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RESEARCH ARTICLE

Impacts on Emergency Department Visits from Personal Responsibility Provisions: Evidence from West Virginia's Medicaid Redesign

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Objective. To examine the impact of a 2007 redesign of West Virginia's Medicaid program, which included an incentive and “nudging” scheme intended to encourage better health care behaviors and reduce Emergency Department (ED) visits.

Data Sources. West Virginia Medicaid enrollment and claims data from 2005 to 2010.

Study Design. We utilized a “differences in differences” technique with individual and time fixed effects to assess the impact of redesign on ED visits. Starting in 2007, categorically eligible Medicaid beneficiaries were moved from traditional Medicaid to the new Mountain Health Choices (MHC) Program on a rolling basis, approximating a natural experiment. Members chose between a Basic plan, which was less generous than traditional Medicaid, or an Enhanced plan, which was more generous but required additional enrollment steps.

Data Collection. Data were obtained from the West Virginia Bureau for Medical Services.

Principal Findings. We found that contrary to intentions, the MHC program increased ED visits. Those who selected or defaulted into the Basic plan experienced increased overall and preventable ED visits, while those who selected the Enhanced plan experienced a slight reduction in preventable ED visits; the net effect was an increase in ED visits, as most individuals enrolled in the Basic plan.

Key Words. Medicaid reform, ED visits, personal responsibility, Mountain Health Choices

Rising health care costs and increased enrollment place pressure on state Medicaid programs and budgets.¹ A particular concern for cost containment in Medicaid has been the rising rate of Emergency Department (ED) visits (Tang et al. 2010), with adults on Medicaid accounting for most of the increase in

ED use between 1997 and 2007. Through the 2010 Affordable Care Act (ACA), over half of states, including West Virginia, expanded Medicaid in 2014 to nonelderly individuals with incomes below 133 percent of the federal poverty level (FPL) (NASHP 2014); since then, states have continued to show interest in reforms aimed at controlling costs and improving health, often through waivers that experiment with design features.

Evidence from pre-ACA Medicaid experiments, such as the West Virginia (WV) Mountain Health Choices (MHC) program, can provide insight into the effects of efforts to mitigate costs and improve health outcomes. Initial state actions seeking to reduce Medicaid program costs occurred through strategies such as shifts to managed care or restrictions in formularies (Siracuse and Vuchetich 2008; Harmon et al. 2011, 2014; Inglehart 2011). But following the passage of the Deficit Reduction Act of 2005, a handful of states experimented with a greater variety of program designs. The WV program was one of the most controversial, as it imposed coverage limits based on member behavior. Assessing the impacts of such efforts is important as states continue to grapple with the goal of reducing costs without causing negative health impacts. In this paper, we take advantage of rich administrative data on the 2007 reform in West Virginia to examine the impacts of an attempt to institute personal responsibility-based reforms in Medicaid.

BACKGROUND ON MHC

Reducing inappropriate ED use was a priority in West Virginia's MHC Medicaid reform (West Virginia Department of Health and Human Resources 2005). In 2005, there were 585 ED visits per 1,000 people in West Virginia, but the Medicaid rate was much higher with 790 visits per 1,000 members (West Virginia Department of Health and Human Resources 2005). MHC began implementation in March 2007 and effectively ended in September 2010 with new federal rules that did not allow beneficiaries to be placed by default into nonbenchmark-equivalent plans (e.g., MHC Basic plan).² The

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WV program was unique in its emphasis on patient responsibility and its linkage of program benefits to individual actions.

Under MHC, beneficiaries could opt into an Enhanced plan, in which they received more comprehensive benefits in exchange for agreeing to certain program rules designed to reduce costs and improve health behavior. Alternatively, they could choose or enroll by default into a Basic option that was less generous than the previous Medicaid benefit package in a number of important dimensions, including prescription drug limits and no coverage for substance abuse, mental health inpatient services, and other services outside of Psychiatrist/Psychologist office visits covered under specialty care.

The Enhanced plan required completing a *Member Agreement* and an individualized *Health Improvement Plan* (see Figures S3 and S4 for examples of these). The *Member Agreement* was a pledge requiring members to use the ED only for emergencies, rely on a “medical home” for services, keep appointments with their doctors, and “do [their] best to stay healthy.” The *Health Improvement Plan* was an agreement developed during a visit with a primary care provider that outlined office visits, diagnostic services, and education programs the member agreed to receive in the coming year. By June of 2010, only 12 percent had selected the Enhanced plan, suggesting that beneficiaries might have considered the costs associated with enrolling in the Enhanced Plan to be high relative to the benefits. The low take-up rate is also consistent with research showing a tendency to use the default options in other domains (e.g., retirement plans in Madrian and Shea 2001).

An important question in evaluating reform efforts is whether the program changes were likely to be binding. Data on enrollees’ prior health care usage patterns suggest that the service restrictions placed on the Basic plan were likely to impose constraints on demand, relative to both the Enhanced plan and traditional Medicaid coverage. For example, the Basic plan limited beneficiaries to no more than four prescriptions per month, but we found that among those who had at least one pre-MHC Medicaid month with more than four prescriptions, more than 55 percent of adults and 40 percent of children were enrolled in the Basic plan (Gurley-Calvez et al. 2011). While a physician could request exemptions from the Basic plan, it was a hurdle that may have restricted access to care and affected the use of ED services. Indeed, summary statistics suggest a decrease in prescription use as an average of 4 percent of enrollees had five or more prescriptions pre-MHC and 1.2 percent had five or more post-MHC.

An interesting economic feature of the Enhanced plan is that its requirements constituted a “nudge” factor (Thaler and Sunstein 2008). The very act

of contacting a physician and filling out a form in that physician's presence pledging to change behavior may have led to changes even if those changes were not tied to direct financial penalties. By examining the effects of the MHC program, we are adding to understanding of the effectiveness of nudging within health care delivery and insurance systems (Lowenstein, Volpp, and Asch 2012).

As MHC was being debated in WV, proponents and opponents alike had only anecdotal evidence to support their positions. Most of the debate centered on whether efforts to increase personal responsibility would be successful without positive patient incentives and provider support, and there was concern over whether setting the Basic plan as the default would result in more unmet need, particularly in prescription use and mental health services (e.g., Hendryx et al. 2009). Our research begins to fill this knowledge gap.

CONCEPTUAL FRAMEWORK AND HYPOTHESES

Although a primary motive for instituting certain features of the reforms (e.g., personal responsibility pledge in the Enhanced plan) was to reduce ED-related costs, we hypothesize that the coverage restrictions in the basic option may have actually led to higher unmet service needs relative to traditional Medicaid coverage (Carlson, DeVoe, and Wright, 2006). This may have resulted in higher ED use, particularly for ambulatory care-sensitive conditions (ACS). On the other hand, we expect lower ED use, particularly for ACS conditions, from the Enhanced plan relative to traditional Medicaid. This leads to an ambiguous prediction of the effect of the MHC program in general relative to traditional Medicaid, but clear predictions for each of the two components separately.

Enhanced plan members pledged to use the ED only for emergency care and were encouraged to develop stronger ties with their primary care physicians by developing a Health Improvement Plan. Basic plan members were limited to four prescriptions per month, and coverage was eliminated for adult mental health and substance abuse services outside of office visits covered under specialty care. Basic plan limits on prescription drug use might have led to substitutions and restrictions in treatment regimens. Lack of coverage for adult mental health and substance abuse services could also affect ED visits, as members might see the ED as the only treatment option.

Our hypotheses are as follows:

Overall ED Utilization Hypothesis: We expect that overall, MHC in WV has resulted in an increase in ED visits, relative to traditional Medicaid. This is because most MHC beneficiaries were enrolled in the Basic plan. We also hypothesize that the increases in ED visits will be largest for adults affected by restrictions in mental health and substance abuse coverage.

Relative ED Utilization Hypothesis (Basic vs. Enhanced): Members enrolled in the Enhanced plan are expected to experience a *reduction* in the probability of an ED visit through increased primary care, relative to traditional Medicaid, while utilization is expected to *increase* for those enrolled in the Basic plan.

DATA

Our data come from West Virginia's Department of Health and Human Resources and include enrollment details (such as age, county, and enrollment anniversary dates) and medical and prescription claims information for all adults and children enrolled in poverty-related Medicaid at any point from January 2005 to October 2010.³ The data include 209,375 MHC-eligible members (172,851 children and 55,587 adults), and about 12 percent of those eligible were enrolled in the Enhanced plan by June 2010.

We test hypotheses regarding program impact using 4 years of a census of administrative claims and enrollment data provided by the West Virginia Department of Health and Human Resources. We limit the sample to the MHC-eligible population (i.e., children and adults who qualify on the basis of income). Our dependent variable of ED visits is an indicator equal to one when that enrollee has at least one ED visit during that month and zero otherwise. We also study whether at least one ED visit of a certain classification occurred during that month for each person. For simplicity, we refer to these measures and any ED visit.

ED visits are identified in the administrative data using CPT-4 service codes and are classified using the NYU ED Algorithm.⁴ The NYU ED Algorithm uses ICD-9 diagnosis codes⁵ to classify each encounter and reports the relative percentage of cases for which that diagnosis falls into each of four categories (thus, it does not provide one definitive category for each ED CPT code). Moreover, when a person has multiple ED visits in a month, we examine each visit separately for categorization. The four categories are nonemergent (where care is not required within 12 hours), emergent/primary care

treatable (where treatment is required within 12 hours but could be provided in a primary care setting), emergent/preventable (where emergency care is required but would have been potentially avoidable with effective ambulatory care, including visits for asthma, diabetes, and congestive heart failure), and emergent/not preventable (where emergency care is required, including visits for trauma, appendicitis, and myocardial infarction). We then create binary variables for each of the four categories (emergent; primary care treatable; emergent preventable; or emergent nonpreventable) that take a value of one in a given month if the person has at least one ED visit with at least a 50 percent probability of being in the relevant category.⁶

Empirical Approach

Our analysis exploits the timing of MHC implementation across and within counties that approximates a natural experiment. MHC was implemented by county, with the first three pilot counties commencing in March 2007 and the remainder following soon afterwards. When a county started its rollout, each Medicaid beneficiary became eligible to choose either the basic or enhanced option on his or her next Medicaid reenrollment date. New Medicaid beneficiaries choose a plan at the time of enrollment. Under MHC, plan enrollment was at the individual level; children and adults in the same family could be enrolled in different plans and have different reenrollment and eligibility periods. Plan selection was valid for 1 year.

This staggered redesign rollout allows us to separate time effects from MHC effects by using those who have not yet reached their eligibility date as a natural comparison group. In essence, those remaining on traditional Medicaid account for other time-varying factors that could have affected the use of ED visits. We examine the impact of the redesign on overall ED use, and then by type of ED visit.

We augment the near-random assignment of MHC eligibility date with a person-level fixed effects model so that MHC program effects are estimated within each member. The fixed effect design allows us to remove the influence of time-invariant characteristics, such as presence of a chronic condition, health attitudes, and sociodemographic factors that are not included in the administrative claims data. In our fixed effects design, only members enrolled in at least 2 months during the time period are included in that analysis and the MHC effect is identified on pre- and post-MHC ED visits for those who have observations in both time periods.

The near-random assignment of enrollment dates eases concerns that those who enter MHC are doing so at a time when they expect to have a substantial change in their medical use pattern. For example, if the date of enrollment could be chosen, enrollees might choose MHC when a need for medical services put them into contact with the medical care system, leading to an erroneous conclusion that the program brought about an increase in service use.

We address the fact that each person is aging over our panel by including broad age categories to capture changes in ED visits that vary by the specific age transitions. For example, ED rates are generally higher for younger children, and we allow for a change in ED rates for those moving from the 0-to-5 category to the 5-to-17 category. Similarly, we include age categories for adults from 18–25 (reference category), 26–35, 36–45, and 46 or more. We find that results are qualitatively similar whether we exclude age controls or enter controls for each year of age (data not shown).

Specifically, we estimate models of the following form:

$$\text{Outcome}_{it} = \gamma \text{MHC}_{it} + \mu_{\text{age_cat},it} + \tau_t + \delta_i + \varepsilon_{it} \quad (1)$$

where Outcome is defined successively as any ED visit, nonemergent ED visit, primary care treatable ED visit, emergent preventable ED visit, or emergent nonpreventable ED visit for individual i in month t . MHC takes a value of 1 when the individual is enrolled in either the Basic or Enhanced plan, and 0 when the individual is enrolled in traditional Medicaid. Time effects are captured with a set of year by month-level indicator variables τ for each month in our study time period from January 2005 to April 2010, age categories are defined as above, and the model includes individual-level fixed effects, denoted δ_i . All models are estimated with robust standard errors clustered at the individual level.

Although the MHC plan rollout structure allows us to separate the treatment impact of MHC redesign from unobserved personal characteristics, we cannot estimate the impact of the specific choice of Basic versus the Enhanced plan as though they had been randomly assigned. The demonstrated evidence on selection and health care use in Gurley-Calvez et al. (2011) shows that members with more doctor's visits and prescriptions were more likely to enroll in the Enhanced plan. Instead, we estimate separate models for the Basic plan and for the Enhanced plan to obtain the average effect of each plan on those who chose it. That is, we compare the average change pre- and postimplementation separately for Basic and Enhanced plan members as compared with the change over the same time period for those who eventually chose the plan.

One concern is that those selecting the Enhanced plan may have a lower propensity for ED visits. We find in our data that there is no statistically significant difference in ED visits for those who eventually enrolled in the Enhanced plan compared to those who were in the Basic plan based on 2006 claims before MHC was implemented, thus mitigating this specific concern. However, even if the two groups are similar in observables, they may be different in unobservable factors that affect their response to the program. We explore the generalizability of our results in the Limitations section.

RESULTS

Monthly ED visit rates for the transition period, October 2007 to June 2008, are presented in Table 1 for children and adults separately for traditional Medicaid (the comparison group), Enhanced, and Basic plans during this time. Conceptually, our sample is defined as anyone who is eventually eligible for MHC; thus, every individual is eventually in the treatment group and we only observe different trend lines during the transition period when there are beneficiaries in both the treatment and comparison groups. As of September 2007, 2 percent of individuals were enrolled in MHC with the remainder still in traditional Medicaid, but by October 2007, 8 percent had moved to MHC and the bulk of the transitions had occurred by June 2008.

Overall and for adult members, rates for any ED visit, any nonemergency visit, and any primary care treatable visit are lower for those member-months in the Enhanced plan and higher for those in the Basic plan, relative to the comparison observations. Overall, 6.22 percent of comparison group members had at least one ED visit on a monthly basis versus 6.05 percent of those in the Enhanced plan and 6.51 percent of those in the Basic plan. This pattern is consistent with expectations, as the lowest ED visit rates are for the Enhanced plan, the highest rates for the Basic plan, with the traditional plan falling in the middle. However, it is not possible to separate out selection effects from program effects in this simple comparison as individuals were able to self-select into the Enhanced and Basic plans.

Figure 1 shows descriptive trends in the ED visit rates by month. This illustrates that although MHC member-months generally registered higher rates of ED visits, their time trends were similar compared to traditional Medicaid member-months during the transition period; this pattern is repeated for nonemergent and primary care treatable visits (data not shown). Figure 1 also shows that initial MHC members had slightly lower ED use than the tradi-

Table 1: Monthly ED Summary Statistics by Reform Plan—October 2007 to June 2008

Variable	All Members			Child Members			Adult Members		
	MHC			MHC			MHC		
	Comp.	Enhanced	Plan	Comp.	Enhanced	Plan	Comp.	Enhanced	Plan
Any ED visit	0.0622 (0.2416)	0.0605 (0.2384)	0.0651 (0.2467)	0.0538 (0.2256)	0.0516 (0.2212)	0.0517 (0.2214)	0.1084 (0.3108)	0.1049 (0.3064)	0.1129 (0.3165)
Any nonemergency	0.0194 (0.1378)	0.0188 (0.1358)	0.0208 (0.1428)	0.0155 (0.1236)	0.0145 (0.1194)	0.0150 (0.1215)	0.0404 (0.1969)	0.0403 (0.1968)	0.0416 (0.1997)
Any primary	0.0327 (0.1778)	0.0318 (0.1754)	0.0337 (0.1804)	0.0290 (0.1679)	0.0285 (0.1663)	0.0275 (0.1636)	0.0527 (0.2235)	0.0483 (0.2145)	0.0557 (0.2294)
Any emergency	0.0027 (0.0527)	0.0029 (0.0538)	0.0029 (0.0538)	0.0025 (0.0498)	0.0025 (0.0503)	0.0024 (0.0485)	0.0044 (0.0661)	0.0047 (0.0682)	0.0048 (0.0693)
Any emergency	0.0108 (0.1034)	0.0106 (0.1022)	0.0119 (0.1084)	0.0089 (0.0938)	0.0081 (0.0894)	0.0088 (0.0932)	0.0214 (0.1448)	0.0230 (0.1499)	0.0230 (0.1500)
nonpreventable	0.4575 (0.4982)	0.4535 (0.4978)	0.4568 (0.4981)	0.5030 (0.5000)	0.5024 (0.5000)	0.5100 (0.4999)	0.2077 (0.4057)	0.2099 (0.4073)	0.2676 (0.4427)
Male									
Age	10.96 (9.81)	11.66 (11.58)	11.76 (11.38)	76.3 (5.19)	72.9 (5.29)	6.70 (5.30)	29.22 (9.09)	33.46 (9.59)	29.78 (8.67)
N	871,591	30,709	495,431	737,270	25,578	386,786	134,321	5,131	108,645

Notes: Entries represent means for all statistics, with standard deviations in parentheses. Sample sizes represent member-months; outcomes are measured at the member-month level. Comp. represents those member-months in the comparison group (traditional Medicaid).
Source: Authors' calculations based on WV Medicaid enrollment and claims data.

Figure 1: Mean Monthly Fraction with Any ED Visit Traditional and Mountain Health Choices Enrollees

Notes: Entries represent mean rates (fraction) of members with any ED visit in that month. The MHC line begins in October 2007 when MHC enrollees constituted at least 5 percent of the Medicaid population. Our series ends in July 2008 excluded, as the vast majority of the eligible population had transitioned to MHC by this time.

Source: Authors' calculations based on WV Medicaid claims and enrollment data for 2006–2008.

tional population, but that their ED use rose on average as composition changed; more individuals transitioned away from traditional Medicaid into MHC.

In Table 2, we present the coefficients and standard errors from linear probability models that show the effect of Medicaid reform on the probability of having an ED visit, where only the results for the key variable (MHCit) are shown for brevity. Table 2a and b shows results for any, nonurgent, and emergent ED use. The last row displays the number of observations (at the person-month level) for each model. These aggregate effects of the MHC program combine the effects of the Enhanced and Basic plans.⁷ We have also estimated these models using an alternative dependent variable of the count of ED visits per person per month, as it is possible that MHC could have affected not only whether an ED visit occurs or not at the monthly level, but also the number of ED visits per month. We find that the results are virtually identical, as we describe below; this is not surprising as we find in our data that its relatively rare for a person to have more than one ED visit per month. Slightly less than 1 percent of all observations (0.94 percent) had more than one ED visit in a single month and among those with at least one visit, 86 percent had exactly one visit and 97 percent had one or two visits.

Consistent with the descriptive evidence, our regression results show that MHC resulted in a statistically significant increase in the probability of any ED visit (column 1, Table 2a). The magnitude indicates an increase of

Table 2: (a) Any and Nonurgent ED Utilization: Aggregate MHC Program Effect; (b) Emergent ED Utilization: Aggregate MHC Program Effect

	(1) Any ED	(2) Any ED Child	(3) Any ED Adult	(4) Any Nonemergent	(5) Any Nonemergent Child	(6) Any Nonemergent Adult	(7) Any Primary Care Treatable	(8) Any Primary Care Child	(9) Any Primary Care Adult
(a)									
MHC	0.0036*** (0.0004)	−0.0007 (0.0005)	0.0103*** (0.0011)	0.0022*** (0.0003)	0.0001 (0.0002)	0.0045*** (0.0007)	0.0015*** (0.0003)	−0.0008** (0.0003)	0.0062*** (0.0007)
N	8,598,487	7,104,885	1,493,602	8,598,487	7,104,885	1,493,602	8,598,487	7,104,885	1,493,602
(b)									
MHC	0.0001 (0.0001)	0.0000 (0.0001)	0.0002 (0.0002)	0.0002 (0.0002)	0.0004** (0.0002)	−0.0000 (0.0002)	0.0012** (0.0002)	0.0012** (0.0005)	
N	8,598,487	7,104,885	1,493,602	8,598,487	7,104,885	1,493,602	8,598,487	7,104,885	1,493,602

Notes: Entries represent coefficients from an individual fixed effects regression. Robust standard errors are clustered at the individual level (in parentheses). All specifications include age category controls and year-month fixed effects.
*** $p < .05$, ** $p < .01$.
Source: Authors' calculations based on WV Medicaid enrollment and claims data for 2005–2010.

0.36 percentage points (a 6 percent increase relative to the base rate of 0.0622 for the comparison observations from Table 1) in a given month. As noted above, we get the same results (6 percent increase) when we replace this binary variable with a continuous variable for number of visits in each month (results not included as a table).

Separate models for children and adults presented in columns (2) and (3) of Table 2a indicate that the effect of MHC on the probability of an ED visit is driven by an increase for adults of 1.03 percentage points (a 9 percent increase relative to the base rate). A similar pattern emerges when we look at the probability of any nonemergent ED visit, with an overall increase of 0.22 percentage points driven by a 0.45 percentage point increase for adults. For primary care treatable ED visits, results displayed in columns 7 to 9 of Table 2a indicate an overall increase of 0.15 percentage points; primary care treatable ED visits increased for adults on MHC by 0.62 percentage points, and there was a small decrease of 0.08 percentage points for children. Table 2b, which shows results for emergent ED visits, indicates no statistically detectable effects of MHC for children or adults in the preventable subcategory (columns 1–3). In the non-preventable ED category, there was a small increase of 0.04 percentage points, driven by a 0.12 percentage point increase for adults.

Table 3a and b contain comparable results for MHC members who eventually enrolled in the Enhanced plan. In contrast to the finding of an aggregate increase in adults' ED visits for the MHC program, Enhanced plan members saw a decrease in the monthly probability of an ED visit for adults, although the results are only marginally statistically significant. Overall likelihood of having an ED visit decreased for adults (0.56 percentage points, 5 percent), and the effect appears to be driven by a decrease in the likelihood of having a primary care treatable ED visit (0.37 percentage points, 7 percent). The likelihood of having a nonemergent visit decreased for children by 0.12 percentage points (8 percent). There is little evidence of a significant impact of the Enhanced plan on emergent ED visits (Table 3b).

Results for Basic plan members (Table 4a and b) suggest a much stronger and opposite finding, especially for adults. Table 4b shows an increase in nonurgent ED visits for adults and no effect to a slightly negative effect for children. Adults saw an increase in the probability of any ED visit (1.09 percentage points, 10 percent), any nonemergent visits (0.47 percentage points, 12 percent), and any primary care treatable visits (0.68 percentage points, 13 percent). Overall, the results are consistent with our hypothesis of an increase in any ED visits for Basic plan members, a decrease in visits for Enhanced plan

Table 3: (a) Nonurgent ED Utilization: MHC Enhanced Plan Effect; (B) Emergent ED Utilization: MHC Enhanced Plan Effect

	(1) Any ED	(2) Any ED Child	(3) Any ED Adult	(4) Any Nonemergent	(5) Any Nonemergent Child	(6) Any Nonemergent Adult	(7) Any Primary Care Treatable	(8) Any Primary Care Child	(9) Any Primary Care Adult
(a)									
MHC Enhanced	0.0001 (0.0012)	-0.0001 (0.0013)	-0.0056* (0.0031)	-0.0001 (0.0007)	-0.0012* (0.0007)	-0.0019 (0.0019)	0.0008 (0.0009)	0.0015 (0.0009)	-0.0037* (0.0022)
N	1,007,428	864,769	142,659	1,007,428	864,769	142,659	1,007,428	864,769	142,659
(b)									
MHC Enhanced	0.0001 (0.0003)	0.0004 (0.0003)	-0.0007 (0.0007)	-0.0007 (0.0007)	-0.0009* (0.0005)	-0.0008 (0.0005)	-0.0020 (0.0015)	-0.0020 (0.0015)	-0.0020 (0.0015)
N	1,007,428	864,769	142,659	142,659	1,007,428	864,769	864,769	142,659	142,659

Notes: Entries represent coefficients from an individual fixed effects regression. Robust standard errors are clustered at the individual level (in parentheses). All specifications include age category controls and year-month fixed effects.
*** $p < .05$; ** $p < .01$.
Source: Authors' calculations based on WV Medicaid enrollment and claims data for 2005–2010.

Table 4: (a) Nonurgent ED Utilization: MHC Basic Plan Effect; (b) Emergent ED Utilization: MHC Basic Plan Effect

	(1) Any ED	(2) Any ED Child	(3) Any ED Adult	(4) Any Nonemergent	(5) Any Nonemergent Child	(6) Any Nonemergent Adult	(7) Any Primary Care Treatable	(8) Any Primary Care Child	(9) Any Primary Care Adult
(a)									
MHC	0.0035***	-0.0010**	0.0109***	0.0022***	0.0001	0.0047***	0.0015***	-0.0010***	0.0068*** (0.0008)
Basic	(0.0005)	(0.0005)	(0.0011)	(0.0003)	(0.0003)	(0.0007)	(0.0003)	(0.0004)	
N	7,591,059	6,240,116	1,350,943	7,591,059	6,240,116	1,350,943	7,591,059	6,240,116	1,350,943
(b)									
MHC	0.0000 (0.0001)	-0.0000 (0.0001)	0.0000 (0.0001)	0.0002 (0.0002)	0.0004** (0.0002)	-0.0000 (0.0002)	0.0011** (0.0005)		
N	7,591,059	6,240,116	1,350,943	7,591,059	6,240,116	1,350,943	7,591,059	6,240,116	1,350,943

Notes: Entries represent coefficients from an individual fixed effects regression. Robust standard errors are clustered at the individual level (in parentheses). All specifications include age category controls and year-month fixed effects.
* $p < .10$; ** $p < .05$; *** $p < .01$.

Source: Authors' calculations based on WV Medicaid enrollment and claims data for 2005–2010.

members, and an overall aggregate increase in ED visits driven by the majority of members enrolling in the Basic plan.

Our examination of primary and secondary diagnosis codes reveals an increase in ED visits with a diagnosis for mental health disorder, drug dependence, and drug poisoning overall, which was concentrated among those who enrolled in the Basic Plan. During the main transition period from October 2007 to June 2008, ED visits with a mental health diagnosis were 6.6 percent higher and drug-related ED visits were 4.3 percent higher for adult MHC members, compared to those on traditional Medicaid (data not shown).⁸ For adults, mental health and drug-related ED visits accounted for 7.6 percent of all ED visits pre-MHC and 9.0 percent of visits post-MHC. Regression estimates suggest an increase of 15.8 percent in the likelihood of having a mental health-related ED visit for adults, but no statistically significant effect for children.

LIMITATIONS

We note several key limitations to our analysis using the available administrative data, only some of which we are able to mitigate. As noted above, the roll-out of MHC was implemented in a manner that mirrors random assignment in that each person was required to switch to the new program on the anniversary of their last enrollment. However, there is a typical cyclical spike around the new school year, and those enrolling at that time may be different in ways that cause bias. We reran our baseline nonemergent models excluding those who became eligible in July–September; these results are nearly identical to those presented in Table 2a and are presented in the Appendix. To test for the possibility that we are just picking up spurious correlation, not treatment effects, we estimated placebo models by assuming that enrollees transitioned 9 months before they actually did. In all cases, we fail to reject the null of zero treatment efficacy.

Previous work has noted evidence of adverse selection into the Enhanced plan, particularly for adults (Gurley-Calvez et al. 2011). More specifically, members with higher past utilization of doctor visits and prescriptions were more likely to enroll in the Enhanced plan. However, there is no evidence of selection on our main outcome variable of ED visits, as already noted elsewhere. As noted above, we do not observe higher pre-MHC ED visits for members who eventually enrolled in the Enhanced plan (6.36 percent) compared to those who were in the Basic plan (6.42 percent) using 2006

data, and we fail to reject the null that the pre-MHC rates are the same across groups (p -value = .39). There still may be unobservable differences that caused individuals to select into each plan. We make an effort to mitigate any plan selection bias by identifying our effects *within* person, so that fixed characteristics such as underlying differences in health should not bias our results. In unreported results, we experimented with an instrumental variables approach, using weather conditions on the plan anniversary date to isolate the portion of variance in enhanced enrollment not related to individual characteristics. When statistically significant, these results were consistent with our panel analysis, but the lack of precision in our estimates precluded us from placing much weight on those results.

Another possible limitation is our use of administrative enrollment and encounter data, which might include measurement errors from sources such as outdated ICD groupings in the NYU algorithm. However, we do not have any reason to believe that measurement error would differ significantly by MHC plan or between those currently eligible and not yet eligible. Similar data have been used in an analysis of MHC plan selection and active decision making (Gurley-Calvez et al. 2011; Walsh et al. 2011).

Another limitation of our analysis is the focus on short-term (1.5–3 years, depending on eligibility date) medical service outcomes when long-term outcomes might be important for health status and state budgets. For example, our results suggest no significant effect of the Enhanced plan on preventable emergent visits. Although elements of the Enhanced plan might be well suited to addressing chronic conditions that lead to preventable ED visits, our data time-frame might not be long enough to identify these effects if they occurred. However, short-term outcomes are of great importance in the political debate, as reforms that do not exhibit early results are much less likely to be extended.

CONCLUSIONS AND FUTURE RESEARCH

Our analysis suggests that the Medicaid reform introduced in WV, which was intended to reduce costs, increase personal responsibility, and decrease ED use, had the unintended consequence of *increasing* ED use. Our results suggest an overall increase in the probability of an ED visit per month of about 6 percent, an increase in nonemergent ED visits of almost 12 percent, and an increase in primary care–treatable visits of about 5 percent. These overall effects were driven by increases in adult nonemergent and primary care–treatable ED visits. The probability of any ED visit was 10 percent higher for

members in the MHC plan relative to members who transitioned at a later date. The probability of adult nonemergent and primary care treatable-ED visits increased by about 12 percent for MHC members.

Separate analyses by MHC plan type provide general support for our hypotheses that ED visits declined in the Enhanced plan, but that these reductions were overwhelmed by higher ED use among the Basic plan members who represented the vast majority of the enrolled population. Results for the Enhanced plan suggest an overall decrease in the probability of an adult ED visit of over 5 percent and of primary care-treatable ED visits of over 7 percent. The probability of nonemergent visits decreased by about 8 percent for children in the Enhanced plan.

Results for members in the Basic plan suggest that the benefit reductions had a significant effect on adults, who were 11 percent more likely to have any ED visit, 12 percent more likely to have a nonemergent ED visit, and 13 percent more likely to have a primary care-treatable visit. The evidence is consistent with adults facing binding constraints on mental health and substance abuse services in the Basic plan, given the finding that enrollees were more likely to have mental health and substance abuse ED visits under MHC.

Overall, the West Virginia Medicaid reform did not achieve the goal of reducing ED visits and instead led to higher ED visits. Our results caution that imposing coverage limitations in prescriptions and mental health/substance abuse for those who do not comply with personal responsibility provisions may have unintended consequences. The aggregate effect of the redesigned Medicaid program was a significant increase in ED visits because more than 85 percent of members chose or defaulted into the Basic plan. At the same time, we find that the small share who did agree to the Enhanced plan provisions were less likely to have nonemergent and primary care-treatable ED visits. This suggests that incorporating nudges in Medicaid plans can have positive effects on vital program outcomes. On balance, the West Virginia experience highlights the challenges in structuring incentive systems in Medicaid programs to achieve cost-saving and improved outcomes.

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NOTES

1. Previous state efforts to contain costs include waiver services (Kitchener, Ng, and Harrington 2004; Kitchener et al. 2005), preferred drug lists (Simon, Tennyson, and Hudman 2009), managed care (Duggan 2004; Kaestner, Dubay, and Kenney 2005; Aizer, Currie, and Moretti 2007), patient-centered medical home models (Pham et al. 2007; Barr 2008; Sidorov 2008; Cooley et al. 2010), and pay-for-performance provider incentives (Christianson 2007; Felt-Lisk, Gimm, and Peterson 2007).
2. There are four benchmarks, including the Federal Employees Health Benefit Program, coverage generally availability to state employees, the commercial HMO plan with the largest enrollment in the state, or a Secretary-approved coverage plan (<https://www.medicaid.gov/Medicaid-CHIP-Program-Information/By-Topics/Benefits/Benchmark-Benefits.html>).
3. West Virginia Medicaid operated almost exclusively in a managed-care environment, where eligible members had a choice between at least two managed-care carriers in each county. Members who did not select a carrier were randomly assigned. West Virginia began the transition to managed care in 2003; carriers were operating in all but four of 55 counties at the time of the MHC rollout.
4. The algorithm is based on the examination of nearly 6,000 ED records and the advice of ED and primary care doctors. Information and the algorithm can be found at <http://wagner.nyu.edu/faculty/billings/nyued-background>.
5. When multiple diagnoses are reported for an ED visit in the claims data, we use the classification indicating highest severity.
6. There is a small fraction of ED visits (0.69 percent, or 3,684 visits in total in our data) that we were unable to classify using the NY algorithm, even when using up to three diagnosis codes.
7. The overall MHC estimate is not equal to the weighted average of the Basic and Enhanced results shown in Table 3, because the separate estimates are measured relative to separate time trends, while the overall model is measured relative to the same trend.
8. Mean mental health visits include those with ICD-9 codes 290–316. Mean drug-related ED visits include drug dependence (304) and poisoning by drugs (960–979). Differences were statistically significant at the 1 percent level.

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SUPPORTING INFORMATION

Additional supporting information may be found in the online version of this article:

- Appendix SA1: Author Matrix.
- Table S1. Nonurgent ED Utilization: Aggregate MHC Program Effect—No School-Year Spike.
- Figure S1. Overview of Services Available for Adults under Medicaid Redesign (Highlight in Gray Indicates Areas with Plan Differences).
- Figure S2. Overview of Services Available for Children under Medicaid Redesign.
- Figure S3. Health Improvement Plan.
- Figure S4. Member Responsibility Agreement.