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Title

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Permalink

<https://escholarship.org/uc/item/2x1774kt>

Journal

Psychiatric Services, 70(10)

ISSN

1075-2730

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Publication Date

2019-10-01

DOI

10.1176/appi.ps.201800553

Peer reviewed



Published in final edited form as:

Psychiatr Serv. 2019 October 01; 70(10): 901–906. doi:10.1176/appi.ps.201800553.

Psychiatric Emergency Department Visits after Regional Expansion of Community Health Centers

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Abstract

Objective: Regional primary health care system capacity may affect the demand for psychiatric visits to the emergency department (ED). In the US, Community Health Centers (CHCs), which serve low-income regions regardless of individuals' ability to pay, expanded primary care services by over 70% in the last decade. No research, however, evaluates whether this expansion affects overall psychiatric ED visits. This hypothesis is tested in 143 US counties which expanded CHC services.

Methods: For the years 2006 to 2011, 18.84 million psychiatric outpatient ED visits were aggregated by county-year for the 143 US counties with a participating CHC. The rate of psychiatric ED cases in a county-year is the dependent variable. Two independent variables were examined: total patients seen at CHCs, and total patients seen with a mental health diagnosis at CHCs. Fixed-effects regression methods controlled for county effects, year effects, and other health care and sociodemographic factors.

Results: Psychiatric ED visits fall below expected levels in county-years where the volume of overall CHC patients rises (coef= $-.059$; standard error=.027, $p=.03$). Findings indicate no relation between the volume of mental health patients seen at CHCs and psychiatric ED visits.

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Contributors:

Tim Bruckner and Jangho Yoon conceived the idea and originated the study. Parvati Singh collected the data, and Parvati Singh, Jangho Yoon, Tim Bruckner, Lonnie Snowden, and Bharath Chakravarthy contributed to the analysis and interpretation of results. Tim Bruckner served as lead author of the manuscript. Parvati Singh, Lonnie Snowden, Jangho Yoon, and Bharath Chakravarthy wrote sections of the manuscript. Tim Bruckner acts as the study guarantor.

Disclosures of Conflicts of Interest: None for any author.

Ethical approval: Ethical approval not required, as this study qualifies as exempt from human subjects research.

Data sharing: The county-level datasets used for the analysis and the statistical code are available from the corresponding author:

Data Integrity: All authors, external and internal, had full access to all of the data (including statistical reports and tables) in the study and can take responsibility for the integrity of the data and the accuracy of the data analysis.

Conclusions: An increase in general primary health care to an underserved population, in the form of CHCs, corresponds with a decline in psychiatric ED visits. This result coheres with a recent Medicaid expansion experiment in which increased access to general primary care reduced the prevalence of undiagnosed and untreated depression. Findings, if replicated, may hold policy implications for regional health systems.

Introduction

In the United States, mental health-related complaints account for 5.6 million annual Emergency Department (ED) visits (1). EDs often provide sub-optimal psychiatric treatment relative to that received in non-urgent care settings (1–3). Scholars assert that a subset of persons with mental disorder could avoid psychiatric ED visits if they instead received proper outpatient or community-based care (4). Within the U.S. context of overcrowded yet underfunded ED care, these psychiatric ED visits impede persons who need emergency services from receiving them, disrupt patient flow and increase health care costs (3, 5, 6). Taken together, this literature indicates that the population rate of psychiatric ED visits may sensitively gauge the overall functioning of the system of mental health care.

Since 2000, the Federal Government invested heavily in expanding primary health care in medically underserved communities. Federally Qualified Health Centers (often referred to as Community Health Centers, or CHCs) represent the nation's single largest investment in comprehensive primary health care for these communities. CHCs currently serve over 27 million Americans, of which 93% report incomes less than 200% of the federal poverty line. CHCs predominantly serve persons insured by Medicaid (39%) and persons without health insurance (38%). From 2006 to 2015, the number of patients seen at CHCs grew by 10 million (7).

The rapid expansion of CHC primary care among low-income populations may affect the population rate of psychiatric ED visits in several ways. First, increased general primary care may promote detection of previously untreated mental disorders which, if properly diagnosed and treated, could divert patients away from the ED. A recent report using national data indicates an increase over time in the provision of office-based mental health care among primary care providers relative to psychiatrists (8). This shift over time of mental health diagnoses, as well as in prescription rates of psychotropic medications, to the primary care setting indicates that expansion of primary health care may increasingly serve patients with mental disorders. Second, expanded specialty mental health care at CHCs could capture patients with emergent conditions and treat them in the non-urgent, rather than in the emergency, setting. Third, consistent with economic theory, patients who experience reduced financial barriers to primary care may then perceive fewer barriers to all aspects of the health care system and therefore utilize the ED more often for non-urgent conditions. Recent experimental results from the Medicaid lottery in Oregon, for instance, show a 40% rise in ED visits among persons newly receiving Medicaid insurance (9).

Given the rapid expansion of primary care at CHCs, and the substantial federal funding devoted to serving these low-income communities, we investigate whether county-level increases in primary care offered at CHCs correspond with changes in that county's rate of

psychiatric ED visits. We examine 18.84 million outpatient psychiatric ED visits in 143 counties from 2006 to 2011, a period which underwent rapid growth in CHCs.

We employ fixed-effects methods in which the counts of psychiatric ED visits and CHC primary mental health care visits, measured at the county-year level, are the units of analysis. Fixed-effects methods control for baseline regional differences in mental health profiles, help-seeking behaviors, and the systems of care when examining whether annual *changes* in psychiatric ED visits vary with annual *changes* in primary care at CHCs. Since the literature does not lead to a clear prediction about the direction of any discovered association, we specify all tests as two-tailed. Results may hold policy implications for developing strategies to reduce the overall demand for psychiatric ED care—especially in medically underserved communities.

Methods

Data and variables

IRB review judged that our study does not qualify as human subjects research; we, therefore, did not receive a Human Subjects protocol number. We retrieved outpatient (treat-and-release) psychiatric ED visits from the State Emergency Department Database (SEDD), the most comprehensive database of individual level ED encounters in the US. The federally-sponsored Healthcare Cost Utilization Project (HCUP) makes the SEDD available for purchase. SEDD reports ED visits for over 99% of hospitals statewide (10). Evaluation studies further demonstrate the high internal consistency and validity of HCUP datasets (11).

We classified an ED visit as a psychiatric ED encounter if any diagnosis (Dx 1 to Dx 25) for a visit listed an ICD 9 diagnosis code corresponding to mental disorders. These categories included the following conditions: mood, conduct, anxiety, and behavioral disorders, suicide attempts and self-harm, among others (see Appendix Table i for full list of ICD-9 codes) (12). In addition, our inclusion of adjustment disorders, delirium, dementia, attention-deficit, personality disorders, alcohol and substance use is based on the Federal Government's classification of these disorders under psychiatric conditions in the Clinical Classification Software (CCS)(12). CCS categorization combines individual ICD 9 diagnoses into clinically meaningful categories among which CCS codes 650 to 670 receive a mental health-related diagnosis (12). We adopt these definitions, used by HCUP and other federal databases, in our analysis. The use of this federally-endorsed classification scheme permits direct comparison of our results to other work in psychiatric services which uses CCS coding (13).

We analyzed states which report county identifiers, age and diagnosis codes per visit in the SEDD. These restrictions yielded nine states for analysis: Arizona, California, Florida, Maryland, Massachusetts, New Jersey, New York, North Carolina and Rhode Island. These states represent the Western, Southeast, Mid-Atlantic and Northeast regions of the US. Given that California, the most populous state of this set, no longer participates in the SEDD after 2011, we examined the years 2006 to 2011 (inclusive). This six-year span experienced a rapid growth in primary care at CHCs.

One of the federal funding requirements for CHCs under section 330 of the Public Health Service Act involves annual reporting of aggregate data on patients, diagnosis, age groups and other related attributes. We acquired these publicly available data, via a Freedom of Information Act Request (#17F167), from the Uniform Data System (UDS) database. The UDS contains information on over 99% of all CHCs (14, 15). Federal officials at UDS perform several verification processes for ensuring CHC data accuracy and reliability (16). For the nine states for which we had SEDD data, we obtained the number of total patients seen at CHCs (overall) and total mental health patients at CHCs with a primary mental health diagnosis. Mental health diagnoses contained in the UDS reports include depression and other mood disorders, anxiety disorders including PTSD, attention deficit and disruptive behavior disorders, and other mental disorders excluding drug or alcohol dependence.

We aggregated the dependent (psychiatric ED visits) and independent (CHC patients) variables by county and converted them to population prevalence per 100,000 persons by dividing aggregate visit/patient counts by county population. We obtained county population estimates from US Census Bureau's Population Estimates program (17).

Analysis

We linked county aggregates of psychiatric ED visits, CHC visits and other county-level covariates through county FIPS codes, which yielded a sample of 745 'county-year' units comprising 143 counties in nine states from 2006–2011. We specified aggregate (county level) psychiatric ED visits per 100,000 population as the outcome of interest. Total patients seen at CHCs and total mental health patients at CHCs, aggregated by county, per 100,000 population served as the two independent variables of interest.

We test whether a county's annual increase in primary care visits at CHCs corresponds with that county's reduction in psychiatric ED visits. Counties, however, have fundamentally different baseline levels of help-seeking in the ED. To control for these strong county-level and annual differences, we applied a fixed effects linear regression approach to estimate within-county associations. This approach accounts for time-invariant factors that may covary with psychiatric ED visits. In a regression framework, we insert into the test equation an indicator variable for each county. This county "fixed effect" captures each county's mean level of psychiatric ED visits over the test period. Inclusion of a county fixed effect essentially removes the county's mean level of ED visits. The analyst can then examine directly the year-to-year change in ED visits in a county as a function of year-to-year changes in primary care visits at CHCs.

Psychiatric ED visits in the US show a strong upward trend over the test period. We therefore specified year fixed effects using binary indicators for each year (2006 as referent year) to control for general temporal trends shared across all counties. In addition, we retrieved from the US Census and Area Health Resource File several county variables that approximate the mental health profile, help seeking behaviors and system of care in that county. These variables include total population size, percent of population in poverty (18), percent without health insurance (19), percent of African Americans (17), number of physicians per capita and hospital beds per county-year (20). We included these county-level covariates in the fixed-effects regression. County fixed effects adjust for time-invariant,

baseline prevalence of mental disorder in a region, and hence, adjust for county-specific mental health profiles. These fixed effects also adjust for differences in psychiatric help-seeking in EDs that appear unique to a county. We specified cluster robust standard errors (clustered by county) to adjust for potential heteroscedasticity of residuals. We performed all analyses using Stata SE version 14.2.

Results

The 743 county-years show an average of 5,480 psychiatric ED visits per 100,000 population (Table 1). This mean level, however, masks the strong rising trend over time (Figure 1). The rate of psychiatric ED visits increases gradually from 2006 to 2011, with an overall increase of 25% over the six-year period (Figure 1). This rise coheres with existing literature on increasing rates of ED utilization for psychiatric disorders in the US (21).

Total patients seen at CHCs in a county-year average 15,737 per 100,000 population. Mental health patients represent 7.5 percent of these CHC patients (i.e., 1,186 per 100,000 population; see Table 1). Figure 2 and Appendix Figure (i) plot CHC patient coverage and mental health patients seen at CHCs respectively. Both variables show a 30% increase in patient volume from 2006 to 2011, although mental health visits (Appendix Figure i) at CHCs decline briefly from 2006 to 2007.

Table 2 (Model a) shows the results for fixed effects regression analysis in which total number of patients seen at CHCs serves as the key independent variable. Psychiatric ED visits vary inversely with total patients seen at CHCs in that county-year (coef: $-.059$, standard error [SE] = $.027$, $p = .03$). This coefficient implies that, for a county with 100,000 population, one would expect approximately six fewer psychiatric ED visits in that county-year for every increase of 100 patients seen at CHCs.

The coefficients for the year indicator variables also support the strong upward trend in psychiatric ED visits. We observe no relation between the other county-level covariates and psychiatric ED visits. Model b in Table 2 repeats the fixed effects analysis but now inserts mental health patients seen at CHCs as the independent variable. Although the coefficient is negatively signed, the volume of mental health patients at CHCs show no relation with psychiatric ED visits in that county-year (Table 2, Model b).

We conducted an exploratory analysis to determine whether the discovered inverse relation between overall CHC patients and psychiatric ED visits concentrates in adults or youth. We analyzed these age groups separately given the different pathways in which youth (vs. adults) ultimately seek psychiatric ED care (22). In keeping with World Health Organization and Healthy People 2020, we defined youth as < 25 years of age and adults as 25 or greater (23, 24). Among youth, a unit increase in patients seen at CHCs varies with a decline in youth psychiatric ED visits by 4 percent ($p < .05$). For adults, a unit increase in adult CHC patients corresponds with a 6 percent reduction in psychiatric ED visits ($p < .05$; see Appendix Table ii).

Discussion

Primary care services at CHCs in low-income, medically underserved communities expanded rapidly in the past decade. We test whether a county's expansion of CHCs corresponds with reductions in the rate of psychiatric ED visits in that county. Findings in 143 counties from 2006 to 2011 indicate that psychiatric ED visits fall below expected levels in county-years in which overall patients seen at CHCs rise. This inverse relation indicates that expansions of low-cost, general primary care at CHCs may divert populations from seeking psychiatric care in the ED setting.

Although we have no information on the quality or level of behavioral health integration of primary care delivered at CHCs, previous work may help contextualize our findings. Nath and colleagues find that an increase in geographic density of CHCs within a county corresponds with reduced ED visits (for any condition) only among the uninsured population (25). It remains plausible that general primary care visits at CHCs may have identified unmet mental health care needs for the uninsured population and substituted for psychiatric ED care. This finding should encourage subsequent evaluations of CHCs which examine, by insurance type, the role of primary mental health care expansion on help-seeking of psychiatric care in the ED.

A time-trend analysis in the US by Olfson and colleagues further supports the inference that primary care serves as the dominant site for detection and treatment/referral of mental disorders (8). From 1995 to 2010, the proportion of visits with mental health complaints, mental disorders, and psychotropic medications rose at a faster rate among primary care physicians than among psychiatrists. Over this time period, the increased provision of mental health care in the primary care setting included not only that for depression, anxiety, and attention deficit hyperactivity disorder but also for bipolar disorder and schizophrenia. Olfson and colleagues reason that the growth in supply of primary care physicians relative to psychiatrists, coupled with the increased comfort of primary care physicians in prescribing psychotropic medications, may account for this trend. Our results cohere with the notion that new patients at CHCs would first receive mental health care within the primary care setting at CHCs.

Strengths of our research include the use of 18.84 million psychiatric outpatient ED visits over 143 US counties, which permits population-level inference to the nine states analyzed. Our fixed-effects approach also controls for county-level and annual confounders that affect the system of mental health care and/or help-seeking in the ED. The consistency of data collection on CHCs over the time span, moreover, allows us to analyze a dynamic period in which both primary care mental health services and psychiatric ED visits experienced rapid growth.

Important limitations of our work include that we cannot know the extent to which persons seeking primary care at CHCs visited the ED for psychiatric care at a lower rate. Our county-level results, rather, pertain to the county's system of mental health care and holds implications for mental health policy rather than for clinical care coordination. We therefore caution against using our county-level results to make inferences to an individual's help-

seeking behavior. In addition, we have no information on the extent to which diagnosis and treatment of mental disorders occur in the primary care setting at CHCs. Whereas qualitative work indicates that the level of care integration varies widely from center to center (26), we know of no source which systematically collects such data. Regarding the ED data, we do not have information on whether the patient was seen by a mental health provider. We also analyze only treat-and-release ED visits, which implies that results have unknown external validity to higher acuity patients whose ED visit results in an inpatient stay.

From 2006 to 2011, CHCs reported only primary diagnosis of visit. For this reason, a comorbid mental disorder—even if treated—may not have received a “mental disorder” code. We await additional work using non-UDS datasets to identify the level of behavioral health integration at CHCs. Lastly, given the omission of California from SEDD beginning in 2012, our time span covers the pre-ACA landscape. Only replication of our work after 2011, using other states or other datasets, will determine whether results generalize to the post-ACA landscape.

The Mental Health Parity and Addiction Equity Act (MHPAEA), passed in 2008, enhanced the ability of persons with private health insurance plans to receive comprehensive mental health care (27). To the extent that persons newly covered under these plans visited CHCs, the MHPAEA may have also increased CHC contact among persons with unmet mental health needs. Another factor that may affect the extent of integrated care at CHCs involves their increasing efforts to organize activities around the concept of the patient-centered medical home (26). This concept created payment reform incentives to treat chronic conditions comprehensively and to enhance coordination of care (28). These new financial incentives to treat mental disorders among Medicaid patients may have affected the level of integrated primary care at CHCs. We remind the reader that only future work can assess the validity of this informed speculation.

The time period of our study includes the most recent economic recession. Research shows that economic downturns increase reliance on safety nets (such as EDs) for psychiatric care (29). Individuals without private health insurance exhibit greater rates of help-seeking for both emergent and non-emergent conditions during such times (30). Demand for psychiatric care at EDs tends to rise sharply during economic downturns precisely when state and federal authorities reduce health care supply (31). Presence of alternate safety nets, such as CHCs, may alleviate ED burden and reduce costs of psychiatric care at emergency facilities, both for patients as well as health systems. We encourage additional work on the role of mental health care delivery in CHCs and in the ED for regions particularly hard hit by the economic recession.

We observe no relation between county-level psychiatric ED visits and volume of mental health patients seen at CHCs. Prior literature offers no clear prediction about the relation between these two variables. Elevated levels of patients receiving a mental health diagnosis in the primary care setting could indicate lower out-of-pocket costs for a visit, which (according to economic theory) may increase use of the ED for psychiatric care (9). Alternatively, effective mental health services in a primary care setting may substitute for an ED visit considered “preventable.” Given that our county-level observational study does not

track out-of-pocket costs or help-seeking decisions among individuals, we could not rigorously test these two possibilities. In addition, in subsequent work we plan to classify psychiatric ED visits according to whether or not they not required immediate care (32). Such information could assist with determining whether, at the population level, CHC expansion of mental health services could avert unnecessary, non-urgent psychiatric visits to the ED.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments:

This research is supported by a grant from the National Institutes of Mental Health (1R21MH110815-01A1). We gratefully acknowledge Mireille Jacobsen and Dana Mukamel at UC Irvine for advice regarding the analytic methodology and management of the SEDD data.

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Competing interests: All authors have completed the ICMJE uniform disclosure form at www.icmje.org/coi_disclosure.pdf and declare: no support from any organisation for the submitted work; no financial relationships with any organizations that might have an interest in the submitted work in the previous three years; no other relationships or activities that could appear to have influenced the submitted work.

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Highlights:

- Community Health Centers (CHCs) supply primary care and mental health services to low-income populations in the US.
- Access to affordable preventive care may reduce reliance on Emergency Departments (EDs) for psychiatric care.
- The analysis of over 18 million ED visits across 143 counties in 9 US states (2006–2011) indicates that an increase in patients seen at CHCs corresponds with a reduction in outpatient psychiatric ED visits.
- By integrating mental health services into primary care, expanded CHC coverage appears to reduce psychiatric ED visits.

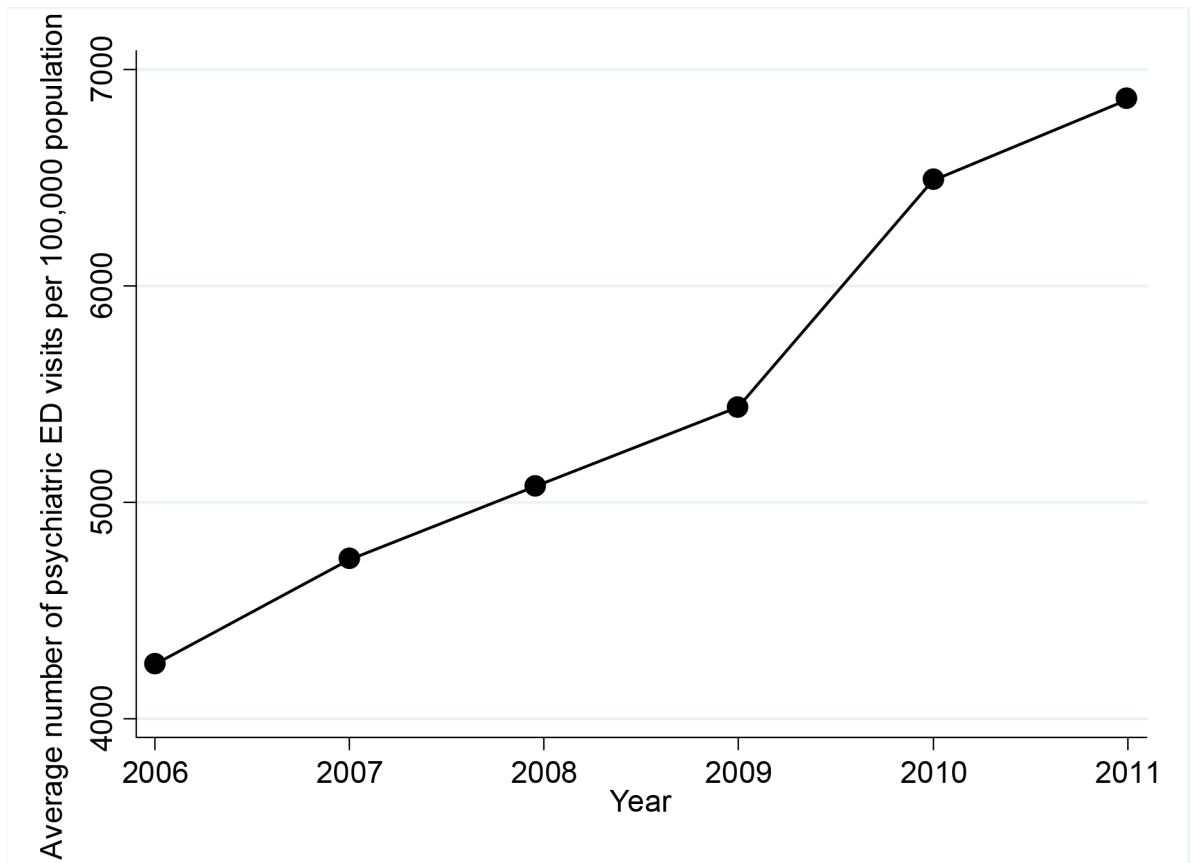


Figure 1:
Mean psychiatric ED visits per 100,000 population in 143 counties in nine states, 2006 to 2011.

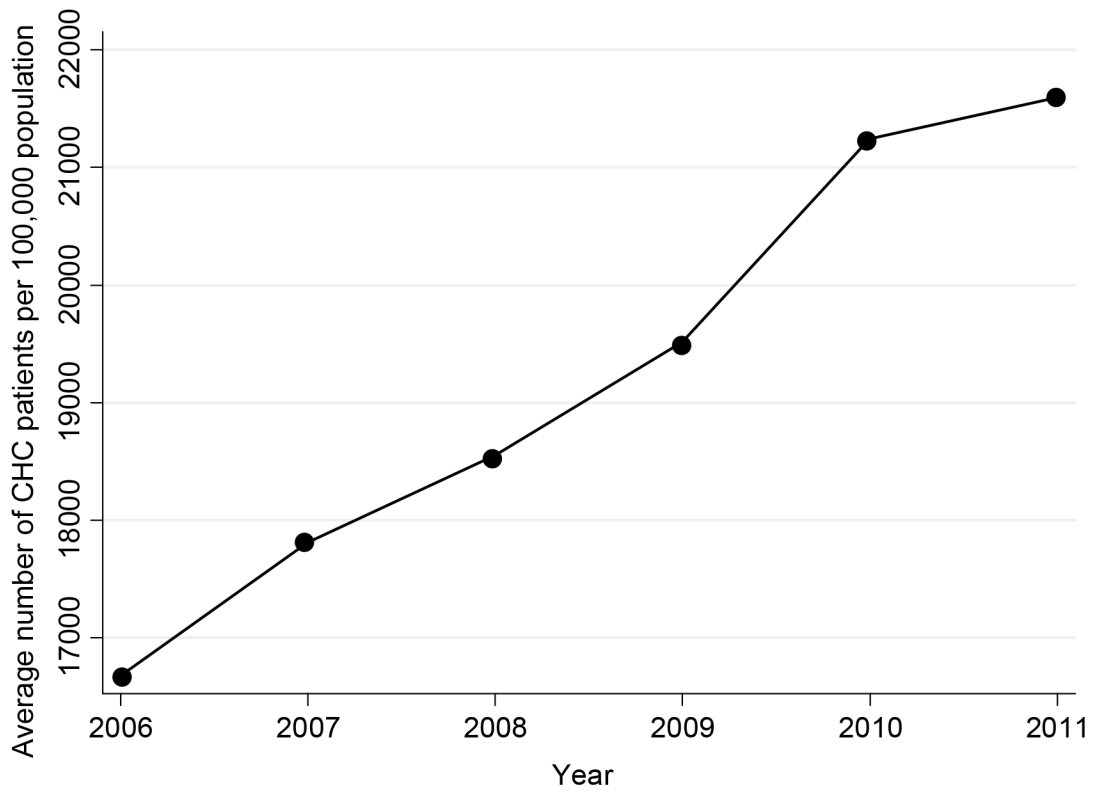


Figure 2: Mean CHC patients per 100,000 population in nine US states, 2006 to 2011.

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Table 1:

County attributes in nine US states, 2006–2011, among counties with at least one Community Health Center

Variables	Mean	Standard Deviation
Psychiatric ED visits (all ages) per 100,000 population	5,480.59	3,494.68
Adult psychiatric ED visits per 100,000 population	4,370.29	2,813.41
Youth psychiatric ED visits per 100,000 population	1,105.31	714.00
CHC patients per 100,000 population	15,737.13	20,532.76
CHC mental health patients per 100,000 population	1,185.97	1,893.31
Percentage of population in poverty	14.56	5.00
Percentage of African American population	11.68	12.98
Percentage of uninsured population	20.36	6.81
Physicians per 100,000 population	266.45	217.11
Hospital beds per 100,000 population	112.97	115.56

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OLS regression results predicting psychiatric ED visits as a function of (i) Model a: CHC total patients per 100,000 population and (ii) Model b: CHC mental health patients per 100,000 population (fixed effects regression coefficients, N = 745)

Table 2:

Covariates	Model a		Model b	
	Coefficient	Standard Error	Coefficient	Standard Error
CHC total patients per 100,000 population	-0.06**	0.03	--	--
CHC mental health patients per 100,000 population	--	--	-0.01	0.12
Hospital beds per 100k population	5.05	6.88	6.56	6.93
Physicians per 100k population	-1.12	6.02	0.09	5.82
Percent uninsured	31.47	31.73	32.91	31.97
Percent African American	82.98	348.65	41.15	355.37
Percentage poverty	-20.56	49.88	-26.75	54.96
Year fixed effects (reference = 2006)				
2007	293.75**	112.53	215.51*	116.68
2008	792.25***	166.39	682.34***	157.31
2009	1341.32***	189.38	1188.40***	171.87
2010	1874.10***	242.36	1732.94***	229.44
2011	2478.25***	286.55	2359.06***	281.88

* p value < 0.1,

** p value < 0.05,

*** p value < 0.001