Factors Associated with Use of Urban Emergency Departments by the U.S. Homeless Population

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SYNOPSIS

Objective. Homeless individuals frequently use emergency departments (EDs), but previous studies have investigated local rather than national ED utilization rates. This study sought to characterize homeless people who visited urban EDs across the U.S.

Methods. We analyzed the ED subset of the National Hospital Ambulatory Medical Care Survey (NHAMCS-ED), a nationally representative probability survey of ED visits, using methods appropriate for complex survey samples to compare demographic and clinical characteristics of visits by homeless vs. non-homeless people for survey years 2005 and 2006.

Results. Homeless individuals from all age groups made 550,000 ED visits annually (95% confidence interval [CI] 419,000, 682,000), or 72 visits per 100 homeless people in the U.S. per year. Homeless people were older than others who used EDs (mean age of homeless people = 44 years compared with 36 years for others). ED visits by homeless people were independently associated with male gender, Medicaid coverage and lack of insurance, and Western geographic region. Additionally, homeless ED visitors were more likely to have arrived by ambulance, to be seen by a resident or intern, and to be diagnosed with either a psychiatric or substance abuse problem. Compared with others, ED visits by homeless people were four times more likely to occur within three days of a prior ED evaluation, and more than twice as likely to occur within a week of hospitalization.

Conclusions. Homeless people who seek care in urban EDs come by ambulance, lack medical insurance, and have psychiatric and substance abuse diagnoses more often than non-homeless people. The high incidence of repeat ED visits and frequent hospital use identifies a pressing need for policy remedies.

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Cities in the United States reported a 12% increase in homelessness from 2007 to 2008, despite national, state, and local efforts to provide housing.[1] In the Annual Homeless Assessment to Congress, the U.S. Department of Housing and Urban Development (HUD) estimated that 759,000 people were homeless on a single night in 2006.[2] Homelessness is associated with significant morbidity and mortality,[3] and homeless patients are likely to have multiple acute and chronic health issues. A previous study found that age-adjusted mortality was 3.5 times greater for homeless compared with non-homeless individuals.[4] Furthermore, homeless people often have mental illness and substance abuse issues[5,6] in addition to being subject to trauma.[7]

Homeless people are often uninsured and face significant barriers to accessing health care.[8] Competing demands for shelter, food, and safety supersede the need to obtain primary medical care for many homeless individuals.[9] As a result, homeless individuals will often use the emergency department (ED) for routine, non-emergent medical needs.[10–12] Homeless people are three times more likely to use the ED than non-homeless people[13] and may contribute to ED overcrowding.[14]

The often transient or episodic nature of homelessness makes it extremely difficult to characterize this population. Nearly all of the published studies examining ED visits by homeless people are limited to single cities and hospitals,[10,13–17] even though the regulatory frameworks for ED practice (e.g., the Emergency Medicine Treatment and Active Labor Act) and for homeless policy itself are developed at the national level. An accurate portrait of the national impact of homelessness on EDs is a necessary prerequisite for informed policy development directed toward improved care for homeless individuals and reduced costs associated with ED use by homeless people.[18]

We sought to characterize visits made by homeless individuals to urban EDs in the U.S. during a two-year period, and to assess whether homelessness itself, or characteristics commonly associated with homelessness, independently predicted ED use.

METHODS

Design

We performed a descriptive, cross-sectional secondary analysis of the ED components of the 2005 and 2006 National Hospital Ambulatory Care Surveys (NHAMCS-ED).[19,20] These surveys are four-stage probability samples of ED visits conducted annually by the National Center for Health Statistics (NCHS) within the Centers for Disease Control and Prevention (CDC). Statistical methods have been published by NCHS.[21] The Thomas Jefferson University Hospital Institutional Review Board exempted this study from review.

Sampling is national in scope, but excludes long-stay, federal, military, and Veterans Administration hospitals. NHAMCS-ED obtains nationally representative estimates by randomly sampling at four stages, beginning with geographic units closely related to counties, then hospitals, then emergency service areas within each sampled hospital, and finally individual clinical encounters. In the last stage, patient records are chosen from consecutive visits using a random start followed by every nth patient record. Each ED contributes patients during a four-week period that is repeated every 16 months. Of EDs that were approached, 91% ($n=352$) and 87% ($n=362$) participated in the survey in 2005 and 2006, respectively. In the entire U.S., there were 4,014 EDs in 2005 and 4,061 EDs in 2006.[22,23] Each encounter yielded a one-page patient record form, which was abstracted from clinical records by local ED personnel trained by field representatives from the U.S. Census Bureau.

Diagnoses and medications were coded, data were edited for consistency, and data entry was subjected to a 10% quality-control check. Item nonresponse rates were generally less than 5%. Exceptions in 2006 were "seen in ED within last 72 hours" (11.0%), "discharged within the last seven days" (25.4%), "length of in-patient stay" (12.3%), "time waiting to see a physician" (13.5%), and "time spent in the ED" (5.2%). The exceptions in 2005 were similar to those in 2006. Some items with nonresponse were imputed. To counter potential imbalances in sampling and produce unbiased annual estimates, weights were assigned to each record. These weights inflate point estimates by reciprocals of selection probabilities, adjustment for nonresponse, population ratio adjustments, and weight smoothing.[24] Although survey data collection involved both urban and rural EDs, this analysis was limited to urban ED visits because there were only five patient record forms marked "homeless" from rural EDs.

The NHAMCS-ED first tallied homeless status in 2005 and did not discriminate chronic from short-term homelessness. A patient residence item contained checkboxes for private residence, nursing home, other institution, other residence, or homeless. Of 69,454 forms filled out in 2005 and 2006, 449 were checked as homeless. Given this sample size, we examined bivariate and multivariable associations with a limited group of variables chosen on the basis of a priori clinical relevance rather than empirical strength of association.

Analysis

The analytic dependent variable was homeless status. Predictor variables included a range of characteristics shown to be potentially relevant in homeless service utilization research.[8,10,14,15] We used Stata® version 10.0 for all statistical analyses.[25] Significance tests and confidence intervals [CIs] were obtained using Stata's "svy" programs (tabulation and logistic regression), which adjust standard errors for correlation within primary sampling units and allow the use of probability weights to obtain national estimates.

RESULTS

There were 234 million weighted ED visits in the U.S. in 2005 and 2006. During this two-year period, ED visits made by homeless individuals from all age groups numbered 1.1 million, or 0.5% of total ED visits. The majority of these (96%) were made by individuals older than 18 years of age. Homeless individuals made 550,000 ED visits (95% CI 419,000, 682,000) annually, or 72 visits per 100 homeless individuals per year during 2005–2006, based on a count of 759,000 people homeless on a single night in 2006.[2] In comparison, the overall population made 115.3 million visits annually, or 40 visits per 100 people per year. In 2005, there were 469,000 urban ED visits by homeless people (95% CI 321,000, 616,000). In 2006, the number of homeless visits increased to 628,000 (95% CI 429,000, 828,000).

Tables 1 and 2 illustrate bivariate relationships between homeless status and demographic and clinical variables. Homeless ED visitors were older and more often uninsured than non-homeless ED visitors. In unadjusted comparisons, a similar percentage of homeless and non-homeless individuals had Medicaid coverage. Homeless people also arrived more frequently by ambulance and were more often treated for an acute injury, alcohol or other drug use, or psychiatric issues than other people.

Importantly, visits by homeless people were far more likely to be characterized by recent use of the ED or hospital admission. Specifically, homeless people were three times more likely to be classified as having undergone evaluation in the same ED within the preceding three days (13.0% homeless vs. 3.9% non-homeless),

Table 1. Annual emergency department visits, by demographic characteristics and homeless status: NHAMCS-ED, U.S., 2005–2006

	Homeless			Non-homeless		
	Number (in thousands)	95% CI	Percent	Number (in thousands)	95% CI	Percent
Total visits	550	419, 682	100.0	99,125	84,856, 113,394	100.0
Age in years (mean)	43.8	42.0, 45.6		36.0	35.2, 36.7	
Gender (male)	423	307, 540	77.0	45,354	41,400, 49,300	45.8
Race						
White	290	214, 366	52.7	57,631	48,167, 67,096	58.1
Black	126	86, 167	23.0	23,246	18,756, 27,737	23.5
Hispanic	116	55, 177	21.1	14,997	11,766, 18,227	15.1
Other	17	6, 29	3.2	3,250	2,241, 4,259	3.3
Geography						
Northeast	116	63, 169	21.1	19,580	14,725, 24,434	19.8
Midwest	NA[a]	NA[a]	12.2[b]	22,253	14,029, 30,477	22.4
South	152	90, 214	27.7	38,585	28,688, 48,481	38.9
West	215	117, 312	39.0	18,707	14,640, 22,775	18.9
Insurance						
Uninsured	189	126, 253	34.4	16,179	13,468, 18,890	16.3
Medicaid	150	100, 199	27.2	24,373	20,192, 28,553	24.6
Other	211	145, 277	38.4	58,573	50,409, 66,737	59.1

[a]Estimates of the number of homeless visits for the Midwest did not meet standards for reliability or precision as determined by the National Center for Health Statistics.

[b]Because precise numbers of Midwestern homeless visits could not be estimated, a percentage is offered based on subtraction of the percentages from the three other regions.

NHAMCS-ED = National Hospital Ambulatory Medical Care Survey—Emergency Department

CI = confidence interval

NA = not applicable

Table 2. Annual emergency department visits, by clinical characteristics and homeless status: NHAMCS-ED, U.S., 2005–2006

	Homeless			Non-homeless		
	Number (in thousands)	95% CI	Percent	Number (in thousands)	95% CI	Percent
Total visits	550	419, 682	100.0	99,125	84,856, 113,394	100.0
Mode of arrival (ambulance)	196	136, 257	35.7	15,870	13,546, 18,193	16.0
Time of arrival						
1st shift	182	125, 239	33.0	38,927	33,261, 44,593	39.3
2nd shift	258	182, 334	46.9	43,376	37,076, 49,676	43.8
3rd shift	110	69, 152	20.0	16,822	14,361, 19,282	17.0
Triage code						
High (level 1)	89	48, 169	16.2	14,972	12,136, 17,809	15.1
Medium (level 2)	205	147, 263	37.3	34,004	28,057, 39,951	34.3
Low (levels 3 and 4)	160	108, 212	29.0	35,328	29,322, 41,334	35.6
Unknown	96	39, 153	17.5	14,821	11,275, 18,366	15.0
Primary complaint/diagnosis						
Injury	304	212, 396	55.3	35,413	30,444, 40,382	35.7
Alcohol or other drug use	100	49, 152	18.3	1,117	924, 1,310	1.1
Psychiatric	57	34, 81	10.4	2,359	2,359, 2,359	2.4
Bounce-backs						
Same ED within 72 hours	64	35, 94	13.0	3,480	2,854, 4,106	3.9
Any hospital discharge within seven days	27	10, 44	6.7	2,040	1,657, 2,422	2.8
Seen by intern or resident	112	57, 166	20.3	10,516	8,038, 12,995	10.6
Disposition						
Left against medical advice or before being seen	53	26, 80	9.6	3,386	2,816, 3,956	3.4
Admitted to hospital or transferred	113	77, 149	20.6	14,333	12,151, 16,515	14.5
Length of stay (mean in days)	5.5	3.8, 7.8		4.1	4.0, 4.2	
Primary ED diagnosis						
Alcohol or other drug-related[a]	101	51, 150	18.3	1,116	958, 1,275	1.1
Psychiatric[b]	57	34, 81	10.4	2,358	12,036, 2,680	2.4

[a]ICD-9 codes 291-292, 303-305

[b]ICD-9 codes 290, 293-302, 306-319

NHAMCS-ED = National Hospital Ambulatory Medical Care Survey—Emergency Department

CI = confidence interval

ED = emergency department

ICD-9 = International Classification of Diseases, Ninth Revision

and more than twice as likely to involve a return (e.g., bounce-back) to the ED after a hospitalization within the previous week (6.7% homeless vs. 2.8% non-homeless).

Table 3 presents the results of a multiple logistic regression analysis of the variables described in Tables 1 and 2, excluding disposition and length of stay for in-patients. Because of missing responses, variables related to recent prior use of EDs or the hospital were also excluded. Demographic variables independently associated with ED visits by homeless people included male

gender, being uninsured, aged >45 years, and Western geographic region. Additionally, in this adjusted analysis, both Medicaid and uninsured status were associated with homelessness relative to "other" status (e.g., insured through Medicare or private insurance). Conversely, there was no independent association between race and homelessness among this sample of ED visits. Homelessness was independently associated with the following clinical variables: arrival to the ED by ambulance, evaluation by a physician-in-training, and leaving the ED before treatment was completed. Time

Table 3. Characteristics associated with homelessness among a national cohort of 1.1 million ED visits in the U.S., NHAMCS-ED, 2005–2006[a]

	Adjusted OR[b]	95% CI	P-value
Age (>45 years)	2.28	1.68, 3.09	<0.01
Gender (male)	3.34	2.33, 4.78	<0.01
Race			
White	Reference		
Black	1.30	0.88, 1.90	0.19
Hispanic	1.35	0.80, 2.29	0.26
Other	0.71	0.32, 1.58	0.40
Geography (West region)	3.14	1.98, 4.97	<0.01
Insurance			
Other	Reference		
Uninsured	3.17	2.04, 4.90	<0.01
Medicaid	1.96	1.34, 2.86	<0.01
Mode of arrival (ambulance)	1.76	1.17, 2.64	0.01
Time of arrival			
1st shift	Reference		
2nd shift	1.17	0.82, 1.67	0.38
3rd shift	1.12	0.74, 1.68	0.60
Triage code			
High (level 1)	Reference		
Medium (level 2)	1.32	0.80, 2.17	0.28
Low (levels 3 and 4)	1.20	0.74, 1.95	0.45
Not reported	1.30	0.71, 2.38	0.39
Seen by intern or resident	1.81	1.10, 2.98	0.02
Primary ED diagnosis			
Other	Reference		
Psychiatric	5.83	3.60, 9.42	<0.01
Alcohol or other drugs	9.05	5.03, 16.29	<0.01
Disposition			
Left against medical advice or before being seen	3.45	1.93, 6.14	<0.01
Admitted to hospital	1.13	0.76, 1.69	0.54

[a]Analysis of 1.1 million weighted ED visits during the years 2005–2006, for characteristics associated with homeless status as the dependent variable, among 234 million visits, with 1.1 million visits classified as "homeless."

[b]Adjusted OR represents the association between each characteristic and the odds of the visit being classified as homeless, relative to it not being so classified, adjusting for all other characteristics shown in the table.

ED = emergency department

NHAMCS-ED = National Hospital Ambulatory Medical Care Survey—Emergency Department

OR = odds ratio

CI = confidence interval

of patient arrival and level of triage on presentation were factors not shown to be independently associated with ED visits by homeless individuals.

The primary diagnoses, as broken down by International Classification of Diseases, Ninth Revision codes for ED visits by homeless and non-homeless individuals, are presented in Table 4. Both groups were most often diagnosed with an injury or poisoning. However, while homeless visitors were often diagnosed with a psychiatric disorder, non-homeless people were only rarely assigned this diagnosis.

DISCUSSION

Homelessness affects major U.S. cities across the nation. To our knowledge, this study is the first to attempt to characterize ED visits made by homeless individuals in the U.S. from a national perspective.

We found that ED visits by homeless people represent a very small percentage (0.5%, weighted) of total ED visits across the U.S. However, on any given day, homeless people are estimated to represent one-quarter of a percent of the general population, given

the U.S. Census Bureau projections for 2006.[26] When analyzing chronic ED users, a San Francisco study found that homelessness was the characteristic most predictive of ED use.[14] Homeless patients have previously been shown to comprise as much as 30% of an ED's yearly adult census.[15] While the prior homeless ED studies relied on geographically local samples, this study underscores that the health service challenges attached to homelessness are national in scope.

Treating homeless patients is costly. A New York City study on public hospitals showed excess costs associated with in-patient hospital admissions for the homeless population.[16] We did not demonstrate a significant difference between homeless and non-homeless people for length of stay of hospitalized patients, but the comparison was very imprecise, with the 95% CIs spanning four days. Homeless individuals are more likely to use ambulance services because they lack transport to a health-care facility.[6,27,28] This study confirmed that association. It also identified an increased tendency toward ED use shortly after recent hospital care. This tendency leads to significant monetary costs and exacerbates an already overburdened emergency care network.

Factors that were associated with homeless individuals' visits to the ED included acute injuries and primary diagnoses related to psychiatric illness and substance abuse, both of which are long-recognized vulnerabilities of the homeless population. Prior studies have shown that homeless people live in fear of being subject to violence.[3,29] The popular press has publicized some episodes of violence directed toward homeless individuals.[30–32] The high prevalence and co-occurrence of psychiatric illness with substance abuse

in the homeless population can make this population difficult to treat.[5,33,34]

These national ED data also show that homeless individuals are more likely than non-homeless individuals to be seen by physicians-in-training (residents and interns). The implications of this finding remain opaque, however, as all individuals seen by physicians-in-training must by law also be evaluated by attending physicians and, therefore, should be receiving the same baseline level of care.

Given increasing public concern regarding overcrowding of EDs, efforts to humanely avert demand associated with homelessness should be of policy interest. For clinicians working in EDs, comprehensive planning of discharges is required because of homeless people's comorbid psychiatric and substance abuse issues and their lack of consistent and safe shelter.[35,36] More comprehensive discharge planning and specialized ED-based programs have been shown to decrease ED visits by the homeless.[26,37,38] Policy makers charged with unburdening overloaded hospitals and EDs may wish to consider medically supervised recovery environments, termed "medical respite programs," now operating in more than 35 sites across the country. Availability of such programs has been associated with reduced hospital readmission in two observational studies, and a third multisite study is presently underway.[39,40] A nationally prominent housing intervention may reduce the burden of homelessness on public resources (including EDs). Specifically, "Housing First" approaches focus on providing housing without requiring abstinence or treatment for medical or mental problems.[41] Several recent studies have demonstrated that this type of program can reduce costs and improve health outcomes.[42–44]

Table 4. Primary diagnoses for emergency department visits by homeless and non-homeless people in the U.S., NHAMCS-ED, 2005–2006

Homeless		Non-homeless	
Diagnosis	Percent	Diagnosis	Percent
Injury/poisoning	21	Injury/poisoning	18
Psychiatric and mental disorders	14	Psychiatric and mental disorders	2
Musculoskeletal system	14	Musculoskeletal system	14
Respiratory system	7	Respiratory system	11
Digestive system	a	Digestive system	14
Nervous system	a	Nervous system	6
Skin, nails, and hair	a	Skin, nails, and hair	3
Eyes and ears	a	Eyes and ears	3
Cardiovascular and lymphatic	a	Cardiovascular and lymphatic	1
Genitourinary system	a	Genitourinary system	4
Other	27	Other	25

aSample size too small to calculate

NHAMCS-ED = National Hospital Ambulatory Medical Care Survey—Emergency Department

Limitations

The estimated number of homeless ED visits, although high, is likely to be an undercount because homeless people may not volunteer housing status and ED staff may fail to inquire about or record this information, as homeless status is not a required item in clinical charts. Furthermore, when homeless patients are seen in the ED, they may not be easily identifiable on chart review because the patient will often list a shelter, friend or family's house, or a fictitious address as their primary residence. Enumerating the homeless is difficult in all circumstances, but especially in the retrospective chart review used for NHAMCS-ED. However, while absolute counts are likely to be underestimates, the relationship between homeless status and other variables is less likely to be biased.

The number of visits to EDs by homeless individuals in the dataset was limited to only two years because the NHAMCS-ED survey first began recording homeless status in 2005. As a result, the unweighted sample size for visits by homeless individuals was only 449. Because of limited statistical power, we assessed only a few of many potential explanatory variables and aggregated categories for some variables (e.g., insurance status and ED diagnosis) based on a priori reasoning, previous literature, and category size.

CONCLUSIONS

Because data on homelessness are now being collected with the NHAMCS-ED annually, regular review of this resource will provide important information in trends of ED use. Although our findings could suggest that national ED usage by homeless people is less than that previously reported in single hospital or city-based ED studies, the prevalence of homeless visitors to the ED is still high. The high frequency of repeat ED visits identifies a systemic shortcoming and underscores the need for policy remedies for homelessness in the U.S.

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