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Brief Report

Use of high- and low-value care among US adults by education levels

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Background: Healthcare reform in the United States has focused on improving the value of health care, but there are some concerns about the inequitable delivery of value-based care.

Objective: We examine whether the receipt of high- and low-value care differs by education levels.

Methods: We employed a repeated cross-sectional study design using data from the 2010–2019 Medical Expenditure Panel Survey. Our outcomes included 8 high-value services across 3 categories and 9 low-value services across 3 categories. Our primary independent variable was education level: (i) no degree, (ii) high school diploma, and (iii) college graduate. We conducted a linear probability model while adjusting for individual-level characteristics and estimated the adjusted values of the outcomes for each education group.

Results: In almost all services, the use of high-value care was greater among more educated adults than less educated adults. Compared to those with no degree, those with a college degree were significantly more likely to receive all high-value services except for HbA1c measurement, ranging from blood pressure measurement (4.5 percentage points [95% CI: 3.9–5.1]) to colorectal cancer screening (15.6 percentage points [95% CI: 13.9–17.3]). However, there were no consistent patterns of the use of low-value care by education levels.

Conclusion: Our findings suggest that more educated adults were more likely to receive high-value cancer screening, high-value diagnostic and preventive testing, and high-value diabetes care than less educated adults. These findings highlight the importance of implementing tailored policies to address education-based inequities in the delivery of high-value services in the United States.

Key words: disparity, education, high-value care, low-value care, United States, value-based care

The US healthcare system has focused on improving the value of care by increasing the use of high-value care (e.g. preventive screenings) and decreasing the use of low-value care (e.g. medications).[1] For example, from 2017 to 2021, the US Center for Medicare and Medicaid Services implemented an advanced medical home model called Comprehensive Primary Care Plus in over 2,600 primary care practices.[2] Such initiatives aimed to increase the use of high-value care services and decrease the use of low-value care services.

Despite national efforts, the delivery of value-based care remains suboptimal.[3–5] Only 8% of US adults aged 35 and older received all of the recommended and appropriate preventive services in 2015.[3] Meanwhile, one-third of older adults received at least one low-value service between 2014 and 2018.[4] These trends of suboptimal care may be even more pronounced among socially marginalized populations, raising concerns about inequitable delivery of value-based care.[6]

Education is a measure often used to examine health disparities among socially marginalized populations.[7] It is possible that less educated adults are less likely to receive high-value services and more likely to receive low-value services due to systematically structured barriers including financial and educational barriers.[8] Prior research shows that high-income adults were more likely to receive preventive services than low-income adults,[8,9] but little is known whether the use of high- and low-value care differs by education levels. To fill the gap in the literature, we examined differences in the use of high- and low-value care among US adults by education levels.

Methods

We used data from the 2010–2019 Medical Expenditure Panel Survey (MEPS), which is a nationally representative survey of the US non-institutionalized population. The data collects information on demographic and socioeconomic status and healthcare use. Specifically, we used 5 datasets from MEPS: the full-year consolidated data files, outpatient visits files, office-based medical provider visit files, prescribed medicine files, and medical conditions files. We included adults aged 18 years or older. MEPS is reviewed and approved annually by the Westat Institutional Review Board (IRB). As our study used fully deidentified publicly available data, no further IRB approval is required.

We identified and measured the use of high- and low-value care based on research using the MEPS.[10–13] The value of care

was determined by clinical experts while accounting for both healthcare costs and clinical benefits. High-value care was defined as care that provides substantial benefits at a reasonable cost, while low-value care was defined as care that provides little or no benefit or even potential harm at a high cost. First, we included 2 high-value cancer screenings (breast and colorectal cancer screening), 3 high-value diagnostic and preventive tests (blood pressure measurement, cholesterol measurement, and influenza vaccine), and 3 high-value diabetes care measures (HbA1c, foot examinations, and eye examinations). Also, we included 2 low-value antibiotic use measures (antibiotic for acute upper respiratory infection[14,15] and antibiotic for influenza[14]), 4 low-value medications measures (benzodiazepine for depression,[16] opioid for back pain,[17] opioid for headache,[18] and nonsteroidal anti-inflammatory drug for individuals with hypertension, heart failure, or chronic kidney disease[16]), and 3 low-value imaging tests (magnetic resonance imaging [MRI]/computed tomography [CT] for back pain, radiograph for back pain, and MRI/CT for headache).[19] For each measure, we identified those who were eligible for the measure (the denominator) using age, sex, and health conditions based on *the International Classification of Diseases, Ninth Revision, Clinical Modification* (ICD-9-CM) or *the International Classification of Diseases, Tenth Revision, Clinical Modification* (ICD-10-CM). We then determined whether eligible individuals received specific services (the numerator). Thus, the sample size varied by outcome measure. The sources of data varied for measuring the use of high- and low-value care. High-value care was measured using self-reported data, while low-value care was measured using claims data, including outpatient visits files, office-based medical provider visit files, and prescribed medicine files.

Our primary independent variable was education level: (i) no degree, (ii) high school diploma, and (iii) college graduate. The first group includes individuals who have not obtained a high school diploma or equivalent. The second group comprises individuals who have completed their high school education and earned a General Educational Development certificate or a high school diploma. The last group encompasses individuals who have completed any level of college education, including associate degrees, bachelor's degrees, master's degrees, doctorate degrees, and professional degrees.

After adjusting for individual-level characteristics (age, sex, race/ethnicity, employment status, marital status, income, health insurance, census region of residence) and year-fixed effects, we conducted a linear probability model and estimated the adjusted values of the outcomes for each education group. Moreover, we estimated the adjusted differences in the outcomes among those with high school diplomas and college degrees relative to those with no degree. We clustered standard errors within individuals as some individuals were included in the data over the course of multiple years. We used survey weights to yield nationally representative estimates. Analyses were implemented using Stata software (version 16.1).

Results

Our study population consisted of 213,424 adults, including 39,116, 93,366, and 80,942 adults with no degree, high school diploma, and college graduate, respectively. The weighted totals for these groups were 256,336,137, 915,742,817, and 968,980,228, respectively. Unadjusted outcomes and sample sizes for each service are presented in the appendix.

Our adjusted analysis showed that in almost all services, the use of high-value care was greater among more educated adults than less educated adults (Fig. 1). Compared to those with no degree, those with college graduate were significantly more likely to receive all high-value services except for HbA1c measurement, including colorectal cancer screening (15.6 percentage points [95% CI: 13.9–17.3]), eye examination for diabetes (14.1 percentage points [95% CI: 11.5–16.7]), breast cancer screening (9.5 percentage points [95% CI: 7.1–11.8]), influenza vaccine (7.9 percentage points [95% CI: 6.4–9.5]), foot examination for diabetes (6.3 percentage points [95% CI: 3.7–8.9]), cholesterol measurement (4.6 percentage points [95% CI: 3.6–5.6]), blood pressure measurement (4.5 percentage points [95% CI: 3.9–5.1]) (Table 1).

There were no consistent patterns of the use of low-value care by education levels (Fig. 1). Compared to those with no degree, those with college graduate were significantly less likely to receive an opioid for back pain (–5.4 percentage points [95% CI: –8.1 to –2.7]) and more likely to receive MRI/CT for back pain (2.6 [95% CI: 0.9–4.4]) (Table 1). However, there were no significant differences in the use of other low-value services by education levels.

Discussion

We demonstrated that more educated adults were more likely to receive high-value care than less educated adults, suggesting the inequitable use of high-value care by education levels. There may be multiple mechanisms for this finding.[8] More educated adults may have more knowledge about the benefits of its value or have different attitudes towards high-value services than less educated adults. Also, more educated adults may see physicians who are more likely to provide value-based care than less educated adults. These findings suggest the need for policies that promote the equitable use of value-based care, especially for high-value care to adults with low education. Due to limited data availability, we could not examine the underlying mechanism driving the identified inequities; further research is warranted.

Our study also found that there were no or small differences in the use of low-value care by education levels. However, it is notable that the use of low-value care is commonly prevalent regardless of education levels. This underscores the urgent need to develop targeted policy interventions aimed at effectively reducing the use of low-value care within the entire population. Prior research found that multicomponent interventions that address both patient and provider roles have the greatest potential to decrease the use of low-value care.[20] By implementing comprehensive strategies that target factors influencing patient decision-making and provider practices, it is possible to maximize the impact of interventions and bring about substantial reductions in the use of low-value care.

This study has several limitations. First, we examined a limited set of high- and low-value services, and thus our findings may not be applicable to other outcome measures. Second, our measures of high-value services were self-reported and thus may be subject to reporting errors. Third, we could not measure all potentially relevant exclusions when identifying the receipt of low-value services. As MEPS reports health conditions based on 3-digit ICD-CM codes, we could

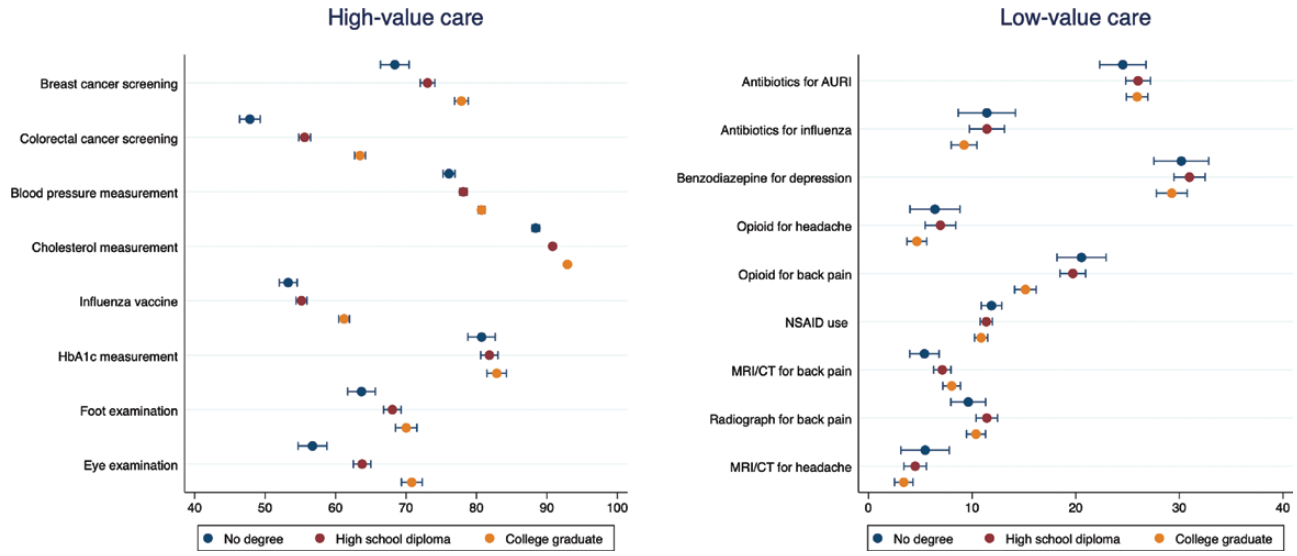

Fig. 1. Adjusted rates of the use of high- and low-value care among adults by education levels, 2010-2019 MEPS. The figure shows the adjusted rates of the use of high- and low-value services by education levels, after controlling for age, sex, race/ethnicity, employment status, marital status, family income, census region, and year. Survey weights were applied to yield nationally representative estimates. Error bars indicate 95% confidence intervals. Abbreviations: MEPS, Medical Expenditure Panel Survey; FPL; federal poverty level; NSAID, nonsteroidal anti-inflammatory drug; MRI, magnetic resonance imaging; CT, computed tomography.

Table 1. Adjusted differences in the use of high- and low-value care among adults by education levels, 2010–2019 MEPS.

	Adjusted estimates	Adjusted differences (relative to those with no degree)	
Outcome	No degree	High-school diploma	College graduate
High-value care			
Cancer screening			
Breast cancer screening	68.4 (66.4 to 70.4)	4.7 (2.4 to 6.9)	9.5 (7.1 to 11.8)
Colorectal cancer screening	47.8 (46.4 to 49.3)	7.8 (6.2 to 9.4)	15.6 (13.9 to 17.3)
Diagnostic and preventive testing			
Blood pressure measurement	88.4 (87.9 to 89)	2.4 (1.8 to 3)	4.5 (3.9 to 5.1)
Cholesterol measurement	76.1 (75.3 to 76.9)	2 (1.1 to 3)	4.6 (3.6 to 5.6)
Influenza vaccine	53.3 (52 to 54.5)	1.9 (0.5 to 3.3)	7.9 (6.4 to 9.5)
Diabetes care			
HbA1c measurement	80.7 (78.8 to 82.7)	1.1 (–1.1 to 3.3)	2.2 (–0.3 to 4.6)
Foot examination	63.7 (61.7 to 65.6)	4.4 (2.1 to 6.7)	6.3 (3.7 to 8.9)
Eye examination	56.7 (54.7 to 58.8)	7.1 (4.7 to 9.4)	14.1 (11.5 to 16.7)
Low-value care			
Antibiotic use			
Antibiotics for acute upper respiratory infection	27.9 (25.4 to 30.4)	1.7 (–1.1 to 4.4)	1.6 (–1.3 to 4.4)
Antibiotics for influenza	11.4 (8.7 to 14.2)	0 (–3 to 3)	–2.2 (–5.3 to 0.9)
Medications			
Benzodiazepine for depression	30.2 (27.5 to 32.8)	0.8 (–2.1 to 3.7)	–0.9 (–4.1 to 2.2)
Opioid for back pain	20.6 (18.2 to 22.9)	–0.8 (–3.4 to 1.8)	-5.4 (–8.1 to -2.7)
Opioid for headache	6.4 (4 to 8.8)	0.5 (–2.1 to 3.2)	–1.7 (–4.5 to 1)
NSAID use for hypertension, heart failure, or kidney disease	11.9 (10.9 to 12.9)	–0.5 (–1.6 to 0.6)	–1 (–2.2 to 0.2)
Imaging			
MRI/CT for back pain	5.4 (4 to 6.8)	1.7 (0.1 to 3.3)	2.6 (0.9 to 4.4)
Radiograph for back pain	9.6 (8 to 11.3)	1.8 (–0.1 to 3.7)	0.7 (–1.2 to 2.7)
MRI/CT for headache	5.5 (3.1 to 7.8)	–1 (–3.4 to 1.5)	–2.1 (–4.6 to 0.5)

Abbreviations: MEPS, Medical Expenditure Panel Survey; FPL; federal poverty level; NSAID, nonsteroidal anti-inflammatory drug; MRI, magnetic resonance imaging; CT, computed tomography.

not completely identify individuals with competing diagnoses. Fourth, we detected statistically insignificant differences in the receipt of some low-value services with relatively large confidence intervals, but this might be partly driven by a small sample size. Finally, we used US data, and thus our results may not be generalizable to other countries. Therefore, it is important to conduct further research in other countries to confirm the findings of our study.

In this nationally representative study, we found that more educated adults were more likely to receive high-value cancer screening, high-value diagnostic and preventive testing, and high-value diabetes care than less educated adults. However, there were no consistent differences in the use of low-value care by education levels. These findings highlight the importance of implementing tailored policies to address education-based inequities in the delivery of high-value services in the United States.

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Conflict of interest

The authors have no conflict of interest.

Data availability

Data will be made available on request.

Ethical approvial

MEPS is reviewed and approved annually by the Westat Institutional Review Board (IRB). As our study used fully deidentified publicly available data, no further IRB approval is required.

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