



Is enrollment in a Medicaid health maintenance organization associated with less preventable hospitalizations?

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ABSTRACT

Introduction: The objective of this study is to compare the performance of Medicaid health maintenance organizations (HMOs) and fee-for-service (FFS) Medicaid regarding the prevalence of potentially preventable hospitalizations, a recognized measure of outpatient care quality.

Methods: This study used nationally representative data on non-institutionalized Medicaid recipients, ages 18–64, from the 2003–2012 Medical Expenditure Panel Survey. Separate analyses are conducted for recipients insured through both Medicaid and Medicare (“dual eligibles”) and recipients whose only health insurance is Medicaid (“non-duals”). In each group the occurrence of potentially preventable hospitalizations is measured, and then survey-weighted multivariable logistic regression models are fit to quantify the relationship between Medicaid HMO status and the occurrence of such stays. The possibility of selection bias into HMOs is considered and explicitly addressed in model estimation using propensity score methods.

Results: Adjusting for covariates and confounders dual eligible enrolled in Medicaid managed care are more likely to have a potentially preventable hospitalization relative to those covered under FFS Medicaid (survey weighted logit model OR = 1.72, 95% CI = 0.98–3.03; propensity score weighted logit model OR = 1.87, 95% CI = 1.06–3.28). In contrast, the odds ratios did not differ among non-duals in Medicaid HMOs versus FFS Medicaid.

Conclusion: These findings suggest that, at least for dual eligibles, the quality of outpatient care in Medicaid HMOs may be worse than under FFS Medicaid. Better and more streamlined clinical preventive approaches for this high risk and vulnerable population might be required in Medicaid HMOs.

1. Introduction

Medicaid, the largest social health insurance program in the United States, now insures > 70 million low-income and financially needy Americans. States provide Medicaid benefits through two distinct delivery systems, conventional fee-for-service (FFS) and managed care (Congressional Budget Office, 2018). Under conventional FFS, Medicaid pays providers a fee for each service provided to recipients, whereas under managed care, Medicaid contracts with risk-based managed care organizations (MCOs) to provide covered services to recipients in exchange for a fixed per-capita fee (Congressional Budget Office (CBO), 2018). Most MCOs are health maintenance organizations (HMOs) that cover all Medicaid services for recipients enrolled in these plans (Henry J Kaiser Family Foundation, 2016). There are also Medicaid MCOs that cover only a narrow set of benefits, e.g., behavioral health services for

recipients who have been diagnosed with a serious mental illness, or long-term care services and supports for recipients needing long term care (CBO, 2018). The percentage of Medicaid enrollees enrolled in some form of Medicaid managed care increased roughly six-fold between 1991 and 2013 (Centers for Medicare and Medicaid Services, 2015; Duggan and Hayford, 2013). Assessing how these plans affect the quality of healthcare provided to recipients is essential to understanding their value added to Medicaid, as well as their long-term sustainability.

Nationwide, about 7 million Medicaid recipients receive both full Medicaid benefits and Medicare, the federal insurance program for adults 65 and older and certain younger people with disabilities (Medicare-Medicaid Coordination Office, 2017). These recipients, called “dual-eligibles” or “duals,” are economically vulnerable individuals with high healthcare needs, e.g., much higher rates of

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physical or mental disabilities and multiple chronic conditions (CBO, 2013). Duals comprise only 15% of all Medicaid recipients but account for 39% of all Medicaid expenditures (Young et al., 2013). Enrollment in Medicaid HMOs is lower among duals, e.g., 24% of duals were insured through such plans in 2012, whereas 70% of non-duals were (CBO, 2018).

Peer-reviewed research on the effects of HMOs under Medicaid is limited, and findings have been mixed. There is scant evidence that Medicaid HMOs have reduced Medicaid expenditures, improved recipients' access to services, or improved the quality of care they receive (Caswell and Long, 2015; Duggan and Hayford, 2013; Herring and Adams, 2011; Sparer, 2012).

One important measure of care quality is the prevalence of "preventable hospitalizations," namely, hospital admissions that potentially could have been prevented with adequate primary care (Agency for Healthcare Research and Quality (AHRQ), 2018). Few studies have examined the association of Medicaid managed care with preventable hospitalizations, and findings have been mixed. Although some suggest that such hospitalizations are less common in Medicaid HMOs (Bindman et al., 2005; Hu and Mortensen, 2018), others suggest the opposite (Porell, 2001; Basu et al., 2004; Park and Lee, 2014).

This paper examines the association of Medicaid HMOs with preventable hospitalizations among nonelderly adult recipients, ages 18–64. If Medicaid HMOs are doing a better job providing primary health care, then we should find that preventable hospitalizations occur less frequently among Medicaid HMO enrollees than among Medicaid FFS enrollees. We pay careful attention to the possibility that the effects of Medicaid HMOs differ for duals and for recipients whose only health coverage is Medicaid, hereafter called "non-duals." Our data source is the Medical Expenditure Panel Survey (MEPS) covering 2003–2012.

Our paper contributes to the literature in three ways. First, previous studies on the effects of Medicaid HMOs on the occurrence of preventable hospitalizations analyzed data from a single state. In contrast, we use nationally representative data on all nonelderly adults with Medicaid, making our study more generalizable. Second, previous studies did not examine whether the effects of Medicaid HMOs might be different for duals and non-duals. We explicitly allow for this possibility because the effects may indeed differ, since duals often have more complex healthcare needs (Neuman et al., 2012). Simply stated, with more medical problems there may be more than can go wrong. Finally, most previous studies ignored the possibility of selection bias into Medicaid HMOs. We use a more thorough methodology and explicitly address this possibility in model estimation using quasi-experimental design techniques. Additionally, we compare how accounting for possible selection bias affects the estimated effects of Medicaid HMOs on the prevalence of preventable hospitalizations.

2. Methods

Data are drawn from the 2003–2012 MEPS, which is nationally representative of the non-institutionalized US population. For these years, MEPS Household Component (HC) files were merged with the MEPS Full-Year Consolidated and Hospital Inpatient Stays files to create a file of all MEPS respondents with hospital stays. This sample was then restricted to individuals with Medicaid coverage, ages 18–64, and this set was further subdivided into duals and non-duals. After excluding respondents with any missing values in the covariates, the final number of duals and non-duals in our analytic sample was 515 and 2937, respectively. Data for 2013 and beyond are excluded from this study because after 2012 MEPS does not include the ICD-9 codes in the publicly available files, and we use ICD-9 codes to identify preventable hospitalizations. Additionally, since many Medicaid programs in 2013 and 2014 raised their payment rates to primary care physicians to no < 100% of Medicare payment rates for primary care services (an Affordable Care Act provision), we stopped at 2012 to enhance the precision of our estimates.

The MEPS is based on a complex survey design that involves stratification, clustering and disproportionate sampling (AHRQ, 2014b). Our models and estimates account for these design elements, and our analyses were conducted using survey command functionalities in Stata v.13 (StataCorp, 2013).

2.1. Outcome variable

For each hospitalization in 2003–2012, MEPS reports up to four ICD-9 codes, each recorded at the 3-digit level. These ICD-9 codes are recorded in the order they were reported by a respondent, not necessarily in their order of clinical importance (AHRQ, 2014a). We generated a binary outcome variable (1 = preventable, 0 = otherwise), *avoid_hosp1234*, which identifies whether a hospitalization was potentially preventable. Supplementary Table 1 lists the specific Ambulatory Care Sensitive (ACS) conditions that trigger indication of a preventable stay.

2.2. Independent variables

The key independent variable is a binary variable, *med_hmo*, which equals 1 if the recipient is enrolled in a Medicaid HMO, 0 otherwise. The MEPS includes a multi-step careful ascertainment process to ensure participant enrollment in a Medicaid HMO. Specifically, if Medicaid or other government program was identified as one of the respondent's sources of hospital/physician insurance coverage, he/she was then asked to identify their plan from a list of state names or programs for the Medicaid HMOs in the respondent's area. If the respondent didn't know their plan's name, they were given the following definition of an HMO and asked whether it describes their Medicaid plan: "With an HMO, you must generally receive care from HMO physicians. If another doctor is seen, the expense is not covered unless you were referred by the HMO, or there was a medical emergency."

Our estimated models account for other factors that could also have influenced occurrence of a preventable hospitalization, including demographics, health and functional status, attitudes towards health insurance and risk-taking, and use of preventive services. These covariates have been previously adopted in studies examining preventable hospitalizations and emergency department utilization (Culler et al., 1998). Demographics include age (< 35, 35–55, and 56 and above), gender, poverty status based on household income relative to poverty thresholds (poor, near poor, low income, and middle-or-high income), education (high school or less, some college, and college or more), and region (northeast, midwest, south, and west).

Health and functional status measures include self-reported health (good/very good/excellent and fair-or-poor), self-reported mental health (good/very good/excellent, and fair-or-poor), whether he/she has any difficulty with activities of daily living (ADLs), whether he/she has any difficulty with instrumental activities of daily living (IADLs), adult Body Mass Index (underweight, normal, overweight, obese), whether he/she has been advised to restrict fatty foods, whether he/she currently smokes, and whether he/she has a usual source of care. We also account for the self-reported presence/absence of ten clinical conditions, each measured by a (0,1) indicator, including the presence of high blood pressure, coronary heart disease (CHD), other heart disease, angina, emphysema, diabetes, and asthma, ever having had a heart attack or myocardial infarction, and ever having had a stroke. AHRQ refers to these conditions as priority conditions due to their high prevalence (AHRQ, 2014b).

To control for attitudes towards health insurance and risk-taking we include four variables that measure whether the respondent agrees with each of four statements (considered one at a time): "I'm healthy enough that I really don't need health insurance," "Health insurance is not worth the money it costs," "I'm more likely to take risks than the average person," and "I can overcome illness without help from a medically trained person."

Table 1
Characteristics of the Medicaid population ages 18–64 by dual-eligibility^a status. Results are based on aggregated data from the Medical Expenditures Panel Survey^b.

Variable	Non-duals	Duals	p-Value ^c
	Unweighted n = 2937 %	Unweighted n = 515 %	
Key variables			
Avoidable hospital stay	13.4	23.9	< 0.0001
Medicaid HMO	46.5	31.9	< 0.0001
Demographic characteristics			
Age			
Less than 35	61.6	11.8	< 0.0001
Between 35 and 56	27.8	58.3	
56 and above	10.6	29.9	
Region			
Northeast	20.5	17.3	0.2423
Midwest	24.1	21.0	
South	33.2	39.7	
West	22.3	22.0	
Male	17.7	36.0	
Education			
High school or less	31.1	28.3	0.1104
Some college	55.3	53.6	
College or more	13.7	18.1	
Income			
Poor	55.7	52.4	0.1872
Near poor	9.0	13.0	
Low income	18.4	18.2	
Middle or high income	17.0	16.4	
Health and functional status characteristics			
Self-reported health			
Fair or poor	35.3	70.9	< 0.0001
Good/very good/excellent	64.7	29.1	
Self-reported mental health			
Fair or poor	20.4	43.8	< 0.0001
Good/very good/excellent	79.6	56.3	
Received help or supervision for instrumental activities of daily living	10.1	33.7	< 0.0001
Received help or supervision for activities of daily living	4.9	19.1	< 0.0001
BMI			
Underweight	2.5	1.3	0.0003
Normal	29.9	21.3	
Overweight	27.0	23.8	
Obese	40.6	53.6	
Current smoker	33.8	48.6	< 0.0001
Access to usual source of care	77.6	91.7	< 0.0001
Preventive care services utilization			
Cholesterol check (more than a year or never)	42.9	11.1	< 0.0001
Flu shot (more than a year or never)	66.4	41.5	< 0.0001
Routine check (more than a year or never)	28.0	12.2	< 0.0001
Advised by doctor to restrict fatty food	32.3	57.9	< 0.0001
Advised by doctor to exercise more	38.4	58.1	< 0.0001
Attitudes towards health insurance and risk agree with following statements			
Do not need health insurance	15.6	5.6	< 0.0001
Health insurance is not worth the money it costs	40.9	32.4	0.0053
More likely to take risks	37.6	37.6	0.9936
Can overcome illness without help from a medically trained person	27.7	13.3	< 0.0001
Clinical conditions (yes)			
Diabetes	13.1	34.1	< 0.0001
Asthma	18.2	30.3	< 0.0001
High blood pressure	28.9	66.3	< 0.0001
Coronary heart disease	6.2	15.5	< 0.0001
Angina	4.4	12.0	< 0.0001
Myocardial infarction	6.3	13.7	0.0001

Table 1 (continued)

Variable	Non-duals	Duals	p-Value ^c
	Unweighted n = 2937 %	Unweighted n = 515 %	
Any other heart disease/condition	12.1	25.7	< 0.0001
Stroke	5.3	16.0	< 0.0001
Emphysema	4.2	14.7	< 0.0001

^a Dual eligibility status: non-duals are Medicaid recipients whose only health insurance is Medicaid. Duals are Medicaid recipients who are also insured through Medicare.

^b Data source: public use data files from the Medical Expenditure Panel Survey (MEPS) for 2003 through 2012.

^c p-Values from survey design based F-test.

Preventive services utilization measures include indicators probing the length of time since the respondent's last routine check-up, the length of time since their last cholesterol check, and the length of time since their last flu shot. These variables proxy for how conscientious a person is about taking care of their own health, which may correlate with their ability to recognize potentially dangerous symptoms or when they should see their doctor.

Definitions for all of model covariates can be found in Supplementary Table 2, and their descriptive statistics, calculated separately for duals and non-duals, are reported in Table 1.

2.3. Analysis

We estimate multivariable logistic regressions for the probability that the hospitalization is a preventable stay. Two models are estimated, one for duals, the other for non-duals. Our interest centers on whether Medicaid HMO enrollees have lower or higher odds of being hospitalized for an ACS condition. The latter would suggest that Medicaid HMOs are not achieving optimal outcomes, vis-à-vis traditional FFS Medicaid, in managing these conditions on an outpatient basis.

2.4. Possible selection bias in Medicaid HMO enrollment

So far, our discussion has ignored the possibility of selection bias into Medicaid HMOs. However, in some states recipients are offered a choice between Medicaid FFS and Medicaid HMOs (CBO, 2018). We argue that it is possible that individuals with certain characteristics may self-select into different Medicaid plans. For example, given an option, people with higher healthcare utilization may choose to enroll in FFS Medicaid where fewer restrictions are placed on which providers they can see and how much care they can receive (Duggan and Hayford, 2013). Voluntary enrollment in public (Medicaid or Medicare) managed care programs shows that enrollees in HMOs often differ on both observable and unobservable dimensions from enrollees in FFS plans (Brown et al., 2014; Glied et al., 1997). As shown in Supplementary Table 3, among both duals and non-duals in our data, there are important systematic differences between HMO and FFS recipients. For example, within the non-dual population, HMO enrollees are less likely to take risks and less likely to think that health insurance is not worth the cost. Differences in income, access to usual source of care and preventive services utilization are also evident between HMO and FFS recipients. A large body of econometric literature suggests that the presence of selection bias can lead to bias in the estimated effect of HMOs (Heckman, 1990; Wooldridge, 2015).

To address this issue, we also estimate the multivariate models using propensity score weighting techniques. In past, researchers have used experimental and other quasi-experimental methods (for example

difference-in-difference) to study related issues. Such methods are appropriate where a change in policy is observed at county/state level. However, we could not use these methods to address the issue we are investigating primarily because of the lack of information within the dataset regarding the location of the respondents. Specifically, we use inverse probability of treatment weighting (IPTW) based on estimated propensity scores (details below). The IPTW is an ideal approach to address the problem at hands and make the groups (HMO vs FFS) as similar and balanced on characteristics of interest as possible (Austin and Stuart, 2015; Guo and Fraser, 2014).

Rosenbaum and Rubin (1983) define the propensity score as the probability of treatment assignment conditional on observed baseline covariates (Rosenbaum and Rubin, 1983). Since the propensity score acts as a balancing score, subjects with the same propensity score have the same distribution of observed baseline covariates whether they are treated or untreated. Although the true propensity score may not be known in observational studies, it is possible to estimate it. We follow Austin (2011) and estimate the propensity score using a logistic regression model, where treatment status (in our case, enrollment in a Medicaid HMO), is regressed on observed baseline characteristics. To obtain the estimated propensity score, the predicted probability of enrollment in Medicaid HMO is derived from the fitted regression model. These methods have been used previously to account for selection bias across several field (Frölich, 2007; Hirano and Imbens, 2001; Rubin, 2001).

IPTW using the propensity score generates weights based on the propensity score, which are then used to form a synthetic sample in which the distribution of covariates in the model is independent of treatment assignment (Austin, 2011). Specifically, the weight assigned to individual i is $w_i = mcd_hmo_i/e_i + (1-mcd_hmo_i)/(1-e_i)$ where e_i is the propensity score for individual i . However, as noted earlier, the complex survey design of MEPS also needs to be taken into account. We do this by using the AHRQ-supplied weights, adjusted with the weights generated from the propensity scores, following recommendations provided by Dugoff et al. (2014). Specifically, we generate a new analytic weight by multiplying the propensity score weight and the AHRQ survey weight. We use these generated weights to re-estimate all logistic regression models specified above including all covariates to ensure double robustness of findings through controlling for any possible residual differences in characteristics following propensity score weighting (Austin and Stuart, 2015; Guo and Fraser, 2014; Lunceford and Davidian, 2004).

To facilitate understanding of the results from our estimated models, we generate and plot the marginal probabilities of a preventable hospitalization for non-duals and duals by HMO status and their 95% confidence intervals in Fig. 1.

3. Results

Table 2 reports the prevalence of potentially preventable hospitalizations among duals and non-duals, as well as the relationship between being enrolled in a Medicaid HMO and the occurrence of such stays. Nationwide, between 2003 and 2012, among all hospitalizations for non-duals, ages 18–64, 13.4% were potentially preventable, whereas among all hospitalizations for duals in this age range, 23.9% were potentially preventable.

Table 2 also summarizes our key findings regarding the effects of Medicaid HMOs on the occurrence of preventable hospitalizations, after controlling for other possible determinants of such stays. Among non-duals we find no significant effect of Medicaid HMO enrollment on the odds of having such a stay. In both the multivariable logit regression estimated using the survey weights and in the multivariate logit regression estimated using the propensity score adjusted weights, which controls for possible self-selection into HMOs, enrollment in a Medicaid HMO has no effect on the probability of a preventable hospitalization. (Supplemental Tables 4 and 5 report the full multivariable logit

regressions estimated for non-duals and duals, respectively.)

In contrast, among duals, enrollment in a Medicaid HMO increases the odds of a preventable hospitalization by 72%, and this effect is statistically significant at the 10% level. The effect of Medicaid HMO status becomes stronger and more significant once propensity score adjusted weights are adopted. That is, after adjusting for possible self-selection into Medicaid HMOs, we find that duals in Medicaid HMO who are hospitalized have 1.8 times higher odds of having a preventable stay, compared to duals in Medicaid FFS who were hospitalized, and this effect is significant at the 5% level (Table 2). We present the corresponding marginal probability estimates derived from these models in Fig. 1.

A few other interesting findings also emerge from the analyses. Among non-duals both of the estimated models reveal that as a non-dual age, their odds of experiencing a potentially preventable stay rise significantly (Supplemental Table 4). Both models also reveal that non-duals who have diabetes, asthma, high blood pressure, angina, or emphysema have significantly higher odds of experiencing a preventable stay.

Among duals there are also significant regional differences in the odds of having had a preventable hospitalization over this period, with those living in the Midwest or South having an odds ratio twice as high as recipients living in the Northeast (Supplemental Table 5). Education is inversely related to the occurrence of preventable hospitalizations. Specifically, duals with a college degree have lower odds of having a preventable stay. Finally, duals who have been advised by their doctor (s) to reduce their intake of fatty foods or foods rich in cholesterol have higher odds of having a preventable stay, suggesting that people with unhealthy eating habits are at higher risk of a preventable hospitalization.

4. Discussion

The relationship between Medicaid HMO status and the occurrence of potentially preventable hospitalizations differs by a recipient's dual eligibility status. Among duals we find a much higher prevalence of preventable hospitalizations in Medicaid HMOs, whereas among non-duals, Medicaid HMO recipients are no more likely than Medicaid FFS recipients to have a preventable stay.

None of the models we estimated provide support for the notion that Medicaid HMO membership leads to fewer hospital stays that could have been avoided with timely and appropriate primary care, i.e., more efficient care in outpatient settings. In the case of non-duals, Medicaid HMOs did not statistically differ from FFS Medicaid on this important quality measure. This finding is consistent with findings from two decades old data reported by Basu et al. (2004). On the other hand, duals enrolled in Medicaid HMOs fared worse than their counterparts under Medicaid FFS. Duals in Medicaid HMOs were 1.7 to 1.8 times more likely than duals in Medicaid FFS to experience a preventable hospitalization. This raises quality concerns regarding Medicaid HMOs for the dual eligible population. Earlier studies have either dropped the duals from their analysis or they treated them the same as non-duals in the analysis. Our results suggest that treating duals as a separate group is necessary to characterize the distinct effects that Medicaid HMOs have on these two different populations.

There is a need to understand why outpatient care quality would be lower among duals in Medicaid HMOs. One possibility is that having Medicaid HMO coverage made it more difficult and confusing to navigate the healthcare system. If the duals' Medicare coverage was under FFS, they may have been unsure about whether particular healthcare providers would require referrals from their Medicaid primary care physician (PCP), or whether they are able to see providers outside of their HMO's network, or whether their Medicare copays would be covered by Medicaid. If, instead, their Medicare coverage was through a managed care plan with its provider network that is different from the Medicaid HMO's network, the issues become even more confusing. This

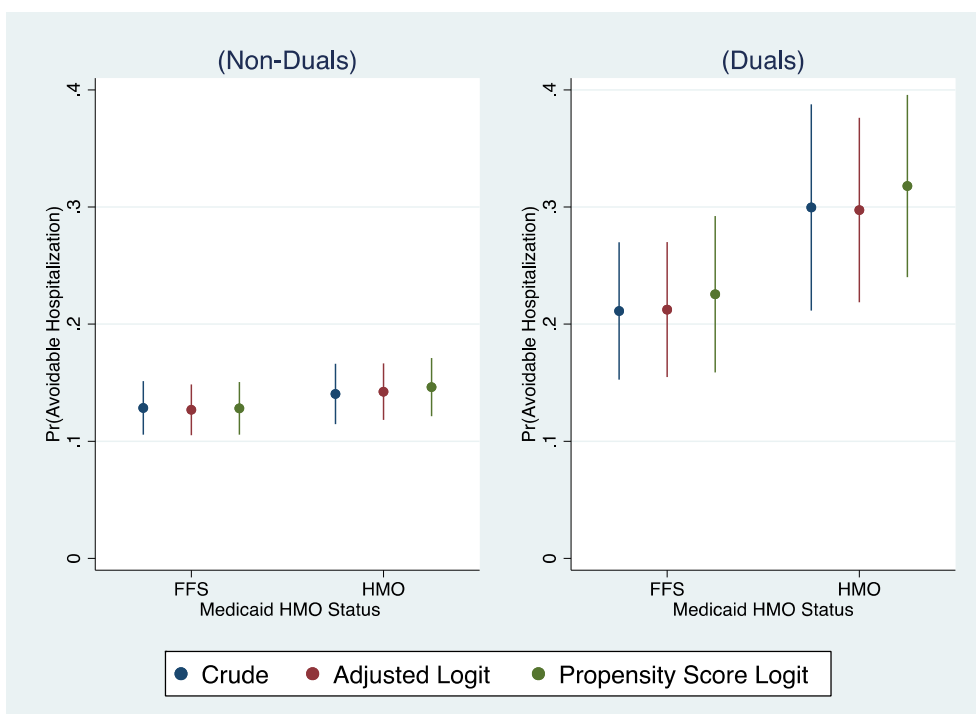


Fig. 1. Marginal probabilities of avoidable hospitalizations for duals and non-duals by Medicaid Health Maintenance Organization (HMO) status and their 95% confidence intervals.

Table 2
Association between Medicaid Health Maintenance Organizations (HMO) coverage and potentially preventable hospitalizations among non-duals and dual eligibles^a, Ages 18–64. Results are based on data from the Medical Expenditures Panel Survey^b.

	Among non-duals	Among duals
Prevalence of potentially preventable hospitalizations		
Full sample (%)	13.40	23.94
Among Medicaid FFS recipients (%)	12.85	21.12
Among Medicaid HMO recipients (%)	14.04	29.97
	<i>p</i> -Value = 0.491	<i>p</i> -Value = 0.083
Logistic regression: survey-weighted logistic model		
Odds ratios ^c	1.18	1.72
(95% CI ^d)	(0.86–1.62)	(0.98–3.03)
	<i>p</i> -Value = 0.310	<i>p</i> -Value = 0.058
Logistic regression: propensity score weights		
Odds ratios ^e	1.20	1.87
(95% CI ^d)	(0.88–1.65)	(1.06–3.28)
	<i>p</i> -Value = 0.248	<i>p</i> -Value = 0.030

^a Dual eligibility status: non-duals are Medicaid recipients whose only health insurance is Medicaid. Duals are Medicaid recipients who are also insured through Medicare.

^b Data source: public use data files from the Medical Expenditure Panel Survey (MEPS) for 2003 through 2012.

^c Adjusted odds ratios from a multivariable logit regression estimated with survey weights, which controls for Medicaid HMO enrollment, demographics, health and functioning, attitudes towards health insurance and risk, preventive care services utilization, and clinical conditions.

^d CI = confidence interval.

^e Adjusted odds ratios from a multivariable logit regression estimated with propensity score weights, which controls for Medicaid HMO enrollment, demographics, health and functioning, attitudes towards health insurance and risk, preventive care services utilization, and clinical conditions.

is especially the case if the Medicare Advantage plan is also an HMO with a different gatekeeper PCP. Navigating services under these scenarios would be challenging for healthy adults. Dual eligibles, many of

whom have stressful and complex medical conditions and extremely limited finances, would find these arrangements even more difficult to manage. Our findings provide support to published evidence suggesting that difficulties navigating coverage rules may obstruct duals from obtaining services when needed; be it preventive, maintenance, or follow-up care (Merrell et al., 1997). We recognize that, usually, Medicare is the first payer for dual eligibles, while Medicaid is the second payer or pays for services not covered by Medicare. However, the way Medicaid and Medicare and coordinate with each other to provide services for duals can be different in different states and different markets (Walsh and Clark, 2002). So sometimes the enrollees are not fully informed or aware of the services they can have access to when they are simultaneously enrolled in Medicare and Medicaid. These complications and the potential lack of understanding of the system, by enrollees, can lead to more confusion among duals regarding their access to health care. Although, efforts and program testing for better care coordination between Medicare and Medicaid are going on, the distribution of administrative power and financial alignment is beyond the scope of our study. This might explain their higher prevalence of potentially preventable hospitalizations.

Another possibility is that Medicaid HMOs simply lack the expertise and experience needed to provide high quality care to duals, who are among the sickest and most vulnerable patients (Friedland and Feder, 1998). Historically, duals have relied on FFS Medicaid. As Gold et al. (2012) note, a small but growing share of duals have been enrolled in Medicaid managed care plans (Gold et al., 2012). Medicaid HMOs have far more experience with non-duals, who tend to be nondisabled and healthier (Miller and Weissert, 2004). Providers in Medicaid HMOs may simply need more experience and training to better manage the complicated problems of duals.

A number of limitations of this analysis should be noted. First, our sample was limited to the period 2003–2012. More recent years were excluded because beginning in 2013 AHRQ no longer reported ICD-9 codes for the hospitalizations of MEPS participants, making it impossible to identify potentially preventable stays. It may be, however, that the performance of today's Medicaid HMOs differs from what we

found for the 2003–2012 era. Second, our findings may not generalize to Medicaid seniors or to children on Medicaid because we deliberately focused on recipients ages 18–64. Third, our analysis examined the collective experience of Medicaid HMOs across the U.S., rather than the specific experience of particular Medicaid managed care programs, or the experience of programs where HMO enrollment was voluntary rather than mandatory for recipients. Because MEPS does not identify the location of participants, it was not possible to examine these issues. Furthermore, the publicly available MEPS data files only contain information on ICD-9 codes up to three-digits, while AHRQ PQI measures use the full five-digit codes. However, prior studies have used three-digits ICD-9 codes for their analysis and we believe this classification is sufficient for our analysis also (Galarraga et al., 2015; Galarraga and Pines, 2016; Wang et al., 2018). In order to further address this concern, we performed a sensitivity analysis in which we excluded all hospital visits for dehydration and performed the same analysis. Then we excluded all hospital visits for diabetes and performed the same analysis. We noticed no significant changes in our findings as compare to the original findings and so reached at consistent conclusions. Furthermore, MEPS relies on self-report to identify the respondents' insurance plans and health services use. This may give rise to measurement error. However, MEPS has been used extensively to study individuals' health usage and expenditure patterns. Secondly, there is evidence that reported insurance status tends to be pretty accurate within the MEPS (Hill, 2007). In addition, there is also published evidence that MEPS respondents accurately report their inpatient hospitalizations (Zuvekas and Olin, 2009). Overall, we believe that MEPS is a reliable data source when it comes to the question in hand. Correcting each of these limitations and using a larger sample size to overcome any power issues represents a fruitful direction for further research on the performance of HMOs under Medicaid.

5. Conclusion

Over the period 2003–2012, dual eligibles, ages 18–64, enrolled in Medicaid HMOs were significantly more likely than dual eligibles under FFS Medicaid to experience a potentially preventable hospitalization. In contrast, among non-duals, ages 18–64, the likelihood of having a preventable hospitalization did not differ in Medicaid HMOs and in FFS Medicaid. These findings raise concerns about care quality in Medicaid HMOs, and suggest that, at least for dual eligibles, the primary care delivered through Medicaid HMOs is of lower quality than the care being provided under FFS Medicaid.

As a result of the Affordable Care Act, 37 states have expanded their Medicaid programs, and Medicaid enrollment nationwide has risen dramatically. For example, between 2013 and 2017 total enrollment in Medicaid rose > 20%, up from 60 to 73.5 million (Statista, 2018). Many of these enrollees are in mandatory Medicaid HMOs, i.e., they were not even given the option of enrolling in FFS Medicaid instead (Centers for Medicare and Medicaid Services, 2016).

Clearly, further research is needed which examines the effects of Medicaid HMOs on other measures of care quality, not just the particular measure examined here. If additional research confirms our findings here, namely that Medicaid recipients receive better primary care under FFS Medicaid, then policymakers should reconsider the notion that Medicaid HMOs are an appropriate vehicle for serving the needs of dual eligibles.

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Declaration of competing interest

The authors report no conflict of interest.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.pmedr.2019.100964>.

References

- Agency for Healthcare Research and Quality, 2014a. MEPS HC-152D: 2012 Hospital Inpatient Stays. Retrieved from. https://meps.ahrq.gov/data_stats/download_data/pufs/h152d/h152ddoc.pdf.
- Agency for Healthcare Research and Quality, 2014b. MEPS HC-155 2012 Full Year Consolidated Data File. Retrieved from. https://meps.ahrq.gov/data_stats/download_data/pufs/h155/h155doc.pdf.
- Agency for Healthcare Research and Quality, 2018. Prevention quality indicators overview. Retrieved from. https://www.qualityindicators.ahrq.gov/modules/pqi_overview.aspx.
- Austin, P.C., 2011. An introduction to propensity score methods for reducing the effects of confounding in observational studies. *Multivariate Behav. Res.* 46 (3), 399–424. <https://doi.org/10.1080/00273171.2011.568786>.
- Austin, P.C., Stuart, E.A., 2015. Moving towards best practice when using inverse probability of treatment weighting (IPTW) using the propensity score to estimate causal treatment effects in observational studies. *Stat. Med.* 34 (28), 3661–3679. <https://doi.org/10.1002/sim.6607>.
- Basu, J., Friedman, B., Burstin, H., 2004. Managed care and preventable hospitalization among Medicaid adults. *Health Serv. Res.* 39 (3), 489–510. <https://doi.org/10.1111/j.1475-6773.2004.00241.x>.
- Bindman, A.B., Chattopadhyay, A., Osmond, D.H., Huen, W., Bacchetti, P., 2005. The impact of Medicaid managed care on hospitalizations for ambulatory care sensitive conditions. *Health Serv. Res.* 40 (1), 19–38. <https://doi.org/10.1111/j.1475-6773.2005.00340.x>.
- Brown, J., Duggan, M., Kuziemko, I., Woolston, W., 2014. How does risk selection respond to risk adjustment? New evidence from the Medicare advantage program. *Am. Econ. Rev.* 104 (10), 3335–3364.
- Caswell, K.J., Long, S.K., 2015. The expanding role of managed care in the Medicaid program: implications for health care access, use, and expenditures for nonelderly adults. *Inquiry* 52. <https://doi.org/10.1177/0046958015575524>.
- Centers for Medicare and Medicaid Services, 2015. Medicaid Managed Care Trends and Snapshots 2000–2013. Centers for Medicare and Medicaid Services Retrieved from. <https://www.medicare.gov/medicaid-chip-program-information/by-topics/data-and-systems/medicaid-managed-care/downloads/2013-medicare-managed-care-trends-and-snapshots-2000-2013.pdf>.
- Centers for Medicare and Medicaid Services, 2016. Medicaid managed care enrollment and program characteristics, 2015. Retrieved from Centers for Medicare and Medicaid Services <https://www.medicare.gov/medicaid/managed-care/downloads/enrollment/2015-medicare-managed-care-enrollment-report.pdf>.
- Congressional Budget Office, 2013. Dual-Eligible Beneficiaries of Medicare and Medicaid: Characteristics, Health Care Spending, and Evolving Policies. Washington DC Retrieved from. <https://www.cbo.gov/sites/default/files/113th-congress-2013-2014/reports/44308dualeligibles2.pdf>.
- Congressional Budget Office, 2018. Exploring the Growth of Medicaid Managed Care. Washington DC Retrieved from. https://www.cbo.gov/system/files?file=2018-08/54235-MMC_chartbook.pdf.
- Culler, S.D., Parchman, M.L., Przybylski, M., 1998. Factors related to potentially preventable hospitalizations among the elderly. *Med. Care* 36 (6), 804–817.
- Duggan, M., Hayford, T., 2013. Has the shift to managed care reduced Medicaid expenditures? Evidence from state and local-level mandates. *J. Policy Anal. Manag.* 32 (3), 505–535.
- Dugoff, E.H., Schuler, M., Stuart, E.A., 2014. Generalizing observational study results: applying propensity score methods to complex surveys. *Health Serv. Res.* 49 (1), 284–303. <https://doi.org/10.1111/1475-6773.12090>.
- Friedland, R.B., Feder, J., 1998. Managed care for elderly people with disabilities and chronic conditions. *Generations* 22 (2), 51.
- Frölich, M., 2007. Propensity score matching without conditional independence assumption—with an application to the gender wage gap in the United Kingdom. *Econ. J.* 10 (2), 359–407.
- Galarraga, J.E., Pines, J.M., 2016. Costs of ED episodes of care in the United States. *Am. J. Emerg. Med.* 34 (3), 357–365.
- Galarraga, J.E., Mutter, R., Pines, J.M., 2015. Costs associated with ambulatory care sensitive conditions across hospital-based settings. *Acad. Emerg. Med.* 22 (2), 172–181.
- Glied, S., Sisk, J., Gorman, S., Ganz, M., 1997. Selection, Marketing, and Medicaid Managed Care (No. w6164). National Bureau of Economic Research.
- Gold, M.R., Jacobson, G.A., Garfield, R.L., 2012. There is little experience and limited data to support policy making on integrated care for dual eligibles. *Health Aff.* 31 (6), 1176–1185.
- Guo, S., Fraser, M.W., 2014. *Propensity Score Analysis*. 12 Sage.
- Heckman, J., 1990. Varieties of selection bias. *Am. Econ. Rev.* 80 (2), 313–318.
- Henry J Kaiser Family Foundation, 2016. Medicaid enrollment in managed care by plan

- type. Retrieved from: <https://www.kff.org/medicaid/state-indicator/enrollment-by-medicaid-mc-plan-type>.
- Herring, B., Adams, E.K., 2011. Using HMOs to serve the Medicaid population: what are the effects on utilization and does the type of HMO matter? *Health Econ.* 20 (4), 446–460. <https://doi.org/10.1002/hec.1602>.
- Hill, S.C., 2007. The accuracy of reported insurance status in the MEPS. *INQUIRY J. Health Care Organ. Provision Financ.* 443–468. https://doi.org/10.5034/inquiryjrnl_44.4.443.
- Hirano, K., Imbens, G.W., 2001. Estimation of causal effects using propensity score weighting: an application to data on right heart catheterization. *Health Serv. Outcome Res. Methodol.* 2 (3), 259–278. <https://doi.org/10.1023/A:1020371312283>.
- Hu, T., Mortensen, K., 2018. Mandatory statewide Medicaid managed care in Florida and hospitalizations for ambulatory care sensitive conditions. *Health Serv. Res.* 53 (1), 293–311. <https://doi.org/10.1111/1475-6773.12613>.
- Lunceford, J.K., Davidian, M., 2004. Stratification and weighting via the propensity score in estimation of causal treatment effects: a comparative study. *Stat. Med.* 23 (19), 2937–2960. <https://doi.org/10.1002/sim.1903>.
- Medicare-Medicaid Coordination Office, 2017. Data analysis brief: Medicare-Medicaid dual enrollment 2006 through 2016. Retrieved from: https://www.cms.gov/Medicare-Medicaid-Coordination/Medicare-and-Medicaid-Coordination/Medicare-Medicaid-Coordination-Office/DataStatisticalResources/Downloads/Eligible-YearEver-EnrolledTrendsReport_2006-2016.pdf.
- Merrell, K., Colby, D.C., Hogan, C., 1997. Medicare beneficiaries covered by Medicaid buy-in agreements. *Health Aff. (Millwood)* 16 (1), 175–184.
- Miller, E.A., Weissert, W.G., 2004. Managed care for Medicare-Medicaid dual eligibles: appropriateness, availability, payment, and policy. *J. Appl. Gerontol.* 23 (4), 333–348.
- Neuman, P., Lyons, B., Rentas, J., Rowland, D., 2012. Dx for a careful approach to moving dual-eligible beneficiaries into managed care plans. *Health Aff. (Millwood)* 31 (6), 1186–1194. <https://doi.org/10.1377/hlthaff.2012.0160>.
- Park, J., Lee, K.H., 2014. The association between managed care enrollments and potentially preventable hospitalization among adult Medicaid recipients in Florida. *BMC Health Serv. Res.* 14, 247. <https://doi.org/10.1186/1472-6963-14-247>.
- Porell, F.W., 2001. A comparison of ambulatory care-sensitive hospital discharge rates for Medicaid HMO enrollees and nonenrollees. *Med. Care Res. Rev.* 58 (4), 404–424. discussion 425–409. <https://doi.org/10.1177/107755870105800402>.
- Rosenbaum, P.R., Rubin, D.B., 1983. The central role of the propensity score in observational studies for causal effects. *Biometrika* 70 (1), 41–55.
- Rubin, D.B., 2001. Using propensity scores to help design observational studies: application to the tobacco litigation. *Health Serv. Outcome Res. Methodol.* 2 (3), 169–188. <https://doi.org/10.1023/A:1020363010465>.
- Sparer, M., 2012. Medicaid Managed Care: Costs, Access, and Quality of Care (23). Retrieved from Princeton. <https://www.rwjf.org/content/dam/farm/reports/reports/2012/rwjf401106>.
- StataCorp, 2013. *Stata Statistical Software: Release 13*. StataCorp LP, College Station, TX.
- Statista, 2018. Total Medicaid enrollment from 1966 to 2018 (in millions). Retrieved from. <https://www.statista.com/statistics/245347/total-medicicaid-enrollment-since-1966/>.
- Walsh, E.G., Clark, W.D., 2002. Managed care and dually eligible beneficiaries: challenges in coordination. *Health Care Financ. Rev.* 24 (1), 63.
- Wang, Y., Wilson, F.A., Stimpson, J.P., Wang, H., Palm, D.W., Chen, B., Chen, L.W., 2018. Fewer immigrants have preventable ED visits in the United States. *Am. J. Emerg. Med.* 36 (3), 352–358. <https://doi.org/10.1016/j.ajem.2017.08.018>.
- Wooldridge, J.M., 2015. *Introductory Econometrics: A Modern Approach*. Nelson Education.
- Young, K., Garfield, R., Musumeci, M., Clemans-Cope, L., Lawton, E., 2013. Medicaid's Role for Dual Eligible Beneficiaries. Retrieved from. <https://kaiserfamilyfoundation.files.wordpress.com/2013/08/7846-04-medicoids-role-for-dual-eligible-beneficiaries.pdf>.
- Zuvekas, S.H., Olin, G.L., 2009. Validating household reports of health care use in the medical expenditure panel survey. *Health Serv. Res.* 44 (5p1), 1679–1700.