Fitzhugh Mullan
Institute for Health
Workforce Equity
THE GEORGE WASHINGTON UNIVERSITY

Research Report

The Impact of Medicaid Expansion on Community Health Center Staffing

Ellen Kurtzman, Jeongyoung Park, Xinxin Han, and Patricia Pittman

September 2017

This project was supported by the Health Resources and Services Administration (HRSA) of the U.S. Department of Health and Human Services (HHS) under grant number U81HP26493. This information or content and conclusions are those of the author and should not be construed as the official position or policy of, nor should any endorsements be inferred by HRSA, HHS, or the U.S. Government.

GW Health Workforce Research Center, 2175 K Street, NW, Suite 500, Washington, DC 20037
Contact: Ellen Kurtzman, School of Nursing, George Washington University, etk@gwu.edu

The Impact of Medicaid Expansion on Community Health Center Staffing

BACKGROUND

Community health centers are independent, community-based nonprofit organizations located in medically underserved communities. By virtue of their disproportionate share of uncompensated and publicly funded care—approximately 70% of CHC patients are at or below 100% of the federal poverty level, 23% are uninsured, and nearly 60% are publicly insured—CHCs are considered safety net providers.[1]

A full complement of health care clinicians and enabling, programmatic, and administrative personnel provide a range of comprehensive primary care and support services to CHC patients. Physicians, advanced practice providers (APPs)—a category which includes nurse practitioners (NPs), physician assistants (PAs), and certified nurse midwives—nurses, and other medical personnel (e.g., medical assistants, nurse aides) provide the vast majority of clinical care.[2] Dentists, mental health providers, and vision care professionals provide services in their respective areas of specialty. Additionally, a variety of enabling staff, including case managers, outreach workers, transportation staff, and community health workers, provide non-clinical services that improve patients' access to care and improve health outcomes.

To meet the needs of the low income, uninsured, and Medicaid populations, the last two decades has seen tremendous growth in the number of CHCs in the United States and their capacities.[3] For example, in 2008, 1,080 CHCs served 17 million patients while that number grew to 1,367 CHCs serving nearly 26 million by 2016.[4] Estimates predict continued growth in coming years with the number of patients served by CHCs nearly doubling to 40 million by 2019.[5]

CHC Growth Under the Affordable Care Act

While CHCs were experiencing steady growth in the years leading up to the passage of the Affordable Care Act (ACA), their growth has been accelerated by the law, which not only extended Medicaid eligibility beginning January 1, 2014 to include those with family incomes of less than 138% of the federal poverty level but also authorized funds to expand the Health Center Program.[6] Nevertheless, the Supreme Court's 2012 ruling, which made Medicaid expansion optional for states, created a "patchwork" of coverage gaps across the country.[7]

A growing body of evidence examines the effects of the ACA, generally, and Medicaid expansion, specifically, on a variety of outcomes in CHCs including patients' quality of care,[8] utilization,[9,10] insurance status,[11] and capacity.[12] Hoopes et al. (2016) used data from 219 CHCs' electronic health records (EHRs) in five expansion and four non-expansion states to examine the impact of Medicaid expansion on visit rates by visit type from 2013-2014. These researchers found that CHCs in expansion states experienced a 6% increase in visits, generally, a 14%, 41%, and 23% increase in new patient, preventive, and limited-service visits, respectively, along with a relative increase in Medicaid-insured visits and a decrease in uninsured visits compared with CHCs in non-expansion states post-expansion.[9] These findings were confirmed by Huguet et al. (2017) who used four years of EHR data (2012-2015) from 412 CHCs in nine expansion and four non-expansion states[11] and Han, Luo, & Ku (2017) who used four years of Uniform Data System (UDS) data (2012-2015) from 805 CHCs in 19 expansion and 21 non-expansion states and a difference-in-differences approach[12] to examine the effects of Medicaid expansion on visit rates and rates by insurance status. In the first of these two studies, the authors found larger increases in Medicaid-insured visits and decreases in uninsured visits post-expansion in expansion states compared with non-expansion states. They also found that privately insured visits increased substantially pre- to post-expansion (2.7 times) in CHCs in non-expansion states with no increase in expansion states. In the second of these studies, Han et al. found that post-

expansion, CHCs in expansion states experienced a 5% higher total patient volume, larger shares of Medicaid patients, smaller shares of uninsured patients, and increases in overall visits and mental health visits compared to CHCs in non-expansion states. An analysis by Wallace, Young, Rodriguez, Bonilla, & Pourat (2016), produced consistent findings; however, these researchers used fewer years of UDS data from four states (2014-2016) and only examined the post-expansion period.[10] While these studies are heterogeneous in nature, taken together they provide compelling evidence that CHCs in expansion states experienced increases in the number of patients and overall visit volume, as well as a shift in payer mix with an increase in Medicaid visit rates and reduction in uninsured visits following expansion compared to CHCs in non-expansion states.

In the context of this increased utilization, concerns have been expressed about whether CHCs had sufficient staffing to handle the surge in visits. To date, two survey-based studies have addressed this question.[13,14] In both cases, these studies' samples were limited to CHCs in a single state, the data were exclusively cross-sectional, and the researchers explored the effect of the ACA on patient volume, staffing, workload, and capacity as perceived by executive directors rather than any direct measure of impact on these outcomes.

We sought to address this same question differently—using longitudinal data and quasi-experimental methods—and took advantage of the natural experiment that was created by Medicaid expansion. Specifically, using a difference-in-differences approach, we compared staffing outcomes in CHCs located in expansion states (treatment) to those in non-expansion states (comparison) both before and after January 1, 2014, the date states first began expanding Medicaid.

METHODS

We used seven years of UDS data (2009-2015), which is the standardized reporting system required of all CHCs under the Health Center grant program.[4] UDS data include information about CHCs' patients, services, staff, costs, and income. We excluded from our sample observations from CHCs in

ten states that either expanded Medicaid before January 1, 2014[i] or delayed their Medicaid expansion until after this date.[ii] To ensure a balanced panel, we also excluded CHCs that did not submit UDS data all seven years. This resulted in a pooled sample of 5,222 observations from 746 CHC grantees in 40 states (19 expansion and 21 non-expansion states).

Staffing outcomes were drawn from one or more UDS items that report the number of annualized full-time equivalents (FTEs[iii]) for staff who work in programs and activities, which are allocated by function into major service categories. All staff time is allocated by function and multiple functions are distributed into major service categories. For example, primary care physicians including those in family practice, general practice, internal medicine, obstetrics/gynaecology, paediatrics, as well as, specialty physicians comprise the "physician" major service category. Appendix A provides a crosswalk of each UDS staff function by major service category. Relevant definitions, variable specifications, and coding instructions are detailed in the UDS Reporting Instructions available from the Health Resources Services Administration (HRSA).[4] For purposes of analysis, we constructed two additional service categories: other medical staff, which was comprised of all nurses and other medical personnel, and all clinical staff, which was comprised of physicians, APPs, and other medical staff.[iv]

We modelled two staffing outcomes:

1. FTEs by function (physicians, APPs, nurses, other medical staff) and service category (clinical staff, enabling staff, total staff); and

[i] Five states expanded before January 1, 2014: California, Connecticut, District of Columbia, Minnesota, New Jersey, and Washington.
[ii] Five states expanded after January 1, 2014: Alaska, Indiana, Michigan, New Hampshire, and Pennsylvania.
[iii] FTEs include paid staff, volunteers, contracted personnel, interns, residents, and preceptors.
[iv] UDS combines all physicians, APPs, nurses, and laboratory, x-ray, and other medical personnel into a "medical staff" category. Our term, "clinical staff," excludes laboratory personnel and x-ray personnel.

2. Composition of the staff, specified as the percent of the clinical staff by function (physicians, APPs, nurses, other medical staff) and the percent of total staff by service category (clinical, enabling).

We used bivariate statistics to describe the sample by Medicaid expansion status before (2009-2013) and after expansion occurred (2014-2015). We used multivariate regression analysis and a difference-in-differences (DID) model to estimate the effect of Medicaid expansion on each staffing outcome, separately. Each regression equation included two binary, independent variables representing the Medicaid expansion status of the state in which the CHC was located and whether the observation was before/after January 1, 2014. Each equation also included an interaction of these two terms, which is an estimate of the treatment effect and referred to as the difference-in-differences estimator (DID). Additionally, we incorporated a variety of covariates, including patient characteristics (insurance status, limited English language), CHC characteristics (size, patient-centered medical home [PCMH] status, rurality, level of state-granted NP practice and prescriptive [Rx] authorities), and population characteristics (primary care physician [PCP] and NP/PA supply, percent persons below poverty level). We controlled for state fixed effects and clustered standard errors at the state-year level.

Findings

Over the seven year study period, CHCs reported a mean of 124.2 total FTEs comprised of 34.8% clinical staff (i.e., physicians, APPs, nurses, other medical personnel) and 9.6% enabling staff. Consistent with prior work by this team[12,15], unadjusted, descriptive statistics suggest that all CHCs grew in size over time, regardless of whether they were located in expansion states or non-expansion states. However, CHCs in expansion states reported larger staff increases than non-expansion states (Figure 1). CHCs in expansion states reported that their total staffs increased by 32.9 FTEs after expansion, while CHCs in

non-expansion states reported an additional 20.1 FTEs. This pattern of higher increases in staff in the two-year period after Medicaid expansion persisted across all service categories (Table 1).

Figure 1

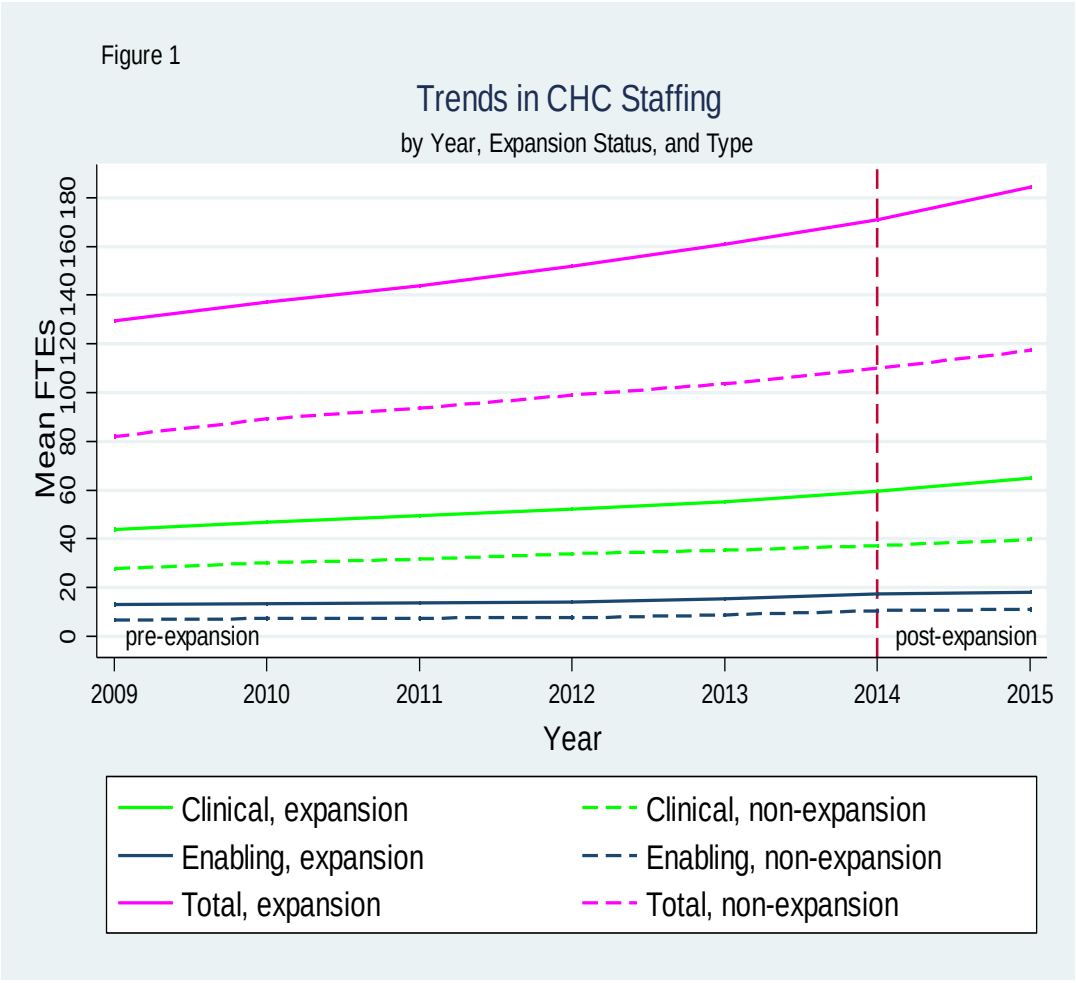

Table 1: Staffing Outcomes by State Medicaid Expansion Status, Before and After Expansion (N=5,222)

Staffing Outcome	Mean Total	Expansion States			Non-Expansion States		
		Before	After	Net Δ	Before	After	Net Δ
Mean FTE							
Physicians	8.64	11.09	12.35	1.26	6.20	6.53	0.33
Advanced Practice\[1,2]	6.72	7.15	9.77	2.62	5.28	6.87	1.59
Nurses\[1,2]	11.89	13.28	16.57	3.29	9.50	11.04	1.54
Other Med\[1,2]	15.31	18.06	23.51	5.45	10.80	14.01	3.21
Clinical\[1,2]	42.55	49.57	62.20	12.63	31.78	38.45	6.67
Enabling\[1,2]	11.47	13.97	17.73	3.76	7.58	10.79	3.21
Total\[1,2]	124.17	144.70	177.61	32.91	93.48	113.62	20.14
% Clinical Staff							
Physicians\[1,2]	19.12	21.45	18.39	-3.06	18.66	16.05	-2.61
Advanced Practice\[1,2]	18.92	16.62	18.42	1.80	20.03	21.34	1.31
Nurses	30.05	28.47	28.57	0.10	31.80	20.21	-11.59
Other Med\[2]	31.91	33.46	24.62	-8.84	29.51	32.40	2.89
% Total Staff							

Physicians\[1,2]	6.60	7.37	6.47	-0.90	6.45	5.48	-0.97
Advanced Practice\[1]	6.56	5.65	6.34	0.69	7.09	7.30	0.21
Nurses	10.48	9.80	9.96	0.16	11.21	10.50	-0.71
Other Med	11.11	11.57	12.08	0.51	10.38	11.18	0.80
Clinical	34.75	34.39	34.84	0.45	35.13	34.46	-0.67
Enabling\[1,2]	9.61	9.73	10.58	0.85	8.83	10.52	1,69

\[1] Difference in expansion states is statistically significant p≤0.01

\[2] Difference in non-expansion states is statistically significant p≤0.01

While our findings show staffing growth, there were also changes—although much more subtle—in staff composition (Table 1). For example, in all CHCs, physicians as a percent of all clinical staff decreased and APPs as a percent of clinical staff increased post-expansion, regardless of expansion status. There was also a sizable decrease in the proportion of other medical personnel after expansion in expansion states (-8.8%) but an increase—although not as large (2.9%)—in other medical personnel after expansion in non-expansion states. While not statistically significant, there was also an increase in nurses as a percent of all clinical staff following expansion in expansion states, while their relative presence fell in CHCs located in non-expansion states.

Results from the multivariate regression models are presented in Tables 2a and 2b. Expansion increased the total number of staff (3.7 FTEs) and the number of enabling staff (0.4 FTEs) reported by CHCs, although these differences were not statistically significant at conventional levels (Table 2a). At the same time, CHCs reported a modest and statistically significant increase in the number of all clinical staff and the proportion of total staff that was clinical by 2.5 FTEs ($p \leq 0.01$) and 0.7% ($p \leq 0.05$), respectively.

Estimates—at the staff function and service category-levels—vary considerably (Table 2b). In most cases the coefficient on the variable reflecting the treatment effect (DID) is positive, small in magnitude, but not statistically significant. For example, in expansion states, CHCs added 0.3 physician FTEs ($p=0.16$) and 0.9 other medical staff FTEs ($p=0.08$). Medicaid expansion had the greatest effect on the number of APPs and nurses—increasing the presence of these professionals by 0.5 FTEs ($p \leq 0.01$) and 0.7 FTEs ($p \leq 0.05$), respectively. In addition to the modest increase in the number of FTEs for selected staff functions, there was also a small effect of expansion on staff composition. Most notably, among CHCs in expansion states, the percent of clinical staff that was nurses increased by 1.42% ($p \leq 0.05$) and the percent of clinical staff that was other medical personnel (e.g., medical assistants,

Table 2a: Impact of Medicaid Expansion on Staffing Outcomes in CHCs (2009-2015) (N=5,222[o])

Variable	Clinical Staff		Enabling Staff		Total Staff
	FTEs	% total	FTEs	% total	FTEs
Expansion state	10.61***	-6.32***	5.86***	4.20***	43.32***
	(1.94)	(0.91)	(0.70)	(0.76)	(5.68)
Post-expansion	0.67	-1.51***	2.53***	3.18***	3.36
	(0.59)	(0.27)	(0.27)	(0.24)	(1.76)
DID estimator	2.45**	0.71*	0.43	0.02	3.71
	(0.81)	(0.36)	(0.40)	(0.33)	(2.19)
Rural	-0.95	-0.16	-2.06***	-0.19	-5.97*
	(0.73)	(0.39)	(0.42)	(0.29)	(3.04)
PCPs per 1,000 pop.	-0.10	-1.09*	2.32***	0.97*	17.36***
	(1.46)	(0.50)	(0.70)	(0.44)	(5.08)
NP/PA per 1,000 pop.	0.71	-0.74*	0.01	0.14	1.64
	(0.75)	(0.31)	(0.41)	(0.32)	(1.79)
% pop. in poverty	0.29***	-0.09***	0.28***	0.09***	1.36***
	(0.05)	(0.03)	(0.03)	(0.03)	(0.18)

Full practice + Rx	-0.95 (0.73)	-1.60*** (0.40)	-1.03 (1.32)	0.21 (0.92)	-7.25 (4.39)
Restricted practice + Rx	-0.10 (1.46)	-1.68** (0.61)	2.04** (0.78)	2.19** (0.83)	-7.20 (3.87)
# patients (in 1,000s)	2.42*** (0.04)	0.05*** (0.01)	0.47*** (0.02)	-0.06*** (0.01)	6.31*** (0.19)
% uninsured	-0.17*** (0.02)	-0.13*** (0.01)	0.08*** (0.01)	0.18*** (0.01)	-0.27*** (0.05)
% limited English	0.13*** (0.02)	<0.01 (0.01)	0.12*** (0.01)	0.10*** (0.01)	0.41*** (0.06)
% PCMH	0.01* (0.01)	<0.01 (0.00)	0.01* (0.00)	<0.01 (0.00)	0.09*** (0.02)
R-squared	0.89	0.26	0.58	0.35	0.84

*p≤0.05 **p≤0.01 ***p≤0.001 *NOTES: Estimates include state fixed effects (not shown) and clustered standard errors at state-year level.* [o]*Due to missing data, FTE estimates are based on 4,390 observations and % FTE estimates on 4,373 observations. DID=difference in differences estimator; Rx=prescriptive authority; PCMH=patient-centered medical home*

Table 2b: Impact of Medicaid Expansion on Staffing Outcomes in CHCs (2009-2015) (N=5,222[o])

Variable	Physicians		Advanced Practice		Nurses		Other Medical Staff	
	FTEs	% clinical	FTEs	% clinical	FTEs	% clinical	FTEs	% clinical
Expansion state	2.75***	-1.32*	2.24***	4.22***	0.10	-3.75*	5.52***	0.86
	(0.46)	(0.58)	(0.35)	(0.90)	(0.89)	(1.65)	(1.70)	(1.89)
Post-expansion	-0.56**	-2.21***	0.51***	1.65***	-0.07	-1.33**	0.80*	1.89***
	(0.18)	(0.28)	(0.12)	(0.33)	(0.24)	(0.50)	(0.36)	(0.47)
DID estimator	0.30	-0.43	0.54**	0.81	0.69*	1.42*	0.92	-1.80**
	(0.21)	(0.33)	(0.17)	(0.44)	(0.34)	(0.56)	(0.53)	(0.59)
Rural	0.62	-0.94**	-0.60***	2.20***	1.83***	7.64***	-2.81***	-8.91***
	(0.33)	(0.35)	(0.15)	(0.38)	(0.41)	(0.90)	(0.59)	(0.87)
PCPs per 1,000 pop.	1.29*	5.32***	-1.68***	-6.53***	0.36	-1.23	-0.07	2.44*
	(0.58)	(0.52)	(0.30)	(0.63)	(0.76)	(1.14)	(1.36)	(1.14)
NP/PA per 1,000 pop.	-0.37*	-2.10***	0.99***	3.49***	0.60	0.01	-0.51	-1.40*
	(0.17)	(0.39)	(0.20)	(0.46)	(0.50)	(0.70)	(0.49)	(0.69)
% pop. in poverty	0.07**	0.06**	0.03*	-0.08**	0.06	0.05	0.12*	-0.04
	(0.03)	(0.02)	(0.01)	(0.03)	(0.04)	(0.06)	(0.05)	(0.06)

Full practice + Rx	-0.75* (0.30)	0.65 (0.68)	-0.11 (0.28)	-0.73 (0.67)	-1.80** (0.68)	-0.90 (1.04)	-0.38 (0.64)	0.98 (0.97)
Restricted practice + Rx	-0.55 (0.29)	-0.78 (0.54)	0.27 (0.20)	2.56*** (0.57)	-1.59*** (0.44)	0.48 (0.61)	-1.15 (0.63)	-2.25** (0.75)
# patients (in 1,000s)	0.58*** (0.02)	0.04*** (0.01)	0.30*** (0.01)	-0.06*** (0.01)	0.55*** (0.04)	0.01 (0.01)	0.99*** (0.05)	0.01 (0.01)
% uninsured	-0.04*** (0.01)	-0.07*** (0.01)	-0.01* (0.00)	0.10*** (0.01)	-0.06*** (0.01)	-0.04* (0.02)	-0.06*** (0.01)	<0.01 (0.02)
% limited English	0.02*** (0.01)	0.02* (0.01)	-0.01*** (0.00)	-0.07*** (0.01)	-0.04** (0.01)	-0.14*** (0.01)	0.16*** (0.02)	0.19*** (0.01)
% PCMH	<0.01*** (0.00)	-0.01*** (<0.01)	<0.01*** (0.00)	<0.01 (0.00)	<0.01 (0.00)	-0.01 (0.01)	0.01 (0.00)	0.02*** (0.01)
R-squared	0.84	0.21	0.69	0.28	0.55	0.32	0.73	0.36

*p≤0.05 **p≤0.01 ***p≤0.001 *NOTES: Estimates include state fixed effects (not shown) and clustered standard errors at state-year level.* [o]*Due to missing data, FTE estimates are based on 4,390 observations and % FTE estimates on 4,373 observations. DID=difference in differences estimator; PCP=primary care physician; NP=nurse practitioner; PA=physician assistant; pop=population; Rx=prescriptive authority; PCMH=patient-centered medical home*

nurse aides, quality assurance/electronic health records staff) decreased by 1.80% ($p \leq 0.01$). Also, the percent of clinical staff that was APPs increased by 0.8% and the percent that was physicians decreased by 0.4%, although these shifts were not statistically significant at conventional levels ($p=0.07$ and $p=0.19$, respectively).

Tables 2a and 2b also provide estimates of the impact of each covariate on CHC staffing—for example, the effect of CHC size and the effect of being located in a rural area. Partial correlations among these variables and the outcomes suggest strong and sizable relationships in some cases. For example, CHCs in locations that have a better supply of physicians employ, on average, 1.3 additional physicians and 1.7 fewer APPs. At the same time, CHCs in locations that have a better supply of NPs and PAs employ, on average, nearly 1.0 additional APP and 0.4 fewer physicians. The strength and size of these partial correlations suggest that, in select cases, predictors—other than Medicaid expansion—are more highly related to CHC staffing than Medicaid expansion.

Limitations

Findings from this study should be interpreted within the limitations of the UDS data and our approach to analysis. As it relates to the former, UDS data include hundreds of variables; however, the data are administrative and do not account for important factors that could be associated with staffing—for example, the practice environment; staff education, experience, and roles; and productivity. Omission of these types of variables from our models could introduce bias. Additionally, data limitations prevent adjustments to our estimates for patient complexity/acuity. More complex patients can reduce practitioners' efficiency and productivity and place upward pressure on staffing.

In addition to the data limitations, establishing causality depends on an experimental design and this study is observational. To account for the counterfactual—that is what would have occurred in the absence of the policy—we constructed a comparison group of states that did not expand Medicaid.

Despite this technique, if CHCs anticipated Medicaid expansion and altered their staffing in advance of the policy change or if CHCs' staffing response to Medicaid expansion was delayed, this model may not capture providers' actual response.

Finally, our approach to analysis is based on strong statistical assumptions, which may not be met. For example, using a difference-in-differences model results in all the observable differences in staffing between expansion and non-expansion states being attributed to the intervention (expansion); however, other, unobservable factors might have affected differences in states' staffing between the two groups. Alternatively, there might have been pre-treatment differences in expansion and non-expansion states that were not adequately controlled for in our models. In both cases, our estimates may not capture meaningful policy impacts.

POLICY IMPLICATIONS

Our findings provide some evidence of a Medicaid expansion-staffing effect. We found an increase of 2.5 FTEs in the number of clinical staff, increases in the number of APPs and nurses, and a shift in the composition of clinical staff with these two groups gaining as a percent of all clinical staff. Estimates that were not sufficiently large to reach statistical significance may, none the less, be meaningful to CHCs. For example, in expansion states, CHCs added 0.3 physician FTEs and 0.9 other medical staff FTEs (Table 2b). Given that CHCs employ an average of 8.6 physicians and 15.3 other medical staff (Table 1), this growth represents a 3.5% and 5.9% relative increase in staff FTEs, respectively.

In addition to the possibility that these changes in staffing were operationally meaningful, even if not statistically significant, the differences we found could represent a sufficient response. Ku et al. examined medical staff productivity in CHCs and found that each staff member averaged 1,071-1,261 medical visits.[15] Han et al. found that Medicaid expansion increased patient visit volume in CHCs by 1,000 (2017).[12] The additional 2.5 clinical staff FTEs that resulted from expansion in our study would have increased visit capacity by 2,677-3,153 visits, which exceeds—by two to three times—the number of additional patients seen by CHCs as a result of expansion.

Shifts in the composition of clinical staff and relative gains in APPs and nurses as a percent all clinical staff in expansion states as compared to non-expansion states suggest that there may be changes occurring in workflow and/or substitution as a result of the need to accommodate increased visits. Indeed, the two state-level studies based on surveys of CHC leadership in Washington[13] and Iowa[14] suggest that CHCs have employed diverse strategies including workflow changes and role expansion, in addition to hiring new staff, to address Medicaid expansion and its accompanying increased patient volume. Given the possibility that CHCs' response to expansion-related utilization has been multifactorial, studies that disentangle the relative contribution of each staffing strategy, and the programs and policies that would advance the most promising ones are warranted. For example, based on this study, a question worthy of future research would be whether and how the relative increase in APP and nurses as a percent of all clinical staff influences staff's roles and workflow and how these adjustments, in turn, impact productivity.

It is important to note that while our analysis modeled staffing changes, UDS data limitations prevented us from accounting for vacancy rates, which are high in some personnel categories and well documented.[16] It is possible that the small, but not statistically significant, increases in staffing that we detected across functions and service categories reflected CHCs' inability to recruit and fill positions, rather than a function of their intent to hire. Additional research that links data on vacancies to the kind of analysis we have conducted would help elucidate this relationship.

It is also worth situating these findings in the context of previous evidence, which found post-expansion shifts in payer mix with an increase in Medicaid visits and decrease in uninsured visits. The incremental increase in revenue that would accompany such a shift, independent of the additional revenue attributable to increased volume, might vary based on CHCs' pre-expansion payer mix and contribute to differential staffing effects. Specifically, CHCs that experienced a greater shift from uninsured visits to Medicaid-insured visits might have larger gains in resources, which could be used to hire additional staff or adjust staff composition. Our models did not account for these presumed changes nor did we forecast the variety of staffing responses that might result from them.

Finally, expansion aside, we know that states' Medicaid income eligibility limits vary and fluctuate over time. In our models, by dichotomizing states' expansion status, we effectively treated expansion and non-expansion states as if they had identical pre-ACA and post-ACA eligibility limits, even though we know that to be untrue.[17,18] In fact, states with more limited (lower) pre-ACA Medicaid eligibility that expanded Medicaid would have experienced greater gains in enrollment under the ACA than expansion states with more generous (high) pre-ACA

Medicaid eligibility. State-to-state variation in enrollment gains would result in inconsistent utilization effects and necessitate different staffing responses by CHCs. By restricting an entire range of eligibility to values of either 1 or 0, we could have obscured meaning meaningful state-to-state differences in CHC staffing. Given the complexity of states' Medicaid policies and variation at their most granular levels, additional research that accounts for these differences should be also pursued.

Building our understanding of how coverage expansion policies impact the delivery system, and the health care workforce, in particular, can inform future coverage reforms at the state- and national-levels, and provide a benchmark for CHC leadership as they consider staffing strategies to address surges in visits.

Appendix A: Crosswalk of Staff Functions by Major Service Category

Major Service Category	Staff Function
Total Physicians	Family Physicians General Practitioners Internists Obstetrician/Gynecologists Pediatricians Other Specialty Physicians
Total NP, PA, and CNMs (APPs)	Nurse Practitioners Physician Assistants Certified Nurse Midwives
Total Medical	Nurses Other Medical personnel Laboratory personnel X-ray personnel
Total Dental	Dentists Dental Hygienists Dental Assistants, Aides, Techs
Total Mental Health	Psychiatrists Licensed Clinical Psychologists Licensed Clinical Social Workers Other Licensed Mental Health Providers Other Mental Health Staff Substance Abuse Services
Other Professional Services	
Total Vision Services	Ophthalmologist Optometrist Other Vision Care Staff
Pharmacy Personnel	
Total Enabling Services	Case Managers Patient/Community Education Specialists Outreach Workers Transportation Staff Eligibility Assistance Workers Interpretation Staff Other Enabling Services
Other Programs/Services	
Total Facility and Non-Clinical Support Staff	Management and Support Staff Fiscal and Billing Staff IT Staff Facility Staff Patient Support Staff

References

[1] Doty, M. M., Abrams, M. K., Hernandez, S. E., Stremikis, K., & Beal, A. C. (2010). Enhancing the capacity of community health centers to achieve high performance. *New York: The Commonwealth Fund*.

[2] Hing, E., Hooker, R. S., & Ashman, J. J. (2011). Primary health care in community health centers and comparison with office-based practice. *Journal of Community Health*, *36*(3), 406-413.

[3] Nath, J. B., Costigan, S., & Hsia, R. Y. (2016). Changes in demographics of patients seen at Federally Qualified Health Centers, 2005-2014. *JAMA Intern Med.*, 176(5), 712-714. doi: 10.1001/jamainternmed.2016.0705. PubMed PMID: 27064681.

[4] U.S. Department of Health & Human Services, Health Resources Services Administration (HRSA). *HRSA Health Center Grantee Data* [Data file]. Retrieved from https://bphc.hrsa.gov/datareporting/index.html

[5] Ku, L. C., Richard, P., Dor, A., Tan, E., Shin, P., & Rosenbaum, S. J. (2010). *Strengthening primary care to bend the cost curve: The expansion of community health centers through health reform.* Geiger Gibson/RCHN Community Health Foundation Research Collaborative. Policy Research Brief No. 19.

[6] U.S. Department of Health & Human Services, Health Resources Services Administration (HRSA). (n.d.). *The Affordable Care Act and health centers.* Rockville, MD: HRSA.

[7] National Federation of Independent Business et al. v. Sebelius, Secretary of Health and Human Services, et al., 567 U.S. 519 (2012). Retrieved from http://www.supremecourt.gov/opinions/11pdf/ 11-393c3a2.pdf

[8] Cole, M. B., Galárraga, O., Wilson, I. B., Wright, B., & Trivedi, A. N. (2017). At Federally Funded Health Centers, Medicaid Expansion Was Associated With Improved Quality Of Care. *Health Affairs*, *36*(1), 40-48.

[9] Hoopes, M. J., Angier, H., Gold, R., Bailey, S. R., Huguet, N., Marino, M., & DeVoe, J. E. (2016). Utilization of community health centers in Medicaid expansion and nonexpansion states, 2013–2014. *Journal of Ambulatory Care Management*, *39*(4), 290-298.

[10] Wallace, S. P., Young, M. E., Rodriguez, M. A., Bonilla, A., & Pourat, N. (2016). Community Health Centers Play a Critical Role in Caring for the Remaining Uninsured in the Affordable Care Act Era. *Policy brief (UCLA Center for Health Policy Research)*, (PB2016-7), 1-8.

[11] Huguet, N., Hoopes, M. J., Angier, H., Marino, M., Holderness, H., & DeVoe, J. E. (2017). Medicaid Expansion Produces Long-Term Impact on Insurance Coverage Rates in Community Health Centers. *Journal of Primary Care & Community Health*, 2150131917709403.

[12] Han, X., Luo, Q., & Ku, L. (2017). Medicaid expansion and grant funding increases helped improve community health center capacity. *Health Affairs*, *36*(1), 49-56.

[13] Miller, S. C., Frogner, B. K., Saganic, L. M., Cole, A. M., & Rosenblatt, R. (2016). Affordable care act impact on community health center staffing and enrollment: A cross-sectional study. *The Journal of Ambulatory Care Management*, *39*(4), 299-307.

[14] Wright, B., Damiano, P. C., & Bentler, S. E. (2014). Assessing the Capacity of Iowa's Community Health Centers to Respond to the Opportunities and Challenges of the Affordable Care Act. *Journal of Health Care for the Poor and Underserved*, *25*(4), 2032-2043.

[15] Ku, L., Frogner, B. K., Steinmetz, E., & Pittman, P. (2015). Community health centers employ diverse staffing patterns, which can provide productivity lessons for medical practices. *Health Affairs*, *34*(1), 95-103.

[16] Rosenblatt, R. A., Andrilla, C. H. A., Curtin, T., & Hart, L. G. (2006). Shortages of medical personnel at community health centers: implications for planned expansion. *JAMA*, *295*(9), 1042-1049.

[17] Courtot, B., & Coughlin, T. A. (2012). Progress in Implementing Selected Medicaid Provisions of the Affordable Care Act: A 10-State Analysis.

[18] Brooks, T., Wagnerman, K., Artiga, S., Cornachione, E., & Ubri, P. (2016). *Medicaid and CHIP eligibility, enrollment, renewal, and cost-sharing policies as of January 2017: Findings from a 50-state survey*. Washington, DC: Georgetown University Center for Children and Families and Kaiser Commission on Medicaid and the Uninsured. Retrieved from http://files.kff.org/attachment/Report-Medicaid-and-CHIP-Eligibility-as-of-Jan-2017