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Cervical and colorectal cancer screening prevalence before and after Affordable Care Act Medicaid expansion

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ABSTRACT

Community health centers (CHCs), which serve socioeconomically disadvantaged patients, experienced an increase in insured visits after the 2014 Affordable Care Act (ACA) coverage options began. Yet, little is known about how cancer screening rates changed post-ACA. Therefore, this study assessed changes in the prevalence of cervical and colorectal cancer screening from pre- to post-ACA in expansion and non-expansion states among patients seen in CHCs.

Electronic health record data on 624,601 non-pregnant patients aged 21–64 eligible for cervical or colorectal cancer screening between 1/1/2012 and 12/31/2015 from 203 CHCs were analyzed. We assessed changes in prevalence and screening likelihood among patients, by insurance type and race/ethnicity and compared Medicaid expansion and non-expansion states using difference-in-difference methodology.

Female patients had 19% increased odds of receiving cervical cancer screening post- relative to pre-ACA in expansion states [adjusted odds ratio (aOR) = 1.19, 95% confidence interval (CI) = 1.09–1.31] and 23% increased odds in non-expansion states (aOR = 1.23, 95% CI = 1.05–1.46): the greatest increase was among uninsured patients in expansion states (aOR = 1.36, 95% CI = 1.16–1.59) and privately-insured patients in non-expansion states (aOR = 1.43, 95% CI = 1.11–1.84). Colorectal cancer screening prevalence increased from 11% to 18% pre- to post-ACA in expansion states and from 13% to 21% in non-expansion states. For most outcomes, the observed changes were not significantly different between expansion and non-expansion states.

Despite increased prevalences of cervical and colorectal cancer screening in both expansion and non-expansion states across all race/ethnicity groups, rates remained suboptimal for this population of socioeconomically disadvantaged patients.

1. Introduction

Community health centers (CHCs) provide services across the United States (US) to nearly 28 million patients every year (National Association of Community Health Centers, 2018). CHCs predominately serve low-income, racial and ethnic minorities, and Medicaid beneficiaries or uninsured patients (National Association of Community Health Centers, 2018). CHCs reduce barriers to cost (through sliding scale fee structures), accept patients without insurance, and tailor services to specific populations (e.g., homeless, non-English speakers) (National Association of Community Health Centers, 2018). Additionally, CHCs offer high quality care, meet or exceed national standards for delivery of many healthcare services (e.g., diabetes care) (National Association of Community Health Centers, 2018), and reduce racial and ethnic health disparities (Politzer et al., 2001; Shi et al., 2004). Despite having access to this excellent care, some patients who seek care in CHCs face barriers to receiving recommended healthcare services (Saloner et al., 2018). For example, patients seen in CHCs have low rates of receiving some preventive care, specialty care, and diagnostic services; rates differ among patients with and without health insurance (Bailey et al., 2015; Gusmano et al., 2002).

In 2010, the Affordable Care Act (ACA) mandated health insurance

Abbreviations: CHC, community health centers; ACA, Affordable Care Act; ADVANCE, Accelerating Data Value Across a National Community health center network; aOR, adjusted odds ratio; CDRN, clinical data research network; CI, confidence interval; EHR, electronic health record; FPL, federal poverty level; FIT, fecal immunochemical test; FOBT, fecal occult blood test; HCN, Health Choice Network; GEE, generalized estimating equation; Pap, Papanicolaou

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cover preventive services (including cancer screenings) at no out of pocket cost to patients. In addition to ensuring access to preventive services, in 2014, the ACA provided federal financial support to states opting to expand Medicaid eligibility to citizens and legal residents earning ≤138% of the federal poverty level (FPL) and introduced health insurance marketplaces for purchase of individual health insurance plans. As of January 1, 2019, 36 states (and the District of Columbia) implemented the ACA Medicaid expansion, while 14 states had not (The Henry J Kaiser Family Foundation, 2018). There are many factors that influence the receipt of preventive cancer screenings including patient characteristics, provider recommendations, health insurance coverage, and costs (Akers et al., 2007; Crawford et al., 2016; Womeodu and Bailey, 1996). As lack of health insurance is associated with delayed cancer screening and being diagnosed with cancer at later stages compared to those with insurance, it is hypothesized that ACA changes in health insurance availability may have an impact on cancer screening rates among the general population and, perhaps, even more so among patients seen in CHCs (American Cancer Society, 2015; Carney et al., 2012; DeVoe et al., 2003; Palmer and Schneider, 2005; Robinson and Shavers, 2008).

Previous studies demonstrated changing patterns of health insurance coverage among patients seen in CHCs after the ACA insurance policies were implemented, including increased rates of Medicaid-paid (in expansion states) and privately-paid (in non-expansion states) visits and decreased uninsured visit rates compared to before the ACA insurance policies were implemented (Angier et al., 2017a; Fedewa et al., 2015; Hong et al., 2017; Hoopes et al., 2016; Huguet et al., 2017). As CHCs have a high percentage of uninsured patients most likely to be impacted by ACA insurance policies, it is a good setting to understand the impact of the ACA insurance policies on cancer screening prevalence. Several studies assessed the impact of some of the ACA provisions on national rates of cancer screenings with mixed results (Sabik and Adunlin, 2017). Some found no improvement in colorectal or breast cancer screening post-ACA (Han et al., 2015; Mehta et al., 2015; Simon et al., 2017), while others found that changes in reducing cost sharing or co-payments were positively associated with screening (Cooper et al., 2016; Jena et al., 2017; Richman et al., 2016; Sabatino et al., 2016). Several studies speculated that ACA Medicaid expansion would exacerbate disparities in cancer screening between expansion and non-expansion states because non-expansion states had lower screening rates pre-ACA than those that expanded (Choi et al., 2015; Sabik et al., 2015). Yet, to date no study focused specifically on how ACA Medicaid expansions impacted cancer screenings by comparing expansion and non-expansion states.

Therefore, the objective to this study is to assess changes in the prevalence of cervical and colorectal cancer screening in a national network of CHCs pre- to post-ACA Medicaid expansion. We focus on cervical and colorectal cancer [limited to fecal occult blood test/fecal immunochemical test (FOBT/FIT)] screenings as they are proven effective (U.S. Preventive Services Task Force, 2018) and available within the clinic setting (i.e., patients do not need to be referred to another healthcare organization to receive the screening). We compared rates in Medicaid expansion and non-expansion states, and evaluated heterogeneity of the Medicaid health policy impact by health insurance type and race/ethnicity.

2. Methods

2.1. Data source

Electronic health record (EHR) data were obtained from the Accelerating Data Value Across a National Community Health Center Network (ADVANCE) clinical data research network (CDRN) of CHCs, one of the CDRNs participating in PCORnet (DeVoe et al., 2014). ADVANCE data used for this study are from OCHIN and Health Choice Network (HCN). OCHIN is the largest network of CHCs utilizing a single instance of one EHR system. Similarly, HCN is a group of CHCs on a single EHR system. The data from OCHIN and HCN are centralized and standardized in the ADVANCE warehouse using the PCORnet common data model. The study CHCs represent approximately 14% of the CHC population across the 13 states included in the analysis; representativeness varies by state, from a high of 83% in Oregon to a low of 4% in North Carolina. The characteristics of the patient population in the ADVANCE data are similar to that of CHCs across the US (National Association of Community Health Centers, 2018). We restricted our clinic study sample to states with CHCs in the ADVANCE network that were 'live' on their EHR system as of 1/1/2012, remained active throughout the study period, and provided adult primary care services; resulting in 203 participating CHCs. Data were collected on all non-pregnant patients (n = 624,601) aged 21–64 at any point in the study period, who were alive throughout the study period, and had at least one ambulatory visit between 2012 and 2015. There is different Medicaid eligibility for pregnant women, which is unrelated to ACA expansions, so they were excluded from this study. Patients included in the screening analyses had to be eligible for colorectal and/or cervical cancer screening during the study period (screening eligibility was assessed separately for the pre-ACA [2012 − 2013] and post-ACA [2014–2015] periods) (Angier et al., 2017b).

Our primary independent variable was state Medicaid expansion status. For the purpose of this study, we defined expansion states in our sample as those that expanded Medicaid on 1/1/2014; non-expansion states were those who did not expand Medicaid through from 1/1/2014 to 12/31/2015. Expansion states in our sample included: California, Hawaii, Maryland, New Mexico, Ohio, Oregon, Rhode Island, Washington, and Wisconsin; non-expansion states were 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 up to 100% FPL on 1/1/2014, thus behaving more like an expansion state (Angier et al., 2017a; Huguet et al., 2017).

2.2. Cancer screening

Our dependent variables were binary outcomes denoting status of receiving cervical cancer screening [Papanicolaou (Pap) test], and FOBT/FIT colorectal cancer screening. Because data on resulted sigmoidoscopy or colonoscopy in this population is often missing from the EHR (these services are conducted outside of the clinics), we focused on FOBT/FIT tests only and did not assess sigmoidoscopy or colonoscopy screenings. We based eligibility for each screening on current guidelines from the US Preventive Services Task Force recommendations relevant during the study time period (https://www.uspreventiveservicestaskforce.org). The eligible population for cervical cancer screening were females aged 21–64 throughout period, without history of hysterectomy. Human papillomavirus co-testing with a 5-year coverage period was taken into account for women ages 30–64. The eligible population for colorectal cancer screening were patients aged 50–64 throughout period, without history of total colectomy. Our analysis assessed whether each screening was received among patients who were eligible pre- and/or post-ACA Medicaid expansion, including an appropriate look-back period for each type of screening (e.g., three years for Pap). In other words, patients could be eligible for the pre-period only, post-period only, or both pre- and post-periods. Specifically, for cervical cancer screening, a woman eligible during the pre-period who received the test at any point during the 24 months would be in the numerator (received service) for the pre-period and the post-period. If a woman was eligible in the pre-period and received the screening in the post-period, this woman would be in the denominator in the pre-period (not received) and the numerator in the post-period (received). We used a similar process for FOBT/FIT received over the 24 months period even though FOBT/FIT is an annual screening. This study does not assess whether patients due for a screening in the pre-

period received it in the post-period as the likelihood of receiving a screening would increase with time, independent of the ACA Medicaid expansion. Breast cancer screening was excluded because results from mammograms are often missing from EHRs and thus difficult to accurately identify overdue or received screenings. We excluded clinical breast exam alone, as the USPSTF does not recommend for or against its use as an effective breast cancer screening test (U.S. Preventive Services Task Force, 2014; U.S. Preventive Services Task Force, 2018).

2.3. Health insurance

EHR data contain information on coverage types and billable codes for services performed at each visit; as these data are used for billing purposes, they provide reliable information on insurance status and services received. Our analyses were stratified to assess the differential impact of Medicaid expansion on cancer screening among patients with Medicaid coverage, privately-purchased insurance, and those who remained uninsured. Other insurance types (e.g., Medicare for disability-eligible patients or grant programs that cover specific services HIV/AIDS care) were excluded from the stratified analyses as eligibility is unrelated to the ACA Medicaid expansion. We used the payer at the last visit within the pre-ACA period and the post-ACA period. Of note, most patients seen in CHCs with private insurance likely directly purchased an individual plan rather than having employer-sponsored coverage (National Association of Community Health Centers, 2018).

2.4. Race/Ethnicity

For race/ethnicity stratified results, we used the following categories: non-Hispanic white, non-Hispanic black, and Hispanic. Other races were excluded as they represent < 10% of the patient population. CHCs are federally 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 most patients.

2.5. Analysis

We computed descriptive statistics for all patients eligible for cervical and/or colorectal cancer screening comparing patient characteristics between those living in expansion and non-expansion states. We calculated the adjusted prevalence of eligible adults who had appropriate cervical and/or colorectal cancer screening in the pre- and post-periods, by expansion status. We then fitted logistic generalized estimating equation (GEE) models with robust sandwich variance estimators to obtain adjusted odds ratios (aORs) comparing post- versus pre-changes in screening *within* expansion groups, and difference-in-difference (DID) estimates with 95% confidence intervals (CI) to test pre-post change *between* expansion groups. GEE models included an indicator for ACA period (pre vs post), Medicaid expansion status (expanded vs. did not expand), and the interaction between these variables. Models were adjusted for age, race/ethnicity, FPL, health insurance type, urban/rural status, number of ambulatory visits, and sex (colorectal model only). GEE models implemented a robust sandwich standard error estimator with a working independent correlation structure of health systems nested within states. We performed an overall model for each outcome that included all eligible patients and we further considered models stratified by insurance status and race/ethnicity. We conducted a sensitivity analysis to assess whether the prevalence of screening changed in expansion and non-expansion states among patients with ≤138% FPL (Medicaid expansion eligibility). Since most patients in CHCs have an FPL ≤138%, the patterns of results were not altered (data not shown). Analyses were performed using SAS software version 9.4 (SAS Institute Inc., Cary, NC, USA); all statistical tests were two-sided and significance was defined as a p-value < 0.05.

Table 1
Community health center and eligible patient characteristics, 2012–2015.

	Expansion states (9 states: CA, HI, MD, NM, OH, OR, RI, WA, WI)	Non-expansion states (4 states: FL, KS, MO, NC)
N primary care CHCs	131	72
Total patients, 2012–2015	329,126	295,475
Total ambulatory encounters, 2012–2015	2,857,880	1,776,472
Last payer mix (% Medicaid/ Medicare/Other Public/ Private/Uninsured)		
Pre-ACA (2012 − 2013)	33.8/6.8/6.1/16.0/ 37.3	22.7/3.3/15.1/7.5/ 51.3
Post-ACA (2014–2015)	52.7/9.3/2.4/17.6/ 18.0	23.0/5.1/9.6/22.3/ 40.0
Patient demographics		
Sex, N (%)		
Female	265,736 (80.7)	243,546 (82.4)
Male	63,390 (19.3)	51,929 (17.6)
Age group, as of 1/1/2014, N (%)		
21–26 y	39,907 (12.1)	32,305 (10.9)
27–39 y	89,876 (27.3)	76,528 (25.9)
40–49 y	56,975 (17.3)	57,046 (19.3)
50–64 y	142,368 (43.3)	129,596 (43.9)
Mean (SD)	43.9 (12.8)	44.4 (12.4)
Race/ethnicity		
Hispanic	101,279 (30.8)	111,044 (37.6)
NH black	33,773 (10.3)	78,585 (26.6)
NH white	164,586 (50.0)	87,618 (29.7)
Other/unknown	29,488 (9.0)	18,228 (6.2)
FPL (last recorded), N (%)		
≤138%	219,804 (66.8)	231,574 (78.4)
> 138%	55,777 (17.0)	35,688 (12.1)
Unknown	53,545 (16.3)	28,213 (9.6)
Urbanicity		
Urban area	223,115 (67.8)	276,881 (93.7)
Urban cluster	73,764 (22.4)	6885 (2.3)
Small town	14,101 (4.3)	9545 (3.2)
Rural	15,882 (4.8)	1935 (0.7)
Unknown	2264 (0.7)	229 (0.1)
Number of ambulatory visits per patient		
Mean (SD), pre-period	2.2 (3.1)	1.5 (2.3)
Median (Q1, Q3), pre-period	1.0 (0, 3)	0.5 (0, 2)
Mean (SD), post-period	2.2 (3.2)	1.5 (2.1)
Median (Q1, Q3), post-period	1.0 (0, 3)	0.5 (0, 2)
Screening eligible denominators		
Cervical pre	176,492	152,915
Cervical post	179,497	158,332
Colorectal pre	92,821	77,135
Colorectal post	99,410	85,488

Note: ACA = Affordable Care Act; CHC = community health center; FPL = Federal poverty level; SD = standard deviation; Q = quarter.

This study was approved by the Oregon Health & Science University Institutional Review Board. Clinical trial registration: NCT02936609.

3. Results

We observed 329,126 patients eligible for screening with > 2.8 million ambulatory visits to expansion state CHCs and 295,475 patients with > 1.7 million visits in non-expansion state CHCs in the four-year study period (Table 1). The visit payer mix followed expected patterns pre- to post-ACA: in expansion states, Medicaid visit rates increased from 33.8% in 2012–2013 to 52.7% in 2014–2015, while uninsured visit rates decreased from 37.3% to 18.0%. In non-expansion states, uninsured visit rates decreased from 51.3% to 40.0% and privately-insured visit rates increased from 7.5% to 22.3% while the proportion of Medicaid visits stayed constant. Compared to the expansion state sample, patients of non-expansion state CHCs were more commonly

Table 2
Cervical cancer screening prevalence, pre- and post-ACA by Medicaid expansion status overall and stratified by insurance group and race/ethnicity.

	Expansion states			Non-expansion states			DID (post/pre, expansion/non-expansion) (95% CI)
	Pre-ACA (2012−13) N (%)	Post-ACA (2014–15) N (%)	Odds of screening, post vs pre 95% (CI)	Pre-ACA (2012–13) N (%)	Post-ACA (2014–15) N (%)	Odds of screening, post vs pre 95% (CI)	
Overall							
Total	176,492 (43.8)	179,497 (48.2)	1.19 (1.09, 1.31)	152,915 (47.6)	158,332 (52.8)	1.23 (1.05, 1.46)	0.97 (0.81, 1.16)
Medicaid	61,165 (48.9)	98,149 (51.6)	1.11 (1.00, 1.24)	34,646 (47.4)	37,317 (53.8)	1.29 (1.08, 1.55)	0.86 (0.70, 1.06)
Private	28,134 (41.3)	31,483 (44.0)	1.12 (0.94, 1.32)	11,439 (45.0)	35,391 (53.9)	1.43 (1.11, 1.84)	0.78 (0.57, 1.07)
Uninsured	67,038 (36.2)	34,939 (43.6)	1.36 (1.16, 1.59)	80,908 (45.5)	65,715 (49.4)	1.17 (0.96, 1.42)	1.16 (0.91, 1.49)
Hispanic							
Total	60,527 (48.2)	61,917 (53.0)	1.21 (1.06, 1.38)	57,781 (54.4)	62,512 (59.8)	1.25 (1.02, 1.54)	0.97 (0.77, 1.21)
Medicaid	17,069 (55.7)	28,021 (54.9)	0.97 (0.80, 1.16)	9362 (50.7)	11,180 (57.1)	1.29 (1.01, 1.65)	0.75 (0.55, 1.01)
Private	7130 (37.8)	8809 (42.8)	1.23 (0.92, 1.65)	2669 (54.5)	14,036 (63.1)	1.42 (0.94, 2.15)	0.87 (0.51, 1.46)
Uninsured	29,178 (42.9)	20,605 (52.6)	1.48 (1.18, 1.84)	37,000 (55.4)	30,298 (58.5)	1.14 (0.91, 1.42)	1.30 (0.94, 1.79)
NH black							
Total	17,770 (43.5)	17,315 (51.2)	1.36 (1.08, 1.71)	43,243 (51.4)	41,934 (56.7)	1.24 (1.04, 1.48)	1.10 (0.82, 1.47)
Medicaid	7993 (52.5)	11,175 (58.4)	1.27 (0.96, 1.68)	11,396 (58.1)	11,895 (62.8)	1.22 (1.02, 1.45)	1.05 (0.75, 1.45)
Private	1668 (42.6)	1968 (52.0)	1.46 (1.14, 1.87)	3826 (48.0)	8609 (56.3)	1.40 (1.14, 1.71)	1.04 (0.75, 1.45)
Uninsured	6281 (32.8)	2761 (42.0)	1.48 (1.19, 1.86)	19,169 (43.5)	14,852 (48.7)	1.24 (0.98, 1.56)	1.20 (0.86, 1.67)
NH white							
Total	83,708 (40.3)	84,418 (44.0)	1.16 (1.07, 1.27)	43,282 (38.8)	44,117 (44.3)	1.25 (1.08, 1.45)	0.93 (0.79, 1.09)
Medicaid	30,081 (44.8)	49,275 (48.8)	1.18 (1.05, 1.32)	12,307 (39.1)	12,437 (46.8)	1.37 (1.13, 1.66)	0.86 (0.69, 1.08)
Private	16,853 (41.2)	17,825 (43.8)	1.11 (0.99, 1.23)	4206 (37.7)	9996 (44.1)	1.30 (1.01, 1.69)	0.85 (0.64, 1.12)
Uninsured	27,014 (29.6)	9443 (33.7)	1.21 (1.06, 1.39)	20,164 (32.9)	16,674 (37.1)	1.20 (1.03, 1.41)	1.01 (0.82, 1.23)

Note: ACA = Affordable Care Act; NH = Non-Hispanic; DID = difference-in-difference.
Eligible population for cervical screening: women age 21–64 throughout period, without history of hysterectomy, due for cervical cancer screening (no documentation of pap received in past 3 years or pap + HPV testing in past years if age 30–64). Odds ratios and DID ratios were obtained from logistic generalized estimating equation models with a robust sandwich variance estimator specifying an independent working correlation structure of health systems nested within states and adjusted for age, race/ethnicity (for the overall sample), federal poverty level, payer type, urban/rural status, and number of ambulatory visits.

female, older, non-white, lower income, and more urban (Table 1).

3.1. Cervical cancer screening

Among female patients aged 21–64, the adjusted prevalence of cervical cancer screening increased pre- to post-ACA in both expansion and non-expansion state CHCs. Patients had 19% increased odds in expansion states and 23% increased odds in non-expansion states of receiving cervical cancer screening post-ACA relative to pre-ACA (Table 2). Prevalence of screening also increased in each insurance subgroup (Medicaid, private insurance, uninsured) in both expansion and non-expansion states. The greatest increase was among uninsured patients in expansion states (aOR = 1.36, 95% CI = 1.16–1.59) and privately-insured patients in non-expansion states (aOR = 1.43, 95% CI = 1.11–1.84). There was no significant relative difference in pre- to post-ACA changes for cervical cancer screening in expansion vs non-expansion states (Table 2).

For results stratified by insurance status and race/ethnicity, non-Hispanic white patients in both expansion and non-expansion states had lower rates of screening relative to Hispanic or non-Hispanic black patients (Table 2). Overall, all race/ethnicity groups in both expansion and non-expansion states improve their odds of screening from pre- to post-ACA with the greatest change among non-Hispanic blacks in expansion states (aOR = 1.36, 95% CI = 1.08–1.71). In expansion states, the odds of screening were higher among non-Hispanic white patients with Medicaid coverage or no coverage post-ACA compared to pre-ACA while in non-expansion states all insurance groups increased their odds of screening. For Hispanic patients, the odds of cervical cancer screening increased from pre- to post-ACA for uninsured patients in expansion states (aOR = 1.48, 95% CI = 1.18–1.84) and Medicaid-insured patients in non-expansion states (aOR = 1.29, 95% CI = 1.01–1.65). Among non-Hispanic black patients, patients with private insurance or no coverage in expansion and Medicaid coverage or private insurance in non-expansion states showed increased odds of receiving cervical cancer screening post- compared to pre-ACA. There was no relative difference in pre- to post-ACA changes for cervical cancer screening in expansion vs non-expansion states by race/ethnicity.

3.2. Colorectal cancer screening

Colorectal cancer screening increased from 10.9% to 17.7% pre- to post-ACA in expansion states (aOR = 1.76, 95% CI = 1.41–2.18) and from 12.9% to 21.0% in non-expansion states (aOR = 1.79, 95% CI = 1.28–2.53) (Table 3). Screening improved for patients with all insurance types: the greatest increase was among patients with Medicaid coverage in expansion states and those with private coverage in non-expansions states. For the overall study sample, no significant changes in screening prevalence pre- to post-ACA between expansion groups were observed.

In expansion states, when stratified by insurance status and race/ethnicity, the prevalence of colorectal cancer screening pre-ACA was lowest among uninsured or privately insured non-Hispanic white patients (< 7%). Most groups had an increase post-ACA in colorectal cancer screening prevalence. Despite the increases seen, colorectal cancer screening remained low in all groups and especially so among uninsured non-Hispanic white and black patients. Uninsured Hispanic patients had more than double the odds of getting screened post- compared to pre-ACA (aOR = 2.37, 95% CI = 1.78–3.16). In non-expansion states, colorectal cancer screening prevalences were highest among Hispanic patients pre- and post-ACA, with significant improvement also seen for non-Hispanic black (aOR = 2.03, 95% CI = 1.38–2.99) and non-Hispanic white (aOR = 1.74, 95% CI = 1.24–2.45) patients post-ACA. DID analyses showed that most changes in colorectal cancer screening prevalence over the ACA study period were similar for expansion and non-expansion groups. The only difference we found was that Hispanic uninsured patients had greater relative increases in colorectal cancer screening prevalence in expansion compared to non-expansion states (DID =1.65, 95% CI = 1.11–2.44).

Table 3
Colorectal cancer screening prevalence, pre- and post-ACA by Medicaid expansion status overall and stratified by insurance group and race/ethnicity.

	Expansion states			Non-expansion states			DID (post/pre, expansion/non-expansion) (95% CI)
	Pre-ACA (2012–13) N (%)	Post-ACA (2014–15) N (%)	Odds of screening, post vs pre 95% (CI)	Pre-ACA (2012–13) N (%)	Post-ACA (2014–15) N (%)	Odds of screening, post vs pre 95% (CI)	
Overall							
Total	92,821 (10.9)	99,410 (17.7)	1.76 (1.41, 2.18)	77,135 (12.9)	85,488 (21.0)	1.79 (1.28, 2.53)	0.98 (0.65, 1.48)
Medicaid	25,256 (11.4)	50,817 (20.3)	1.97 (1.50, 2.60)	13,682 (13.2)	15,140 (20.4)	1.69 (1.08, 2.63)	1.17 (0.70, 1.96)
Private	16,606 (8.0)	19,104 (13.7)	1.82 (1.40, 2.36)	5768 (12.8)	21,897 (24.6)	2.22 (1.49, 3.32)	0.82 (0.51, 1.31)
Uninsured	32,744 (9.1)	13,553 (15.3)	1.81 (1.38, 2.38)	39,641 (12.7)	32,748 (18.2)	1.54 (1.13, 2.08)	1.18 (0.80, 1.74)
Hispanic							
Total	22,998 (15.3)	25,494 (23.7)	1.72 (1.26, 2.34)	26,917 (20.7)	31,470 (30.6)	1.69 (1.15, 2.49)	1.02 (0.61, 1.68)
Medicaid	5365 (14.2)	12,363 (25.4)	2.05 (1.44, 2.93)	3769 (24.0)	4629 (30.6)	1.40 (0.83, 2.34)	1.47 (0.79, 2.74)
Private	3046 (11.3)	4426 (16.4)	1.54 (0.93, 2.55)	961 (20.2)	8555 (38.6)	2.48 (1.53, 4.03)	0.62 (0.30, 1.27)
Uninsured	9715 (12.1)	5468 (24.5)	2.37 (1.78, 3.16)	16,934 (20.2)	13,333 (26.7)	1.44 (1.09, 1.91)	1.65 (1.11, 2.44)
NH black							
Total	10,229 (9.9)	10,495 (14.1)	1.50 (1.23, 1.81)	21,872 (10.8)	22,441 (19.7)	2.03 (1.38, 2.99)	0.74 (0.47, 1.15)
Medicaid	3375 (8.6)	6054 (15.7)	1.98 (1.39, 2.81)	4210 (9.8)	4450 (19.3)	2.21 (1.38, 3.54)	0.90 (0.50, 1.59)
Private	940 (8.5)	1212 (15.3)	1.95 (1.27, 3.01)	1957 (12.1)	4996 (23.7)	2.26 (1.43, 3.57)	0.86 (0.46, 1.60)
Uninsured	3895 (8.5)	1448 (9.7)	1.16 (0.90, 1.50)	9380 (11.0)	7699 (18.3)	1.81 (1.16, 2.81)	0.64 (0.39, 1.06)
NH white							
Total	52,061 (9.0)	54,480 (15.2)	1.82 (1.48, 2.24)	24,283 (9.6)	26,526 (15.7)	1.74 (1.24, 2.45)	1.05 (0.70, 1.57)
Medicaid	13,936 (10.8)	27,310 (19.2)	1.96 (1.47, 2.61)	5169 (9.4)	5352 (14.7)	1.66 (1.00, 2.74)	1.18 (0.66, 2.10)
Private	11,368 (6.9)	11,850 (12.9)	1.98 (1.56, 2.50)	2562 (10.2)	6848 (18.0)	1.93 (1.25, 2.98)	1.03 (0.63, 1.68)
Uninsured	16,632 (6.9)	5560 (9.2)	1.38 (1.05, 1.81)	11,252 (8.2)	9770 (12.1)	1.55 (1.13, 2.11)	0.89 (0.60, 1.33)

Note: ACA = Affordable Care Act; NH = Non-Hispanic; DID = difference-in-difference.
Eligible population for colorectal screening: age 50–64 throughout period, without history of total colectomy, due for colorectal cancer screening (no documentation of FOBT/FIT received in past 1 year). Odds ratios and DID ratios were obtained from logistic generalized estimating equation models with a robust sandwich variance estimator specifying an independent working correlation structure of health systems nested within states and adjusted for age, race/ethnicity (for the overall sample), federal poverty level, payer type, urban/rural status, and number of ambulatory visits.

4. Discussion

Overall, cervical and colorectal cancer screenings among eligible patients seen in study CHCs improved after ACA Medicaid expansion in both expansion and non-expansion states. Contrary to our hypothesis, we did not find an association between expansion status and increased cancer screening disparities in CHC settings; these results may not apply to non-CHC settings or CHCs not included in the study sample. The improvements in cancer screenings in CHCs suggest that both increased insurance options (Medicaid expansion and subsidized exchange coverage) and preventive service coverage requirements (ensuring no out-of-pocket cost to patients for these screenings) helped patients obtain recommended services. Results from this study are in line with single state health insurance expansion analyses (Hendryx and Luo, 2018; Marino et al., 2016; Van Der Wees et al., 2013) demonstrating the positive association between health insurance coverage and cancer screening.

Surprisingly, uninsured patients post-ACA Medicaid expansion saw an increase in cervical and colorectal cancer screenings. These findings are likely due to the additional funding that came from both a rise in overall insured visits and federal grant dollars after ACA Medicaid expansion. Specifically, CHCs experienced increased operating capacity (Han et al., 2017) which allowed them to provide more care, especially preventive care (Han et al., 2017), likely benefiting patients who visited CHCs but remained uninsured.

Results presented in this study also showed that the prevalence of cervical and colorectal cancer screenings were similar across race and ethnicity; in fact, receipt of screenings was often highest among Hispanic patients, especially post-ACA. This result agrees with a few previous studies, which found that Hispanics had higher rates of cervical cancer screening than non-Hispanic whites (Cowburn et al., 2013; Owusu et al., 2005) and could result from the important role CHCs play in reducing racial/ethnic health disparities (Politzer et al., 2001; Riedy et al., 2007; Shi et al., 2004). Some of the strategies CHCs use to reduce disparities include: providing additional non-healthcare services to mitigate access barriers (e.g., transportation assistance, child care) and offering health education, counseling, and case management. Another explanation for these findings may be that CHCs access the Centers of Disease Prevention and Control grant funding to provide cancer screenings to their uninsured and/or Hispanic patients. Specifically, the National Breast and Cervical Cancer Early Detection Program (https://www.cdc.gov/cancer/nbccedp/) provides access to breast and cervical cancer screening to low-income women and is strongly utilized by Hispanic women (Centers for Disease Control and Prevention, n.d.). This program funds screening tests through grants to those providing the services and may help explain the ability of those without insurance to receive these screenings. Similarly, programs and initiatives such as Colorectal Cancer Control Program (available in 6 states in our study) and the National Colorectal Cancer Roundtable Initiative (National Colorectal Cancer Roundtable, 2015) (which has the goal of reaching ≥80% CRC screening by 2018) may have facilitated access to colorectal cancer screening in several states.

Despite improvements in cancer screening following the implementation of the ACA, many patients had no record of having received cervical or colorectal cancer screening during the study period. These findings suggest that even with increased access to health insurance coverage many barriers remain for socioeconomically disadvantaged patients to receive timely cancer screening. Previous studies (Daly et al., 2015; De Alba and Sweningson, 2006; Ojinnaka et al., 2015) found the following decreased cancer screening rates: low health literacy, English proficiency, and lack of screening infrastructure within the clinic (i.e., do not perform colonoscopy). Future research is needed to understand these and additional barriers and facilitators to cancer screening in CHC populations. Identifying strategies used by high performing clinics could be an avenue to develop interventions aimed at promoting cancer screening for socioeconomically disadvantaged populations.

4.1. Limitations

We were unable to assess patient-reported screening histories or screenings received outside of this CHC network and thus our screening rates may be underestimated, particularly for colorectal cancer screening; however, we do not expect that this underestimate would differ by expansion status. The method used to assess screening aligns with the specifications of quality metric reporting systems like Uniform Data System and Meaningful Use (http://www.bphcdata.net/docs/table_6b.pdf), except our measurement periods were two years instead of one year and patients were not required to have a medical visit in the specific period to place them in the denominator for that period as long as they had at least one visit in the four-year study period. Thus, the screening rates reported here are not directly comparable to quality metrics or those generated by other methods. Lastly, we did not assess whether or not the National Breast and Cervical Cancer Early Detection Program or the Colorectal Cancer Control Program paid for the cancer screenings, as the information on who received grant monies for these screenings is not available in the ADVANCE dataset. Because we used a 24-month period to assess receipt of FOBT/FIT, the prevalence of up-to-date CRC screening could be overestimated since this is an annual test, however, the objective of this study was to understand the change in prevalence between the pre- and post-periods not to compute the actual yearly prevalence of FOBT/FIT.

5. Conclusion

Screening prevalence for cervical and colorectal cancer increased post-ACA in both expansion and non-expansion states. Nearly all racial and ethnic groups and insurance types saw improvement, however screening rates remain suboptimal. More efforts are needed to improve receipt of cancer screenings for patients seen in CHCs.

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Declaration of Competing Interest

Authors have no competing interests to disclose.

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