that are not subject to the influence of random variability. Because hospitalizations for ACS conditions remain relatively rare events, it

is common practice to analyze and report ACS admissions as a single composite index at the population level to ensure reliable precision.

- Construct Validity – Hospitalization rates for separate ACS conditions should relate to one another, as well as to existing indicators of access. A number of studies have demonstrated that the variation of individual ACS conditions are highly internally consistent, which also supports the practice of combining these conditions into a single composite measure.²⁰ (Correlation with existing indicators of access to care, such as income or insurance status, is discussed in Proposition 2.)
- Bias – It has also been important to determine if rates of ACS hospitalizations, as indicators of access to care, are confounded by systematic differences in patient case-mix, especially disease prevalence, disease severity and comorbidity. (Research studies that attempt to sort out these issues are discussed in Proposition 3 while further work in adequate risk adjustment procedures is discussed in Proposition 4.)

As researchers have sought to study ACS hospitalizations separately as useful tools for improving clinical quality, criteria for statistical reliability have become increasingly important. In October 2002, through literature review and empirical analysis, the Agency for Healthcare Research and Quality (AHQR) selected 16 ambulatory care sensitive conditions (called Prevention Quality Indicators), rated empirically based on face validity, precision, minimum bias, and construct validity, as well as their potential for fostering quality improvement and applicability.¹

Although it is too early to determine the impact of the AHQR report, ACS research represents a growing interest in producing useful health measures from the limited data available. As state health departments and voluntary collaboratives among providers and health plans continue to expand the richness of these standardized datasets, our understanding and definition of preventable hospitalizations are certain to evolve.

Proposition 2: Populations with barriers in access to care experience higher ACS hospitalization rates.

Numerous studies have demonstrated significant variation of ACS rates across populations and geographic areas, with the highest rates among those demographic groups that are known to experience reduced access to primary care – particularly low-income persons, Medicaid beneficiaries, the uninsured and African Americans. The magnitude and consistency of these findings have been accepted by many researchers as indirect evidence that preventable hospitalizations may be associated with deficiencies in access to care.

Income. Lack of financial resources, often measured by low annual income, has long been recognized as a major barrier to the purchase of health care services and health insurance. Although income for individuals is not commonly recorded in hospital discharge datasets, linking individuals by their residence zip codes to census tract information is considered a reliable method of approximating income in population studies. In New York City, Billings et al (1993) demonstrated that non-elderly individuals living in low-income zip code areas were four times more likely to be hospitalized for ACS conditions than individuals from high-income zip code areas.² The authors further concluded that differences in race, disease prevalence, concurrent

substance abuse and physician decision-making did not appear to explain the disparity. These findings have stimulated further studies at the local level, state level, nationally, and among children, all of which have repeatedly identified a strong association of low income with higher ACS hospitalization rates.^{4, 21-25} Interestingly, among Americans age 65 and over, almost all of whom qualify for Medicare and may as a result have relatively equal access to care regardless of financial resources, the association of income and ACS hospitalization rates is insignificant or dramatically reduced.^{23, 26} Cross-national studies have also found that the income gradient observed in America is diminished, or even disappears, in nations with universal health care.^{27, 28}

These findings support the assumption that ACS admissions may reflect reduced access to health care among the poor. Our understanding of the link between health and poverty has become considerably more sophisticated, however. In future research it will be valuable to demonstrate how much of the higher risk for ACS hospitalization is associated with decreased access, and how much may be due to the independent effects of social class on health or to confounding factors related to both poverty and health. Lower socioeconomic status has been associated with increased likelihood of ACS hospitalizations even after adjusting for case severity²⁹, disease prevalence and health care seeking behavior³⁰ and universal insurance²⁸. Unmeasured characteristics related to income might also place patients at risk for ACS hospitalization, factors that include education, language and health-related behavior.

Insurance status. A major effect of income on access to health care is determined through the ability to purchase health insurance. Problems in access to care are common among the uninsured and individuals with Medicaid.³¹ Weissman, Gastonis

and Epstein (1992) studied the link between health insurance status and admissions for avoidable hospitalizations among the non-elderly in Massachusetts and Maryland. They found significantly higher admission rates for most avoidable conditions among Medicaid and uninsured patients as compared to privately insured patients.⁷ Pappas et al. (1997) calculated national age-adjusted ACS hospitalization rates for 1990 and arrived at similar results.²³ In a study of 1990-1995 ACS hospitalization trends in 19 states, Friedman et al. found that preventable hospitalization rates had increased for uninsured and Medicaid children during this time period while they had dropped for privately insured children by more than a third.³²

While the association between health insurance, access and ACS hospitalizations is striking, it is also clear that comparisons between insurance groups are subject to the transitory and risk-selected nature of health insurance in this country. Several studies have found lower rates of ACS hospitalization among uninsured patients compared to Medicaid and privately insured adults and children.^{24, 30, 32} These findings demonstrate only a few of the complexities of interpreting ACS hospitalization rates by insurance status. First, it is believed that barriers to primary care may force the uninsured to delay seeking care until the increasing severity of a condition requires hospitalization, leading to higher ACS hospitalization rates for the uninsured. Yet, lack of insurance may also lead to increased treatment in the emergency department without admission, causing an apparent drop in ACS hospitalization rates. Second, health insurance groups are often risk-selected groups, with distinct health care needs, making it difficult to compare hospitalization rates. Third, insurance status reported at the time of discharge does not always indicate actual access to primary care before admission, since most hospitals will

attempt to identify uninsured individuals who are eligible for Medicaid enrollment. ACS admission rates may therefore be subject to misclassification of insurance status, in this case perhaps resulting in an overestimate of ACS admissions for Medicaid patients while underestimating the risk for the uninsured.

Race. Race and ethnicity, while often correlated with economic resources and insurance status, have been increasingly recognized as independent predictors of the level of health care access and effectiveness a patient may receive.³³ Pappas et al (1997) calculated 1990 national ACS hospitalization rates and found that blacks had consistently higher ACS hospitalization rates than whites, even among the privately insured and the highest income groups.²³ However, as was the case for the effects of income, this racial difference was not significant for persons aged 65 and over. In a study of trends between 1980 through 1998, Kozak et al (2001) found that non-elderly black patients not only had higher rates of ACS hospitalizations than non-elderly whites, but the disparity had grown wider between 1980 and 1998 as the rate among blacks increased and the rate among whites decreased. These disparities were not found between blacks and whites over 65, however, with both groups experiencing similar increases.³⁴ Studies among children have also found that blacks are significantly more likely to be hospitalized for ACS conditions when compared to whites, even when controlling for income²⁴, or adjusting for age, gender and insurance status³⁵.

Several studies have attempted to sort out whether racial differences in health status or comorbidity have contributed to these disparities. Using 1996 discharge data from 10 states, Gaskin and Hoffman (2000) controlled for 30 comorbidities, area socioeconomic status, insurance coverage and availability of primary care, and found that

Hispanic children, working-age African American adults and Hispanic and African American elderly patients remained more likely to be admitted for ACS conditions than their white counterparts.³⁶ Culler, Parchman and Przybylski (1998) found that elderly black Medicare beneficiaries that had an increased risk of ACS hospitalization compared to whites, even when controlling for predisposing, enabling and need variables such as education, income, self-rated health status and the presence of chronic health conditions.²⁶

The distribution and trend of these racial disparities are alarming and may be driven by differences in health care access and quality. ACS conditions may serve as useful indicators of racial inequalities in access to care.

Physician Supply. A number of studies have also examined the relationship of preventable hospitalization rates and the area supply of medical providers. Policymakers have often evaluated access by whether communities have adequate health care resources, frequently using the number of health care professionals or hospital beds in an area to drive health care planning efforts. However, despite this focus on physical resources, the strength of the relationship between the *potential* access of the health care system and health *outcomes* of care is inconsistent in the literature.

Several studies have found that increased supply of primary care physicians is associated with lower rates of hospitalization for ACS conditions.^{37, 38} Among Medicare beneficiaries, the association of physician supply and ACS hospitalizations has only been demonstrated among vulnerable Medicare beneficiaries in poor or fair health living in primary care shortage areas or for beneficiaries living in the one percent of areas with the very fewest number of physicians.^{39, 40} However, a number of researchers have

concluded that while physician supply may at times demonstrate a statistically significant negative effect ACS hospitalizations, race and income appear to be much stronger predictors.^{38, 40-42} The much larger importance of race and poverty in explaining differences in preventable hospitalization rates raises concerns about policies that distribute scarce health care resources on the basis of structural measures of the health care system.

The above findings on income, insurance status, and race demonstrate a significant and consistent pattern of higher hospitalizations for ACS conditions among those traditionally found to experience the greatest barriers to primary care. Despite these advancements, further research has been necessary to sort out how the degree to which these disparities can truly be attributed to differences in access to the health care system, independent of potential confounding factors.

Proposition 3: ACS hospitalization rates are indicators of access to care.

As a measure of poor health outcomes, preventable hospitalization rates demonstrate marked disparities by income, insurance status and race (Proposition 2), and may therefore serve as valuable indicators for tracking the health status of vulnerable populations. If preventable hospitalizations are to be a useful measure of the accessibility and effectiveness of ambulatory care, however, it is necessary to establish that the potential relationship between preventable hospitalization rates and access remains independent of potentially confounding factors. As is true for most health outcomes, the factors leading to hospitalization may be affected by any number of predisposing or need factors. Specifically, patients who experience decreased access to care may also have a

higher risk for preventable hospitalization due to increased ACS disease prevalence and severity, coexisting health conditions, differences in health seeking behavior and compliance, or lower thresholds for admission by hospital physicians.

Some research has questioned whether preventable hospitalizations are associated with access to care. Using data from the National Medical Expenditure Survey, Lambrew et al. (1996) found that having a regular source of care had a beneficial effect on several of the utilization indicators recommended by the IOM for monitoring access to care, but no significant relationship with preventable hospitalization rates.⁴³ The authors noted, however, that survey data can be useful in assessing process-related indicators that occur frequently, but small samples available through surveys are not generally useful in measuring the likelihood of relatively uncommon events like preventable hospitalizations. In a study of Delaware Medicaid recipients, Gill (1997) also found that having a regular source of care was not associated with a lower likelihood of preventable hospitalization.⁴⁴ However, this study established having a regular source of care administratively, defined by having the majority of office visits with a single provider. This novel methodology required restricting the study sample to those recipients with at least two office visits in a year, introducing potential problems of small sample size and selection bias.

Several studies have validated the use of ACS hospitalization rates as an indicator of the accessibility and effectiveness of primary care. Using a measure of continuity of care among continuously enrolled Delaware Medicaid, Gill (1998) found that individuals who experienced higher continuity of care had a decreased future likelihood of chronic preventable hospitalizations and all hospitalizations.⁴⁵ Using self-rated measures of

access to care, Bindman et al. (1995) studied five chronic ACS conditions using a random-digit telephone survey of non-elderly adults and a survey of physicians in 41 geographic areas of California.³⁰ The study found that higher patient ratings of access to care in a community were strongly associated with lower hospitalization rates for ACS chronic conditions, even after adjusting for community differences in the prevalence of the study conditions, demographics, insurance status, patient health seeking behavior, and physician admitting practices. Although community measures of race, insurance type and disease prevalence were also significant in the multivariate model, these findings have provided the strongest support for the validity of ACS conditions as an independent index of access to care.

Further validation of the relationship between access and preventable hospitalizations will require longitudinal patient-level analysis or for the full range of chronic and acute ACS conditions. Additional research is also necessary to understand the progression of events that occur between the onset of symptoms and hospitalization of the patient for preventable conditions. For example, Oster and Bindman (2003) used the National Hospital Ambulatory Care Survey and the National Health Interview Survey to determine whether higher preventable hospitalization rates for chronic conditions among blacks and Medicaid patients could be attributed to differences in disease prevalence and severity, or to lower admission thresholds for these groups in emergency departments.⁴⁶ The authors concluded that the slightly higher prevalence of chronic ACS disease among blacks compared to whites did not explain the dramatic differences in emergency department visits or hospital admissions for chronic ACS conditions. Moreover, the analysis found that Medicaid and black patients were assigned to triage

severity categories and admitted from these triage categories at similar rates compared to privately insured and white patients, respectively. These findings suggest that higher preventable hospitalization rates among black and Medicaid patients do not appear to be caused by differences in disease prevalence, disease severity or emergency department admitting behavior.

Proposition 4: Improvements in access to primary care results in fewer ACS hospitalizations.

Working from the assumptions from Proposition 3 that higher preventable hospitalizations rates are indicators of barriers to health care, it has been speculated that effective improvements in access to ambulatory care services may have measurable effects on preventable hospitalization rates. A number of studies have tested this hypothesis by applying the concept of preventable hospitalizations towards the evaluation of programs or policies intended to improve access to care.

Federally Qualified Health Centers. Federally qualified health centers (FQHCs) and public clinics serve as providers of preventive and primary care services to low-income and uninsured individuals. These organizations, often praised for the continuum of comprehensive services they offer and their experience with underserved populations, can provide access to care and quality despite existing barriers. Falik et al (2001) studied whether Medicaid enrollees that rely on FQHCs as a regular source of care experience increased access to care as measured by ACS conditions.⁴⁷ The analysis found that Medicaid beneficiaries that rely on FQHCs for most of their care are less likely to be hospitalized or seek emergency room care for ACS conditions, even when controlling for

case-mix and socioeconomic status. In a small area analysis in Virginia, Epstein (2001) modeled the impact of living in an area with an FQHC on preventable hospitalizations among low-income and elderly residents.⁴⁸ Comparing zip code clusters in designated medically underserved areas, communities containing an FQHC had fewer preventable hospitalizations than communities without an FQHC.

Health Insurance Expansions. Incremental expansion of health insurance has been a major strategy for improving access to health services for the uninsured. Although it is widely believed that health insurance expansion will increase the use of beneficial preventive and primary care services and consequently improve health, evaluating the success of these programs can be difficult and costly. Kaestner (2001) investigated whether Medicaid expansions between 1988 and 1992 improved children's health, comparing the change in the rate of preventable hospitalizations among eligible low-income children to the change in the rate of preventable hospitalizations among ineligible children.⁴⁹ The results of this study were mixed, with relative improvements in the incidence of preventable hospitalizations in some age groups, but no change in other age groups. The State Children's Health Insurance Program, established through the Balanced Budget Act of 1997, represents one of the most significant recent attempts to expand health insurance coverage to uninsured children. Tracking preventable hospitalizations has been proposed as one component in the evaluation of state CHIP programs.³²

Managed Care. Some researchers have tested the hypothesis that managed care will prevent ACS hospitalizations by increasing the use of preventive and primary care. In a study of area variation in preventable hospitalizations for New York children by

Friedman and Basu (2001), there was an inverse relationship between area ACS admissions and private managed care penetration.³⁸ According to their model, an increase in managed care penetration by 20 percent (from 13 percent to 16 percent), measured by the proportion of all child admissions from private HMOs, was associated with a decrease in preventable hospitalizations by 1.8 percent. In a second study by Friedman, Basu and Burstin (2002) that analyzed adult discharges in New York, private HMO enrollees were also less likely to have an ACS admission when compared to other insured adults.¹¹ However, these studies were cross-sectional and limited to an area of low managed care penetration at the time. In a longitudinal analysis of chronic ACS admissions among California working-age adults between 1990 and 1997, a period when managed care penetration increased by 15 percent, Backus et al. (2002) found there was a small but statistically significant negative relationship between managed care and ACS admissions.⁵⁰ A 10-point increase in area percentage of private managed care penetration was associated with a 3.1 percent decrease in the area chronic ACS hospitalization rate.

Medicaid managed care. Although managed care has been hypothesized to improve access to primary care among healthy privately insured individuals, the rapid adoption of managed care by state Medicaid programs has raised concerns about whether Medicaid beneficiaries might instead experience declines in access and health. Limited studies from beneficiary surveys and HEDIS measures demonstrate mixed findings on access.⁵¹⁻⁵³ Monitoring access and quality routinely is costly, however, which has furthered interest in preventable hospitalizations rates as a simple monitoring tool for Medicaid managed care.

Studies of preventable hospitalizations among Medicaid managed care enrollees have been limited. Friedman, Basu and Burstin (2002) found that while private HMO enrollees were less likely to have an ACS admission than other insured adults, a similar effect for Medicaid HMO enrollees could not be found compared to other Medicaid enrollees.¹¹ Gadowski et al. (1998) found a weak negative association between preventable hospitalizations and managed care in a comparison of Medicaid children before and after the implementation of a Medicaid managed care program in Maryland.⁵⁴ In contrast, Lo Sasso and Freund (2000) found that AFDC and SSI Medicaid beneficiaries enrolled in Medicaid managed care in one county had a small but significantly higher risk of preventable hospitalization over time, suggesting that the adoption of managed care may have presented access problems to these beneficiaries.⁵⁵ Porell (2001) compared preventable hospitalizations among Medicaid risk HMO enrollees and Medicaid enrollees in a fee-for-service-based primary care case management program in Massachusetts.⁵⁶ Unadjusted preventable hospitalization rates were similar for the two groups, but adjustments for age, sex and race revealed higher preventable hospitalizations rates among HMO enrollees.

Although these preventable hospitalization studies can only draw attention to potential access or quality problems, they clearly indicate that further research is necessary to explain these findings. From these examples, researchers have demonstrated that preventable hospitalizations are valuable, low-cost assessment measures that can be derived from existing data. These studies may provide early warnings signs, which can be used to justify further investments in more costly and sensitive studies to understand the mechanisms of these findings.

Proposition 5: ACS Hospitalization rate as a performance measure.

Preventable hospitalizations have also been proposed as health outcomes in the measurement of quality performance for health plans, hospitals and physician groups. The extension of preventable hospitalization rates from a measure of access to a measure of quality builds on the close relationship of health care access and clinical effectiveness, both of which are necessary components of quality care. Access to care itself is an important component of health plan quality, since overly restrictive barriers or an inadequacy of local providers may cause unnecessary hospitalizations for enrollees in a plan of poor quality.

The relationship between preventable hospitalization rates and quality is not well defined. For instance, even among individuals with adequate access to care, the adequacy and comprehensiveness of services, the coordination and management of care, and the clinical abilities of ambulatory care providers may also be important determinants of preventable hospitalization.

There is some evidence to support the assumptions that the quality of care may be associated with preventable hospitalizations. Parchman and Culler (1994) found that the area supply of family and general practice physicians, but not the supply of general internists and general pediatricians, was associated with a lower rate of preventable hospitalizations in Pennsylvania.³⁷ Hakim (2001) found that higher compliance with pediatric preventive care guidelines was associated with fewer preventable hospitalizations among Medicaid children.⁵⁷ Falik et al (2001) found that Medicaid beneficiaries that relied on FQHCs for most of their care were less likely to be

hospitalized or seek ER care for ACS conditions compared to beneficiaries that relied on other community providers.⁴⁷ Continued research on the relationship between quality and preventable hospitalizations will require further research using clinically detailed data among individuals with adequate access to care.

Nevertheless, recent efforts to measure quality among health care organizations have favored utilization measures over health outcomes like preventable hospitalizations. This is best exemplified by the early adoption and subsequent removal of hospitalizations for asthma, one type of hospitalization included in the definition of ACS conditions, as an indicator of quality by the National Committee on Quality Assessment (NCQA). Instead, NCQA now measures prescription rates for asthma controller medications. Eddy (2001) has explained the preference for process-based measures by the “probabilistic nature, rarity and confounding” inherent in most health outcomes. First, preventable hospitalizations are probabilistic in that they sometimes occur even with the highest quality care, and poor quality care does not always lead to hospitalization. Without direct observation of care that is provided, interpretation of preventable hospitalizations is subject to uncertainty. Second, compared to measures of utilization, preventable hospitalizations are relatively rare events and sometimes unreasonably large populations are required to achieve statistically sensitive and stable measures. Third, as discussed previously, in addition to the accessibility and effectiveness of the health care system, patient characteristics such as race, socioeconomic status, disease prevalence, comorbidity and health care seeking behavior may also be risk factors for preventable hospitalization.

Although there has been a reluctance to accept health outcomes as indicators of clinical quality, it has been equally difficult to develop process-based measures that have comprehensible and measurable relationships to health. Taken together, utilization and outcome indicators could provide an enriched picture of the complex and often subtle differences in the delivery of care. The uncertainties around preventable hospitalizations in quality performance measurement are not unique to this one indicator, or even to outcome measures as a whole. Adequate risk adjustment for those confounding factors outside of the control of the health care system will increase the confidence that higher rates of preventable hospitalizations are indicative of a problem within the health system.⁵⁸ These considerations also merit caution, as over-adjustment for risk factors may allow health systems or health systems the freedom to overlook important causes of disease in their patient populations.²⁹ Continued progress in outcome research, perhaps building on the experience with preventable hospitalizations, will increase the sophistication of performance indicator assessment and interpretation.

Conclusions

The IOM published *Access to Health Care in America* with the intention of developing a set of indicators for monitoring access to health care at the national level over time. Preventable hospitalization rates are appealing as intuitive, comprehensible indicators of the availability and effectiveness of primary health care that can be analyzed at low-cost using routinely collected data (Proposition 1). Many researchers, as well as state and local health departments, have already begun programs to track preventable hospitalizations as measures of health status and access to care among different

populations (Proposition 2). These characteristics also appeal to researchers interested in understanding the predictors and outcomes of access to care (Proposition 3) or evaluating the effectiveness of policies or programs (Proposition 4). Preventable hospitalizations have also been proposed as outcome indicators in performance measurement of health systems and health plans, and with appropriate risk adjustment, this indicator may contribute to a more complete picture of the quality of care in America. (Proposition 5)

Although ten years of research have greatly added to our understanding of this indicator, further research is necessary to clarify our definitions of preventable hospitalizations, to understand the potentially confounding factors of the relationship between access and hospitalization for ACS conditions, and to appropriately adjust for these factors in making comparisons on the basis of access and quality. In many respects, this completeness of this picture will depend on the extent that hospitalization data is integrated with sources of data from other entities of the health care system.

Nevertheless, creativity and improvements in the quality of information have enabled research that strongly support the use of preventable hospitalizations as significant outcomes related to access and the effect of access on health.

The health care system is experiencing growing demands for accountability and quality information. Efforts by NCQA and others have contributed tremendously to the ability to measure and monitor important aspects of clinical practice, but these efforts are voluntary, resource-intensive, and unavailable at the population or community level. In contrast, improvements in the collection and analysis of routinely available administrative datasets, such as those used in studies of preventable hospitalizations, can provide efficient and effective tools for monitoring access and quality. The extent and

diversity of work in the field of preventable hospitalizations demonstrate the robust potential to use these data creatively and pursue important research questions that were previously unanswerable.

INTERLUDE

While Paper One paints a backdrop of the theoretical opportunities and challenges in the development and application of reliable and useful measure of access to care, Paper 2 illustrates in depth how researchers can apply this indicator to confront a difficult question in health services research.

Although Medicaid managed care first gained widespread popularity nearly a decade ago, serious questions remain about the impact of this major reform movement on access to care and health outcomes for Medicaid beneficiaries. Paper Two uses ACS hospitalizations to examine the nexus of three important issues: access to care for Medicaid beneficiaries, the implementation of Medicaid managed care, and the differential experiences of diverse racial and ethnic groups. In the completion of this study, moreover, Paper Two illustrates how a number of the methodological problems mentioned in Paper One can be resolved and addressed in pursuit of an important question.

MEDI-CAL MANAGED CARE, PREVENTABLE HOSPITALIZATIONS, AND INTERACTIONS WITH RACE AND ETHNICITY

BACKGROUND

Managed Care and Vulnerable Populations

Despite the rapid and mandatory enrollment of Medicaid beneficiaries into managed care plans across the country, evidence regarding the impact of managed care on access and health for Medicaid beneficiaries has been inconclusive.^{51, 54, 55, 59-63} It is necessary to understand how managed care affects access to care and health outcomes for populations with very different needs and barriers to care. Preventable hospitalization rates may serve as a valuable tool for understanding and monitoring the impact of Medicaid managed care on access to care.

Although most Medicaid agencies and providers had relatively little experience with managed care by the early 1990s, two conclusions about the ailing conventional Medicaid system had become widely accepted: 1) The traditional fee-for-service (FFS) system lacked mechanisms to control accelerating rates of Medicaid costs and utilization; and 2) Medicaid had failed to ensure that beneficiaries receive continuous, comprehensive, and coordinated primary care services – or access to a “medical home.”^{64,65} Managed care organizations (MCOs), in contrast, offered the capabilities to control the cost and volume of services through a number of mechanisms, especially through contractual and financial arrangements with primary care physicians to ensure the coordination and delivery of primary and preventive care. As a result, 49 states now

have some form of Medicaid managed care program in place, and national enrollment has increased from 9.5 percent of total enrollment in 1991 to 57.6 percent in 2002.⁶⁶

The potential impact of this major shift towards managed care on access to care and health for Medicaid beneficiaries has been difficult to predict. MCOs seek to reduce the likelihood of costly complications and hospitalization by improving access to primary and preventive care services. Improving the likelihood that patients can identify a regular source of care can lead to improvements in ambulatory care use and fewer emergency room visits.⁶⁷ However, MCOs also provide financial and administrative incentives to reduce health care utilization, and it is not clear that these strategies will be successful given traditionally low physician participation and reimbursement rates in Medicaid. Moreover, early research demonstrated that managed care may lead to improved health outcomes among patients with health problems that are non-poor, but poor patients with health problems experienced worse outcomes in managed care plans.⁶⁸ This evidence suggests that managed care might be too restrictive for those individuals with the greatest needs and fewest resources. Even compared to commercially insured low-income managed care enrollees, Medicaid managed care enrollees are more likely to be poorer, have health problems and experience access problems.⁵² Nevertheless, by requiring patients to select primary care providers and by paying physicians capitated fees to deliver continuous and coordinated care, MCOs may be successful in aligning incentives towards increased access.

Despite the growth of Medicaid managed care experience, questions about the impact on access to care remain largely unanswered. Many states focused their efforts on strong contractual requirements for health plans, using structural standards such as the

adequacy of provider networks, provider credentialing, linguistic capabilities, hours of operation or cultural competency, but it is unclear how well these standards have been enforced.⁶⁵ Increasingly, states are also requiring health plans to submit information about process of care standards based on the Medicaid Health Plan Employer Data and Information Set (HEDIS).^{69,53} Although the growth of these monitoring efforts is promising, the scope and reliability of these measures can be limited by the cost and availability of the encounter data that is necessary for these analyses. Furthermore, the significance of process of care measures and their impact on outcomes of care are often unclear and non-intuitive. Alternatively, surveys of Medicaid managed care enrollees have also been inconclusive. One survey found that Medicaid beneficiaries who voluntarily enrolled in managed care plans were more likely to report having a usual source of care compared to beneficiaries in conventional Medicaid.⁶³ However, other surveys have not found appreciable differences in access to care among Medicaid beneficiaries in fee-for-service and managed care.^{51, 52, 61} There are few studies investigating the effects of Medicaid managed care on access and health outcomes related to access, especially in states that have adopted mandatory enrollment on a large scale.

The effect of managed care on Medicaid beneficiaries of different racial or ethnic groups is also an important question. It has become increasingly clear that the race and ethnicity of a patient is often a predictor of the access and quality of care a patient experiences.³³ Among Medicaid beneficiaries of different racial/ethnic groups, the barriers to care that normally confront Medicaid beneficiaries can be further complicated by differences in health needs, cultural attitudes, health behavior, language, literacy rates, and the perceptions and prejudices among both patients and providers. Latino Medicaid

beneficiaries in California, for instance, are almost three times as likely to lack a usual source of care compared to whites Medicaid beneficiaries – or 20 percent compared to 7 percent.⁷⁰ The transition from FFS to Medicaid managed care may therefore affect racial/ethnic groups differently. These differences may occur through the exacerbation or alleviation of historical barriers to care, or through the creation of new problems for some groups. A number of studies have investigated whether managed care narrows or exacerbates racial/ethnic disparities through surveys of publicly and commercially insured individuals. In one study, managed care was associated with greater access to care for members of all racial and ethnic groups, although the disparities between minorities and whites in managed care remained similar to disparities in other health plan types.⁷¹ A study of voluntary Medicare HMO enrollees found that access was better for all racial/ethnic groups, especially for elderly Latinos, but disparities by race/ethnicity persisted.⁷² In another study, managed care enrollees across all racial/ethnic groups were more likely to have a usual source of care and greater continuity of care, but these racial/ethnic groups also reported different types of barriers to care.⁷³ The effect of mandatory managed care enrollment on different racial/ethnic groups enrolled in Medicaid has not been established, despite ongoing debate about the significant potential for managed care to improve or exacerbate historical barriers in access to care.

Preventable Hospitalizations

The analysis of preventable hospitalizations – or hospitalizations for ambulatory care sensitive (ACS) conditions – has emerged as a valuable tool for understanding and monitoring access to care. While beneficiary surveys are often used to measure opinions about access to care, they are resource-intensive and often cannot be used to analyze

small regions or subpopulations over time. In contrast, preventable hospitalization rates represent significant health outcomes potentially related to poor access that can be abstracted from routinely collected statewide data and analyzed at a relatively low cost.

Hospitalizations for ACS conditions have been defined as admissions for a subset of medical conditions that may have a decreased likelihood of occurring with effective and timely ambulatory care. More specifically, the receipt of timely and appropriate outpatient care may help to avoid hospitalization by 1) preventing the onset of an avoidable illness, 2) controlling the severity of an acute episodic illness, or 3) improving the management of a chronic disease.²

Since the Institute of Medicine proposed that preventable hospitalizations might serve as a useful indicator of access to care in 1993, numerous studies have demonstrated consistent findings. Individual characteristics that are often correlated with reduced access to care, such as being black^{23, 26}, Hispanic³⁶, uninsured⁷ or receiving Medicaid⁷ are associated with higher risk of preventable hospitalization. Living in low-income areas² and designated primary care shortage areas³⁹ are also associated with higher rates of preventable hospitalization. In studies of Medicaid beneficiaries specifically, receiving care from federally qualified health centers⁴⁷, higher continuity of care⁴⁵, and better compliance with preventive care guidelines in the first two years of life⁵⁷ are associated with a lower likelihood of preventable hospitalization. Finally, in a study that controlled for differences in demographics, income, prevalence of disease, health care seeking behavior and physician admitting practices, Bindman et al. found that the risk of preventable hospitalization was independently and inversely associated with self-rated access to care.³⁰

Several recent studies have used this indicator to test the hypothesis that commercial managed care may reduce preventable hospitalizations for the general population. One cross-sectional study of New York children found that higher area managed care penetration was associated with lower preventable hospitalization rates.³⁸ A second study used time series data to demonstrate that higher growth in managed care penetration was associated with larger reductions in the rate of preventable hospitalizations among adults in California.⁵⁰ A third study found that adults enrolled in a commercial HMO had a lower likelihood of preventable hospitalization compared to individuals in commercial FFS.¹¹

Studies of preventable hospitalizations among Medicaid managed care enrollees have been limited and inconclusive. One study of New York adults found that while enrollment in managed care among the commercially insured was associated with a lower likelihood of hospitalization for an ACS condition, a similar effect was not found among Medicaid beneficiaries.¹¹ However, the authors pointed out that Medicaid managed care was still in the early stages of implementation at the time of this study. In a pre-post study of Medicaid children in Maryland, Gadowski et al. (1998) found a weak negative association between preventable hospitalizations and managed care.⁵⁴ However, at least two studies have raised concerns. One study of two California counties found that AFDC and SSI Medicaid beneficiaries enrolled in Medicaid managed care had a small but significantly higher risk of preventable hospitalization over time, and the authors questioned whether managed care might have presented access problems for these beneficiaries.⁵⁵ A second study compared preventable hospitalizations among Medicaid risk HMO enrollees and Medicaid enrollees in a fee-for-service-based primary care case

management program in Massachusetts.⁵⁶ Unadjusted preventable hospitalization rates were similar for the two groups, but adjustments for age, sex and race revealed higher preventable hospitalizations rates among HMO enrollees. The evidence is inconclusive given the magnitude of Medicaid managed care reform. Furthermore, there has been very little research to suggest whether Medicaid's diverse racial/ethnic groups have experienced managed care similarly.

Objectives

During the 1990s, California began rapid implementation of what was to become one of the largest mandatory Medicaid (known as Medi-Cal in California) managed care programs in the country. The state's explicitly stated goals included controlling costs and increasing access to primary care providers. The following study was completed in collaboration with the ongoing Medi-Cal Preventable Hospitalizations Study at the Primary Care Research Center of San Francisco General Hospital – University of California, San Francisco. The first objective of this analysis, which has been analyzed in further detail by the Medi-Cal Preventable Hospitalizations Study, is to determine whether enrollment in Medi-Cal managed care was associated with lower preventable hospitalization rates compared to traditional fee-for-service Medi-Cal. The second objective of this study is to determine if the impact of Medi-Cal managed care on preventable hospitalizations rates was similar for different racial/ethnic groups.

MATERIALS AND METHODS

Study Design and Population

This study applied individual-level multivariate regression techniques to analyze statewide preventable hospitalization rates from 1994 to 1999. The study population included non-elderly Medi-Cal beneficiaries who were enrolled in Medi-Cal through eligibility for Aid to Families with Dependent Children (AFDC) or Temporary Aid to Needy Families (TANF) between 1994 and 1999. This group – comprising roughly 49 percent of California Medi-Cal beneficiaries in 1999 – was the primary focus of California’s Medi-Cal managed care program.

Preventable hospitalization information was obtained from 1994-1999 California Office of Statewide Hospital Planning and Development (OSHPD) hospital discharge datasets. Hospitalizations for Medi-Cal beneficiaries while traveling in contiguous states (Arizona, Nevada and Oregon) were also included. A major contribution of this study is the use of a unique dataset that links the hospital discharge data with Medi-Cal enrollment data available from the California Department of Health Services (DHS) for the same six-year period. Studies of preventable hospitalization and Medicaid managed care are often limited by hospital discharge data that provide only basic demographic, insurance and diagnosis information for each patient.¹¹ In general, this information lacks the detail and accuracy necessary for studying Medicaid’s heterogeneous and increasingly complex characteristics. For instance, misclassification of insurance status can occur as participation of commercial managed care plans in public insurance programs like Medicaid blurs patient reporting of insurance type. In addition, these datasets are often unable to discern whether beneficiaries were eligible for Medi-Cal

through AFDC/TANF or Supplemental Security Insurance (SSI), two groups with very different health care needs and different rates of enrollment in managed care. In contrast, linking discharge data with enrollment data provides the detail to provide a more complete picture of federally required demographic information; verify enrollment in Medi-Cal; stratify TANF- and SSI-eligible beneficiaries; classify whether beneficiaries were enrolled in managed care under voluntary or mandatory circumstances; and establish the period of time that an individual had been enrolled in Medi-Cal prior to hospitalization.

For each hospitalization, the OSHPD hospital discharge dataset was used to identify preventable hospitalizations (by ICD-9 code) as well as the season (by month) and year (1994-1999) of admission. The linked information from the DHS enrollment dataset was used to define each hospitalization by managed care enrollment (MC/FFS), race/ethnicity (Hispanic, black, Asian, white, Other), age (0-17, 18-64), sex (male, female) and county of residence (58 counties). The DHS enrollment information was also used to define whether the hospitalized patient was enrolled in Medi-Cal during the month prior to hospitalization.

Preventable Hospitalization Rates

Based on a review of studies using ACS hospitalizations, this analysis included 22 pediatric and adult conditions and corresponding ICD-9 codes (*International Classification of Diseases, 9th Revision, Clinical Modification*) to define preventable hospitalizations. (Table 1) Admissions for each condition were based on the primary diagnosis, as well as established inclusions and exclusions based on secondary diagnoses and age categories.⁴

Table 1: Ambulatory Care Sensitive Conditions

Diabetes	Bacterial pneumonia
Asthma	Cellulitis
Congestive heart failure	Hypoglycemia
Chronic obstructive pulmonary disorder	Gastroenteritis
Hypertension	Kidney/Urinary tract infection
Angina	Dehydration
Congenital syphilis	Iron deficiency anemia
Immunization-related conditions	Nutritional deficiencies
Grand mal and other epileptic convulsions	Failure to thrive
Severe upper respiratory infections	Pelvic inflammatory disease
Pulmonary and other tuberculosis	Dental conditions

Note: ICD-9 codes and exclusions available upon request.

Preventable hospitalization rates were calculated as the number of preventable hospitalizations per 10,000 Medi-Cal person-months. The numerator – or count of preventable hospitalizations – was derived from the linked California OSPHD discharge dataset. Hospitalizations for each of the 22 ACS conditions were combined into a single count. The denominator – or the population at risk – was obtained from the California Department of Health Services monthly enrollment data, and provides an accurate count of monthly enrollment by demographic group and enrollment status. Standardized rates were calculated using the population distribution of 1994 Medi-Cal enrollees.

Researchers have cautioned about coding bias caused by hospitalization of patients who are uninsured until the time of admission, but who had been eligible for Medicaid, and who are therefore enrolled in Medicaid by the time of discharge to ensure that the hospital received payment.³² Even though these patients were uninsured prior to hospitalization, the hospitalizations are reported as Medicaid discharges, creating a potential bias towards higher apparent hospitalization rate among Medicaid beneficiaries. Because this study was concerned primarily with the influence of being enrolled in managed care or fee-for-service Medi-Cal on the future risk of preventable

hospitalization, hospitalizations were only included if the beneficiary had been enrolled in Medicaid managed care one month prior to hospitalization.

Voluntary and Mandatory Managed Care Enrollment

Mandatory Medi-Cal managed care was implemented over time and county-by-county during the study period, often preceded by a period of voluntary enrollment. Because selection bias may occur through the voluntary enrollment of healthier Medi-Cal beneficiaries into managed care, it is valuable to test for these effects by creating a restricted comparison of beneficiaries in fee-for-service and mandatory managed care. Separate preventable hospitalization rates were calculated for individuals who were enrolled in managed care under mandatory circumstances. Discrimination of voluntary from mandatory enrollment was determined with the date of Medi-Cal eligibility, aid category and county of residence.

Readmissions

Multiple readmissions by a small number of patients may drive variations in preventable hospitalization rates. Alternatively, MCOs may reduce preventable hospitalization rates simply by reducing the likelihood of readmission for those first admitted for a primary admission. In an attempt to account for the influence of readmissions, primary admissions were defined as the first admission by an individual during the six-year study period for an ACS condition. Readmissions were defined as any subsequent preventable hospitalization for an individual following a primary hospitalization for a preventable condition. Although it is important to understand the proportion of hospitalizations that are readmissions, the author acknowledges the difficulty of interpreting the significance of readmissions in this analysis. The effect of

managed care on readmissions is an important question, but it is also clear that some proportion of hospitalizations that are classified as primary hospitalizations in this analysis will in fact be readmissions for individuals who were hospitalized prior to the study period.

Marker Conditions

It is hypothesized that managed care may alter hospitalization rates for ACS conditions by making changes in access to care. However, the managed care environment may also reduce hospitalizations through mechanisms unrelated to access to care. To assess this hypothesis, it is important to determine that the same changes in preventable hospitalizations are not also observable in hospitalization rates for conditions that are not considered sensitive to access to care. Hospitalizations for the broad range of non-ACS conditions are driven by multiple factors and can be difficult to interpret, however. Researchers have therefore identified a category of hospitalizations for “marker” conditions, such as appendicitis or bowel obstruction, which are not thought to be affected by the availability of ambulatory care, and which can provide an objective standard for comparison.^{2, 11} This study will provide comparison analyses of hospitalization rates for appendicitis as a marker condition. Although variation has been observed in cases of appendicitis by race, age, season, and sex, the incidence of appendicitis is relatively stable.^{74, 75} It is important to note that while hospitalizations for *ruptured* appendicitis may indicate problems in access to care^{76, 77} and are therefore classified as preventable hospitalizations, a change in the rate of hospitalizations for all categories of appendicitis may indicate that there are alternative explanations for the effects of managed care on hospitalization rates besides changes in access to care.

Analysis

To compare the rates of hospitalization per 10,000 Medi-Cal person-months for fee-for-service and managed care, Poisson regression techniques were employed to control for potentially confounding factors. The Poisson distribution is often used to approximate situations with a large number of observations and relatively rare events, as is found in the case of preventable hospitalizations. Additionally, Poisson regression is ideal for analyzing person-time data used in this study. By analyzing the data in terms of person-months during a time period when many individuals were shifted from fee-for-service to managed care, the model compares preventable hospitalization rates for person-months in managed care and fee-for-service at one point in time, as well as person-months for individuals who were previously enrolled in fee-for-service but who were later enrolled in managed care. Statistical models were analyzed using the Statistical Analysis System's Genmod procedure.

The primary independent variables included managed care (MC, FFS) and race (Hispanic, black, Asian, white). Cross products were created to test whether the effect of managed care was influenced by a beneficiary's race/ethnicity. It was also important to control for potential differences between the groups that may have confounded the results. Controlling variables included beneficiary sex and age (0-17, 18-64), the season (by month) and year (1994-1999) of enrollment, and the county of residence (58 counties). Seasonality was thought to be a potential confounder because both enrollment and preventable hospitalizations fluctuate throughout the year, with the highest rates of preventable hospitalizations occurring during the winter. Controlling for the year of enrollment and admission allows for a comparison of FFS and MC person-months drawn

from a six-year period that adjusts for differences attributable to annual secular trends. The county of residence was considered an important adjustment for differences in the environment or health care system experienced by beneficiaries from different counties, especially since Medi-Cal managed care was implemented at the county level. As mentioned previously, to reduce the potential bias of those who are enrolled in Medi-Cal at the time of hospitalization, hospitalizations were included only for those who were enrolled in Medi-Cal one month prior to hospitalization.

To estimate the effect of Medi-Cal managed care (Objective 1), the Poisson regression model was used to estimate a rate ratio (MC/FFS) and standardized rates based on a 1994 population distribution for managed care (MC) and fee-for-service (FFS). Rate ratios and standardized rates were also calculated for each racial/ethnic group to demonstrate whether the effect of managed care was different across race/ethnicity groups (Objective 2).

Three additional models were employed to test the hypothesis that changes in preventable hospitalization rates by race/ethnicity are due to changes in access to care. The first model compared the effects of mandatory managed care with fee-for-service by excluding individuals who enrolled in Medicaid managed care voluntarily. The second model estimated the effects of managed care on primary hospitalization for an ACS condition by excluding readmissions during the six-year period. The third model provides a comparison of the impact of Medi-Cal managed care on hospitalizations for marker conditions that are not considered sensitive to ambulatory care.

RESULTS

Objective 1: The Impact of Medi-Cal Managed Care

Figure 1 demonstrates that managed care enrollment grew rapidly during the six-year period, increasing from 23 percent in 1994 to 78 percent in 1999. Table 2 profiles the demographic characteristics of the Medi-Cal person-months in either managed care or fee-for-service during the six-year study period. There were a total of 69,998,312 person-months enrolled in managed care and 88,136,161 person-months in fee-for-service Medi-Cal during the six-year period. The year distribution conveys the growth of managed care and the decrease in fee-for-service over time. The age, sex and race/ethnicity distributions of the two groups are similar, with a few exceptions. There is a slightly larger proportion of <18-year-old beneficiaries in managed care compared to fee-for-service (70 percent vs. 66 percent). There are also a higher proportion of blacks and a lower proportion of whites in managed care.

The Medi-Cal beneficiaries in this study were hospitalized 124,387 times for ACS conditions during the six-year period. The average unadjusted preventable hospitalization rates were 6.3 per 10,000 person-months in managed care and 9.1 per 10,000 person-months in fee-for-service. (Table 3)

Adjusting for beneficiary age, sex, and race, the month and year of enrollment, and the county of residence, the managed care/fee-for-service (MC/FFS) rate ratio was 0.63, ($p < .001$). (Table 3) In other words, managed care was associated with 37 percent fewer preventable hospitalizations compared to fee-for-service. The standardized preventable hospitalization rate for managed care was 6.0 per 10,000 person-months compared to 9.5 per 10,000 person-months in fee-for-service.

Figure 1: AFDC/TANF Enrollment, by Managed Care or FFS

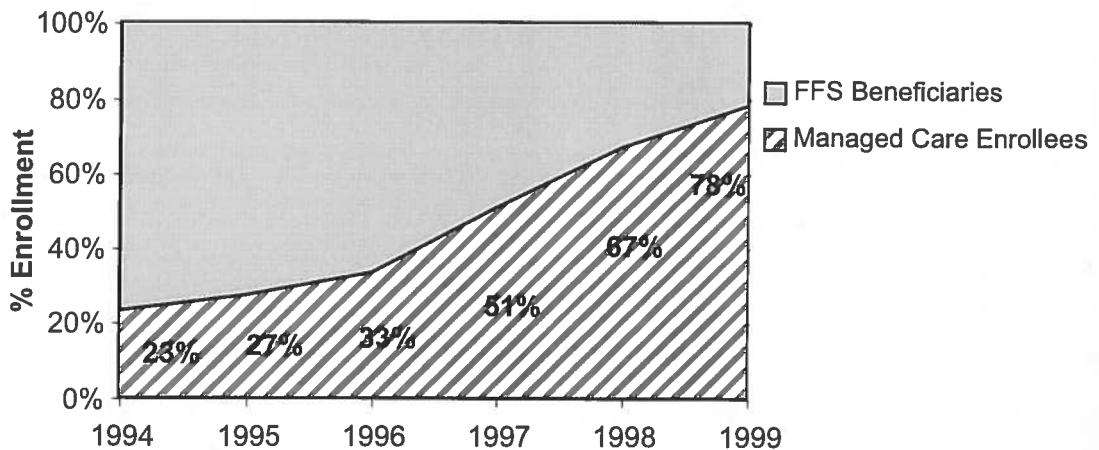


Table 2: Demographics, Managed Care vs. Fee-For-Service (1994-1999)

		Managed Care (Column %)	Fee-For-Service (Column %)
Year	1994	10%	25%
	1995	12%	24%
	1996	14%	22%
	1997	19%	15%
	1998	22%	8%
	1999	25%	5%
Age	<18	70%	66%
	18-64	30%	34%
Sex	Male	41%	42%
	Female	59%	58%
Race	Other	1%	1%
	Hispanic	42%	41%
	Black	23%	15%
	Asian	11%	12%
	White	23%	31%
Person-Months		69,998,312	88,136,161
Preventable Hospitalizations		43,983	80,404

Table 3: Unadjusted and Adjusted Preventable Hospitalization Rates

Unadjusted		Multivariate Regression Model					
ACS Rates (per 10,000 person-months)	Rate Ratio (MC/FFS)	Percent Difference MC vs. FFS	ACS Rates* (per 10,000 person-months)		Adjusted Rate Ratio (MC/FFS)	Percent Difference	
			FFS	MC			
MC: 6.3	FFS: 9.1	0.69	-31%	FFS: 9.5	MC: 6.0	0.63*	-37%

Abbreviations: MC = Managed Care; FFS = Fee-for-Service

*Adjusted for beneficiary age and sex; month and year of enrollment; and county of residence.

*p<.001

Objective 2: Interactions with Race and Ethnicity

Table 4 profiles the distribution of managed care and fee-for-service person-months by race and ethnicity. Again, the age and sex distributions across managed care and fee-for-service groups were generally similar. A larger proportion of Hispanics appeared to be less than 18 years old (75 percent and 70 percent) while whites were the least likely to be in this age category (63 percent and 61 percent).

Unadjusted preventable hospitalization rates were very different across race/ethnicity groups. In fee-for-service, the rate of preventable hospitalizations was higher for Hispanics (10.1 per 10,000 person-months) and blacks (11.8 per 10,000 person-months) when compared to whites (8.1 per 10,000 person-months), and lowest for Asians (4.9 per 10,000 person-months). (Table 5) Moreover, managed care was associated with fewer preventable hospitalizations than fee-for-service across all four race/ethnicity groups, but the largest differences occurred among Hispanics (-41 percent) and the smallest decreases occurred among whites (-16 percent).

Table 4: Demographics, Managed Care vs. FFS by Race, 1994-1999 Person-Months

	Hispanic		Black		Asian		White	
	MC	FFS	MC	FFS	MC	FFS	MC	FFS
Year								
1994	10%	24%	11%	27%	4%	30%	10%	25%
1995	11%	24%	13%	25%	7%	28%	13%	23%
1996	13%	23%	14%	22%	13%	22%	15%	20%
1997	18%	16%	18%	15%	24%	11%	19%	15%
1998	22%	8%	21%	8%	26%	6%	20%	10%
1999	26%	6%	24%	4%	27%	3%	22%	7%
Age								
0-17	75%	70%	68%	67%	66%	66%	63%	61%
18-64	25%	30%	32%	33%	34%	34%	37%	39%
Sex								
Male	43%	42%	37%	38%	46%	47%	39%	40%
Female	57%	58%	63%	62%	54%	53%	61%	60%
Person-Months	29,292,570	35,741,939	16,067,389	13,473,341	8,034,779	10,528,474	16,080,063	27,439,897
Preventable Hospitalizations	17,651	35,973	12,425	15,961	2,639	5,119	10,867	22,349

After adjusting for potentially confounding differences between the comparison groups, the results remained consistent with the unadjusted findings. In fee-for-service, the rate of preventable hospitalizations was significantly higher for Hispanics (10.3 per 10,000 person-months) and blacks (11.5 per 10,000 person-months) when compared to whites (8.7 per 10,000 person-months), and lower among Asians (5.0 per 10,000 person-months). (Table 5 and Figure 2) The estimated managed care/fee-for-service (MC/FFS) rate ratio for each race/ethnicity group indicated that the rate of preventable hospitalization was significantly lower in managed care than in fee-for-service for all four racial/ethnic groups (0.56 for Hispanics, 0.63 for blacks, 0.64 for Asians and 0.77 for whites; $p < .001$ for each). In other words, compared to fee-for-service for each race/ethnicity group, the preventable hospitalization rate in managed care was 44 percent lower for Hispanics, 37 percent lower for blacks, 36 percent lower for Asians, and 23 percent lower for whites. Interestingly, interpretation of the interaction probability values confirms that the effects of managed care for Hispanics, blacks and Asians were significantly larger than the effect of managed care among whites ($p < .001$ for each). The largest decrease occurred among Hispanics, who had a higher rate of preventable hospitalizations than whites in fee-for-service. However, the percent decrease associated with managed care for Asians was also larger than that of whites, despite lower preventable hospitalization rates for Asians in both fee-for-service and managed care.

Table 5: Unadjusted and Adjusted Preventable Hospitalization Rates, By Race

	Unadjusted				Multivariate Regression Model				
	Unadjusted ACS Rates (per 10,000 person-months)		Rate Ratio (MC/FFS)	Percent Difference	Adjusted ACS Rates ^ψ (per 10,000 person-months)		Adjusted Rate Ratio (MC/FFS)	Percent Difference	Interaction Pr>Chi2
	MC	FFS			MC	FFS			
Hispanic	6.0	10.1	0.59	-41%	5.8	10.3	0.56	-44%*	<.001**
Black	7.7	11.8	0.65	-35%	7.3	11.5	0.63	-37%*	<.001**
Asian/Pac	3.3	4.9	0.67	-33%	3.2	5.0	0.64	-36%*	<.001**
White	6.8	8.1	0.84	-16%	6.7	8.7	0.77	-23%*	Reference

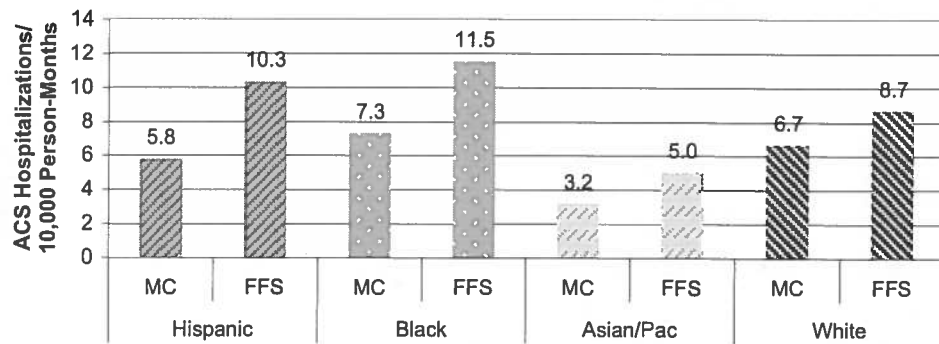
Abbreviations: MC = Managed Care; FFS = Fee-for-Service

^ψAdjusted for beneficiary age and sex; month and year of enrollment; and county of residence.

* p<.001

**Interpreted as the probability that the effect of MC is similar to the effect of MC among the reference group (white)

Figure 2: Adjusted Preventable Hospitalization Rates, 1994-1999, Managed Care (MC) vs. Fee-for-service (FFS), By Race



Rate Ratio ^ψ (MC/FFS)	.56*	.63*	.64*	.77*
Percent Difference	-44%	-37%	-36%	-23%
Interaction Pr>Chi2**	p<.001	p<.001	p<.001	Reference

Abbreviations: MC = Managed Care; FFS = Fee-for-Service

^ψAdjusted for beneficiary age and sex; month and year of enrollment; and county of residence.

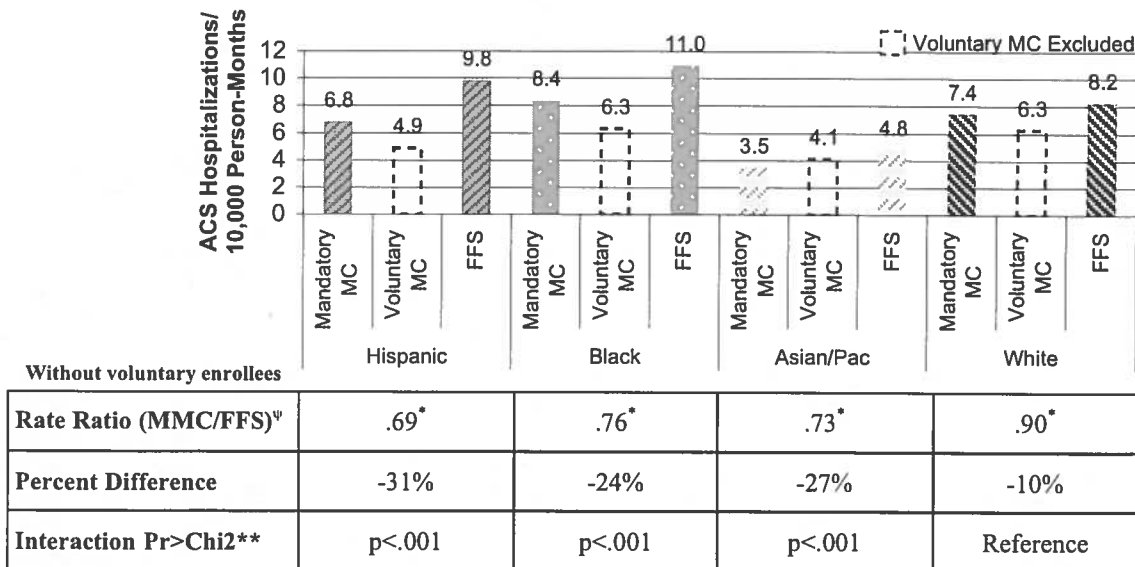
* p<.001

**Interpreted as the probability that the effect of MC is similar to the effect of MC among the reference group (white)

Mandatory Managed Care vs. Fee-for-Service

Comparing only mandatory managed care enrollees and fee-for-service beneficiaries gave a slightly different picture, but the pattern across race groups remained the same. (Figure 3) Mandatory managed care enrollees generally had higher preventable hospitalization rates than the voluntary managed care enrollees (with the exception of Asians), indicating that healthier individuals may have been more likely to enroll in managed care voluntarily. However, preventable hospitalization rates for only mandatory managed care enrollees remained significantly lower than the rates in fee-for-service. The estimated rate ratio was 0.69 for Hispanics, 0.76 for blacks, 0.73 for Asians, and 0.90 for whites ($p < .001$ for all groups). Moreover, the difference between managed care and fee-for-service remained significantly larger among Hispanics (-31 percent), blacks (-24 percent), and Asians (-27 percent), as compared to whites (-10 percent).

Figure 3: Adjusted Preventable Hospitalization Rates, 1994-1999, Mandatory Managed Care vs. Fee-For-Service, By Race



Abbreviations: MC = Managed Care; FFS = Fee-for-Service

^ψAdjusted for beneficiary age and sex; month and year of enrollment; and county of residence.

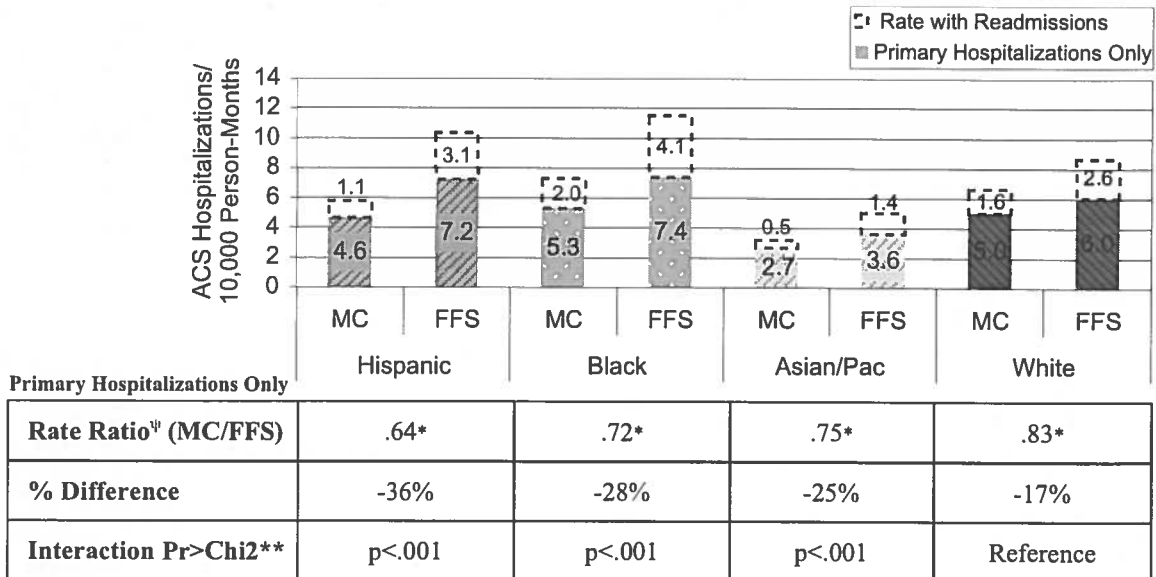
* $p < .001$

**Interpreted as the probability that the effect of MC is similar to the effect of MC among the reference group (white)

Primary Hospitalization and Multiple Readmissions

Readmissions accounted for a significant proportion of preventable hospitalizations in all four race/ethnicity groups, and were more likely to occur among fee-for-service compared to managed care beneficiaries. However, when readmissions were excluded and only primary hospitalizations were included in the analysis, managed care enrollees continued to have significantly lower preventable hospitalizations rates than fee-for-service beneficiaries across all race/ethnic groups. (Figure 4) The MC/FFS rate ratio was 0.64 for Hispanics, 0.72 for blacks, 0.75 for Asians and 0.83 for whites ($p < .001$ for all groups). Moreover, the difference between managed care and fee-for-service remained significantly larger for Hispanics (-36 percent), blacks (-28 percent), and Asians (-25 percent) compared to the difference among whites (-17 percent).

Figure 4: Adjusted Preventable Hospitalization Rates, 1994-1999, MC vs. FFS, Without Readmissions, By Race



Abbreviations: MC = Managed Care; FFS = Fee-for-Service

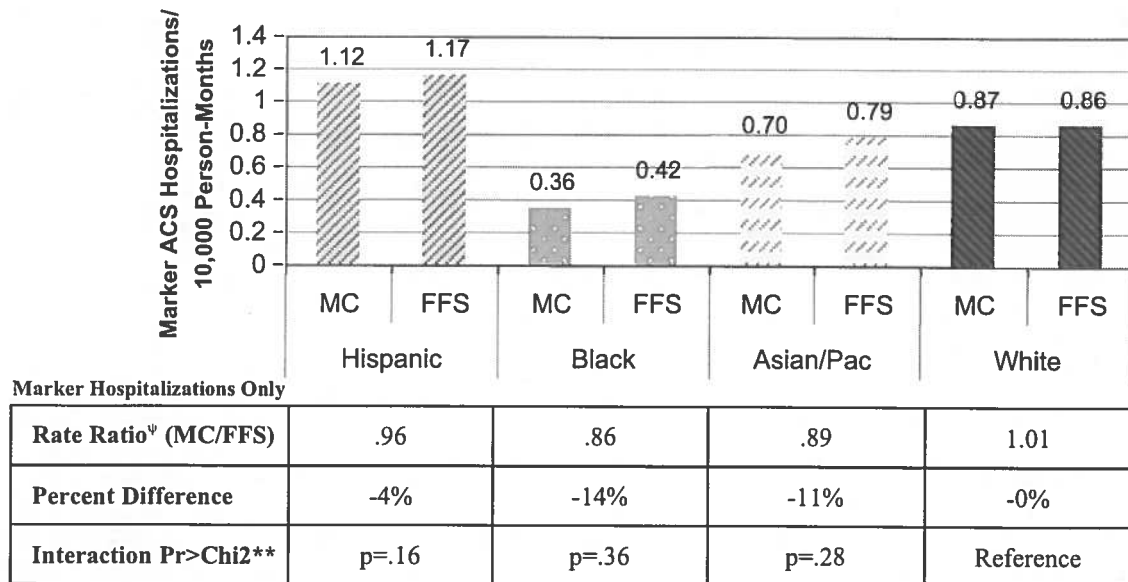
* $p < .001$

**Interpreted as the probability that the effect of MC is similar to the effect of MC among the reference group (white)

Non-ACS "Marker" Hospitalizations for Appendicitis

If the reductions in preventable hospitalizations associated with managed care can be explained through improvements in access to ambulatory care, then these findings should not be reflected in rates of "marker" conditions that are not thought to be preventable by improved access to ambulatory care. Hospitalizations for appendicitis were analyzed using similar models to test this alternative hypothesis and demonstrated a very different picture from the previous analyses of preventable hospitalizations. (Figure 5) As expected, adjusted rates of hospitalization for appendicitis were significantly different for each racial/ethnic group, with the highest rates occurring among Hispanics and the lowest rates among blacks. However, managed care was associated with only small differences within race/ethnicity groups, especially in comparison to the magnitude of changes observed in preventable hospitalizations. Ranging from 0 to -14 percent, the

Figure 5: Adjusted Marker Hospitalization Rate, 1994-1999, by Race and Managed Care



Abbreviations: MC = Managed Care; FFS = Fee-for-Service

**Interpreted as the probability that the effect of MC is similar to the effect of MC among the reference group (white)

reductions were statistically significant in multivariate models, but these results should be interpreted with caution given the large sample of person-months used in this analysis. Additionally, in contrast to the analyses of preventable hospitalizations, the effect of managed care on rates of hospitalization for appendicitis were not significantly different for Hispanics, blacks or Asians when compared to whites.

DISCUSSION

Medi-Cal beneficiaries who were enrolled in managed care had fewer preventable hospitalizations compared to beneficiaries enrolled in traditional fee-for-service Medi-Cal. This evidence suggests that difficulties in receiving outpatient care in the fee-for-service system may have led to greater deterioration of beneficiary health and higher risk of preventable hospitalization. More importantly, this evidence supports the hypothesis that Medi-Cal managed care may have reduced the rate of preventable hospitalizations by facilitating greater access to primary care compared to traditional FFS. This difference appears both statistically and clinically significant, and provides encouraging support for California's reforms.

Although managed care was associated with significantly fewer preventable hospitalizations rates for all four race/ethnicity groups, the largest differences were found among Asians, blacks and especially Hispanics. The effect of managed care for Hispanics (-44 percent) was almost twice that of whites (-23 percent). These findings remained significant after controlling for important confounding factors, as well as after adjusting for risk selection due to voluntary enrollment and excluding readmissions. Larger reductions also do not appear to be driven by higher absolute preventable

hospitalization rates in fee-for-service, since Asians also experienced proportionally larger reductions compared to whites despite having dramatically lower rates in both managed care and fee-for-service. In addition, a similar association was not found between managed care and hospitalizations for appendicitis, suggesting that managed care did not simply reduce hospitalization rates for all conditions and that changes in preventable hospitalization rates may be associated with improvements in access.

It is not clear that whites and non-whites experience managed care differently. Instead, it is more likely that larger improvements for non-whites were attributable to greater pre-existing barriers to primary care – and therefore higher preventable hospitalization rates – in the traditional fee-for-service system. If non-whites had greater difficulties in accessing and receiving primary care because of problems like language, cultural attitudes or other barriers, then the implementation of mandatory managed care and the alignment of incentives towards receiving continuous and coordinated care through a designated primary care provider may have worked to alleviate these disparities.

The results of this study are based on comparisons of person-months in fee-for-service or managed care during a six-year period of rapid managed care reform. Although multivariate regression techniques were employed to adjust for potentially important differences between these groups, it is possible that there was incomplete adjustment for other important differences in predisposing factors such as severity of disease or comorbidity. Some studies have used comorbidity scales that were originally designed to predict the level of hospital resources that would be required rather than the likelihood of hospitalization.^{11, 38} Other studies have used the 1-4 APR severity scale

assigned upon admission to adjust for differences by severity of disease.¹ Preliminary analysis of the data suggested correlation with high severity and hospitalization that would limit the usefulness of this adjustment. Moreover, it is not clear that adjustment for disease severity is appropriate. Because the severity of an individual's condition may be a predisposing factor for hospitalization, but also an intermediate health outcome related to access, overadjustment for these differences in severity of disease may reduce important differences in health status. These scales may be useful when comparing widely diverse populations with variable socioeconomic status, or when using standard discharge data that lack important details about Medicaid patients, such as their eligibility category. However, this study used information from Medi-Cal enrollment data to restrict the study population to individuals with relatively similar socioeconomic status (AFDC/TANF-eligible Medi-Cal beneficiaries) and health requirements (non-SSI). This study further tested alternative explanations that voluntary managed care enrollment by healthy individuals, or readmissions for less healthy individuals, contributed to the differences observed among managed care and fee-for-service beneficiaries.

While managed care may have reduced preventable hospitalization rates through better access to primary care, it is possible that reductions were caused by decreased access to hospital care for Medi-Cal beneficiaries, especially among minorities. It has been suggested that fewer preventable hospitalizations could be attributable to higher thresholds of admission for certain patients by physicians.² It is possible that the implementation of managed care created pressure on physicians to limit hospitalizations by raising the threshold for admission. This alternative explanation is unsettling, but there has not been evidence to support its validity. A cross-sectional study found that

physician practice style did not appear to explain variations in preventable hospitalization.³⁰ A recent study also found that admission rates for patients presenting in the emergency department were not significantly different by race or insurance status when controlling for severity, suggesting that physician admitting practices were not subject to systematic biases.⁴⁶

As an indicator of access to care, preventable hospitalization rates do not reveal the sequences of events that lead to hospitalizations, or the individual factors that prevent hospitalizations. It is hypothesized that managed care enrollees, especially minorities who may have had reduced access to care in fee-for-service, experienced reductions in preventable hospitalizations through a concerted emphasis on continuous and coordinated care from a primary care provider. While this was certainly one of the stated objectives for Medi-Cal managed care reform, there is no data to confirm that Medi-Cal patients truly experienced improvements in continuity and coordination and further research is necessary to elucidate the extent to which these good intentions became a reality. It is also not clear that reductions in preventable hospitalization were attributable to unique qualities of managed care, or simply through improving the likelihood of having a regular source of care. Furthermore, it is not evident whether Medi-Cal managed care physicians were able to improve the provision of preventive care, acute care or chronic disease education and management, although some improvements in a limited number of preventive and chronic disease care measures have been reported for Medi-Cal managed care plans in California.⁵³ Different mechanisms may also explain improvements in access to care for different race/ethnicity groups. Language proficiency and cultural

competency standards for managed care organizations may have improved the Medi-Cal system's ability to serve California's diverse populations.

Ultimately, a comprehensive understanding of Medi-Cal Managed Care requires an evaluation of multiple indicators and potential effects. Important issues include the impact on patient satisfaction and access to other types of services, the financial health of Medicaid providers and the safety net, the effects on the health system's ability to cross-subsidize care for the uninsured, the impact on state Medicaid spending, and the ability of the program to withstand future budget constraints and cutbacks.

CONCLUSIONS

Medicaid managed care was implemented across the county in an attempt to contain spiraling costs while improving access to a “medical home,” but its impact on access to care has remained unclear. Preventable hospitalizations may be a valuable and relatively cost-effective method for monitoring access to care. It was hypothesized that managed care improved access to care by facilitating a continuous relationship with a primary care provider, and that this relationship might differentially affect race/ethnicity groups and the unique barriers to care that they experience. In this evaluation of California’s Medi-Cal managed care program, managed care was associated with improved outcomes in one indicator of access to care – preventable hospitalizations. Moreover, the largest reductions occurred among minority groups that faced greater barriers to having a primary care provider in traditional fee-for-service. Further research is necessary to provide a more complete picture of the impact and mechanisms of Medicaid managed care.

REFERENCES

1. *AHRQ Quality Indicators - Guide to Prevention Quality Indicators: Hospital Admission for Ambulatory Care Sensitive Conditions*. Rockville, MD: Agency for Healthcare Research and Quality; 2001. AHRQ Pub. No. 02-R0203.
2. Billings J, Zeitel L, Lukomnik J, Carey TS, Blank AE, Newman L. Impact of socioeconomic status on hospital use in New York City. *Health Aff (Millwood)*. Spring 1993;12(1):162-173.
3. Rutstein DD, Berenberg W, Chalmers TC, Child CG, 3rd, Fishman AP, Perrin EB. Measuring the quality of medical care. A clinical method. *N Engl J Med*. Mar 11 1976;294(11):582-588.
4. Millman M, ed. *Access to health care in America*. Washington, DC: National Academy Press; 1993. Institute of Medicine - Committee on Monitoring Access to Personal Health Care Services.
5. Solberg LI, Kent E, Peterson RWE, Kenneth Romness, Elizabeth Rohrenbach, Terry Thell, Angela Smith, Ann Routier, Mary Wermuth Stillmank, Solomon Zak. The Minnesota Project: A Focused Approach to Ambulatory Quality Assessment. *Inquiry*. 1990;27(Winter 1990):359-367.
6. Bigby J, Dunn J, Goldman L, et al. Assessing the preventability of emergency hospital admissions: A method for evaluating quality of medical care in a primary care facility. *American Journal of Medicine*. 1987;83(December):1031-1036.
7. Weissman JS, Gatsonis C, Epstein AM. Rates of avoidable hospitalization by insurance status in Massachusetts and Maryland. *Jama*. Nov 4 1992;268(17):2388-2394.
8. Sanderson C, Dixon J. Conditions for which onset or hospital admission is potentially preventable by timely and effective ambulatory care. *J Health Serv Res Policy*. Oct 2000;5(4):222-230.
9. Brown AD, Goldacre MJ, Hicks N, et al. Hospitalization for ambulatory care-sensitive conditions: a method for comparative access and quality studies using routinely collected statistics. *Can J Public Health*. Mar-Apr 2001;92(2):155-159.
10. Caminal J, Mundet X, Ponsa J, Sanchez E, Casanova C. [Hospitalizations due to ambulatory care sensitive conditions: selection of diagnostic codes for Spain]. *Gac Sanit*. Mar-Apr 2001;15(2):128-141.

11. Basu J, Friedman B, Burstin H. Primary care, HMO enrollment, and hospitalization for ambulatory care sensitive conditions: a new approach. *Med Care*. Dec 2002;40(12):1260-1269.
12. Foster DA, Talsma A, Furumoto-Dawson A, et al. Influenza vaccine effectiveness in preventing hospitalization for pneumonia in the elderly. *Am J Epidemiol*. Aug 1 1992;136(3):296-307.
13. Perlstein PH, Lichtenstein P, Cohen MB, et al. Implementing an evidence-based acute gastroenteritis guideline at a children's hospital. *Jt Comm J Qual Improv*. Jan 2002;28(1):20-30.
14. Weinberg AD, Minaker KL. Dehydration. Evaluation and management in older adults. Council on Scientific Affairs, American Medical Association. *Jama*. Nov 15 1995;274(19):1552-1556.
15. Hackner D, Tu G, Weingarten S, Mohsenifar Z. Guidelines in pulmonary medicine: a 25-year profile. *Chest*. Oct 1999;116(4):1046-1062.
16. Gibbons RJ, Abrams J, Chatterjee K, et al. ACC/AHA 2002 guideline update for the management of patients with chronic stable angina--summary article: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Committee on the Management of Patients With Chronic Stable Angina). *Circulation*. Jan 7 2003;107(1):149-158.
17. Suissa S, Ernst P, Kezouh A. Regular use of inhaled corticosteroids and the long term prevention of hospitalisation for asthma. *Thorax*. Oct 2002;57(10):880-884.
18. Ghosh CS, Ravindran P, Joshi M, Stearns SC. Reductions in hospital use from self management training for chronic asthmatics. *Soc Sci Med*. Apr 1998;46(8):1087-1093.
19. Greineder DK, Loane KC, Parks P. A randomized controlled trial of a pediatric asthma outreach program. *J Allergy Clin Immunol*. Mar 1999;103(3 Pt 1):436-440.
20. Bethell C. *Preventable hospitalization as an indicator of health system performance: An evaluation of the ambulatory care sensitive hospitalization measure.*: Ph.D. dissertation, University of Chicago; 1996.
21. Begley CE, Slater CH, Engel MJ, Reynolds TF. Avoidable hospitalizations and socio-economic status in Galveston County, Texas. *J Community Health*. Oct 1994;19(5):377-387.

22. Djojonegoro BM, Aday LA, Williams AF, Ford CE. Area income as a predictor of preventable hospitalizations in the Harris County Hospital District, Houston. *Tex Med.* Jan 2000;96(1):58-62.
23. Pappas G, Hadden WC, Kozak LJ, Fisher GF. Potentially avoidable hospitalizations: inequalities in rates between US socioeconomic groups. *Am J Public Health.* May 1997;87(5):811-816.
24. Parker JD, Schoendorf KC. Variation in hospital discharges for ambulatory care-sensitive conditions among children. *Pediatrics.* Oct 2000;106(4 Suppl):942-948.
25. Caper P. The Microanatomy of Health Care. *Health Aff (Millwood).* Spring 1993;12(1):174-177.
26. Culler SD, Parchman ML, Przybylski M. Factors related to potentially preventable hospitalizations among the elderly. *Med Care.* Jun 1998;36(6):804-817.
27. Casanova C, Colomer C, Starfield B. Pediatric hospitalization due to ambulatory care-sensitive conditions in Valencia (Spain). *Int J Qual Health Care.* Feb 1996;8(1):51-59.
28. Billings J, Anderson GM, Newman LS. Recent findings on preventable hospitalizations. *Health Aff (Millwood).* Fall 1996;15(3):239-249.
29. Blustein J, Hanson K, Shea S. Preventable hospitalizations and socioeconomic status. *Health Aff (Millwood).* Mar-Apr 1998;17(2):177-189.
30. Bindman AB, Grumbach K, Osmond D, et al. Preventable hospitalizations and access to health care. *Jama.* Jul 26 1995;274(4):305-311.
31. Berk ML, Schur CL. Access to Care: How much difference does Medicaid make? *Health Aff (Millwood).* May/June 1998;17(3):169-180.
32. Friedman B, Jee J, Steiner C, Bierman A. Tracking the State Children's Health Insurance Program with hospital data: national baselines, state variations, and some cautions. *Med Care Res Rev.* Dec 1999;56(4):440-455.
33. Smedley BD, Stith AY, Nelson AR, eds. *Unequal Treatment: Confronting Racial and Ethnic Disparities in Health Care.* Washington, D.C.: National Academy of Sciences; 2003. Medicine Io, ed.

34. Kozak LJ, Hall MJ, Owings MF. Trends in avoidable hospitalizations, 1980-1998. *Health Aff (Millwood)*. Mar-Apr 2001;20(2):225-232.
35. Shi L, Lu N. Individual sociodemographic characteristics associated with hospitalization for pediatric ambulatory care sensitive conditions. *J Health Care Poor Underserved*. Nov 2000;11(4):373-384.
36. Gaskin DJ, Hoffman C. Racial and ethnic differences in preventable hospitalizations across 10 states. *Med Care Res Rev*. 2000;57 Suppl 1:85-107.
37. Parchman ML, Culler S. Primary care physicians and avoidable hospitalizations. *J Fam Pract*. Aug 1994;39(2):123-128.
38. Friedman B, Basu J. Health insurance, primary care, and preventable hospitalization of children in a large state. *Am J Manag Care*. May 2001;7(5):473-481.
39. Parchman ML, Culler SD. Preventable hospitalizations in primary care shortage areas. An analysis of vulnerable Medicare beneficiaries. *Arch Fam Med*. Nov-Dec 1999;8(6):487-491.
40. Schreiber S, Zielinski T. The meaning of ambulatory care sensitive admissions: urban and rural perspectives. *J Rural Health*. Fall 1997;13(4):276-284.
41. Ricketts TC, Randolph R, Howard HA, Pathman D, Carey T. Hospitalization rates as indicators of access to primary care. *Health Place*. Mar 2001;7(1):27-38.
42. Grumbach K. *Primary care resources and preventable hospitalizations in California*. Berkeley, CA: California Policy Seminar, University of California; 1995.
43. Lambrew JM, DeFries GH, Carey TS, Ricketts TC, Biddle AK. The effects of having a regular doctor on access to primary care. *Med Care*. Feb 1996;34(2):138-151.
44. Gill JM. Can hospitalizations be avoided by having a regular source of care? *Fam Med*. Mar 1997;29(3):166-171.
45. Gill JM, Mainous AG, 3rd. The role of provider continuity in preventing hospitalizations. *Arch Fam Med*. Jul-Aug 1998;7(4):352-357.

46. Oster A, Bindman AB. Emergency department visits for ambulatory care sensitive conditions: insights into preventable hospitalizations. *Med Care*. Feb 2003;41(2):198-207.
47. Falik M, Needleman J, Wells BL, Korb J. Ambulatory care sensitive hospitalizations and emergency visits: experiences of Medicaid patients using federally qualified health centers. *Med Care*. Jun 2001;39(6):551-561.
48. Epstein AJ. The role of public clinics in preventable hospitalizations among vulnerable populations. *Health Serv Res*. Jun 2001;36(2):405-420.
49. Kaestner R, Joyce T, Racine A. Medicaid eligibility and the incidence of ambulatory care sensitive hospitalizations for children. *Social Science & Medicine*. Jan 2001;52(2):305-313.
50. Backus L, Moron M, Bacchetti P, Baker LC, Bindman AB. Effect of managed care on preventable hospitalization rates in California. *Med Care*. Apr 2002;40(4):315-324.
51. Long SK, Coughlin TA. Impacts of Medicaid managed care on children. *Health Serv Res*. Apr 2001;36(1 Pt 1):7-23.
52. Lillie-Blanton M, Lyons B. Managed care and low-income populations: recent state experiences. *Health Aff (Millwood)*. May-Jun 1998;17(3):238-247.
53. *Medi-Cal Managed Care Health Plans*. Sacramento, CA: California Department of Health Services; December 2001 2001.
54. Gadomski A, Jenkins P, Nichols M. Impact of a Medicaid primary care provider and preventive care on pediatric hospitalization. *Pediatrics*. Mar 1998;101(3):E1.
55. Lo Sasso AT, Freund DA. A longitudinal evaluation of the effect of Medi-Cal managed care on supplemental security income and aid to families with dependent children enrollees in two California counties. *Med Care*. Sep 2000;38(9):937-947.
56. Porell FW. A comparison of ambulatory care-sensitive hospital discharge rates for Medicaid HMO enrollees and nonenrollees. *Med Care Res Rev*. Dec 2001;58(4):404-424; discussion 425-409.
57. Hakim RB, Bye BV. Effectiveness of compliance with pediatric preventive care guidelines among Medicaid beneficiaries. *Pediatrics*. Jul 2001;108(1):90-97.

58. Giuffrida A, Gravelle H, Roland M. Measuring quality of care with routine data: avoiding confusion between performance indicators and health outcomes. *Bmj*. Jul 10 1999;319(7202):94-98.
59. Tai-Seale M, LoSasso AT, Freund DA, Gerber SE. The long-term effects of Medicaid managed care on obstetrics care in three California counties. *Health Serv Res*. Aug 2001;36(4):751-771.
60. Smith WR, Cotter JJ, McClish DK, Bovbjerg VE, Rossiter LF. Access, satisfaction, and utilization in two forms of Medicaid managed care. *Clin Perform Qual Health Care*. 2000;8(3):150-157.
61. Coughlin TA, Long SK. Effects of medicaid managed care on adults. *Med Care*. Apr 2000;38(4):433-446.
62. Ganz ML, Sisk JE. Evaluation of Medicaid managed care for children: access and satisfaction. *Am J Public Health*. Dec 2000;90(12):1947-1948.
63. Sisk JE, Gorman SA, Reisinger AL, Glied SA, DuMouchel WH, Hynes MM. Evaluation of Medicaid managed care. Satisfaction, access, and use. *Jama*. Jul 3 1996;276(1):50-55.
64. U.S. General Accounting Office, Medicaid: States Turn to Managed Care to Improve Access and Control Costs," GAO/T-HRD-93-10 (Washington GAO, March 1993).
65. Holahan J, Zuckerman S, Evans A, Rangarajan S. Medicaid managed care in thirteen states. *Health Aff (Millwood)*. May-Jun 1998;17(3):43-63.
66. Data from the Centers for Medicare and Medicaid Services Website, "Medicaid Managed Care Trends," <http://cms.hhs.gov/medicaid/managedcare/enrolstats.asp> (June 2002).
67. Cunningham PJ, Trude S. Does Managed Care Enable More Low Income Persons to Identify a Usual Source of Care? *Medical Care*. 2001;39(7):716-726.
68. Ware JE, Jr., Brook RH, Rogers WH, et al. Comparison of health outcomes at a health maintenance organisation with those of fee-for-service care. *Lancet*. May 3 1986;1(8488):1017-1022.
69. National Committee for Quality Assurance, "Medicaid Benchmarks for HEDIS Effectiveness of Care and CAHPS® 2.0H measures (02/08/00)" (NCQA: Washington, DC).

70. Author's analysis of the 2001 California Health Interview Survey data available at <http://www.chis.ucla.edu/main/default.asp>
71. Hargraves JL, Cunningham PJ, Hughes RG. Racial and ethnic differences in access to medical care in managed care plans. *Health Serv Res.* Oct 2001;36(5):853-868.
72. Wallace SP, Villa VM, Enriquez-Haass V, Mendez CA. Access is better for racial/ethnic elderly in Medicare HMOs--but disparities persist. *Policy Brief UCLA Cent Health Policy Res.* May 2001(PB2001-2):1-4.
73. Phillips KA, Mayer ML, Aday LA. Barriers to care among racial/ethnic groups under managed care. *Health Aff (Millwood).* Jul-Aug 2000;19(4):65-75.
74. Luckmann R, Davis P. The epidemiology of acute appendicitis in California: racial, gender, and seasonal variation. *Epidemiology.* Sep 1991;2(5):323-330.
75. Addiss DG, Shaffer N, Fowler BS, Tauxe RV. The epidemiology of appendicitis and appendectomy in the United States. *Am J Epidemiol.* Nov 1990;132(5):910-925.
76. Gadomski A, Jenkins P. Ruptured appendicitis among children as an indicator of access to care. *Health Serv Res.* Apr 2001;36(1 Pt 1):129-142.
77. Braveman P, Schaaf VM, Egerter S, Bennett T, Schechter W. Insurance-related differences in the risk of ruptured appendix. *N Engl J Med.* Aug 18 1994;331(7):444-449.