Federally Qualified Health Center Access and Emergency Department Use Among Children

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abstract

OBJECTIVE: To determine whether increasing access to federally qualified health centers (FQHCs) in California was associated with decreased rates of emergency department (ED) use by children without insurance or insured by Medicaid.

METHODS: We combined several data sets to longitudinally analyze 58 California counties between 2005 and 2013. We defined access to FQHCs by county using 2 measures: FQHC sites per 100 square miles between 2005 and 2012 and percentage of Medicaid-insured and uninsured children served by FQHCs from 2008 to 2013. Our outcome was rates of ED use by uninsured or Medicaid-insured children ages 0 to 18 years. To determine the effect of changes in FQHC access on the outcome within a county over time, we used negative binomial models with county fixed effects and controls for preselected time-varying county characteristics and secular trends.

RESULTS: Increased geographic density of FQHC sites was associated with ≤18% lower rates of ED visits among Medicaid-insured children and ≤40% lower ED utilization among uninsured children ($P = .05$ and $P < .01$, respectively). However, the percentage of Medicaid-insured and uninsured children seen at FQHCs was not associated with any significant change in ED visit rates among Medicaid-insured or uninsured children.

CONCLUSIONS: Whereas increased geographic FQHC access was associated with lower rates of ED use by uninsured children, all other measures of FQHC access were not associated with statistically significant changes in pediatric ED use. These results provide community-level evidence that expanding FQHCs may have a limited impact on pediatric ED use, suggesting the need to explore additional factors driving ED utilization.

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Ms Nath conceptualized and designed the study, acquired the data, contributed to the analysis and interpretation of the data, and drafted the initial manuscript; Ms Costigan contributed to data acquisition, assisted in the analysis and interpretation of the data, and drafted the initial manuscript; Ms Lin carried out the initial analyses and reviewed and revised the manuscript; Dr Vittinghoff contributed to the study design, assisted with the analysis and interpretation of the data, and reviewed and revised the manuscript; Dr Hsia contributed to the study design, assisted with data acquisition, contributed to the analysis and interpretation of the data, and critically reviewed the manuscript; and all authors approved the final manuscript as submitted.

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WHAT'S KNOWN ON THIS SUBJECT: Federally qualified health centers (FQHCs) provide primary care for almost 7 million underserved children nationwide. Although many cite that primary care is a means to prevent unnecessary emergency department use, no evidence exists supporting that mechanism in children.

WHAT THIS STUDY ADDS: Increased FQHC access, measured both geographically and as a proportion of underserved patients seen, was largely not associated with changes in rates of emergency department use by uninsured and Medicaid-insured children in California counties between 2005 and 2013.

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Nearly 1 in 5 American children will make ≥1 visit to the emergency department (ED) each year, accounting for >26 million visits annually.[1,2] Although the ED provides essential health care access for seriously ill or injured children needing immediate care, ED visits by children are the least likely of any age group to be triaged as "immediate" or "emergent" and are least likely to result in admission.[3] As many as 85% of all ED visits by children are for conditions that could have been treated in a primary care setting or prevented by better long-term access to preventive care.[4] These potentially preventable visits can be ≤7 times more expensive than primary care visits[5] and may contribute to ED crowding that can result in lower quality of care for all patients.[6–10]

Children from vulnerable populations, including uninsured and underinsured groups, are more likely to visit the ED for potentially preventable conditions[11] and are also the most likely to encounter access barriers to primary care.[12,13] Federally qualified health centers (FQHCs) are community health clinics, public housing centers, school clinics, and other delivery sites funded through block grants from the Health Resources and Services Administration (HRSA) and increased Medicaid reimbursements that provided health and social services to nearly 7 million children nationwide in 2013.[14,15] The Affordable Care Act has also provided funding for hundreds of new FQHC locations nationwide to improve primary care access for growing numbers of newly insured vulnerable people seeking medical care.[15]

Although improved access to primary care, such as FQHCs, for vulnerable populations is often suggested as a potential solution to the problem of potentially preventable ED use by children and adults,[16,17] no studies have investigated the independent association between FQHC access and ED utilization among children. Furthermore, existing studies on the association between access to FQHCs and acute care use that do not stratify by age or focus on adults specifically have largely been cross-sectional,[18–20] focused on hospitalizations,[21] or limited to a single clinic.[22] Thus, given the lack of focus on children and ED use, along with the confounding associated with cross-sectional studies, it is impossible to determine from the current literature whether any independent relationship exists between FQHC access and ED use among children.

We conducted a longitudinal study of 58 counties in California to determine whether change in FQHC access is associated with change in ED use by uninsured and Medicaid-insured children ages 0 to 18 years between 2005 and 2013. By using a longitudinal fixed-effects model, we aimed to determine the independent association between primary care access for children of vulnerable insurance status in a community and ED use by the same groups. Our study provides a detailed examination of this question by capturing 2 measures of access: the geographic density of FQHC delivery sites and the percentage of Medicaid-insured and uninsured children served in face-to-face encounters by FQHCs.

METHODS

Data Sources

We assessed FQHC access by county by using publicly available data we obtained from HRSA's Uniform Data System (UDS) on the number of FQHC locations in each county and number of pediatric patients served. We used 2010 land mass by county from the US Census Bureau to calculate our predictor of density of locations per 100 square miles. We then obtained comprehensive records of all ED visits in California by using the nonpublic versions of the Office of Statewide Health Planning & Development's (OSHPD) ED data and patient discharge data. To establish a denominator of uninsured and Medicaid-insured children in each county, we used Small Area Health Insurance Estimates files from the US Census Bureau and California Department of Health Care Services Medi-Cal enrollment counts from the Medi-Cal Eligibility Data System. Finally, we obtained county-level covariates by using the Area Health Resource Files from HRSA.

Predictors

We measured access to FQHCs in each county by the density of FQHC sites per 100 square miles and the percentage of Medicaid-insured and uninsured children ages 0 to 18 years served at an FQHC.

Geographic Clinic Access

HRSA funds FQHCs through block grants that are typically given to grantee umbrella organizations that often operate numerous delivery sites. To best measure geographic access to care delivery, we identified the presence of FQHC delivery sites each year by using the grantee-reported site listings in the UDS, using zip code to assign clinics to a county. However, because the raw listings of delivery sites by grantees were often inconsistent and had missing data, we manually verified each clinic site's years of operation and zip code each year by using online documentation and, if necessary, phone calls to the clinics or grantees directly. We were unable to complete this time-intensive process for 2013 UDS data acquired later in this project, and therefore this geographic access analysis is limited to the 2005 to 2012 window.

We chose to include clinics for all years they reported providing services during our direct verification, even if they were not listed in UDS during the entire period they reported. This method differed from the patient count data described

below that were gathered only from the UDS, without manual verification. We included all California FQHC clinic sites listed in UDS in our clinic count because health services such as dental care and mental health care as well as social services provided by FQHCs influence the factors driving underserved patients to visit the ED.[23–25] The final counts of clinics by year and zip code were then merged into the OSHPD ED visit files. We then aggregated these data to the county level and divided the clinic count by the area of the county to obtain the density of delivery sites per 100 square miles. This predictor provides a proxy measure for geographic access to care, indicating roughly how difficult it would be for patients to travel to care at an FQHC.

As a sensitivity analysis, we also analyzed the geographic access as sites per 100 000 residents in each county. This sensitivity analysis captures an alternative definition of access that describes the physical location service level per person rather than per area. We calculated the number of sites as described above and divided that count by the corresponding total county population in each county-year.

Percentage of Medicaid-Insured and Uninsured Children Served

We also wanted to estimate the actual penetrance of FQHC services into the underserved populations they aim to reach. To determine this percentage, we first totaled the number of pediatric patients seen at FQHCs in each county-year. For purposes of reporting in the UDS, an FQHC patient is defined as anyone who had ≥1 face-to-face encounters at the FQHC to receive services. Regardless of how many visits he or she made, each patient is counted only once per HRSA grantee. This measurement allows us to capture the number of patients served rather than the total number of visits. However, if a patient made visits to >1 grantee, he or she may be counted multiple times. We abstracted the number of FQHC patients in California from the UDS by year, grantee, and zip code. We multiplied each grantee's patient counts by the proportion of their patients who were between the ages of 0 and 18 in that year to calculate the number of children served by that grantee in each zip code. To get the total number of children served by FQHCs in a given zip code, we totaled the pediatric patient counts in each zip code from all grantees. We had to limit use of this predictor to the 2008 to 2013 study window because patient location data were not reliable before 2008. We then divided the pediatric patient total by the number of Medicaid-insured and uninsured children in that county-year.

Outcome

We included all ED visits listed in the OSHPD data by Medicaid-insured and uninsured patients ages 0 to 18 in each county. These groups were chosen to focus on children who would have been most likely to be affected by access to an FQHC. The corresponding population of uninsured or Medicaid-insured children per county was included as an offset in the model to create the outcome of ED visit rates per population.

Covariates

For our model, we a priori included 9 variables shown in previous literature to predict ED use in a given county that may have varied over time[6,21]: percentage of population living in poverty, median household income, unemployment rate, primary care doctors per population, short-term hospital beds per population, percentage of the population with a college degree, health professional shortage area status, percentage of population who are African American, and percentage who are Hispanic.

Statistical Analysis

We used negative binomial models to estimate the dependence of the number of ED visits in each county and year on 2 measures of access: the density of FQHC clinics and the percentage of Medicaid-insured and uninsured county residents ages 0 to 18 seen at FQHCs. We used the overall number of Medicaid-insured or uninsured children in each county-year as the denominator for estimating effects on visit rates. Our models included county as a fixed effect and controlled for 9 prespecified factors that also potentially changed within counties during the study period. Accordingly, access effect estimates depend solely on within-county contrasts across years, thus avoiding bias stemming from fixed but unmeasured county-level confounders. To flexibly control for secular effects, we included year as a categorical variable, and we used robust SEs to account for overdispersion. Because the estimated effects of both access measures violated the assumption of log-linearity, we categorized both in quartiles based on their overall distributions over the study period (see tables for quartile ranges). Analyses were performed in SAS 13.1 (SAS Institute, Inc, Cary, NC) and Stata version 14.0 (Stata Corp, College Station, TX). Two-tailed significance was assessed at $P < .05$. The University of California San Francisco Committee on Human Research approved this study.

RESULTS

The average demographics of the 58 California counties followed in this analysis are shown in Table 1. The number of FQHC delivery sites in California increased from 910 in 2005 to 1197 in 2012; by county, the median number of sites per 100 square miles rose from 0.38 to 0.51 over the same period. Several counties

TABLE 1 Average Demographic Characteristics of 58 California Counties Studied, 2005 to 2013

	2005	2006	2007	2008	2009	2010	2011	2012	2013
Percentage in poverty	13.2	13.5	12.8	13.5	14.3	15.7	16.6	16.6	16.6
Median household income, $ per year	48 503	50 775	52 844	54 453	52 700	51 610	51 579	52 687	54 235
Percentage unemployed	6.7	6.3	6.8	8.6	12.8	14.0	13.4	12.3	10.3
Primary care physicians per 1000 population	30.3	29.7	29.7	28.9	28.8	28.2	27.9	28.6	29
Acute care hospital beds per capita	0.23	0.24	0.2	0.19	0.19	0.19	0.18	0.19	0.18
Percentage of population with college degree	24.6	24.6	24.6	24.9	25.1	25.1	25.1	25.1	25.1

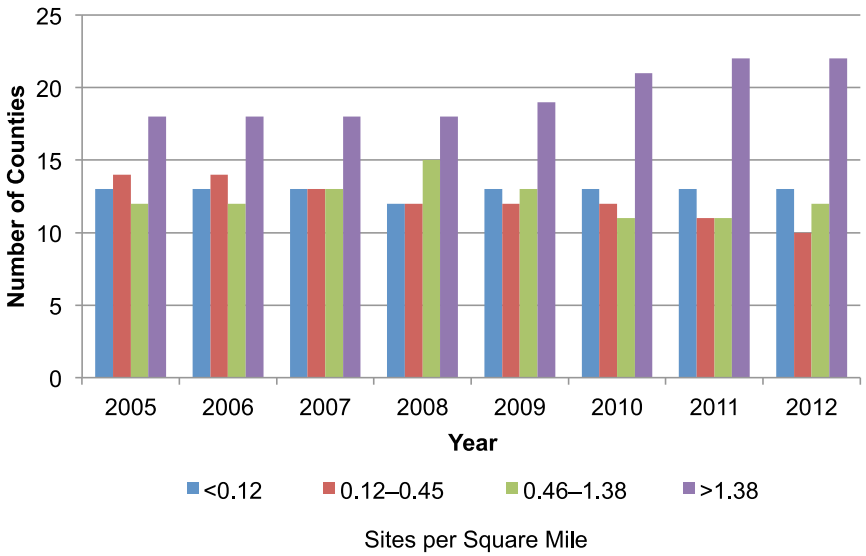

FIGURE 1
Number of counties by quartile of FQHC delivery site density (number of sites per 100 square miles), 2005 to 2012. Total of 58 California counties each year. Groups reflect average quartiles calculated over the 8-year study period.

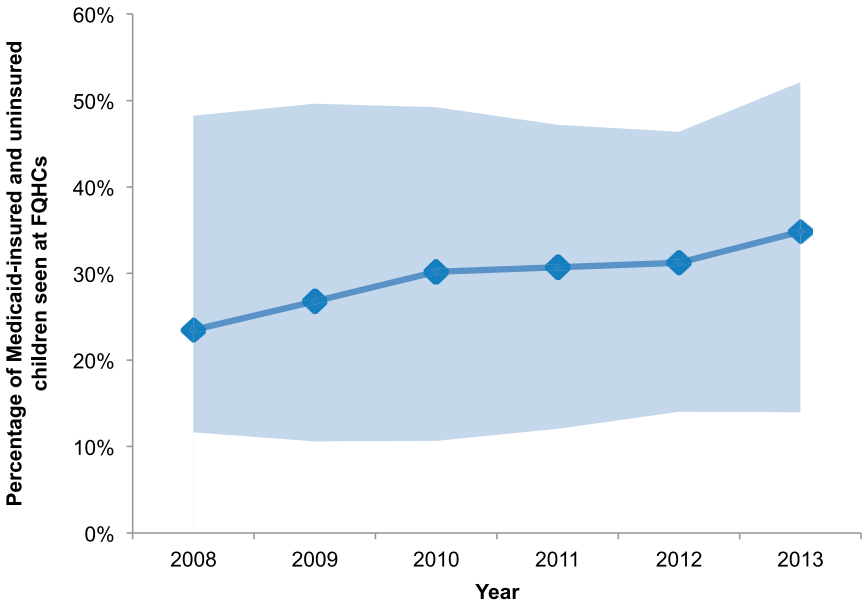

FIGURE 2
Median (line) and interquartile range (shaded area) of percentage of Medicaid-insured and uninsured children served by FQHCs per county, by year, 2008 to 2013.

entered higher quartiles of site density over the study period (Fig 1).

The number of pediatric patients served by an FQHC in California grew from 858 000 in 2008 to 1.15 million in 2013. The median percentage of Medicaid-insured and uninsured children seen at FQHCs per county increased from 23% to 35% over the same period (Fig 2).

By using the density of FQHC delivery sites to measure access, we found a marginally significant overall relationship ($P = .05$, test for heterogeneity) with the rate of ED use by Medicaid-insured children (Table 2), with 18% lower rates

of ED use in counties with >1.38 delivery sites per 100 square miles compared with those that had <0.12 delivery sites per 100 square miles. Among uninsured children, we found a statistically significant overall relationship between ED use and density of FQHCs ($P < .01$, test for heterogeneity). Counties moving to >1.38 sites per 100 square miles had 40% lower rates of ED use among uninsured children than those that had <0.12 sites per 100 square miles.

When we measured FQHC access by the percentage of Medicaid-insured or uninsured children in that county served by an FQHC, we did not find a statistically significant association between changes in FQHC access and changes in ED visit rates by Medicaid-insured or uninsured children ($P = .82$ and $P = .09$ test for heterogeneity, respectively; Table 3).

Finally, our sensitivity analysis with FQHC access measured as delivery sites per 100 000 population similarly showed no statistically significant relationship between changes in FQHC access and ED visit rates among Medicaid-insured or uninsured children (Supplemental Table 4).

TABLE 2 Effects of FQHC Delivery Site Density on ED Visit Rates, Children Ages 0 to 18, 2005 to 2012

Quartile, Sites per 100 Square Miles	Medicaid		Uninsured	
	IRR	*P*	IRR	*P*
<0.12	Reference	.05[a]	Reference	<.01[a]
0.12–0.45	0.98	.75	0.79	.09
0.46–1.38	0.78	.11	0.63	<.01
>1.38	0.82	.03	0.60	.01

Results of a negative binomial model with robust SEs showing the effects of FQHC delivery site density on ED visit rate by county among children ages 0 to 18 who are either uninsured or have Medicaid insurance. Estimates adjusted for year and county as fixed effects as well as time-varying county-level covariates including percentage of population living in poverty, median household income, unemployment rate, primary care doctors per population, short-term hospital beds per population, percentage of the population with a college degree, health professional shortage area status, percentage of population who are African American, and percentage who are Hispanic. IRR = incidence rate ratio.
[a] Overall *P* value for heterogeneity across 4 quartiles.

TABLE 3 Effects of Percentage of Medicaid-Insured and Uninsured Children Served by FQHCs on ED Visit Rates by Children Ages 0 to 18, 2008 to 2013

Quartile, Percentage of Children Seen at FQHCs	Medicaid		Uninsured	
	IRR	*P*	IRR	*P*
0%–11.6%	Reference	.82[a]	Reference	.09[a]
11.7%–30.1%	0.99	.84	1.05	.34
30.2%–48.9%	1.01	.73	1.01	.86
>48.9%	1.03	.60	1.15	.09

Results of negative binomial model with robust SEs showing effects of percentage of Medicaid-insured and uninsured patients on ED visit rates by county among children ages 0 to 18 without insurance or insured through Medicaid. Estimates adjusted for year and county as fixed effects as well as time-varying county-level covariates including percentage of population living in poverty, median household income, unemployment rate, primary care doctors per population, short-term hospital beds per population, percentage of the population with a college degree, health professional shortage area status, percentage of population who are African American, and percentage who are Hispanic. IRR = incidence rate ratio.
[a] Overall *P* value for heterogeneity across 4 quartiles.

DISCUSSION

Our results indicated that improved access, when measured by the actual penetrance of FQHCs into their target Medicaid-insured and uninsured populations, was not associated with lower rates of ED use by uninsured and underinsured children in California. We did find that increasing geographic density of FQHC sites was associated with ≤40% lower rates of ED use among uninsured children and was marginally statistically significantly associated with ≤18% lower rates of ED use by Medicaid-insured children ($P = .05$).

Our mixed results indicate that the relationship between primary care access and ED use differs depending on how access is measured. Our geographic results largely concur with previous cross-sectional work showing that areas with an FQHC had lower rates of ED use.[20,21] This finding provides a compelling case that access to physical sites of primary care does affect the likelihood of using acute care in the ED, especially among uninsured children.

However, our results based on the proportion of the target population contrast with previous cross-sectional work showing that Medicaid beneficiaries seen primarily at FQHCs had lower rates of acute care use compared with those served at private clinics.[18,19] This finding provides a more complex answer to the question of whether increasing the number of patients served affects ED use. Importantly, this measure also captures patients who have overcome the additional barriers to care besides geography, such as difficulties with transportation, education and health literacy, hours of clinic availability, and wait times.[26–28] Thus, these results from our longitudinal fixed-effects model provide new, compelling evidence to this literature showing that volume-based measures of primary care access may not actually affect ED use at the community level.

In the long-standing policy debate about how to reduce potentially preventable ED use, lower costs, and reduce ED crowding, a proposed approach has been to improve access to high-quality primary care for underserved children who disproportionately use the ED.[16,29] The logic behind this strategy is based on evidence that underserved children, particularly those without insurance or who are on Medicaid, have worse access to primary care compared with their privately insured counterparts.[30–32] In addition, parents bringing children

to the ED often cite poor access to primary care as a primary driver of that visit.[26] Although this strategy has a strong theoretical framework, our results question its empirical validity. Geographic access to sites appears to be associated with lower ED use for uninsured children, but actual access in terms of patients seen does not appear to make a difference in ED use. Thus, in addition to making sure communities have ample geographic access to affordable primary care, the evidence from this work suggests that perhaps other, currently unexplored mechanisms to reduce ED use among underserved populations should be investigated.

For instance, although our analysis was focused on access to FQHC care, numerous studies have shown that factors beyond access to a primary care provider also play a role in determining patients' use of the ED. These include the quality and patient-centeredness of the care provided, the referral practices of primary care physicians, and operational factors such as nurse triage lines and evening clinic hours.[7,26,28,33–35] Our study did not account for those factors, and the comparative value of individual strategies that existing primary care clinics can implement to reduce ED use is an important area for future research.

This study is limited in that our fixed-effects model, though allowing us to remove all between-county omitted variable bias by focusing on access changes within each county, does not eliminate the possibility of confounding of the relationship between FQHC access and ED use by related factors that changed within a given county over time. We attempted to limit this confounding by including a number of time-variant county characteristics associated with ED use in previous literature. In addition, we think that secular within-county changes over 5 to 7 years are likely to be small compared with the between-county differences that are controlled. Second, our analysis is subject to ecologic biases, such that the inverse adjusted associations we found between FQHC access and ED visits at the community level may only loosely reflect the effects of access on ED use by individual patients. However, it would require unavailable patient level data, particularly for uninsured patients, to avoid this potential limitation. Furthermore, although the use of counties as proxies for market areas approximates geographic access, it is not a perfect measure. For instance, boundary bias may exist if an FQHC clinic in a neighboring county is closer for some residents than their own county's clinics. However, no other geographic boundary allows us to combine the necessary sources of data for this analysis.

In addition, because the UDS data do not provide the insurance statuses of patients by ZIP code, the numerator of our second measure of access (percentage of Medicaid-insured and uninsured children seen at FQHCs) may include some privately insured children who are not in our denominator. This measure thus overestimates the percentage of underserved children seen at FQHCs, particularly in rural counties where FQHCs serve as essential health access points for people of all insurance statuses. However, in 2007 >83% of all FQHC patients in California were either uninsured or Medicaid beneficiaries,[36] and therefore we believe this is a reasonable estimate of the target population, preferable to using the total pediatric population of each county as the denominator. Furthermore, because we are specifically examining changes in access over time, any overestimation of FQHC services should not bias our results unless the overestimation differentially changed in different counties over the study period.

CONCLUSIONS

Increased penetrance of FQHC services into target pediatric patient populations was not associated with lower rates of ED use by uninsured and Medicaid-insured children in California. However, we did find that geographic access to FQHCs was associated with lower rates of ED use by uninsured children. These longitudinal results question the conventional wisdom that expanding access to affordable primary care provided by FQHCs alone could decrease rates of ED use by underserved children. They also suggest the need to investigate alternative factors besides primary care access that could aid EDs struggling with crowding and reduce costs for potentially preventable acute care use.

ABBREVIATIONS

ED: emergency department
FQHC: federally qualified health center
HRSA: Health Resources and Services Administration
OSHPD: Office of Statewide Health Planning & Development
UDS: Uniform Data System

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