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## RESEARCH ARTICLE

# Primary care physicians' participation in the Medicare shared savings program and preventive services delivery: Evidence from the first 7 years

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## Abstract

**Objective:** To evaluate whether primary care physicians' participation in the Medicare Shared Savings Program (MSSP) is associated with changes in their preventive services delivery.

**Data Sources:** Medicare Provider Utilization and Payment Physician and Other Supplier Public Use File and MSSP Accountable Care Organizations (ACO) Provider-Level Research Identifiable File from 2012 to 2018.

**Study Design:** The design was a two-way fixed effects model estimating within-provider changes in preventive services delivery over time controlling for provider time-invariant characteristics, national time trends, and characteristics of served patients. The following preventive services were evaluated: influenza vaccination, pneumococcal vaccination, clinical depression screening, colorectal cancer screening, breast cancer screening, Body Mass Index (BMI) screening and follow-up, tobacco use assessment, and annual wellness visits. Both the likelihood of providing services and the volume of services delivered were evaluated.

**Data Collection/Extraction Methods:** Secondary data linked at the provider level.

**Principal Findings:** MSSP participation was associated with an increase in the likelihood of providing influenza vaccination (0.7 percentage-points), pneumococcal vaccination (2.0 percentage-points), clinical depression screening (2.1 percentage-points), tobacco use assessment (0.3 percentage-points), and annual wellness visits (4.1 percentage-points). A similar increase was found for the volume of services delivered per 100 patients for several preventive services: influenza vaccination (0.18), pneumococcal vaccination (0.56), clinical depression screening (0.46), and annual wellness visits (1.52). MSSP participation was associated with a decrease in the likelihood (−0.4 percentage-points) and the volume of colorectal cancer screening (−0.03).

**Conclusions:** Primary care physicians' participation in MSSP was associated with an increase in the likelihood and the volume of several preventive services.

## KEYWORDS

accountable care organizations, health care delivery, Medicare, Medicare shared savings program, preventive care

### What is known on this topic

- The MSSP is the most widespread value-based program through which the Centers for Medicare & Medicaid Services (CMS) contracts with providers to provide care and accept accountability for the overall quality and cost for Medicare beneficiaries.
- Financial incentives and quality performance metrics are included in the MSSP to stimulate individual providers and organizations to deliver more preventive services.
- Not much is known on the association between providers' participation in MSSP and their preventive care delivery, particularly using provider-level data.

### What this study adds

- This study used provider-level data on MSSP participation and preventive services delivery to provide evidence on whether MSSP participation is associated with changes in preventive care delivery.
- Participation in MSSP was associated with an increase in the likelihood and volume of delivering influenza vaccination, pneumococcal vaccination, clinical depression screening, and annual wellness visits.
- MSSP participation was associated with a decrease in the likelihood and the volume of delivering colorectal cancer screening.

## 1 | INTRODUCTION

Delivering quality health services to Medicare beneficiaries at a sustainable cost has been a vexing problem, especially with an increasingly aging population and impending Medicare funding solvency. One commonly suggested approach to addressing this challenge and improving population health is increasing preventive care utilization. Preventive care is widely considered a core path to promoting population health and wellness, reducing the need for medical services, and containing health care costs.<sup>1-6</sup> However, preventive care utilization rates among older adults above 65 are low, and less than half of this population utilize a core set of clinical preventive services.<sup>7</sup>

Value-based payment programs may offer incentives for health care providers to increase preventive services. Under the Patient Protection and Affordable Care Act (ACA), the Centers for Medicare & Medicaid Services (CMS) launched the Medicare Shared Savings Program (MSSP) in 2012. The MSSP is the most widespread value-based program through which CMS contracts with groups of providers as Accountable Care Organizations (ACOs) to provide care and accept accountability for the overall quality and cost for assigned Medicare fee-for-service (FFS) beneficiaries. The MSSP requires ACOs to meet the quality performance standard and compares their assigned beneficiaries' per capita expenditures to historical benchmarks to determine whether the ACOs qualify for the shared savings payment. In 2021, CMS contracted with 477 ACOs that served 10.7 million Medicare beneficiaries.<sup>8</sup>

The MSSP incorporates incentives for individual providers and organizations to deliver more preventive services. Of the 33 initial MSSP quality measures, eight were for preventive care (Appendix Table A1). For each quality measure, CMS provides detailed guidelines including affected populations, types of services, and clinical recommendations. Providers meeting or exceeding the preventive care

benchmarks are more likely to receive shared savings. Besides this direct incentive, MSSP ACOs may use increasing preventive care utilization as a strategy to prevent the needs for expensive treatments and control health care expenditures.<sup>9,10</sup> Studies showed that some ACOs tried to increase preventive services delivery by educating their providers about the value of preventive care, incorporating reminders for services in electronic health records (EHR), and actively monitoring providers' preventive care provision and connecting it to individual bonus.<sup>11,12</sup>

This paper provides novel evidence on whether MSSP participation is associated with preventive services delivered by primary care physicians (PCPs). Despite the direct incentives for increasing preventive care as discussed above, there is overall little empirical evidence on how the MSSP has affected preventive care delivery. Prior research has focused mostly on cancer screening services.<sup>13,14</sup> Furthermore, prior work has exclusively used either ACO or beneficiary level data, but not data on individual providers who offer the services and whose decisions directly impact how preventive services are delivered. A broader literature on the MSSP suggests a potential of curtailing medical expenditures,<sup>15,16</sup> eliminating unnecessary utilization,<sup>17-20</sup> and improving patient experiences.<sup>21</sup> Yet, not much is known on whether individual providers' participation in MSSP is related to their preventative services delivery.

In this study, we examined the association between PCPs' participation in MSSP and their preventive services delivery. We included a wide range of preventive services and used national provider-level data on participating and non-participating providers across the periods before and after MSSP participation. As the US health care system continues to shift from volume-based toward value-based payment models, this study informs future policy discussions on how the MSSP and similar programs may affect preventive care delivery and ultimately population health.

## 2 | METHODS

### 2.1 | Data sources

Provider-level data on preventive services delivery came from the 2012 to 2018 annual Medicare Provider Utilization and Payment Physician and Other Supplier Public Use File (POS PUF) published by CMS. Each year, the POS PUF included counts of specific health care services, including preventive services, delivered by each provider aggregated from CMS Medicare Part B Claims for Medicare FFS populations, along with provider characteristics such as specialty and the demographic distribution of the patients they served. To identify a provider's participation in MSSP ACOs, we used the 2012–2018 annual MSSP ACO Provider-Level Research Identifiable File (RIF), which recorded MSSP participation status for institutional and individual providers in a given year.<sup>22</sup> We linked the two datasets at the provider level using the National Provider Identifier (NPI).

### 2.2 | Sample

The main sample included all PCPs who are eligible for participating in MSSP based on CMS' beneficiary assignment methodology except pediatricians.<sup>23</sup> We included PCPs whose specialty codes were family practice, general practice, geriatric medicine, or internal medicine. We focused on PCPs because they accounted for the large majority of preventive services delivered to Medicare beneficiaries by physicians.

### 2.3 | Variables

#### 2.3.1 | Outcome variables

We selected the preventive services based on MSSP quality performance metrics, which included influenza immunization, pneumococcal vaccination, adult weight screening and follow-up, tobacco use assessment and tobacco cessation intervention, clinical depression screening, colorectal cancer screening, breast cancer screening, and screening for high blood pressure.<sup>24</sup> We identified the Health care Common Procedure Coding System (HCPCS) and the Current Procedural Terminology (CPT) Codes in the Medicare Provider Utilization and Payment data that most closely captured these preventive services (Appendix Table A2). We used the codes for Body Mass Index (BMI) screening/follow-up to measure adult weight screening. We removed high blood pressure screening from our outcome list because high blood pressure screening was commonly embedded in primary care visits and there was no specific HCPCS/CPT code for office-based high blood pressure screening. Further, because ACOs used annual wellness visits as a key mechanism for preventive care delivery,<sup>12</sup> we included annual wellness visits as an outcome.

For each preventive service, we coded two outcome measures: (1) a binary indicator for whether the PCP provided the service at all in a given year, which we used to evaluate the likelihood of providing

the service; and (2) the number of preventive services the PCP provided per 100 unique Medicare patients seen by the provider in a given year, which we used to evaluate the volume of services.

#### 2.3.2 | Independent variables

MSSP participation was coded as 1 if the provider was listed in the MSSP ACO Provider-Level RIF as an ACO participating provider in a given year, and as 0 otherwise. For PCPs who joined MSSP ACOs in 2012 (with an April 1 or July 1 start date), we coded their first year of participation as 2012 in our main models.

#### 2.3.3 | Control variables

To control for potential confounders, we included in the regression models time-varying characteristics of the patient panels served by the provider. These variables included patient average age, race/ethnicity composition, and gender composition. In addition, we included an indicator for whether a state expanded Medicaid under the ACA in the models to capture other changes in demand for services.

### 2.4 | Statistical analysis

We examined the association of PCPs' participation in MSSP with preventive services delivery using a two-way fixed effects regression model that estimated within-provider variation in MSSP participation and preventive services delivery over time while controlling for provider time-invariant factors, national time trends in outcomes, and measured time-varying confounders. The model was specified as follows:

$$\text{Outcome}_{it} = \alpha + \beta \text{MSSP Participation}_{it} + X_{it}\Phi + \text{Year}_t + \delta_i + \varepsilon$$

where  $\text{Outcome}_{it}$  was one of the outcome measures for provider  $i$  in year  $t$ ;  $\text{MSSP Participation}_{it}$  was the binary indicator of MSSP participation for provider  $i$  in year  $t$ ;  $X_{it}$  was a vector of time-varying control variables described above;  $\text{Year}_t$  was the year fixed effects, which captured national time trends in outcomes;  $\delta_i$  was the provider fixed effects, which captured time-invariant differences between PCPs; and  $\varepsilon$  was the error term. The key parameter of interest was  $\beta$ , the association of MSSP participation with preventive services delivery.

In addition to the main models, we estimated a series of alternate models to evaluate certain assumptions and the sensitivity of estimates to model or sample specifications. To evaluate whether the association varies by the duration of MSSP participation, we estimated an alternate model that replaced  $\text{MSSP Participation}_{it}$  with a series of binary variables indicating the number of years that PCPs had participated in the MSSP up to a given year. In another model, we added county rural/urban status and

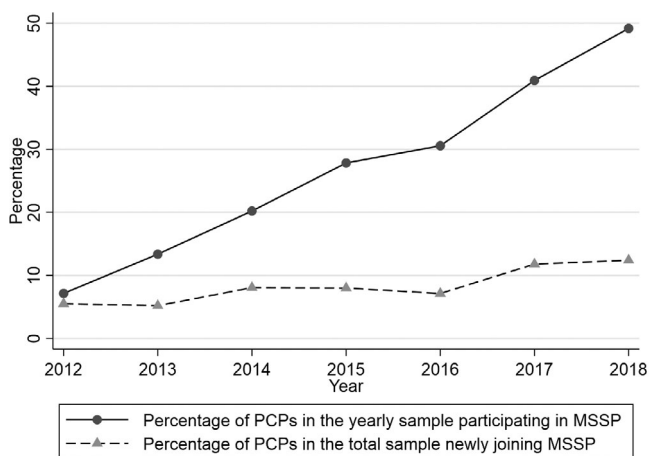
census region as covariates to check for any residual confounding from such variables. Another alternate model added county-specific time trends as covariates to control for local changes in access to or supply of preventive services. We also added health characteristics of patients served by the PCPs including patient mean risk score and proportions of patients with certain health conditions (hypertension, depression, diabetes, and cancer) as control variables in an alternate model. We did not add those to the main models as they are possibly endogenous to PCPs' MSSP participation. We evaluated the effect of switching the first participation year for PCPs who joined the MSSP in 2012 from 2012 to 2013 (the first performance year as assigned by CMS). Finally, since MSSP ACOs and their participants may leave the program after each 3-year contract period or terminate the participation agreement by submitting 30-day advance notice to CMS, we excluded 24% of MSSP participants who left the MSSP during the study period to evaluate the effect of program attrition.

We estimated the regression model using ordinary least-squares (OLS) for all outcomes because it provided directly interpretable estimates and enabled including the provider fixed effects ( $\delta_i$ ). Standard errors were clustered at the provider level. All analyses were conducted using STATA Version 17.<sup>25</sup>

### 3 | RESULTS

#### 3.1 | Descriptive results

The main sample included 228,432 PCPs and 1,273,800 PCP-year observations over 2012–2018; and 136,328 PCPs participated in MSSP during this period. Figure 1 presents the percentage of PCPs in the total sample who newly joined the MSSP each year and the percentage of PCPs in the yearly sample who participated in the program. Over time, the percentage of PCPs newly joining the program increased from 5.5% in 2012 to 12.4% in 2018. The percentage of PCPs participating in the program increased from 7.1% to 49.2% over the same period.



**FIGURE 1** PCP MSSP participation rate. MSSP, Medicare shared savings program; PCP, primary care physician

Table 1 presents summary statistics comparing MSSP participants (those who ever participated in MSSP between 2012 and 2018) and non-participants (those who never participated in MSSP during the

**TABLE 1** Comparison of patient panel characteristics and preventive services delivery in 2012 between MSSP participants and non-participants

	PCPs never in MSSP	PCPs ever in MSSP
Patient panel characteristics		
Patient panel size	281.45	334.62
Patient average age	71.42	71.74
Percent of Non-Hispanic White patients	75.09	79.41
Percent of Medicare/Medicaid dual eligible patients	33.96	30.35
Percent of Black or African American patients	15.00	14.92
Percent of Hispanic patients	10.15	7.76
Percent of Asian Pacific Islander patients	4.71	2.95
Percent of American Indian/Alaska Native patients	1.98	1.19
Percent of female patients	58.69	59.43
Patient average risk score	1.53	1.55
Percent of patient with hypertension	67.31	68.26
Percent of patient with depression	27.36	27.94
Percent of patient with diabetes	37.4	36.83
Percent of patient with cancer	11.4	11.8
Proportion of PCPs who provided preventive services (%)		
Influenza vaccination	40.76	46.54
Pneumococcal vaccination	12.88	19.05
Depression screening	0.41	0.69
Colorectal cancer screening	2.23	3.36
Breast cancer screening	0.85	1.4
BMI screening and follow-up	0.28	0.26
Tobacco use assessment	2.06	2.57
Annual wellness visits	16.1	20.69
No. of preventive services per 100 patients		
Influenza vaccination	10.16	10.83
Pneumococcal vaccination	0.87	1.2
Depression screening	0.09	0.13
Colorectal cancer screening	0.3	0.38
Breast cancer screening	0.12	0.18
BMI screening and follow-up	0.1	0.06
Tobacco use assessment	0.33	0.28
Annual wellness visits	3.68	4.41

Abbreviations: BMI, body mass index; MSSP, Medicare shared savings program; PCP, primary care physician.

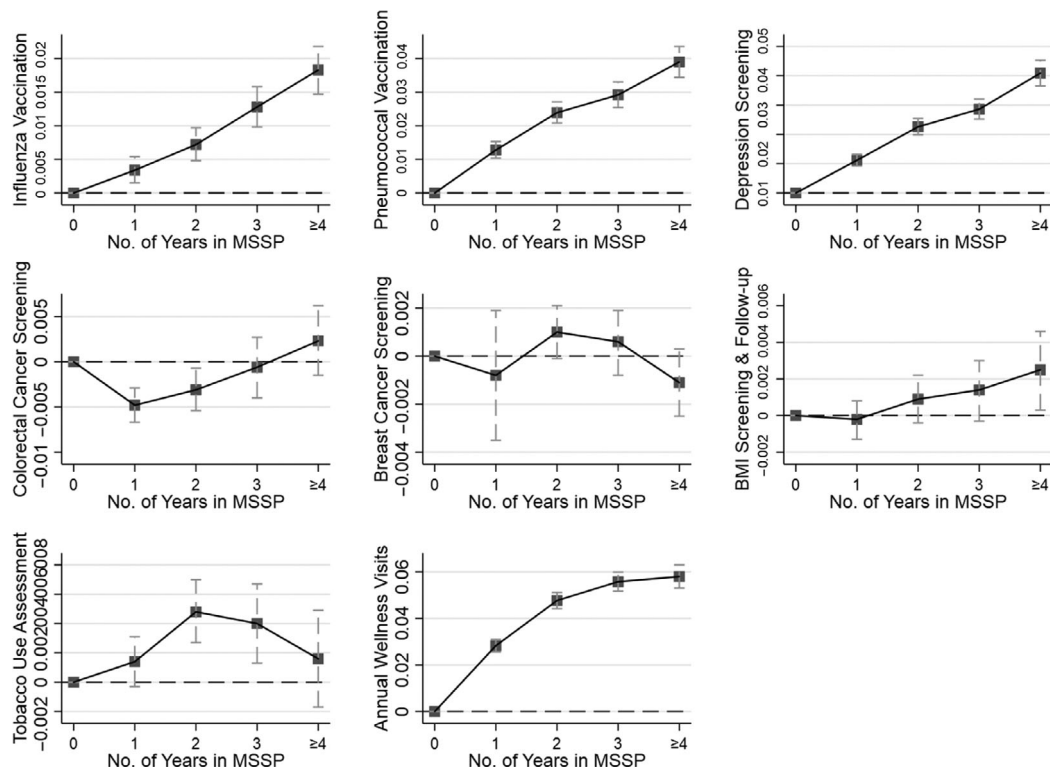
**TABLE 2** Regression estimates of the association of MSSP participation with preventive services delivery

	Likelihood		Volume (per 100 patients)	
	Estimate (1)	Mean for PCPs never in MSSP in 2012 (2)	Estimate (3)	Mean for PCPs never in MSSP in 2012 (4)
Influenza vaccination	0.0068*** (0.0010)	0.4076	0.1848*** (0.0269)	10.16
Pneumococcal vaccination	0.0197*** (0.0012)	0.1288	0.5598*** (0.0231)	0.87
Depression screening	0.0209*** (0.0010)	0.0041	0.4566*** (0.0298)	0.09
Colorectal cancer screening	-0.0038*** (0.0010)	0.0223	-0.0286** (0.0107)	0.30
Breast cancer screening	-0.0006 (0.0008)	0.0085	-0.0048 (0.0051)	0.12
BMI screening and follow-up	0.0009 (0.0005)	0.0028	-0.0118 (0.0137)	0.10
Tobacco use assessment	0.0032*** (0.0008)	0.0206	0.0132 (0.0102)	0.33
Annual wellness visits	0.0412*** (0.0014)	0.161	1.5235*** (0.0458)	3.68

Note: All models included year and provider fixed effects and controlled for patient average age, race/ethnicity and gender compositions, and a state-level indicator of Medicaid expansion. Provider-clustered standard errors are showed in parentheses. Columns 2 and 4 display mean values for PCPs never in MSSP in 2012.

Abbreviations: BMI, body mass index; MSSP, Medicare shared savings program; PCP, primary care physician.

\* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$ .



**FIGURE 2** Regression estimates of the association of MSSP participation with likelihood of preventive services delivery by duration of MSSP participation. The independent variable and x-axis are based on the number of years PCPs have participated in the MSSP. All models included year and provider fixed effects and controlled for patient average age, race/ethnicity and gender compositions, and a state-level indicator of Medicaid expansion. Standard errors are clustered at the provider level. BMI, body mass index; MSSP, Medicare shared savings program; PCP, primary care physician

same period) on their patient panel characteristics and preventive services delivery in 2012. The two groups were similar on most patient panel characteristics except that MSSP participants on average served more patients (335 vs. 281 per PCP). Higher proportions of MSSP

participating PCPs delivered preventive services in 2012 except for BMI screening and follow-up. Regarding the volume of preventive services, MSSP participating and non-participating PCPs were largely equivalent in 2012, both delivering low volumes.

### 3.2 | Main estimates

Table 2 presents the regression estimates of the association of PCPs' MSSP participation with likelihood and volume (per 100 patients) of preventive services delivery. MSSP participation was associated with a higher likelihood of providing most of the evaluated preventive services including influenza vaccination (0.7 percentage-points), pneumococcal vaccination (2.0 percentage-points), clinical depression screening (2.1 percentage-points), tobacco use assessment (0.3 percentage-points), and annual wellness visits (4.1 percentage-points). In contrast, MSSP participation was associated with a lower likelihood of providing colorectal cancer screening (−0.4 percentage-points). All estimates were statistically significant at  $p < 0.001$ .

The estimates for the number of preventive services delivered per 100 patients were generally in the same direction as those for the likelihood of providing the services. MSSP participation was associated with more influenza vaccinations (0.18), pneumococcal vaccinations (0.56), clinical depression screening (0.46), and annual wellness visits (1.52), all statistically significant at  $p < 0.001$ . Estimates for colorectal cancer screening (−0.03) were significant at  $p < 0.01$  level. Estimates for the likelihood and volume of breast cancer screening and BMI screening and follow-up were small and statistically non-significant.

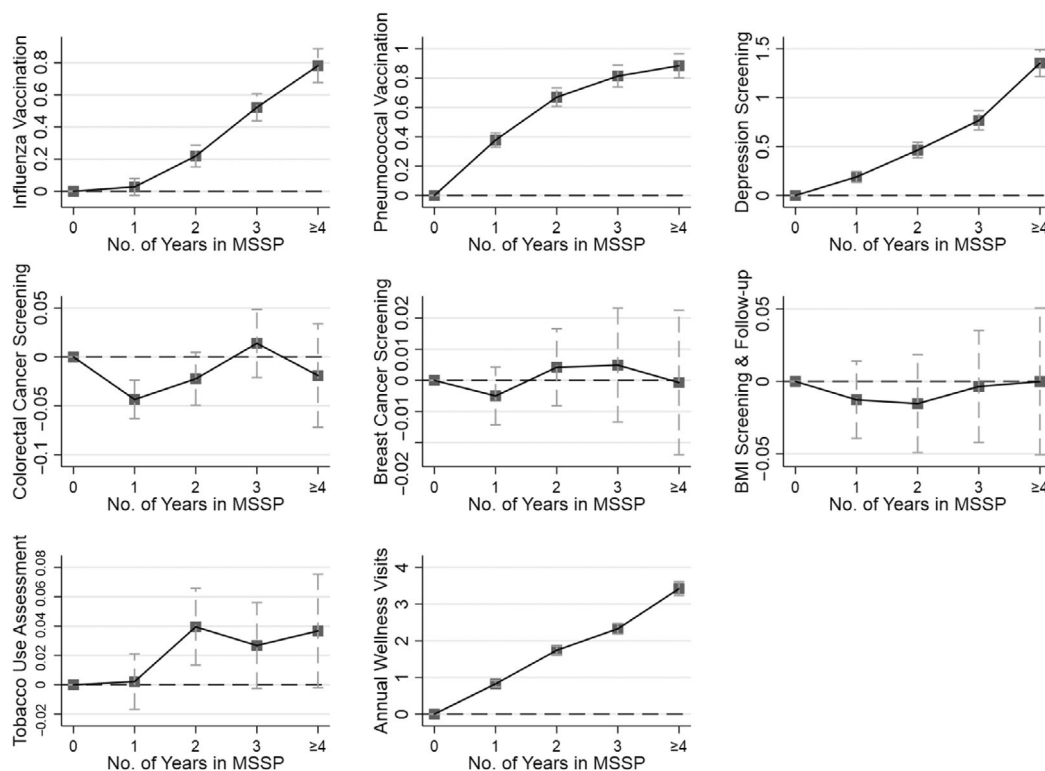
### 3.3 | Estimates from alternate models

Figures 2 and 3 present the point estimates and 95% confidence intervals for the association of MSSP participation with likelihood and volume of preventive services, respectively, by duration of participation. For influenza vaccination, pneumococcal vaccination, clinical depression screening, and annual wellness visits, there is a greater increase in the likelihood and the volume of preventive services delivery with more years of MSSP participation. We did not observe this trend, however, for other types of preventive services.

The results of the models adding control variables and changing the first participation year for the 2012 cohort are presented in Appendix Tables A3 and A4 for the likelihood and volume models, respectively. The results from these models are similar to the main models. Also reported in those tables are estimates excluding MSSP participants who left the MSSP during the study period. Results from this sample show larger point estimates than the main models, but the directions and significance levels are consistent with the main models.

### 3.4 | Additional checks

One potential source of bias in the regression estimates is difference in outcome trends before joining MSSP between participating and



**FIGURE 3** Regression estimates of the association of MSSP participation with volume of preventive services delivery by duration of MSSP participation. The independent variable and x-axis are based on the number of years PCPs have participated in the MSSP. All models included year and provider fixed effects and controlled for patient average age, race/ethnicity and gender compositions, and a state-level indicator of Medicaid expansion. Standard errors are clustered at the provider level. BMI, body mass index; MSSP, Medicare shared savings program; PCP, primary care physician



non-participating PCPs. As a qualitative check of this bias, we graphed outcome trends separately for each cohort of PCPs joining MSSP in 2014–2018 (with at least 2 years of data before joining MSSP since the data were first available in 2012) compared to PCPs who never participated in MSSP. We show these trends in Appendix Figures A1–A16. For influenza vaccination, pneumococcal vaccination, clinical depression screening, and annual wellness visits, the pre-MSSP trends appeared to be parallel between MSSP participants and those who never joined MSSP for most cohorts. For colorectal cancer screening, breast cancer screening, BMI screening and follow-up, and tobacco use assessment, there were apparent differences in pre-trends, suggesting possible biases. However, across most outcomes, there was a noticeable change in the post-MSSP trend compared to the pre-trend that supported the observed regression estimates.

Finally, to further understand the possibility of time-varying confounding, we regressed MSSP participation on PCP-level time-varying covariates including patient demographic variables, patient panel size, patient mean risk score, and proportions of patients with certain health conditions, controlling for provider and year fixed effects. Results (Appendix Table A5) suggest that MSSP participation is positively correlated with the percentage of Black/African American patients and the proportions of patients diagnosed with hypertension and depression, but negatively correlated with the percentage of Medicare/Medicaid dual-eligible patients and the proportion of patients diagnosed with cancer. Overall, there is little evidence from this analysis of a systematic correlation between MSSP participation and these time-varying patient characteristics that would suggest a clear direction of bias from unobservable PCP-level time-varying confounders.

## 4 | DISCUSSIONS

This study provides novel evidence on whether PCP participation in MSSP is associated with delivering preventive services using national provider-level data over 7 years. We found that MSSP participation was associated with an increase in several preventive services including influenza immunization, pneumococcal vaccination, clinical depression screening, tobacco use assessment, and annual wellness visits. In contrast, MSSP participation was associated with a decrease in colorectal cancer screening, and not associated with breast cancer screening and BMI screening.

The MSSP aligns preventive care delivery with quality measures and financial incentives. A study conducted by the Centers for Disease Control and Prevention interviewed health care experts and health care industry managers and summarized four major levers for promoting preventive care delivery: (1) financial and economic considerations influencing provider priorities and decision making; (2) using metrics to drive changes in the health care system; (3) important role of health care payers; and (4) rapid transformation from volume-based to value-based payment models.<sup>26</sup> The MSSP incorporates all those levers such that we would expect the program to influence providers

in delivering more preventive care, as evident in our findings. Further, because preventive care provision and utilization are jointly determined by provider and patient decisions, programs such as the MSSP need to consider strategies on both sides to further promote preventive care. On the provider side, MSSP ACOs may motivate PCPs to provide specific preventive services by designing training programs, measuring performance, and directly linking preventive care provision to physician payment.<sup>12</sup> On the patient side, MSSP ACOs may encourage their patients to use preventive care via patient education, appointment reminders, and offering certain incentives.<sup>12,27,28</sup> Considering that physicians play a key role in patient education, several MSSP ACOs designed patient communication toolkits to improve patient-physician communication.<sup>28</sup> Relying on interpersonal trust in patient-physician relationships, physicians can discuss pros and cons of preventive care during office visits, change patients' perceptions of preventive care, and increase the probability of patients accepting service recommendations.<sup>29,30</sup>

Although not a MSSP quality measure, annual wellness visits are recommended for PCPs to evaluate patients' health status, personalize follow-up care, and address specific patient needs. The association between annual wellness visits and MSSP participation is particularly relevant given the persistently low rates of wellness visits among Medicare patients. In 2018, 45% of PCPs in the study sample provided at least one annual wellness visit, yet the overall rate was 14.3 visits per 100 patients, consistent with other studies.<sup>31,32</sup> One potential constraint for providers to offer these visits is cumbersome documentation and billing requirements.<sup>31,32</sup> To help providers overcome this constraint, ACOs may use existing practice transformation coaches or administrative staffs to develop the documentation assistance tools, or leverage the EHR system to simplify the documentation and billing procedures. Further, ACOs can develop additional tools and care management protocols to help providers improve annual wellness visit rates.

The increase in clinical depression screening associated with MSSP participation suggests additional pathways through which MSSP can broadly affect population health. The inclusion of clinical depression screening into quality performance metrics provides a strong incentive for ACOs to increase screening. However, increased screening does not necessarily indicate adequate integration of mental health services in ACOs' care delivery models. Researchers found that Medicare ACOs failed to generate actual integration between mental health and primary care practice.<sup>33</sup> Fullerton et al. revealed that nearly half of the ACOs in their survey did not implement any behavioral health initiatives.<sup>34</sup> Many ACOs were reported to limit their focus on improving clinical depression screening rates without a broader emphasis on mental health services. Overall, the MSSP has reportedly had minimal effects on mental health expenditure, utilization, and quality outcomes.<sup>35</sup> Future work is needed to understand the extent to which financial incentives explain the gap in improvement in depression screening but not in mental health services. One potential policy change is considering incorporating additional performance indicators in the MSSP quality metrics for mental health services.



We found that MSSP participation was associated with less colorectal cancer screening but no change in breast cancer screening. An earlier study had found a small decrease in breast and prostate cancer screening but a modest increase in colorectal cancer screening at the patient level after MSSP ACO enrollment.<sup>13</sup> That study recapitulated data on Medicare beneficiaries' enrollment in MSSP ACOs in early years (i.e., 2012–2013). In contrast, our study used provider-level data on services delivery and examined a longer period, which might contribute to the difference in findings. It is important to note that both colorectal and breast cancer screenings are recommended by the US Preventive Services Task Force (USPSTF) as preventive services with considerable net benefits.<sup>36</sup> The lack of incentive to increase these services under MSSP is concerning and calls for further research to elucidate the effects of value-based payment models on cancer screening.

Our findings have important implications for ongoing national discussions on reforming health care delivery and payment models. The results suggest that ACO PCPs were more likely to provide several preventive services included in the MSSP quality performance measures, which supports the positive effect of incorporating targeted services into quality performance measures on the transformation of care delivery. Several preventive services recommended by the USPSTF, which may benefit Medicare patients, are not incorporated in the MSSP quality performance measures, such as osteoporosis screening to prevent future fractures, screening and behavioral counseling for unhealthy alcohol and drug use, and screening for Hepatitis B Virus infection.<sup>36</sup> These preventive services can increase early detection, facilitate timely treatment, and reduce risk behaviors for older adults. We did not evaluate these services, but future work is needed to investigate whether MSSP participation is associated with preventive services outside the MSSP quality performance metrics. The findings also support the adoption of similar program designs by other payers such as Medicaid and private insurance plans. Some states have been establishing Medicaid ACO programs for targeted populations,<sup>37</sup> with early evidence suggesting an increase in preventive services utilization.<sup>38</sup>

Our findings should be interpreted with some caution. First, our estimates should not be interpreted as causal effects. The main models accounted for provider-level time-invariant confounders and national time trends, while additional models controlled for patient health characteristics and geographic indicators. However, it is still possible that provider participation in MSSP is correlated with pre-participation trends in outcomes that differ between participants and non-participants, especially for the 2012 and 2013 cohorts for which pre-trend data are not available. There is also the possibility of provider/practice time-varying confounders such as capacity or clinical practice changes, for instance, the adoption of preventive care protocols and the usage of EHR systems within our study period. Second, the outcomes derived from HCPCS/CPT codes might also have some measurement errors due to inaccurate or missing coding. For example, body weight screening might be coded in some cases under evaluation and management (CPT code 99212–99215), which is underspecified and thus not included in our outcome measure. Such errors, however, are unlikely to be associated with MSSP participation, and therefore, would likely increase the standard errors but not bias the

effect estimates. Finally, we could not evaluate the mechanisms for the observed associations between MSSP participation and preventive services delivery given the available data. Future research using mixed methods can shed light on the mechanisms that would explain the observed changes in preventive services delivery.

## 5 | CONCLUSION

Using provider-level data over a 7-year period, this study adds to the evidence on the relationship between MSSP participation and the delivery of preventive services. The study finds that PCPs' participation in MSSP was associated with an increase in the likelihood and the volume of several evaluated preventive services. In contrast, MSSP participation was associated with a decrease in the likelihood and volume of colorectal cancer screening. Future work is needed to understand the mechanisms that explain the observed changes and the long-term effects of these changes on population health and health care expenditures.

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## CONFLICT OF INTEREST

The authors declare no conflict of interest.

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## SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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