

ORIGINAL RESEARCH

The Impact of the Affordable Care Act (ACA) Medicaid Expansion on Visit Rates for Diabetes in Safety Net Health Centers

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Objective: To (1) compare clinic-level uninsured, Medicaid-insured, and privately insured visit rates within and between expansion and nonexpansion states before and after the Affordable Care Act (ACA) Medicaid expansion among the 3 cohorts of patient populations; and (2) assess whether there was a change in clinic-level overall, primary care visits, preventive care visits, and diabetes screening rates in expansion versus nonexpansion states from pre-ACA to post-ACA Medicaid expansion.

Methods: Electronic health record data on nonpregnant patients aged 19 to 64 years, with ≥ 1 ambulatory visit between 01/01/2012 and 12/31/2015 ($n = 483,912$ in expansion states; $n = 388,466$ in nonexpansion states) from 198 primary care community health centers were analyzed. Using a difference-in-difference methodology, we assessed changes in visit rates pre-ACA versus post-ACA among a cohort of patients with diabetes, prediabetes, and no diabetes.

Results: Rates of uninsured visits decreased for all cohorts in expansion and nonexpansion states. For all cohorts, Medicaid-insured visit rates increased significantly more in expansion compared with nonexpansion states, especially among prediabetic patients (+71%). In nonexpansion states, privately insured visit rates more than tripled for the prediabetes cohort and doubled for the diabetes and no diabetes cohorts. Rates for glycosylated hemoglobin screenings increased in all groups, with the largest changes among no diabetes (rate ratio, 2.26; 95% CI, 1.97–2.56) and prediabetes cohorts (rate ratio, 2.00; 95% CI, 1.80–2.19) in expansion states.

Conclusion: The ACA reduced uninsurance and increased access to preventive care for vulnerable patients, especially those with prediabetes. These findings are important to consider when making decisions regarding altering the ACA. (J Am Board Fam Med 2018;31:905–916.)

Keywords: Cohort Studies, Community Health Centers, Diabetes Mellitus, Hemoglobins, Medicaid, Medically Uninsured, Prediabetic State, Primary Health Care

Diabetes mellitus is one of the nation's leading causes of morbidity and mortality; over 30 million people in the United States have diabetes and an-

other 86 million have prediabetes.¹ Patients with diabetes and prediabetes need to maintain a regular source of care and access health care services (eg, prescription medications, diabetic eye exams, and laboratory monitoring) to control, manage, or prevent diabetes-related complications, a challenging

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task for patients without continuous health insurance coverage. In addition, patients without health insurance are more likely to have undiagnosed diabetes and receive fewer preventive services overall than those with coverage.² Uninsured patients are also less likely to receive recommended diabetes screening and care and have poorer diabetes control than those with insurance.^{3–11} Thus, both health insurance and continued access to health care services are essential for optimal diabetes prevention, care, and management.²

The Patient Protection and Affordable Care Act (ACA) reform substantially improved access to health insurance and health care services for patients, especially among low-income adults.^{12–15} With the goal of covering all low-income US citizens and legal residents,¹⁶ the ACA mandated health insurance coverage, called for the expansion of Medicaid to adults earning $\leq 138\%$ of the federal poverty level (FPL), and provided subsidies to those making between 100% and 400% FPL to help purchase individual health insurance. Following the Supreme court ruling allowing states to choose whether or not to expand Medicaid, 32 states (and the District of Columbia) implemented expansions and 18 states did not (as of January 2018).¹⁷ This “natural experiment” presents a unique opportunity to learn whether and to what extent Medicaid expansion can affect health care access and services for low-income patients with diabetes.

Many low-income adults in the United States receive care from community health centers (CHCs). CHCs provide health care to over 25 million people across America, regardless of patients’ insurance status and offer sliding scale fees and low-income discounts to assist with cost.¹⁸ Despite this discounted care, significant cost barriers still exist for uninsured patients. For example, one study estimated the average mean price for a CHC office visit for an uninsured patient was \$89.¹⁹ These financial barriers likely contribute to lower rates of preventive services, specialty care, and diagnostic procedures among uninsured compared with insured CHC patients.^{3,11,20,21} In fact, CHC visit patterns and services received at visits are different among patients with and without health insurance.²² Following ACA implementation, CHCs saw a sharp rise in Medicaid-paid visits and a decrease in uninsured visits,^{23,24} most notably in expansion states. In addition, CHCs continue to ac-

cept new patients with Medicaid coverage, which is not the case for other primary care providers.^{25,26}

This longitudinal, 4-year study used electronic health record (EHR) data from CHCs in 13 states (9 expansion states, 4 nonexpansion states) to compare changes in payer mix and primary care visit rates in expansion and nonexpansion states among 3 cohorts of patient populations, those with diabetes, prediabetes, and no diabetes. Specifically, we (1) compared clinic-level uninsured, Medicaid-insured, and privately insured visit rates within and between expansion and nonexpansion states before and after the ACA Medicaid expansion among 3 cohorts of patient populations; and (2) assessed whether there was a change in clinic-level total, primary care, and preventive care visits and diabetes screening rates in expansion versus nonexpansion states from pre-ACA to post-ACA Medicaid expansion. We hypothesized that CHCs in expansion states would see an increase in insured visits and overall visits among all 3 patient populations but expected the greatest increase to be among those with diabetes, as they have ongoing disease management needs. We also hypothesized that in nonexpansion states, CHC patient populations would experience a growth in insured visits and overall visits, but the increase would be smaller than in expansion states due to private health insurance cost sharing. These results will describe population-level changes in the type of payment CHCs received and health care services CHCs provided following the ACA Medicaid expansion and whether these changes were different among the 3 population cohorts.

Methods

Data Source

EHR data were obtained from the Accelerating Data Value Across a National Community Health Center Network (ADVANCE) clinical data research network (CDRN) of PCORNnet.²⁷ The ADVANCE CDRN is a unique “community laboratory” for research with underrepresented populations receiving care in CHCs. The 4-year study period included 2-years pre-ACA (1/1/2012 to 12/31/2013) and 2-years post-ACA (1/1/2014 to 12/31/2015) Medicaid expansion. Data for >5 million ambulatory visits were collected for 872,378 non-pregnant patients aged 19 to 64 years, with ≥ 1 ambulatory visit between 1/1/2012 and 12/31/2015

($n = 483,912$ in expansion states, $n = 388,466$ in nonexpansion states) from 198 primary care CHCs “live” on their EHR system as of 1/1/2012 ($n = 131$ CHCs in expansion states, $n = 67$ CHCs in non-expansion states).

Data Quality

EHR data contain information on payer types as well as billable codes for services performed at each visit; as these data are used for billing purposes, they represent reliable information on insurance status and services received at each visit, overcoming the limitations of recall bias and potential misinformation from survey respondents who may be confused regarding their insurance coverage status, especially given the complexity of the US health insurance system. In addition, CHCs are required to collect and report many individual-level demographic data variables to the US Health Resources and Services Administration to receive funding or designation under the Health Center Program. Therefore, EHR data from CHCs contain self-reported data on race/ethnicity, language, and FPL on nearly all patients.

Definitions of Population Cohorts

We used a validated computable phenotype to identify the patient population with diabetes.^{28–32} Those in the diabetes cohort had any combination of 2 diabetes-relevant “events,” which included outpatient International Classification of Disease-9 or 10 diabetes-relevant diagnoses code(s), diagnostic-level laboratory results [1 glycohemoglobin (HbA1c) or glucose test meeting criteria for diabetes], and/or an order for antihyperglycemic agents no more than 730 days apart.^{28–32} Patient populations who had only 1 diabetes-relevant event were considered unconfirmed diabetes and were included in the prediabetes cohort. Patients were also included in the prediabetes cohort if they had at least 1 HbA1c result between 5.7% to 6.4% and/or a fasting glucose between 100 mg/deciliter to 125 mg/deciliter, and no diabetes-relevant events. All others were included in the population cohort of patients without diabetes (referred to as no diabetes). Because the objective of this study was to assess changes in CHC population coverage and patterns in total, primary care, and preventive care visits and diabetes screening rates, we included patients diagnosed with diabetes and prediabetes at any time during the entire study period (pre-ACA or post-ACA). Most prediabetes

(95%) and diabetes (68%) patients received a diagnosis before 2014.

Medicaid Expansion Status

We defined pre-Medicaid and post-Medicaid expansion periods based on if a state expanded Medicaid. We defined expansion states as those that expanded Medicaid on 1/1/2014 and nonexpansion states as those that had not expanded by 12/31/2015. Expansion states included California, Hawaii, Maryland, New Mexico, Ohio, Oregon, Rhode Island, Washington, and Wisconsin; and nonexpansion states included Florida, Kansas, Missouri, and North Carolina. Wisconsin was considered an expansion state because although they did not expand Medicaid to 138% FPL, they opened enrollment to adults with 100% FPL on 1/1/2014, thus behaving more like an expansion state.^{12,15,23}

Insurance Coverage

For this visit-based study, we determined patient insurance status at the time of care receipt and knew how insurance status differed from visit to visit. These visit-level data were aggregated to the CHC level to estimate insurance mix pre-ACA and post-ACA and provide information on how the insurance visit mix changed overall between expansion and nonexpansion CHCs. Visit coverage was based on the primary payer listed for each visit and grouped as Medicaid, private, uninsured, or other public. Other public included (1) Medicare (for disability-eligible patients, as our patient population was under age 65); and, (2) grant programs that cover specific services such as breast and cervical cancer screening, family planning, and HIV/AIDS care. In CHCs, most private insurance is directly purchased as opposed to employer-sponsored coverage. CHCs serve patient populations who are predominantly low-income (71% with FPL below 100%), and national CHC data show that less than 30% of adults with <100% FPL have employer-sponsored coverage.¹⁸ In addition, Census data show that while direct-purchase insurance increased by 29% nationwide post-ACA, employer-sponsored insurance changed by <1%.³³ Therefore, any changes in private insurance visit rates in CHC likely reflect an increase in direct-purchase insurance.

Health Care Services

Health care use included total visits (rates of all billable encounters), primary care visits (all primary care, new patient, and established patient visits), and receipt of preventive care services. New patient visits included those who had not received services in the past 3 years, following the Current Procedural Terminology. Established patients with new types of insurance coverage were not considered new patients. Preventive care visits indicated non-problem-focused encounters for general wellness and prevention (eg, annual exams and physicals). Visit types were determined using the primary Current Procedural Terminology code for each visit and primary care provider type. Diabetes screening included both HbA1c and fasting glucose testing.

Analysis

We summarized the demographic characteristics of CHC patient populations in expansion and nonexpansion states stratified by population cohort. We estimated clinic-level insurance types (uninsured, Medicaid, private, and other public); total, primary care, and preventive care visit rates; and diabetes screening in both the pre-ACA and post-ACA periods, stratified by diabetes status (diabetes, prediabetes, and no diabetes). We computed visit rates by dividing the number of visits in a given interval (ie, pre-ACA or post-ACA period) by the total number of adult patients seen in a clinic over the study period, scaled to 1000 patients per month. We estimated post-expansion versus pre-expansion rate ratios (RR) within each expansion group and difference-in-difference ratios (comparing prepost changes in rates between expansion groups) with 95% CIs by fitting generalized estimating equation Poisson models with robust sandwich variance estimators for each outcome. We clustered all models by CHC and used an exchangeable covariance structure to account for within-clinic temporal correlation for each diabetes status level. We produced unadjusted and adjusted estimates of RR and difference-in-difference ratios. In all adjusted models, we included the following covariates associated with differences in health insurance status^{23,24}: sociodemographic variables (clinic-level distributions of sex, age, race/ethnicity, and FPL), urban versus rural clinic location, and state-level factors (type of health insurance marketplace [state-run or federally facilitated], 2013 minimum wage, 2013 uninsured

rate, 2013 unemployment rate, and prevalence of diabetes among CHC patients in 2013). Of note, there was no evidence of multicollinearity between the 2013 uninsured rate and 2013 unemployment rate (correlation, <0.5). We conducted a sensitivity analysis excluding the state-level variables from models; results were not altered (see Appendix). Analyses were conducted using R version 3.4.0, and statistical significance was set at type I error of 5%. This study was approved by the institutional review board.

Results

Table 1 describes the patient population and facility characteristics by expansion and diabetes status. The distribution of patient characteristics across the 3 population cohorts was similar in expansion and nonexpansion states. A greater proportion of the population with diabetes were male and older (40 to 64 years of age), relative to those with prediabetes or no diabetes. Notably, a large proportion of the patient population in nonexpansion states and expansion states had incomes $\leq 138\%$ FPL (the expanded Medicaid eligibility criteria). In both expansion and nonexpansion states, CHCs saw an increase in new patient visits in the postperiod, especially in the no diabetes cohort. With this increase in new patient visits, CHCs saw an equivalent decrease in established patient visits. Yet, >70% of visits in the postperiod were established patient visits in the diabetes and prediabetes cohorts.

Change in Rates of Payment Types by Diabetes Status and Expansion Status

Before ACA implementation, CHCs in expansion and nonexpansion states saw greater rates of uninsured visits among patient populations with diabetes and prediabetes than among those with no diabetes (Table 2). The decline in uninsured visits after ACA implementation was significantly greater in expansion states, with a decrease of >50% compared with nonexpansion states with <20% change. CHCs saw similar drops in uninsured visit rates among all 3 cohorts (diabetes, prediabetes, and no diabetes).

The rate of Medicaid visits (Table 3) at CHCs in expansion states increased the most among the prediabetes cohort (RR, 1.71; 95% CI, 1.53–1.88), a 71% increase compared with an increase of 57% for the diabetes cohort (RR, 1.57; 95% CI, 1.43–

Table 1. Characteristics of Community Health Centers and Patients in the Accelerating Data Value Across a National Community Health Center Network Clinical Data Research Network from 2012 to 2015

States	Nonexpansion States			Expansion States		
	Community health center/state-level covariates					
	FL, KS, MO, NC			CA, HI, MD, NM, OH, OR, RI, WA, WI		
No. eligible CHCs	67			131		
No. rural CHCs (%)	3 (4.5)			23 (17.6)		
No. urban CHCs (%)	64 (95.5)			108 (82.4)		
Marketplace type, n (%)						
Federally supported, state-based	0			75 (57.3)		
Federal	67 (100)			13 (9.9)		
State	0			43 (32.8)		
Minimum wage, 2013, mean \$/h	\$7.73			\$8.26		
Unemployment rate, 2013, mean %	7.26%			7.91%		
Adult uninsured rate, 2013, mean %	25.07%			17.62%		
Patient-level covariates						
Count	Diabetes	Prediabetes	No Diabetes	Diabetes	Prediabetes	No Diabetes
Total no. patients	48,382	69,476	270,608	58,205	87,020	338,687
Established patient visit count pre-ACA, n	217,063	238,129	476,218	379,394	414,318	806,398
Established patient visit count post-ACA, n	168,026	198,079	310,978	332,773	384,859	583,975
New patient visit count pre-ACA, n	8,928	9,389	11,578	29,895	11,998	13,134
New patient visit count post-ACA, n	58,028	73,017	167,133	298,178	76,325	105,671
Female, n (%)	27,485 (56.8)	42,546 (61.2)	173,390 (64.1)	31,250 (53.7)	46,312 (53.2)	191,485 (56.5)
Age group, n (%)						
19 to 25 y	1,375 (2.8)	3,745 (5.4)	59,453 (22.0)	1,923 (3.3)	5,867 (6.7)	81,296 (24.0)
26 to 39 y	7,834 (16.2)	16,511 (23.8)	101,157 (37.4)	11,043 (19.0)	24,507 (28.2)	132,408 (39.1)
40 to 64 y	39,173 (81.0)	49,220 (70.8)	109,998 (40.6)	45,239 (77.7)	56,646 (65.1)	124,983 (36.9)
Household income, n (%)						
≤100% FPL	33,779 (69.8)	46,543 (67.0)	181,044 (66.9)	33,721 (57.9)	50,324 (57.8)	182,657 (53.9)
100% to 138% FPL	4,912 (10.2)	6,856 (9.9)	27,891 (10.3)	7,199 (12.4)	11,004 (12.6)	37,128 (11.0)
≤138% FPL	5,834 (12.1)	9,329 (13.4)	32,457 (12.0)	8,099 (13.9)	13,304 (15.3)	52,517 (15.5)
Unknown	3,857 (8.0)	6,748 (9.7)	29,216 (10.8)	9,186 (15.8)	12,388 (14.2)	66,385 (19.6)
Race/ethnicity, n (%)						
Hispanic	16,935 (35.0)	27,100 (39.0)	101,690 (37.6)	22,230 (38.2)	28,572 (32.8)	98,218 (29.0)
NH non-white	17,165 (35.5)	21,070 (30.3)	71,111 (26.3)	9,431 (16.2)	12,800 (14.7)	48,178 (14.2)
NH white	12,461 (25.8)	18,481 (26.6)	85,897 (31.7)	24,294 (41.7)	42,040 (48.3)	173,868 (51.3)
Unknown	1,821 (3.8)	2,825 (4.1)	11,910 (4.4)	2,250 (3.9)	3,608 (4.1)	18,423 (5.4)

ACA, Affordable Care Act; CHC, community health center; FPL, federal poverty level; NH, non-Hispanic.

1.71) and 60% for the no diabetes cohort (RR, 1.60; 95% CI, 1.46–1.73). In nonexpansion states, the rate of privately insured visits more than tripled for the prediabetes cohort (RR, 3.17; 95% CI, 2.02–3.38) and more than doubled for the diabetes (RR, 2.77; 95% CI, 1.79–3.75) and no diabetes (RR,

2.70; 95% CI, 2.02–3.38) cohorts; despite the large increases in privately insured visit rates from pre-ACA to post-ACA, the post-ACA rate of insured visits (private + Medicaid insured) was lower in nonexpansion states than the insured visit rate in expansion states.

Table 2. Visit Rates Before and After Affordable Care Act, Accelerating Data Value Across a National Community Health Center Network Clinical Data Research Network from 2012 to 2015*

Patient Information	Unadjusted Visit Rate				Covariate Adjusted Visit Rate					
	Nonexpansion State		Expansion State		Nonexpansion State		Absolute Rate Difference	Expansion State		Absolute Rate Difference
	Pre-ACA	Post-ACA	Pre-ACA	Post-ACA	Pre-ACA	Post-ACA		Pre	Post	
Uninsured										
Diabetes	61.2	52.0	75.3	33.2	43.2	36.7	−6.5	63.1	27.8	−35.3
Prediabetes	52.6	45.1	52.4	25.2	39.8	34.1	−5.7	50.1	24.1	−26.0
No diabetes	30.2	24.6	31.4	14.7	27.6	22.5	−5.1	37.2	17.4	−19.8
Medicaid										
Diabetes	37.4	37.1	80.0	125.6	35.8	35.5	−0.3	62.7	98.4	35.7
Prediabetes	29.4	31.4	70.4	120.0	27.9	29.9	2.0	48.9	83.5	34.6
No diabetes	15.0	15.0	31.7	50.6	20.6	20.5	−0.1	36.5	58.3	21.8
Privately insured										
Diabetes	9.7	26.9	34.0	37.5	16.0	44.2	28.2	19.2	21.2	2.0
Prediabetes	9.9	31.5	31.3	34.5	18.0	57.0	39.0	20.2	22.3	2.1
No diabetes	4.7	12.6	18.4	19.5	12.0	32.3	20.3	14.5	15.4	0.9
Other public										
Diabetes	36.4	28.8	39.9	43.2	47.7	37.7	−10.0	21.6	23.4	1.8
Prediabetes	28.7	24.1	26.9	28.0	48.3	40.5	−7.8	15.8	16.4	0.6
No diabetes	13.2	9.7	7.8	7.0	29.6	21.7	−7.9	6.1	5.5	−0.6
Total Visits										
Diabetes	144.8	144.8	229.2	239.5	169.9	169.9	0.0	177.8	185.8	8.0
Prediabetes	120.6	132.1	181.0	207.7	148.8	163.0	14.2	140.2	160.9	20.7
No diabetes	63.1	61.9	89.3	91.9	99.1	97.2	−1.9	90.9	93.6	2.7
Primary care visits										
Diabetes	122.6	120.6	190.1	195.8	132.9	130.7	−2.2	140.7	144.9	4.2
Prediabetes	103.6	111.6	152.8	173.6	120.9	130.2	9.3	118.0	134.1	16.1
No diabetes	54.8	52.7	75.4	76.6	90.8	87.4	−3.4	86.2	87.7	1.5
Preventive care visits										
Diabetes	4.7	5.9	4.1	4.6	6.6	8.3	1.7	2.9	3.2	0.3
Prediabetes	7.0	9.4	5.2	6.8	10.2	13.8	3.6	4.5	5.9	1.4
No diabetes	5.8	7.0	4.6	5.1	9.9	11.9	2.0	4.3	4.7	0.4
Glucose testing										
Diabetes	67.4	81.9	76.6	87.6	65.4	79.5	14.1	78.2	89.5	11.3
Prediabetes	36.3	45.0	35.8	44.2	33.9	42.0	8.1	35.3	43.6	8.3
No diabetes	12.2	14.7	11.1	14.3	18.5	22.3	3.8	19.3	24.8	5.5
HbA1c screening										
Diabetes	52.3	76.3	65.5	82.7	53.8	78.4	24.6	70.9	89.5	18.6
Prediabetes	16.0	28.0	10.2	20.3	14.4	25.3	10.9	10.4	20.7	10.3
No diabetes	2.6	4.3	1.3	3.0	3.2	5.5	2.3	2.3	5.2	2.9

ACA, Affordable Care Act.

*Nonexpansion states: FL, KS, MO, and NC; expansion states: CA, HI, MD, NM, OH, OR, RI, WA, and WI. Visit rates were by dividing the number of visits in a given interval (ie, pre-ACA or post-ACA period) by the total number of adult patients seen in a clinic over the study period, scaled to 1000 patients per month. Total visits: Current Procedural Terminology (CPT) 99201 to 99205, 99212 to 99215, 99241 to 99245, 99381 to 99384, 99385 to 99387, or 99391 to 99397 with MD, DO, NP, PA, midwife, or resident with no specialty listed. Generalized estimating equation Poisson models adjusted for clinic-level demographic distributions (sex, age, federal poverty level, primary language, race, and ethnicity), state-level factors (marketplace type, 2013 minimum wage and unemployment rates, and 2013 uninsured rate), and 2013 state-level CHCs diabetes prevalence (<https://bphc.hrsa.gov/datareporting/index.html>) clustered by facility to account for within-facility correlation.

Table 3. Adjusted Rate Ratios and Difference-in-Difference in Visit Rates by Diabetes Status and Medicaid Expansion Status, Accelerating Data Value Across a National Community Health Center Network Clinical Data Research Network from 2012 to 2015*

Patient Information	Nonexpansion	Expansion	Expansion vs Nonexpansion DD Ratio (95% CI)
	Post-ACA vs Pre-ACA RR (95% CI)	Post-ACA vs Pre-ACA RR (95% CI)	
Uninsured			
Diabetes	0.85 (0.76–0.94)	0.44 (0.39–0.49)	0.52 (0.44–0.60)
Prediabetes	0.86 (0.76–0.95)	0.48 (0.42–0.54)	0.56 (0.47–0.65)
No diabetes	0.82 (0.74–0.89)	0.47 (0.42–0.52)	0.57 (0.50–0.65)
Medicaid			
Diabetes	0.99 (0.92–1.07)	1.57 (1.43–1.71)	1.58 (1.40–1.77)
Prediabetes	1.07 (0.98–1.16)	1.71 (1.53–1.88)	1.59 (1.38–1.80)
No diabetes	1.00 (0.91–1.09)	1.60 (1.46–1.73)	1.60 (1.40–1.80)
Privately insured			
Diabetes	2.77 (1.79–3.75)	1.10 (0.96–1.25)	0.40 (0.25–0.55)
Prediabetes	3.17 (2.03–4.31)	1.10 (0.90–1.31)	0.35 (0.21–0.49)
No diabetes	2.70 (2.02–3.38)	1.06 (0.94–1.18)	0.39 (0.28–0.50)
Other public			
Diabetes	0.79 (0.66–0.92)	1.08 (0.97–1.20)	1.37 (1.10–1.64)
Prediabetes	0.84 (0.65–1.03)	1.04 (0.86–1.22)	1.24 (0.89–1.59)
No diabetes	0.73 (0.59–0.87)	0.90 (0.77–1.04)	1.24 (0.94–1.53)
Total visit			
Diabetes	1.00 (0.93–1.07)	1.05 (0.99–1.09)	1.04 (0.95–1.14)
Prediabetes	1.10 (1.00–1.19)	1.15 (1.09–1.20)	1.05 (0.94–1.16)
No diabetes	0.98 (0.91–1.06)	1.03 (0.98–1.08)	1.05 (0.95–1.15)
Primary care			
Diabetes	0.98 (0.91–1.06)	1.03 (0.98–1.07)	1.05 (0.96–1.14)
Prediabetes	1.08 (0.98–1.17)	1.14 (1.08–1.19)	1.05 (0.95–1.16)
No diabetes	0.96 (0.88–1.04)	1.02 (0.96–1.07)	1.06 (0.95–1.16)
Preventive Care			
Diabetes	1.26 (1.03–1.50)	1.12 (1.02–1.23)	0.89 (0.71–1.08)
Prediabetes	1.35 (1.13–1.58)	1.31 (1.19–1.42)	0.96 (0.79–1.14)
No diabetes	1.20 (1.04–1.37)	1.11 (1.01–1.20)	0.92 (0.77–1.07)
Glucose testing			
Diabetes	1.22 (1.11–1.32)	1.14 (1.09–1.20)	0.94 (0.84–1.04)
Prediabetes	1.24 (1.13–1.35)	1.23 (1.17–1.30)	0.99 (0.89–1.09)
No diabetes	1.20 (1.09–1.31)	1.29 (1.21–1.37)	1.07 (0.95–1.19)
HbA1c screening			
Diabetes	1.46 (1.35–1.56)	1.26 (1.21–1.31)	0.87 (0.80–0.94)
Prediabetes	1.76 (1.56–1.95)	2.00 (1.80–2.19)	1.14 (0.87–1.40)
No diabetes	1.70 (1.45–1.96)	2.26 (1.97–2.56)	1.33 (1.09–1.57)

ACA, Affordable Care Act; RR, rate ratio; CI, confidential interval; DD, difference-in-difference testing post-period versus pre-period in expansion versus non-expansion states.

*Nonexpansion states: FL, KS, MO, and NC; expansion states: CA, HI, MD, NM, OH, OR, RI, WA, and WI. Visit rates were by dividing the number of visits in a given interval (ie, pre-ACA or post-ACA period) by the total number of adult patients seen in a clinic over the study period, scaled to 1000 patients per month. Boldfaced values indicate statistically significant difference, $P < .05$. Total visits: CPT 99201 to 99205, 99212 to 99215, 99241 to 99245, 99381 to 99384, 99385 to 99387, or 99391 to 99397 with MD, DO, NP, PA, midwife, or resident with no specialty listed. Generalized estimating equation Poisson models adjusted for clinic-level demographic distributions (sex, age, federal poverty level, primary language, race, and ethnicity), state-level factors (marketplace type, 2013 minimum wage and unemployment rates, 2013 uninsured rate), and 2013 state-level CHCs diabetes prevalence (<https://bphc.hrsa.gov/datareporting/index.html>) clustered by facility to account for within-facility correlation. DD estimates obtained from linear combinations of time \times expansion status interaction.

Change in Rates of Visit Types by Diabetes Status and Expansion Status

In both expansion and nonexpansion states, CHCs' rates of total visits post-ACA were highest among the cohort with diabetes. Overall, the rates of total and primary care visits did not increase from pre-ACA to post-ACA in expansion and nonexpansion states for the diabetes or no diabetes cohorts. Among the prediabetes cohort, total and primary care visit rates at CHCs in expansion significantly increased by 15% (RR, 1.15; 95% CI, 1.09–1.20) and 14% (RR, 1.14; 95% CI, 1.08–1.19), respectively. The total visit rate also increased in nonexpansion states for the prediabetes cohort (RR, 1.10; 95% CI, 1.10–1.19).

After ACA implementation, preventive care visits for the prediabetes cohort increased 31% in expansion state CHCs (RR, 1.31; 95% CI, 1.19–1.42) and 35% in nonexpansion state CHCs (RR, 1.35; 95% CI, 1.13–1.58). Among the prediabetes cohort in expansion states, rates for HbA1c screenings doubled (RR, 2.00; 95% CI, 1.80–2.19) and rates for glucose testing increased by 23% (RR, 1.23; 95% CI, 1.17–1.30). Among the prediabetes cohort in nonexpansion states, HbA1c screenings increased 76% and glucose testing increased 24%. Among the cohort with diabetes, HbA1c tests increased less in expansion states than in nonexpansion state CHCs (26% vs 46%, respectively). Among the cohort with no diabetes, rates of screening for HbA1c and glucose testing increased in both expansion and nonexpansion state CHCs.

Conclusions

After ACA Medicaid expansion, rates of total and primary care visits did not change significantly for CHC patient populations with diabetes or those with no diabetes in expansion and nonexpansion states. Instead, CHCs experienced a shift in visit payer types (from uninsured to insured visits) rather than an increase in health care use. Patient populations with prediabetes saw a slight increase in total visit rates in both expansion (15%) and nonexpansion (14%) state CHCs.

Although total visit rates remained fairly stable, rates of insured CHC visits increased and rates of uninsured visits decreased among all 3 population cohorts included in this study in both expansion and nonexpansion state CHCs, which was reported previously for CHC patients.^{12–15} When compar-

ing visit rates among the 3 population cohorts, those with diabetes had higher total visit rates (2.2/y) than those with prediabetes (1.9/y) or no diabetes (1.1/y). This total visit rate for those with diabetes is similar to national averages.³⁴

In expansion states, CHCs saw an increase in Medicaid-insured visits for all 3 population cohorts included in the study. Nonexpansion state CHCs had a surge in privately insured visits, especially among the populations of patients with diabetes and prediabetes. This change is likely due to (1) a shift in the type of visits from uninsured to privately insured due to the individual mandate, (2) motivated patients who obtained insurance to help manage existing health conditions, and (3) an influx of new patients with private insurance. Paradise et al³⁵ showed that CHCs are caring for a larger number of patients with private insurance post-ACA compared with pre-ACA because these patients experienced difficulties affording high deductibles and are in private plans with significant cost sharing. Han et al³⁶ highlighted increased funding for CHCs following the implementation of the ACA, which allowed CHCs to hire additional staff members and boost capacity for care. Indeed, the Uniform Data System (<https://bphc.hrsa.gov>) reports showed that the number of key staff members (eg, physicians, nurses, and physician assistants) have progressively increased to care for this influx of patients. Despite improvement, uninsured visit rates in nonexpansion states were higher post-ACA than in expansion states, suggesting that financial barriers may still exist for uninsured patients to acquire insurance coverage in nonexpansion states.

Contrary to our hypothesis, total visit rates for the population of patients with diabetes pre-ACA versus post-ACA were stable, which is likely due to the accessibility of care provided by CHCs. In addition to accessible care, CHCs provide high-quality care; they exceed Healthy People 2020 goals in various health outcomes, including diabetes control.¹⁸ These findings reinforce the importance of CHCs for delivering care to vulnerable populations with chronic disease. Notably, even though the total number of visits for the population of patients with diabetes did not change, diabetes-specific screening rates increased, suggesting that insurance coverage had a positive impact on the receipt of timely preventive care.

The population of patients with prediabetes had an increase in total visit rates after ACA implemen-

tation, and this prediabetes cohort also experienced the most sizable rise in rates of diabetes-specific screenings, especially in expansion state CHCs. The greatest change was observed for rates of HbA1c screenings, a critical preventive service for monitoring this population at risk of developing diabetes.²

The significant increase in screening tests for the diabetes and prediabetes cohorts suggest that although uninsured patient populations were able to access visits pre-ACA, gaining insurance helped many of them access needed laboratory services post-ACA, which is consistent with previous findings in a much smaller subset of CHC patients.²² Furthermore, the ACA included provisions that required all payers to fully cover many preventive services, including diabetes screening, and imposed strict limitations on cost sharing (eg, copayments and deductibles) for others. It is likely that these provisions benefited even CHC patient populations who had insurance pre-ACA by removing cost barriers to receiving preventive services, especially among those with high-deductible private insurance plans.¹¹ Because this provision was enacted before the study period, it likely did not impact our findings.

Proposals to “repeal and replace” the ACA suggest loosening or eliminating cost sharing limitations.³⁷ Yet, insurance plans with significant cost sharing and high out-of-pocket costs create critical access barriers to medical care, including specialty care and prescription medications essential for patients with chronic conditions. Under the ACA, low-income patients making <150% FPL can enroll in plans with significantly lower cost sharing. Thus, removing requirements for payers to cover preventive services and enabling payers to increase cost sharing for patients with diabetes or prediabetes could be harmful for access to needed preventive care.

This study has some limitations; it includes CHCs who are part of the ADVANCE network and, therefore, results may not be representative of all clinics, states, or expansion status groups. This analysis is visit based and does not assess the CHC population without visits. Although we adjusted for clinic panel and economic differences, unmeasured confounders, such as clinic-specific insurance outreach efforts, private insurance details (eg, deductibles and copayments), provider-patient communication, context and content of the visits, and

citizenship status could impact our results. Patients who gained health insurance post-ACA may seek care outside CHCs; however, evidence suggests that most established CHC patients who gain coverage continue to receive care from CHCs.^{38,39} In addition, the present analysis did not assess whether the diabetes screenings were conducted as recommended. Future patient-level work is needed to assess whether the observed increase in HbA1c testing follows the recommended screening interval and eligibility. Some states (California, Washington, and Minnesota) expanded Medicaid eligibility early, which may attenuate the observed changes from pre-expansion to postexpansion states. Lastly, this analysis does not address changes in HbA1c or other patient outcomes. Future work should assess whether these changes improved patients’ health outcomes.

In conclusion, CHCs do an excellent job of providing access to care for vulnerable populations. After implementation of the ACA, CHCs experienced a reduction in uninsured visit rates and an increase in Medicaid-insured visit rates, which has likely enabled them to provide more comprehensive services to their vulnerable patients. For example, the CHC population with prediabetes had increased rates of diabetes screenings after ACA implementation. The various different options to repeal, replace, under budget, or alter the ACA could lead to millions of low-income patients who gained coverage under the ACA to lose coverage, benefits, financial assistance, and/or consumer protection. Although the findings show that CHC populations, especially those with diabetes or prediabetes, receive health care services from CHCs regardless of health insurance status, they also show that gaining health insurance coverage after implementation of the ACA was associated with improved receipt of preventive services, which reduces health care expenditures and saves lives.⁴⁰

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Appendix: Community Health Center Visit Rates Before and After Affordable Care Act in Expansion and Nonexpansion States, Accelerating Data Value Across a National Community Health Center Network Clinical Data Research Network from 2012 to 2015

Patient Information	Model Excluding State-Level Factors*				Model Adjusting for State-Level Factors Excluding DM Prevalence†				Model Adjusting for State-Level Factors and State DM Prevalence‡			
	Nonexpansion Visit Rate		Expansion Visit Rate		Nonexpansion Visit Rate		Expansion Visit Rate		Nonexpansion Visit Rate		Expansion Visit Rate	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Uninsured												
DM	50.1	42.6	62.9	27.8	43.2	36.7	63.1	27.8	46.6	39.6	61.9	27.3
Pre-DM	44.8	38.4	45.4	21.8	39.8	34.1	50.1	24.1	42.8	36.7	48.6	23.3
No DM	36.5	29.8	40.1	18.8	27.6	22.5	37.2	17.4	29.4	23.9	35.7	16.7
Medicaid												
DM	32.9	32.7	67.8	106.3	35.8	35.5	62.7	98.4	37.0	36.7	62.8	98.5
Pre-DM	25.2	27.0	53.6	91.4	27.9	29.9	48.9	83.5	28.6	30.7	48.5	82.7
No DM	19.1	19.1	40.0	63.9	20.6	20.5	36.5	58.3	20.8	20.7	35.9	57.3
Privately insured												
DM	9.4	26.0	27.8	30.7	16.0	44.2	19.2	21.2	16.6	46.0	19.2	21.2
Pre-DM	10.4	33.1	30.8	34.0	18.0	57.0	20.2	22.3	18.6	58.9	19.9	22.0
No DM	6.0	16.1	19.5	20.6	12.0	32.3	14.5	15.4	12.1	32.8	14.1	15.0
Other public												
DM	27.5	21.7	32.1	34.8	47.7	37.7	21.6	23.4	49.2	38.8	21.4	23.2
Pre-DM	26.3	22.1	23.5	24.4	48.3	40.5	15.8	16.4	49.7	41.6	15.6	16.2
No DM	15.0	11.0	8.0	7.2	29.6	21.7	6.1	5.5	30.4	22.2	6.0	5.4
Total visit												
DM	139.1	139.1	210.0	219.5	169.9	169.9	177.8	185.8	180.6	180.7	176.7	184.7
Pre-DM	116.8	128.0	160.5	184.1	148.8	163.0	140.2	160.9	157.0	171.9	137.3	157.6
No DM	74.9	73.4	99.4	102.3	99.1	97.2	90.9	93.6	102.6	100.6	87.7	90.3
Primary care												
DM	109.1	107.3	162.9	167.7	132.9	130.7	140.7	144.9	140.3	138.0	140.3	144.5
Pre-DM	96.4	103.8	134.5	152.7	120.9	130.2	118.0	134.1	126.6	136.4	116.0	131.7
No DM	70.4	67.8	94.8	96.3	90.8	87.4	86.2	87.7	93.5	90.0	83.5	84.9
Preventive care												
DM	4.7	5.9	4.1	4.7	6.6	8.3	2.9	3.2	7.1	8.9	2.9	3.2
Pre-DM	6.6	8.9	6.0	7.8	10.2	13.8	4.5	5.9	10.8	14.7	4.4	5.7
No DM	5.6	6.7	4.8	5.3	9.9	11.9	4.3	4.7	10.4	12.5	4.1	4.5
Glucose testing												
DM	71.6	87.0	71.5	81.8	65.4	79.5	78.2	89.5	64.0	77.8	78.6	89.8
Pre-DM	38.3	47.5	33.2	40.9	33.9	42.0	35.3	43.6	33.2	41.2	35.6	43.9
No DM	20.9	25.2	18.2	23.5	18.5	22.3	19.3	24.8	18.2	21.9	19.5	25.1
HbA1c screening												
DM	58.8	85.7	68.5	86.4	53.8	78.4	70.9	89.5	57.3	83.5	70.3	88.7
Pre-DM	15.7	27.6	9.9	19.8	14.4	25.3	10.4	20.7	15.2	26.7	10.1	20.2
No DM	3.4	5.9	2.2	5.0	3.2	5.5	2.3	5.2	3.3	5.7	2.2	5.1

ACA, Affordable Care Act; DM, diabetes mellitus; pre, pre-ACA; post, post-ACA.

*Adjusted for clinic-level distributions of sex, age, race/ethnicity, and federal poverty level, urban vs. rural clinic location.

†Adjusted for clinic-level distributions of sex, age, race/ethnicity, and federal poverty level, urban vs. rural clinic location, and state-level factors (type of health insurance marketplace [state-run or federally facilitated], 2013 minimum wage, 2013 uninsured rate, and 2013 unemployment rate).

‡Adjusted for clinic-level distributions of sex, age, race/ethnicity, and federal poverty level, urban vs. rural clinic location, and state-level factors (type of health insurance marketplace [state-run or federally facilitated], 2013 minimum wage, 2013 uninsured rate, and 2013 unemployment rate), state-level 2013 CHCs DM prevalence (source, HRSA, Health Center Data & Reporting, <https://bphc.hrsa.gov/datareporting/index.html>).