

# Care for Food-Insecure Enrollees in Medicare Advantage vs Traditional Medicare

Sungchul Park, PhD; and Brent A. Langellier, PhD

**M**edicare Advantage (MA) plans provide a managed care approach to delivering Medicare-covered services. MA plans are the privately administered alternative to the fee-for-service traditional Medicare (TM) program administered by the federal government. The most notable difference between MA and TM programs is that MA plans are paid on a capitated basis rather than for each service performed. This creates the financial incentive for MA plans to keep their enrollees healthy. MA plans use various techniques to maintain enrollee health while controlling costs, such as investing in quality improvement activities and preventive services.<sup>1-5</sup>

There is ample evidence that MA plans improve the efficiency of health care delivery without compromising care quality. Because healthier persons tend to enroll in MA than TM,<sup>6-11</sup> however, a direct comparison between MA and TM enrollees may potentially produce biased results. Prior studies that have compared MA enrollees with matched groups of TM enrollees have generally found that MA enrollees tend to have lower health care utilization,<sup>1,12-17</sup> better clinical quality outcomes,<sup>18,19</sup> better patient experiences,<sup>18,20</sup> and lower readmission rates.<sup>1,13,14</sup>

An understudied but potentially insightful question is whether MA enrollment leads to better outcomes and lower costs among enrollees with social risk factors. Food insecurity, which is defined as being unable at some point during the year to acquire a sufficient quantity of nutritious, culturally appropriate food because of lack of money or other resources,<sup>21</sup> is one of the most pressing challenges in society today. In 2016, 9.1% of Americans 65 years and older—about 4.5 million—were food insecure.<sup>22</sup> If food insecurity prevalence remains steady, by 2050 there will be more than 8 million food-insecure older adults.<sup>23</sup>

MA plans may better serve food-insecure enrollees. Some MA plans have recently provided additional programs to address food insecurity. Such programs may have the potential to allow food-insecure enrollees to receive appropriate care in a timely manner, possibly preventing progression of chronic diseases. Food-insecure enrollees may also benefit from efficient care provision by reducing unnecessary or ineffective care. This may be particularly relevant to

## ABSTRACT

**OBJECTIVES:** To examine whether enrollment in Medicare Advantage (MA) and fee-for-service traditional Medicare (TM) is differential by food insecurity and then examine differences in health care utilization, financial burden, care satisfaction, and health status between food-insecure enrollees in MA and TM and between food-secure enrollees in MA and TM.

**STUDY DESIGN:** We employed a retrospective cohort study design. Using the 2015-2016 Medicare Current Beneficiary Survey, we identified the following 4 mutually exclusive groups: food-insecure enrollees in MA, food-insecure enrollees in TM, food-secure enrollees in MA, and food-secure enrollees in TM.

**METHODS:** We used an instrumental variable approach to address endogenous choice between MA and TM. Using a 2-stage least squares regression model, we estimated the adjusted outcomes for each group and differences in the adjusted outcomes between food-insecure enrollees in MA and TM and between food-secure enrollees in MA and TM.

**RESULTS:** There were no significant differences in enrollment between MA and TM by food insecurity status. Compared with food-insecure enrollees in TM, food-insecure enrollees in MA had significantly lower health care utilization and financial burden. A similar pattern was observed among food-secure enrollees, but the difference in health care utilization was greater between food-insecure enrollees in MA and TM than between food-secure enrollees in MA and TM. There were no significant differences in care satisfaction and health status between MA and TM. However, food insecurity status did not improve in MA and TM enrollees over time.

**CONCLUSIONS:** MA may deliver care more efficiently to food-insecure beneficiaries than TM, but it is not better at reducing food insecurity.

*Am J Manag Care.* 2021;27(7):e234-e241. doi:10.37765/ajmc.2021.88707

low-income older adults because they may skip or reduce meals or purchase cheaper but less healthful food at times because of lack of financial resources.<sup>24</sup> If MA plans do provide care more efficiently to food-insecure enrollees, it may reduce enrollees' financial burden and improve food insecurity. However, it is worth noting that evidence suggests limited uptake of the supplemental benefits (including programs for food insecurity) offered by MA plans. Approximately 2% of MA plans provided meal programs for their enrollees in 2020.<sup>25</sup>

On the other hand, MA plans may have some incentive to prevent enrollment or induce disenrollment among food-insecure enrollees. Food-insecure enrollees are more likely to incur costs that are higher than the capitation payments made to MA plans. This is because food-insecure enrollees generally have poorer health status and incur higher costs compared with food-secure enrollees,<sup>26-29</sup> but the risk adjustment formula that governs capitation payments does not account for social risk factors, including food insecurity.<sup>30</sup> However, there is limited evidence regarding enrollment in MA and TM by food insecurity or whether one program provides more effective or efficient care to food-insecure beneficiaries.

In this study, we conducted 2 main analyses. First, we examined whether enrollment rates of food insecurity differed between MA and TM. Second, we examined whether there were significant differences in health care utilization, financial burden, care satisfaction, and health status between food-insecure enrollees in MA and TM. We then compared our findings with those of a similar analysis among food-secure enrollees. As a secondary analysis, we also examined changes in food insecurity status in MA and TM over time.

## METHODS

### Data and Sample

Our primary data came from the 2015-2016 Medicare Current Beneficiary Survey (MCBS). The MCBS provides comprehensive information on demographic, socioeconomic, and health care–related characteristics for a nationally representative sample of Medicare beneficiaries. We also used the Geographic Variation Public Use File to obtain county-level MA penetration rates. We identified Medicare enrollees 65 years or older with 12 months of continuous enrollment in MA or TM. We excluded those who died and those whose original eligibility for Medicare was attributable to end-stage renal disease. We then categorized the sample into 4 mutually exclusive groups: food-insecure enrollees in MA, food-insecure enrollees in TM, food-secure enrollees in MA, and food-secure enrollees in TM. We identified food insecurity through the 6-item version of the US Department of Agriculture's food security questionnaire.<sup>21</sup> Specifically, respondents were asked if their food had ever run out, if they had no money to get more, or if they were unable to eat balanced meals, cut meal size or skipped meals, ate less than they ought, or were hungry because of insufficient money. We defined

### TAKEAWAY POINTS

- ▶ In a retrospective cohort study using the Medicare Current Beneficiary Survey, food-insecure beneficiaries in Medicare Advantage (MA) had lower health care utilization and financial burden than food-insecure beneficiaries in traditional Medicare (TM).
- ▶ However, there were no differences in care satisfaction and health status.
- ▶ Changes over time in beneficiaries' food insecurity status were similar between MA and TM.

those enrollees with 2 or more affirmative responses, out of 6, as being food insecure.

### Outcome Variables

We used 5 types of outcomes. To determine differential enrollment in MA and TM by food insecurity, we examined prevalence of food insecurity in both programs. As described earlier, we assessed those with 2 or more affirmative responses, out of 6, as being food insecure and those with 5 or more affirmative responses as having very low food security (food insecurity with hunger). We used food insecurity as an outcome, as well as a key independent variable. We assessed the following 4 types of service utilization: inpatient hospital admission, outpatient hospital visit, medical provider visit, and prescription drug purchase (measured as a single purchase of a single drug in a single container). We used the following 2 measures of financial burden: out-of-pocket (OOP) spending and share of OOP in annual income. Annual income included total annual income for themselves and their spouse from all sources including earnings, asset income, Social Security, and pensions. We assessed care satisfaction using the following 5 measures: experience of trouble in getting needed care, availability of care by specialists when one needs it, ease of getting to a doctor from where person lives, OOP costs paid for medical care, and overall quality of medical care received. Experience of trouble in getting needed care was assessed in 2 levels: yes or no. Other measures were assessed in 4 levels: very dissatisfied, dissatisfied, satisfied, or very satisfied. Finally, we assessed self-reported health status using the following 2 measures: general health status compared with same-aged people and overall health status compared with a year ago. General health status compared with same-aged people was assessed in 5 levels: poor, fair, good, very good, or excellent. Overall health status compared with a year ago was assessed in 2 levels: worse or same/better health. A higher value indicates better care satisfaction or health status.

### Independent Variables

Our key independent variables were MA enrollment, presence of food insecurity, and the interaction of MA enrollment and food insecurity. To control for differences in characteristics between MA and TM enrollees, we included the following control variables: age, gender, race/ethnicity, education, income, Medicare/Medicaid dual eligibility, marital status, status of living with someone, residence in metro area, Census region of residence, comorbidities, activities of daily living (ADL) limitations, and body mass index.

**TABLE 1.** Sample Characteristics of TM and MA Enrollees With and Without Food Insecurity

Characteristics	With food insecurity			Without food insecurity		
	TM enrollees (n=591)	MA enrollees (n=490)	P	TM enrollees (n=5122)	MA enrollees (n=3471)	P
Age in years, mean (SD)	63.5 (12.8)	66.1 (11.9)	<.0001	72.1 (11.0)	73.2 (9.4)	<.0001
Female, n (%)	376 (63.6)	313 (63.9)	.930	2688 (52.5)	1911 (55.1)	.019
Race/ethnicity, n (%)			<.0001			<.0001
Non-Latino White	380 (64.3)	247 (50.4)		4316 (84.3)	2717 (78.3)	
Non-Latino Black	128 (21.7)	120 (24.5)		425 (8.3)	325 (9.4)	
Non-Latino Asian	7 (1.2)	10 (2.0)		69 (1.3)	45 (1.3)	
Latino	59 (10.0)	99 (20.2)		265 (5.2)	337 (9.7)	
Others	47 (8.0)	36 (7.3)		159 (3.1)	92 (2.7)	
Education, n (%)			.131			<.0001
Less than high school	193 (32.7)	165 (33.7)		737 (14.4)	642 (18.5)	
High school completion	238 (40.3)	211 (43.1)		1854 (36.2)	1281 (36.9)	
Some college or associate's degree	113 (19.1)	86 (17.6)		1154 (22.5)	702 (20.2)	
Bachelor's degree	27 (4.6)	17 (3.5)		695 (13.6)	459 (13.2)	
Advanced degree	20 (3.4)	9 (1.8)		660 (12.9)	381 (11.0)	
Income, n (%)			.389			<.0001
< \$25,000	486 (82.2)	394 (80.4)		1878 (36.7)	1427 (41.1)	
\$25,000-\$50,000	80 (13.5)	83 (16.9)		1421 (27.7)	1008 (29.0)	
> \$50,000	25 (4.2)	13 (2.7)		1823 (35.6)	1036 (29.8)	
Dual eligibility for Medicare and Medicaid, n (%)	288 (48.7)	234 (47.8)	.749	733 (14.3)	499 (14.4)	.932
Married, n (%)	145 (24.5)	143 (29.2)	.085	2627 (51.3)	1766 (50.9)	.709
Living with others, n (%)			.197			.850
Living alone	224 (37.9)	183 (37.3)		1641 (32.0)	1129 (32.5)	
Living with spouse	131 (22.2)	134 (27.3)		2446 (47.8)	1625 (46.8)	
Living with nonspouse family	198 (33.5)	148 (30.2)		853 (16.7)	594 (17.1)	
Living with nonrelatives	38 (6.4)	25 (5.1)		182 (3.6)	123 (3.5)	

(continued)

**Instrumental Variable**

Research suggests that healthier persons enroll in MA than TM<sup>7-10,31</sup>; therefore, MA enrollment may be an endogenous variable. This could undermine the validity of directly comparing health care utilization, financial burden, care satisfaction, and health status between MA and TM enrollees. We addressed this by using an instrumental variable (IV) approach. Because Medicare enrollees in a county with a greater MA penetration rate are more likely to enroll in MA, this may induce selection bias. To control for unmeasured confounding due to selection bias, following prior research,<sup>17,32</sup> we used the exogenous variation in the county-level MA penetration rate as an instrument for individual-level MA enrollment. It is hypothesized that the MA penetration rate in a county is positively related with MA enrollment and is presumed to be not directly related with health care utilization, financial burden, care satisfaction, and

health status. We calculated the county-level MA penetration rate as the proportion of MA enrollees among all Medicare beneficiaries.

**Statistical Analysis**

We estimated sample characteristics and outcomes between MA and TM enrollees by food insecurity status. We also estimated outcomes between MA and TM enrollees by the magnitude of food insecurity. Then, we estimated the adjusted outcomes using a 2-stage least squares regression model. In the first stage, we obtained the predicted likelihood of enrolling in MA based on the county-level MA penetration rates. In the second stage, we estimated the association between predicted enrollment in MA from the first stage and the outcomes of interest. We used linear probability models for binary outcomes, linear regression models for nonbinary outcomes in care satisfaction and health status, and generalized linear models with gamma distribution and log link function for health care utilization and financial burden. Both stages adjusted for control variables described earlier. For analysis using food insecurity status as an outcome, we did not include food insecurity status and its interaction term with MA enrollment as control variables. We then estimated the adjusted outcome for each group and differences in the adjusted outcomes between MA and TM enrollees by food insecurity. We also examined the same analysis using analysis without IV and compared findings from analyses with and without IV. As a secondary analysis, we analyzed changes in food insecurity status for MA and TM enrollees during 2015-2016. We limited

the study population described earlier to those with 24 months of continuous enrollment in MA or TM and then calculated the proportion of each of 4 mutually exclusive groups based on food insecurity status in 2015 and 2016. We used survey weights to obtain nationally representative estimates.

**RESULTS**

Our sample included 9674 Medicare enrollees (Table 1). Sample characteristics were similar between food-insecure enrollees in MA and TM and between food-secure enrollees in MA and TM. Across both programs, food-insecure enrollees were more likely than food-secure enrollees to be younger, to be Latino or Black, to have dual eligibility, to have less than a high school education, to have income less than \$25,000, to have comorbidities, to have a higher

number of ADL limitations, and to be obese. Results for unadjusted outcomes are presented in **eAppendix Table 1** (eAppendix available at [ajmc.com](http://ajmc.com)). There were small differences in unadjusted outcomes between food-insecure and very food-insecure enrollees in MA and TM (**eAppendix Table 2**).

Our first-stage IV analysis showed that county-level MA penetration rate was a strong and valid instrument. County-level MA penetration rate was significantly predictive of the likelihood of enrolling in MA (**eAppendix Table 3**). *F* statistics were higher than 10.<sup>33</sup> Most individual covariates were balanced across values of the instrument.

Our IV analysis showed no significant differences in the prevalence of food insecurity between MA and TM enrollees (1.9 percentage points [95% CI, -4.1 to 7.9] for food insecurity and 1.4 percentage points [95% CI, -2.7 to 5.5] for food insecurity with hunger) (**Figure**).

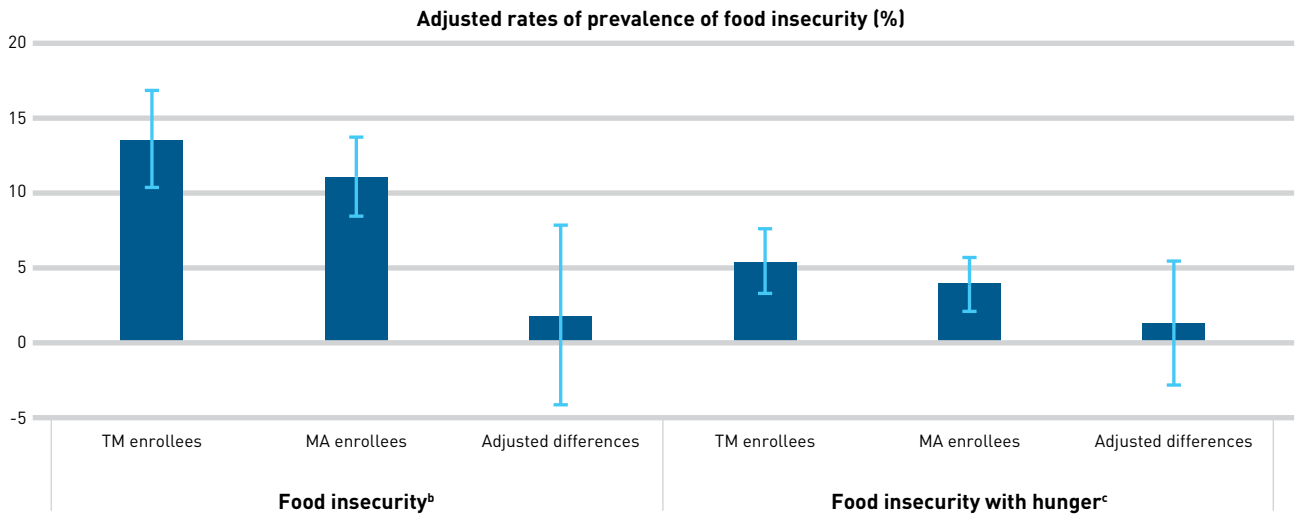
Food-insecure enrollees in MA had lower health care utilization and financial burden than food-insecure enrollees in TM during 2015-2016 (**Table 2**). For health care utilization, food-insecure enrollees in MA had a mean predicted value from regression of 21.3 fewer (95% CI, -25.3 to -17.2) medical provider visits, 12.6 fewer (95% CI, -23.5 to -1.7) prescription drug purchases, 4.3 fewer (95% CI, -5.4 to -3.1) outpatient hospital visits, and 0.2 fewer (95% CI, -0.3 to -0.1) inpatient hospital admissions than food-insecure enrollees in TM. For financial burden, compared with food-insecure enrollees in TM, food-insecure enrollees in MA spent an average of \$395 less (95% CI, -\$683 to -\$107) on OOP costs and 2.8 percentage points less (95% CI, -5.1 to -0.4) of their annual income on OOP costs.

Similar trends were observed among food-secure enrollees, but several differences emerged between food-secure and food-insecure enrollees (**Table 2**). For health care utilization, the magnitude of the differences was larger between food-insecure enrollees in MA and TM than between food-secure enrollees in MA and TM. For financial burden, the difference in OOP spending was smaller between food-insecure enrollees in MA and TM than between food-secure enrollees in MA and TM, but the difference in the share of OOP as a proportion of annual income was slightly larger.

**TABLE 1.** (Continued) Sample Characteristics of TM and MA Enrollees With and Without Food Insecurity

Characteristics	With food insecurity		P	Without food insecurity		P
	TM enrollees (n=591)	MA enrollees (n=490)		TM enrollees (n=5122)	MA enrollees (n=3471)	
Residence in metro area, n (%)	381 (64.5)	409 (83.5)	<.0001	3536 (69.0)	2867 (82.6)	<.0001
Census region of residence, n (%)			<.0001			<.0001
New England	17 (2.9)	5 (1.0)		205 (4.0)	79 (2.3)	
Middle Atlantic	67 (11.3)	81 (16.5)		669 (13.1)	573 (16.5)	
East North Atlantic	121 (20.5)	59 (12.0)		971 (19.0)	661 (19.0)	
West North Atlantic	32 (5.4)	10 (2.0)		401 (7.8)	248 (7.1)	
South Atlantic	176 (29.8)	139 (28.4)		1107 (21.6)	683 (19.7)	
East South Central	60 (10.2)	38 (7.8)		447 (8.7)	164 (4.7)	
West South Central	50 (8.5)	64 (13.1)		442 (8.6)	275 (7.9)	
Mountain	37 (6.3)	29 (5.9)		418 (8.2)	300 (8.6)	
Pacific	30 (5.1)	56 (11.4)		458 (8.9)	434 (12.5)	
Puerto Rico	1 (0.2)	9 (1.8)		4 (0.1)	54 (1.6)	
Comorbidity, n (%)						
Atherosclerosis	56 (9.5)	42 (8.6)	.606	501 (9.8)	326 (9.4)	.548
Hypertension	413 (69.9)	368 (75.1)	.056	3536 (69.0)	2392 (68.9)	.905
Heart attack	90 (15.2)	82 (16.7)	.500	614 (12.0)	398 (11.5)	.462
Stroke	80 (13.5)	83 (16.9)	.120	553 (10.8)	366 (10.5)	.711
Coronary heart disease	69 (11.7)	71 (14.5)	.170	563 (11.0)	369 (10.6)	.598
Cancer	167 (28.3)	115 (23.5)	.074	2053 (40.1)	1258 (36.2)	<.0001
Rheumatoid arthritis	171 (28.9)	161 (32.9)	.164	784 (15.3)	549 (15.8)	.521
Osteoporosis	127 (21.5)	124 (25.3)	.139	1044 (20.4)	743 (21.4)	.251
Asthma/COPD	207 (35.0)	180 (36.7)	.560	1056 (20.6)	637 (18.4)	.010
Diabetes	29 (4.9)	33 (6.7)	.198	232 (4.5)	188 (5.4)	.061
Mental illness	160 (27.1)	94 (19.2)	.002	447 (8.7)	224 (6.5)	<.0001
Depression	325 (55.0)	252 (51.4)	.242	1250 (24.4)	839 (24.2)	.805
Number of ADL limitations, n (%)			.309			.016
0	189 (32.0)	170 (34.7)		3022 (59.0)	2154 (62.1)	
1-2	153 (25.9)	136 (27.8)		1227 (24.0)	781 (22.5)	
≥3	249 (42.1)	184 (37.6)		873 (17.0)	536 (15.4)	
BMI, n (%)			.566			.900
Underweight (< 18.5)	14 (2.4)	11 (2.2)		86 (1.7)	58 (1.7)	
Healthy weight (18.5-24.9)	135 (22.8)	128 (26.1)		1639 (32.0)	1091 (31.4)	
Overweight (25.0-29.9)	178 (30.1)	133 (27.1)		1887 (36.8)	1306 (37.6)	
Obese (≥30.0)	264 (44.7)	218 (44.5)		1510 (29.5)	1016 (29.3)	
Year, n (%)			.082			.509
2015	304 (51.4)	226 (46.1)		2438 (47.6)	1627 (46.9)	
2016	287 (48.6)	264 (53.9)		2684 (52.4)	1844 (53.1)	

ADL, activities of daily living; BMI, body mass index; COPD, chronic obstructive pulmonary disease; MA, Medicare Advantage; TM, traditional Medicare.

**FIGURE.** Adjusted Differences in Prevalence of Food Insecurity Between TM and MA Enrollees<sup>a</sup>

MA, Medicare Advantage; TM, traditional Medicare.

<sup>a</sup>We used the county-level MA penetration rate as an instrument for individual-level MA enrollment to control for unmeasured confounding due to selection bias. Using the predictive marginal effects at representative values estimated from a 2-stage least squares regression model, we used the method of recycled predictions to estimate the predicted mean values of the outcomes for each group in MA and TM. We then conducted postestimation tests to estimate the differences in the adjusted outcomes between MA and TM beneficiaries. To control for differences in characteristics between MA and TM beneficiaries, we also included the following control variables: age, gender, race/ethnicity, education, income, Medicare/Medicaid dual eligibility, marital status, status of living with someone, residence in metro area, Census region of residence, comorbidities, body mass index, and activities of daily living limitations.

<sup>b</sup>We defined those with 2 or more affirmative responses, out of 6, as being food insecure.

<sup>c</sup>We defined those with 5 or more affirmative responses, out of 6, as having very low food security.

There were no significant differences in care satisfaction and self-reported health status between food-secure enrollees in MA and TM or between food-insecure enrollees in MA and TM (Table 3). However, food-insecure enrollees were more likely to have lower care satisfaction and worse self-reported health status than food-secure enrollees. Particularly, 15.9% and 16.8% of food-insecure enrollees in MA and TM, respectively, experienced trouble in getting needed care, whereas shares of those who encountered trouble in getting needed care among food-secure enrollees in MA and TM were 3.8% and 4.2%, respectively.

Results from analyses without IV are presented in Appendix Tables 4 and 5.

No substantial differences were detected in changes in food insecurity status for MA and TM enrollees during 2015-2016 (Table 4). The proportion of enrollees who were food insecure in 2015 but became food secure in 2016 was low in both MA and TM (2.8%). However, more enrollees were food secure in 2015 but food insecure in 2016, and the proportions were also similar in MA and TM (3.2% and 3.6%, respectively).

## DISCUSSION

We found no differential enrollment rates in MA and TM by food insecurity status. However, food-insecure enrollees in MA had lower health care utilization and financial burden than food-insecure

enrollees in TM. We observed a similar pattern among food-secure enrollees, but the difference in health care utilization was greater between food-insecure enrollees than food-secure enrollees across the board. There were no differences in care satisfaction or self-reported health status between food-insecure enrollees in MA and TM and between food-secure enrollees in MA and TM.

We observed that sample characteristics were similar between food-insecure enrollees in MA and TM and between food-secure enrollees in MA and TM, respectively. However, food-insecure enrollees tended to have poor socioeconomic status and greater medical conditions and behavioral factors, consistent with findings from prior research.<sup>22,28,29,34</sup> This may reflect that food insecurity can be both a cause and a consequence of poor health,<sup>35</sup> leaving food-insecure enrollees, especially those with low income, most vulnerable to preventable disease.

Our finding that food-insecure enrollees in MA had lower health care utilization and financial burden than food-insecure enrollees in TM suggests that MA plans may be delivering care more efficiently by reducing unnecessary care. Food-insecure enrollees already face financial challenges, forcing them to choose between food or medicine.<sup>35</sup> Thus, reducing the financial burden of health care may enable them to allocate scarce dollars toward other health-enhancing spending such as food consumption. However, our findings should be interpreted cautiously because they may reflect a denial of care by MA plans through limited networks or prior authorization. Despite

**TABLE 2.** Adjusted Differences in Health Care Utilization and Financial Burden Between TM and MA Enrollees With and Without Food Insecurity

Outcomes	Adjusted estimate, mean (95% CI) <sup>a</sup>					
	With food insecurity			Without food insecurity		
	TM enrollees	MA enrollees	Adjusted differences	TM enrollees	MA enrollees	Adjusted differences
<b>Health care utilization</b>						
Inpatient hospital admission (n=9674)	0.4 (0.3-0.5)	0.2 (0.1-0.3)	-0.2 (-0.3 to -0.1)	0.2 (0.2-0.2)	0.1 (0.1-0.2)	0.0 (-0.1 to 0.0)
Outpatient hospital visit (n=9674)	7.6 (6.5-8.7)	3.3 (2.9-3.8)	-4.3 (-5.4 to -3.1)	5.3 (5.0-5.6)	3.2 (3.0-3.5)	-2.0 (-2.4 to -1.7)
Medical provider visit <sup>b</sup> (n=9674)	38.7 (35.2-42.2)	17.4 (15.3-19.6)	-21.3 (-25.3 to -17.2)	30.9 (29.8-32.0)	16.2 (15.3-17.0)	-14.8 (-16.2 to -13.3)
Prescription drug purchase <sup>c</sup> (n=7708)	84.2 (75.4-92.9)	71.6 (65.0-78.3)	-12.6 (-23.5 to -1.7)	45.5 (43.5-47.5)	40.2 (38.3-42.1)	-5.2 (-7.9 to -2.6)
<b>Financial burden</b>						
OOP spending in \$ (n=9674)	1605 (1377-1834)	1210 (1029-1391)	-395 (-683 to -107)	2484 (2357-2611)	1902 (1789-2014)	-582 (-750 to -414)
Share of OOP in income (n=9674)	10.8 (8.8-12.7)	8.0 (6.7-9.3)	-2.8 (-5.1 to -0.4)	8.3 (7.8-8.8)	6.4 (6.0-6.8)	-1.9 (-2.5 to -1.3)

MA, Medicare Advantage; OOP, out-of-pocket; TM, traditional Medicare.

<sup>a</sup>We used the county-level MA penetration rate as an instrument for individual-level MA enrollment to control for unmeasured confounding due to selection bias. Using the predictive marginal effects at representative values estimated from a 2-stage least squares regression model, we used the method of recycled predictions to estimate the predicted mean values of the outcomes for each group in MA and TM. We then conducted postestimation tests to estimate the differences in the adjusted outcomes between MA and TM beneficiaries. To control for differences in characteristics between MA and TM beneficiaries, we also included the following control variables: age, gender, race/ethnicity, education, income, Medicare/Medicaid dual eligibility, marital status, status of living with someone, residence in metro area, Census region of residence, comorbidities, body mass index, and activities of daily living limitations.

<sup>b</sup>The unit of measurement is a separate visit, procedure, service, or supplied item.

<sup>c</sup>The unit of measurement is a single purchase of a single drug in a single container.

**TABLE 3.** Adjusted Differences in Care Satisfaction and Health Status Between TM and MA Enrollees With and Without Food Insecurity

Outcomes	Adjusted estimate, mean (95% CI) <sup>a</sup>					
	With food insecurity			Without food insecurity		
	TM enrollees	MA enrollees	Adjusted differences	TM enrollees	MA enrollees	Adjusted differences
<b>Care satisfaction<sup>b</sup></b>						
Trouble in having needed care (n=9665)	16.8 (13.0-20.7)	15.9 (11.8-19.9)	-1.0 (-6.6 to 4.7)	4.2 (1.7-6.7)	3.8 (0.7-7.0)	-0.4 (-5.9 to 5.2)
Availability of care by specialists when needed (n=8759)	3.2 (3.1-3.2)	3.1 (3.0-3.2)	0.0 (-0.1 to 0.1)	3.3 (3.2-3.4)	3.4 (3.3-3.5)	0.1 (0.0-0.2)
Ease of getting to a doctor from where person lives (n=9433)	3.2 (3.1-3.2)	3.1 (3.0-3.2)	0.0 (-0.1 to 0.1)	3.4 (3.4-3.5)	3.4 (3.4-3.5)	0.0 (-0.1 to 0.1)
OOP costs paid for medical care (n=9292)	2.9 (2.8-3.0)	2.8 (2.7-2.9)	-0.1 (-0.2 to 0.1)	3.2 (3.1-3.3)	3.2 (3.1-3.3)	0.0 (-0.2 to 0.1)
Overall quality of medical care received (n=9303)	3.3 (3.2-3.4)	3.3 (3.2-3.4)	0.0 (-0.1 to 0.1)	3.6 (3.5-3.7)	3.5 (3.4-3.6)	-0.1 (-0.2 to 0.0)
<b>Health status<sup>b</sup></b>						
General health status compared with same-aged people (n=9637)	2.6 (2.5-2.7)	2.7 (2.6-2.8)	0.1 (-0.1 to 0.2)	3.5 (3.4-3.6)	3.4 (3.3-3.6)	-0.1 (-0.3 to 0.2)
Overall health status compared with a year ago (n=9658)	0.7 (0.6-0.7)	0.7 (0.6-0.8)	0.0 (0.0-0.1)	0.8 (0.8-0.9)	0.8 (0.8-0.9)	0.0 (-0.1 to 0.1)

MA, Medicare Advantage; OOP, out-of-pocket; TM, traditional Medicare.

<sup>a</sup>We used the county-level MA penetration rate as an instrument for individual-level MA enrollment to control for unmeasured confounding due to selection bias. Using the predictive marginal effects at representative values estimated from a 2-stage least squares regression model, we used the method of recycled predictions to estimate the predicted mean values of the outcomes for each group in MA and TM. We then conducted postestimation tests to estimate the differences in the adjusted outcomes between MA and TM beneficiaries. To control for differences in characteristics between MA and TM beneficiaries, we also included the following control variables: age, gender, race/ethnicity, education, income, Medicare/Medicaid dual eligibility, marital status, status of living with someone, residence in metro area, Census region of residence, comorbidities, body mass index, and activities of daily living limitations.

<sup>b</sup>A higher value indicates better care satisfaction or health status.

**TABLE 4.** Changes in Food Insecurity Status Between TM and MA Enrollees

Change	n (%)	
	TM enrollees (n = 1302)	MA enrollees (n = 824)
Food security → Food security	1144 (87.9)	711 (86.3)
Food security → Food insecurity	42 (3.2)	30 (3.6)
Food insecurity → Food security	36 (2.8)	23 (2.8)
Food insecurity → Food insecurity	80 (6.1)	60 (7.3)

MA, Medicare Advantage; TM, traditional Medicare.

the reduced utilization, food-insecure enrollees still have the most financial risk. We found that food-insecure enrollees had lower OOP spending, probably because of financial support from Medicaid and subsidies, but their share of OOP spending as a proportion of annual income was relatively higher than that of food-insecure enrollees. Health care utilization among TM enrollees was higher across the board, and health care utilization was even higher among food-secure enrollees in TM than food-insecure enrollees in MA. This is likely a reflection of the lack of a direct financial incentive for TM to control utilization, leading to excess care provision.<sup>14,36</sup>

We detected no differences in the prevalence of food insecurity, care satisfaction, or self-reported health status between food-insecure enrollees in MA and TM. This provides suggestive evidence that MA plans may not tailor benefit packages to avoid food-insecure enrollees. Research has found that MA plans change benefit packages to encourage innovation and change care management techniques to deliver more efficient care. For example, MA plans have expanded networks of primary care providers<sup>37</sup> and provide relatively low cost sharing for primary care, specifically to encourage use of primary care and thus reduce unnecessary specialty care.<sup>38</sup> Our findings of few differences in care satisfaction or health status between enrollees with similar food security status strengthen evidence that MA plans may achieve lower health care utilization through high efficiency of care.

Food insecurity did not improve among MA beneficiaries. This suggests that MA plans had a limited role in addressing food insecurity, with several explanations. First, food-insecure enrollees are often dually eligible for Medicaid. Because Medicaid programs may provide their own meal support programs, addressing food insecurity may be less important to MA plans. Also, MA plans were not permitted to provide nonmedical benefits during our study period. Starting in 2019, CMS allowed MA plans to offer nonmedical benefits such as home-delivered meals to chronically ill enrollees with complex needs. However, adoption of the new benefits has been limited,<sup>39</sup> perhaps because of lack of financial incentives. Because these services have the potential to improve health outcomes while reducing costs,<sup>40</sup> social risk factors must be accounted for in payment systems.<sup>41</sup>

### Limitations

This study has modest limitations. First, our instrument was shown to be empirically valid and strong, but it may not fully address unobserved confounding. Specifically, we could not test the assumption

that the instrument and the error term in the outcome equation were not correlated. For example, MA plan availability, quality, and recruitment could be greater in counties with a lower proportion of food-insecure enrollees or sicker enrollees. However, we found no evidence that counties with higher county-level MA penetration rates had higher proportions of food-insecure enrollees or sicker enrollees. Even so, our findings should be interpreted with an awareness of the limitations. Second, some of the variables we used may be subject to self-reporting errors. Finally, we did not evaluate objective quality measures, and thus our interpretation that lower health care utilization among MA enrollees may not come at the cost of worse care quality may be limited.

## CONCLUSIONS

Although there were no differential enrollment rates in MA and TM by food insecurity status, MA plans may deliver care for food-insecure enrollees more efficiently than TM, leading to lower health care utilization and financial burden. However, MA plans were limited in addressing food insecurity. Policy makers should consider how to account for food insecurity in payment systems to incentivize plans to address underlying social needs more effectively in health care settings. ■

**Author Affiliations:** Department of Health Management and Policy, Dornsife School of Public Health, Drexel University (SP, BAL), Philadelphia, PA.

**Source of Funding:** This work was supported by grant R01 AG049815 from the National Institutes of Health.

**Author Disclosures:** The authors report no relationship or financial interest with any entity that would pose a conflict of interest with the subject matter of this article.

**Authorship Information:** Concept and design (SP, BAL); analysis and interpretation of data (SP, BAL); drafting of the manuscript (SP); critical revision of the manuscript for important intellectual content (SP, BAL); statistical analysis (SP); obtaining funding (SP); and supervision (SP).

**Address Correspondence to:** Sungchul Park, PhD, Department of Health Management and Policy, Dornsife School of Public Health, Drexel University, Nesbitt Hall, 3215 Market St, Philadelphia, PA 19104. Email: smp462@drexel.edu.

## REFERENCES

- Huckfeldt PJ, Escarce JJ, Rabideau B, Karaca-Mandic P, Sood N. Less intense postacute care, better outcomes for enrollees in Medicare Advantage than those in fee-for-service. *Health Aff (Millwood)*. 2017;36(1):91-100. doi:10.1377/hlthaff.2016.1027
- Curto V, Einav L, Finkelstein A, Levin J, Bhattacharya J. Health care spending and utilization in public and private Medicare. *Am Econ J Appl Econ*. 2019;11(2):302-332. doi:10.1257/app.20170295
- Medicare Payment Advisory Commission. *Report to the Congress: Medicare Payment Policy*. Medicare Payment Advisory Commission; 2015. Accessed June 8, 2021. [http://www.medpac.gov/docs/default-source/reports/mar2015\\_entirereport\\_revised.pdf](http://www.medpac.gov/docs/default-source/reports/mar2015_entirereport_revised.pdf)
- Langellier BA, Park S. Financial performance of Medicare Advantage contracts in 2014 and plan renewal, consolidation, and termination rates in the subsequent year. *Med Care*. 2020;58(8):674-680. doi:10.1097/MLR.0000000000001314
- Park S, Langellier BA, Burke RE. Telehealth benefits offered by Medicare Advantage plans in 2020. *Med Care*. 2021;59(1):53-57. doi:10.1097/MLR.0000000000001408
- Newhouse JP, McGuire TG. How successful is Medicare Advantage? *Milbank Q*. 2014;92(2):351-394. doi:10.1111/1468-0009.12061
- Medicare Payment Advisory Commission. *Report to the Congress: Medicare and the Health Care Delivery System*. Medicare Payment Advisory Commission; 2012. Accessed June 8, 2021. [http://www.medpac.gov/docs/default-source/reports/jun12\\_entirereport.pdf](http://www.medpac.gov/docs/default-source/reports/jun12_entirereport.pdf)
- Meyers DJ, Belanger E, Joyce N, McHugh J, Rahman M, Mor V. Analysis of drivers of disenrollment and plan switching among Medicare Advantage beneficiaries. *JAMA Intern Med*. 2019;179(4):524-532. doi:10.1001/jamainternmed.2018.7639
- Goldberg EM, Trivedi AN, Mor V, Jung H, Rahman M. Favorable risk selection in Medicare Advantage: trends in mortality and plan exits among nursing home beneficiaries. *Med Care Res Rev*. 2005;74(6):736-749. doi:10.1177/1077558716662565

10. Park S, Basu A, Coe NB, Khalil F. Service-level selection: strategic risk selection in Medicare Advantage in response to risk adjustment. National Bureau of Economic Research working paper No. 24038. November 2017. Accessed June 8, 2021. <https://www.nber.org/papers/w24038>
11. Newhouse JP, Price M, McWilliams JM, Hsu J, Souza J, Landon BE. Adjusted mortality rates are lower for Medicare Advantage than traditional Medicare, but the rates converge over time. *Health Aff (Millwood)*. 2019;38(4):554-560. doi:10.1377/hlthaff.2018.05390
12. Avalere Health. Medicare Advantage achieves cost-effective care and better outcomes for beneficiaries with chronic conditions relative to fee-for-service Medicare. Avalere Health. July 2018. Accessed June 8, 2021. [https://img04.en25.com/Web/AvalereHealth/%7B914072d2-41c3-4645-84e0-2ac8f761be2e%7D\\_BMA\\_Report.pdf](https://img04.en25.com/Web/AvalereHealth/%7B914072d2-41c3-4645-84e0-2ac8f761be2e%7D_BMA_Report.pdf)
13. Henke RM, Karaca Z, Gibson TB, et al. Medicare Advantage and traditional Medicare hospitalization intensity and readmissions. *Med Care Res Rev*. 2018;75(4):434-453. doi:10.1177/1077558717692103
14. Kumar A, Rahman M, Trivedi AN, Resnik L, Gozalo P, Mor V. Comparing post-acute rehabilitation use, length of stay, and outcomes experienced by Medicare fee-for-service and Medicare Advantage beneficiaries with hip fracture in the United States: a secondary analysis of administrative data. *PLoS Med*. 2018;15(6):e1002592. doi:10.1371/journal.pmed.1002592
15. Landon BE, Zaslavsky AM, Saunders RC, Pawlson LG, Newhouse JP, Ayanian JZ. Analysis of Medicare Advantage HMOs compared with traditional Medicare shows lower use of many services during 2003-09. *Health Aff (Millwood)*. 2012;31(12):2609-2617. doi:10.1377/hlthaff.2012.0179
16. Landon BE, Zaslavsky AM, Saunders RC, Pawlson LG, Newhouse JP, Ayanian JZ. A comparison of relative resource use and quality in Medicare Advantage health plans versus traditional Medicare. *Am J Manag Care*. 2015;21(8):559-566.
17. Park S, White L, Fishman P, Larson EB, Coe NB. Health care utilization, care satisfaction, and health status for Medicare Advantage and traditional Medicare beneficiaries with and without Alzheimer disease and related dementias. *JAMA Network Open*. 2020;3(3):e201809. doi:10.1001/jamanetworkopen.2020.1809
18. Timbie JW, Bogart A, Damberg CL, et al. Medicare Advantage and fee-for-service performance on clinical quality and patient experience measures: comparisons from three large states. *Health Serv Res*. 2017;52(6):2038-2060. doi:10.1111/1475-6773.12787
19. Figueroa JF, Blumenthal DM, Feyman Y, et al. Differences in management of coronary artery disease in patients with Medicare Advantage vs traditional fee-for-service Medicare among cardiology practices. *JAMA Cardiol*. 2019;4(3):265-271. doi:10.1001/jamacardio.2019.0007
20. Elliott MN, Landon BE, Zaslavsky AM, et al. Medicare prescription drug plan enrollees report less positive experiences than their Medicare Advantage counterparts. *Health Aff (Millwood)*. 2016;35(3):456-463. doi:10.1377/hlthaff.2015.0816
21. Bickel G, Nord M, Price C, Hamilton W, Cook J. Guide to measuring household food security. United States Department of Agriculture. 2000. Accessed June 8, 2021. <https://fns-prod.azureedge.net/sites/default/files/FSGuide.pdf>
22. Madden JM, Shetty PS, Zhang F, et al. Risk factors associated with food insecurity in the Medicare population. *JAMA Intern Med*. 2020;180(1):144-147. doi:10.1001/jamainternmed.2019.3900
23. 2017 national population projections tables: main series. US Census Bureau. 2017. June 8, 2021. <https://www.census.gov/data/tables/2017/demo/popproj/2017-summary-tables.html>
24. Berkowitz SA, Seligman HK, Choudhry NK. Treat or eat: food insecurity, cost-related medication underuse, and unmet needs. *Am J Med*. 2014;127(4):303-310.E3. doi:10.1016/j.amjmed.2014.01.002
25. Meyers DJ, Gadbois EA, Brazier J, Tucher E, Thomas KS. Medicare plans' adoption of special supplemental benefits for the chronically ill for enrollees with social needs. *JAMA Netw Open*. 2020;3(5):e204690. doi:10.1001/jamanetworkopen.2020.4690
26. Berkowitz SA, Seligman HK, Meigs JB, Basu S. Food insecurity, healthcare utilization, and high cost: a longitudinal cohort study. *Am J Manag Care*. 2018;24(9):399-404.
27. Berkowitz SA, Basu S, Meigs JB, Seligman HK. Food insecurity and health care expenditures in the United States, 2011-2013. *Health Serv Res*. 2018;53(3):1600-1620. doi:10.1111/1475-6773.12730
28. Gundersen C, Ziliak JP. Food insecurity and health outcomes. *Health Aff (Millwood)*. 2015;34(11):1830-1839. doi:10.1377/hlthaff.2015.0645
29. Bishop NJ, Wang K. Food insecurity, comorbidity, and mobility limitations among older U.S. adults: findings from the Health and Retirement Study and Health Care and Nutrition Study. *Prev Med*. 2018;114:180-187. doi:10.1016/j.ypmed.2018.07.001
30. Joynt KE, De Lew N, Sheingold SH, Conway PH, Goodrich K, Epstein AM. Should Medicare value-based purchasing take social risk into account? *N Engl J Med*. 2017;376(6):510-513. doi:10.1056/NEJMp1616278
31. Park S, Fishman P, White L, Larson EB, Coe NB. Disease-specific plan switching between traditional Medicare and Medicare Advantage. *Perm J*. 2020;24:19.059. doi:10.7812/TPP/19.059
32. Park S, Larson EB, Fishman P, White L, Coe NB. Differences in health care utilization, process of diabetes care, care satisfaction, and health status in patients with diabetes in Medicare Advantage vs traditional Medicare. *Med Care*. 2020;58(11):1004-1012. doi:10.1097/MLR.0000000000001390
33. Staiger D, Stock JH. Instrumental variables regression with weak instruments. *Econometrica*. 1997;65(3):557-586. doi:10.2307/2171753
34. Venci BJ, Lee SY. Functional limitation and chronic diseases are associated with food insecurity among U.S. adults. *Ann Epidemiol*. 2018;28(3):182-188. doi:10.1016/j.annepidem.2018.01.005
35. Seligman HK, Schillinger D. Hunger and socioeconomic disparities in chronic disease. *N Engl J Med*. 2010;363(1):6-9. doi:10.1056/NEJMp1000072
36. Duggan M, Gruber AJ, Vabson AB. The consequences of health care privatization: evidence from Medicare Advantage exits. *Am Econ J Econ Policy*. 2018;10(1):153-186. doi:10.1257/pol.20160068
37. Feyman Y, Figueroa JF, Polsky DE, Adelberg M, Frakt A. Primary care physician networks in Medicare Advantage. *Health Aff (Millwood)*. 2019;38(4):537-544. doi:10.1377/hlthaff.2018.05501
38. Park S, Figueroa JF, Fishman P, Coe NB. Primary care utilization and expenditures in traditional Medicare and Medicare Advantage, 2007-2016. *J Gen Intern Med*. 2020;35(8):2480-2481. doi:10.1007/s11606-020-05826-x
39. Meyers DJ, Durfee SNM, Gadbois EA, Thomas KS. Early adoption of new supplemental benefits by Medicare Advantage plans. *JAMA*. 2019;321(22):2238-2240. doi:10.1001/jama.2019.4709
40. Shier G, Ginsburg M, Howell J, Volland P, Golden R. Strong social support services, such as transportation and help for caregivers, can lead to lower health care use and costs. *Health Aff (Millwood)*. 2013;32(3):544-551. doi:10.1377/hlthaff.2012.0170
41. Johnston KJ, Bynum JPW, Joynt Maddox KE. The need to incorporate additional patient information into risk adjustment for Medicare beneficiaries. *JAMA*. 2020;323(10):925-926. doi:10.1001/jama.2019.22370

Visit [ajmc.com/link/88707](https://ajmc.com/link/88707) to download PDF and eAppendix



**eAppendix Table 1.** Unadjusted outcomes of traditional Medicare and Medicare Advantage enrollees with and without food insecurity.

Outcomes	With food insecurity			Without food insecurity		
	TM enrollees	MA enrollees	P value	TM enrollees	MA enrollees	P value
<b>Prevalence</b>						
Food insecurity <sup>†</sup> (n=9674)	10.3 (30.45)	12.4 (32.92)	<.0001			
Food insecurity with hunger <sup>‡</sup> (n=9674)	4.0 (19.53)	4.5 (20.77)	0.003			
<b>Health care utilization</b>						
Inpatient hospital admission (n = 9674)	0.3 (0.9)	0.2 (0.6)	0.067	0.2 (0.6)	0.1 (0.4)	<.0001
Outpatient hospital visit (n = 9674)	7.5 (9.4)	3.0 (4.6)	<.0001	5.5 (8.5)	3.1 (5.8)	<.0001
Medical provider visit <sup>§</sup> (n = 9674)	39.5 (38.7)	16.7 (20.3)	<.0001	31.2 (31.3)	15.8 (20.0)	<.0001
Prescription drug purchase <sup>¶</sup> (n = 7708)	67.8 (75.6)	67.2 (67.1)	0.739	37.4 (43.3)	38.8 (55.2)	0.178
<b>Financial burden</b>						
OOP spending (n = 9674)	1679 (2414)	1224 (2372)	0.006	2531 (4049)	1846 (2901)	<.0001
Share of OOP in income (n = 9674)	10.9 (27.5)	8.0 (16.4)	0.029	8.4 (19.5)	6.3 (14.5)	<.0001
<b>Care satisfaction<sup>¶</sup></b>						
Trouble in having needed care (n = 9665)	17.0 (37.6)	16.7 (37.3)	0.410	3.8 (19.0)	4.4 (20.5)	0.333
Availability of care by specialists when needs it (n = 8759)	3.2 (0.6)	3.1 (0.7)	0.351	3.3 (0.6)	3.4 (0.6)	0.017
Ease of getting to a doctor from where person live (n = 9433)	3.1 (0.7)	3.1 (0.7)	0.482	3.4 (0.6)	3.5 (0.6)	0.001
OOP costs paid for medical care (n = 9292)	2.9 (0.8)	2.8 (0.9)	0.544	3.2 (0.7)	3.2 (0.7)	0.004
Overall quality of medical care received (n = 9303)	3.3 (0.7)	3.3 (0.7)	0.827	3.6 (0.5)	3.6 (0.6)	0.781
<b>Health status<sup>  </sup></b>						
General health status compared to same-age people (n = 9637)	2.6 (1.1)	2.7 (1.1)	0.225	3.4 (1.1)	3.5 (1.1)	0.006
Overall health status compared to a year ago (n = 9658)	0.7 (0.5)	0.7 (0.5)	0.212	0.8 (0.4)	0.8 (0.4)	0.026

Abbreviations: TM, traditional Medicare; MA Medicare Advantage, SD; standard deviation.

<sup>†</sup>We identified food insecurity through the six-item version of the US Department of Agriculture’s food security questionnaire. Specifically, respondents were asked if their food had ever run out, if they had no money to get more, or if they were unable to eat balanced meals, cut meal size or skipped meals, ate less than they ought, or were hungry because of insufficient money. We defined those with two or more affirmative responses out of six as being food insecure.

<sup>‡</sup>We defined those with five or more affirmative responses as having very low food security.

<sup>§</sup>The unit of measurement is a separate visit, procedure, service, or a supplied item.

<sup>¶</sup>The unit of measurement is a single purchase of a single drug in a single container.

<sup>||</sup>A higher value indicates better care satisfaction or health status.

**eAppendix Table 2.** Unadjusted outcomes of traditional Medicare and Medicare Advantage enrollees with food insecurity and traditional Medicare and Medicare Advantage enrollees with food insecurity with hunger.

Outcomes	With food insecurity <sup>†</sup>			With food insecurity with hunger <sup>‡</sup>		
	TM enrollees	MA enrollees	P value	TM enrollees	MA enrollees	P value
Health care utilization						
Inpatient hospital admission	0.3 (0.7)	0.2 (0.7)	0.067	0.4 (0.8)	0.2 (0.6)	0.319
Outpatient hospital visit	7.7 (9.8)	3.1 (4.7)	<.0001	9.0 (11.4)	3.1 (4.4)	<.0001
Medical provider visit <sup>§</sup>	38.8 (35.4)	17.2 (20.9)	<.0001	43.8 (41.6)	17.9 (21.2)	<.0001
Prescription drug purchase <sup>¶</sup>	69.4 (77.4)	67.9 (68.7)	0.739	83.8 (90.8)	71.9 (70.9)	0.141
Financial burden						
OOP spending	1616 (2404)	1211 (2416)	0.006	1653 (2809)	1296 (2663)	<.0001
Share of OOP in income	10.4 (26.8)	7.5 (14.8)	0.029	11.2 (19.4)	9.0 (17.4)	<.0001
Care satisfaction <sup>¶</sup>						
Trouble in having needed care	17.3 (37.8)	15.4 (36.1)	0.410	20.8 (40.6)	19.9 (40.0)	0.826
Availability of care by specialists when needs it	3.2 (0.6)	3.1 (0.6)	0.351	3.1 (0.6)	3.0 (0.7)	0.415
Ease of getting to a doctor from where person live	3.2 (0.7)	3.1 (0.7)	0.482	3.1 (0.7)	3.1 (0.6)	0.939
OOP costs paid for medical care	2.9 (0.8)	2.8 (0.9)	0.544	2.9 (0.9)	2.7 (0.9)	0.006
Overall quality of medical care received	3.3 (0.7)	3.3 (0.7)	0.827	3.2 (0.8)	3.2 (0.6)	0.924
Health status <sup> </sup>						
General health status compared to same-age people	2.6 (1.1)	2.7 (1.1)	0.225	2.4 (1.1)	2.6 (1.0)	0.114
Overall health status compared to a year ago	0.7 (0.5)	0.7 (0.5)	0.212	0.6 (0.5)	0.6 (0.5)	0.654

Abbreviations: TM, traditional Medicare; MA Medicare Advantage, SD; standard deviation.

<sup>†</sup>We identified food insecurity through the six-item version of the US Department of Agriculture’s food security questionnaire. Specifically, respondents were asked if their food had ever run out, if they had no money to get more, or if they were unable to eat balanced meals, cut meal size or skipped meals, ate less than they ought, or were hungry because of insufficient money. We defined those with two or more affirmative responses out of six as being food insecure.

<sup>‡</sup>We defined those with five or more affirmative responses as having very low food security.

<sup>§</sup>The unit of measurement is a separate visit, procedure, service, or a supplied item.

<sup>¶</sup>The unit of measurement is a single purchase of a single drug in a single container.

<sup>|</sup>A higher value indicates better care satisfaction or health status.

**eAppendix Table 3.** Results from first-stage regression of county-level Medicare Advantage penetration on Medicare Advantage enrollment.

Outcomes	County-level MA penetration, coefficient (95% CI)	Observation	R-squared	F-statistics
Prevalence				
All prevalence outcomes	0.010 (0.009 to 0.011)	9674	0.134	23.52
Health care utilization				
All utilization outcomes except for prescription drug purchase	0.009 (0.008 to 0.010)	9674	0.224	158.04
Prescription drug purchase	0.009 (0.008 to 0.010)	7708	0.246	127.27
Financial burden				
All financial burden outcomes	0.009 (0.008 to 0.010)	9674	0.224	158.04
Care satisfaction				
Trouble in having needed care	0.009 (0.008 to 0.010)	9665	0.224	157.54
Availability of care by specialists when needs it	0.009 (0.008 to 0.010)	8759	0.229	136.38
Ease of getting to a doctor from where person live	0.009 (0.008 to 0.010)	9433	0.225	154.62
OOP costs paid for medical care	0.009 (0.008 to 0.010)	9292	0.220	150.42
Overall quality of medical care received	0.009 (0.008 to 0.010)	9303	0.227	147.04
Health status				
General health status compared to same-age people	0.009 (0.008 to 0.010)	9637	0.224	158.27
Overall health status compared to a year ago	0.009 (0.008 to 0.010)	9658	0.224	158.19

**eAppendix Table 4.** Results from linear regression (non-IV analysis) on adjusted differences in health care utilization and financial burden between traditional Medicare and Medicare Advantage enrollees with and without food insecurity.

Outcomes	Adjusted estimate, Mean (95% CI) <sup>†</sup>					
	With food insecurity			Without food insecurity		
	TM enrollees	MA enrollees	Adjusted differences	TM enrollees	MA enrollees	Adjusted differences
<b>Health care utilization</b>						
Inpatient hospital admission (n = 9674)	0.4 (0.3 to 0.5)	0.2 (0.1 to 0.2)	-0.2 (-0.3 to -0.1)	0.2 (0.2 to 0.2)	0.1 (0.1 to 0.2)	0 (-0.1 to 0)
Outpatient hospital visit (n = 9674)	7.6 (6.6 to 8.7)	3.3 (2.9 to 3.7)	-4.3 (-5.5 to -3.2)	5.3 (5 to 5.6)	3.2 (3 to 3.4)	-2.1 (-2.5 to -1.7)
Medical provider visit <sup>‡</sup> (n = 9674)	39 (35.5 to 42.5)	17.3 (15.1 to 19.4)	-21.8 (-25.8 to -17.7)	31.1 (30 to 32.2)	16 (15.2 to 16.8)	-15.1 (-16.4 to -13.7)
Prescription drug purchase <sup>§</sup> (n = 7708)	82.2 (73.8 to 90.6)	73 (66.2 to 79.9)	-9.1 (-19.8 to 1.5)	44.7 (42.8 to 46.6)	41 (38.9 to 43)	-3.7 (-6.4 to -1)
<b>Financial burden</b>						
OOP spending (n = 9674)	1619 (1392 to 1845)	1200 (1021 to 1380)	-418 (-701 to -136)	2497 (2370 to 2625)	1886 (1779 to 1994)	-611 (-774 to -448)
Share of OOP in income (n = 9674)	10.9 (8.9 to 12.9)	8 (6.6 to 9.3)	-2.9 (-5.3 to -0.5)	8.3 (7.8 to 8.9)	6.3 (5.9 to 6.7)	-2 (-2.6 to -1.4)

Abbreviations: TM, traditional Medicare; MA, Medicare Advantage; SD; standard deviation, OOP, out-of-pocket.

<sup>†</sup>We used the county-level MA penetration rate as an instrument for individual-level MA enrollment to control for unmeasured confounding due to selection bias. Using the predictive marginal effects at representative values estimated from a two-stage least squares regression model, we used the method of recycled predictions to estimate the predicted mean values of the outcomes for each group in MA and TM. We then conducted post-estimation tests to estimate the differences in the adjusted outcomes between MA and TM beneficiaries. To control for differences in characteristics between MA and TM beneficiaries, we also included the following control variables: age; gender; race/ethnicity; education; income; Medicare/Medicaid dual eligibility; marital status; status of living with someone; residence in metro area; census region of residence; comorbidities; body mass index; and activities of daily living limitations.

<sup>‡</sup>The unit of measurement is a separate visit, procedure, service, or a supplied item.

<sup>§</sup>The unit of measurement is a single purchase of a single drug in a single container.

**Appendix Table 5.** Results from linear regression (non-IV analysis) on adjusted differences in care satisfaction and health status between traditional Medicare and Medicare Advantage enrollees with and without food insecurity.

Outcomes	Adjusted estimate, Mean (95% CI) †					
	With food insecurity			Without food insecurity		
	TM enrollees	MA enrollees	Adjusted differences	TM enrollees	MA enrollees	Adjusted differences
<b>Care satisfaction‡</b>						
Trouble in having needed care (n = 9665)	16.8 (12.9 to 20.7)	15.9 (11.8 to 20)	-0.9 (-6.5 to 4.8)	3.5 (2.7 to 4.3)	4.7 (3.9 to 5.6)	1.2 (0 to 2.4)
Availability of care by specialists when needs it (n = 8759)	3.2 (3.1 to 3.2)	3.1 (3 to 3.2)	0 (-0.1 to 0.1)	3.3 (3.3 to 3.4)	3.4 (3.3 to 3.4)	0 (0 to 0.1)
Ease of getting to a doctor from where person live (n = 9433)	3.2 (3.1 to 3.2)	3.1 (3 to 3.2)	0 (-0.1 to 0.1)	3.4 (3.4 to 3.5)	3.5 (3.4 to 3.5)	0 (0 to 0.1)
OOP costs paid for medical care (n = 9292)	2.9 (2.8 to 3)	2.8 (2.7 to 2.9)	-0.1 (-0.2 to 0.1)	3.2 (3.2 to 3.3)	3.2 (3.1 to 3.2)	-0.1 (-0.1 to 0)
Overall quality of medical care received (n = 9303)	3.3 (3.2 to 3.4)	3.3 (3.2 to 3.4)	0 (-0.1 to 0.1)	3.6 (3.5 to 3.6)	3.6 (3.5 to 3.6)	0 (0 to 0)
<b>Health status‡</b>						
General health status compared to same-age people (n = 9637)	2.6 (2.5 to 2.7)	2.7 (2.6 to 2.8)	0.1 (-0.1 to 0.2)	3.5 (3.4 to 3.5)	3.5 (3.5 to 3.5)	0 (0 to 0.1)
Overall health status compared to a year ago (n = 9658)	0.7 (0.6 to 0.7)	0.7 (0.6 to 0.8)	0 (0 to 0.1)	0.8 (0.8 to 0.8)	0.8 (0.8 to 0.9)	0 (0 to 0)

Abbreviations: TM, traditional Medicare; MA, Medicare Advantage; SD; standard deviation, OOP, out-of-pocket.

†We used the county-level MA penetration rate as an instrument for individual-level MA enrollment to control for unmeasured confounding due to selection bias. Using the predictive marginal effects at representative values estimated from a two-stage least squares regression model, we used the method of recycled predictions to estimate the predicted mean values of the outcomes for each group in MA and TM. We then conducted post-estimation tests to estimate the differences in the adjusted outcomes between MA and TM beneficiaries. To control for differences in characteristics between MA and TM beneficiaries, we also included the following control variables: age; gender; race/ethnicity; education; income; Medicare/Medicaid dual eligibility; marital status; status of living with someone; residence in metro area; census region of residence; comorbidities; body mass index; and activities of daily living limitations.

‡A higher value indicates better care satisfaction or health status.