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Eili Y. Klein

Johns Hopkins University

Scott Levin

Johns Hopkins University

Matthew F. Toerper

Clemson University

Michael Makowsky

Clemson University, mdmakow@clemson.edu

Tim Xu

Johns Hopkins University

See next page for additional authors

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Authors

Eili Y. Klein, Scott Levin, Matthew F. Toerper, Michael Makowsky, Tim Xu, Gai Cole, and Gabor Kelen

The Effect of Medicaid Expansion on Utilization in Maryland Emergency Departments

Eili Y. Klein PhD^{1,2,*}, Scott Levin PhD¹, Matthew F. Toerper BS¹, Michael Makowsky³, Tim Xu MPP⁴, Gai Cole DrPH¹, Gabor Kelen MD, FRCP(C)¹

¹ Department of Emergency Medicine, Johns Hopkins University School of Medicine, Baltimore, MD, USA

² Center for Disease Dynamics, Economics & Policy, Washington, DC , USA

³ Clemson University, Department of Economics, Clemson, SC, USA

⁴ Johns Hopkins University School of Medicine, Baltimore, MD, USA

* Corresponding Author

Eili Y. Klein

Assistant Professor

Department of Emergency Medicine

Johns Hopkins University

5801 Smith Ave

Suite 3220, Office 265, Davis Building

Baltimore, MD 21209

Phone: (410) 735-7559

Fax: (410) 735-6425

Email: eklein@jhu.edu

Author Contributions

EYK conceived of the study, obtained and analyzed the data, and wrote the paper. MT and GC assisted in getting data. MM assisted with data analysis. SL, MT, TX, GC, and GK provided critical revisions to the paper.

Abstract

Objective: A proposed benefit of expanding Medicaid eligibility under the Affordable Care Act (ACA) was a reduction in emergency department (ED) utilization for primary care needs. Pre-ACA studies found new Medicaid enrollees increased their ED utilization rates, but the effect on system-level ED visits was less clear.

Methods: We performed a retrospective cross-sectional study of ED utilization patterns across Maryland using data from Maryland's Health Services Cost Review Commission. We also analyzed utilization differences between pre-ACA (July 2012-December 2013) uninsured patients who returned post-ACA (July 2014-December 2015).

Results: The total number of ED visits in Maryland fell by 36,531 (-1.2%) between the six quarters pre-ACA and the six post-ACA quarters. Medicaid-covered ED visits increased from 23.3% to 28.9% (159,004 additional visits), while uninsured patient visits decreased from 16.3% to 10.4% (181,607 fewer visits). Coverage by other insurance types remained largely stable between periods. We found no significant relationship between Medicaid expansion and changes in ED volume by hospital. For patients uninsured pre-ACA who returned post-ACA, the adjusted visits per person over six quarters was 2.38 (95% confidence interval [CI], 2.35-2.40) for those newly enrolled in Medicaid post-ACA compared to 1.66 (95% CI, 1.64-1.68) for those remaining uninsured.

Conclusions: There was a substantial increase in patients covered by Medicaid in the post-ACA period, but this did not significantly affect total ED volume. Returning patients newly enrolled in

Medicaid visited the ED more than their uninsured counterparts, however this cohort only accounted for a small percentage of total ED visits in Maryland.

Introduction

The expansion of Medicaid eligibility under the Affordable Care Act (ACA) came into effect on January 1, 2014. The ACA was designed to expand health insurance coverage to uninsured Americans, and in addition to expanding Medicaid eligibility the law provided a mechanism for expanding private insurance for those not eligible for Medicaid through the use of healthcare insurance exchanges combined with income-based subsidies.¹ Numerous studies have shown that uninsured patients disproportionately visit the emergency department (ED) for “non-emergency” conditions due to limited access to other healthcare services.²⁻⁷ Thus, part of the rationale for expanding insurance coverage was an expected decrease in ED patients who could be more cost-effectively treated in other care settings (e.g. primary care facilities⁸) as well as a reduction in ED crowding which adversely affects patient outcomes.⁹

Pre-ACA research on the effect of expanding insurance coverage, particularly Medicaid, on ED utilization has been mixed. In Oregon, due to limited funds, a lottery was used to expand Medicaid in 2008. This ‘natural’ experiment found that those who gained Medicaid coverage increased their ED utilization by 41% compared to those who applied but did not gain coverage.¹⁰ Moreover, a study of young adults “aging-out” of private and Medicaid insurance found that they used the ED less frequently after losing coverage.¹¹ In Massachusetts, the most analogous experience to the expansion of insurance under the ACA, results were mixed. Studies found that insurance expansion in Massachusetts was associated with no change,^{12, 13} a decrease,¹⁴ and a modest increase in ED utilization.¹⁵ The increase in ED utilization was estimated to have been most pronounced in areas where Medicaid enrollment increased the most¹⁵ and may have depended on the patient’s prior insurance status.¹⁶ Finally, studies of the

ACA's provision allowing young adults to retain coverage under their parents' private health insurance plans showed decreased ED use by young adults.^{17, 18}

Studies of the ACA's effect on ED utilization have also been mixed. A large study of EDs across the United States found no increase in ED utilization after ACA implementation,¹⁹ while a study of all EDs in Illinois found a modest increase in ED visits attributable to insurance expansion under the ACA.²⁰ Understanding the effect of insurance expansion, particularly Medicaid, on ED utilization is important for policy planning at both the state and hospital levels. This is particularly relevant as a Supreme Court ruling on the ACA enabled states to choose whether or not to adopt Medicaid expansion.²¹ Maryland chose to expand Medicaid coverage, resulting in a large population of uninsured individuals newly eligible for Medicaid. This provided an opportunity to evaluate the impact of Medicaid expansion on ED utilization. The objective of this study was to examine the effect of Medicaid expansion on total ED visits in Maryland, and whether gaining insurance affected ED utilization among newly insured patients.

Methods

Design and Setting

We performed a retrospective cross-sectional study examining the relationship between type (or lack) of health insurance and total ED visits stratified by individual ED, across the state of Maryland between 2012 and 2015. In addition, we analyzed ED utilization patterns for uninsured patients who visited an ED pre-ACA and returned post-ACA.

Data

We obtained administrative claims data for 48 EDs from Maryland's Health Services Cost Review Commission (HSCRC) from July 2012 through December 2015. Two of the EDs were free-standing. Hospitals in the state must report detailed patient visit data to the HSCRC in order to obtain reimbursement for care. The data included patient demographic information, diagnoses, and the type of insurance: (1) Commercial; (2) Medicaid; (3) Medicare; (4) other (including coverage by other government programs and worker's compensation); and (5) uninsured (including both self-pay and no-charge patients). Though data were anonymized, a unique patient identifier allowed returning patients to be tracked over time and between hospitals. Data was restricted to patients 20 years of age and older because adults were the primary targets of insurance expansion post January 2014, and age data from HSCRC were reported in five-year increments to ensure protection of privacy. Medicaid enrollment data, grouped by county, were obtained for the years 2012 through 2015 from the Maryland Department of Health and Mental Hygiene.²² The study was approved by the Johns Hopkins Institutional Review Board (#00031973).

Statistical Analysis

To control for the initial expansion of insurance in 2014 when individuals were still being enrolled in Medicaid, we excluded the initial six months of 2014. The pre-ACA period was thus from July 2012 through December 2013, while the post-ACA Medicaid expansion period was from July 2014 through December 2015. The effect of changes in the percentage of Medicaid visits (pre- and post-ACA) on changes in the number of patient visits for each ED state-wide was investigated using ordinary least squares regression. The analysis controlled for whether the hospital was a teaching hospital, which metro area it was located in (DC, Baltimore, other),

whether the hospital was a trauma center, the percentage of the population served by the ED in the pre-ACA period that was either uninsured or on Medicaid (a measure of the degree to which a hospital is considered a Safety Net Hospital), as well as the total number of patient visits to the ED in the pre-ACA period (a measure of ED size). An analysis using hospital-level fixed effects was also performed (Supplementary Material).

These results were further contextualized by examining individual patient utilization changes post-ACA, stratified by new insurance type. Individuals were included if they visited an ED in both the pre- and post-ACA periods. Insurance groups included patients who returned and were (a) uninsured for all visits, (b) covered by Medicaid for all visits, (c) covered by commercial insurance for all visits, or (d) returned on alternate insurance (e.g., Medicare) or had multiple visits with different insurance types. The measurement of the effect of the ACA on utilization (i.e., adjusted average visits in the post-ACA period) for this population was estimated using a negative binomial regression that controlled for patient characteristics (gender, race, ethnicity, and age) and health status (Charlson comorbidity index), as well as the hospital visited. Analysis was conducted using R 3.02 and Stata version 14.

Results

State-Wide Utilization Patterns

The number of people covered by Medicaid in Maryland increased more than 20% between the 2013 and 2015 (Figure 1). The majority of new enrollees were in the most populous counties in Maryland (Baltimore City and County, Prince George's, and Montgomery), which accounted for 63% of total Medicaid enrollees in Maryland. Increased Medicaid enrollment resulted in a

significant change in the ED payer-mix. The percentage of ED visits by patients covered by Medicaid increased from 23.3% in the pre-ACA period to 28.9% in the post-ACA period, while the number of patients without insurance declined from 16.3% to 10.4% (Figure 2A). Medicare and commercial payers increased 1.4 percentage points and decreased 1.6 percentage points, respectively. The change in the payer-mix resulted in an overall 37% decrease in uninsured visits from 495,200 during the pre-ACA period to 313,593 during the post-ACA period, with every ED in Maryland experiencing an absolute decrease in the percentage of uninsured patient visits except for one that first opened in 2014 (Figure 2b).

The total number of ED visits decreased by 36,531 (-1.2%) between the six quarters pre-ACA and the six quarters post-ACA. This was largely due to the number of visits in 2012 Q3 (July to September) being higher compared to later third quarters (Figure 3a). Despite significant variability in the number of arrivals at each ED between the pre- and post-ACA periods, we observed no significant effect of the ACA on the total number of patients arriving in an ED. (Figure 3b and Supplementary Table 1).

Patient-Level Utilization Patterns

There were 289,461 uninsured patient visits to an ED in Maryland in the pre-ACA period. The demographics and ED visit frequency of this uninsured cohort was compared to patients covered by Medicare, Medicaid, or commercial insurance pre-ACA as exhibited in Table 1. The average ED utilization (i.e., number of visits per person) for Medicare and Medicaid patients was greater than patients that were uninsured or commercially insured.

Among those patients that visited an ED without insurance in the pre-ACA period, 67,790 patients (37%) made at least one visit to an ED in the post-ACA period. For this returning cohort, 19,266 (28%) remained uninsured for all visits; 20,769 (31%) were consistently enrolled in Medicaid, 10,367 (15%) consistently had commercial insurance, and the remaining 17,426 (26%) returned covered by an alternate insurance or had multiple visits with different types of insurance (Table 2). In the latter group the majority of the 68,618 visits were covered by Medicaid (41%), followed by uninsured (31%), commercial insurance (14%), Medicare (8%), and other (6%).

The adjusted visits per person in the post-ACA periods for those remaining uninsured was 1.66 (95% confidence interval [CI], 1.64-1.68), while those returning with Medicaid was 2.38 (95% CI, 2.35-2.40), a 43% increase in utilization (0.72 more visits per person). Patients with commercial insurance had a lower adjusted utilization rate of 1.59 (95% CI, 1.57-1.62) visits per person, while those with a mixed status had a higher rate of 3.72 (95% CI, 3.69-3.76). By comparison, the unadjusted average ED utilization for patients who visited the ED in both the pre- and post-ACA six quarter periods, and were continuously covered by Medicaid, was 3.29 (95% CI, 3.26-3.32), while for the 89,941 Medicaid patients seen in the six quarters post-ACA period that had not visited an ED in the six quarters pre-ACA period the unadjusted ED utilization rate was 1.73 (95% CI, 1.71-1.74).

Limitations

First, the effects of Medicaid expansion on uninsured individuals were measured as changes in ED utilization rates among patients who returned rather than among all eligible individuals, as

we were unable to account for changes in insurance status among those who did not return. Second, although the proportion uninsured in Maryland is consistent with the national average, differences in state policies may limit generalizability to other states. Most notably, the HSCRC sets fixed rates for all payers. However, our results were broadly consistent with the pre-ACA experiences in Oregon and Massachusetts as well as initial post-ACA analyses nationwide. Third, in Maryland, a new global payment system for hospitals was enacted to provide hospitals with a financial incentive to reduce wasteful spending, which may confound changes in ED utilization.²³ Fourth, the majority of Medicaid patients in Maryland are enrolled through managed care organizations which control patients' hospital and physician choices, which may be different from how Medicaid enrollment works in other states. Fifth, as with any analysis of large datasets, issues of data completeness and integrity can bias the results if there are systematic errors. Lastly, Medicaid expansion through the ACA went into effect on January 1, 2014, but recruitment and enrollment efforts were not static through the study period, though we attempted to account for that by excluding the first six months of 2014 which was the period of greatest change. In addition, there may be differential hospital or regional effects of the ACA. Some hospitals or regions may have been more effective in getting insured patients linked with primary care. Despite these limitations, if insurance was the dominant factor in ED utilization, the dramatic increase in Medicaid enrollment over the study period would have more significantly affected ED visits.

Discussion

Despite studies of the effects of insurance expansion in Oregon and Massachusetts prior to the ACA, as well as newer post-ACA studies, uncertainty exists regarding the effect of Medicaid

expansion on utilization of ED services. While individuals randomized to receive Medicaid in Oregon visited the ED significantly more,¹⁰ data from Massachusetts on total ED utilization was mixed, but did not show large increases in total ED utilization.¹²⁻¹⁵ Post-ACA studies on impact of Medicaid expansion on ED utilization have also been mixed, with one state-level study finding an increase,²⁰ a large multi-state study and a partial study of Maryland finding no increase.^{19, 24} Our results describing the effect of the ACA on Maryland EDs suggest a reason for the contradiction between increased individual-level utilization and little or no change in ED volumes: a small number of newly insured patients utilized the ED more, but not in numbers that greatly influenced the total number of ED arrivals at a hospital or state-level. The population of uninsured individuals in the pre-ACA period who returned to the ED with Medicaid only accounted for 6% of all Medicaid visits and less than 2% of all visits.

While we found no significant relationship between Medicaid expansion and ED utilization at the hospital level, we did find that the average utilization rate for uninsured individuals who visited an ED in the pre-ACA period and enrolled in Medicaid was 43% (0.72 more visits per person) greater than for patients that remained uninsured. The average increase in ED visits was higher in magnitude than the difference observed in the Oregon lottery study, though it was a similar relative increase.¹⁰ Despite the differences in methodology, the similarity of the results strongly suggests that increased access to insurance does lead to an increase ED utilization at the individual level. However, this was true only for those that gained Medicaid and not those who gained commercial insurance. This likely points to a self-selection bias, as returning patients newly enrolled in Medicaid tended to be older and have more comorbidities compared to those who remained uninsured or who gained commercial insurance.

The ED utilization rate post-ACA among patients newly-insured with Medicaid remained lower than that of patients who were enrolled in Medicaid pre-ACA. One potential reason for this may be that Medicaid expansion was brought about by raising the income eligibility threshold. The affected population may utilize the health system differently than individuals already enrolled in Medicaid. The lack of change in total ED volumes pre- and post-ACA, and the higher rate of ED utilization by Medicaid patients, suggests that patients in lower-income areas with a high proportion of the population covered by Medicaid may disproportionately rely on EDs for episodic care due to a lack of alternatives.²⁵ Despite the rapid increase in urgent care centers and retail clinics over the last decade, the majority of them are not located in lower-income neighborhoods, in part due to low insurance coverage.^{26, 27}

While our results give context to some of the mixed results seen between limited overall ED utilization and individual increases in utilization, features of Maryland's payment system affect the generalizability of this study. Since the 1970s, Maryland has had in place a single-rate system in which all payers pay the same rate for hospital services.²⁸ This single-rate system was amended in 2014 to include a global budget cap in which hospitals receive a fixed annual amount for inpatient and hospital-based outpatient services.^{28, 29} The global payment system's goal is to shift Maryland hospitals away from volume-based payments and towards quality-oriented pay-for-performance models aimed at reducing patient avoidable utilization. This incentivizes hospitals to invest in population health since changes in payer-mix yield little financial benefit. Increased insurance coverage makes it easier to connect patients to other services,³⁰ thus hospitals have invested in ensuring patients are enrolled in programs for which they are eligible,

such as Medicaid, even though, as discussed above, this is may be associated with increased utilization of the healthcare system. Evidence of the effects of these contrasting goals is lacking.

Conclusion

Medicaid expansion due to the ACA has been implemented in 29 states.³¹ In Maryland, newly enrolled Medicaid patients used the ED significantly more than those who remained uninsured. However, these incremental visits were marginal and had no appreciable effect on total ED visits at the hospital level or in aggregate across Maryland, even in hospitals serving large proportions of uninsured and Medicaid patients. Our results suggest that in the short term, expanding Medicaid coverage in Maryland did not lead to significant changes in overall ED utilization.

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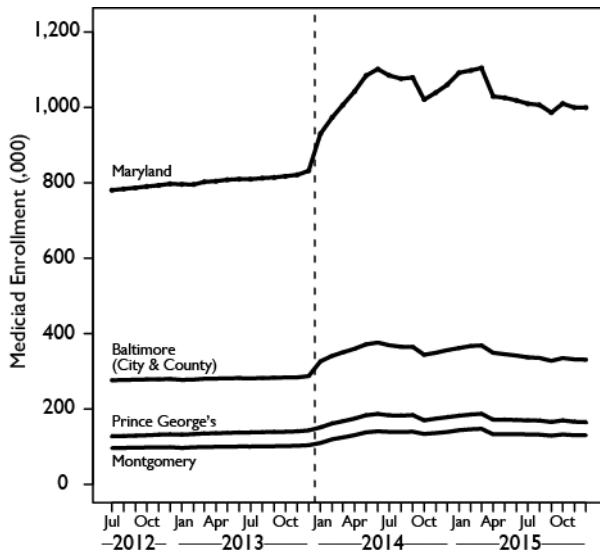


Figure 1: Changes in Medicaid Enrollment in Maryland

Baltimore City, Baltimore County, Prince George’s, and Montgomery counties are the four counties with the largest number of Medicaid enrollees in Maryland. Baltimore City and Baltimore County were combined as they are closely linked and county residents utilize the hospitals in the city similarly to city residents. Dashed line indicates implementation of Medicaid expansion under the Affordable Care Act. According to program officials, the decrease in Medicaid enrollees after an initial peak was due to enrollment campaigns ending and administrative processing of individuals not demonstrating Medicaid eligibility (personal communication).

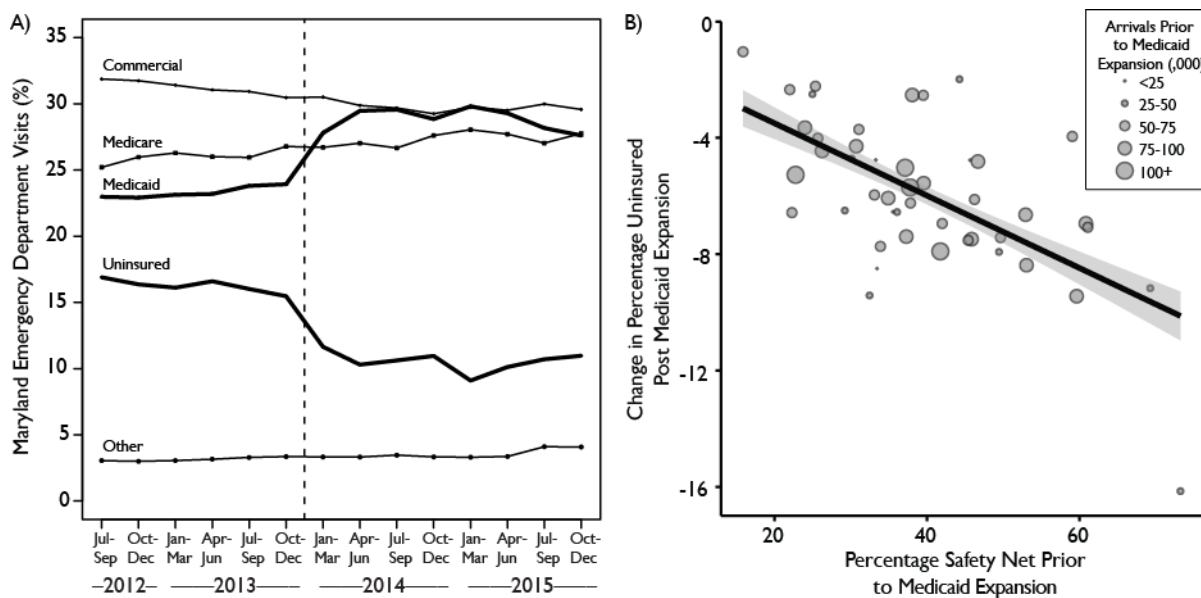


Figure 2: Change in Maryland emergency department payer mix pre- and post-ACA Medicaid expansion

Panel A shows the change in payer mix across all emergency department visits in the state of Maryland by quarter. The dotted line indicates implementation of Medicaid expansion under the Affordable Care Act. Each dot in panel B is the change in absolute percentage of uninsured patient visits from the pre-ACA period to the post-ACA period for each Maryland ED based on its Safety Net Utilization (Medicaid + uninsured) in the pre-ACA period. The black line is the linear regression of the relationship demonstrating a significant relationship between these two variables controlling for hospital characteristics, and the grey area is the 95% confidence interval of the regression. The size of the dots corresponds to the volume of arrivals each hospital had in the pre-ACA period. The volume of the hospital was not significantly correlated to the change in payer mix.

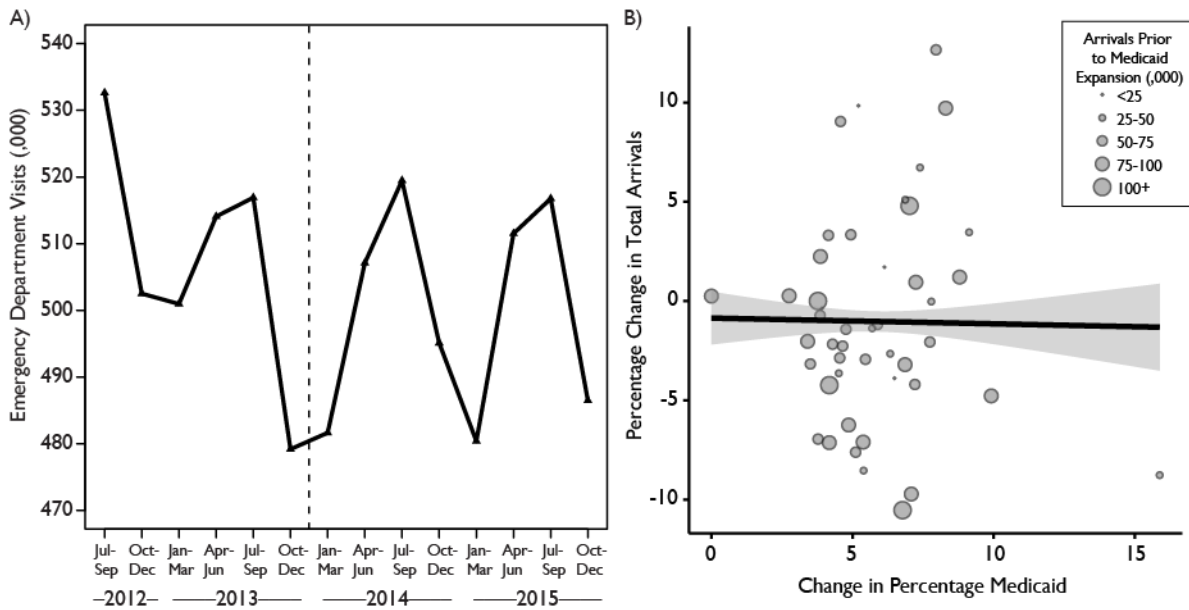


Figure 3: Change in Maryland emergency department arrivals pre- and post-ACA Medicaid expansion.

Panel A shows the total number of emergency department visits in the State of Maryland by quarter. The dotted line indicates implementation of Medicaid expansion under the Affordable Care Act. Each dot in panel B is the percentage change in total arrivals for each Maryland ED compared to its change in visits covered by Medicaid from the pre-ACA period to the post-ACA period. The black line is the linear regression of the relationship demonstrating no significant relationship between these two variables controlling for hospital characteristics, and the grey area is the 95% confidence interval of the regression. The size of the dots corresponds to the volume of arrivals each hospital had in the pre-ACA period. The volume of the hospital was not significantly correlated to the change in total arrivals.

Table 1: Demographics of Patients Visiting the Emergency Department in 2013

	Uninsured†	Medicaid†	Medicare†	Commercial†
Patients	185,631	155,955	292,298	498,584
Visits	289,461	427,405	679,159	756,956
Visits per person	1.56 (1.55-	2.74 (2.72-	2.32 (2.31-	1.52 (1.51-1.52)
Patients with 1 visit	72%	47%	51%	72%
Patients with 2 visits	16%	21%	22%	17%
Patients with ≥ 3 visits	12%	32%	27%	11%
Female (% of patients)	40.8%	70.9%	59.1%	56.4%
Race (% of patients)				
African-American or Black	44.7%	55.6%	27.9%	33.7%
White	33.3%	35.2%	67.6%	57.9%
Other	22.0%	9.2%	4.5%	8.4%
Ethnicity (% of patients)				
Hispanic	17.1%	5.0%	1.4%	3.6%
Admitted (% of visits)	7.0%	12.3%	38.0%	13.2%
Age (% of patients)				
20-44	69.5%	70.4%	4.2%	49.1%
45-64	28.3%	27.9%	13.9%	45.5%
65+	2.2%	1.7%	82.0%	5.5%

†Only includes patients that visited an emergency department with the noted insurance (i.e., excludes patients that had more than one visit with different payers.)

Table 2: Effect of Established Uninsured Patients Gaining Medicaid on ED Visits in 2014

	Remained Uninsured†	Newly Enrolled in Medicaid†	Newly Enrolled in Commercial†	Other‡
Patients	19,266	20,769	10,367	17,426
Visits	32,387	50,601	16,672	68,618
Visits per person	1.68 (1.66-1.70)	2.44 (2.40-2.47)	1.61 (1.59-1.63)	3.94 (3.87-4.00)
Patients with 1 visit	65%	47%	65%	14%
Patients with 2 visits	20%	23%	21%	27%
Patients with ≥ 3 visits	15%	30%	14%	59%
Adjusted visits per person (95% CI) *	1.66 (1.64-1.68)	2.38 (2.35-2.40)	1.59 (1.56-1.62)	3.73 (3.69-3.76)
Female (% of patients)	35.9%	46.5%	49.4%	41.8%
Race (% of patients)				
White	32.8%	38.3%	39.6%	37.5%
African-American or Black	47.5%	53.2%	50.2%	51.6%
Other	19.7%	8.5%	10.2%	10.9%
Ethnicity (% of patients)				
Hispanic	20.3%	6.5%	8.9%	8.1%
Admitted (% of visits)	2.6%	11.7%	7.8%	9.4%
Age (% of patients)				
20-44	74.9%	60.0%	62.6%	62.0%
45-64	23.9%	39.3%	36.3%	29.7%
65+	1.2%	0.6%	1.1%	8.2%
Health Status of patients				
Charlson (avg)	0.15	0.53	0.27	0.45
Charlson (%>0)	12.1%	25%	17.5%	29.9%

* Adjusted for patient characteristics (gender, race, ethnicity, and age) and health status (Charlson comorbidity index), as well as the hospital visited; † These are patients that were uninsured in the pre-ACA period and returned in the post-ACA period and either remained uninsured or returned on Medicaid. ‡ Uninsured patients in the pre-ACA period that returned in post-ACA period either on an alternate insurance or had multiple visits with different insurance status.

Supplementary Material

Hospital Fixed Effects Regression Analysis

We identified the effect of Medicaid expansion under the Affordable Care Act on (logged) hospital visits and the uninsured patient rate, and tested its robustness, using several different ordinary least squares (OLS) model. In Supplementary Table 1, column 1, we modeled the effect of Medicaid expansion on Log Visits with fixed effects for each hospital in the data set using an indicator variable (ACA) for the quarters in which Medicaid was expanded. The coefficient on the Medicaid expansion variable was negative, but not statistically significant. In column 2, we performed a difference-in-difference analysis, including variables for which quartile each hospital is in with regard to the percentage of patients that are considered safety net patients (Medicaid and uninsured) and interacting these groupings with the Medicaid expansion indicator. The coefficient on the Medicaid expansion variable was now positive, but still not significant ($p > 0.75$). We did find a significant effect for the fourth Safety Net Group (SafetyNetGroup4), which is the quartile encompassing the hospitals with the greatest percentage of uninsured and Medicaid patients. However, this effect is significant for before Medicaid expansion, suggesting that these hospitals tended to get more visits. In an effort to better control for year to year differences, we included year fixed effects in column 3. Given its obvious collinearity, we dropped the standalone Medicaid expansion indicator in column 3, only including it as an interaction with the different safety net groups. Here we continued to find that SafetyNetGroup4, was significant and the ACA*SafetyNetGroup4 was marginally significant, further suggesting the hospitals serving this subpopulation account for the bulk of the resulting reduction in hospital visits.

In columns 4 through 6, we performed a similar OLS model, using the percentage of uninsured patients as the dependent variable. To avoid endogeneity with the expansion of Medicaid, we used the (one year) lagged Safety Net Group identifier. Here we found a consistent effect of Medicaid expansion, reducing the percentage of uninsured patients across all specifications. Further, the effect is significant for each of the subgroups. It is notable, however, that the magnitude of this reduction is the largest for hospitals serving the most vulnerable sub-populations (SafetyNetGroup4).

Supplementary Table 1: Hospital Fixed Effects Regression Analysis

	Visits‡	Visits‡	Visits‡	Uninsured (%)	Uninsured (%)	Uninsured (%)
ACA	-0.012	0.008		-0.059***	-0.038**	
SafetyNetGroup2		-0.008	-0.012		0.018*	0.039**
SafetyNetGroup3		0.018	0.014		0.025*	0.046**
SafetyNetGroup4		0.082*	0.078*		0.039**	0.060**
ACA*SafetyNetGroup2†		-0.017	-0.009		-0.022*	-0.061***
ACA*SafetyNetGroup3†		-0.025	-0.017		-0.017*	-0.055**
ACA*SafetyNetGroup4†		-0.032	-0.024		-0.039***	-0.077***
Constant	9.181***	9.194***	9.161***	0.159***	0.137***	0.116***

† All specifications with Uninsured Per Capita as a dependent variables (columns 4,5, and 6) use the lagged Safety Net Group identifier to prevent endogeneity with Medicaid expansion. ‡ Logged variable. There are 44 individual Hospital ID fixed effects. Errors are clustered by the six hospital market areas. *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$