



## Preventable Hospitalization and Medicaid Managed Care: Does Race Matter?

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**Abstract:** This study examines the preventable hospitalization patterns of Medicaid patients by race/ethnicity to determine whether Medicaid managed care (MMC) has been more effective in some subgroups than others. It uses logistic models for three states, comparing preventable hospitalizations with marker admissions (urgent admissions, insensitive to primary care). Hospital discharge data from the Healthcare Cost and Utilization Project State Inpatient database of the Agency for Health Care Research and Quality for New York, Pennsylvania, and Wisconsin residents aged 20–64 years is used. In a more urban state, New York, MMC was effective for Whites but not for minorities. In a more rural state, Wisconsin, MMC was effective for minorities. Overall, the evidence is not strong that any particular racial group consistently benefited from MMC, or that any state consistently showed a favorable impact of MMC across racial groups. However, racial/ethnic disparity associated with the risk of preventable hospitalization is significantly lower among Medicaid patients than among private fee-for-service patients.

**Key words:** Preventable hospitalization, ambulatory care sensitive conditions, Medicaid, managed care, racial disparity.

**I**ncreasingly, states are enrolling their Medicaid populations into managed care both to improve beneficiary access and to control costs. The area of preventable hospitalizations, admissions that can be prevented with better primary care, has begun to excite interest, especially among state Medicaid programs. Alternatively known as ambulatory care sensitive (ACS) admissions, preventable hospitalization is a well accepted measure of primary care access.<sup>1,2</sup>

Theoretically, managed care can lower preventable hospitalizations by making more primary and preventive services available to patients. Several studies have found an association between managed care and preventable hospitalization for private managed care patients.<sup>3–5</sup> Only a few studies reported evidence on Medicaid managed care. Among these, two studies reported only a weak association between managed care enrollment and preventable hospitalization among Medicaid children.<sup>6,7</sup> Among studies on adults, two<sup>8,9</sup> reported that Medicaid managed care was less successful

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than private managed care in initiating declines in preventable hospitalizations, one<sup>10</sup> found no significant difference in access to care between Medicaid FFS and Medicaid HMO enrollees, while another<sup>11</sup> found increased access barriers among Medicaid HMO enrollees compared with their fee-for-service (FFS) counterparts. Thus, the results of these studies have been sufficiently negative to warrant further evaluation of Medicaid managed care.

The current paper probes the question of whether Medicaid managed care (MMC) is achieving expected results in some sub-populations but not in others. This study will examine whether HMO enrollment had a differential impact on preventable hospitalization pattern (and therefore on access) among Medicaid enrollees depending on demographic variables such as race and ethnicity. Racial/ethnic differences in preventable hospitalization rates have received some attention from researchers in the past. Several earlier population-based studies examined the relationship between preventable hospitalization rates and various demographic and socioeconomic factors. Among studies based on individual-level data, Culler et al.,<sup>12</sup> Blustein et al.,<sup>13</sup> and Laditka,<sup>14</sup> focused on elderly populations, while Laditka, et al.<sup>15</sup> focused on both working age adults and elderly. Gaskin and Hoffman<sup>16</sup> looked at both children and working age adults of 10 U.S. states to examine preventable hospitalization patterns by race for three broad insurance groups (Medicaid, private, uninsured). To date, only one study examined preventable hospitalization pattern by race for Medicaid managed care patients in California.<sup>17</sup> Two studies<sup>18,19</sup> examined racial disparities in service use and access among Medicaid managed care enrollees, but did not specifically address preventable hospitalizations.

In this study, we provide an analysis of the preventable hospitalization patterns of Medicaid managed care patients enrolled in HMOs by race and ethnicity. To determine whether MMC had been more effective in some racial/ethnic subgroups, we compare Medicaid patients enrolled in HMOs with patients having other types of insurance coverage (i.e., Medicaid FFS, private FFS, and private HMO) for each racial/ethnic subgroup. We focus on adults (aged 20–64 years) in 3 states, New York, Pennsylvania, Wisconsin. The states were selected to represent different levels of MMC penetration in 1997 and varying program characteristics.<sup>9</sup> By 1997, more than one quarter of the Medicaid population in 40 states and Washington D.C. were enrolled in managed care. The years 1991–1996 showed the highest growth in Medicaid managed care enrollment (over 300%) while Medicaid enrollment grew by only 17%. The study builds on previous research,<sup>9</sup> where these 3 states were found not to have experienced a significant decline in preventable hospitalization rates in MMC relative to Medicaid FFS in 1997. This study investigates whether the lack of reduction in preventable hospitalization between MMC and Medicaid FFS might be associated with differential effects of MMC across racial groups.

**Background and hypotheses.** The incidence of hospitalization for preventable conditions historically has been high for racial/ethnic minorities.<sup>16</sup> While previous studies primarily focused on private managed care patients, the results generally showed little or no effect of managed care on racial disparity. Schneider et al.<sup>20</sup> showed that although racial disparity in influenza vaccination is narrower in managed care relative to FFS plans, the difference is not statistically significant. Other studies also

concluded that differences between ethnic/racial minorities and Whites in managed care plans are similar to differences observed in non-managed care plans.<sup>21</sup>

Previous research has also reported that Medicaid patients are more likely to have higher rates of preventable hospitalization than non-Medicaid patients.<sup>22</sup> However, it is not clear to what extent this fact is attributable to differential access among racial/ethnic sub-populations. Since Nonwhites are more likely to have preventable hospitalizations, one would expect that Medicaid patients, dominated by a Nonwhite majority, would experience higher risks of preventable hospitalization that could be associated with racial disparity. Gaskin and Hoffman,<sup>16</sup> however, noted that Medicaid enrollment, in general, may have an equalizing effect on access and could narrow racial disparity in preventable hospitalizations relative to private plans. Although their analysis did not separate out Medicaid managed care, one might expect, on the same note, that minorities may have greater use of primary and preventive services in Medicaid managed care than in other insurance plans. There are several reasons for this, including the requirement to have a primary care provider, better tracking systems and patient education, and coordination of care provided in HMO plans, particularly in primary care case management models. If plans are at full or partial financial risk, they may have a financial incentive to withhold care. However, Medicaid agencies turned to managed care to improve access to primary care physicians and insisted that participating plans use their market power to improve access for Medicaid recipients.

Studies to date have not offered clear benefits from Medicaid managed care. A study by Lieu et al.<sup>23</sup> reported that Black and Latino children in Medicaid managed care had worse asthma status and less use of preventive asthma medications than those in Medicaid FFS, though most other processes of asthma care, including preventive visits to physicians seemed to be equal or better for minorities in Medicaid managed care. However, a study by Tai-Seale et al.<sup>18</sup> found that physician service use disproportionately declined among minorities in a waiver county that implemented Medicaid managed care. Among other studies, Greenberg et al.<sup>19</sup> reported that Medicaid managed care had neither a positive nor a negative effect on access to care among African Americans relative to whites, while Vargas et al.<sup>24</sup> reported that racial and ethnic differences in health service use among Medicaid enrollees were not consistent across states and depended more on local factors. A more recent study by Bindman et al.,<sup>17</sup> however, was able to separate voluntary versus mandatory enrollment in Medicaid HMOs in California, 1994–1999, and concluded that HMOs improve access to preventive care and that this benefit may be greater for traditionally underserved minority populations.

## Methods

**Study design.** Three states selected for this study represent different levels of Medicaid managed care penetration. While Wisconsin had a small Medicaid population but a moderate level of managed care penetration among Medicaid patients (49%), New York had a large Medicaid population but a small managed care penetration (28%) at the time studied. Pennsylvania had a large Medicaid population and fairly large managed care penetration in 1997 (55%). The characteristics of the programs

also varied. While Pennsylvania had a significant proportion of enrollees, primarily children, still in primary care case management (PCCM) (16%), other states had almost all of their Medicaid enrollees in full-risk plans. A significant proportion of managed care plans in New York and Pennsylvania were Medicaid-only HMOs (42% and 33%, respectively), while Wisconsin had majority Medicaid managed care patients in commercial HMO plans.

We use multivariate cross-sectional design with patient level data for each state to compare preventable admissions with other types of admissions. Although data across states were pooled to get the general result, each state is also analyzed separately because of differences in Medicaid coverage, and the types of managed care contracts. The methodological approach we take is somewhat different from that taken in previous studies that primarily used a heterogeneous group of non-preventable hospitalizations,<sup>12,16,20</sup> and/or non-hospitalized patients<sup>12,15</sup> as comparison categories. Following methods used in previously published studies,<sup>8,9</sup> we used marker admissions as the comparison category in this study. Since the study is based on hospital discharge data, information on individuals not hospitalized was not available. Thus, odds of preventable admissions could not be compared with odds of non-admissions. Instead, we are limited to comparing one type of admission with any other or all other admissions. By restricting the analysis to a specific comparison group, the study offers less sensitivity to the impact of particular areas with an unusual mixture of admissions.<sup>8</sup>

Unlike preventable conditions, admissions from *marker* conditions are more urgent in nature and not preventable by ambulatory care.<sup>25</sup> Marker conditions have been defined as diagnoses for which provision of timely and effective ambulatory care immediately prior to admission is likely to have little impact on the need for hospital admission.<sup>25</sup> Billings et al.<sup>25</sup> developed a diagnostic framework for analyzing hospital use patterns based on the recommendation of a medical advisory panel. It has been demonstrated in previous studies that the primary variables that would affect the rates of preventable admissions would have minimal effects on rates of marker admissions. Across counties, the marker admission rate for adult non-elderly residents is generally not correlated with median family income, hospital bed capacity, and primary care physicians per capita.<sup>8</sup> In particular, since marker admissions should be insensitive to primary care, they provide an appropriate comparison group for preventable hospitalizations.<sup>26</sup> Further, HMO enrollment should influence ACS admissions more than markers (due to low out-of-pocket costs for preventive services, and additional primary care providers).

In order to test the patient characteristics associated with different types of hospital admissions, we use multivariate logistic regression models for each individual state separately. We also pooled data across states and ran logistic models. The model controls for socioeconomic and demographic variables, severity of illness, and county resources. For each state, we stratify the sample by race and perform separate logistic regression analysis for each racial group. Since splitting the sample is the least restrictive method in terms of number of coefficients allowed to vary by race, we use it as a starting point. Additionally, we test for the selective interactive effects of race with insurance coverage in an unstratified model.

The odds ratios in all these logistic models represent the odds of admissions for ACS conditions relative to the odds of admissions for marker conditions. In identifying adults in ACS or in *marker* groups, cases falling under dual admission categories (of ACS and *marker*) have been assigned to *marker* based on the principal diagnosis of these discharges. The individual case is the unit of observation, while some independent variables at a larger level, such as a county, are also used. Similar models are used for each state except for New York, where New York City is included as an additional predictor. The parameters of the models are estimated by maximum likelihood methods in the STATA software release 8.0 (STATA Corporation, College Station, Texas), using established strategies including the allowance for correlated errors within county of residence (i.e., clustering). Without this allowance for correlated errors, the precision of estimation with a large sample of cases would be overestimated (i.e., the reported standard errors of coefficients would be too low).

**Source of data and description of variables.** Information on hospital discharges during 1997 for residents of New York, Pennsylvania, and Wisconsin who were 20–64 years of age was drawn from complete hospital discharge files for these states. These records were assembled, edited, and standardized as part of the Healthcare Cost and Utilization Project (HCUP) State Inpatient Data base (HCUP-SID) of the Agency for Healthcare Research and Quality. To create the analytical file, inpatient discharge records from HCUP files were linked to the 1997 Area Resource File (ARF) for sociodemographic and other information on the patient's county of residence and to the American Hospital Association's (AHA) survey files for 1997 for information on hospitals where patients were treated.

Ambulatory care sensitive conditions and marker conditions are defined on the basis of past research by Billings and others.<sup>25</sup> The conditions are usually defined by principal diagnoses diagnostic codes from the International Classification of Diseases, Ninth Revision (ICD-9-CM) system. In several cases, specific exclusion criteria based on age, sex, and selected procedures have been used. Ambulatory care sensitive conditions included congenital syphilis; immunization-related and preventable conditions; severe ear, nose, and throat infections; chronic obstructive pulmonary disease; diabetes; convulsions; gastroenteritis requiring hospitalization; asthma; congestive heart failure; angina; bacterial pneumonia; tuberculosis; hypertension; cellulitis; hypoglycemia; kidney/urinary tract infection; dehydration-volume depletion; iron deficiency anemia; nutritional deficiencies; failure to thrive; pelvic inflammatory disease; and certain dental conditions. Marker conditions included appendicitis with appendectomy, gastrointestinal obstruction, fracture of hip/femur, and acute myocardial infarction. The latter admissions are believed to be preventable in many cases with a long-term program of controlling risk factors, but the view of the advisory panel was that most new admissions for acute myocardial infarction were not preventable by the use of primary and preventive services within the several weeks prior to admission.

The independent variables used in these regressions include the broad categories of patient characteristics, county characteristics, and characteristics of the hospitals where the patients were treated. The following patient characteristics, based on individual level data, are considered: age, race, sex, insurance status, source of

admission, and severity of illness. Except for severity of illness, other patient characteristics are used as categorical variables. Race is grouped in four categories: White (non-Hispanic), African American (non-Hispanic), Hispanic, and Other, unless missing. In some comparisons, White and Other have been combined into a single category.

Insurance status of patients is grouped into Medicare, Medicaid FFS, Medicaid HMO, self-pay, commercial HMO, and all other types of insurance, which is principally private FFS insurance plus a small group of all other types of public programs. Medicaid HMO patients primarily included those enrolled in full-risk HMO plans. A small number of Medicaid patients in other forms of managed care (e.g., primary care case management (PCCM)), or in partial capitated plans, such as a prepaid health plan (PHP)), would be included under Medicaid fee for service. The all–other–types category was the largest payer group in all states and was used as the default category (referred to as private FFS).

Three major sources of admissions are distinguished: admission from emergency rooms, transfers from another facility, and all others. The first two sources are indicators of illness of relatively great severity. A more direct measure of severity of illness was calculated using a variable called RDSCALE, which is a later development of the Disease Staging System<sup>27,28</sup> by Medstat, Inc. RDSCALE is continuous variable and a single resource-based predictor assigned to each patient, and represents a patient's within-diagnosis-related-group (DRG) severity and the complexity of his/her DRG.<sup>29</sup>

County-level variables include geographic location of the county, socio-demographic conditions, and county resources. Data for these variables are obtained from 1997 ARF. Residents were grouped into three categories for geographic location: metropolitan areas, non-metropolitan and adjacent to metropolitan areas, non-metropolitan and not adjacent to metropolitan areas. To capture county demographic factors, we used data on median family income. Four county resource variables were used in this study: inpatient days per capita, hospital outpatient visits per capita, the number of primary care physicians per 1,000 population, and the number of specialists per 1,000 population. These are all used as continuous variables in the logistic models. Although reflecting utilization, both outpatient visits and inpatient days per capita represent respectively total hospital outpatient and inpatient capacities in the county. Primary care physicians outside hospitals include office-based general internists, general practice physicians and family practice physicians. Note that this fails to represent the role of nurse practitioners in primary care, which may be particularly important for HMOs.

We also examined selected hospital attributes from the AHA file of the hospitals where patients were treated. These attributes included urban versus rural, teaching status, and number of beds. Except for teaching status, the other major descriptors were subsequently dropped because of collinearity with other variables and low predictive power. Teaching status is indicated by membership in the Council of Teaching Hospitals (COH), and is a categorical variable. Another variable used as an indirect measure of severity is distance from patient's home to admitting hospital.<sup>3,30</sup> This variable was calculated by using software that connects latitudes and longitudes of patient ZIP codes with those of the hospital ZIP codes.

## Results

Table 1 provides descriptive information on preventable hospitalization rates for all adults, for Medicaid adults, and for adults by racial groups. Table 2 reports logistic regression results from data stratified by racial groups, with Medicaid FFS used as the reference group for insurance status. Tables 3 and 4 report the results from unstratified logistic regression models where interactions of payer categories of interest (Medicaid FFS and Medicaid HMO) with race as well as severity are tested, using respectively pooled data of three states, and individual state data. For both Tables 3 and 4, private FFS has been used as the reference group for insurance status. While Table 3 displays the full model in order to show the effects of other covariates, only selected variables pertinent to our analysis are reported in Tables 2 and 4. (The rest are available from the authors.)

**Race and Medicaid.** Unadjusted descriptive data in Table 1 shows that admission rates for preventable conditions were higher among Medicaid or Nonwhite patients than among other subgroups. The same is found in data reported in Tables 3 and 4, which found admissions for preventable conditions as more likely to occur among Medicaid or Nonwhite patients relative to marker admissions after controlling for other covariates. African Americans in all states and Hispanics in New York had significantly higher rates of preventable hospitalizations than their counterparts.

Logistic regression results by racial/ethnic sub-groups in Table 2 shows a consistent pattern of significantly lower preventable hospitalization rates among Nonwhite than among White patients, especially among African Americans, in Medicaid FFS relative to those in private FFS plans. For example, in the pooled sample reported in Table 2, while African Americans in private FFS were 46% less likely (OR= 0.54 CI= 0.46, 0.64) than African Americans in Medicaid FFS to have a preventable admission, Whites in private FFS were 58% (OR=0.42, CI=0.40, 0.45) less likely than the corresponding Whites in Medicaid FFS to have a preventable admission. Thus, relative to Whites, African Americans admitted for preventable conditions were significantly more likely to be private FFS than Medicaid FFS. This is also observed in individual state data of New York and Pennsylvania. Table 2 shows that in both of those states, odds ratios for private FFS versus Medicaid FFS were higher for African Americans than for Whites.

The results of interactions between Medicaid and African American race in Tables 3 and 4 are similar. The interaction coefficients for African American race with Medicaid fee-for-service enrollment were significant in the state pool as well as in all three states, with odds ratios consistently lower than 1. The odds ratios for interactions of African American race with Medicaid HMO enrollment were less than 1 and significant in the state pool, as well as in Pennsylvania. These results indicate that, compared with those in privately insured plans, African American Medicaid patients had significantly lower odds of preventable hospitalizations than of marker admissions. This is more consistently found in Medicaid fee-for-service than in Medicaid HMO plans. These results indicate that being African American is not as strongly associated with preventable hospitalizations in the Medicaid population as it would be in the privately insured population. The interactions of Medicaid and Hispanic ethnicity were used only in test runs, which found no significant

**Table 1.****PREVENTABLE ADMISSION RATES FOR ADULTS (AGE 20–64)  
BY STATE, 1997**

	New York	Pennsylvania	Wisconsin
<b>Rates per 1,000 adult admissions</b>			
All adults	13.80	13.60	9.33
Medicaid adults	14.66	15.35	14.01
<b>Rates per 1,000 adult population by racial groups</b>			
All adults, White	9.73	10.68	8.13
All adults, African American	27.05	33.34	29.44
All adults, Hispanic	12.29	20.66	10.29

**Table 2.****LOGISTIC REGRESSION RESULTS BY EACH RACIAL GROUP:  
ODDS RATIOS OF PREVENTABLE HOSPITALIZATIONS  
RELATIVE TO MARKER ADMISSIONS FOR ADULTS  
(REFERENCE GROUP=MEDICAID FFS), 1997**

	White		Black		Hispanic	
	Medicaid HMO	Private FFS	Medicaid HMO	Private FFS	Medicaid HMO	Private FFS
Pooled States	1.00 (.74, 1.34)	.42 (.40, .45)*	.97 (.81, 1.15)	.54 (.46, .63)*	.99 (.81, 1.21)	.46 (.41, .51)*
New York	.56 (.42, .74)*	.40 (.35, .44)*	.85 (.68, 1.05)	.47 (.42, .52)*	1.14 (.80, 1.63)	.46 (.41, .51)*
Pennsylvania	1.42 (1.08, 1.86)*	.48 (.45, .51)*	1.13 (.93, 1.37)	.66 (.57, .75)*	.93 (.64, 1.35)	.46 (.31, .68)*
Wisconsin	1.18 (.81, 1.73)	.35 (.30, .40)*	.72 (.60, .87)*	.72 (.36, 1.42)	.41 (.23, .072)*	.35 (.18, .66)*

\* Significant at  $p < .01$ .

Note: Regression models were run by each racial group, pooled states, and for each state. Variables controlled for in each of these logistic regression models included age, sex, insurance status, source of admission, severity score, per capita inpatient days, primary care physicians per 1000, specialists per 1000, outpatient visits per capita, location in a geographic area, median county income, distance to admitting hospital, and teaching status of admitting hospital.

**Table 3.****RESULTS OF LOGISTIC REGRESSION, POOLED DATA FOR STATES  
(NEW YORK, PENNSYLVANIA, WISCONSIN), ADULTS, 1997**

Variables	Odds Ratio (OR) Preventable Hospitalizations vs. Marker Admissions <sup>a</sup>
Private HMO vs. Private FFS	.74 (.70, .79)**
Medicaid FFS vs. Private FFS	1.74 (1.58, 1.91)**
Medicaid HMO vs. Private FFS	1.82 (1.53, 2.16)**
Self-pay vs. Private FFS	.96 (.90, 1.03)
African American <sup>b</sup>	2.60 (2.39, 2.82)**
Hispanic <sup>b</sup>	1.24 (1.07, 1.45)**
Male vs. Female	.71 (.69, .74)**
Age 20-44 vs. Age 45-64 years	.78 (.74, .83)**
Severity score (RDSCALE)	.76 (.72, .79)**
Primary care physicians per 1,000 population	.45 (.29, .70)**
Per capita inpatient days	1.05 (.95, 1.07)
Specialists per 1,000 population	1.22 (1.08, 1.38)**
Outpatient visits per capita	.98 (.95, 1.02)
Metro vs. Metro-adjacent area	1.02 (.93, 1.12)
Rural vs. Metro-adjacent area	1.09 (.98, 1.21)
Median county Income (in thousand \$)	.99 (.98, .99)**
Distance between Home and hospital	.997 (.996, .998)**
Inpatient days per capita	1.06 (.95, 1.17)
Source of admission=Transfer vs. other	.25 (.21, .28)**
Source of admission=Emergency room vs. other	.64 (.59, .68)**
Teaching vs. non-teaching	.97 (.89, 1.06)
Medicaid FFS x African American	.79 (.64, .98)*
Medicaid HMO x African American	.88 (.77, .99)*
Medicaid FFS x severity	1.10 (1.06, 1.14)**
Medicaid HMO x severity	1.09 (1.01, 1.16)*

\* Significant at  $p < .05$ . \*\* Significant at  $p < .01$ .

<sup>a</sup>The standard errors of this model are adjusted for 'clustering' within counties of patient residence.

<sup>b</sup>The default race was "White, non-Hispanic" plus "Other".

**Author: indications of significance switched so that highest level has \*\***

associations except in New York (where more preventable hospitalizations among Hispanic Medicaid HMO enrollees were found).

In contrast, the evidence was relatively weak that preventable hospitalization rates consistently declined in MMC relative to Medicaid FFS in any racial group, particularly among minorities. As shown in Table 2, the odds ratios between Medicaid managed care and Medicaid FFS were statistically significant for minorities in one out of three states studied. In Wisconsin, both African Americans and Hispanics had

**Table 4.****RESULTS OF LOGISTIC REGRESSION, SELECTED VARIABLES BY STATE, ADULTS, 1997**

Variables	Odds Ratio (OR)		
	Preventable Hospitalizations vs. Marker Admissions <sup>a</sup>		
	New York	Pennsylvania	Wisconsin
Private HMO vs. Private FFS	.71 (.65, .76)**	.80 (.76, .84)**	.79 (.70, .90)**
Medicaid FFS vs. Private FFS	1.96 (1.72, 2.24)**	1.41 (1.30, 1.52)**	2.25 (1.72, 2.96)**
Medicaid HMO vs. Private FFS	1.62 (1.29, 2.02)**	1.85 (1.41, 2.44)**	2.09 (1.31, 3.34)**
Self-pay vs. Private FFS	.91 (.85, .99)*	1.08 (.97, 1.20)	1.05 (.92, 1.18)
African American vs. White and Other	2.55 (2.24, 2.91)**	2.30 (2.10, 2.53)**	3.07 (2.30, 4.11)**
Hispanic vs. White and Other	1.24 (1.03, 1.50)*	1.18 (.96, 1.44)	1.11 (.97, 1.27)
Severity score (RDSCALE)	.82 (.80, .84)**	.70 (.64, .76)**	.64 (.58, .70)**
Medicaid FFS x African American	.87 (.77, .99)*	.84 (.73, .99)*	.54 (.38, .77)**
Medicaid HMO x African American	.93 (.65, 1.32)	.69 (.50, .97)*	.59 (.33, 1.03)
Medicaid FFS x severity	1.02 (.99, 1.06)	1.14 (1.09, 1.20)**	1.19 (1.00, 1.42)*
Medicaid HMO x severity	1.01 (.89, 1.14)	1.15 (1.07, 1.23)**	1.06 (.93, 1.21)

\* Significant at  $p < 0.05$ . \*\* Significant at  $p < 0.01$ .

<sup>a</sup>The standard errors of this model are adjusted for 'clustering' within counties of patient residence. Note: In addition to the variables listed above, the models controlled for other variables as displayed in Table 3.

**Author: indications of significance switched so that highest level has \*\***

a lower likelihood of preventable hospitalization in MMC than in Medicaid FFS. However, no statistically significant difference was found in New York, Pennsylvania, or the state pool. Among Whites, there were conflicting, but significant associations found in two states (New York and Pennsylvania). While White New York residents experienced a significantly lower likelihood of preventable hospitalizations in MMC than in Medicaid FFS, opposite was found for White Pennsylvania residents.

**Other notable effects.** Preventable hospitalizations were also frequent among female, older (45–64 years of age) patients with less disease severity, as shown in Table 3. However, Medicaid enrollees, even when they were more severely ill, were more likely to be admitted for preventable conditions than for marker conditions. This is evident in the odds ratios of two interaction terms in the model: (severity score X Medicaid fee for service) and (severity score X Medicaid HMO). Both of these terms were greater than 1 and significant in all states except New York. There

was no clear indication, however, that ACS patients with higher severity were more likely to be Medicaid HMO enrollees than Medicaid FFS patients, as the two odds ratios had very close values.

**Sensitivity analysis.** We tested a model where other demographic characteristics of Medicaid patients were considered. Test runs involving interactions of Medicaid insurance with sex and age show that, compared with non-Medicaid patients, Medicaid adults admitted for preventable conditions were more likely to be young (20–45 years of age). No consistent finding could be reported from Medicaid and sex interactions. The interactions of Medicaid insurance with Hispanic ethnicity showed a significant likelihood of preventable hospitalizations among Hispanics enrolled in Medicaid HMOs in New York.

Due to the likelihood of association with marker admissions, and the risk of not adequately representing causes of admission, sensitivity tests were carried out excluding the following variables: admission from emergency rooms, transfer admissions, teaching hospital, and distance. These exclusions did not cause any change in our major findings.

We also tested whether excluding interactions between severity and insurance variables (Medicaid FFS and Medicaid HMO) would change the results. With the exception of Pennsylvania, no other states showed significant changes. In Pennsylvania, the coefficient for Medicaid FFS and the African American interaction term was no longer significant, possibly indicating that among African American Medicaid adults, there is a particularly sharp distinction, with less severely ill patients tending to show preventable conditions, while more severe cases are admitted for marker conditions. When severity of Medicaid patients is used as a control, an odds ratio above 1 indicates that African American Medicaid patients would more likely be admitted for preventable conditions at the mean level of severity.

## Discussion

While previous studies found that managed care in Medicaid is not associated with the same reduction in preventable hospitalization as managed care in privately insured populations, the current study asks whether racial differences can account for the general finding, since there is a higher proportion of minority group members in Medicaid (among the non-elderly) than in the general population. We hypothesized that members of minority groups may have greater use of primary and preventive services in Medicaid managed care relative to other insurance plans. The results of the study seem to be equivocal as only weak evidence was found that preventable hospitalization rates have significantly declined for members of minority groups in MMC in comparison with Medicaid FFS. In one out of three states (Wisconsin), the hypothesized association was found among Nonwhites. Although Wisconsin had a relatively high MMC penetration, it also is a rural state with a small minority population (8.3% in 1997 compared with 23.4% and 11.6% in New York and Pennsylvania, respectively<sup>31</sup>). The two large urban states studied (New York and Pennsylvania), as well as the state pool, did not show any evidence that access has significantly increased for minorities in MMC relative to Medicaid FFS. For Whites, a significant decline in preventable hospitalization rate was found in New York, with

an opposite and equally strong increase in Pennsylvania,\* with no overall significant effect. As a whole, therefore, the evidence is not strong that any particular racial group consistently benefited from MMC, or that any state in our sample consistently showed a favorable impact of MMC across different racial groups.

The findings of this study are consistent with results reported in other studies<sup>32,19</sup> that MMC would be less likely to increase access among minorities. Although previous studies also reported evidence of greater likelihood of some preventive service utilization among Hispanics enrolled in private managed care plans,<sup>33</sup> the same could not be predicted for Hispanics enrolled in Medicaid HMOs. Our findings for African Americans are also consistent with research that demonstrates no significant increase in preventive service utilization among African Americans enrolled in private managed care plans.<sup>33</sup> Several explanations have been provided in previous research<sup>18</sup> to account for lack of effects of Medicaid managed care among minority group members (e.g., travel distance to see network providers, factors such as prejudice and institutional racism<sup>34</sup> when allocating limited commitment to Medicaid beneficiaries under Managed care, and the incentive for withholding care in managed care (which would affect minority group members more)).

Our results, however, indicate that African American Medicaid patients had significantly lower odds of preventable hospitalization than White Medicaid patients, compared with the corresponding private FFS patients. Overall, racial disparities associated with the risk of preventable hospitalization were less pronounced among Medicaid adults than among privately insured adults. The evidence may suggest some beneficial effect of Medicaid enrollment for African Americans who usually have higher rates of preventable illness. This might indicate that uniform coverage for Medicaid beneficiaries may reduce some of the racial inequalities in access. This finding is also supported in previous research<sup>16</sup> that reported the fewest disparities among Medicaid beneficiaries compared with other insurance groups.

Our study has certain limitations. While comparing Medicaid patients with privately insured patients, we could not fully account for the underlying health status differences between the two groups. However, since we focus our comparisons on within-group differences in racial disparity, the differences in health status among Medicaid and privately insured persons should not affect our conclusions. The main attempt to capture potential differences in health status among population groups in this study was the Medstat severity index, based on serious comorbidities and age within diagnostic groups. In addition, our analysis included race and median county income, which may also capture some of the differences in health status. We may also be limited by selection bias for HMO enrollment. Given the favorable selection for HMOs, the racial disparities may seem narrower in Medicaid managed care than in Medicaid FFS since members of minority groups that usually have a relatively great burden of illness may be less likely to enroll in voluntary enrollment plans. All three

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\*Although reasons for differences across states are not quite apparent, Pennsylvania had a slightly higher proportion of non-elderly below poverty covered by Medicaid (61.3%) than in New York (58.9%) or Wisconsin (55.4%). However, Pennsylvania also had a much larger number of community health centers (131 in 1996) than either New York (82) or Wisconsin (55) and a lower proportion of population underserved by primary care physicians than the other two states.<sup>31</sup>

states had a combination of mandatory and voluntary programs. For adults, it is not possible to know from hospital discharge records which beneficiaries were subject to mandatory managed care enrollment. Our study accounted for selection bias by using a large number of severity measures that have been used in earlier published studies, including RDSCALE, source of admission, teaching status of admitting hospital, and distance traveled for hospitalization. Additionally, we included interactions of severity (RDSCALE) with Medicaid FFS and Medicaid HMO enrollment. There was no clear indication that patients admitted for preventable conditions with higher severity were more likely to be enrolled in Medicaid HMO than in Medicaid FFS plans. Some of our findings could also be explained better if we had data on length of enrollment in Medicaid plans and reasons for eligibility, which determine the benefits received by Medicaid enrollees.

Another source of potential bias is our inability to correctly identify Medicaid patients who were previously uninsured. Not only are these individuals likely to move into Medicaid at hospitalization but they may be likely to move into Medicaid FFS. Medicaid HMO patients are probably enrolled in Medicaid before their hospital admissions and therefore more likely to have access to primary care services than Medicaid FFS adults. Uninsured adults moved into Medicaid are also more likely to be admitted for marker conditions as these are mostly urgent admissions. It should be noted, however, that some of the preventable conditions are also urgent as these are flare-ups of chronic conditions and acute infections or other problems that were not promptly treated (e.g., bacterial pneumonia, cellulitis, urinary tract infection, dehydration).

## Conclusion

Reducing preventable hospitalization is an important focus to make health care more efficient.<sup>35</sup> States are increasingly enrolling their Medicaid population into managed care both to improve beneficiary access to preventive and acute services and to control health care costs. Our study indicates that while Medicaid may ameliorate the effects of racial/ethnic disparities in preventable hospitalization somewhat, no additional benefit has been clearly achieved in Medicaid managed care for non-elderly adults. Some racial disparity in use of preventive services persists in even the most highly regarded managed care plans that serve Medicaid patients.<sup>24</sup> It may be desirable to test a much wider range of strategies outside the orbit of private physician offices and hospitals to increase the use of preventive services in lower-income populations.

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