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Presence of a Community Health Center and Uninsured Emergency Department Visit Rates in Rural Counties

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ABSTRACT: *Context: Community health centers (CHCs) provide essential access to a primary care medical home for the uninsured, especially in rural communities with no other primary care safety net. CHCs could potentially reduce uninsured emergency department (ED) visits in rural communities.* **Purpose:** *We compared uninsured ED visit rates between rural counties in Georgia that have a CHC clinic site and counties without a CHC presence.* **Methods:** *We analyzed data from 100% of ED visits occurring in 117 rural (non-metropolitan statistical area [MSA]) counties in Georgia from 2003 to 2005. The counties were classified as having a CHC presence if a federally funded (Section 330) CHC had a primary care delivery site in that county throughout the study period. The main outcome measure was uninsured ED visit rates among the uninsured (all-cause ED visits and visits for ambulatory care sensitive conditions). Poisson regression models were used to examine the relationship between ED rates and the presence of a CHC. To ensure that the effects were unique to the uninsured population, we ran similar analyses on insured ED visits.* **Findings:** *Counties without a CHC primary care clinic site had 33% higher rates of uninsured all-cause ED visits per 10,000 uninsured population compared with non-CHC counties (rate ratio [RR] 1.33, 95% confidence interval [CI] 1.11-1.59). Higher ED visit rates remained significant (RR 1.21, 95% CI 1.02-1.42) after adjustment for percentage of population below poverty level, percentage of black population, and number of hospitals. Uninsured ED visit rates were also higher for various categories of diagnoses, but remained statistically significant on multivariate analysis only for ambulatory care sensitive conditions (adjusted RR = 1.22, 95% CI 1.01-1.47). No such relationship was found for ED visit rates of insured patients (RR 1.06, 95% CI 0.92-1.22).* **Conclusions:** *The absence of a CHC is associated with a substantial excess in uninsured ED visits in rural counties, an excess not seen for ED visit rates among the insured.*

A large proportion of patients visiting emergency departments (ED) have problems that could have been managed appropriately in general primary care practice.[1,2] ED visits by uninsured patients create a special problem for hospitals and society because the burden of indigent care in a costly ED setting is borne by other patients, payors, and their communities. In most states, uninsured rates are higher in rural areas than in urban areas, and the financial burden of uninsured ED visits has a direct impact on the financial viability of small rural hospitals.[3] Applying South Carolina's billing data to national ED visit data, Bennett et al projected that rural self-pay patients accounted for an estimated $5.3 billion in ED-related charges in 2000.[4] The burden of cost also falls on the uninsured themselves, who personally paid 47% of their own ED costs out of pocket. In some

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settings, an inappropriate use of the ED may also contribute to the problem of ED crowding.[5,6]

Aside from cost factors, some patients simply choose to use the ED because care is more comprehensive and convenient.[7] Being uninsured is not by itself a risk factor for increased ED visits, but ED visits are higher among those in poor health and whose regular care is disrupted.[8] ED visits may also represent a larger proportion of total health care use for the uninsured and minority patients because their access to office-based primary care is less.[9,10] The lack of access to quality health care is especially a concern in rural areas. Although about 20% of Americans live in rural areas, only 9% of physicians practice there.[11]

One strategy for reducing unnecessary ED utilization is to promote access to primary care in settings that specifically serve the uninsured, who might otherwise have no medical home. Over the past 4 decades, community health centers (CHCs) and other federally qualified health centers (FQHC) (such as health centers serving migrant, homeless, and public housing populations) have provided a very important source of primary health care for low-income and medically underserved urban and rural residents. In 2004, 91% of 15 million health center patients nationwide had family incomes at or below 200% of the federal poverty level. About 40% of health center patients were not covered by insurance, and another 36% were covered by Medicaid.[12] More than half of CHC patients are African American, Hispanic or Latino, or American Indian. CHCs should be distinguished from rural health clinics (RHCs), which can qualify for enhanced Medicare/Medicaid reimbursement by increasing the availability of primary care professionals (including mid-level practitioners) in rural communities, but they do not receive grant funding explicitly to care for the uninsured.[13]

Access to affordable health care through a CHC may reduce unnecessary reliance on EDs among the uninsured. A study in 1 community showed that within 3 years of establishing a CHC, uninsured visits to the local hospital ED decreased by almost 40%, whereas insured ED visits continued to grow.[14] In a follow-up study, after 10 years, uninsured ED visits remained 25% lower than when public funding of the CHC began.[15] The decreased number of uninsured ED visits also saved the hospital and uninsured patients almost $14 million. More recently, the National Association of Community Health Centers has published a monograph citing uncontrolled case studies of health center impact on reducing ED visits and suggested that CHCs could potentially effect a $4 billion reduction in ED visits nationwide.[16]

However, more rigorous and population-based evidence on the association between CHCs and ED use by the uninsured is especially limited, particularly with regard to rural communities. Therefore, we undertook this study to compare uninsured ED visit rates between rural counties in Georgia that have a CHC clinic site and counties without a CHC presence.

Methods

Study Setting and Population. The purpose of this study was to compare uninsured ED visit rates between rural counties in Georgia that have a CHC clinic site and rural counties without a CHC presence. The counties were categorized as rural or non-rural based on their 2003 metropolitan statistical area (MSA) status, as defined by the US Census Bureau. The study included all of Georgia's 117 rural (non-MSA) counties.

Source of Data. ED visit data were obtained under a data use agreement with the Georgia Hospital Association. ED visit data were added to the existing hospital discharge data collection system in 2002. These reflect administrative data, not clinical records, with 1 record per ED visit. We analyzed data from 100% of ED visits for patients 18-64 years old occurring in Georgia's rural counties from 2003 to 2005. The rural counties were selected, in part, because they are less likely to have multiple, overlapping safety net primary care service delivery agencies, making the impact of CHCs more directly measurable. Patients were categorized as insured or uninsured for each visit. We categorized patients as uninsured if the payor variable identified no public or private insurance and no alternative payment source. For the denominator of our uninsured ED visit rates, we used the US Census Bureau decennial count of the number of uninsured in each county for 2000.

Independent (Predictor) Variable. CHCs are community-owned organizations that provide comprehensive primary care regardless of the ability to pay, using a sliding-scale fee structure subsidized by grants from the Health Resources and Services Administration's Bureau of Primary Health Care under Section 330 of the US Public Health Service Act. Other FQHCs include health centers serving specific sub-populations such as migrant, homeless, and public housing communities. These other categories of FQHCs were not a significant source of year-round care in Georgia's rural counties, so our analyses are specific to Section 330 CHCs. All CHCs and their satellite clinics in the non-MSA Georgia counties were identified. The counties were classified as having a CHC presence if a CHC had a clinical delivery site (main office or satellite

clinic) offering comprehensive primary care within that county's borders throughout the study period (January 1, 2003, through December 31, 2005). Since we focused on rural counties, we also ran an analysis on counties that had an RHC but not a CHC versus counties with neither a CHC nor an RHC, but the sample size of RHC counties without a CHC was small (n = 8).

Dependent (Outcome) Variable. ED visits were identified and categorized by clinical reason for the ED visit. Counts for each county were then determined. The visit rates per 10,000 uninsured per year were calculated by dividing the 3-year total counts by 3 and dividing by the US Census Bureau counts of the uninsured population (for 2000) for each county. All analyses were performed first on uninsured emergency encounters, then repeated on the visit rates by insured patients, to ensure that our outcomes specifically reflected the differences among the uninsured.

In addition to measuring total ED visits for the uninsured, we also categorized the principal diagnosis or the reason for the ED visit as either an ambulatory care sensitive condition (ACSC) or a non-ACSC. ACSCs are conditions for which hospitalizations may have been prevented or conditions that might have been less serious if they had received early, appropriate primary care. Twenty-eight ACS conditions were flagged by the International Classification of Diseases, Ninth Revision (ICD-9) code using standard lists promulgated by the Agency for Healthcare Research and Quality (AHRQ).[17,18]

We also used software algorithms developed by Billings et al at the Center for Health and Public Research at New York University to sort ED visits first into emergent and non-emergent visits (excluding mental health and substance abuse-related conditions), then dividing the emergent visits into those which were primary care-treatable and those requiring ED care, and finally dividing the emergent conditions requiring true ED care into those which might or might not have been "preventable or avoidable." [19,20]

For statistical analysis, we followed the methodology of Billings et al and reclassified the ED visits into 1 of the following 4 categories (after excluding visits for mental health/substance abuse-related conditions):[21]

- Non-emergency (primary care-treatable by definition)
- Emergency, but primary care-treatable
- Emergency, ED care needed, but primary care-preventable
- Emergency, ED care needed and not primary care-preventable

The algorithm assigns a probability to each visit for each category. If the probability for a category was greater than or equal to 0.80, then the visit was assigned to this category.

We also examined ED visits for chronic conditions that are among the most common diagnoses seen in CHC practices (diabetes, hypertension, and asthma), and for which ED visits may be considered largely preventable. Specifically, visits to the ED for uncontrolled diabetes or hypertension or asthma by uninsured patients may reflect on the effectiveness of the primary care safety net. Diabetes-related encounters were identified as such if the principal diagnosis ICD-9 code for the encounter was in the range of 250.00-250.99. Hypertension-related encounters were identified as such if the principal diagnosis ICD-9 code for the encounter was in the range of 401.00-405.99 or 437.20-437.29. Asthma-related encounters were identified as such if the principal diagnosis ICD-9 code for the encounter was in the range of 493.00-493.99.

Covariates. The unit of analysis for this study is the county (uninsured ED visit rates at the county level), so we intentionally only controlled for county-level covariates.[22,23] Our data set unfortunately did not allow us to identify individual persons in the visit-level data, so we are not able to control for person-level clustering (multiple visits by 1 individual), and could not tie the person-level characteristics associated with each ED visit to the denominator population in our Poisson models. However, we did control for county aggregates of individual-level variables that might influence health care utilization.[24,25]

Since we were evaluating the impact of primary care safety net clinics on health care utilization at the county level, we assessed the impact of contextual variables describing the community such as population density, percentage of population below poverty level, percentage of population aged 65 and older, percentage of black population, and percentage of Latino population for each county. We also assessed potential county-level covariates describing local health care resources, such as the number of hospitals with an ED,[26] and the number of adult-focused primary care physicians (family practice and internal medicine) per 100,000 total population for the patient's county of residence.[27] Several of these variables were omitted from the final analysis because they did not add independently to the multivariate models, nor did they influence the association between presence of a CHC and the outcome measures. A final list of covariates appears in Table 3.

Statistical Analyses. All statistical analyses were done using SAS version 9 (SAS Institute Inc., Cary, N.C.). We calculated the rates and 95% confidence interval (CIs) for each of the outcome variables and covariates. Poisson models were used for the bivariate analyses instead of *t* tests to account for the non-normal distribution of the visit rates. Poisson models were also fitted for the multivariate analyses because of the non-negative nature of rate data. Rate ratios (RR) were calculated using the log of the county uninsured population as the offset variable for the Poisson models in the GENMOD procedure. The RR produced is the weighted rate for counties without a CHC divided by the weighted rate for counties with a CHC. The scaled deviance of each model was greater than 1, suggesting overdispersion of the variance of the rates in relation to the mean of the rates, thus violating a key assumption of ordinary Poisson regression models. To overcome this limitation, we fit overdispersed Poisson models (which estimate a parameter for the scaled deviance) to the data to account for the population of each county when calculating the RRs and 95% CIs.[28] Multivariate Poisson regression models (adjusted for overdispersion) were estimated to assess the independent association of CHC counties with uninsured ED visit rates while controlling for the county-level population and health system covariates described above. All *P* values are 2-tailed, with values less than .05 considered statistically significant.

Results

Table 1 presents the characteristics of counties with a CHC clinic site (n = 24) and without a CHC clinic site (n = 93). Overall, the CHC and non-CHC counties are similar except that counties with a CHC tended to have a lower population density (40.0 persons per square mile, 95% CI 29.5-50.4 vs 62.7 persons per square mile, 95% CI 51.2-74.3) and were less likely to have a hospital (RR 54.2%, 95% CI 34.2-74.1 vs RR 80.7%, 95% CI 72.6-88.7). These factors were controlled for in our multivariate models.

There were 2,070,778 ED visits captured during 2003-2005 in rural Georgia counties, with 695,690 (33.6%) reporting no health insurance (self-pay or uninsured). In total, 615,789 visits (34% uninsured) were attributed to patients residing in counties without a CHC, whereas 79,901 (30.7% uninsured) were for patients residing in counties with a CHC. The demographic characteristics of the patient for each uninsured ED visit are summarized in Table 2, and show that sex, age, and race/ethnicity for persons making ED visits were quite similar for both CHC and non-CHC counties.

Table 1. Characteristics of Counties With and Without a Community Health Center (CHC)

	Counties Without FQHC	Counties With FQHC
Number of counties	93	24
2004 population total	1,351,919	215,559
Proportion of counties with at least 1 Hospital*	80.7%	54.2%
County Population Characteristics	Mean (95% CI)	Mean (95% CI)
Population	24,478 (19506-29450)	15,348 (11007-19690)
Population density (persons per square mile)*	62.7 (51.2-74.3)	40.0 (29.5-50.4)
Percent age 65+	12.7 (12.1-13.4)	14.0 (12.8-15.2)
Percent black	27.9 (24.6-31.2)	35.3 (26.3-44.2)
Percent Latino	3.6 (2.8-4.4)	2.3 (0.90-3.7)
Percent poverty	17.7 (16.8-18.6)	18.9 (16.9-20.9)
Rate of primary care physicians/100,000 population	45.7 (41.1-50.3)	47.9 (38.2-57.8)

*t test P < .05.

Non-CHC counties had a higher rate of all types of ED visits compared with CHC counties (Table 3). They had a 33% greater rate of all emergency room visits (RR 1.33, 95% CI 1.11-1.59), and a 37% greater risk of ACSC visits (RR 1.37, 95% CI 1.11-1.70). On bivariate analysis, all categories of visits (including "emergency care needed" visits) were higher, but only total ED visits (RR 1.21, 95% CI 1.02-1.42) and ACSCs visits (RR 1.22, 95% CI 1.01-1.47) remained significant after adjustment for percentage of population below poverty level, percentage of black population, and number of hospitals (Table 3). As expected, the CIs were much wider after adjusting for overdispersion.

In order to ensure that these findings did not reflect some unmeasured secular difference between CHC and non-CHC counties that would affect ED visit rates universally, we ran the same analysis for ED visits by insured patients and found that the outcomes were unique to the uninsured. Total ED visit rates for insured patients were not significantly higher in the non-CHC counties (adjusted RR 1.06, 95% CI 0.92-1.22; Table 4); neither was there any CHC versus non-CHC county difference found for ACSCs among the insured (adjusted RR 1.07, 95% CI 0.90-1.27; Table 4).

Table 2. Demographic Profile of ED Visits in Counties With and Without a CHC

	CHC	Non-CHC
Total	79,901	615,789
Sex*		
Female	39,954	322,203
	(50.0%)	(52.3%)
Male	39,945	293,547
	(50.0%)	(47.7%)
Race*		
Black or African American	28,054	173,073
	(35.1%)	(28.1%)
White	47,307	382,919
	(59.2%)	(62.2%)
Hispanic/Latino	4,427	58,731
	(5.5%)	(9.5%)
Other	70	769
	(0.1%)	(0.1%)
Mean age, years (SD)*	34.1	33.9
	(11.3)	(11.2)

*Chi-square or *t* test *P* < .0001.

Finally, we compared the 8 counties with only an RHC and no CHC versus counties with neither an RHC nor a CHC and found no reduction in uninsured ED visit rates. On the contrary, we found that RHCs appeared to be a marker for higher-need counties, with higher rates of uninsured total ED visits than in counties with no safety net clinic at all (adjusted RR 1.29, 95% CI 1.10-1.51; data not shown in tables), as well as with higher rates of uninsured visits for ACSCs (RR 1.40, 95% CI 1.16-1.67; data not shown). This suggests that our findings with regard to ED visit rates are unique to the uninsured segment of the population, and also unique to CHCs versus RHCs.

Discussion

The main finding of this study is that rural counties without a CHC have significantly higher uninsured ED visit rates than do rural counties with a CHC clinic site, even after controlling for various county-level covariates that might also effect ED utilization. The presence or absence of a CHC had no effect on ED visit rates by insured patients.

Uninsured ED visits represent a significant problem in Georgia. Of the roughly 2 million ED visits by non-elderly adult patients occurring in Georgia in this 3-year period, roughly one third were visits by the uninsured, even though only 18% of Georgia's non-elderly adults are uninsured. CHCs clearly play a major role as a primary care safety net in Georgia. In 2003, 43.5% of the patient visits provided by Georgia's 19 CHC organizations (76 clinic sites) were to uninsured patients. Sixty-nine percent of patients were African American or Latino, and 70% had documented family incomes below 200% of the federal poverty level.

Our findings are consistent with earlier studies, showing that primary care access can reduce ED visit rates. For example, national data show a positive association between primary care shortage densities and ED visit densities.[29] Mauskopf et al reported that New York State Medicaid HIV patients without a usual source of primary care had higher odds of ED use than patients with a medical home.[30] Falik et al have also shown that Medicaid patients enrolled as patients in a comprehensive CHC have fewer ambulatory care sensitive ED visits than other Medicaid clients, even after controlling for case mix.[31] A survey of 700 patients waiting for ED care at a public hospital showed that patients with a regular source of care used the ED more appropriately than did patients without a regular source of care.[32]

Oster and Bindman found evidence in the National Hospital Ambulatory Care Survey that not having a primary care home led uninsured and minority patients to have higher rates of preventable hospitalization.[33] In fact, expanding Medicaid coverage to all poor adults in Oregon may actually have increased hospitalization rates for preventable conditions because it lowered financial access barriers to hospital admission for the newly insured without first ensuring appropriate use of a primary care medical home.[34]

However, none of these studies specifically addressed the impact of primary care safety net health centers such as CHCs on indigent care ED visits by the uninsured, and the few published studies looking at CHCs and uninsured ED visits have been uncontrolled case studies. Communities with no CHC or other primary care safety net might naturally expect increased uninsured visits to the ED, which becomes the "safety-net for the safety-net," especially since the Emergency Medicine Treatment and Labor Act (EMTALA) mandates that EDs evaluate all patients regardless of insurance status or the ability to pay.[35]

CHCs play an important role in reducing access barriers to primary care services in rural areas. Compared with the general rural population, rural CHC patients are more likely to receive certain preventive services and experience lower rates of low birth weight, particularly for African-American infants.[36] CHCs are specifically charged with providing a comprehensive primary care medical home for patients who might otherwise not be able to access care, and they specifically are mandated to offer sliding-scale, reduced fee care to the uninsured based

Table 3. Mean Annual Rate and Crude and Adjusted Rate Ratios of Emergency Department Visits Among Uninsured Adults in Non-CHC Versus CHC Counties, 2003-2005

	Number of Events, 2003-2005		Mean Annual Rate*		Unadjusted Model		Adjusted Model[†]	
	No CHC	CHC	No CHC	CHC	RR	95% CI	RR	95% CI
All emergency visits	615,789	79,901	7,343	5,510	1.33	1.11-1.59	1.21	1.02-1.42
Ambulatory care sensitive conditions	131,095	16,508	1,563	1,138	1.37	1.11-1.70	1.22	1.01-1.47
Non-emergent or emergent, primary care-treatable	89,447	11,802	1,067	814	1.31	1.06-1.62	1.18	0.97-1.43
Emergent, ED care needed	25,409	3,617	303	249	1.21	1.03-1.44	1.11	0.95-1.31
Diabetes	3,272	430	39	30	1.32	1.04-1.66	1.24	0.98-1.56
Asthma	6,169	806	73	56	1.32	1.04-1.68	1.21	0.95-1.53
Hypertension	4,854	716	58	49	1.17	0.91-1.51	1.20	1.11-1.30

*Rates calculated per 10,000 uninsured adults, based on the 2000 census estimates of uninsured[43]; No CHC: 279,536 CHC: 48,340.
[†]Poisson regression model adjusted for percentage of black population, percentage of population below poverty level, number of hospitals, and overdispersion of variance.

Table 4. Mean Annual Rate and Crude and Adjusted Rate Ratios of Emergency Department Visits Among Insured Adults in Non-CHC Versus CHC Counties, 2003-2005

	Number of Events, 2003-2005		Mean Annual Rate*		Unadjusted Model		Adjusted Model[†]	
	No CHC	CHC	No CHC	CHC	RR	95% CI	RR	95% CI
All emergency visits	1,189,135	179,585	3,696	3,580	1.03	0.88-1.21	1.06	0.92-1.22
Ambulatory care sensitive conditions	216,435	32,351	673	644	1.04	0.86-1.26	1.07	0.90-1.27
Non-emergent or emergent, primary care-treatable	156,077	22,582	485	450	1.08	0.89-1.30	1.09	0.91-1.30
Emergent, ED care needed	62,431	10,103	194	201	0.96	0.83-1.12	0.98	0.86-1.13
Diabetes	8,300	1,449	26	29	0.89	0.71-1.12	0.95	0.78-1.17
Asthma	11,543	1,844	36	37	0.98	0.78-1.23	1.06	0.86-1.30
Hypertension	9,402	1,665	29	33	0.87	0.67-1.14	1.01	0.81-1.26

*Rates calculated per 10,000 uninsured adults, based on the 2000 census estimates of uninsured; No CHC: 1,072,383 CHC: 167,219.
[†]Poisson regression model adjusted for percentage of black population, percentage of population below poverty level, number of hospitals, and overdispersion of variance.

on income level and the ability to pay. This is a more relevant measure of primary care access for the uninsured than is the simple availability of primary care physicians in the county, who primarily serve insured patients. In fact, in our preliminary analyses, the number of primary care physicians per 100,000 population had absolutely no effect on multivariate models of uninsured ED visits.

Studies by Starfield et al had previously shown a significant impact of primary care physician supply on total mortality, disease-specific mortality, and hospitalizations for ACSCs, but did not specifically focus on ED visits or on the uninsured.[37,38] For the uninsured, our findings suggest that primary care access is indeed important, but only when we look at the segment of primary care providers actually

providing care to substantial numbers of uninsured patients (ie, CHCs). We could not identify private practice primary care practitioners (if any) serving large numbers of uninsured patients, but at least, related to the outcome of ED visits for the uninsured, the presence of a CHC was more significant than was the overall number of primary care clinicians serving the broader population.

Similarly, our results indicate that even providing enhanced Medicare-Medicaid reimbursement to practices that use mid-level practitioners to expand capacity in underserved rural areas through the Rural Health Clinic model did not have any effect on reducing ED visits among the uninsured. In contrast to CHCs, RHCs do not receive a federal grant to subsidize care for the uninsured, and therefore have a very

limited capacity to provide a primary care home for the uninsured. Our data actually suggest that RHCs may be a marker for high-need counties, which indeed have higher rates of uninsured ED visits and perhaps might benefit from the presence of a comprehensive, federally funded CHC.

The importance of CHCs in improving access to primary care for underserved populations has been increasingly recognized. In 2002, the Congress passed an initiative to serve an additional 6.1 million persons by building new CHC access points and expanding the existing facilities to provide primary care homes for uninsured and high-disparity populations.[39,40] These expansions may be offset by ongoing increases in the uninsured population, as well as by state and federal Medicaid cutbacks, which could increase financial pressures on CHCs. Additional research will be needed to assess the impact of these CHC expansions on uninsured ED visits and hospitalizations in rural areas as well as on the long-term financial viability of rural hospitals. Attention to proportionate expansion of the National Health Service Corps and Title VII mechanisms for enhancing the production of primary care physicians willing to serve in underserved areas may also be a limiting factor to further expansion, especially in rural communities.[41]

We expected to find a substantial impact of CHCs on ED visits for ACSCs or primary care-treatable conditions. We were somewhat troubled to see higher rates of "true emergency, non-preventable" ED visit rates in non-CHC counties, but these were not statistically significant after adjustment for covariates and overdispersion. It is plausible, however, that patients who have an established relationship with a comprehensive primary care CHC as their medical home may choose to go there even for urgent conditions. The farmworker with a broken arm, for example, who goes to the health center and gets an X-ray, a splint, and a referral to an orthopedist, would be categorized as having a "true emergency," but might still have received more cost-effective care from the CHC than he/she would have from the ED. An alternative explanation is that 1 or more unrecognized covariates affecting ED use have also somehow affected the placement of a CHC in a given community, but this did not show up in ED visit rates for insured patients.

One limitation of this study is that it relied on hospital-generated reports of ED visits, similar to hospital discharge data. These data are most reliable for elements that are tied to payment of claims, such as diagnosis, date of service, etc., and are less reliable for unrelated fields such as Hispanic ethnicity. The diagnosis codes on billing claims also do not always reflect the complexity of reasons for the visit that might be found in the clinical record. Unfortunately, there was no unique identification number for each individual person in the database, so we could not flag multiple visits by the same person or look separately at persons who might be frequent utilizers of ED visits.

We did assess the ratio of ACSC visits to "non-preventable, true emergency" visits in order to eliminate the effect of uncertainties in the uninsured counts as a denominator and still found a significant (albeit smaller) impact of CHCs on ACSC visits relative to "true emergencies" (data not shown). Unfortunately, this would underestimate the impact of CHCs if they reduce both ACSC and non-ACSC visits, as our analysis of rates would indicate.

Another limitation is that these data do not allow us to assess the primary care safety net more deeply than the simple presence or absence of a safety net clinic site for the uninsured. Some of these clinics might have a very robust capacity to serve the uninsured population from a wide catchment area, whereas smaller clinics might have a smaller capacity or lower market penetration among the uninsured. Because CHCs report their number of uninsured users by organization rather than by clinic site (each CHC might have 1 or more satellite clinic locations in multiple counties), we could not control for the uninsured CHC patient volumes in each county. We could only determine the patient's county of residence and compare it with the county in which the CHC had a clinic site. We also know that, in a few of the non-CHC counties, there are free clinics (often faith-based volunteer clinics) offering services to the uninsured, but usually at much lower volumes than those offered by the CHCs. If they had an impact on our analysis, they would have reduced ED visit rates in the non-CHC counties, which would actually bias our results in the direction of finding no difference between CHC and non-CHC counties.

Finally, our data come only from one state, albeit one with a large number of rural counties. Southern states are known for having higher uninsured rates, less generous Medicaid eligibility criteria, less adequate supplies of health professionals in rural areas, and overall poorer health outcomes. In an unpublished study from South Carolina's Rural Health Research Center, the presence of a CHC was associated with a decreased ED visit rate (from 37.4 per 100 persons per year to 31.0 visits per 100 persons).[42] Further research will be needed to determine if these results are generalizable to rural areas in other regions of the United States.

We conclude that there is a significant excess of uninsured ED visits in rural counties that do not have a federally funded CHC clinic site, compared with CHC counties, even after controlling for various county-level covariates that might also effect ED utilization. This excess is unique to the uninsured segment of the population, which CHCs have a unique capacity to serve. RHCs did not have a similar protective effect. CHCs have the potential to prevent emergency visits by providing a primary care medical home for best-practice chronic disease care and preventive services. They are also a more cost-effective and care-appropriate setting for managing acute but primary care-treatable episodes of care. Further research is needed to directly assess the proportion of uninsured clients from each county receiving care in CHCs and having ED visits for emergent and non-emergent conditions and also quantify the economic benefit attributable to the CHC-associated reduction in uninsured ED visit rates.

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