

What Accounts For Differences In The Use Of Hospital Emergency Departments Across U.S. Communities?

Reducing ED use defies simple solutions such as expanding insurance coverage or restricting access for noncitizens.

by Peter J. Cunningham

ABSTRACT: Increases in the use of hospital emergency departments (EDs) might contribute to crowding at some EDs, higher health care costs, and lower-quality primary care. This study examines the extent to which differences in populations and health system factors account for variations in ED use across U.S. communities. Contrary to popular perceptions, communities with high ED use have fewer numbers of uninsured, Hispanic, and noncitizen residents. Outpatient capacity constraints also contribute to high ED use. However, high ED use in some communities also likely reflects generic preferences for EDs as a source of care for nonurgent problems. [*Health Affairs* 25 (2006): w324–w336; 10.1377/hlthaff.25.w324]

VISITS TO HOSPITAL EMERGENCY DEPARTMENTS (EDs) increased 26 percent between 1993 and 2003, to about 114 million visits annually.¹ About one-third of ED visits are classified as nonurgent or semi-urgent, which suggests that the care sought during many of these visits could be provided in other settings. Although the causes of ED overcrowding might have more to do with inadequate inpatient capacity at hospitals, increases in ED use contribute to overcrowding, which can lead to longer waiting times and more ambulance diversions to other facilities.² Growing use of the ED for nonurgent medical problems can also increase health care costs and negatively affect quality of, continuity of, and patients' satisfaction with care.³

■ **Explanations for increased ED use.** Numerous explanations for the increase in ED use by the U.S. population have been offered. These include changes in the population that have increased demand for EDs, and health system changes that have constrained capacity of other outpatient care. Increases in the number of uninsured people, who lack access to other types of outpatient care, are often cited.⁴

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Medicare and Medicaid beneficiaries tend to have the highest levels of health care use overall, including EDs, and public coverage expansions since the late 1990s, along with increases in the number of elderly Americans in Medicare, could also be contributing to increases in ED use.⁵ In addition, some have expressed concern that continued increases in the number of undocumented immigrants are straining hospitals' ED capacity, especially along the Mexican border.⁶

Increased constraints in health system capacity are also cited as reasons for increased ED use. Rising demand for medical care has strained many office-based physician practices, increasing practitioners' workloads and making it more difficult for patients to obtain appointments with them.⁷ Thus, EDs might have become more attractive sources of nonurgent care because of their convenience, round-the-clock care delivery, and open access without an appointment.⁸

■ **Need for systematic analysis.** Policymakers and health system planners would benefit from a systematic analysis of how ED use is interrelated with other developments in the health care system and differences in population characteristics. Examining variations in ED use across communities is a useful way to proceed with such an analysis, since the regional and community variation in ED use is likely to be considerable, as has been demonstrated with many other aspects of medical practice and service use.⁹ Also, constraints on outpatient capacity and other health system factors are most likely to be observed and experienced at a community level, and communities vary greatly on many of the population characteristics that are correlated with high or low levels of ED use. Understanding these differences could also provide insights into how changes in the population and health care system are likely to influence changes in ED use in the future.

■ **Study goal.** Using data from the 2003 Community Tracking Study (CTS) household survey, this study examines the extent of variation in ED use across communities and how this variation is related to many of the population and health system characteristics described above. The study focuses specifically on the extent to which high levels of ED use in some communities are related to high levels of uninsurance and Medicaid coverage, as well as high numbers of noncitizens and racial/ethnic minorities, who are known to have reduced access to medical care. Also considered is evidence that greater convenience of EDs and outpatient capacity constraints contribute to high levels of ED use in some communities.

Study Data And Methods

■ **Data sources.** The main source of data for this analysis is the 2003 CTS household survey. The survey, conducted by the Center for Studying Health System Change (HSC), was designed to produce representative estimates of health insurance coverage, access to care, and use of services for the U.S. civilian noninstitutionalized population and sixty randomly selected communities.¹⁰ The CTS is primarily a telephone survey, supplemented by in-person interviews of households without telephones, to ensure representation. The overall sample for the survey

includes about 46,600 people.

The survey is ideally suited for examining variation in ED use because the sample is clustered in sixty representative communities (including both metro and nonmetro areas). This permits statistically valid estimates of ED use and other measures from the survey at the community level. The design also permits secondary data sources on health system capacity to be linked to the CTS communities.

■ **Measuring ED use.** Survey respondents were asked to report on the number of visits to hospital EDs in the previous twelve months. They were also asked to distinguish between ED visits that resulted in an inpatient stay and those that did not. This study excludes ED visits that resulted in an inpatient stay because they are likely to be the least discretionary type of visit and less affected by patients' preferences and health system factors. Because the survey was based on a sample of households, community-level estimates do not include ED visits by people residing in institutions (for example, nursing homes or prisons), people whose primary residence is outside of the community, or those without any permanent address.

■ **Analysis.** The study examined the extent of variation in ED use across twelve case-study communities (which included larger survey samples) as well as all sixty CTS communities. The analysis was conducted at the person level and then aggregated to examine the variation across communities or groups of communities. ED visits were computed as averages for people in individual communities or groups of communities, and the result was multiplied by 100 to reflect visits per 100 people. The sixty sites were grouped into four quartile groups based on their level of ED use. The quartile groups were weighted to account for differences in the size of communities within quartiles.¹¹

The analysis also quantifies the extent to which population characteristics and health system factors account for variation across the four groups of communities. This analysis was based on a multivariate regression analysis, conducted at the person level, that included both person-level and community-level variables as independent variables.

Given that ED use is highly skewed for individuals (that is, a high proportion of people have no visits), a conventional two-part model was estimated.¹² The first part estimated the probability of having any ED visit; the second part estimated the number of visits for those with any visits. To simplify the presentation and discussion, the results of the two regressions were combined and are presented as marginal differences in ED visits per 100 people for selected population and health system factors of particular interest.¹³

Population factors. Independent variables in the regression included both person-level (for population factors) and community-level variables (for health system factors). Person-level variables were derived entirely from the CTS household survey and included age, sex, race/ethnicity (white, black, Hispanic, other), general health status, and the number of chronic conditions. Citizenship status was also included; it did not distinguish between documented and undocumented non-

citizens. Insurance coverage was measured at the time of the interview, and specific categories included Medicare, private insurance coverage, Medicaid or other state coverage, any other type of coverage, and uninsured. The size of the population at each site was also included as a control variable.

Health system factors. With one exception, health system factors were measured at the site level and linked to sample people in those sites. Indicators of outpatient capacity constraints were identified as average waiting times for physician office appointments in the site (computed from the CTS household survey), the number of non-ED physician visits per physician in the site (computed from the CTS household and physician surveys), the number of physicians per person, and community health center (CHC) revenue per poor person within five miles of each person in the sample.¹⁴

Hospitals' availability and proximity. Measures of the availability and proximity of hospital EDs included the number of hospital EDs in the site per 10,000 people and distance (in miles) to the closest ED for each person in the sample.¹⁵ Measures of actual ED capacity (number of beds or stations within hospitals) were not available at the national level.¹⁶ Enrollment in health maintenance organizations (HMOs) for insured people (public and private) was measured for each person based on the response to a question in the survey.

Accounting for variation. To determine the extent to which the health system and population characteristics identified above account for the variation in ED use across communities, indicators for groups of CTS communities based on ED visit quartiles were included as independent variables. Essentially, these indicators reflect quartile differences in ED use among people living in these community groups that are not accounted for by the other factors in the model.

Adjusted means of ED use were computed for the "high" and "low" quartile groups and were compared with actual ED visit levels.¹⁷ The difference of the differences (actual differences in ED use between groups in the high and low quartiles minus the adjusted differences) reflects the amount of variation in ED use across the four quartile groups explained by the analysis.

Study Findings

■ **Variation in ED use across case-study sites.** The study found considerable variation in ED use across the twelve CTS case-study sites. The average for 2003 was around 32 ED visits per 100 people for both the United States and large metropolitan areas (Exhibit 1).¹⁸ This varied from a high of almost 40 visits per 100 in Cleveland to about 21 visits in Orange County, California. Despite popular perceptions, communities with the highest levels of ED use did not necessarily have the highest numbers of uninsured, low-income, racial/ethnic minority, or immigrant residents. For example, Cleveland and Boston had the highest ED use levels among the twelve CTS sites and some of the lowest uninsurance rates, while Phoenix and Orange County had both low ED use and higher-than-average uninsurance rates in 2003. In addition,

EXHIBIT 1
Variation In Hospital Emergency Department (ED) Visits In Twelve U.S. Communities, Large MSAs, And U.S. Total, 2003

Case-study site/ metro area	Number of ED visits per 100 people	Percent of population uninsured	Percent of population low income	Percent of population black	Percent of population Hispanic	Percent of population noncitizen
Cleveland, OH	39.9**	7.9**	26.4	16.8**	3.2**	2.6**
Boston, MA	36.4	5.7**	20.3**	5.1**	6.4**	6.9
Greenville, SC	36.0	12.9	35.2**	17.5**	2.7**	2.4**
Little Rock, AR	32.1	13.4	32.4	20.6**	2.1**	1.1**
Syracuse, NY	31.9	7.5**	28.9	5.8**	2.0**	0.7**
Indianapolis, IN	31.3	10.7**	27.6	13.1	2.7**	1.7**
Seattle, WA	30.2	7.8**	21.6**	4.1**	5.3**	6.6
Lansing, MI	30.1	7.1**	23.3**	7.7	4.7**	1.8**
Northern NJ	26.2**	12.2	24.1**	19.9**	12.9	9.2
Miami, FL	25.0**	23.1**	47.2**	18.9**	57.7**	26.5**
Phoenix, AZ	24.1**	15.9	30.6**	3.0**	23.8	11.9
Orange County, CA	21.0**	18.2**	27.1	1.6**	30.7**	15.6**
Large MSAs	31.8	13.4	30.5	11.5	17.0	8.0
Total U.S.	31.8	13.3	33.5	11.6	13.9	6.3

SOURCE: Community Tracking Study household survey, 2003.

NOTES: Statistical significance denotes difference with large metropolitan statistical areas (MSAs).

**p < .05

communities with the lowest ED use also tended to have a higher percentage of Hispanics and noncitizens than communities with high ED use.

■ **Variation across all CTS communities.** Exhibit 2 expands the analysis of community variation to include all sixty CTS communities, grouped into quartiles based on their levels of ED use. Consistent with Exhibit 1, the results show that in 2003, communities with the highest levels of ED use did not typically have population characteristics that are commonly associated with high levels of ED use. In fact, there was little variation across the four groups of communities on measures of poverty or health insurance coverage. In terms of race/ethnicity, communities with high ED use had a higher percentage of African Americans than low-ED-use communities had, although low-ED-use communities had much higher levels of Latinos and noncitizens compared to high-ED-use communities. More consistent with expectations is that communities with low ED use tended to have somewhat higher numbers of children (who use less health care generally) and fewer people with multiple chronic conditions.

Exhibit 2 also shows that certain health system characteristics tend to be correlated with communities' levels of ED use. For example, in 2003, communities with high ED use tended to have greater outpatient capacity constraints than communities with lower ED use, as indicated by significantly longer average appointment waiting times. While high-ED-use communities also contained more hospital EDs relative to the population than low-ED-use communities had, there were no statistically significant differences in the average distance to the ED between high-

EXHIBIT 2
Variation In Population And Health System Characteristics Across Sixty U.S. Communities, By Quartile Of Emergency Department (ED) Use, 2003

Characteristic	Quartile			
	1 (high ED use)	2	3	4 (low ED use)
Sample size (persons)	11,880	13,370	10,016	11,274
Population characteristics				
Less than 100% of poverty	12.9%	14.7%	13.8%	11.3%
Less than 200% of poverty	32.5	35.1	34.1	31.3
Insurance				
Uninsured	12.0	12.7	13.8	14.8
Privately insured	59.6	61.4	58.7	60.1
Medicaid/SCHIP	9.5	9.8	10.1	10.4
Medicare	15.2	13.5	15.0	12.4**
Race and ethnicity				
Black	15.1	13.5	10.8	6.4**
Hispanic	8.8	8.0	16.5	24.9**
Noncitizen	4.1	3.8	7.4	10.3**
Age and health status				
Under age 18	23.7	26.6**	24.9	27.1**
Age 65 or older	12.9	11.2	13.3	10.9
In fair/poor health	15.1	13.7	13.3	12.9
2+ chronic conditions	13.4	12.7	11.6	10.2**
Average population size	2,009,300	1,409,600**	1,798,100	3,238,300**
Health system characteristics				
Percent of insured in HMO	32.6%	30.2%	33.3%	42.6%**
Average number of primary care providers per 10,000 people ^a	5.2	4.9	5.4	5.0
Hospital EDs and distance				
Average number of hospital EDs per 100,000 people ^b	1.6	1.3	1.1	0.9**
Average distance to ED (miles) ^b	5.9	5.9	5.5	4.5
Community health center (CHC) capacity				
Average CHC revenue per poor person within 5 miles ^c	109	101	71**	60**
Number of non-ED outpatient visits per physician per 100 people ^a	331	306	286	291
Average appointment waiting time for sick visits (days)	23.4	22.9	20.0	18.4**

SOURCE: All data based entirely on the Community Tracking Study (CTS) household survey, 2003, except where noted.

NOTES: Statistical significance denotes difference with first quartile. SCHIP is State Children's Health Insurance Program. HMO is health maintenance organization. CHC is community health center.

^aCTS physician survey, 2001.

^bAmerican Hospital Association annual survey, 2002.

^cHealth Resources and Services Administration, 2002 Uniform Data System.

** $p < .05$

and low-use communities. Contrary to expectations, communities with high ED use had greater CHC capacity in 2003 compared to communities with low ED use, which could reflect in part the smaller population and lower population density of high-ED-use areas compared to low-use areas. More consistent with expectations is that low-use communities tended to have a higher percentage of their insured populations enrolled in HMOs in 2003 compared to other communities.

■ **Marginal effects of population factors.** Insurance, demographic, socioeconomic, and health factors are strongly related to individuals' ED use, although some of these results run contrary to popular perceptions. For example, in 2003, the uninsured had about sixteen fewer visits on average (per 100 people) compared to Medicaid enrollees, about twenty fewer visits compared to Medicare enrollees, and roughly similar levels of use compared to privately insured people (Exhibit 3). Noncitizens had much lower levels of ED use than citizens did (about 17 fewer visits

EXHIBIT 3
Marginal Differences In Emergency Department (ED) Use, By Selected Population And Health System Characteristics, 2003

	All income levels	Less than 100% of poverty	100–299% of poverty	300% of poverty and higher
ED visits per 100 people, U.S. total	31.9	59.8	31.9	24.2
Marginal differences insurance (relative to uninsured)				
Medicaid/state coverage	16.4 ^a	13.7 ^a	11.9 ^a	– ^c
Privately insured	–2.0	5.4 ^a	1.4	–7.7
Medicare	20.5 ^a	18.5 ^a	15.2 ^a	13.7
Race/ethnicity (vs. white)				
Black	9.9 ^{a,b}	3.7	8.2 ^a	11.9
Hispanic	1.3	–4.1	4.9	1.3
Noncitizen (vs. citizen)				
	–17.2 ^{a,b}	–30.3 ^{a,b}	–11.9 ^{a,b}	–4.2
Family income as percent of poverty (vs. below 100% of poverty)				
100–199%	–11.2 ^{a,b}	– ^c	– ^c	– ^c
200–299%	–16.7 ^{a,b}	– ^c	– ^c	– ^c
300–399%	–15.5 ^{a,b}	– ^c	– ^c	– ^c
400% or higher	–14.1 ^a	– ^c	– ^c	– ^c
Fair/poor health (vs. excellent or good health)				
	35.5 ^{a,b}	30.6 ^{a,b}	30.8 ^{a,b}	23.9 ^{a,b}
HMO enrollment (vs. enrolled in non-HMO)				
	3.3 ^b	–6.0 ^a	2.2	4.5
Increase of 1 standard deviation on the following measures				
Number of EDs per 10,000 ^d	1.4	–2.1	1.1 ^b	3.1 ^a
Distance to EDs (miles) ^d	–3.3 ^{a,b}	–5.1	–1.0	–4.5 ^a
Appointment waiting time (days)				
	2.1 ^a	7.4 ^b	3.0 ^a	0.2
Outpatient visits per physician				
	5.1 ^{a,b}	12.7 ^{a,b}	4.9 ^{a,b}	2.6 ^a
CHC revenue per poor person in ZIP code area ^e				
	1.8	–7.6 ^a	–1.0 ^a	6.8 ^b

SOURCE: All data based entirely on the Community Tracking Study (CTS) household survey, 2003, except where noted.

NOTES: Estimates are based on a two-step linear regression analysis, with the first step estimating the probability of having any ED visit, and the second step estimating the number of ED visits for those with any visit. The results from the two regressions were combined to reflect marginal differences in ED visits per 100 people. HMO is health maintenance organization.

^a Underlying coefficient in regression model for the probability of ED use is statistically significant ($p < .05$).

^b Underlying coefficient in regression model for the number of ED visits (for people with one or more) is statistically significant ($p < .05$).

^c Not applicable.

^d American Hospital Association annual survey, 2002.

^e Health Resources and Services Administration, 2002 Uniform Data System.

per 100 people, on average), and the difference between poor citizens and non-citizens was almost twice as large. In terms of racial/ethnic differences, blacks had higher ED use levels than whites and Hispanics did in 2003. More in line with expectations was the higher ED use by poor people (less than 100 percent of poverty) compared to other income groups, and higher ED use by people in fair/poor health and with chronic medical conditions.

■ **Impact of HMOs.** Enrollment in HMOs also affects people's use of EDs, although these effects tend to vary by income. For example, in 2003, enrollment in HMOs reduced ED use for poor people by about 6 visits per 100 people but apparently had little effect on other income groups. This may reflect in part the higher overall levels of ED use by poor people (that is, more excess use for HMOs to contain and divert to other primary care sources). Also, poor people were less able to pay ED costs out of pocket when authorization was denied by an HMO.

■ **Impact of outpatient capacity.** This study also shows that longer waiting times for appointments with physicians and a higher number of physician office visits relative to the number of physicians in a community increased ED visit levels, and the effects were greatest for poor people (Exhibit 2). In part, this may reflect the fact that physicians with full practices and constrained reimbursement from Medicaid and other payers were less willing to see low-income patients in their offices and more likely to refer such patients to the ED.

■ **Impact of CHC capacity.** Less surprising was that greater CHC capacity reduces ED visits for poor and low-income people, although greater CHC capacity appeared to increase ED visits among higher-income people. One possible explanation for this is that if CHCs reduced crowding and waiting times at some EDs by providing an alternative source of primary care for low-income people, the "freed-up" capacity in the ED would then be used by higher-income people, especially if the ED was more convenient. The results also show that closer proximity to EDs increased their use, especially for higher-income people.

Implications Of Findings For Communities

Despite the large number of population and health system factors that contribute to ED use, differences in these characteristics explain only about 40 percent of the variation in ED visits between high- and low-use communities.¹⁹ About 25 percent of the difference in ED use is explained by differences in population characteristics alone, of which the most important factors were the percentages of non-citizens and the racial/ethnic composition. But as our findings indicate, communities have high rates of per person ED use in part because they have fewer, rather than greater, numbers of Hispanics and noncitizens.

■ **Increasing insurance coverage.** For communities whose populations have high rates of ED use, it is not clear how much they could reduce those rates by emulating the health care systems of communities with low use. For example, efforts to increase insurance coverage in high-use communities may be a viable strategy for in-

creasing access and reducing the amount of uncompensated care in a community, but it will not decrease overall ED use, both because coverage rates are already slightly higher in high-use communities and because insured people have as much ED use as uninsured people have, or more.

■ **Increasing outpatient capacity.** Increasing outpatient capacity may result in some modest reductions in ED visits for high-use communities. For example, if average appointment waiting times and outpatient visits per physician in high-use communities were similar to those in low-use communities, ED visits per 100 people in high-use communities would decrease from about 45 to 41 visits.

■ **Expansions of HMOs and CHCs.** Expansions of HMOs and CHCs might help reduce ED use among poor and low-income people, although differences in these two factors are not large enough to account for much of the variation in ED use, even among the poor.

■ **Unexplained differences.** Some of the unexplained differences in ED use across communities might be attributable to key factors not included in the analysis or that were not precisely measured (such as differences in ED capacity). However, as noted in other studies of regional practice variations, it is also likely that some communities are intrinsically high or low users of EDs for reasons that are particular to each community and its health care system.²⁰ One indication of this is that in 2003, ED visits tended to be higher across all population characteristics in high-use communities relative to low-use communities (Exhibit 4). For example, ED visits among uninsured, Medicaid, privately insured, and Medicare populations were all higher in high-use communities than in their low-use counterparts. Similar trends were observed for various racial/ethnic groups and income levels, although differences among noncitizens were not statistically significant.

Similarly, people in high-use communities tended to rely on the ED for a larger share of their outpatient health care than did people in low-use communities (about 21 percent versus about 14 percent), and this general pattern held regardless of insurance status, race/ethnicity, and family income. It is likely that unexplained community variations reflect populations' generic preferences and habits regarding use of EDs as a source of medical care for nonurgent problems.

Implications For The Future

■ **Hispanic immigration.** Population increases will contribute to increases in the overall number of ED visits nationally; however, projected changes in the composition of the population are likely to have mixed effects on ED visit levels. The proportion of the population that is of Hispanic origin is expected to increase from 12.6 percent in 2000 to 15.5 percent in 2010 and 20.1 percent by 2030.²¹ There is much concern that some of the increase will be driven by illegal immigration, which is cited as straining ED capacity in some hospitals, especially along the U.S./Mexico border.²² However, given the very low levels of ED use among poor noncitizens in general (many of whom are likely to be undocumented immigrants), it is very un-

EXHIBIT 4
Use Of Hospital Emergency Departments (EDs) In Communities With High And Low ED Use, 2003

	ED visits per 100 people		ED visits as a proportion of all outpatient visits (%)	
	High-ED-use communities	Low-ED-use communities	High-ED-use communities	Low-ED-use communities
All people	45.4	22.5**	21.0	14.2**
Insurance coverage				
Uninsured	71.2	15.6**	25.2	10.8**
Medicaid/state	90.8	33.0**	37.2	16.5**
Private	33.4	19.8**	18.0	14.1**
Medicare	42.8	28.6**	18.4	14.7**
Race/ethnicity				
White	37.7	20.3**	18.9	13.9**
Black	57.4	36.0**	24.0	18.4**
Hispanic	65.5	21.5**	25.5	13.7**
Citizenship				
Citizen	46.3	23.3**	21.3	14.4**
Noncitizen	24.3	15.5	12.1	11.9
Family income (as percent of poverty)				
<100%	96.5	33.4**	32.2	16.9**
100-199%	51.0	21.3**	23.1	13.5**
200-299%	46.2	24.8**	21.1	15.9**
300-399%	31.7	21.8**	19.3	13.7**
400% or higher	28.8	19.4**	16.3	13.2**

SOURCE: Community Tracking Study (CTS) household survey, 2003.

NOTES: Statistical significance denotes difference with high-ED-use communities on the same measure. High-ED-use communities are defined as the 25 percent of CTS communities with the highest number of ED visits per 100 people. Low-ED-use communities are defined as the 25 percent of CTS communities with the lowest number of ED visits per 100.

***p* < .05

likely that these highly localized problems with ED crowding will affect the nation more generally as the Latino population increases and migrates to other parts of the country. Low use of the ED among noncitizens reflects low use of health care services in general and perhaps fear among undocumented immigrants about being asked about their immigration status.

■ **Medicare and Medicaid.** High levels of ED use among Medicare beneficiaries and Medicaid enrollees are a potential source of increases in ED visit rates in the future. The aging of the population and retirement of the baby-boom generation will greatly increase Medicare enrollment and the proportion of the population who are elderly, who tend to have higher levels of ED use compared to other age groups.

Also, continued increases in private insurance costs could result in increases in both Medicaid and other public coverage of nonelderly people, as well as increases in the number of uninsured people. High use of EDs in Medicaid likely reflects in part little or no cost sharing for health services use, and perhaps lack of access to office-based physicians (because of low physician reimbursement rates under

Medicaid).²³ Thus, higher levels of ED use associated with increased enrollment in public coverage could be offset to some extent by increasing access to office-based physicians, providing inducements to use non-ED settings for nonurgent care, and perhaps greater utilization management as evidenced by the lower ED use among poor people enrolled in HMOs.

■ **Rates of uninsurance.** By contrast, increases in uninsurance rates are unlikely to result in net increases in ED visit rates. Although uninsured people rely on EDs to a greater extent than insured people do because of a lack of access to other outpatient care, their actual use of hospital EDs is no greater than that of the privately insured, probably because fear of incurring the entire cost of an ED visit acts as a constraint on how frequently they visit EDs. Although rising uninsurance rates might not raise ED visit rates among the population, higher levels of uncompensated ED visits in many hospitals are likely to result, especially in public hospitals and other safety-net hospitals that tend to serve a high proportion of uninsured people.²⁴

■ **Health care demand.** Continued increases in ED use nationally are more likely to be driven by increased demand for health care in general than by changes in the population, as was the case with the increase in ED use over the past decade.²⁵ If increases in the number of physicians are not sufficient to meet the increased demand, as some are projecting, then ED visit levels among the population could also increase as they absorb the overflow of patients who cannot get timely appointments with their regular physicians.²⁶ As the results of this analysis suggest, outpatient capacity constraints are likely to affect poor and low-income people the most, probably because of lower physician reimbursement and perhaps also the perception among some physicians that many low-income patients are greater malpractice risks.

■ **ED overcrowding.** The implications of these results for ED overcrowding are unclear, since much overcrowding is driven by problems with inpatient capacity in the hospitals that are experiencing crowding rather than simply increased demand for EDs. In addition, although higher demand for EDs in some communities might be driven in large part by health system issues and characteristics of the population in those communities, the effect on hospital EDs in those communities is likely to be uneven, since certain hospitals tend to attract a higher volume of some patients more than others.²⁷

REDUCING USE OF HOSPITAL EDs for nonurgent medical problems is desirable for other reasons, in that it could help lower health care costs and even improve patients' experiences with the health care system, but reducing ED use defies simple solutions such as expanding insurance coverage or restricting access for undocumented immigrants. Increasing non-ED capacity in the health care system, as well as expanding the availability of CHCs and HMOs for low-income people, might lead to some marginal reductions in ED use. Nevertheless, while reducing ED use might be desirable from a health-system perspective,

EDs are likely to remain highly popular and convenient sources of medical care for many people and communities, including the majority of ED users who have private insurance coverage.

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11. Standard errors of the estimates used in tests of differences between means took into account the clustering of the sample into the four quartile groups and were computed using the SUDAAN software. See B.V. Shah et al., *SUDAAN User's Manual, Release 7.0*. (Research Triangle Park, N.C.: Research Triangle Institute, 1996). Tests of differences between quartile groups are computed using the Z-test of differences between means.
12. H. Duan et al., *A Comparison of Alternative Models for the Demand for Medical Care*, RAND Health Insurance Experiment Series R-2754-HHS (Santa Monica, Calif.: RAND, 1982).
13. To compute marginal differences in ED visits between groups (for example, between citizens and non-citizens), regression-adjusted means were first computed separately for the probability of any ED use and the number of visits per user. Adjusted means were computed based on the predicted values for individuals when indicator variables for groups were set to 1. The adjusted average number of ED visits per 100 people for each group was then computed by multiplying the adjusted mean for probability of use with the adjusted mean for the number of visits (and multiplying the result by 100). Marginal differences reported in Exhibit 3 reflect these differences in adjusted ED visits per 100 people. Full regression results are available upon request from Peter Cunningham, pcunningham@hschange.org.
14. Based on linking CHC data to CTS survey respondents by ZIP code. CHC data are from Bureau of Primary Health Care, "Uniform Data System," April 2006, <http://bphc.hrsa.gov/uds> (accessed 6 July 2006). For more information on the CTS physician survey, see N. Diaz-Tena et al., *Community Tracking Study: Physician Survey Methodology Report 2000-01 (Round Three)*, Technical Pub. no. 38, May 2003, <http://www.hschange.com>

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15. Derived by linking data from the American Hospital Association (AHA) annual survey to CTS respondents. Distance to the closest ED was computed by linking hospitals with EDs to survey respondents at the ZIP code level and computing distances (in miles) between ZIP code centroids for each survey respondent. For information on the survey of hospitals, see American Hospital Association, *Annual Survey of Hospitals, 2002* (Chicago: AHA, 2003).
 16. Previous research found that even as the number of hospital EDs in the state declined, overall capacity in terms of the number of ED stations increased. See S. Lambe et al., "Trends in the Use and Capacity of California's Emergency Departments, 1990–1999," *Annals of Emergency Medicine* 39, no. 4 (2002): 389–396.
 17. Adjusted means for the quartile groups were computed based on predicted values of ED use when the indicator variable for the quartile group is set to 1. Adjusted visits per 100 people were computed by multiplying the predicted percentage with any ED visit with the predicted number of visits per user and multiplying this result by 100.
 18. This estimate is slightly less than a similar estimate based on the 2003 National Hospital Ambulatory Medical Care Survey (NHAMCS) (34.3 visits per 100 people). When ED visits resulting in inpatient stays are included, estimates from the two surveys are almost identical (about forty visits per 100 people). For more detail on the NHAMCS estimate, see McCaig and Burt, *National Hospital Ambulatory Medical Care Survey*.
 19. The actual difference in ED visits between high- and low-use communities was about 23 visits per 100 people. The adjusted difference (controlling for all factors in the regression analysis) was 14 visits per 100 people. The explained difference between high- and low-use communities was therefore computed as the difference between the actual and adjusted difference, which is 9 visits per 100 people (or 40 percent of the actual difference).
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 24. This was examined more explicitly with the CTS data in P.J. Cunningham, "Medicaid/SCHIP Cuts and Hospital Emergency Department Use," *Health Affairs* 25, no. 1 (2006): 237–247.
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