

The Expanding Role of Managed Care in the Medicaid Program: Implications for Health Care Access, Use, and Expenditures for Nonelderly Adults

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Kyle J. Caswell, PhD¹ and Sharon K. Long, PhD¹

Abstract

States increasingly use managed care for Medicaid enrollees, yet evidence of its impact on health care outcomes is mixed. This research studies county-level Medicaid managed care (MMC) penetration and health care outcomes among nonelderly disabled and nondisabled enrollees. Results for nondisabled adults show that increased penetration is associated with increased probability of an emergency department visit, difficulty seeing a specialist, and unmet need for prescription drugs, and is not associated with reduced expenditures. We find no association between penetration and health care outcomes for disabled adults. This suggests that the primary gains from MMC may be administrative simplicity and budget predictability for states rather than reduced expenditures or improved access for individuals.

Keywords

Medicaid, managed care, access to health care, health care utilization, health care costs

Introduction

States have turned to managed care as a strategy to control health care expenditures and improve the quality of care in the Medicaid program, with the role of managed care expected to increase with the 2014 Medicaid expansion under the Affordable Care Act (ACA).^{1–3} By focusing on efficient and effective care delivery, Medicaid managed care (MMC) is expected to lower expenditures and provide greater administrative simplicity and budget predictability for states and, potentially, improve access to care and health outcomes for program enrollees. The risk, however, is that the incentives for reduced expenditures under managed care lead to restrictions on access and lower quality of care for Medicaid enrollees. By 2010, 35 states and the District of Columbia had implemented some level of fully capitated managed care in their Medicaid programs.⁴ The scope of MMC penetration varied across states, as did the population groups affected. In general, MMC penetration is greater for children and parents, although states are increasingly turning to managed care for aged and disabled populations.²

The growing use of managed care by states for their Medicaid populations has continued despite a lack of consistent evidence that managed care has reduced expenditures or improved access to care for enrollees.¹ Existing research finds little evidence that managed care substantially reduces health care expenditures, if at all, among nonelderly Medicaid

enrollees overall,^{5–7} or among nonelderly adults with disabilities.⁸ Recent work by Marton et al. is one exception, which focused on all children with Medicaid in 2 distinct managed care programs in Kentucky during the late 1990s.⁹ That study found that managed care results in spending reductions, albeit the reductions vary with different types of managed care programs. Conversely, there is some evidence that overall expenditures may actually have increased with the expansion of MMC among welfare-eligible enrollees (adults and children) in California.¹⁰

The evidence on the association between managed care and Medicaid enrollees' access to care is also mixed. For example, Herring and Adams found that, among nonelderly Medicaid enrollees overall (including children), increased managed care penetration is associated with an increase in the number of emergency department (ED) and medical practitioner visits, and a decrease in the number of inpatient stays and surgeries.⁵ They also find that higher MMC penetration increased reliance of the ED as a usual source of care. In contrast, work by Garrett and Zuckerman, who study an earlier time period,

¹The Urban Institute, Washington, DC, USA

Corresponding Author:

Kyle J. Caswell, Research Associate, The Urban Institute, 2100 M Street NW, Washington, DC 20037, USA.
Email: kcaswell@urban.org



found that mandatory health maintenance organization (HMO) programs decreased the probability of an ED visit among nonelderly adult Medicaid enrollees.¹¹ The work by Marton et al. for children discussed above finds that MMC decreased outpatient utilization, while increasing child wellness visits.⁹ The findings for professional provider utilization, which did not occur in a hospital outpatient or inpatient setting, were mixed—increasing under 1 MMC model and decreasing under the other. Among disabled adults, Burns found that mandatory MMC enrollees did not experience improvements in access to care,¹² whereas Coughlin et al. found that MMC led to some improvements in access to care.¹³

This study builds on prior work to examine the impacts of increasing managed care penetration on health care access, use, and expenditures for nonelderly adults within the Medicaid program, taking advantage of the variation in fully capitated MMC enrollment within and across states.ⁱⁱ In its approach, this work is closest to that of Herring and Adams,⁵ yet it is distinct along several dimensions. First, the main independent variable in this analysis, the proportion of Medicaid enrollees in fully capitated managed care (ie, MMC penetration), is defined at the county level rather than the Metropolitan Statistical Area (MSA) as in the work by Herring and Adams.⁵ This difference is important as MMC is generally implemented at the county level when states expand their managed care delivery systems. Consequently, there can be variation in managed care across counties within a given MSA. Second, our work covers a more recent period of time (2006–2009) compared with 1996 through 2003. The more recent time period is important insofar as more time has passed since many counties implemented MMC and the impacts of MMC may take time to materialize, and health care markets change over time. Third, our work distinguishes between nonelderly Medicaid adults receiving Supplemental Security Income (SSI), who are, by definition, severely disabled,ⁱⁱⁱ and the non-SSI Medicaid population, whereas the work by Herring and Adams combines the two populations and adults and children. The ability to identify SSI enrollees is important because they have different medical needs than the non-SSI population and face different managed care options under Medicaid. Finally, our work utilizes actual medical spending data, rather than imputed expenditures. In short, our study offers a more timely and stronger assessment of the impacts of expanding MMC than has previously been available.

Results show that a higher level of county MMC penetration was associated with an increase in non-SSI enrollees' probability of an outpatient ED visit, reported difficulty seeing a specialist, and reported unmet need for prescription drugs. We also observe no evidence of reduced expenditures associated with higher MMC penetration for this population. Results specific to the SSI population reveal little association between MMC and health outcomes. We find no evidence that MMC is related to changes in access to care, use of medical services, or reduced expenditures for the SSI population;

however, small sample sizes make those estimates imprecise. Overall, the results for the non-SSI population generally corroborate those from Herring and Adams of some evidence of poorer access and no evidence of reduced expenditures. This implies that policy makers considering expanding managed care for their current Medicaid population, or new enrollees in states that expand Medicaid under the ACA, should not necessarily expect reduced expenditures or improvements to access to health care. The primary gain from MMC for the states may be administrative simplicity and budget predictability rather than either reduced expenditures or improved access.

Methods

Data and Sample

Several sources of data are used in this study. First, household survey data are from the Medical Expenditure Panel Survey–Household Component (MEPS-HC), which is representative of the US civilian noninstitutionalized population. We pool 4 data files representing calendar years 2006 through 2009. From the MEPS-HC, we utilize detailed information on enrollees' health care access, use, and expenditures, as well as health insurance, disability status, and demographic characteristics (discussed in detail below). The MEPS has a complex survey design and sampling weights, and all point estimates, standard errors, and significance tests reported in this study incorporate these features of the data.

The MEPS data are supplemented with county-level MMC penetration rates constructed from the Medicaid Statistical Information System (MSIS) person summary files for years 2006 through 2009.^{iv} This is our main explanatory variable of interest. The MSIS is a source of administrative data, provided by each state and the District of Columbia to the Centers for Medicare and Medicaid Services (CMS).¹⁴ From the MSIS data, we utilize information on monthly Medicaid enrollment status among all Medicaid enrollees by type of Medicaid (e.g., comprehensive managed care) and basis of enrollment (e.g., disability). These penetration rates are our key independent variable of interest (discussed in detail below). These data were merged with the MEPS data for individuals by county of residence and calendar year.^v

In addition, we supplement the MEPS and MSIS data with county- and state-level information culled from multiple sources. These data, which are discussed in more detail below, were used to control for important characteristics correlated with both the outcomes of interest and county MMC penetration. These data are from the Behavioral Risk Factor Surveillance System,¹⁵ Area Health Resources Files,¹⁶ Federal Reserve Economic Data,¹⁷ US Census Bureau State Government Finances,¹⁸ Kaiser Family Foundation,¹⁹ US Census Bureau Small Area Income and Poverty Estimates,²⁰ CMS, National Summary of State Medicaid Managed Care Programs, and Medicaid Managed Care Enrollment Report.^{21,22}

We imposed several restrictions on the MEPS sample given the focus of this study. First, we limit the sample to nonelderly Medicaid enrollees aged 19 to 64 years. Second, we exclude dual Medicaid-Medicare enrollees given that they face very different managed care choices. Third, we exclude enrollees with less than full-year coverage given our focus on health care access and expenditures over the prior year. This insures that the access, use, and expenditure measures correspond to an equivalent period of Medicaid coverage. Finally, we distinguish between severely disabled enrollees, defined as those who received SSI at any point during the year, and nondisabled enrollees.

The pooled 2006-2009 MEPS data contain 135 030 individual records, 124 511 of which are out of the age range for this study or did not have Medicaid coverage at any point during the year (restriction 1). An additional 1274 enrollees were dual eligibles (restriction 2) and 4200 had less than full-year coverage (restriction 3). Finally, we exclude an additional 225 records due to missing data for the control variables included in the analysis (74) or a sampling weight equal to 0 (151). The final sample for the analysis includes 4820 Medicaid enrollees, of whom 1011 were disabled adults receiving SSI benefits.

Empirical Model

Managed care can have both direct and indirect effects on health care access and expenditures for Medicaid enrollees. For Medicaid enrollees in managed care plans, we would expect direct effects on health care use and expenditures due to changes in provider incentives. Changing incentives under managed care can affect both the price of care and the quantity of care provided to enrollees,²³ although given the low provider reimbursement rates under Medicaid there may be little room to lower prices to providers under managed care.⁶ For Medicaid enrollees who remain in fee-for-service Medicaid, there is the potential for spillover effects from changes in the market and care delivery patterns as managed care expands. Examples include Medicaid delivery system consolidation, changes in provider practice style, and pressure from market competition.²⁴⁻²⁶

In this study, we estimate reduced form models of the overall association between MMC penetration and enrollees' health care access, use, and expenditures, controlling for characteristics of the enrollee and his or her county and state. In cases where an outcome is continuous—counts of medical use and expenditures—we estimate 2-part models where the first part estimates the probability of any medical use or expenditures, and the second part estimates the level of use or expenditures conditional on nonzero use or expenditures. Our general specification takes the following form:

$$Y_{icst} = g(\alpha + \gamma P_{ct} + X'_{it}\beta_1 + C'_{ct-1}\beta_2 + S'_{st-1}\beta_3 + \eta_t, \varepsilon_{icst}) \quad (1)$$

where Y_{icst} represents a given outcome of interest for individual i in county c in state s in year t , P_{ct} equals the MMC penetration rate in county c in year t , X_{it} includes individual- and family-level characteristics associated with individual i , C_{ct-1} includes county-level controls, S_{st-1} includes state-level controls, η_t are year fixed effects, α_0 is the constant term, and ε_{icst} is an error term. Exact definitions are discussed in detail below. The parameter estimate of interest is $\hat{\gamma}$, which measures the direct and indirect association of MMC penetration with the outcomes of interest. Models are estimated for the non-SSI and SSI populations in turn. This is because the medical needs of the 2 populations are likely to differ in ways that we cannot control for in the analysis (discussed below) and, consequently, the impacts of managed care may also differ for the 2 groups. Furthermore, as managed care enrollment is higher for the non-SSI population, the parameter estimate $\hat{\gamma}$ is likely to capture more of the direct effects of managed care for non-SSI enrollees.

To measure the association between MMC penetration and health care access, and any health care use or any expenditures—measured as any use of particular medical services and any medical expenditure—the function g in Equation 1 is defined as the logistic function. This is appropriate as these outcomes are all binary. The associations between MMC penetration and positive medical use are estimated as zero-truncated Poisson models, and the associations with positive medical expenditures are estimated as gamma generalized linear models (GLMs) with a log link.

Dependent Variables (Y_{icst})

The dependent variables in this analysis cover 3 broad categories: health care access, use, and expenditures. Specifically, we study 5 access to care outcomes, where enrollees indicated whether in the past year they had (1) a usual source of care, excluding the ED; (2) any unmet need for medical care, tests, or treatments; (3) any unmet need for prescription drugs; (4) difficulty seeing a specialist; and (5) difficulty seeing a specialist, among those who reported the need to visit a specialist.^{vi}

Similarly, we study 4 types of medical care use. For each, we study whether a respondent reported any use of a given type during the last year, and among those who reported use we study the quantity of use over the year. Types of medical care use include inpatient stays, outpatient ED visits,^{vii} general doctor visits, and specialist visits. Doctor and specialist visits include those that take place in either an outpatient- or office-based setting.

Finally, we examine 3 different measures of medical expenditures: total medical expenditures (all payers combined, including out-of-pocket expenditures), total out-of-pocket expenditures, and total expenditures by the Medicaid program. As our data span several calendar years, we inflate pre-2009 calendar year expenditure data to real 2009 US

dollars. Total expenditures and Medicaid expenditures were inflated using the National Income and Product Accounts, price index for gross domestic product (GDP).²⁷ Out-of-pocket expenditures were inflated using the all urban consumers, Consumer Price Index.²⁸ The results are not sensitive to the choice of deflator.

MMC Penetration (P_{ct})

County MMC penetration, the main independent variable of interest, is defined as the share of a given county's nondual Medicaid population aged 19 to 64 enrolled in fully capitated managed care in a given year. As noted above, the penetration rates were calculated from the MSIS data by enrollee type (SSI and non-SSI) and account for less than full-year enrollment status.^{viii} In presenting the results, we focus on the average marginal effect (AME) of these penetration rates from the relevant logistic models, zero-truncated Poisson models or GLM models.

As discussed above, MMC penetration captures both direct and indirect effects of managed care on the outcomes of interest, compared with the direct effects of individual MMC enrollment. MMC penetration also has the advantage of moving away from the individual enrollment decision, which likely results in nonrandom take-up of managed care and, thus, the potential of biased estimates of the link between MMC enrollment and the outcomes of interest.^{ix} Using the penetration rates, however, may also result in biased estimates if counties or states shifted from fee-for-service to MMC in reaction to factors that also affect the health care outcomes (such as limited provider availability). To address this latter concern, we include an array of relevant county- and state-level characteristics in the model (discussed below).

Other Independent Variables (X_{it} , C_{ct-1} , S_{st-1})

We control for a rich array of individual characteristics associated with the outcomes of interest (X_{it}). Demographic controls include sex, age (19-29, 30-39, 40-49, 50-64), race/ethnicity (white/non-Hispanic, black/non-Hispanic, Hispanic, and other/non-Hispanic), marital status (married, never married, widowed/divorced/separated), US citizenship status, and highest educational attainment (less than high school, high school graduate, greater than high school). Health characteristics include both physical and mental health status (excellent or very good, good, fair or poor) and the number of chronic and nonchronic health conditions. Family-level controls (defined over health insurance eligibility units [HIEUs])^x include family income with respect to the Federal Poverty Level (FPL; less than 50%, 50%-100%, 100%-150%, 150%-200%, 200% and greater), the number of dependent family members,^{xi} and whether there was someone in the family with a chronic condition other than the sample member.

To further isolate the link between county MMC penetration and the outcomes of interest, we include lagged county- and state-level variables to address the potential of MMC policy endogeneity and to control for important environmental factors that are likely to affect the outcomes, such as provider supply (C_{ct-1} , S_{st-1}). Policy endogeneity would arise if there were characteristics of a state (or its counties) that affected both the outcomes of interest and the state's policy decisions with respect to MMC, such as whether to implement or expand MMC. Failing to control for such factors in the analysis would lead to biased estimates.^{xii}

The county and state measures come from multiple sources and were merged with the MEPS data by the individuals' county/state of residence by year. To account for the state policy environment, we include 3 state-level variables. The first 2 are state expenditures as percent of revenues,¹⁸ and state GDP per capita,^{16,17} which serve as proxies for budgetary pressures in the state. Increased pressure may influence the decision to shift from fee-for-service to managed care if it is perceived to result in savings. The third state policy environment variable is state Medicaid income eligibility as percent of FPL for a working-parent family of 3,¹⁹ which is a proxy for the state's Medicaid eligibility generosity. States with more generous programs will have more eligibles, all else equal, and are possibly more motivated to seek savings by shifting to managed care.

Local (county level) health care market characteristics will affect the Medicaid enrollees' access to and use of care, and may also affect decisions on the implementation of MMC across geographic areas in a state. We include 4 county-level controls to capture the supply side of the local environment: the number of hospital beds per 1000 individuals, the number of primary care physicians per 1000 individuals, whether the county has 1 or more Federally Qualified Health Centers, and the number of hospitals with an ED per 1000 individuals.¹⁶ A relatively low capacity to provide medical care may impact enrollees' access to care, treatment setting, and expenditures, which in turn may influence decisions to shift to managed care. We also include the Medicare + Choice Hospital Insurance aged payment rate as a proxy for the price of medical services in the county.¹⁶ Higher prices for services, holding quantity and other factors constant, influence expenditures on services, which is important to control for by itself. Nonetheless, higher prices could influence counties' decisions to shift to managed care for perceived savings.

To capture health care needs in the local market, we include the share of adults diagnosed with diabetes¹⁵ and median household income per capita at the county level.²⁰ These are rough proxies for population health that in turn influences the quantity of medical services demanded in the local market. And depending on the capacity of the local health care market, it may impact access and use of services, expenditures, and county decisions to shift to managed care. We also include county population per square mile,¹⁶ as

Table 1. County Medicaid Managed Care Penetration Rates Corresponding to MEPS Respondents by SSI/non-SSI Status, 2006-2009.

	Percentile						Mean	N
	10th	25th	50th	75th	90th	95th		
Non-SSI enrollees	0.1%	48.9%	80.8%	85.4%	91.7%	97.6%	64.1%	3809
SSI enrollees	0.0%	0.3%	21.1%	64.6%	89.8%	96.5%	33.4%	1011

Source. 2006-2009 MEPS and the Medicaid Statistical Information System.

Note. Dual Medicare-Medicaid enrollees were excluded in the penetration rate calculations, as were beneficiaries with less than fully capitated plans. MEPS = Medical Expenditure Panel Survey; SSI = Supplemental Security Income.

urban areas, with their larger population bases, are more conducive to managed care. Finally, we include a binary variable that indicates whether the county participates in Primary Care Case Management (PCCM) for its Medicaid enrollees, calculated from the MSIS administrative data.^{xiii} This is important as PCCM is distinct from capitated managed care, and PCCM penetration is correlated with capitated managed care penetration as PCCM is often a first step toward capitated managed care. Likewise, though similar, PCCM health care delivery systems produce different incentives for providers than capitated programs that may influence the outcomes studied here.

Additional Specifications

Although the MMC penetration rate is our primary independent variable of interest, we supplement these findings with 5 alternative specifications to evaluate the robustness of our results. First we estimate models where the penetration rate is lagged 1 year, as lagged penetration is arguably more exogenous than contemporary penetration.^{xiv} Second, we estimate models where the penetration rate corresponds only to counties with mandatory MMC, where the rate equals 0 in nonmandatory counties. Data on mandatory MMC come from CMS, National Summary of State Medicaid Managed Care Programs, and Medicaid Managed Care Enrollment Report.^{21,22} Third, models are estimated with a binary variable indicating whether the county has mandatory MMC program by subpopulation,^{xv} and a fourth specification with a binary indicator for whether there is any MMC in the county for a given subpopulation. The final specification includes a binary indicator from the MEPS data, where respondents reported that they are enrolled in a MMC plan.

Limitations

Our estimates of the link between county MMC penetration and health care access, use, and expenditures do not necessarily identify causal effects. Although we estimate rich models, there may be important omitted variables that affect both county MMC penetration and the study outcomes that could bias our estimates of the effect of MMC. For example, although we attempt to control for MMC policy endogeneity, factors influencing state policy decisions do so with a lag

that is likely to be longer than that which we are able to control for. Thus, it is likely that we reduce but do not eliminate such bias. Second, we focus on adults with full-year Medicaid to link access, use, and expenditures over the year to Medicaid coverage for the same time period. However, as a substantial share of non-SSI Medicaid enrollees cycle in and out of coverage, the results reported here may not be generalizable to the full Medicaid population. Third, we focus on national estimates, knowing that Medicaid and MMC vary considerably across the states. The results reported here provide the average effects across the nation and are not necessarily applicable to individual states or counties. That is, our sample is too small to control for state (or county) fixed effects, which is a limitation of the data. Finally, we focus on payments for health care services in this analysis and so do not capture the full expenditures of administering the Medicaid program under managed care and fee-for-service Medicaid.

Results

Summary Statistics

Table 1 reports on the distribution of county MMC penetration faced by non-SSI and SSI Medicaid enrollees in the MEPS, combined over years 2006 to 2009. MMC penetration was generally greater among non-SSI enrollees than SSI enrollees. For example, average MMC penetration among respondents in the MEPS subsample equals 33.4% for SSI enrollees and 64.1% among non-SSI enrollees (see Table 1). Likewise, one-half of non-SSI enrollees resided in counties with MMC penetration equal to 80.8% or higher, whereas half of SSI enrollees resided in counties with MMC penetration at 21.1% or higher. In addition to MMC penetration, three-quarters of non-SSI respondents reported they were enrolled in a managed care plan, as did approximately 63% of SSI enrollees (see Table A1 of the appendix). Finally, 82.4% of non-SSI enrollees resided in an area with mandatory MMC, whereas less than half (45.9%) of SSI respondents resided in mandatory MMC areas over the period (Table A1).

Table 2 reports summary statistics on health care access, use, and expenditures—the dependent variables in this analysis—by SSI status. Nearly 90% of the SSI and 80% of the

Table 2. Health Care Access, Use, and Expenditures for Nonelderly Adult Full-Year Medicaid Enrollees by SSI Status, 2006-2009.

	Non-SSI enrollees						SSI enrollees					
	Pr[Y > 0]	SE	N	E[Y Y > 0]	SE	N	Pr[Y > 0]	SE	N	E[Y Y > 0]	SE	N
Health care access over the year												
Had a usual source of care (excluding emergency department)	78.9%	1.1	3767	—	—	—	87.6%	1.5	1000	—	—	—
Unmet need for medical care, tests, or treatments	3.7%	0.5	3795	—	—	—	7.9%	1.1	1009	—	—	—
Unmet need for prescription drugs	2.7%	0.4	3794	—	—	—	7.1%	1.1	1011	—	—	—
Difficulty seeing a specialist	12.3%	0.8	3573	—	—	—	14.2%	1.4	953	—	—	—
Difficulty seeing a specialist conditional on need to see one	39.5%	2.1	1005	—	—	—	28.6%	2.8	456	—	—	—
Health care use over the year												
Inpatient stay(s)	15.9%	0.8	3809	1.3	0.0	575	22.6%	1.7	1011	1.6	0.1	223
Outpatient emergency department visit(s)	22.9%	0.9	3809	1.6	0.1	864	28.3%	1.8	1011	1.8	0.1	307
General doctor visit(s)	52.5%	1.1	3793	3.1	0.1	1790	68.1%	2.1	1008	4.6	0.5	642
Specialist (medical doctor) visit(s)	44.5%	1.2	3793	5.5	0.2	1476	61.8%	2.1	1003	8.3	0.7	565
Health care expenditures over the year (2009 US\$)												
Total health care expenditures	85.3%	0.8	3809	\$5165	\$233	3130	94.2%	0.9	1011	\$12 337	\$999	942
Out-of-pocket health care expenditures	64.6%	1.2	3809	\$288	\$20	2305	81.8%	1.8	1011	\$473	\$46	828
Medicaid health care expenditures	82.6%	0.9	3809	\$4306	\$212	3033	93.2%	1.0	1011	\$10 617	\$942	936

Source. 2006-2009 Medical Expenditure Panel Survey.

Note. The subsample excludes dual Medicaid-Medicare enrollees, and respondents with less than full-year Medicaid status. Monetary values were inflated to constant 2009 US dollars. SSI = Supplemental Security Income. Pr[Y>0] = probability that a given event Y is greater than zero. SE = Standard Error. N = Sample size. E[Y|Y > 0] = expected value of Y conditional on Y greater than zero. "—" = not applicable.

non-SSI enrollees reported that they had a usual source of care other than the ED during the year. Less than 8% of SSI enrollees and less than 4% of non-SSI enrollees reported unmet need for medical care or prescription drugs during the year. Reflecting their higher health care needs, health care use and expenditures were greater among SSI enrollees, although the majorities of both groups have some medical spending during the year. For example, nearly 95% of SSI enrollees, and 85% of non-SSI enrollees, reported nonzero medical spending during the year. Table A1 reports summary statistics for the control variables used in this analysis by SSI status.

Average Marginal Effects

Table 3 reports estimates of the Average Marginal Effect (AME) associated with changes in county MMC penetration from the health care access, use, and expenditures models. These are estimates of the change in the probability of a given event, unit of service, or change in medical spending, corresponding (approximately) to a 1 percentage point change in county MMC penetration.^{xvi} Table A2 of the appendix provides an example of the complete estimation results for whether non-SSI enrollees reported an outpatient ED visit (logit model), and Tables A3 and A4 provide the full range of alternative modelspecifications.

Among non-SSI enrollees (left, Panel A, Table 3), who are more likely to be enrolled in MMC, we find that an increase in county MMC penetration is associated with an increase in the probability of reporting unmet need for prescription drugs ($P < .10$) and difficulty seeing a specialist ($P < .10$ among all non-SSI enrollees, and $P < .05$ for those who reported need to see a specialist). Furthermore, increasing county MMC penetration *increases* the probability of reporting an ED visit ($P < .01$) among non-SSI enrollees. (Below we report results over the entire range of county MMC penetration to illustrate the magnitude of the main findings.) Results from the additional specifications, reported in Table A3, generally corroborate the results discussed here.^{xvii} Despite the finding of increased difficulty seeing a specialist, we find no evidence that increased MMC penetration decreased the probability of visiting a specialist (Panel A), or the number of specialist visits among those who visited one (Panel B). We also find no evidence of a significant change in the probability of positive medical expenditures. Nor do we find any evidence that MMC penetration is associated with the quantity of medical use more generally among those who use services, or medical expenditures among those with positive expenditures (Panel B, Table 3).

Results for the SSI population are generally insignificant (right, Table 3). Although there appears to be some evidence of a positive association between MMC penetration and the number of inpatient visits, results appear sensitive alternative

Table 3. AME of County Medicaid Managed Care Penetration on Health Care Access, Use, and Expenditures.

Main independent variable corresponding to AME estimates	MMC penetration rate, specific to the subpopulation below					
Subpopulation	Non-SSI enrollees			SSI enrollees		
Dependent variable (below, separate model per row by subpopulation)	AME	SE	P	AME	SE	P
Panel A: Pr[Y > 0 X]						
Health care access over the year ^a						
Had a usual source of care (excluding emergency department)	−0.048	0.035	.171	−0.041	0.038	.287
Unmet need for medical care, tests, or treatments	0.008	0.013	.554	−0.017	0.032	.598
Unmet need for prescription drugs	0.026	0.014	.065	−0.009	0.034	.780
Difficulty seeing a specialist	0.043	0.025	.082	0.011	0.040	.788
Difficulty seeing a specialist, conditional on need to see one	0.140	0.062	.025	−0.042	0.083	.614
Any health care use over the year ^a						
Inpatient stay(s)	−0.019	0.026	.448	0.056	0.053	.292
Outpatient emergency department visit(s)	0.074	0.028	.008	−0.066	0.051	.200
General doctor visit(s)	−0.066	0.038	.083	0.004	0.049	.933
Specialist (medical doctor) visit(s)	−0.054	0.035	.127	0.104	0.066	.113
Any health care expenditures over the year ^a						
Total health care expenditures	−0.004	0.021	.853	0.002	0.015	.901
Out-of-pocket health care expenditures	−0.034	0.034	.316	−0.049	0.041	.230
Medicaid health care expenditures	0.014	0.025	.578	0.002	0.023	.948
Panel B: E[Y Y > 0, X]						
Quantity of health care use, among users ^b						
Inpatient stay(s)	0.0	0.2	.845	0.8	0.3	.016
Outpatient emergency department visit(s)	0.1	0.2	.815	0.3	0.3	.390
General doctor visit(s)	−0.5	0.3	.159	0.6	0.6	.307
Specialist (medical doctor) visit(s)	−0.1	0.8	.926	−1.1	2.0	.601
Quantity of health care expenditures, among those with expenditures ^c						
Total health care expenditures	−\$484	\$936	.605	−\$190	\$2645	.943
Out-of-pocket health care expenditures	−\$4	\$53	.939	\$99	\$106	.352
Medicaid health care expenditures	−\$536	\$803	.505	−\$17	\$2415	.994
Models include geographic and individual-level control variables		Yes			Yes	

Source. 2006-2009 Medical Expenditure Panel Survey and the Medicaid Statistical Information System.

Note. Each AME is estimated from a separate multivariate model. See the "Methods" section for the list of covariates not reported here, or Table A2 for an example of the analytic model corresponding to results in bold. The subsample of full-year Medicaid enrollees excludes dual Medicaid-Medicare enrollees, and respondents with less than full-year Medicaid status. Monetary values were inflated to constant 2009 US dollars. AME = average marginal effect; MMC = Medicaid managed care; SSI = Supplemental Security Income; GLM = generalized linear model.

^aResults from logit models.

^bResults from truncated Poisson regression models. ^cResults from GLM log link models.

specifications reported in Table A4. As discussed further below, drawing statistical inferences from the SSI population is complicated due to the much smaller subsample compared with the non-SSI population (see Table 2), highlighting the need for stronger data to examine this population.^{xviii}

Figure 1 reports the average predicted values for key outcomes among the non-SSI population over the entire

range of MMC penetration, from no managed care to 100% managed care penetration. (Data corresponding to Figure 1 are reported in Table A5.) The steeper the slope is in a given graph, the greater the impact of increased MMC penetration on a given outcome. Investigating the change over a wide range in MMC penetration is important insofar as when states expand managed care, they

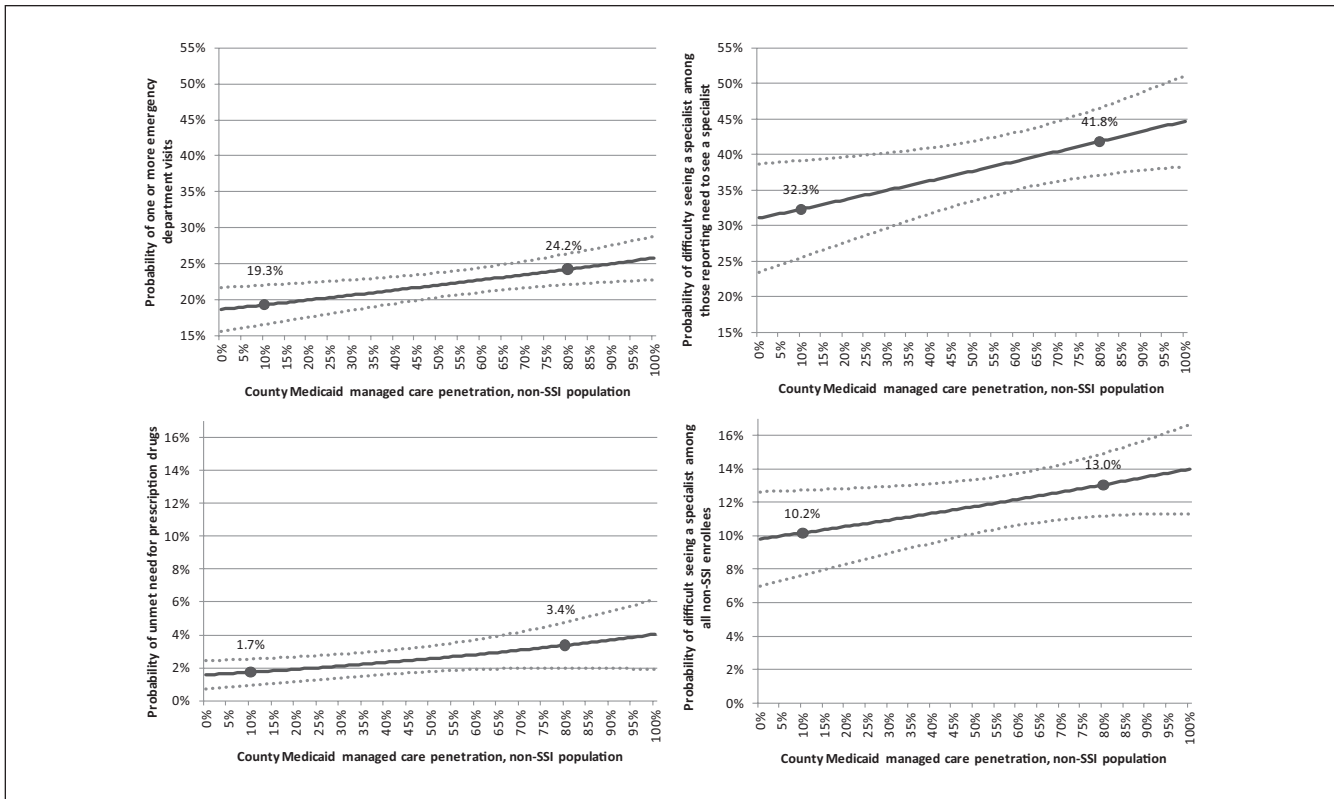


Figure 1. Estimated probability of medical use and access to care (with 95% confidence intervals) among non-SSI Medicaid enrollees by county Medicaid managed care penetration, with markers at 10% and 80% penetration.

Source. 2006-2009 Medical Expenditure Panel Survey and the Medicaid Statistical Information System.

Note. Results are estimates of average predicted probabilities of a given outcome over the range of Medicaid managed care penetration from logistic models. See the "Methods" section for details on model specification. SSI = Supplemental Security Income.

generally shift additional groups of individuals into managed care so that MMC penetration increases by more than a small margin.

Panel A of Figure 1 shows the predicted probability of any outpatient ED visit at different levels of county MMC penetration among nonelderly adult non-SSI enrollees. For example, at 10% MMC penetration, the probability of any outpatient ED visit (Panel A) is estimated to be 19.3%, whereas at a MMC penetration of 80%, the probability of ED visit increases to 24.2%. That is, an increase in MMC penetration from a relatively low level to MMC as the dominant care delivery system increases the probability of any outpatient ED visit by 4.9 percentage points for non-SSI enrollees, which is a 25.4% increase.

Figure 1 also plots the predicted probabilities for reported difficulty seeing a specialist among those who reported the need to see one (Panel B) and among all non-SSI enrollees (Panel D), and unmet need for prescription drugs (Panel C) at different levels of county MMC penetration. As shown, the estimated probability of reported difficulty seeing a specialist, among those who reported need to see one, increases 9.5 percentage points (from 32.3% to 41.8%, for an increase of

29.4%) as MMC penetration rises from 10% to 80%. The proportional increase for reported difficulty seeing a specialist is similar, from 10% to 80% penetration, among the entire non-SSI population (Panel D): 27.5% or 2.8 percentage points (from 10.2% to 13.0%). Finally, the probability of reported unmet need for prescription drugs (Panel C) increases by 100.0%, or 1.7 percentage points (from 1.7% to 3.4%) with the same shift in MMC penetration.

Discussion

This study finds that increased MMC penetration in a county is associated with an increase in the probability of an ED visit, and reported difficulty seeing a specialist and unmet need for prescription drugs among nonelderly non-SSI Medicaid adults. Furthermore, we find no evidence of reduced expenditures associated with increased MMC penetration for the non-SSI population. For nonelderly SSI Medicaid adults, we observe no consistent evidence that MMC penetration influences medical care access, use, or expenditures. We do not, however, interpret this as evidence that MMC has no impact on the outcomes examined. Our

SSI sample is small, raising concerns about the precision of our estimates for this subpopulation, a limitation of the MEPS sample size.

Overall these results, especially among non-SSI Medicaid enrollees, seemingly contradict conventional theories on the expenditures and benefits of managed care. That is, managed care is generally intended to provide access to appropriate care in a timely, efficient, and cost-effective way by shifting the locus of care from higher cost settings to primary care. If successful, one would expect higher levels of primary care use, lower levels of specialist use that could be provided in primary care settings, lower levels of unmet need for care, and lower levels of inpatient stays and ED visits for ambulatory care sensitive conditions, and, as a result, reduced expenditures associated with those changes. Nonetheless, incentive structures created by managed care organizations may not always result in intended/desired outcomes.

There are characteristics of states' Medicaid programs that may lead to outcomes that are inconsistent with conventional managed care theory. The largest factor, perhaps, is the programs' low reimbursement rates. Low rates, combined with incentives to reduce expenditures within managed care organizations, could lead to reductions in appropriate access to care and/or quality of care should it limit the number and/or quality of providers available (e.g., narrow limits on number or type of prescription drugs or specialist care). Furthermore, reductions in appropriate care could eventually lead to more high-cost care (e.g., inpatient and/or ED care). Furthermore, the opportunities for both more cost-effective and lower cost care delivery will depend on a given state's starting point. That is, states with low reimbursement rates and/or efficient care delivery systems will offer fewer opportunities for changes that generate reduced expenditures. Finally, specific incentives faced by providers and hospitals, defined by managed care organizations, are not the same across organizations and may impact populations in different ways as demonstrated in the work by Marton et al.⁹

Results in this study for non-SSI adult enrollees are qualitatively consistent with those in the work by Herring and Adams.⁵ If enrollees are more likely to utilize the outpatient ED, along with no perceptible decrease in general doctor and/or specialist visits as MMC penetration increases, enrollees may not necessarily experience less access to care. However, it is not clear that this would improve the welfare of enrollees. Herring and Adams,⁵ who studied the SSI and non-SSI nonelderly populations together (including children), found that increased MMC penetration associates with medical care use patterns which the authors interpret as not

welfare improving—such as increased reliance on the ED for a usual source of care, and increased number of ED visits. Finally, the lack of effect of MMC on Medicaid expenditures in our work is also consistent with these authors' research, as well as more recent work by Duggan and Hayford.⁶

Taken together, these results raise concerns about the feasibility of states achieving their goals of controlling health care expenditures and improving care by expanding use of MMC. The greatest gains for states may be administrative gains and budget predictability rather than either reduced expenditures or improved access.

The implication of these findings are of particular concern for the SSI population, given their greater health care needs and higher health care expenditures; however, more research with larger sample sizes is needed to more fully address the implications of MMC for this subpopulation. Given the limitations of national data sources for the SSI population, this work highlights the need for state-specific studies that could provide the sample size needed to better assess the implications of MMC for these vulnerable adults. Recent work by Marton et al.,⁹ who study children in 2 managed care plans in Kentucky, is a step in this direction. However, further work that focuses on the disabled, adults, and additional states is needed. In addition, future work would benefit from going beyond the general measures available in MEPS to consider additional dimensions of care. For example, quality of care and patient experiences based on the Healthcare Effectiveness Data and Information Set (HEDIS), or the Consumer Assessment of Healthcare Providers and Systems (CAHPS), could be insightful.

Our findings for the non-SSI population will help to inform the trend toward medical homes and accountable care organizations (ACOs). That is, to the extent that medical homes and ACOs in Medicaid are based on the MMC model, the benefits generated from these alternatives may also be limited. Silow-Carroll et al.,³ however, highlight that the ACO model with its focus on greater integration and coordination of care, and greater emphasis on high-risk individuals, could offer greater improvements in care than have been generated by the traditional MMC model to date. These authors also note that many managed care organizations, including MMC organizations, are shifting toward the ACO model. Consequently, if the ACO model is more successful in achieving its intended benefits than the current MMC model, such a move could improve MMC. Going forward, it will be important to study whether ACOs and medical homes, whether stand-alone models or models developed as part of MMC plans, can produce the improvements over fee-for-service Medicaid that to date have largely proven elusive with MMC.

Appendix

Table A1. Characteristics of Nonelderly Adult Medicaid Enrollees by SSI Status, 2006-2009.

	Non-SSI enrollees	SSI enrollees
Enrolled in Medicaid managed care plan	74.9%	62.7%
Respondent resides in county with mandatory Medicaid managed care, by subpopulation ^o	82.4%	45.9%
Female	71.1%	61.8%
Age (years)		
19-29	39.7%	21.1%
30-39	25.1%	16.6%
40-49	18.9%	21.7%
50-64	16.3%	40.6%
Race/ethnicity		
White, non-Hispanic	39.7%	51.8%
Black, non-Hispanic	26.1%	28.4%
Hispanic	25.7%	13.7%
Other, non-Hispanic	8.5%	6.0%
Marital status		
Married	33.0%	19.0%
Never married	46.3%	46.7%
Widowed/divorced/separated	20.7%	34.3%
Non-US citizen	18.6%	9.5%
Educational status		
Less than high school	35.0%	47.9%
High school graduate	39.9%	39.5%
Greater than high school	25.1%	12.7%
Physical health status		
Excellent/very good	44.6%	20.1%
Good	31.7%	28.5%
Fair/poor	23.7%	51.4%
Mental health status		
Excellent/very good	53.3%	25.0%
Good	31.1%	35.0%
Fair/poor	15.6%	40.0%
Number of nonchronic conditions	1.3	1.9
Number of chronic conditions	1.4	3.1
Someone in family with chronic condition (other than respondent)	39.5%	22.8%
Dependent child in family	71.1%	22.9%
Family income as % of FPL		
Less than 50% FPL	36.7%	7.3%
50%-100% FPL	27.0%	53.9%
100%-150% FPL	15.8%	22.8%
150%-200% FPL	9.6%	7.2%
200% FPL and greater	11.0%	8.8%
County and state characteristics		
Lag (1) Share of adults diagnosed with diabetes in county [†]	8.5%	9.0%
Lag (1) Population per square mile in county [‡]	4608.6	4016.2
Lag (1) Number of hospital beds per 1K population in county [‡]	3.4	3.5
Lag (1) Number of primary care physicians per 1K population in county [‡]	1.0	1.0
Lag (1) One or more federally qualified health centers in county [‡]	83.2%	77.3%
Lag (1) Medicare + Choice hospital insurance aged payment rate in county [‡]	415.6	410.2
Lag (1) State GDP per capita (1/10 000) [§]	4.7	4.5
Lag (1) State expenditures as % of revenues [¶]	94.0%	93.5%
Lag (1) State Medicaid income eligibility as % FPL, working-parent family of 3 [#]	109.9%	89.1%
Lag (1) Median household income in county [*]	49 714.0	47 033.8
Lag (1) Number of hospitals with ED per 1K population in county [‡]	0.01	0.01
PCCM in county [*]	13.7%	19.1%
Survey year		
2006	22.8%	25.7%
2007	25.0%	23.9%
2008	24.7%	23.9%
2009	27.6%	26.5%
N	3809	1011

Source. 2006-2009 MEPS unless marked as follows: ^oCenter for Medicare & Medicaid Services; ^{*}Medicaid Statistical Information System (MSIS); [†]Behavioral Risk Factor Surveillance System (BRFSS); [‡]Area Resource File (ARF); [§]Federal Reserve Economic Data (FRED) for state GDP and ARF for state population; [¶]US Census Bureau, State Government Finances; [#]Kaiser Family Foundation; ^{*}US Census Bureau, Small Area Income and Poverty Estimates.

Note. Family characteristics such as income are defined based on MEPS health insurance eligibility units. The subsample of full-year Medicaid enrollees excludes dual Medicaid-Medicare enrollees, and respondents with less than full-year Medicaid status. SSI = Supplemental Security Income; FPL = Federal Poverty Level; GDP = gross domestic product; ED = emergency department; PCCM = Primary Care Case Management; MEPS = Medical Expenditure Panel Survey.

Table A2. Complete Results From Logit Model Measuring Whether Non-SSI Medicaid Enrollees Had One or More Outpatient Emergency Department Visits.

	Coefficient	SE	t	P
Medicaid managed care penetration rate among non-SSI enrollees*	0.483	0.179	2.700	.007
Female	0.063	0.141	0.450	.656
Age (years)				
19-29	0.882	0.206	4.290	.000
30-39	0.593	0.198	2.990	.003
40-49	0.517	0.222	2.330	.020
50-64 (reference)				
Race/ethnicity				
White, non-Hispanic (reference)				
Black, non-Hispanic	0.400	0.142	2.830	.005
Hispanic	0.231	0.139	1.660	.098
Other, non-Hispanic	-0.206	0.261	-0.790	.431
Marital status				
Married	0.052	0.143	0.360	.718
Never married (reference)				
Widowed/divorced/separated	0.267	0.149	1.800	.073
Non-US citizen	-0.367	0.170	-2.150	.032
Educational status				
Less than high school	-0.111	0.124	-0.900	.370
High school graduate (reference)				
Greater than high school	0.030	0.140	0.210	.831
Physical health status				
Excellent/very good	-0.261	0.147	-1.780	.076
Good (reference)				
Fair/poor	0.330	0.180	1.840	.067
Mental health status				
Excellent/very good	0.202	0.156	1.300	.196
Good (reference)				
Fair/poor	0.311	0.175	1.780	.076
Number of nonchronic conditions	0.387	0.044	8.760	.000
Number of chronic conditions	0.110	0.041	2.670	.008
Someone in family with chronic condition (other than respondent)	0.049	0.123	0.390	.694
Dependent child in family	0.168	0.161	1.040	.297
Family income as % of FPL				
Less than 50% FPL	0.061	0.172	0.350	.723
50%-100% FPL	0.144	0.172	0.840	.404
100%-150% FPL (reference)				
150%-200% FPL	0.235	0.228	1.030	.302
200% FPL and greater	-0.348	0.286	-1.220	.225
County and state characteristics				
Lag (1) Share of adults diagnosed with diabetes in county [†]	8.329	4.769	1.750	.081
Lag (1) Population per square mile in county [‡]	0.000	0.000	1.290	.198
Lag (1) Number of hospital beds per 1K population in county [‡]	0.032	0.035	0.920	.357
Lag (1) Number of primary care physicians per 1K population in county [‡]	-0.481	0.201	-2.390	.017
Lag (1) One or more federally qualified health centers in county [‡]	0.012	0.170	0.070	.943
Lag (1) Medicare + Choice hospital insurance aged payment rate in county [‡]	-0.002	0.001	-1.730	.083
Lag (1) State GDP per capita (1/10 000) [§]	0.053	0.061	0.860	.388
Lag (1) State expenditures as % of revenues [^]	-0.670	0.753	-0.890	.374
Lag (1) State Medicaid income eligibility as % FPL, working-parent family of 3 [^]	-0.054	0.135	-0.400	.688
Lag (1) Median household income in county [^]	0.000	0.000	1.700	.089
Lag (1) Number of hospitals with ED per 1K population in county [‡]	3.189	3.834	0.830	.406
PCCM in county [*]	0.238	0.160	1.480	.138
Survey year				
2006	0.085	0.253	0.340	.737
2007	-0.224	0.257	-0.870	.383
2008	-0.259	0.294	-0.880	.379
2009 (reference)				
N	3809			

Source. 2006-2009 Medical Expenditure Panel Survey (MEPS) unless marked as follows: *Medicaid Statistical Information System (MSIS); [†]Behavioral Risk Factor Surveillance System (BRFSS); [‡]Area Resource File (ARF); [§]Federal Reserve Economic Data (FRED) for state GDP and ARF for state population; [^]US Census Bureau, State Government Finances; [^]Kaiser Family Foundation; [^]US Census Bureau, Small Area Income and Poverty Estimates.

Note. Family characteristics such as income are defined based on MEPS health insurance eligibility units. The subsample excludes dual Medicaid-Medicare enrollees, and respondents with less than full-year Medicaid status. SSI = Supplemental Security Income; FPL = Federal Poverty Level; GDP = gross domestic product; ED = emergency department; PCCM = Primary Care Case Management; MEPS = Medical Expenditure Panel Survey.

Table A3. AME of County Medicaid Managed Care Penetration on Health Care Access, Use, and Expenditures Among Non-SSI Enrollees.

Model specification	S1			S2			S3			S4			S5			S6		
	MMC penetration rate			Lag (1) MMC penetration rate			Mandatory MMC penetration rate			Mandatory MMC in county			Any MMC in county			MMC enrollment		
Main independent variable	Range: [0.00-1.00]			Range: [0.00-1.00]			Range: [0.00-1.00]			Range: [0.1]			Range: [0.1]			Range: [0.1]		
Dependent variable (below, separate model per row by subpopulation)	AME	SE	P	AME	SE	P	AME	SE	P	AME	SE	P	AME	SE	P	AME	SE	P
Panel A: Pr[Y>0 X]																		
Health care access over the year ^a																		
Had a usual source of care (excluding emergency department)	-0.048	0.035	.171	-0.054	0.037	.145	-0.041	0.033	.225	-0.005	0.028	.860	-0.041	0.037	.270	0.009	0.021	.660
Unmet need for medical care, tests, or treatments	0.008	0.013	.554	0.002	0.017	.927	0.009	0.012	.490	0.011	0.012	.394	0.009	0.017	.584	-0.002	0.010	.833
Unmet need for prescription drugs	0.026	0.014	.065	0.024	0.015	.112	0.024	0.012	.053	0.013	0.008	.103	0.015	0.013	.248	0.023	0.009	.010
Difficulty seeing a specialist	0.043	0.025	.082	0.046	0.028	.104	0.043	0.023	.060	0.023	0.020	.252	-0.010	0.026	.711	0.028	0.017	.100
Difficulty seeing a specialist, conditional on need to see one	0.140	0.062	.025	0.150	0.066	.023	0.138	0.059	.020	0.087	0.055	.117	0.060	0.070	.394	0.099	0.041	.018
Any health care use over the year ^a																		
Inpatient stay(s)	-0.019	0.026	.448	-0.021	0.029	.458	-0.019	0.024	.418	-0.030	0.020	.124	-0.032	0.025	.202	-0.040	0.017	.017
Outpatient emergency department visit(s)	0.074	0.028	.008	0.082	0.031	.009	0.077	0.026	.003	0.063	0.022	.005	0.065	0.029	.027	0.026	0.018	.151
General doctor visit(s)	-0.066	0.038	.083	-0.067	0.041	.104	-0.064	0.035	.064	-0.036	0.028	.200	-0.023	0.037	.527	0.014	0.021	.511
Specialist (medical doctor) visit(s)	-0.054	0.035	.127	-0.092	0.041	.024	-0.048	0.032	.135	-0.038	0.030	.212	-0.034	0.039	.386	-0.022	0.024	.366
Any health care expenditures over the year ^a																		
Total health care expenditures	-0.004	0.021	.853	0.001	0.024	.982	0.000	0.019	.999	-0.021	0.017	.215	-0.034	0.025	.169	0.019	0.014	.180
Out-of-pocket health care expenditures	-0.034	0.034	.316	-0.033	0.038	.394	-0.044	0.031	.156	-0.056	0.025	.027	-0.049	0.035	.168	0.004	0.020	.848
Medicaid health care expenditures	0.014	0.025	.578	0.020	0.026	.432	0.025	0.024	.286	0.007	0.021	.738	0.012	0.029	.677	0.022	0.015	.145
Panel B: E[Y Y > 0, X]																		
Quantity of health care use, among users ^b																		
Inpatient stay(s)	0.044	0.225	.845	0.001	0.299	.999	0.071	0.220	.746	0.063	0.142	.659	-0.138	0.147	.350	-0.009	0.099	.928
Outpatient emergency department visit(s)	0.056	0.239	.815	0.100	0.259	.700	0.067	0.221	.763	0.052	0.176	.767	-0.112	0.215	.601	-0.143	0.139	.305
General doctor visit(s)	-0.466	0.330	.159	-0.526	0.392	.180	-0.495	0.333	.138	-0.253	0.323	.433	-0.331	0.366	.366	-0.346	0.233	.138
Specialist (medical doctor) visit(s)	-0.073	0.788	.926	-0.344	0.895	.701	0.219	0.741	.767	0.519	0.575	.368	-0.828	0.692	.232	-0.688	0.576	.233
Quantity of health care expenditures, among those with expenditures ^c																		
Total health care expenditures	-\$484	\$936	.605	-\$531	\$993	.593	-\$530	\$837	.527	\$805	\$616	.192	\$641	\$745	.390	-\$942	\$458	.040
Out-of-pocket health care expenditures	-\$4	\$53	.939	-\$20	\$60	.740	\$7	\$48	.882	-\$14	\$40	.734	-\$13	\$51	.792	-\$5	\$35	.878
Medicaid health care expenditures	-\$536	\$803	.505	-\$899	\$870	.302	-\$489	\$726	.501	\$55	\$582	.924	-\$480	\$685	.483	-\$1000	\$420	.018
Models include geographic and individual-level control variables	Yes			Yes			Yes			Yes			Yes			Yes		

Source. 2006-2009 Medical Expenditure Panel Survey and the Medicaid Statistical Information System.

Note. Each average marginal effect is estimated from a separate multivariate model. See the "Methods" section for the list of covariates not reported here, or Table A2 for an example of one model. The subsample excludes dual Medicaid-Medicare enrollees, and respondents with less than full-year Medicaid status. Monetary values were inflated to constant 2009 US dollars. AME = average marginal effect; SSI = Supplemental Security Income; MMC = Medicaid managed care.

^aIndicates results from logit models.^bIndicates results from truncated Poisson regression models.^cIndicates results from GLM log link models.

Table A4. AME of County Medicaid Managed Care Penetration on Health Care Access, Use, and Expenditures Among SSI enrollees.

Model specification	S1			S2			S3			S4			S5			S6		
	MMC penetration rate			Lag (1) MMC penetration rate			Mandatory MMC penetration rate			Mandatory MMC in county			Any MMC in county			MMC enrollment		
Main independent variable	Range: [0.00-1.00]			Range: [0.00-1.00]			Range: [0.00-1.00]			Range: [0, 1]			Range: [0, 1]			Range: [0, 1]		
Dependent variable (below, separate model per row by subpopulation)	AME	SE	P	AME	SE	P	AME	SE	P	AME	SE	P	AME	SE	P	AME	SE	P
Panel A: Pr[Y > 0 X]																		
Health care access over the year ^a																		
Had a usual source of care (excluding emergency department)	-.041	0.038	.287	-.039	0.045	.392	-.022	0.036	.536	-.050	0.026	.059	-.044	0.031	.157	-.044	0.026	.094
Unmet need for medical care, tests, or treatments	-.017	0.032	.598	-.025	0.032	.436	-.022	0.032	.483	0.011	0.022	.624	0.041	0.026	.113	-.001	0.023	.650
Unmet need for prescription drugs	-.009	0.034	.780	-.039	0.047	.412	0.000	0.031	.991	0.028	0.022	.210	0.012	0.027	.652	-.001	0.018	.975
Difficulty seeing a specialist	0.011	0.040	.788	-.039	0.049	.421	0.006	0.037	.878	0.064	0.027	.016	0.077	0.039	.050	0.032	0.028	.239
Difficulty seeing a specialist, conditional on need to see one	-.042	0.083	.614	-.0167	0.104	.108	-.050	0.075	.507	0.084	0.052	.106	0.090	0.079	.254	0.024	0.052	.645
Any health care use over the year ^a																		
Inpatient stay(s)	0.056	0.053	.292	0.054	0.059	.358	0.032	0.051	.528	0.044	0.035	.208	0.041	0.038	.285	0.086	0.033	.008
Outpatient emergency department visit(s)	-.066	0.051	.200	-.094	0.057	.104	-.018	0.047	.703	0.065	0.034	.055	-.023	0.047	.625	-.006	0.033	.857
General doctor visit(s)	0.004	0.049	.933	0.085	0.055	.120	0.005	0.046	.908	-.042	0.037	.257	-.017	0.049	.729	0.052	0.033	.121
Specialist (medical doctor) visit(s)	0.104	0.066	.113	0.167	0.081	.038	0.104	0.060	.080	0.087	0.043	.044	0.000	0.053	.994	0.042	0.037	.259
Any health care expenditures over the year ^a																		
Total health care expenditures	0.002	0.015	.901	0.044	0.021	.041	0.006	0.014	.642	-.004	0.013	.748	-.002	0.015	.913	-.003	0.014	.814
Out-of-pocket health care expenditures	-.049	0.041	.230	-.061	0.047	.195	-.044	0.037	.231	-.045	0.027	.093	-.063	0.032	.049	-.043	0.027	.103
Medicaid health care expenditures	0.002	0.023	.948	0.060	0.027	.029	0.001	0.021	.949	-.014	0.023	.525	0.003	0.022	.906	0.001	0.023	.965
Panel B: E[Y Y > 0, X]																		
Quantity of health care use, among users ^b																		
Inpatient stay(s)	0.835	0.345	.016	0.193	0.380	.612	0.830	0.310	.008	0.328	0.262	.212	-.063	0.331	.849	-.074	0.285	.796
Outpatient emergency department visit(s)	0.271	0.315	.390	0.544	0.391	.167	0.291	0.313	.353	0.104	0.221	.636	0.155	0.209	.458	-.047	0.210	.824
General doctor visit(s)	0.603	0.590	.307	0.588	0.646	.363	0.695	0.578	.231	0.276	0.424	.515	-.0275	0.510	.589	-.041	0.372	.913
Specialist (medical doctor) visit(s)	-.1065	2.038	.601	-.3054	2.134	.154	-.0599	1.892	.752	0.389	1.407	.782	4.877	1.773	.006	-.0323	1.408	.819
Quantity of health care expenditures, among those with expenditures ^c																		
Total health care expenditures	-.190	\$2645	.943	-.799	\$2954	.787	-.715	\$2433	.769	\$3242	\$1690	.056	\$6524	\$1858	.000	\$4825	\$1442	.001
Out-of-pocket health care expenditures	\$99	\$106	.352	\$155	\$111	.163	\$135	\$104	.193	\$80	\$78	.307	\$110	\$82	.182	-\$5	\$67	.938
Medicaid health care expenditures	-\$17	\$2415	.994	-\$991	\$2485	.690	-\$555	\$2210	.802	\$2692	\$1489	.071	\$5047	\$1652	.002	\$3194	\$1208	.009
Model includes geographic controls																		
	Yes			Yes			Yes			Yes			Yes			Yes		

Source. 2006-2009 Medical Expenditure Panel Survey and the Medicaid Statistical Information System.

Note. Each average marginal effect is estimated from a separate multivariate model. See the "Methods" section for the list of covariates not reported here, or Table A2 for an example of one model. The subsample excludes dual Medicaid-Medicare enrollees, and respondents with less than full-year Medicaid status. Monetary values were inflated to constant 2009 US dollars. AME = average marginal effect; SSI = Supplemental Security Income; MMC = Medicaid managed care; GLM = generalized linear models.

^aIndicates results from logit models.

^bIndicates results from truncated Poisson regression models.

^cIndicates results from GLM log link models.

Table A5. Estimated Probability of Medical Use and Access to Care Over the Range of Medicaid Managed Care Penetration Among Non-SSI Enrollees.

County Medicaid managed care penetration	Any unmet need for prescription drugs		Any difficulty seeing a specialist		Any difficulty seeing a specialist, conditional on need to see one		Any outpatient emergency department visit	
	P	SE	P	SE	P	SE	P	SE
0.000	.016	0.004	.098	0.014	.311	0.039	.186	0.016
0.010	.016	0.004	.098	0.014	.312	0.038	.187	0.015
0.020	.016	0.004	.099	0.014	.313	0.038	.188	0.015
0.030	.016	0.004	.099	0.014	.314	0.038	.188	0.015
0.040	.016	0.004	.100	0.014	.316	0.037	.189	0.015
0.050	.017	0.004	.100	0.014	.317	0.037	.190	0.015
0.060	.017	0.004	.100	0.014	.318	0.036	.190	0.015
0.070	.017	0.004	.101	0.013	.319	0.036	.191	0.014
0.080	.017	0.004	.101	0.013	.321	0.036	.191	0.014
0.090	.017	0.004	.101	0.013	.322	0.035	.192	0.014
0.100	.017	0.004	.102	0.013	.323	0.035	.193	0.014
0.110	.018	0.004	.102	0.013	.325	0.034	.193	0.014
0.120	.018	0.004	.102	0.013	.326	0.034	.194	0.014
0.130	.018	0.004	.103	0.013	.327	0.033	.195	0.013
0.140	.018	0.004	.103	0.012	.328	0.033	.195	0.013
0.150	.018	0.004	.104	0.012	.330	0.033	.196	0.013
0.160	.018	0.004	.104	0.012	.331	0.032	.197	0.013
0.170	.019	0.004	.104	0.012	.332	0.032	.197	0.013
0.180	.019	0.004	.105	0.012	.334	0.031	.198	0.013
0.190	.019	0.004	.105	0.012	.335	0.031	.199	0.012
0.200	.019	0.004	.105	0.012	.336	0.031	.199	0.012
0.210	.019	0.004	.106	0.011	.338	0.030	.200	0.012
0.220	.020	0.004	.106	0.011	.339	0.030	.201	0.012
0.230	.020	0.004	.107	0.011	.340	0.030	.201	0.012
0.240	.020	0.004	.107	0.011	.341	0.029	.202	0.012
0.250	.020	0.004	.107	0.011	.343	0.029	.203	0.012
0.260	.020	0.004	.108	0.011	.344	0.028	.203	0.011
0.270	.020	0.004	.108	0.011	.345	0.028	.204	0.011
0.280	.021	0.004	.109	0.010	.347	0.028	.205	0.011
0.290	.021	0.004	.109	0.010	.348	0.027	.205	0.011
0.300	.021	0.004	.109	0.010	.349	0.027	.206	0.011
0.310	.021	0.004	.110	0.010	.351	0.027	.207	0.011
0.320	.021	0.004	.110	0.010	.352	0.026	.208	0.011
0.330	.022	0.004	.111	0.010	.353	0.026	.208	0.010
0.340	.022	0.004	.111	0.010	.355	0.025	.209	0.010
0.350	.022	0.004	.111	0.010	.356	0.025	.210	0.010
0.360	.022	0.004	.112	0.009	.357	0.025	.210	0.010
0.370	.023	0.004	.112	0.009	.359	0.025	.211	0.010
0.380	.023	0.004	.113	0.009	.360	0.024	.212	0.010
0.390	.023	0.004	.113	0.009	.361	0.024	.212	0.010
0.400	.023	0.004	.113	0.009	.363	0.024	.213	0.010
0.410	.023	0.004	.114	0.009	.364	0.023	.214	0.009
0.420	.024	0.004	.114	0.009	.366	0.023	.214	0.009
0.430	.024	0.004	.115	0.009	.367	0.023	.215	0.009
0.440	.024	0.004	.115	0.009	.368	0.023	.216	0.009
0.450	.024	0.004	.115	0.009	.370	0.022	.217	0.009
0.460	.025	0.004	.116	0.008	.371	0.022	.217	0.009
0.470	.025	0.004	.116	0.008	.372	0.022	.218	0.009
0.480	.025	0.004	.117	0.008	.374	0.022	.219	0.009
0.490	.025	0.004	.117	0.008	.375	0.021	.219	0.009
0.500	.026	0.004	.117	0.008	.376	0.021	.220	0.009
0.510	.026	0.004	.118	0.008	.378	0.021	.221	0.009
0.520	.026	0.004	.118	0.008	.379	0.021	.222	0.009
0.530	.026	0.004	.119	0.008	.381	0.021	.222	0.009
0.540	.027	0.004	.119	0.008	.382	0.021	.223	0.009
0.550	.027	0.004	.120	0.008	.383	0.021	.224	0.009
0.560	.027	0.004	.120	0.008	.385	0.021	.224	0.009
0.570	.027	0.004	.120	0.008	.386	0.021	.225	0.009
0.580	.028	0.004	.121	0.008	.387	0.021	.226	0.009
0.590	.028	0.005	.121	0.008	.389	0.020	.227	0.009
0.600	.028	0.005	.122	0.008	.390	0.020	.227	0.009

(continued)

Table A5. (continued)

County Medicaid managed care penetration	Any unmet need for prescription drugs		Any difficulty seeing a specialist		Any difficulty seeing a specialist, conditional on need to see one		Any outpatient emergency department visit	
	P	SE	P	SE	P	SE	P	SE
0.610	.028	0.005	.122	0.008	.392	0.020	.228	0.009
0.620	.029	0.005	.123	0.008	.393	0.021	.229	0.009
0.630	.029	0.005	.123	0.008	.394	0.021	.230	0.009
0.640	.029	0.005	.123	0.008	.396	0.021	.230	0.009
0.650	.029	0.005	.124	0.008	.397	0.021	.231	0.009
0.660	.030	0.005	.124	0.008	.399	0.021	.232	0.009
0.670	.030	0.005	.125	0.008	.400	0.021	.233	0.009
0.680	.030	0.005	.125	0.008	.401	0.021	.233	0.009
0.690	.030	0.006	.126	0.008	.403	0.021	.234	0.009
0.700	.031	0.006	.126	0.008	.404	0.021	.235	0.009
0.710	.031	0.006	.126	0.008	.406	0.022	.235	0.010
0.720	.031	0.006	.127	0.009	.407	0.022	.236	0.010
0.730	.032	0.006	.127	0.009	.408	0.022	.237	0.010
0.740	.032	0.006	.128	0.009	.410	0.022	.238	0.010
0.750	.032	0.006	.128	0.009	.411	0.023	.238	0.010
0.760	.033	0.006	.129	0.009	.413	0.023	.239	0.010
0.770	.033	0.007	.129	0.009	.414	0.023	.240	0.010
0.780	.033	0.007	.130	0.009	.416	0.023	.241	0.011
0.790	.033	0.007	.130	0.009	.417	0.024	.242	0.011
0.800	.034	0.007	.130	0.010	.418	0.024	.242	0.011
0.810	.034	0.007	.131	0.010	.420	0.024	.243	0.011
0.820	.034	0.007	.131	0.010	.421	0.025	.244	0.011
0.830	.035	0.008	.132	0.010	.423	0.025	.245	0.011
0.840	.035	0.008	.132	0.010	.424	0.025	.245	0.012
0.850	.035	0.008	.133	0.010	.425	0.026	.246	0.012
0.860	.036	0.008	.133	0.011	.427	0.026	.247	0.012
0.870	.036	0.008	.134	0.011	.428	0.027	.248	0.012
0.880	.036	0.008	.134	0.011	.430	0.027	.248	0.013
0.890	.037	0.009	.135	0.011	.431	0.027	.249	0.013
0.900	.037	0.009	.135	0.011	.433	0.028	.250	0.013
0.910	.037	0.009	.136	0.012	.434	0.028	.251	0.013
0.920	.038	0.009	.136	0.012	.436	0.029	.252	0.013
0.930	.038	0.009	.137	0.012	.437	0.029	.252	0.014
0.940	.038	0.010	.137	0.012	.438	0.030	.253	0.014
0.950	.039	0.010	.137	0.012	.440	0.030	.254	0.014
0.960	.039	0.010	.138	0.013	.441	0.031	.255	0.014
0.970	.039	0.010	.138	0.013	.443	0.031	.255	0.015
0.980	.040	0.010	.139	0.013	.444	0.032	.256	0.015
0.990	.040	0.011	.139	0.013	.446	0.032	.257	0.015
1.000	.040	0.011	.140	0.014	.447	0.033	.258	0.015

Source. 2006-2009 Medical Expenditure Panel Survey and the Medicaid Statistical Information System.

Note. Results are estimates of average predicted probabilities for medical use over the range of Medicaid managed care penetration from logistic models. See the "Methods" section for details on model specification. Results in bold correspond to 10% and 80% MMC penetration, respectively, and which are the levels emphasized in Figure 1 and in the text.

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Notes

- i. See a recent and comprehensive review of the literature on Medicaid managed care (MMC) and its relationship with expenditures, access, and quality of health care by Sparer.¹
- ii. States also rely on partially capitated managed care, which tends to cover a single service, such as behavioral health, dental care, or transportation, or Primary Care Case Management (PCCM) programs, which provide a supplement to fee-for-service rates for care coordination.
- iii. Supplemental Security Income (SSI) provides cash assistance to low-income aged and disabled individuals, with most SSI beneficiaries automatically eligible for Medicaid by virtue of their receipt of SSI.²⁹
- iv. During the time this research was conducted, the 2009 Medicaid Statistical Information System (MSIS) person summary file was the most recent available, which is why we use Medical Expenditure Panel Survey (MEPS) data through 2009 (and not 2010).
- v. The research in this article was conducted at the Agency for Healthcare Research and Quality (AHRQ) Data Center in Rockville, MD.
- vi. This information is from the self-administered adult questionnaire that includes the question (number 16),³⁰ "In the last 12 months, did you or a doctor think you needed to see a specialist?" If affirmative, the subsequent question is "In the last 12 months, how often was it easy to see a specialist that you needed to see?" to which they could choose "never," "sometimes," "usually," or "always." We define "difficult seeing a specialist" as responses equal to "never [easy]" or "sometimes [easy]."
- vii. Outpatient emergency department visits are those that do not result in an inpatient admission.
- viii. To account for the fact that beneficiaries had less than full-year enrollment, penetration rates are defined as the sum of eligibility months over a given 12-month period divided by the number of eligibles in a given month over a given 12-month period.
- ix. Although more of an issue in voluntary MMC programs, self-selection is also a concern in mandatory programs, where exemptions and exclusions from managed care are often available.
- x. Health insurance eligibility units (HIEUs) are defined as group family members who are normally eligible for health insurance through the adult family members' health insurance policy. For more details, see documentation on the 2010 MEPS–Household Component (MEPS-HC) data file, p. C-29.³¹
- xi. Dependents are defined as children aged 0 to 19, and young adults 18 to 23 who are full-time students and never married.
- xii. Ideally, these variables would be specified with a longer lag. However, we are limited by data availability for previous years. For other literature which controls for policy endogeneity, see work by Besley and Case, and, more recently, Monheit et al.^{32,33}
- xiii. County PCCM is the only county-level control variable not specified with a lag, resulting in a slight abuse of notation. This is because we do not have MSIS data for years prior to 2006. As a result, including this information with a lag will result in dropping all MEPS observations from calendar year 2006. We consider the benefit of adding this information without a lag greater than the cost of dropping a year of MEPS data or omitting the control variable.
- xiv. These specifications result in smaller sample size, omitting data for 2006, as we do not have penetration rates for years prior to 2006.

- xv. The correlation between the penetration rate and the binary mandatory MMC flag is (predictably) very high (approximately .75). Consequently, models that include both explanatory variables simultaneously most likely suffer from multicollinearity and are not reported here.
- xvi. As the penetration rates are continuous, these estimates represent *instantaneous rates of change* associated with a change in the penetration rate. Below we report results over the full range of MMC to shed light on the magnitude of these results at all values of MMC.
- xvii. Although there is some evidence that MMC penetration is associated with increased probability of a general doctor visit in Table 3, there is less evidence to support this finding among the alternative specifications in Table A3.
- xviii. Among statistically insignificant estimates common to both subpopulations, confidence intervals of estimates for the SSI population are generally much wider. That is, the "zeros" are less precisely estimated for the non-SSI enrollees.

References

1. Sparer M. *Medicaid Managed Care: Costs, Access, and Quality of Care*. Princeton, NJ: Robert Wood Johnson Foundation; 2012. Research Synthesis Report 23. <http://media.khi.org/news/documents/2013/01/14/managed-care-rwjf.pdf>. Accessed February 7, 2015.
2. Smith VK, Gifford K, Ellis E, Rudowitz R, Snyder L. *Medicaid Today; Preparing for Tomorrow A Look at State Medicaid Program Spending, Enrollment and Policy Trends*. Washington, DC: Kaiser Commission on Medicaid and the Uninsured; 2012.
3. Silow-Carroll S, Edwards J, Rodin D. *State Levers for Improving Managed Care for Vulnerable Populations: Strategies With Medicaid MCOs and ACOs*. Lansing, MI: Health Management Associates; 2013.
4. Centers for Medicare and Medicaid Services (CMS). *Number of Managed Care Entity Enrollees by State as of July 1, 2010*. <http://www.medicaid.gov/Medicaid-CHIP-Program-Information/By-Topics/Data-and-Systems/Medicaid-Managed-Care/Downloads/managed-care-enrollees-by-state-07012010.pdf>. Accessed February 7, 2015.
5. Herring B, Adams EK. Using HMOs to serve the Medicaid population: what are the effects on utilization and does the type of HMO matter? *Health Econ*. 2011;4(20):446-460. doi:10.1002/hecl.1602.
6. Duggan M, Hayford T. Has the shift to managed care reduced Medicaid expenditures? evidence from state and local-level mandates. *J Policy Anal Manag*. 2013;32(3):505-535. doi:10.1002/pam.21693.
7. Kirby J, Machlin S, Cohen J. Has the increase in HMO enrollment within the Medicaid population changed the pattern of health service use and expenditures? *Med Care*. 2003;41(7):III24-III34. http://journals.lww.com/lww-medicalcare/Fulltext/2003/07001/Effects_of_Medicaid_Managed_Care_on_Adults.4.aspx. Accessed February 7, 2015.
8. Burns ME. Medicaid managed care and cost containment in the adult disabled population. *Med Care*. 2009;47(10):1069-1076. doi:10.1097/MLR.0b013e3181a80fef.
9. Marton J, Yelowitz A, Talbert JC. A tale of two cities? the heterogeneous impact of Medicaid managed care. *J Health Econ*. 2014;36:47-68. doi:10.1016/j.jhealeco.2014.03.001.

10. Duggan M. Does contracting out increase the efficiency of government programs? evidence from Medicaid HMOs. *J Public Econ*. 2004;88(12):2549-2572. <http://www.sciencedirect.com/science/article/pii/S0047272703001415>. Accessed February 7, 2015.
11. Garrett B, Zuckerman S. National estimates of the effects of mandatory Medicaid managed care programs on health care access and use, 1997-1999. *Med Care*. 2005;43(7):649-657. doi:10.1097/01.mlr.0000167105.75204.71.
12. Burns ME. Medicaid managed care and health care access for adult beneficiaries with disabilities. *Health Serv Res*. 2009;44(5, pt 1):1521-1541. <http://onlinelibrary.wiley.com/doi/10.1111/j.1475-6773.2009.00991.x/full>. Accessed February 7, 2015.
13. Coughlin TA, Long SK, Graves JA. Does managed care improve access to care for Medicaid beneficiaries with disabilities? A national study. *Inquiry*. 2008;45(4):395-407. doi:10.5034/inquiryjml.45.04.395.
14. MSIS—Medicaid Statistical Information System. <http://www.medicaid.gov/medicaid-chip-program-information/by-topics/data-and-systems/msis/medicaid-statistical-information-system.html>. Accessed March 12, 2015.
15. Centers for Disease Control and Prevention (CDC). *BRFSS—Behavioral Risk Factor Surveillance System*. <http://www.cdc.gov/brfss/>. Accessed February 7, 2015.
16. *AHRF: Area Health Resources Files*. <http://ahrh.hrsa.gov/>. Accessed February 7, 2015.
17. *FRED—Federal Reserve Economic Data—St. Louis Fed*. <http://research.stlouisfed.org/fred2/>. Accessed February 7, 2015.
18. US Census Bureau. *State Government Finances*. <http://www.census.gov/govs/state/>. Accessed February 7, 2015.
19. Ross D, Jarlenski M, Artiga S, Marks C. *A Foundation for Health Reform: Findings of a 50 State Survey of Eligibility Rules, Enrollment and Renewal Procedures, and Cost-Sharing Practices in Medicaid*. Washington, DC: Kaiser Family Foundation; 2009.
20. US Census Bureau. *SAIPE, Small Area Income and Poverty Estimates*. <http://www.census.gov/did/www/saipe/>. Accessed February 7, 2015.
21. Centers for Medicare and Medicaid Services (CMS). *2010 National Summary of State Medicaid Managed Care Programs as of July 1, 2010*. <http://www.cms.gov/Research-Statistics-Data-and-Systems/Computer-Data-and-Systems/MedicaidDataSourcesGenInfo/downloads/2010NationalSummaryPub.pdf>. Accessed February 7, 2015.
22. Centers for Medicare and Medicaid Services (CMS). *Medicaid Managed Care Enrollment Report, Summary Statistics as of July 1, 2011*. <http://www.medicaid.gov/medicaid-CHIP-Program-Information/By-Topics/Data-and-Systems/Downloads/2011-Medicaid-MC-Enrollment-Report.pdf>. Accessed February 7, 2015.
23. Chernew M, Gowrisankaran G, McLaughlin C, Gibson T. Quality and employers' choice of health plans. *J Health Econ*. 2004;23:471-492. doi:10.1016/j.jhealeco.2003.09.010.
24. Baker L. The effect of HMOs on fee-for-service health care expenditures: evidence from Medicare. *J Health Econ*. 1997;6(4):453-481. <http://www.sciencedirect.com/science/article/pii/S0167629696005358>. Accessed February 7, 2015.
25. Baker L. Association of managed care market share and health expenditures for fee-for-service Medicare patients. *JAMA*. 1999;281(5):432-437. doi:10.1001/jama.281.5.432.
26. Bundorf MK, Schulman KA, Stafford JA, Gaskin D, Jollis JG, Escarce JJ. Impact of managed care on the treatment, costs, and outcomes of fee-for-service Medicare patients with acute myocardial infarction. *Health Serv Res*. 2004;39(1):131-152. doi:10.1111/j.1475-6773.2004.00219.x.
27. US Department of Commerce, Bureau of Economic Analysis. *National Income and Product Accounts Tables, Table 1.1.4, Price Indexes for Gross Domestic Product*. <http://bea.gov/iTable/iTable.cfm?ReqID=9&step=1#reqid=9&step=3&isuri=1&903=4>. Accessed February 7, 2015.
28. US Department of Labor, Bureau of Labor Statistics. *Consumer Price Index—All Urban Consumers, U.S. All Items, 1982-84=100—CUUR0000SA0*. <http://data.bls.gov/cgi-bin/surveymost?cu>. Accessed February 7, 2015.
29. Social Security Administration. *Understanding Supplemental Security Income (SSI)—SSI and Eligibility for Other Government and State Programs*. <http://www.socialsecurity.gov/ssi/text-other-ussi.htm>. Accessed February 7, 2015.
30. Adult Self-Administered Questionnaire (AHRQ). *Adult Self-Administered Questionnaire 2010*. http://meps.ahrq.gov/mepsweb/survey_comp/hc_survey/paper_quest/2010/2010_SAQ_ENG.shtml. Accessed February 7, 2015.
31. Adult Self-Administered Questionnaire (AHRQ). *MEPS HC-138: 2010 Full Year Consolidated Data File*. http://meps.ahrq.gov/mepsweb/data_stats/download_data/pufs/h138/h138doc.shtml. Accessed February 7, 2015.
32. Besley T, Case A. Unnatural experiments? estimating the incidence of endogenous policies. *Econ J*. 2000;110:F672-F694. <http://www.blackwellpublishing.com/journal.asp?ref=0013-0133>. Accessed February 26, 2015.
33. Monheit AC, Cantor JC, Delia D, Belloff D. How have state policies to expand dependent coverage affected the health insurance status of young adults? *Health Serv Res*. 2011;46(1, pt 2):251-267. doi:10.1111/j.1475-6773.2010.01200.x.