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Research Article

The Effect of Medicaid Eligibility on Utilization of Services and Access to Care among Health Center Patients: A Regression Discontinuity Design

Hailun Liang,[1] **Lei Tao**,[2] **and Leiyu Shi**[3]

[1]*Renmin University of China, Beijing, China*
[2]*Education University of Hong Kong, Hong Kong, China*
[3]*Johns Hopkins Primary Care Policy Center, Baltimore, MD 21205, USA*

Correspondence should be addressed to Leiyu Shi; lshi2@jhu.edu

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The United States' Affordable Care Act (ACA) aims to improve access to and quality of care for low-income patients. To do so, it expands Medicaid eligibility from individuals under 100% of the federal poverty level (FPL) to include those under 138% of the FPL. Based on the 2014 Health Center Patient Survey (a nationally representative survey sponsored by the Health Resources and Services Administration (HRSA) ($n = 4{,}380$)), this study examined the effects of the Medicaid eligibility on having a usual source of care and the utilization of preventive services among health center patients. A regression discontinuity approach was used to identify the causative impact of Medicaid enrollment on low-income and nonelderly health center patients. Our findings suggest that Medicaid enrollment led to a substantial increase in the probability of both undergoing a routine checkup and having had a fecal occult blood test within the past year. These results indicate that changes to Medicaid policy have the potential to affect vulnerable populations. The evidence we provide supports the importance of maintaining the ACA due to its expanded Medicaid funding.

1. Introduction

The Affordable Care Act (ACA) expanded Medicaid coverage to individuals whose household income is below 138% of the federal poverty level (FPL). By one estimate, such an expansion of Medicaid could benefit more than 30 million low-income Americans [1]. The primary policy objectives of the ACA were to decrease the number of uninsured individuals and improve the affordability of health care in the US [2]. However, since the Obama Administration signed the ACA in 2010, states have repeatedly challenged the constitutionality of mandatory Medicaid expansion [3]. As a result, it was not until January 2014 that the first batch of states adopted the Medicaid coverage expansion.

The ACA Medicaid expansion expanded Medicaid coverage to nearly all adults with incomes up to 138% of the federal poverty level ($17,774 for an individual in 2021) and provided states with an enhanced federal matching rate (FMAP) for their expansion populations. To date, 40 states (including DC) have adopted the Medicaid expansion, and 11 states have not adopted the expansion [4]. The new financial incentive for expansion in the American Rescue Plan Act (ARPA) of 2021 has reignited a debate on Medicaid expansion under the ACA in the states that have not adopted the expansion.

Furthermore, the coronavirus pandemic has adversely affected health outcomes and economic well-being. While Medicaid has served as a coverage safety net during the pandemic and resulting economic crisis, coverage options for many low-income adults are limited in nonexpansion states [5]. Thus, a deeper understanding of the effect of Medicaid eligibility in the prepandemic period of Medicaid expansions will also shed light on the consequences of utilization and access to care among the

low-income population from current and potentially future situations.

Despite the widespread establishment of Medicaid programs, there is limited evidence regarding the impact of the 2014 wave of eligibility expansion on health center (HC) patients. Most of the existing studies focus on examining the performance of early Medicaid expansions. For example, studies related to Oregon's 2008 expansion [6], New York's 2001 expansion [7, 8], and Arizona's Medicaid program in 2001 [9] found that Medicaid expansion resulted in increased utilization of the healthcare system and in-person primary care visits. Crucially, newly insured patients were more likely to have a usual source of care. However, the uninsured population in one state could significantly differ from the number of uninsured in the overall population. Additionally, many studies used data from oncology patients [10], pregnant women [11], and individuals released from jail [12]. This is problematic as the effects of Medicaid likely vary across populations with different socioeconomic and health statuses. In contrast with previous healthcare reform approaches, the ACA has extended eligibility to nondisabled and nonelderly US citizens. At present, it remains unclear how Medicaid eligibility affects HC patients, who are typically from low-income backgrounds and have rates of chronic disease.

In addition to the narrow focus of the previous research on this matter, existing evidence pertaining to the overall effect of Medicaid is somewhat mixed. For instance, Hofer et al. [13] utilized the 2006 and 2007 Medical Expenditure Panel Surveys to analyze the effects of Medicaid on primary care utilization among the nonelderly population. They concluded that a change to increase the Medicaid coverage rate would significantly increase the number of primary care physician visits. Contrastingly, in a randomized controlled experiment, Allen et al. [14] found that expanded Medicaid coverage did not produce any significant improvements in physical health outcomes.

Since the ACA expansion of Medicaid in 2014, there have been numerous studies that looked at its impact. The causal effect of Medicaid enrollment on HC patients, however, remains unclear. In contrast to earlier research, which largely focused on the impacts of Medicaid for the general population or for low-income populations, the current study builds on the previous evidence focused on outcomes for specific populations (federally funded health center patients) and their preventive health needs, as well as the identifying causal effects. The causative impact of Medicaid coverage expansion was identified by using a regression discontinuity approach. Specifically, the effects of Medicaid eligibility on having a usual source of care and healthcare utilization among health center patients were examined using the latest available National Health Center Patient Survey.

2. Policy Background and Literature Review

2.1. ACA Act and Medicaid Expansion. Medicaid is a federal-state partnership program designed to provide free public health insurance to low-income American adults. Since its establishment in 1965, Medicaid has grown into a major source of spending for healthcare services in the US, covering more than 1 in 5 low-income Americans [15, 16]. Although Medicaid plays a significant role in the promotion of an inclusive healthcare system, the eligibility requirements are relatively strict. As such, the provision of health care cannot be said to be universal for low-income adults in the US.

Given that a large number of poor adults were still uninsured, the Obama Administration signed the Affordable Care Act (ACA) into law in 2010, with the express aim of providing public health insurance coverage to more low-income Americans. The passage of the ACA expanded Medicaid eligibility to uninsured adults whose household incomes were below 138% of the federal poverty level (FPL) and adults without dependent children [15]. Since Medicaid is a federal-state partnership program, the federal government's actions relating to mandatory Medicaid expansion have repeatedly been challenged by states [3].

The broad effects of Medicaid on the low-income population have been well documented in the existing literature. Studies have identified an association between Medicaid enrollment and an increase in having a usual source of care, higher quality of care, more in-person primary care visits, and service utilization among the general population [6–9]. However, as noted previously, the effects of Medicaid likely vary across populations with different socioeconomic and health statuses [10, 17, 18]. As will be elaborated in the following, individuals attending community health centers (CHCs) are typically low-income ethnic minorities who experience high rates of chronic disease. It should be noted that less is known about how Medicaid eligibility affects these CHC patients after the passage of the ACA.

2.2. Section 330 Health Center Program. The health center program was established through Section 330 of the Public Health Service Act in 1996. It was specifically designed to ensure individuals in underprivileged and rural communities in the US have access to a usual source of care. As long as they meet the comprehensive qualifying standards, public, private, and nonprofit healthcare organizations in these medically underserved areas can apply to be a federally funded health center. Health centers provide a range of comprehensive healthcare services, including behavioral health, primary care, preventive care, and chronic disease management. Another essential feature of health centers is the commitment to providing health services to underserved populations and communities regardless of their ability to pay for such services [19]. As of today, the majority of health centers are CHCs, providing services for more than 20 million patients across 8,500 sites [19]. This study focuses on CHC patients.

The characteristics of health center patients make them a suitable subpopulation to study the effects of Medicaid expansion. Compared to the general low-income population, CHC patients are poorer, have a higher rate of unemployment, and are more likely to be uninsured [20]. In

addition, the proportion of racial or ethnic minority groups attending CHCs is much higher than the proportion of the overall low-income population. A recent report found that more than a quarter of patients in CHCs preferred to be treated in a language other than English [21]. Furthermore, CHC patients are more likely to suffer from chronic diseases, such as diabetes and asthma, and report poorer health than low-income individuals generally [20, 22]. Given that the primary aim of Medicaid is to decrease the number of uninsured individuals and improve the health status of poor adults, it is reasonable to expect that CHC patients may be particularly affected by Medicaid expansion. However, research examining the impact of Medicaid eligibility on CHC patients is limited.

2.3. Medicaid Expansion for Community Health Center Patients. As previously mentioned, most CHC patients are socioeconomically disadvantaged individuals, which is the target population of Medicaid. The Medicaid expansion under the ACA had a significant impact on providing CHC patients with insurance coverage. In 2015, the year after the Medicaid expansion, around 49% of CHC patients were covered by Medicaid [23]. Meanwhile, there continue to be significant differences in the Medicaid coverage rate between the expansion and nonexpansion states: compared to CHC patients in states that refused to expand Medicaid eligibility, the Medicaid coverage rate is more than 20% higher in Medicaid expansion states (55% vs. 34%) [23].

Expanded Medicaid eligibility has been found to increase the likelihood that individuals have a usual source of care [24, 25] and utilize preventive services [26], while also reducing out-of-pocket spending [27, 28] in general populations. For CHC patients, expanded Medicaid enrollment may positively affect their ability to access care and make preventive care visits. For example, by analyzing data from the Uniform Data System, Cole et al. [29] found that the Medicaid expansion was associated with greater use of preventive services and increased access to primary care among rural CHC patients. In addition, as a large share of CHCs' revenues comes from Medicaid, the increased Medicaid coverage rate increases the financial resources that can be used to improve the quality of care CHCs are able to provide. For instance, CHCs in expansion states employ as twice as many clinicians as CHCs in nonexpansion states [30].

However, findings on healthcare utilization are more mixed, with some studies suggesting improvements have been made, while others conclude that expansion did not have an effect. Regarding having a usual source of care, the increased numbers of insured patients may cause capacity problems for local medical agencies, which makes having a usual source of care more difficult, especially for newly Medicaid-registered patients. In addition, after being insured by Medicaid, some patients may leave the CHCs to attend other private healthcare providers and, as a result, may see a doctor less frequently. Similarly, after the ACA expansion, 21.3% of low-income adults still reported difficulty accessing care [31]. With regard to utilization, increased health insurance coverage may not necessarily lead to the uptake of all types of preventive services, as some patients may be used to not undergoing screenings or may be very sensitive to the price of preventive care. Utilizing nationally representative data, Simon et al. [32] found that the 2014 Medicaid expansion had no effect on certain types of preventive services, including flu shots, HIV tests, and Pap smears. Similarly, Nassh and Vujicic [33] failed to find any differences in dental care use between patients in expansion and nonexpansion states.

3. Study Data and Methods

3.1. Data and Measures. Our study utilized data from the 2014 Health Center Patient Survey, a nationally representative survey sponsored by the Health Resources and Services Administration (HRSA). The survey features patient-level data derived from in-person, one-on-one interviews with Health Center Program patients. The Health Center Patient Survey has recently been published and is accessible to the public at https://bphc.hrsa.gov/datareporting/research/hcpsurvey/index.html. The 2014 Health Center Patient Survey is the most recent publicly available nationwide data on HC and consists of a probability sample of 7,002 patients representing over 22 million patients seen at HCs in 2014. The Patient Survey collected data from the patients of health centers funded through four Bureau of Primary Health Care (BPHC) grant programs: the Community Health Center (CHC) Program, the Migrant Health Center (MHC) Program, the Health Care for the Homeless (HCH) Program, and the Public Housing Primary Care (PHPC) Program.

The Patient Survey employed a three-stage sampling design to obtain the sample: the first-stage sampling units were HCs, the second-stage sampling units were HC sites, and the third-stage sampling units were patients who had made at least one visit to an eligible HC site in the past 12 months. The data collection was carried out between September 2014 and April 2015. Meanwhile, the interview portion of the survey was administered using computer-assisted personal interviewing (CAPI) and was conducted in one of five languages: English, Spanish, Chinese, Korean, or Vietnamese. In total, 169 HC grantees were recruited, data were collected from 521 HC sites, and 7,002 patient interviews were carried out. The final response rate among patients confirmed to be eligible was 91.4%.

Following the ACA's expansion of the scope of Medicaid, individuals whose household incomes fell between 100% and 138% of the FPL were newly eligible for Medicaid coverage. Notably, some Medicaid eligibility groups are limited by age or by pregnancy or parenting status. The current study focuses on nonelderly adults aged 18 to 65 whose family incomes fall within these thresholds; limiting the study's scope in this way is meaningful for understanding the effects of Medicaid enrollment during the expansion. Under the ACA, states have the option to expand Medicaid eligibility for nonelderly people with an income up to 138% of the FPL, while those states that chose not to expand Medicaid preferred to stick to 100% of the FPL. The Kaiser

Family Foundation's "State Health Facts–Current Status of State Medicaid Expansion" gathered information on state Medicaid expansion status and eligibility [5]. Accordingly, we used the document to code each state's Medicaid expansion status and corresponding Medicaid thresholds (100% FPL or 138% FPL). In 2014, 138% of FPL corresponded to $16,106 for a single-person family [34]. States that expanded Medicaid coverage prior to 1 September 2014 were coded as 138% FPL for their Medicaid eligibility. Notably, slightly more than half of all states implemented Medicaid expansion in 2014 (see Table 1). Following the previous research [35, 36], we restricted the sample to health center patients aged 18 to 65 whose normalized household incomes were $25,000 dollars above or below the Medicaid eligibility thresholds. In addition, the income between 100% and 200% FPL was typically regarded as a low-income population which is our target sample. The $25,000 corresponds to around 200% FPL in 2014. Thus, thresholds above 200% were not excluded. As noted previously, we restricted the sample to health center patients aged 18 to 65, and the household incomes were normalized above or below the Medicaid eligibility thresholds. Our final sample consisted of 4,380 health center patients.

Our primary outcomes were having a usual source of care and health services utilization at health centers among low-income patients. The measure of having a usual source of care was defined as a patient having a particular place where they usually go if sick or in need of advice about their health. We also included two measures regarding health services utilization: the receipt of a checkup in the past year and the receipt of a fecal occult blood test in the past year, as they are the most available services for the health center patients. General health checkups are considered an integral part of primary care practice and are offered systematically to the general population [37]. Routine checkup plays a key role for health center patients in preventing diseases and the associated economic burden [38]. We included this measure as it is a typical process measure of healthcare utilization for public reporting [39] and also a type of routine care that is sensitive to whether an individual has health coverage [40]. The rationale for choosing colorectal cancer screening is that it is a type of cancer screening for the whole population that is recommended by the US Preventive Services Task (USPSTF), as opposed to a breast or cervical cancer screening only for women or lung cancer screening which is only administered to high-risk individuals. The fecal occult blood test is also a more cost-saving and available colorectal cancer screening method compared to the colonoscopy as most community health centers may be unable to provide on-site screening colonoscopy [41]. All-access and preventive service measures were coded as dichotomous variables (yes vs. no).

Table 1: Status of state action on the Medicaid expansion decision as of September 1, 2014.

State	Cutoff
Alabama	100
Alaska	100
Arizona	138
Arkansas	138
California	138
Colorado	138
Connecticut	138
Delaware	138
Florida	100
Georgia	100
Hawaii	138
Idaho	100
Illinois	138
Indiana	100
Iowa	138
Kansas	100
Kentucky	138
Louisiana	100
Maine	100
Maryland	138
Massachusetts	138
Michigan	138
Minnesota	138
Mississippi	100
Missouri	100
Montana	100
Nebraska	100
Nevada	138
New Hampshire	138
New Jersey	138
New Mexico	138
New York	138
North Carolina	100
North Dakota	138
Ohio	138
Oklahoma	100
Oregon	138
Pennsylvania	100
Rhode Island	138
South Dakota	100
South Carolina	100
Tennessee	100
Texas	100
Utah	100
Vermont	138
Virginia	100
Washington	138
West Virginia	138
Wisconsin	100
Wyoming	100

Note. Medicaid eligibility expansion information is extracted from the Kaiser Family Foundation (2020). A total of 26 states expanded their Medicaid eligibility cutoffs from 100% to 138% as of September 1, 2014: AR, AZ, CA, CO, CT, DE, HI, IL, IA, KY, MD, MA, MI, MN, NV, NH, NJ, NM, NY, ND, OH, OR, RI, VT, WA, and WV.

3.2. Methods. To the best of our knowledge, while there have been studies of the effects of Medicaid eligibility on healthcare among HC patients, to date, there has not been a national analysis that uses quasiexperimental methods [42, 43]. We address this important gap in the literature using Health Center Patient Survey data and a regression discontinuity (RD) model. We used an RD design to evaluate the effect of Medicaid eligibility on health center patients' having a usual source of care and healthcare utilization.

RD is a quasiexperimental approach whose results compare favorably to results obtained using RCTs, the gold standard, while being more practical and cost-effective. The intuition for the RD approach relied on the premise that HC patients just around the cut point were similar to each other. Even though the cut point placed patients into different groups, it mimicked a random assignment of patients around the cut point. Therefore, RD has the advantage of identifying causal effects when the treatment condition is determined by an exogenous policy [44]. With this in mind, the present study made use of the fact that Medicaid enrollment was only accessible to individuals if their household income was below 138% of the FPL (after expansion). Similar to a randomized controlled trial, this method randomly assigned the population into one of two groups, in which one group received the intervention (Medicaid participation) while the other group did not. The only difference between these two groups was that people whose household incomes fell below 138% of the FPL received an intervention while ineligible populations did not. Thus, we used the ACA expansion thresholds as a new exogenous source of variation in insurance coverage, and the effect of Medicaid eligibility can be estimated by comparing changes in the outcomes of respondents whose household incomes fell close to the Medicaid eligibility threshold.

The primary assumption of the RD design is that treatment (Medicaid eligibility) is determined by an assignment variable (family income). This condition may not be perfectly satisfied in practice due to the fact that Medicaid enrollment is not strictly limited by income. Therefore, we empirically tested whether the income eligibility rule could generate a clear breakpoint in the Medicaid coverage rate at 138% of the FPL cutoff (see Figure 1). We found that the probability of Medicaid participation had a discontinuity of about 16 percentage points at the threshold, demonstrating that family income was a reliable assignment variable to predict the treatment condition. We further tested whether individuals could manipulate their income level to qualify for Medicaid coverage (see Figure 2). The distribution of the standardized household income near the left and right sides of the breakpoint indicated that there was no imbalance except for a slightly right-skewed distribution.

Following previous research [45], we estimated the treatment effects by using local polynomial regressions with a triangular kernel. We set the cut-off value at 138% FPL for the expansion states and 100% FPL for the nonexpansion states, corresponding to the Medicaid expansion decision. Our base model used a quadratic functional form because lower-order polynomial functions have been shown to be preferable [46]. Our regression discontinuity design specifications took the following forms:

$$\begin{aligned} y_i &= \alpha + \beta M_i + k_{2g}\left(z_i; \alpha_{2g}\right) + u_i, \\ M_i &= \pi_0 + \pi_1 Eli_i + k_{1g}\left(z_i; \alpha_{1g}\right) + v_i, \end{aligned} \tag{1}$$

where y_i is respondent i's outcome (utilization or having a usual source of care) and M_i indicates whether the respondent had Medicaid coverage. Meanwhile, α is the average value of the outcome for those in the treatment group after controlling for the eligibility variable. Since Medicaid enrollment is not mandatory, M_i is not necessarily equal to an indicator of eligibility status, Eli_i, which takes a value of one if the respondent was eligible for Medicaid; e.g., family income (z_i) is below the threshold. Comparing outcomes of eligible and noneligible individuals close to the eligibility threshold identifies the average effect of assignment into treatment or the intention to treat effect (ITT) at the threshold (β). It should be noted that the ITT effect can be significantly lower in absolute value than the effect the program had on those with Medicaid coverage. Proceeding on the assumption that the probability of having Medicaid coverage as a function of income is discontinuous at the threshold and that, in the absence of treatment, the association between the outcome variable and income is smooth, the parameter can be estimated using the eligibility indicator Eli_i, which is randomly assigned in the neighborhood of the threshold as an instrument to indicate Medicaid coverage. π_1 measures the jump in Medicaid coverage rate at the threshold. The parameters α and π_0 are the constant. Finally, k_{1g} and k_{2g} are polynomials of order g of family income, and u_i and v_i are unobserved error components.

As bandwidth significantly influences the estimation of the effects, bandwidth selection should be carried out using a data-driven method (e.g., see Calonico et al. [47]). However, some scholars have also suggested that bandwidth should consider different contexts, and as such, selection is a matter of discretion of the researcher [48]. In this research, our primary aim is to evaluate the effects of Medicaid eligibility from 100% to 138% of FPL, and on this basis, we set the "preferred" bandwidth as four thousand for each local linear regression. The rdrobust package and rdbwselect command were also used to perform data-driven bandwidth selection. In addition to the baseline model, we used different models with various bandwidths to ascertain whether the base results are robust. In the subsequent sensitivity analyses, we altered various aspects of the models, including the covariates and polynomial order. Stata/SE version 14.0 was used to perform the analyses.

4. Results

Table 2 presents the sociodemographic characteristics of the samples in terms of their Medicaid eligibility status. Differences were found between the two groups in terms of individual characteristics, health insurance status, and patient type. Specifically, individuals in the ineligible group were more likely to be older and male. Meanwhile, respondents in the eligible group had a lower education level and a higher unemployment rate than those in the ineligible group. Regarding health insurance status, ineligible people had a higher private insurance coverage rate (35.6%), which was more than twice that of the eligible group (10.2%). As mentioned earlier, Medicaid eligibility is not strictly limited by household income, as it also accounts for other factors such as disability, nationality, and occupation. Therefore, we found that some ineligible individuals still successfully obtained Medicaid; even so, the proportion of the ineligible

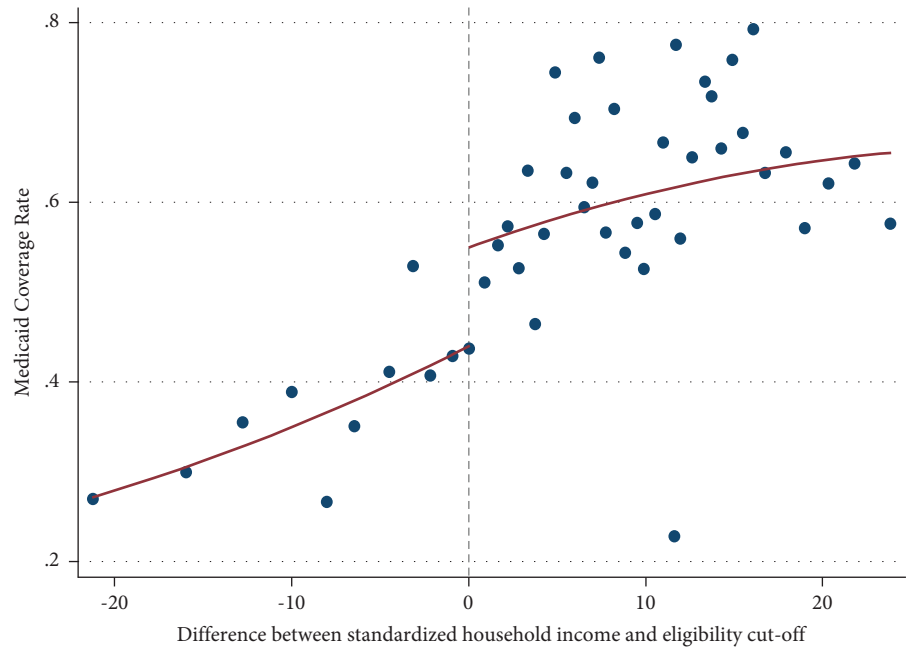

FIGURE 1: Medicaid participation rate. *Note*. Each dot represents the average coverage rate of Medicaid in a bin of 1 thousand dollars width.

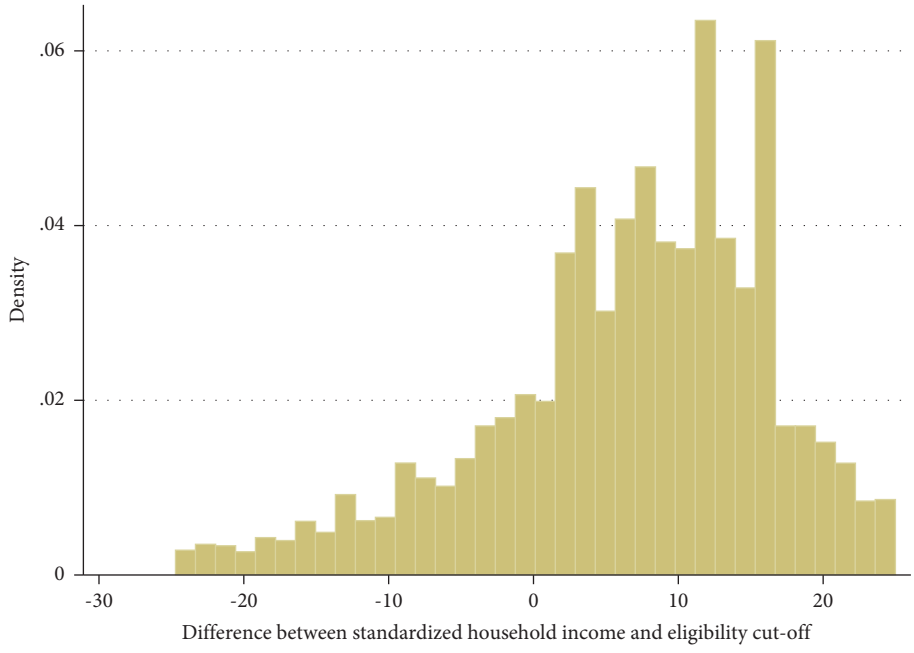

FIGURE 2: Assigning variable density distribution.

group (33.3%) was significantly lower than that of the eligible group (50.3%).

Table 3 presents the results of regression discontinuity estimations for all three outcomes. Figure 3 visually displays the effects of Medicaid eligibility on individuals' usual source of care. As can be seen, there was a discontinuity on both sides of the Medicaid eligibility cutoff. However, according to the results from Table 3, the effect was not statistically significant. Figure 4 details the discontinuity in the checkup service coverage ratio above and below the cutoff for Medicaid eligibility. As noted previously, Medicaid was expected to increase the use of preventive health services by subsidizing health care for populations below the poverty line. Similarly, we observed a sharp decrease in the fecal occult blood test (FOBT) service among individuals in the ineligible group at the standardized cutoff. The values of difference were derived from the results by using the rd command. The eligible group to the right of the cutoff had a nearly 18% coverage rate for FOBT, while only 9% of individuals to the left of the cutoff reported the same rate (Figure 5).

Table 2: Sample sociodemographic characteristics, nonelderly adults aged 18 to 65.

	Total (SE)	Ineligible group for Medicaid (SE)	Eligible group for Medicaid (SE)
Sample size	4,380	935	3,445
Weighted population	11,347,126	3,345,145	8,001,981
Gender			
Male	34.4 (1.77)	39.6 (3.63)	32.3 (2.01)
Female	65.6 (1.77)	60.4 (3.63)	67.7 (2.01)
Education level			
Less than high school	34.1 (1.73)	21.8 (3.03)	38.8 (2.05)
High school	29.3 (1.70)	24.5 (3.40)	31.2 (1.97)
More than high school	36.6 (1.76)	53.8 (3.70)	29.9 (1.93)
Employment status			
Employed	41.6 (1.83)	58.8 (3.54)	35.0 (2.03)
Unemployed	16.5 (1.33)	9.19 (2.02)	19.3 (1.65)
Not in the labor force	41.8 (1.80)	32.0 (3.29)	45.7 (2.10)
Health insurance			
Privately obtained insurance	17.3 (1.44)	35.6 (3.56)	10.2 (1.31)
Medicare	7.8 (0.76)	5.5 (1.14)	8.8 (0.96)
Medicaid	45.5 (1.82)	33.3 (3.49)	50.3 (2.11)
Publicly obtained insurance	1.6 (0.25)	2.4 (0.66)	1.3 (0.23)
Noninsured	27.7 (1.73)	23.3 (3.21)	29.4 (2.05)
Location			
Urban	48.7 (1.81)	42.0 (3.54)	51.3 (2.11)
Rural	51.3 (1.81)	58.0 (3.54)	48.7 (2.11)
Patient type			
Public housing primary care	0.9 (0.08)	0.5 (0.13)	1.1 (0.10)
Migrant health center	2.6 (0.18)	3.2 (0.25)	1.0 (0.18)
Health care for the homeless	3.2 (0.23)	2.1 (0.43)	3.7 (0.28)
Community health center	93.3 (0.34)	96.4 (0.51)	92.0 (0.45)

Note. Analyses accounted for both the design effect and the sampling weights.

Table 3: RD results: effects of Medicaid on having a usual source of care and preventive services.

	N	Baseline model	Model 1	Model 2	Model 3	Model 4
Having an usual source of care	915	0.096	0.056	0.118	0.141	0.07
Checkup	902	0.499^{***}	0.45^{***}	0.516^{***}	0.532^{***}	0.468^{***}
Fecal occult blood test	468	0.168^{*}	0.120^{*}	0.183^{*}	0.200^{**}	0.140
Bandwidth		4	5	3.75	3.5	4.5
Polynomial		1	1	1	1	1
Predisposing factors		Y	Y	Y	Y	Y
Enabling factors		Y	Y	Y	Y	Y

Note. The sample is restricted to individuals aged 18 to 65 from the 2014 Health Center Patient Survey. All the models control for predisposing and enabling factors and use the first polynomial. Predisposing factors include four variables: age, sex, employment status, and educational attainment. Enabling factors contain two variables: patient type and living area. Model 1 to model 4 set the bandwidth as \$5,000 dollars, \$3,750 dollars, \$3,500 dollars, and \$4,500 dollars, respectively. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

As shown in Table 3, the estimates in each column came from a separate linear probability model. In each column, the sample is restricted to those observations with family income levels that fall within the bandwidth indicated. The control covariates were then categorized as predisposing and enabling factors based on Andersen's behavioral model [49]. The predisposing factors included four variables (age, sex, employment status, and educational attainment) while the enabling factors included two variables (patient type and living area). Results suggest that Medicaid did not significantly increase the probability of having a usual source of care coverage for newly insured health center patients at the bandwidth of \$4,000 dollars. It should be noted that there was little variation in the results based on the bandwidth. Medicaid significantly helped low-income individuals to access checkup services, resulting in a 50% ($p < 0.001$) increase in checkup coverage among individuals eligible for Medicaid at the \$4,000 dollar bandwidth. Additionally, there was a significant 16.8% rise ($p < 0.05$) in the fecal occult blood test coverage rate for Medicaid patients at the \$4,000 dollar bandwidth.

In order to examine the robustness of these results, we applied three other specification tests. First, to rule out the possibility that the results were caused by the discontinuity of the control variables rather than the assignment variable, we tested whether the control variables were continuous at the cutoff. Figure 6 indicates that all covariates were continuous on both sides of the breakpoint. Second, we changed

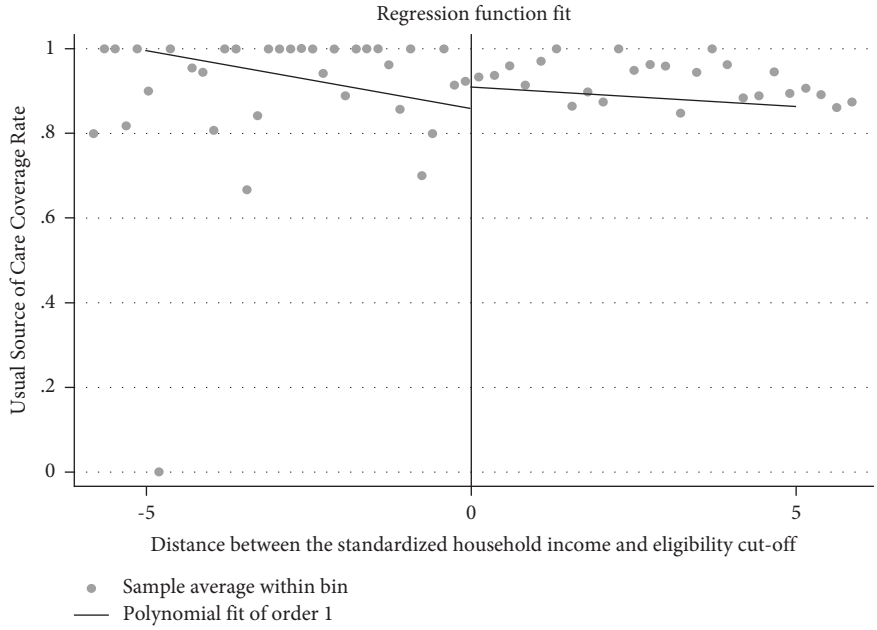

Figure 3: Effects of Medicaid expansion on the coverage rate of usual source of care. Discontinuities in the association between Medicaid expansion and usual source of care coverage are shown. The vertical axis represents the proportion of usual source of care coverage, while the horizontal axis portrays the distance between the standardized household income and eligibility cutoff. Observations to the left of the threshold—normalized to 0—are from the treatment group with household incomes below 138% of the poverty line in 2014, while observations to the right of the threshold come from the control group with household incomes higher than 138% of the poverty line in 2014. Each dot represents the average coverage rate of usual source of care in a bin of 0.2 thousand dollars width. The solid line depicts the fitted values of the first-order polynomial.

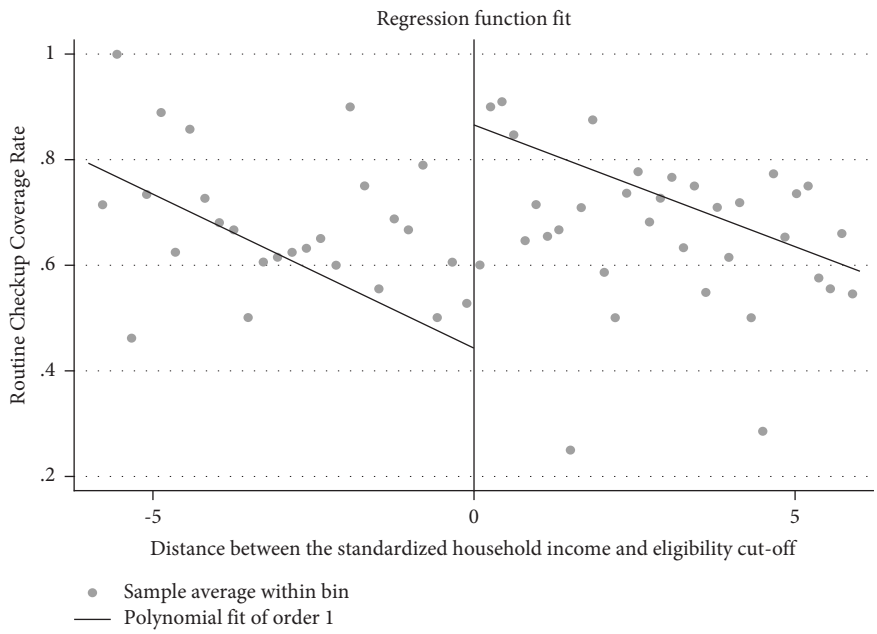

Figure 4: Effects of Medicaid expansion on the coverage rate of routine checkups. Discontinuities in the association between Medicaid expansion and routine checkup coverage are shown. The vertical axis represents the proportion of routine checkups covered, while the horizontal axis portrays the distance between the standardized household income and eligibility cutoff. Observations to the left of the threshold—normalized to 0—are from the treatment group with household incomes below 138% of the poverty line in 2014, while observations to the right of the threshold come from the control group with household incomes higher than 138% of the poverty line in 2014. Each dot represents the average coverage rate of routine checkups in a bin of 0.2 thousand dollars width. The solid line depicts the fitted values of the first-order polynomial.

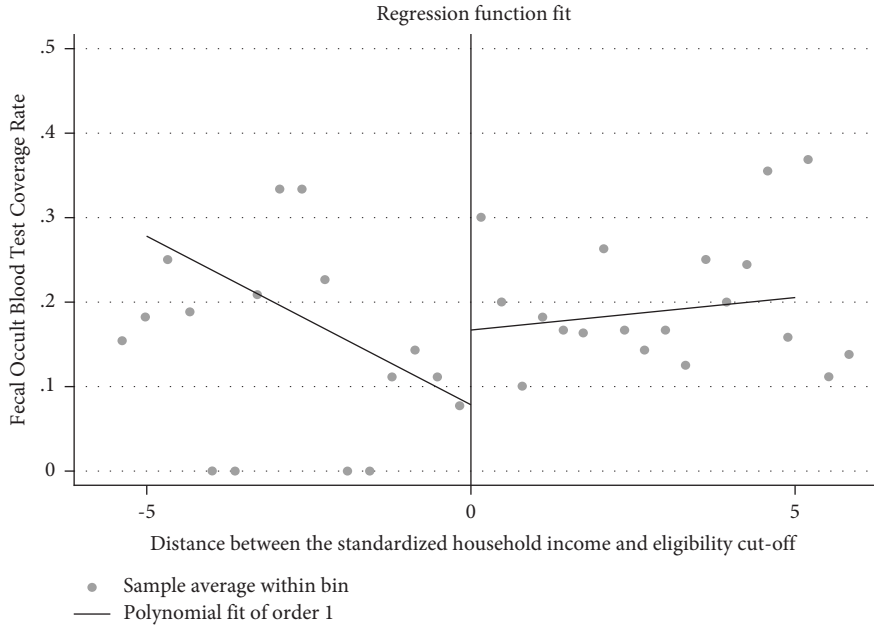

Figure 5: Effects of Medicaid expansion on the coverage rate of fecal occult blood tests. Discontinuities in the association between Medicaid expansion and fecal occult blood test coverage are shown. The vertical axis represents the proportion of fecal occult blood tests covered, while the horizontal axis portrays the distance between the standardized household income and eligibility cutoff. Observations to the left of the threshold—normalized to 0—are from the treatment group with household incomes below 138% of the poverty line, while observations to the right of the threshold come from the control group with household incomes higher than 138% of the poverty line in 2014. Each dot represents the average coverage rate of fecal occult blood tests in a bin of 0.2 thousand dollars width. The solid line depicts the fitted values of the first-order polynomial.

the control variables in the model to test whether doing so would produce a substantial variation in the estimation results. There was no evidence that the effects would become less significant when the control variables were changed (including adding or excluding predisposing factors and enabling factors) (see Table 4). Finally, we reported the estimation results of using different polynomial orders (using 2 or 3) in the models to determine whether the polynomial order had a significant influence on the results. The results of this test were similar to the main findings, indicating that the results were relatively robust (see Table 4).

5. Discussion

At the ten-year mark since the passage of the ACA, there is a substantial body of research that has investigated the effects of Medicaid enrollment. However, very few studies have identified a causal relationship or adopted multiple eligibility thresholds that take into account variances across states. Over simply comparing the pre- and postpolicy outcomes, the advantage of the RD approach is that it allowed us to estimate the policy effect around the exogenous discontinuity and was, therefore, sensitive to any lag that may have occurred between the policy effective date and the consequent increased Medicaid enrollment. It reduced the risk of bias inherent in observational studies.

This study contributes to the literature and addresses the gaps in the existing research, demonstrating that Medicaid enrollment improved preventive service use among US health center patients. Moreover, obtaining Medicaid coverage had significant positive effects on the frequency with which patients undergo routine checkups and colorectal cancer screenings. Multiple robustness checks, including changing bandwidth, considering different polynomial orders, and adding more covariates, affirmed the robustness of our findings.

Our results indicate that there was an insignificant improvement in having a usual source of care among low-income and nonelderly HC patients who were newly eligible for Medicaid under the expansion project. One possible reason for this is that HCs provide affordable care to all patients regardless of insurance coverage [50]. Alternatively, another explanation may be that the health center is required to discount or waive the fee that patients need to pay (as determined by their household income). As a result of these features, the health center assumes the role of a safety net in the US healthcare system, especially in medically underserved urban and rural areas [51, 52].

Regarding the outcomes for preventive services, we found that newly insured Medicaid beneficiaries reported an increased utilization of preventive services, including routine checkups and colorectal cancer screenings. There is a wealth of evidence to support the existence of a positive relationship between insurance and the use of preventive services [53, 54]. Notably, uninsured people may be less likely to utilize preventive services due to cost considerations. From a health economics perspective, Medicaid may help minimize the out-of-pocket expenses and deductibles incurred when using health services, while encouraging the

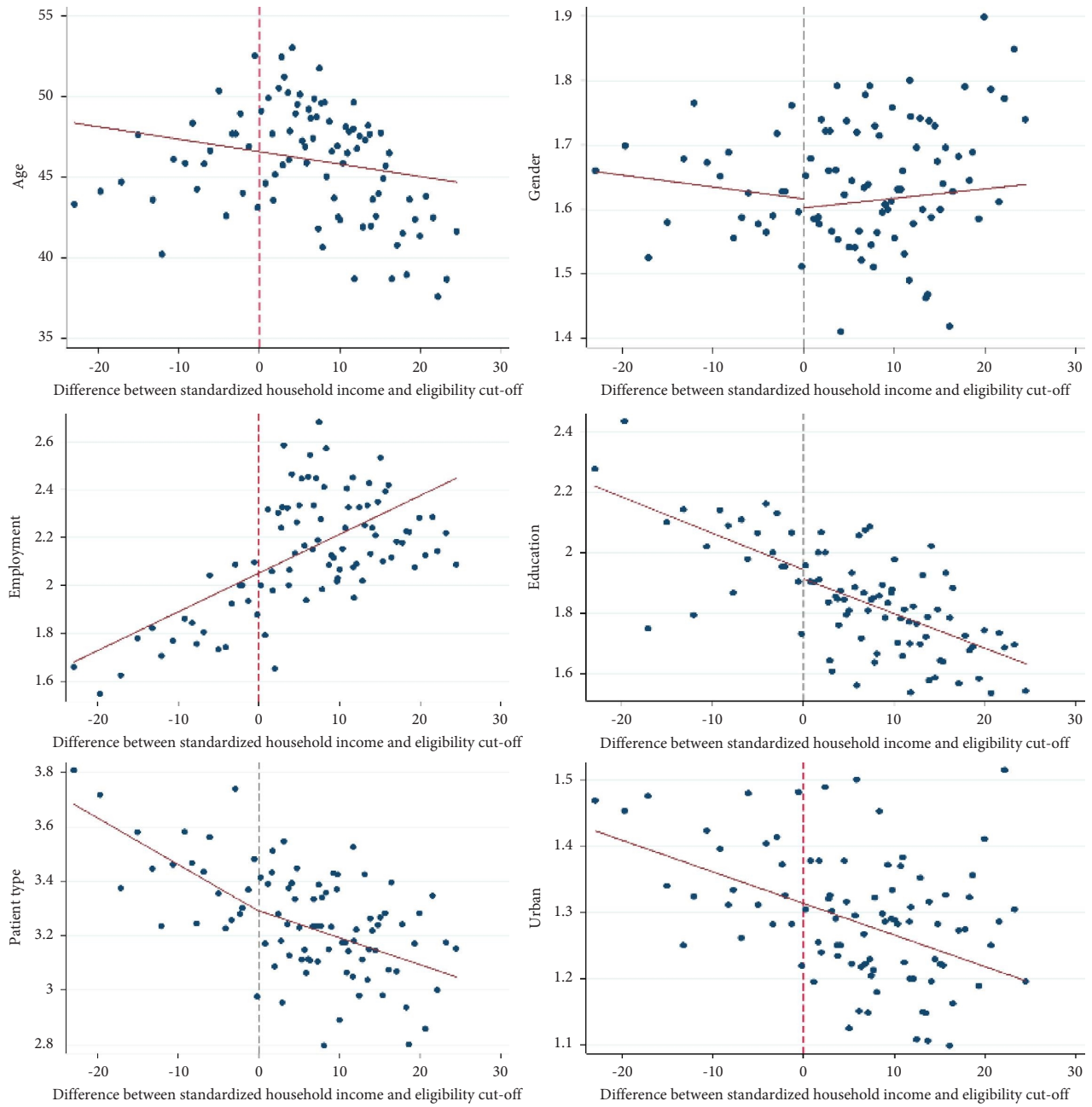

Figure 6: Sensitivity analyses: continuity test for the covariates. *Note*. From the upper left to the lower right, the vertical axes represent age, sex, employment status, educational attainment, patient type, and living area, respectively.

Table 4: Sensitivity analyses: alterations in the covariates and polynomial order.

	N	Baseline model	Model 1	Model 2	Model 3	Model 4	Model 5
Having an usual source of care	915	0.090	0.112	0.105	0.099	0.115	0.121
Checkup	902	0.522***	0.493***	0.488***	0.534***	0.471***	0.572***
Fecal occult blood test	468	0.206**	0.221**	0.240	0.198	0.187*	0.171*
Bandwidth		4	4	4	4	6	7
Polynomial		2	2	2	2	3	3
Predisposing factors		Y	N	Y	N	Y	Y
Enabling factors		Y	Y	N	N	Y	Y

Note. The sample is restricted to individuals aged 18 to 65 from the 2014 Health Center Patient Survey. Predisposing factors include four variables: age, sex, employment status, and educational attainment. Enabling factors contain two variables: patient type and living area. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

use of more preventive services [55]. Another possible explanation for the increased use of checkups may be the enhanced contact between patients and physicians [56], as regular contact with the primary care system may encourage patients to utilize any additional health services available to them. Moreover, a combination of generosity and longer duration of Medicaid programs may improve access to and utilization of healthcare services [57].

Our findings pertaining to having a usual source of care are consistent with previous studies that identified the insignificant effect of Medicaid on having a usual source of care [58]. Utilizing the National Health Interview Survey, Wherry and Miller [58] found that the Medicaid expansion did not give rise to any improvements among patients in measures relating to having a usual source of care. In contrast with the existing studies, the oversampling of underprivileged patients in the 2014 HCPS data allowed us to provide more robust estimations for vulnerable populations. Concerning the use of preventive services, our findings are also comparable to the conclusions of the existing research. For example, relying on the CDC Behavioral Risk Factor Surveillance Study data, Torres et al. [59] and Zerhouni et al. [60] found that adults in Medicaid expansion states were more likely to undergo regular checkups and receive overall screenings compared to those in nonexpansion states. Meanwhile, a recent study by Hill and Abdus [61] also indicated that Medicaid enrollment increased the probability of a patient having a routine checkup in the past year by 17.1 percentage points.

It must be noted that our study had several limitations. First, there may be some selection effects arising from the survey sample and Medicaid expansion. Specifically, newly insured individuals could have entered the sample or exited, which may lead the target population to be not equally represented. Moreover, the estimated effects of Medicaid eligibility were calculated using local average treatment effects based on a narrow population around the cutoff, and the current study focused on the descriptions of HC patient subpopulation. Thus, our results are not necessarily generalizable to the entire population or other programs with different cutoffs. Second, our sample only consisted of adults and excluded the elderly population, which may account for a significant portion of new Medicaid beneficiaries. It is important to note that elderly patients in HCs may have higher a rate of chronic diseases and a greater need for health services, implying that they are sensitive to changes in insurance status. It is suggested that further research should estimate the effects of Medicaid on the elderly population. Thirdly, this study was limited in its self-reported measurement of outcomes, which may lead to potential recall bias. Finally, as a result of the nature of cross-sectional data, we could only estimate the short-term effects of Medicaid eligibility. Previous research has illustrated that Medicaid coverage may exert significantly different influences on health outcomes over time [62]. On this basis, greater effort should be made to evaluate the long-term effects of Medicaid enrollment.

Our study results highlight important policy implications that policymakers can refer to and draw on as they consider further changes to Medicaid policy and the potential impact that changes to the US primary care system can have on vulnerable populations. The evidence we provide supports the federal decision to continue expanding funding to Medicaid, as opposed to repealing the ACA. Expanding Medicaid eligibility from 100% to 138% of the FPL among HC patients increased the use of preventive services. Such an increase can provide substantial benefits to population health, including but not limited to better chronic disease management, early detection, cancer prevention, and reduced mortality rates [63, 64]. However, as of 2022, 11 states still refuse to expand Medicaid coverage [4]. Our study thus carries significant policy implications for those states that have yet to expand Medicaid eligibility. More specifically, nonexpansion states may extend Medicaid coverage to low-income residents whose household incomes are below 138% of the FPL. In light of the 2020 presidential election results, it is likely that the ACA, including Medicaid expansion, will be sustained or reinforced under the Biden administration, substantially shaping Medicaid policy in the coming years. During the 2020 election campaign, Biden proposed broader coverage expansions using a federal public option to offer coverage to more low-income Americans. For those states yet to expand, Medicaid expansion may be a viable policy option for improving care utilization among vulnerable populations. However, incentives such as legislation offering states more benefits or updates to state waivers are needed to make Medicaid expansion more attractive and encourage broader Medicaid coverage.

Results from this study also highlight important policy implications that could affect the future capacity of community health centers: changes to Medicaid's eligibility or to other aspects of the program will likely affect health centers, given that their patients are predominantly uninsured and low income. Our study offers fresh evidence on both the effect of Medicaid eligibility after 2014 and also the utilization of preventive services among low-income adults who use health centers. Health center patients are the typical target policy sample of the ACA, which aims to increase the insurance coverage of low-income and underprivileged populations. Additionally, this study took advantage of the regression discontinuity method, a quasiexperimental design, to identify any causal links between Medicaid eligibility and the outcome variables. This serves to evaluate the ACA's objective to improve care utilization and quality of care, particularly for vulnerable population groups. It is imperative that policymakers could be attentive to the consequences of these changes for health centers and the patients that they serve.

This research also raises related questions regarding the potential impact of the COVID-19 epidemic on the service capacity of CHCs. Specifically, the pandemic is known to have caused excess reduction in healthcare accessibility and utilization across the board, while demand for primary care services appears to be recovering presently, and the full extent of the effect of the pandemic on the accessibility and utilization patterns is not yet known [65]. Future research may evaluate the differential impact of the pandemic and expansion on healthcare access and utilization among HC

patients. From a policy perspective, the current casual results are encouraging as the Biden Administration implements the safety-net enhancements from the ARPA and as more nonexpansion states may be opting into Medicaid expansions. It is anticipated that these efforts will help to sustain HC in the delivery of healthcare services to the underserved population.

6. Conclusion

In conclusion, this study used the most recent nationwide data to evaluate the effects of the Medicaid eligibility on the utilization of two preventive health services among HC patients. We provide the first causal evidence on the effects of Medicaid among the HC patients, which are of particular value to Medicaid enrollees but are underused. The study confirmed the positive effects of Medicaid coverage: increased utilization of routine checkups and colorectal cancer screening. Achieving a better understanding of the role of Medicaid coverage for HC patients can help policymakers to recognize the importance of insurance coverage for such patients and, in response, craft programs to meet their needs more effectively.

Data Availability

Data are publicly available at https://bphc.hrsa.gov/data-reporting/health-center-patient-survey, provided by the U.S. Health Resources and Services Administration.

Conflicts of Interest

The authors declare that there are no conflicts of interest.

Acknowledgments

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References

[1] M. Buettgens, J. Holahan, and H. Recht, "Medicaid expansion, health coverage, and spending: an update for the twenty-one states that have not expanded eligibility," 2015, https://www.kff.org/medicaid/issue-brief/medicaid-expansion-health-coverage-and-spending-an-update-for-the-21-states-that-have-not-expanded-eligibility/.

[2] B. Moy, A. P. Abernethy, and J. M. Peppercorn, "Core elements of the Patient Protection and Affordable Care Act and their relevance to the delivery of high-quality cancer care," *American Society of Clinical Oncology educational book. American Society of Clinical Oncology. Annual Meeting*, vol. 32, pp. e4–e8, 2012.

[3] S. Rosenbaum and T. M. Westmoreland, "The Supreme Court's surprising decision on the Medicaid expansion: how will the federal government and states proceed?" *Health Affairs*, vol. 31, no. 8, pp. 1663–1672, 2012.

[4] Kaiser Family Foundation, "Status of state medicaid expansion decisions: interactive map," 2022, https://www.kff.org/medicaid/issue-brief/status-of-state-medicaid-expansion-decisions-interactive-map/.

[5] Kaiser Family Foundation, "Building on the evidence base: studies on the effects of medicaid expansion," 2021, https://www.kff.org/medicaid/report/building-on-the-evidence-base-studies-on-the-effects-of-medicaid-expansion-february-2020-to-march-2021.

[6] R. Gold, S. R. Bailey, J. P. O'Malley et al., "Estimating demand for care after a medicaid expansion: lessons from Oregon," *The Journal of Ambulatory Care Management*, vol. 37, no. 4, pp. 282–292, 2014.

[7] O. Aliu, K. A. Auger, G. H. Sun et al., "The effect of pre-affordable care act (ACA) medicaid eligibility expansion in New York state on access to specialty surgical care," *Medical Care*, vol. 52, no. 9, pp. 790–795, 2014.

[8] A. M. Giladi, O. Aliu, and K. C. Chung, "The effect of medicaid expansion in New York state on use of subspecialty surgical procedures by medicaid beneficiaries and the uninsured," *Journal of the American College of Surgeons*, vol. 218, no. 5, pp. 889–897, 2014.

[9] B. A. Langellier, J. Guernsey de Zapien, C. Rosales, M. Ingram, and S. C. Carvajal, "State medicaid expansion, community interventions, and health care disparities in a United States-Mexico border community," *American Journal of Public Health*, vol. 104, no. 8, pp. E94–E100, 2014.

[10] M. Courtney-Brooks, E. B. Pelkofski, C. L. Engelhard, and L. R. Duska, "The Patient Protection and Affordable Care Act: impact on the care of gynecologic oncology patients in the absence of Medicaid expansion in central Virginia," *Gynecologic Oncology*, vol. 130, no. 2, pp. 346–349, 2013.

[11] S. H. Long and M. S. Marquis, "The effects of Florida's Medicaid eligibility expansion for pregnant women," *American Journal of Public Health*, vol. 88, no. 3, pp. 371–376, 1998.

[12] S. A. Somers, E. Nicolella, A. Hamblin, S. M. McMahon, C. Heiss, and B. W. Brockmann, "Medicaid expansion: considerations for states regarding newly eligible jail-involved individuals," *Health Affairs*, vol. 33, no. 3, pp. 455–461, 2014.

[13] A. N. Hofer, J. M. Abraham, and I. Moscovice, "Expansion of coverage under the patient protection and affordable care act and primary care utilization," *The Milbank Quarterly*, vol. 89, no. 1, pp. 69–89, 2011.

[14] H. Allen, K. Baicker, S. Taubman, B. Wright, and A. Finkelstein, "The Oregon health insurance experiment: when limited policy resources provide research opportunities," *Journal of Health Politics, Policy and Law*, vol. 38, no. 6, pp. 1183–1192, 2013.

[15] R. Rudowitz, R. Garfield, and E. Hinton, "10 things to know about Medicaid: setting the facts straight," 2019, https://www.kff.org/medicaid/issue-brief/10-things-to-know-about-medicaid-setting-the-facts-straight/.

[16] S. Rosenbaum, "Medicaid," *New England Journal of Medicine*, vol. 346, no. 8, pp. 635–640, 2002.

[17] L. Dubay, T. Joyce, R. Kaestner, and G. M. Kenney, "Changes in prenatal care timing and low birth weight by race and socioeconomic status: implications for the Medicaid expansions for pregnant women," *Health Services Research*, vol. 36, no. 2, pp. 373–398, 2001.

[18] R. Weech-Maldonado, L. S. Morales, M. Elliott, K. Spritzer, G. Marshall, and R. D. Hays, "Race/ethnicity, language, and patients' assessments of care in Medicaid managed care," *Health Services Research*, vol. 38, no. 3, pp. 789–808, 2003.

[19] P. Shin, C. Alvarez, J. Sharac, S. Rosenbaum, A. Van Vleet, and J. Paradise, "A profile of community health center patients: implications for policy," 2013, http://kff.org/medicaid/issue-brief/a-profile-of-community-health-center-patients-implications-for-policy/GoogleScholar.

[20] P. Shin, J. Sharac, C. Alvarez, and S. J. Rosenbaum, "Community Health Centers in an era of health reform: an overview and key challenges to Health Center growth," 2013, http://kaiserfamilyfoundation.files.wordpress.com/2013/03/8098-03.pdf.

[21] E. J. Heisler, "'Federal health centers: an overview'. Congressional research service brief: 7–5700," 2017, https://fas.org/sgp/crs/misc/R43937.pdf.

[22] L. Shi, J. Regan, R. M. Politzer, and J. Luo, "Community health centers and racial/ethnic disparities in healthy life," *International Journal of Health Services*, vol. 31, no. 3, pp. 567–582, 2001.

[23] S. Rosenbaum, J. Paradise, A. Markus et al., "Community health centers: recent growth and the role of the ACA," 2017, https://files.kff.org/attachment/Issue-Brief-Community-Health-Centers-Recent-Growth-and-the-Role-of-the-ACA.

[24] B. DiPietro, S. Artiga, and A. Gates, "Early impacts of the medicaid expansion for the homeless population," 2019, https://files.kff.org/attachment/early-impacts-of-the-medicaid-expansion-for-the-homeless-population-issue-brief.

[25] H. Lee and F. W. Porell, "The effect of the Affordable Care Act Medicaid expansion on disparities in access to care and health status," *Medical Care Research and Review*, vol. 77, no. 5, pp. 461–473, 2020.

[26] M. J. Hoopes, H. Angier, R. Gold et al., "Utilization of community health centers in Medicaid expansion and non-expansion states, 2013–2014," *The Journal of Ambulatory Care Management*, vol. 39, no. 4, pp. 290–298, 2016.

[27] A. W. Mulcahy, C. Eibner, and K. Finegold, "Gaining coverage through Medicaid or private insurance increased prescription use and lowered out-of-pocket spending," *Health Affairs*, vol. 35, no. 9, pp. 1725–1733, 2016.

[28] B. D. Sommers, R. J. Blendon, E. J. Orav, and A. M. Epstein, "Changes in utilization and health among low-income adults after Medicaid expansion or expanded private insurance," *JAMA Internal Medicine*, vol. 176, no. 10, pp. 1501–1509, 2016.

[29] M. B. Cole, B. Wright, I. B. Wilson, O. Galárraga, and A. N. Trivedi, "Medicaid expansion and community health centers: care quality and service use increased for rural patients," *Health Affairs*, vol. 37, no. 6, pp. 900–907, 2018.

[30] P. Shin, S. J. Rosenbaum, B. K. Bruen, A. Lu, R. Arguello, and J. Tolbert, "Medicaid and community health centers: the relationship between coverage for adults and primary care capacity in medically underserved communities," 2012, https://www.kff.org/health-reform/issue-brief/medicaid-and-community-health-centers-the-relationship/.

[31] A. Shartzer, S. K. Long, and N. Anderson, "Access to care and affordability have improved following Affordable Care Act implementation; problems remain," *Health Affairs*, vol. 35, no. 1, pp. 161–168, 2016.

[32] K. Simon, A. Soni, and J. Cawley, "The impact of health insurance on preventive care and health behaviors: evidence from the first two years of the ACA Medicaid expansions," *Journal of Policy Analysis and Management*, vol. 36, no. 2, pp. 390–417, 2017.

[33] K. Nasseh and M. Vujicic, "Early impact of the affordable care act's Medicaid expansion on dental care use," *Health Services Research*, vol. 52, no. 6, pp. 2256–2268, 2017.

[34] Department of Health and Human Services, "2014 poverty guidelines," 2014, https://aspe.hhs.gov/2014-poverty-guidelines.

[35] L. Dague, "The effect of Medicaid premiums on enrollment: a regression discontinuity approach," *Journal of Health Economics*, vol. 37, pp. 1–12, 2014.

[36] D. B. Muhlestein and E. E. Seiber, "State variability in children's Medicaid/CHIP crowd-out estimates," *Medicare & Medicaid Research Review*, vol. 3, no. 3, pp. 1–23, 2013.

[37] R. Bin Abdul Baten and G. L. Wehby, "Effects of the 2014 affordable care act medicaid expansions on health care access and health status of poor adults aged 60–64 Years: evidence from the first 6 years," *The Gerontologist*, vol. 62, no. 6, pp. 923–930, Article ID gnab189, 2021.

[38] D. Yue, N. Pourat, X. Chen et al., "Enabling services improve access to care, preventive services, and satisfaction among health center patients," *Health Affairs*, vol. 38, no. 9, pp. 1468–1474, 2019.

[39] Agency for Healthcare Research and Quality, "Types of health care quality measures," 2015, https://www.ahrq.gov/talkingquality/measures/types.html.

[40] C. O. Ojinnaka and Y. Suri, "Impact of medicaid expansion on healthcare access among individuals living with chronic diseases," *American Journal of Preventive Medicine*, vol. 59, no. 2, pp. 149–156, 2020.

[41] M. Sarfaty, M. Doroshenk, J. Hotz et al., "Strategies for expanding colorectal cancer screening at community health centers," *CA: A Cancer Journal for Clinicians*, vol. 63, no. 4, pp. 221–231, 2013.

[42] B. Saloner, A. S. Wilk, and J. Levin, "Community health centers and access to care among underserved populations: a synthesis review," *Medical Care Research and Review*, vol. 77, no. 1, pp. 3–18, 2020.

[43] C. L. Behr, P. Hull, J. Hsu, J. P. Newhouse, and V. Fung, "Geographic access to federally qualified health centers before and after the affordable care act," *BMC Health Services Research*, vol. 22, no. 1, p. 385, 2022.

[44] G. W. Imbens and T. Lemieux, "Regression discontinuity designs: a guide to practice," *Journal of Econometrics*, vol. 142, no. 2, pp. 615–635, 2008.

[45] J. Porter, "Estimation in the regression discontinuity model," *Department of Economics*, University of Wisconsin at Madison, Madison, WI, USA, 2003.

[46] A. Gelman and G. Imbens, "Why high-order polynomials should not be used in regression discontinuity designs," *Journal of Business & Economic Statistics*, vol. 37, no. 3, pp. 447–456, 2019.

[47] S. Calonico, M. D. Cattaneo, and R. Titiunik, "Robust nonparametric confidence intervals for regression-discontinuity designs," *Econometrica*, vol. 82, no. 6, pp. 2295–2326, 2014.

[48] M. E. Burns, L. Dague, T. DeLeire et al., "The effects of expanding public insurance to rural low-income childless adults," *Health Services Research*, vol. 49, no. S2, pp. 2173–2187, 2014.

[49] R. M. Andersen, "National health surveys and the behavioral model of health services use," *Medical Care*, vol. 46, no. 7, pp. 647–653, 2008.

[50] H. L. Liang, M. A. Beydoun, and S. M. Eid, "Health needs, utilization of services and access to care among Medicaid and uninsured patients with chronic disease in health centres," *Journal of Health Services Research & Policy*, vol. 24, no. 3, pp. 172–181, 2019.

[51] R. M. Politzer, J. Yoon, L. Shi, R. G. Hughes, J. Regan, and M. H. Gaston, "Inequality in America: the contribution of health centers in reducing and eliminating disparities in access to care," *Medical Care Research and Review*, vol. 58, no. 2, pp. 234–48, 2001.

[52] J. Regan, A. H. Schempf, J. Yoon, and R. M. Politzer, "The role of federally funded health centers in serving the rural

population," *The Journal of Rural Health*, vol. 19, no. 2, pp. 117–124, 2003.
[53] S. H. Busch, C. L. Barry, S. J. Vegso, J. L. Sindelar, and M. R. Cullen, "Effects of a cost-sharing exemption on use of preventive services at one large employer," *Health Affairs*, vol. 25, no. 6, pp. 1529–1536, 2006.
[54] J. A. Pagan, A. Puig, and B. J. Soldo, "Health insurance coverage and the use of preventive services by Mexican adults," *Health Economics*, vol. 16, no. 12, pp. 1359–1369, 2007.
[55] A. Atherly and K. Mortensen, "Medicaid primary care physician fees and the use of preventive services among medicaid enrollees," *Health Services Research*, vol. 49, no. 4, pp. 1306–1328, 2014.
[56] L. Y. Shi, L. A. Lebrun-Harris, C. A. Daly et al., "Reducing disparities in access to primary care and patient satisfaction with care: the role of health centers," *Journal of Health Care for the Poor and Underserved*, vol. 24, no. 1, pp. 56–66, 2013.
[57] W. W. Tarazi, C. J. Bradley, D. W. Harless, H. D. Bear, and L. M. Sabik, "Generosity and duration of medicaid expansion waivers and access to care," *American Journal of Preventive Medicine*, vol. 55, no. 5, pp. 624–632, 2018.
[58] L. R. Wherry and S. Miller, "Early coverage, access, utilization, and health effects associated with the Affordable Care Act Medicaid expansions: a quasi-experimental study," *Annals of Internal Medicine*, vol. 164, no. 12, pp. 795–803, 2016.
[59] H. Torres, E. Poorman, U. Tadepalli et al., "Coverage and access for Americans with chronic disease under the affordable care act A quasi-experimental study," *Annals of Internal Medicine*, vol. 166, no. 7, pp. 472–479, 2017.
[60] Y. A. Zerhouni, Q. D. Trinh, S. Lipsitz et al., "Effect of medicaid expansion on colorectal cancer screening rates," *Diseases of the Colon & Rectum*, vol. 62, no. 1, pp. 97–103, 2019.
[61] S. C. Hill and S. Abdus, "The effects of Medicaid on access to care and adherence to recommended preventive services," *Health Services Research*, vol. 56, no. 1, pp. 84–94, 2021.
[62] S. Miller and L. R. Wherry, "Health and access to care during the first 2 Years of the ACA medicaid expansions," *New England Journal of Medicine*, vol. 376, no. 10, pp. 947–956, 2017.
[63] E. J. Comino, G. P. Davies, Y. Krastev et al., "A systematic review of interventions to enhance access to best practice primary health care for chronic disease management, prevention and episodic care," *BMC Health Services Research*, vol. 12, no. 1, p. 415, 2012.
[64] M. V. Maciosek, A. B. Coffield, T. J. Flottemesch, N. M. Edwards, and L. I. Solberg, "Greater use of preventive services in US health care could save lives at little or no cost," *Health Affairs*, vol. 29, no. 9, pp. 1656–1660, 2010.
[65] Q. Luo, A. Moghtaderi, A. Markus, and A. Dor, "Financial impacts of the Medicaid expansion on community health centers," *Health Services Research*, vol. 57, no. 3, pp. 634–643, 2022.