Medicaid

The Impact of Medicaid Managed Care on Hospitalizations for Ambulatory Care Sensitive Conditions

Andrew B. Bindman, Arpita Chattopadhyay, Dennis H. Osmond, William Huen, and Peter Bacchetti

Objective. To determine whether Medicaid managed care is associated with lower hospitalization rates for ambulatory care sensitive conditions than Medicaid fee-for-service. We also explored whether there was a differential effect of Medicaid managed care by patient's race or ethnicity on the hospitalization rates for ambulatory care sensitive conditions.

Data Sources/Study Setting. Electronic hospital discharge abstracts for all California temporary assistance to needy families (TANF)-eligible Medicaid beneficiaries less than age 65 who were admitted to acute care hospitals in California between 1994 and 1999.

Study Design. We performed a cross-sectional comparison of average monthly rates of admission for ambulatory care-sensitive conditions among TANF-eligible Medicaid beneficiaries in fee-for-service, voluntary managed care, and mandatory managed care.

Data Collection/Extraction Methods. We calculated monthly rates of ambulatory care-sensitive condition admission rates by counting admissions for specified conditions in hospital discharge files and dividing the monthly count of admissions by the size of the at-risk population derived from a separate monthly Medicaid eligibility file. We used multivariate Poisson regression to model monthly hospital admission rates for ambulatory care-sensitive conditions as a function of the Medicaid delivery model controlling for admission month, admission year, patient age, sex, race/ethnicity, and county of residence.

Principal Findings. The adjusted average monthly hospitalization rate for ambulatory care-sensitive conditions per 10,000 was 9.36 in fee-for-service, 6.40 in mandatory managed care, and 5.25 in voluntary managed care ($p < .0001$ for all pairwise comparisons). The difference in hospitalization rates for ambulatory care sensitive conditions in Medicaid fee-for-service versus managed care was significantly larger for patients from minority groups than for whites.

Conclusions. Selection bias in voluntary Medicaid managed care programs exaggerates the differences between managed care and fee-for-service, but the 33 percent lower rate of hospitalizations for ambulatory care sensitive conditions found in mandatory managed care compared with fee-for-service suggests that Medicaid managed care is associated with a large reduction in hospital utilization, which likely reflects health benefits. The greater effect of Medicaid managed care for minority compared with white beneficiaries is consistent with other findings that suggest that managed care is associated with improvements in access to ambulatory care for those patients who have traditionally faced the greatest barriers to health care.

Key Words. Medicaid, managed care, preventable hospitalizations, ambulatory care sensitive conditions

Medicaid originated in the mid-1960s as a jointly financed federal and state health insurance program for low-income, disabled, and elderly Americans. Medi-Cal, California's Medicaid program, is the largest state Medicaid program in the country. In fiscal year 2002–2003, Medi-Cal provided health insurance to roughly 6.3 million Californians at an estimated cost of almost \$27 billion (Street 2002).

Enrollment in the Medi-Cal program does not necessarily ensure access to health care services. Surveys of California physicians have found that a little more than half accept Medi-Cal patients (Bindman, Yoon, and Grumbach 2003), and that the supply of primary care physicians available to Medi-Cal beneficiaries is below recommended federal standards (Council on Graduate Medical Education 1996). A survey of Medi-Cal beneficiaries conducted in 1999 found that 56 percent of beneficiaries reported difficulty in finding doctors who were willing to treat Medi-Cal patients (Medi-Cal Policy Institute 2000). Furthermore, there are racial and ethnic differences in Medi-Cal beneficiaries' access to a regular source of care. For example, in 2001, Latino Medi-Cal beneficiaries were almost three times as likely to lack a usual source of care compared with white Medi-Cal beneficiaries (20 versus 7 percent) (UCLA Center for Health Policy Research 2002).

During the period of 1994–1999, California expanded Medi-Cal managed care from 16 to 50 percent statewide, in part, to improve beneficiaries' access to and quality of ambulatory care (Klein and Donaldson 2002). Medi-Cal managed care was implemented on a county by county basis through a combination of voluntary and mandatory managed care targeting mainly beneficiaries eligible through the temporary assistance to needy families

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(TANF) program (predominantly women and children). As opposed to Medi-Cal fee-for-service, Medi-Cal managed care requires beneficiaries to have a regular source of primary care to receive health care services.

This study describes variation in outpatient care for Medi-Cal beneficiaries using hospitalization rates for ambulatory care sensitive conditions. Ambulatory care sensitive conditions such as asthma, diabetes, and hypertension are conditions that can often be managed with timely and effective treatment in an outpatient setting, thereby preventing hospitalization. The Agency for Health Research and Quality includes hospitalizations for these conditions as a part of their prevention indicators because “even though these indicators are based on hospital inpatient data, they provide insight into the quality of the health care system outside of the hospital setting”(Agency for Health Research and Quality 2004). Hospital admissions for these conditions reflect a decline in health status, and higher rates of admission for these conditions are associated with worse access to care (Bindman, Grumbach, and Osmond 1995). Ambulatory care sensitive condition admission rates have repeatedly been shown to be higher in the U.S. among low-income persons, African-Americans, Hispanics, Medicaid beneficiaries, and the uninsured (Gaskin and Hoffman 2000, Pappas et al. 1997). Medicaid patients who have more continuity of care with a regular provider have lower rates of hospitalizations for chronic ambulatory care sensitive conditions (Gill and Mainous 1998).

Some policy analysts have been concerned that the resource limitations within managed care could undermine Medicaid beneficiaries’ access to high-quality care and thereby increase hospitalizations for ambulatory care sensitive conditions (Institute of Medicine 2000). On the other hand, the requirement that beneficiaries have a regular source of care and the financial arrangements within Medi-Cal managed care would appear to create an incentive for reducing unnecessary hospitalizations. Medi-Cal managed care plans are paid a capitation rate from the state based on the number of beneficiaries who sign up with their plan on a monthly basis. The capitation payment is used to cover beneficiaries’ inpatient and outpatient costs. Medi-Cal managed care plans are at risk for the cost of their patients’ care and they have a financial incentive to shift expensive hospital-based care to less expensive outpatient treatment.

The few studies that have examined the impact of Medicaid managed care on ambulatory care sensitive condition admission rates have been limited to case studies of a few counties (Lo Sasso and Freund 2000; Tai-Seale et al. 2001) or by the health-related selection bias inherent in voluntary Medicaid

managed care programs (Gadomski, Jenkins, and Nichols 1998; Long and Coughlin 2001; Porell 2001). The aim of the current study is to improve our understanding of hospitalization rates for ambulatory care sensitive conditions in a large Medicaid program that used three different delivery models: fee-for-service, voluntary managed care, and mandatory managed care. We also explored whether there was a differential effect of Medicaid managed care by patient's race or ethnicity on the hospitalization rates for ambulatory care sensitive conditions.

METHODS

The timeframe of this project, 1994–1999, corresponds to the period of a “natural experiment” during which there was a substantial increase in the use of managed care in the Medi-Cal program. Prior to 1994, five of California's 58 counties participated in a demonstration project of mandatory Medi-Cal managed care. During the period of the study, 16 additional large urban counties in the state (where approximately 85 percent of the Medi-Cal beneficiaries in the state reside) also implemented a mandatory managed care program for all of their TANF-eligible Medi-Cal beneficiaries. The implementation of Medi-Cal managed care took somewhat different forms in the affected counties. The main difference was whether the managed care was provided by a county (public) operated health plan, commercial (private) health plans, or some combination of the two. Prior to this mandated requirement, TANF-eligible Medi-Cal beneficiaries may have either been in fee-for-service or voluntary managed care, and counties that did not implement mandatory Medi-Cal managed care during the study period continued to have Medi-Cal beneficiaries in either fee-for-service or voluntary managed care.

The data for this study come from two main sources: (1) the annual California hospital discharge data available from the California Office of Statewide Health Planning and Development (OSHPD), and (2) the California Department of Health Services (DHS) Medi-Cal monthly eligibility file. The California hospital discharge record includes among other things, information on admission month and year, patient demographics, and diagnosis and procedure codes. OSHPD applies several hundred audit rules to ensure the validity of their data before making them available and would not release the key data elements used in this study if they exceeded an error tolerance level of 0.1 percent (Office of Statewide Health Planning and Development 2000). This file also contains a field indicating expected source of payment, but

there are reasons to suspect that this information may be inaccurate, particularly for Medi-Cal beneficiaries. To enhance the accuracy of whether a hospitalized individual was in fact a Medi-Cal beneficiary, we used a special research file that linked hospital discharge data with the DHS Medi-Cal eligibility file for the period of 1994–1999. This file provided additional information for the entire year on patients' month-by-month Medi-Cal enrollment status, aid category, health plan, and the county of residence. These data elements, combined with DHS supplied information on the date in which a California county implemented mandatory Medi-Cal managed care, enabled us to classify each hospitalization as occurring for a Medi-Cal beneficiary in fee-for-service, voluntary managed care, or mandatory managed care. Overall, 93 percent of Medi-Cal hospitalizations recorded by DHS could be linked using patient identifiers, such as social security numbers, with a hospitalization record in the OSHPD file. The 7 percent that could not be matched were mostly among newborns whose records could not be distinguished from their mothers' (Rains and Tagupa 2001).

Since we are using hospitalizations as an indicator of ambulatory care prior to the hospitalization, we chose to assign to Medi-Cal only those hospitalizations in which an individual had Medi-Cal coverage in the month prior to hospitalization. In this way we avoided the misclassification of an uninsured individual who gained Medi-Cal as a result of their hospitalization. However, this approach required that we exclude January admissions from our analysis as information on an individual's Medi-Cal eligibility was only available for the calendar year, and we could not determine if someone with a January admission was a Medi-Cal beneficiary in the previous December. Also since our hospitalization discharge and enrollment files were linked to a calendar year, we could not accurately calculate admission rates for hospital admissions that resulted in discharges in a different calendar year. Less than 1 percent of admissions had discharges in a subsequent year and these were excluded from the analysis.

We captured Medi-Cal beneficiaries' hospitalizations in states that border California by searching for Medicaid beneficiaries with California zip codes in Arizona's, Nevada's, and Oregon's hospital discharge abstracts records for the same time period. Ambulatory care sensitive condition hospitalizations of California residents in these three states totaled less than 0.2 percent of such hospitalizations within California.

Data on number, demographics, eligibility category, and health plan type of the entire Medi-Cal population (not just those hospitalized) were obtained from DHS's Medi-Cal monthly eligibility file. The enrollment files for

years prior to 1996 contained information only as of the first month of each quarter (January, April, July, and October). We used linear interpolation to obtain the estimate for the other 8 months of those years.

It was our hypothesis that, if Medi-Cal managed care was having a positive effect on Medi-Cal beneficiaries' access to ambulatory care, then we would observe a lower rate of ambulatory care sensitive admissions among Medi-Cal beneficiaries in managed care than we would among Medi-Cal beneficiaries in fee-for-service care. Assuming that voluntary Medi-Cal managed care would disproportionately attract healthier Medi-Cal beneficiaries than would be assigned under a mandatory Medi-Cal managed care program, we also expected to observe lower rates of admissions for ambulatory care sensitive conditions in voluntary than mandatory Medi-Cal managed care.

If mandatory Medi-Cal managed care completely eliminated the opportunity for beneficiaries to choose between managed care and fee-for-service, then the difference in hospitalization rates for ambulatory care sensitive conditions between voluntary and mandatory managed care could be assumed to be because of health selection bias in voluntary managed care. However, even in counties where enrollment in managed care was mandatory, TANF-eligible Medi-Cal beneficiaries were given an opportunity to apply to remain within fee-for-service care. In 1999 approximately 10 percent of TANF-eligible Medi-Cal beneficiaries in mandatory managed care counties were still in fee-for-service care. We suspected that it was the sicker patients with higher hospitalization rates who would have been most likely to opt out of mandatory managed care. To address this potential bias, we performed an "intention to treat" reanalysis to arrive at a more conservative estimate of the effect of mandatory Medi-Cal managed care. In this analysis, beneficiaries were categorized as fee-for-service or mandatory managed care not on the basis of their actual Medi-Cal health plan assignment, but by whether their intended assignment was to be in mandatory managed care on the basis of their aid category, county of residence, and a date of admission after the implementation of mandatory Medi-Cal managed care in their county.

We used commonly accepted lists of conditions defined with diagnostic codes for children and adults to calculate the number of hospitalizations for ambulatory care sensitive conditions for Medi-Cal beneficiaries (see online-only Appendix available at www.blackwell-synergy.com) (Millman 1993; Billings et al. 1993). Hospitalizations were considered to be for ambulatory care sensitive conditions when any of the ICD-9 codes for these conditions were listed as the primary reason for the admission. We also counted the number of Medi-Cal hospitalizations for the nonambulatory care sensitive

condition of appendicitis under the assumption that if the mechanism through which Medi-Cal managed care lowered rates of ambulatory care sensitive conditions was improving access to ambulatory care, we should not observe differences between Medi-Cal managed care and fee-for-service in the admission rates for appendicitis. Appendicitis is a nonambulatory care sensitive condition because there are no ambulatory care based strategies for preventing a hospitalization for this condition. However, appendicitis admission rates could still vary in association with the Medi-Cal delivery model as physicians exercise discretion in determining whether or not to admit and operate on patients who present with symptoms that may be consistent with appendicitis knowing that some of those cases will not ultimately have appendicitis. If we found lower rates of admission for ambulatory care sensitive conditions and the nonambulatory care sensitive condition, appendicitis, in Medi-Cal managed care this would imply that managed care was associated with a higher threshold for admission rather than better access to ambulatory care.

For the duration of the entire study period (1994–1999), we calculated the average monthly rate of hospitalization for ambulatory care sensitive conditions and for appendicitis for TANF-eligible Medi-Cal beneficiaries in fee-for-service, voluntary managed care, and mandatory managed care. We limited the analysis to individuals who were less than age 65 under the assumption that older individuals were likely to also have Medicare insurance. The numerator of the rate was the count of hospitalizations for the specified conditions in a given month. Using a record linkage number that enabled us to determine whether the admission was the first for an individual in our dataset or a readmission, we calculated separate rates counting the number of beneficiaries with at least one hospitalization for an ambulatory care sensitive condition and then counting all of their hospitalizations for these conditions. We did this for two reasons: (1) we wanted to assess whether managed care might be exerting its effect on initial admissions that are more related to access versus readmissions that are more related to the quality of care for individuals already recognized as having an ambulatory care sensitive condition, and (2) we thought it was possible that some unobserved factors may have predisposed some individuals with multiple admissions to be more likely to be in fee-for-service versus managed care. The denominator population for calculating the admission rate for each Medi-Cal delivery model was obtained from the Medi-Cal monthly eligibility file.

Recognizing that nonrandomly distributed patient and county characteristics could confound our results, we used multivariate Poisson regression analysis to model the monthly ambulatory care sensitive condition admission

rate as a function of the Medi-Cal delivery model (fee-for-service, voluntary managed care, and mandatory managed care) controlling for admission month, admission year, patient age (0–17 versus 18–64 years), sex, race/ethnicity (African-American, Asian and Pacific Islander, Hispanic, non-Hispanic White, and Other), and county of residence. Adjusting for month controlled for seasonal variation in admission rates while including year of admission in the model controlled for secular changes in the hospitalization rate for the study conditions. The inclusion of county of residence in the model adjusted for unmeasured differences across counties in hospitalization rates for ambulatory care sensitive. Furthermore, the county of residence variable accounted for within county clustering of these rates over time. In order to account for any residual clustering or correlation, we also corrected for any remaining overdispersion in our model by using a scale factor that was equal to the value of the square root of Pearson χ^2 divided by the degrees of freedom (McCullagh and Nelder 1989). As a further check against the possibility that residual autocorrelation could alter our results, we evaluated a model that included autocorrelation, using the generalized estimating equations method (Liang and Zeger 1986). We found that the estimated autocorrelation was only 0.08 and our results did not differ in any substantial way (data not shown).

Observations of the number of hospitalizations for ambulatory care-sensitive conditions were ascertained from the hospital discharge files and were aggregated into analytic cells defined by different combinations of values for the independent variables. For example, one cell corresponded to the number of hospitalizations for ambulatory care-sensitive conditions among TANF-eligible Medicaid beneficiaries in fee-for-service care who in February 1994 were between 0 and 17 years of age, female, African-American, and residing in Los Angeles county. Such an approach can accommodate changes in individual characteristics over time, such as type of health plan held by a beneficiary as fee-for-service or mandatory managed care. Using the combination of the values of the specified independent variables, there were 229,680 different possible cells in which to place observations. Since the data from out-of-state admissions did not include information on Medi-Cal eligibility category we were unable to include them in our multivariate model. The corresponding denominator population for calculating the admission rate for each cell was obtained from the Medi-Cal monthly eligibility file that had detailed information on each of our independent variables. The number of Medicaid beneficiaries “at risk” for a hospitalization for an ambulatory care-sensitive condition varied across cells and was included as an offset variable in the model. The coefficient estimates from Poisson regression model were used

to obtain predicted rates standardized to adjust for differences in group composition. As with the unadjusted results, we performed separate multivariate analyses using counts of all ambulatory care sensitive condition hospitalizations, and counts of persons who had at least one ambulatory care sensitive condition hospitalizations in the 6-year study period.

To explore whether there was a differential effect of Medi-Cal managed care on ambulatory care sensitive condition admission rates that was dependent on the race or ethnicity of the Medi-Cal beneficiary, we repeated the multivariate analyses including an interaction term for patient's race or ethnicity by Medicaid delivery model (fee-for-service, voluntary managed care, or mandatory managed care).

The study protocol was reviewed and approved by the University of California San Francisco Committee on Human Research and the California Department of Health Services Committee on the Protection of Human Subjects.

RESULTS

Statewide, the percentage of TANF-eligible Medi-Cal beneficiaries enrolled in mandatory or voluntary managed care increased from 23 to 78 percent during the study period (Figure 1).

Most of the increase in Medi-Cal managed care was through mandatory programs. There were 2.4 million TANF-eligible Medi-Cal beneficiaries per year who contributed more than 150 million person-months of observations during the 6 years of the study. Observations of TANF-eligible Medi-Cal beneficiaries in mandatory managed care increased over time while the opposite was true for fee-for-service and voluntary managed care (Table 1). Of the approximately 50 million person-months of observations for TANF-eligible Medi-Cal beneficiaries in mandatory managed care, 2 percent occurred in 1994 and 34 percent occurred in 1999. In contrast, 25 percent of the more than 88 million person-months of observations of TANF-eligible Medi-Cal beneficiaries in fee-for-service care were in 1994 and only 6 percent of their observations were in 1999. TANF-eligible Medi-Cal beneficiaries in voluntary managed care dropped precipitously with the rise of mandatory managed care beginning in 1997. TANF-eligible Medi-Cal beneficiaries in mandatory and voluntary managed care tended to be younger than those in fee-for-service care. There was also a higher percentage of African Americans and a lower percentage of whites in voluntary and mandatory managed care than fee-for-service.

Figure 1: Percentage of Temporary Assistance to Needy Families—Eligible Medi-Cal Beneficiaries Enrolled in Fee-for-Service and Managed Care

During the study period, 26 percent of TANF-eligible Medi-Cal beneficiaries' nonpregnancy-related hospitalizations were for one of the specified ambulatory care sensitive conditions. There were approximately 58,000 individuals with more than 82,000 hospitalizations for ambulatory care sensitive conditions in fee-for-service. The total number of hospitalizations for ambulatory care sensitive conditions in both mandatory and voluntary Medi-Cal managed care was about half that seen in fee-for-service.

On average the monthly admission rate for ambulatory care sensitive conditions was lower in Medi-Cal managed care than it was in fee-for-service care. As anticipated the average ambulatory care sensitive condition admission rates were lower in voluntary than mandatory Medi-Cal managed care, reflecting the predilection for healthier Medi-Cal beneficiaries to elect managed care under voluntary conditions. The average ambulatory care sensitive condition hospitalization rates per 10,000 were 9.12 in fee-for-service care and 5.76 and 6.49 in voluntary and mandatory managed care, respectively (Table 2). As compared with TANF-eligible Medi-Cal beneficiaries in fee-for-service, those in mandatory managed care had a 28.8 percent lower rate of admission and those in voluntary managed care had a 36.8 percent lower rate. Limiting the analysis to a count of persons who had one or more hospitalizations for ambulatory care sensitive conditions during 1994–1999 revealed the same pattern of higher admission rates in fee-for-service care than managed care and higher admission rates in mandatory than voluntary managed care. As expected, the measured difference in hospitalization rates for ambulatory care

Table 1: Sample Characteristics of TANF-Eligible Medi-Cal Beneficiaries

	<i>Medi-Cal Delivery Model</i>		
	<i>Fee-for-Service (%)</i>	<i>Mandatory Managed Care (%)</i>	<i>Voluntary Managed Care (%)</i>
Year			
1994	25	2	28
1995	24	4	30
1996	22	9	27
1997	15	22	12
1998	8	29	3
1999	6	34	< 1
Age (years)			
0–17	66	69	71
18–64	34	31	29
Ethnicity			
White	31	24	22
Hispanic	41	39	50
Black	15	22	27
Asian/PI	12	15	< 1
Other	1	1	1
Gender			
Male	42	41	40
Female	58	59	60
Total person-months	88,136,161	50,128,235	19,870,076
No. of ambulatory care sensitive hospitalizations	82,525	33,181	11,673
No. of individuals with ambulatory care sensitive hospitalizations	57,834	24,042	9,244

TANF, temporary assistance to needy families.

sensitive conditions between fee-for-service and mandatory managed care beneficiaries was smaller when we reanalyzed our results according to whether or not a hospitalized TANF-eligible Medi-Cal beneficiary was intended to be in mandatory managed care on the basis of the county implementing this delivery change. However, even in the intention to treat analysis, the hospitalization rate for ambulatory care sensitive conditions was significantly lower among mandatory managed care than fee-for-service beneficiaries (7.41 per 10,000 versus 8.85 per 10,000, respectively; 16.3 percent difference; $p < .0001$).

After adjusting for patient demographics, county of residence, month of admission, and year of admission differences across the Medi-Cal delivery model groups, TANF-eligible Medi-Cal beneficiaries in managed care still had

Table 2: Average Monthly Hospitalization Rates for Ambulatory Care Sensitive Conditions among TANF-Eligible Medi-Cal Beneficiaries

	<i>Rate (per 10,000)</i>	<i>95% CI</i>	<i>% Difference</i>
Total hospitalizations including readmissions			
Fee-for-service	9.12	8.98–9.26	Referent
Mandatory managed care	6.49*	6.36–6.59	– 28.8
Voluntary managed care	5.76*	5.48–5.88	– 36.8
Beneficiaries with any hospitalization			
Fee-for-service	6.43	6.33–6.53	Referent
Mandatory managed care	4.74*	4.65–4.81	– 26.3
Voluntary managed care	4.58*	4.42–4.68	– 28.8

* $p < .0001$ compared with referent group.
TANF, temporary assistance to needy families; CI, confidence interval.

lower average monthly ambulatory care sensitive condition admission rates than those in fee-for-service (Table 3). The adjusted average monthly ambulatory care sensitive condition admission rate per 10,000 was 9.36 in fee-for-service, 6.40 in mandatory managed care, and 5.25 in voluntary managed care. Limiting the analysis to a count of persons who had any hospitalizations

Table 3: Adjusted Average Monthly Hospitalization Rates for Ambulatory Care Sensitive Conditions and Appendicitis among TANF-Eligible Medi-Cal Beneficiaries

	<i>Ambulatory Care Sensitive Conditions</i>			<i>Appendicitis</i>		
	<i>Rate (per 10,000)</i>	<i>95% CI</i>	<i>% Difference</i>	<i>Rate</i>	<i>95% CI</i>	<i>% Difference</i>
Total hospitalizations including readmissions						
Fee-for-service	9.36	9.30–9.43	Referent	0.88	0.87–0.89	Referent
Mandatory managed care	6.40*	6.36–6.45	– 32.6	0.92	0.91–0.93	4.5
Voluntary managed care	5.25*	5.22–5.29	– 43.9	0.80**	0.79–0.81	– 9.0
Beneficiaries with any hospitalization						
Fee-for-service	6.43	6.39–6.47	Referent	0.85	0.84–0.86	Referent
Mandatory managed care	4.95*	4.91–4.98	– 23.0	0.92***	0.91–0.98	8.0
Voluntary managed care	4.10*	4.07–4.12	– 36.3	0.80	0.79–0.81	– 6.0

Adjusted for patient age, sex, race/ethnicity, county of residence, month of admission, year of admission.
* $p < .0001$;
** $p = .003$;
*** $p = .01$ compared with referent group.
TANF, temporary assistance to needy families; CI, confidence interval.

for ambulatory care sensitive conditions in the study period revealed the same pattern of higher adjusted admission rates in fee-for-service care than managed care and higher adjusted admission rates in mandatory than voluntary managed care. Reanalyzing the results on the basis of whether a TANF-eligible Medi-Cal beneficiary was intended to be in managed care, the hospitalization rate for ambulatory care sensitive conditions was 9.07 per 10,000 fee-for-service beneficiaries and 7.45 per 10,000 mandatory managed care beneficiaries (17.8 percent difference, $p < .0001$).

While the adjusted hospitalization rate for ambulatory care sensitive conditions in Medi-Cal managed care was almost a third lower in mandatory managed care than fee-for-service, the adjusted hospitalization rates for appendicitis were not significantly different between these two groups.

In all four racial/ethnic groups, the adjusted hospitalization rate for ambulatory care sensitive conditions was lower in Medi-Cal managed care groups than in fee-for-service (Figure 2). However, the relative difference between the hospitalization rates for ambulatory care sensitive conditions was significantly larger between fee-for-service and mandatory managed care for patients from minority groups than for whites (Table 4). Except for Asians, who participated at a very low rate in voluntary Medi-Cal managed care, the hospitalization rate for ambulatory care sensitive conditions was as expected higher in mandatory than voluntary Medi-Cal managed care.

Figure 2: Adjusted Average Monthly Ambulatory Care Sensitive Hospitalization Rate by Medi-Cal Delivery Model and Race

Table 4: Percentage Difference in Adjusted Average Monthly Ambulatory Care Sensitive Hospitalization Rates in Managed Care Groups Compared to Fee-for-Service, by Race

	African American		Asian		Latino		White	
	Mandatory managed care (%)	Voluntary managed care (%)	Mandatory managed care (%)	Voluntary managed care (%)	Mandatory managed care (%)	Voluntary managed care (%)	Mandatory managed care (%)	Voluntary managed care (%)
Total hospitalizations including readmissions	-28.2*	-42.7**	-36.0*	-24.0	-37.0*	-51.0**	-18.8	-27.1
Beneficiaries with any hospitalization	-21.9*	-35.6**	-25.0*	-11.1	-28.2*	-43.7**	-10.2	-20.3

* $p < .0001$ compared with difference in rates between fee-for-service and mandatory managed care among whites.

** $p < .0001$ compared with difference in rates between fee-for-service and voluntary managed care among whites.

DISCUSSION

Using a unique database that allowed us to overcome many of the limitations of previous studies of Medicaid managed care, we found significantly fewer hospitalizations for ambulatory care sensitive conditions among TANF-eligible Medi-Cal beneficiaries in managed care compared with fee-for-service. Selection bias in voluntary Medi-Cal managed care may exaggerate the difference between managed care and fee-for-service, but the one-third lower adjusted hospitalization rate for ambulatory care sensitive conditions in mandatory managed care than fee-for-service suggests that Medi-Cal managed care is associated with large reductions in hospital utilization. This difference in hospitalization rates between fee-for-service and managed care persisted even after controlling for differences in the characteristics of patients, county effects, and seasonal and secular trends. Applying the difference in ambulatory care sensitive condition admission rates between mandatory managed care and fee-for-service care to the entire TANF-eligible Medi-Cal population suggests that mandatory managed care was associated with 7,000 fewer hospitalizations for ambulatory care sensitive conditions per year in California. Medi-Cal managed care was associated with a decrease in both the rate at which beneficiaries have any hospitalizations for ambulatory care sensitive conditions and the rate of total hospitalizations for these conditions. These findings suggest that the measured effect of Medi-Cal managed care was not biased by a disproportionate number of beneficiaries with multiple admissions in the fee-for-service group. Furthermore, Medi-Cal managed care may be associated with better access to ambulatory care as represented by the lower number of initial admissions for ambulatory care sensitive conditions and better quality of ambulatory care as reflected in the lower number of readmissions.

The finding that Medi-Cal beneficiaries from minority groups experienced a greater difference than whites in hospitalizations for ambulatory care sensitive conditions in managed care compared with fee-for-service further supports the hypothesis that managed care achieves its effect on hospitalization rates through ambulatory care delivery. Medicaid beneficiaries in other states have reported an increase in having a regular source of care after the implementation of Medicaid managed care (Sisk et al. 1996; Coughlin and Long 2000; Cunningham and Trude 2001). In traditional Medi-Cal fee-for-service, beneficiaries from minority groups have reported lower rates of having a regular source of care than white beneficiaries; however, African-American and Latino TANF-eligible beneficiaries in Medi-Cal managed care were

just as likely as whites to report a usual source of care (UCLA Center for Health Policy Research 2002). The requirement in Medi-Cal managed care that a beneficiary have a primary care provider may contribute to eliminating racial and ethnic disparities in access to health care. The widening disparity over time found nationally between African Americans and whites in hospitalizations for ambulatory care sensitive conditions underscores the potential importance of applying the lesson learned from Medi-Cal managed care regarding a regular source of care to the country as a whole (Davis, Yong, and Gibbons 2003).

One alternative explanation for our findings is that Medi-Cal managed care beneficiaries are healthier and therefore less in need of hospitalization than Medi-Cal fee-for-service beneficiaries. We believe that our study design makes this unlikely. First, unlike most reported evaluations of Medicaid managed care, our study was able to control for patient health status by separating Medi-Cal beneficiaries on the basis of their eligibility category. By focusing exclusively on TANF-eligible Medi-Cal beneficiaries we eliminated confounding that would have been introduced by including SSI-eligible beneficiaries who are on average sicker than TANF-eligible beneficiaries and more likely to be in fee-for-service care. Second, while mandatory Medi-Cal managed care counties were not chosen at random from among all California counties, the policy was applied to where the overwhelming majority of TANF-eligible beneficiaries lived and we adjusted the results for this potential bias by including county of residence in our models as a covariate. Third, our ability to distinguish between Medi-Cal beneficiaries in voluntary- and mandatory managed care enabled us to estimate the contribution of selection bias to differences in hospitalization rates for ambulatory care sensitive conditions among Medi-Cal beneficiaries. Finally, reanalysis of our results using a conservative intention to treat design that would have eliminated any potential for a healthy selection bias in mandatory managed care diminished but did not eliminate the large difference in hospitalizations for ambulatory care sensitive conditions we observed in mandatory managed care compared with fee-for-service care. Assuming from this reanalysis that the difference in hospitalization rates for ambulatory care sensitive conditions between mandatory and voluntary managed care is attributable to health selection bias in voluntary managed care, we estimate that about a third (7.45 per 10,000 – 5.10 per 10,000 divided by 7.45 per 10,000) of the difference in hospitalization rates for ambulatory care sensitive conditions between Medi-Cal voluntary managed care and fee-for-service care is attributable to health selection. Even if we were to reclassify voluntary managed care beneficiaries as fee-for-service and

thereby make the most extreme conservative assumption that differences in hospitalization rates between voluntary managed care and fee-for-service beneficiaries were entirely because of health selection, Medi-Cal beneficiaries in managed care would still have a 5 percent ($p < .0001$) lower rate of hospitalizations for ambulatory care sensitive conditions than those in fee-for-service. We believe, however, that this is an underestimate of the effect of Medi-Cal managed care because it assumes that managed care, had no impact on beneficiaries in voluntary managed care and that managed care would not have had an impact on beneficiaries assigned to mandatory managed care, who were allowed to opt out. These assumptions are inconsistent with the findings for the mandatory managed care beneficiaries.

Another interpretation of our study findings is that the lower rate of admission for ambulatory care sensitive conditions in Medi-Cal managed care represents a decline in beneficiaries' access to hospital care. We think this is unlikely for a couple of reasons. First, while there were large differences between Medi-Cal fee-for-service and managed care in the hospitalization rates for ambulatory care sensitive conditions, there was little difference in the hospitalization rates for the nonambulatory care condition, appendicitis. These different results by diagnosis suggest that Medi-Cal managed care did not merely create an increased barrier to inpatient care. Second, the overwhelming majority of admissions for ambulatory care sensitive conditions occur from emergency departments. The hospital discharge records used in this study do not permit us to determine whether a higher admission threshold was applied to Medi-Cal managed care than fee-for-service patients or to minority than white patients in California emergency rooms. However, a national study of emergency departments did not find differences in admitting practices for ambulatory care sensitive conditions in managed care or by patients' race (Oster and Bindman 2003).

The lower rate of hospitalizations for ambulatory care sensitive conditions for TANF-eligible Medi-Cal beneficiaries in managed care compared with fee-for-service suggests that the financing and organization of Medicaid is associated with beneficiaries' use of services. At a time when many states are looking for means to reduce spending in their Medicaid programs as a way to bring their budgets into balance, capitated Medicaid managed care programs that require TANF-eligible beneficiaries to have a regular source of care may be a cost-saving and health-promoting first step. Future evaluations should determine whether additional interventions, such as disease management programs, can further reduce hospitalizations for ambulatory care sensitive conditions among Medicaid beneficiaries and whether managed care can

safely be applied to the disabled Medicaid population who have even higher rates of hospitalizations than TANF-eligible beneficiaries.

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Appendix: Ambulatory Care Sensitive Condition ICD-9 Codes

<u>Description</u>	<u>ICD-9 Code</u>
Angina	4111, 4118, 413 Excludes cases with procedure codes [01-86.99]
Asthma	493
Bacterial Pneumonia	481 4821, 4823, 4829, 483, 485-486 Excludes patients aged < 2months and cases with secondary diagnosis of Sickle cell [2826]
Bronchitis	4660 only if secondary diagnosis is 491, 492, 494, or 496
Cellulites	681, 682, 683, 686 Excludes cases with any procedure codes except 860 where it is the only procedure
Congenital Syphilis	090 (secondary diagnosis for new born only)
Congestive heart failure	428, 40201, 40211, 40291, 5184
COPD	491, 492, 494, 496,
Dehydration	2765
Dental condition	521-523, 525, 528
Diabetes	2500, 2501, 2502, 2503, 2508, 2509
Failure to thrive	7834
Gastroenteritis	5589
Grand mal seizure disorders	7803, 345
Hypertension	4010, 4019, 40200, 40210, 40290 Excludes cases with procedures 36.01, 36.02, 36.05, 36.1, 37.5, 37.7
Hypoglycemia	2512
Immunization preventable conditions (1<=age<=5)	033, 390, 391, 037, 045, 3200 3202
Iron deficiency Anemia (age < 5yrs.)	2801, 2808, 2809
Kidney & Urinary tract infection	590, 5990, 5999
Nutritional deficiency	260-262, 2680-2681
Pelvic inflammatory disease (women only)	614 (cases with surgical procedure of hysterectomy 683-688 excluded)
Ruptured appendix	5400-5401
Severe ENT infection	382 (excludes cases with procedure code 2001), 462, 463, 465, 4721
Skin graft with cellulites	DRG 263, 264 (excludes admission from SNF)
Tuberculosis	011-018