

Special Article

HOSPITALIZATION COSTS ASSOCIATED WITH HOMELESSNESS  
IN NEW YORK CITY

SHARON A. SALIT, M.A., EVELYN M. KUHN, PH.D., ARTHUR J. HARTZ, M.D., PH.D., JADE M. VU, M.P.H.,  
AND ANDREW L. MOSSO, B.A.

**ABSTRACT**

**Background** Homelessness is believed to be a cause of health problems and high medical costs, but data supporting this association have been difficult to obtain. We compared lengths of stay and reasons for hospital admission among homeless and other low-income persons in New York City to estimate the hospitalization costs associated with homelessness.

**Methods** We obtained hospital-discharge data on 18,864 admissions of homeless adults to New York City's public general hospitals (excluding admissions for childbirth) and 383,986 nonmaternity admissions of other low-income adults to all general hospitals in New York City during 1992 and 1993. The differences in length of stay were adjusted for diagnosis-related group, principal diagnosis, selected co-existing illnesses, and demographic characteristics.

**Results** Of the admissions of homeless people, 51.5 percent were for treatment of substance abuse or mental illness, as compared with 22.8 percent for the other low-income patients, and another 19.7 percent of the admissions of homeless people were for trauma, respiratory disorders, skin disorders, and infectious diseases (excluding the acquired immunodeficiency syndrome [AIDS]), many of which are potentially preventable medical conditions. For the homeless, 80.6 percent of the admissions involved either a principal or a secondary diagnosis of substance abuse or mental illness — roughly twice the rates for the other patients. The homeless patients stayed 4.1 days, or 36 percent, longer per admission on average than the other patients, even after adjustments were made for differences in the rates of substance abuse and mental illness and other clinical and demographic characteristics. The costs of the additional days per discharge averaged \$4,094 for psychiatric patients, \$3,370 for patients with AIDS, and \$2,414 for all types of patients.

**Conclusions** Homelessness is associated with substantial excess costs per hospital stay in New York City. Decisions to fund housing and supportive services for the homeless should take into account the potential of these services to reduce the high costs of hospitalization in this population. (N Engl J Med 1998;338:1734-40.)

©1998, Massachusetts Medical Society.

SINCE the early 1980s, homelessness has been an intractable problem in the nation's largest cities. Some observers trace the growth of homelessness largely to the social policies of the 1970s, including the deinstitutionalization of the mentally ill and the dismantling of government-sponsored housing and social-services programs for the poor.<sup>1-3</sup> In more recent years, questions have been raised about whether the many public resources used by homeless persons are ultimately more costly than housing and other services that could prevent homelessness. Because data on the social costs associated with homelessness have been difficult to obtain, however, policy makers have not been able to evaluate these issues fully.

Numerous investigators have documented high rates of illness and mortality among homeless persons.<sup>4-8</sup> Most studies, however, have relied on self-reported data from shelter residents<sup>5,6,9,10</sup> or administrative data on users of services, usually clinic patients,<sup>8,11,12</sup> who may not be typical of general homeless populations. The authors of a 1994 study of mortality among homeless persons in Philadelphia<sup>4</sup> were the first to gain access to the clinical records of a large sample of a defined homeless population.

Our study was undertaken in response to the growth in the number of homeless patients in New York City's public hospitals since the late 1980s and to reports that many of these patients were spending long periods in hospitals awaiting placement in public housing or community-treatment programs, which are in short supply in the city. We obtained discharge data on nearly 19,000 admissions of homeless patients and compared their diagnoses and lengths of stay with those of other low-income persons in New York City to estimate the hospitalization costs that may be associated with homelessness itself. Comparisons of the lengths of stay were adjusted for the se-

From the New York City Health and Hospitals Corporation, New York (S.A.S., J.M.V., A.L.M.); the Department of Emergency Medicine, Medical College of Wisconsin, Milwaukee (E.M.K.); and the Department of Family Medicine and the Public Policy Center, University of Iowa, Iowa City (A.J.H.). Address reprint requests to Ms. Salit at the United Hospital Fund, Empire State Bldg., 350 Fifth Ave., 23rd Fl., New York, NY 10118.

verity of illness, coexisting illnesses prevalent among the homeless (substance abuse, mental illness, and infection with the human immunodeficiency virus [HIV]), and demographic characteristics.

## METHODS

### Study Design and Sources of Information

We compared homeless patients discharged from New York City's public general hospitals with two other groups of low-income patients: public-hospital patients not identified as homeless (referred to here as public-hospital patients) and patients covered by Medicaid who were discharged from private general hospitals (referred to here as private-hospital patients) in New York City. Homeless patients were compared with other low-income patients to adjust for the effects of poverty on hospitalization costs.<sup>13,14</sup> Two comparison groups were chosen so as to represent a range of low-income patients. The public hospitals are known to treat the most disadvantaged of the city's poor, many of whom may live in conditions not materially different from those of the homeless. By contrast, a smaller proportion of private-hospital Medicaid patients would be expected to be homeless or marginally housed.

We obtained hospital-discharge data on 354,494 adults (people more than 17 years of age) admitted to the public hospitals during 1992 and 1993 from the New York City Health and Hospitals Corporation. Hospital-discharge data on 184,726 adult Medicaid recipients admitted to private hospitals in New York City during 1992 were obtained from the New York Statewide Planning and Reporting Cooperative System.

### Identifying Homeless People in Hospital Data Bases

Homeless people were identified in the public hospitals' data bases from patient-address information. Patients whose addresses were recorded by hospital staff as "homeless," "undomiciled," or "shelter" were included, as were patients whose addresses matched an address of 1 of the city's 43 public homeless shelters (privately operated shelters, which provided 5000 of the city's 29,000 beds for homeless families and single adults during the study period, were not included). These methods identified 19,355 discharges of homeless adults during 1992 and 1993. About 60 percent were identified by hospital coding and 40 percent by matches with shelter addresses. To verify the reliability of our methods and findings, we reviewed them with hospital staff. We discovered during the course of the study that many homeless women who gave birth were placed in special housing that was not included on the public-shelter list. For this reason and because a large proportion of patients in the comparison groups were admitted for childbirth, we excluded maternity discharges from the study. With the exclusion of maternity patients, our final data set included discharges of 18,864 homeless patients, 244,345 public-hospital patients, and 139,641 private-hospital patients. We had no means of identifying homeless patients at private hospitals, so this comparison group included some homeless persons, although the public hospitals are believed to treat most hospitalized homeless persons in the city.

### Unit of Analysis

We were required to use the hospital discharge, instead of the individual patient, as the unit of analysis, because patient identifiers were not available for private-hospital patients. However, we were concerned that if readmission rates varied significantly according to patient group, the use of discharge data alone could bias the results. Since we had patient identifiers for public-hospital patients, we were able to examine this issue. We found that homeless patients had higher readmission rates than other public-hospital patients (for readmissions within the public-hospital system), but the demographic and clinical characteristics of public-hospital patients were similar whether our analysis was based on

patients or on discharges, suggesting that our results would not be sensitive to the unit of analysis.

## Statistical Analysis

### Length of Stay

We compared the mean lengths of stay for homeless, public-hospital, and private-hospital patients after adjusting for the patients' characteristics (diagnosis-related group [DRG], principal diagnosis, coexisting illnesses, and demographic characteristics) using analysis of covariance (SAS program PROC GLM<sup>15,16</sup>). In a preliminary analysis, we found that the effects of the DRG, principal diagnosis, and coexisting illnesses on the length of stay were not additive. For this reason, we subdivided the DRGs on the basis of a three-digit code from the *International Classification of Diseases, 9th Revision* (ICD-9) for principal diagnosis and the presence or absence of a coexisting diagnosis of serious mental illness, the variables that most affected the length of stay. Serious mental illness included ICD-9 codes 295.00 through 298.99 (psychoses), 290.00 through 290.99, 293.00 through 294.99, 318.10, and 318.20 (organic brain diseases), and 301.00 through 301.99 (personality disorders). After we excluded the patients in the DRG subgroups with fewer than two homeless patients, there were 1350 DRG subgroups included in the analysis, and we conducted the analysis at the DRG-subgroup level of detail.

We also adjusted differences in the length of stay for two additional coexisting illnesses common among homeless patients: substance abuse and HIV infection. Substance abuse included ICD-9 codes 291.00 through 292.99 (alcohol and drug psychosis) and 303.00 through 305.99 (alcohol and drug dependency and abuse, excluding code 305.10 [tobacco abuse]). HIV infection included ICD-9 codes 042.00 through 044.99. Adjustments were also made for demographic characteristics (age, sex, race, and insurance payer).

Discharges were excluded from the analysis of the length of stay if they did not fall into any of the 1350 DRG subgroups described above. This criterion excluded discharges of 991 homeless patients, 40,781 public-hospital patients, and 21,682 private-hospital patients from the analysis. Discharges were also excluded if the patients' stays were terminated for reasons unrelated to the need for treatment (i.e., death, transfer to another hospital, or discharge against medical advice). Transfers and discharges against medical advice were excluded because the lengths of stay for the patients involved did not reflect the care that was medically necessary. Deaths were excluded so that patients with the most severe illnesses would not be counted as having had shorter stays. These exclusions removed from the analysis an additional 4183 discharges of homeless patients (355 deaths, 345 transfers, and 3483 discharges against medical advice), 42,167 discharges of public-hospital patients (11,453 deaths, 5828 transfers, and 24,886 discharges against medical advice), and 23,486 discharges of private-hospital patients (5151 deaths, 1500 transfers, and 16,835 discharges against medical advice). The final analysis of the length of stay included discharges of 13,690 homeless patients, 161,397 public-hospital patients, and 94,473 private-hospital patients.

Nearly two thirds of the 69,836 discharges involving terminated stays were discharges against medical advice. The high rate of such discharges among low-income patients in New York City is reported to be related in part to substance abuse — an explanation consistent with our finding that 56 percent of the discharges against medical advice among all the patient groups in our data set involved principal or secondary diagnoses of substance abuse, as compared with 31 percent of the other discharges. Discharges against medical advice are also reported to be associated with high readmission rates. Therefore, had we included these discharges, the differences in length of stay between the homeless patients and the other patients might have been reduced, although some of this reduction might have been offset by higher readmission rates among patients discharged against medical advice.

To eliminate the effects of extreme outliers on comparisons of

the length of stay, we truncated hospital stays at 150 days (i.e., stays over 150 days were considered to be 150 days long). The differences in these truncated stays were used to estimate the costs associated with homelessness. Even with stays truncated at 150 days, it was possible that longer stays by homeless patients could have been caused by a few outliers. To reduce the effect of outliers further, we also analyzed the data with stays truncated at 60 days.

**Costs**

Data on the costs and charges for individual public-hospital patients were not available. Therefore, we used two sources of information to estimate costs per day for homeless patients: (1) the actual cost per day according to the major medical service (i.e., medicine and surgery, psychiatry, treatment for the acquired immunodeficiency syndrome (AIDS), or alcohol or drug detoxification) as listed in the public hospitals' 1994 *Medicare Institutional Cost Reports*, adjusted for inflation to 1997, and (2) the intensity weights of the cost per day according to DRG (i.e., the relative cost per day for each DRG) from New York State's hospital-payment system. For a given medical service, the cost per day for the homeless patients was obtained by multiplying the cost per day for public-hospital patients by the ratio of the average DRG-weighted cost for homeless patients to the average DRG-weighted cost for all public patients.

In calculating the cost of additional days per hospital stay that were associated with homelessness, we made three assumptions that gave us lower bounds for these cost estimates. First, we conservatively assumed that all additional days occurred at the end of long stays and valued these days at 60 percent of the average per diem cost, the marginal payment rate for such additional days under the federal Medicare and New York State hospital-payment systems during the study period. Second, we applied the 60 percent marginal-cost rate to the average costs per day, which already included the reduced cost effects of long stays by outliers. Finally, we excluded the number of days over 150 per stay, since the cost of care for these days might have been less than 60 percent of the cost of usual care.

**RESULTS**

**Characteristics of the Homeless Patients**

As shown in Table 1, the demographic characteristics of the homeless patients differed significantly from those of the comparison groups. The homeless patients were far more likely to be male, black, and middle-aged. They also were more likely to be covered by Medicaid and less likely to be uninsured than the other public-hospital patients.

The reasons for hospitalization also differed in the homeless and the comparison groups. Most strikingly, 51.5 percent of the admissions of homeless patients were for treatment of substance abuse or mental illness, as compared with 18.4 percent for the public-hospital patients and 27.2 percent for the private-hospital patients (Table 2). Admissions for substance abuse were substantially higher in the private hospitals, because the public-hospital system provides proportionately less inpatient substance-abuse treatment in the city.

Because substance abuse and mental illness accounted for such a large share of the discharges of homeless patients, we excluded these cases to compare the proportions of discharges for other clinical categories among the three groups of patients. Among

**TABLE 1. PATIENTS' CHARACTERISTICS.\***

CHARACTERISTIC	HOMELESS PATIENTS (N=18,864)	PUBLIC-HOSPITAL PATIENTS (N=244,345)	PRIVATE-HOSPITAL PATIENTS (N=139,641)
	percentage of discharges		
Sex			
Male	81.7	52.2	51.2
Female	18.3	47.8	48.8
Age (yr)			
18-34	34.0	31.6	33.6
35-54	53.6	35.6	42.6
55-64	8.3	12.4	13.3
>64	4.1	20.4	10.5
Race or ethnic group			
Black	56.2	42.8	40.3
Hispanic	20.5	34.4	20.1
White	21.2	16.7	22.3
Other	2.1	6.1	17.3
Insurance payer			
Medicare	6.4	19.4	0
Medicaid	80.4	51.5	100
Commercial	1.0	7.0	0
Uninsured	4.6	13.2	0
Other	7.6	8.9	0

\*Maternity-related discharges have been excluded. P<0.001 for the differences between the homeless patients and each of the other two groups.

**TABLE 2. DISCHARGES ACCORDING TO PRINCIPAL DIAGNOSIS.\***

PRINCIPAL-DIAGNOSIS CATEGORY	HOMELESS PATIENTS (N=18,864)	PUBLIC-HOSPITAL PATIENTS (N=244,345)	PRIVATE-HOSPITAL PATIENTS (N=139,641)
	percentage of discharges		
Substance abuse	28.5	9.2	22.2
Mental illness	23.0	9.2	5.0
Subtotal	51.5	18.4	27.2
	(N=9149)	(N=199,427)	(N=101,646)
Other†			
Respiratory system	17.2	12.4	13.3
AIDS	16.6	6.3	11.2
Trauma	12.9	12.9	5.4
Skin	8.4	4.0	3.7
Circulatory system	8.4	16.7	16.6
Digestive system	5.8	7.5	8.1
Nervous system	5.4	5.6	6.3
Endocrine or metabolic system	3.6	3.6	4.4
Kidney or urinary tract	3.2	4.7	5.3
Liver or pancreas	2.9	3.6	4.9
Musculoskeletal system	2.8	2.5	3.4
Female reproductive system	2.3	8.6	6.6
Infections or parasites	2.2	1.3	1.5
Ears, nose, and throat	2.2	2.1	1.6
Blood or immunologic system	1.3	1.4	2.5
Neoplasms	0.5	1.1	2.5
Other	4.3	5.7	2.7

\*The principal-diagnosis categories represent the primary reasons for hospital admissions and are mutually exclusive. Maternity-related discharges have been excluded. P<0.001 for the differences between the homeless patients and each of the other two groups.

†Percentages for the diagnoses are of all diagnoses other than substance abuse or mental illness.

the remaining 48.5 percent of the discharges of homeless patients, a disproportionate number of patients were admitted for respiratory disorders, trauma, skin disorders, and infections (excluding AIDS-related infections) or parasitic diseases — medical conditions for which hospitalization is often preventable. The homeless patients had proportionately fewer admissions for circulatory, digestive, kidney or urinary, and hepatic or pancreatic disorders.

The homeless patients also had significantly higher rates of coexisting substance abuse, mental illness, and AIDS. As shown in Table 3, the homeless patients were two to three times as likely to have coexisting substance abuse and two to three times as likely to have coexisting mental illness as the comparison groups. Of the discharges of homeless patients, 80.6 percent had a principal or coexisting diagnosis of substance abuse or mental illness — roughly twice the rate for the comparison groups. Substance abuse was the leading problem among the homeless patients, reported for 71.4 percent of the discharges.

To determine to what extent the differences in principal diagnoses between the homeless and the housed patients were due to the large numbers of homeless patients with coexisting substance abuse or psychiatric conditions, we recalculated the percentage of discharges according to clinical category after adjusting for these illnesses. As shown in Table 4, for all of the main clinical categories (except AIDS) for which the homeless patients had significantly larger percentages of discharges, the differences between the homeless patients and the other patients persisted after adjustment for coexisting substance abuse. For trauma patients without coexisting substance abuse, the relative differences between groups increased, but for those with coexisting substance abuse the differences between groups decreased.

**TABLE 3.** DISCHARGES WITH SELECTED COEXISTING ILLNESSES.\*

VARIABLE	HOMELESS PATIENTS (N=18,864)	PUBLIC-HOSPITAL PATIENTS (N=244,345)	PRIVATE-HOSPITAL PATIENTS (N=139,641)
	percentage of discharges		
Coexisting illness†			
Substance abuse	42.9	18.7	16.1
Mental illness	7.4	3.2	2.3
AIDS	6.4	2.8	4.8
Principal or coexisting diagnosis‡			
Substance abuse	71.4	27.9	38.3
Mental illness	30.3	12.4	7.3
Substance abuse or mental illness	80.6	33.4	41.3
AIDS	14.5	8.0	12.9

\*P<0.001 for the differences between the homeless patients and each of the other two groups.

†Discharges of patients with a principal diagnosis of any of these conditions have been excluded.

‡Discharges of patients with the condition present as a principal or coexisting diagnosis have been included.

**Lengths of Stay**

Table 5 shows the adjusted mean lengths of stay (truncated at 150 days) according to broad DRG categories. The homeless patients stayed, on average, 5.1 days (49 percent) longer than the private-hospital patients, 3.1 days (25 percent) longer than the public-hospital patients, and 4.1 days (36 percent) longer than the two comparison groups combined. The differences were greatest for mental illness, AIDS, and surgery.

We performed two analyses to evaluate whether a majority of the homeless patients had longer stays or a small percentage of the patients had very long

**TABLE 4.** DISCHARGES ACCORDING TO SELECTED CLINICAL CATEGORIES FOR PATIENTS WITH AND THOSE WITHOUT COEXISTING SUBSTANCE ABUSE.\*

PRINCIPAL-DIAGNOSIS CATEGORY	PATIENTS WITHOUT COEXISTING SUBSTANCE ABUSE			PATIENTS WITH COEXISTING SUBSTANCE ABUSE		
	HOMELESS PATIENTS (N=3659)	PUBLIC-HOSPITAL PATIENTS (N=162,716)	PRIVATE-HOSPITAL PATIENTS (N=81,946)	HOMELESS PATIENTS (N=4556)	PUBLIC-HOSPITAL PATIENTS (N=30,637)	PRIVATE-HOSPITAL PATIENTS (N=17,419)
Respiratory system	16.7	11.9	13.2	17.6	14.6	13.5
AIDS	9.3	3.4	7.4	22.2	20.5	28.1
Trauma	15.3	12.9	5.1	11.5	13.5	6.3
Skin	7.7	4.0	3.4	9.2	3.9	4.5

\*Clinical categories for which homeless patients had a significantly greater percentage of discharges than the comparison groups have been included. Discharges of patients with principal diagnoses of mental illness or substance abuse and those with a secondary diagnosis of mental illness have been excluded. P<0.001 for the differences between the homeless patients and each of the other two groups.

**TABLE 5.** ADJUSTED MEAN LENGTH OF HOSPITAL STAY ACCORDING TO PRINCIPAL-DIAGNOSIS CATEGORY.\*

PRINCIPAL-DIAGNOSIS CATEGORY	HOMELESS PATIENTS (N=13,690)	PUBLIC-HOSPITAL PATIENTS (N=161,397)	PRIVATE-HOSPITAL PATIENTS (N=94,473)	DIFFERENCE BETWEEN HOMELESS AND PUBLIC-HOSPITAL PATIENTS	DIFFERENCE BETWEEN HOMELESS AND PRIVATE-HOSPITAL PATIENTS
				length of stay (days)	
All categories	15.6	12.5	10.5	3.1	5.1
Mental illness	36.2	29.9	21.3	6.4	14.9
AIDS	25.4	20.1	19.4	5.3	6.0
Surgery	17.0	11.5	9.9	5.5	7.1
Trauma	6.7	5.7	4.9	1.0†	1.8‡
Medicine	10.7	9.1	8.8	1.6	1.9
Substance abuse	9.2	9.3	6.8	-0.1§	2.4

\*Differences in the lengths of stay were adjusted for diagnosis-related group, principal diagnosis, selected coexisting illnesses, and demographic characteristics. Deaths, discharges against medical advice, and transfers were excluded. Discharges were grouped according to principal-diagnosis categories, which are mutually exclusive. Stays longer than 150 days were counted as lasting 150 days.  $P < 0.001$  for all differences between the homeless patients and each of the other two groups, unless otherwise noted.

† $P < 0.05$  for the difference in the mean length of stay.

‡ $P < 0.01$  for the difference in the mean length of stay.

§The difference in the mean length of stay was not significant.

stays. We first reduced the effects of long stays by truncating the length of stay at 60 days. Even after this adjustment, the mean length of stay for the homeless patients was still 3.4 days more than for the private-hospital patients and 1.8 days more than for the public-hospital patients. Therefore, long stays (60 to 150 days) among the homeless did not account for most of the differences in length of stay. Second, we compared median lengths of stay (unadjusted for covariates) for the six principal diagnoses with the highest volume of discharges among the homeless: schizophrenia (36 days for the homeless patients, 29 days for the public-hospital patients, and 21 days for the private-hospital patients), affective psychoses (28, 23, and 17 days), HIV-related tuberculosis (26, 20, and 20 days), HIV-related pneumonia (11, 10, and 12 days), fractures of the face (9, 6, and 5 days), and hernia procedures (3, 2, and 2 days). These differences further suggested that longer stays among the homeless were not due to a small percentage of outliers.

Although a higher percentage of the homeless patients had stays longer than 60 days (8.3 percent, as compared with 3.1 percent of the public-hospital patients and 1.5 percent of the private-hospital patients), two thirds were psychiatric patients, as compared with about one third of the comparison groups. An additional 9 percent of the homeless patients discharged after long stays had AIDS, so mental illness and AIDS accounted for nearly three quarters of the long stays among the homeless. Of the patients with

long stays, just 1.1 percent of the homeless patients, 0.4 percent of the public-hospital patients, and 0.1 percent of the private-hospital patients had stays longer than 150 days.

#### Cost of Additional Days per Discharge

We found that the differences in the length of stay between the homeless and the housed patients in 1997 dollars (averaging the private-hospital and public-hospital stays) cost \$4,094 per discharge of a psychiatric patient, \$3,370 per discharge of a patient with AIDS, and \$2,414 per discharge for all causes (excluding substance abuse, for which the homeless patients' stays were only negligibly longer than those of the comparison groups).

#### DISCUSSION

We found major differences in the causes of hospitalization and lengths of stay between homeless people and other low-income people in New York City. The vast majority of hospitalized homeless people had principal or coexisting diagnoses of substance abuse or mental illness, and nearly three quarters were hospitalized for conditions for which hospitalization is often preventable, including substance abuse, mental illness, respiratory disorders, trauma, skin disorders, and infectious diseases other than AIDS. The homeless patients stayed an average of 4.1 days per hospital stay, or 36 percent, longer than the other patients — a difference that was not explained by adjustments for poverty, severity of ill-

ness, coexisting illnesses, or demographic characteristics. Most of the additional days of hospitalization were accounted for by the patients with psychiatric disorders or AIDS (57 percent and 12 percent, respectively). The average cost of additional days per discharge (\$2,414) among the homeless nearly equaled the annual public-assistance rent allowance for a single person in New York City (\$2,580).<sup>17</sup>

Our statistical analysis could not account for many unmeasurable differences between homeless and housed patients that might explain some of the clinical and length-of-stay variations we found. However, our findings were consistent with reports by public-hospital staff that longer stays among homeless patients are primarily due to a lack of housing. The leading cause of long stays cited by hospital staff was placement problems among homeless psychiatric patients. The public hospitals have been under a court order since 1991 to place all such patients in supportive housing at the time of discharge. However, because of a shortage of supportive housing in the city and the continued downsizing of state psychiatric hospitals, this process can be delayed for months. City officials report that there are just 110 vacancies to accommodate an estimated 200 additional people who become eligible for these apartments every month.<sup>18</sup>

Efforts are also made to place other homeless patients in housing or shelters, but such placement is difficult because of overcrowding in the adult shelters<sup>18</sup> and chronic shortages of low-rent housing in the city. City officials estimate that 100,000 of 145,000 rooms in low-rent rooming houses were lost in the city from the late 1970s through the mid-1980s.<sup>19</sup> As a result, some homeless patients are kept in hospitals until beds in shelters become available, especially during the winter months when shelters are often filled to capacity.

Physicians also reported delaying the discharge of homeless patients who required follow-up care, knowing that these patients' access to ambulatory care and clean environments or their compliance with treatment might be limited. Our finding that the number of excess days was particularly high for homeless patients who underwent surgery was consistent with these reports. Finally, physicians indicated that they lower the threshold for admission for homeless patients whose medical conditions are likely to worsen if they remain in shelters or on the streets. Our finding that homeless people were hospitalized disproportionately often for such conditions as respiratory and skin disorders, trauma, and infectious or parasitic diseases that often can be treated on an outpatient basis agree with these reports.

Several interventions should be considered to reduce the high hospital costs associated with homelessness. One strategy would be to increase the supply of supportive housing for the homeless mentally ill, a group that accounted for the majority of the

excess hospital days among homeless patients. As we mentioned, the discharge of these patients can be delayed for months because of the lack of housing. We found that a third of the homeless psychiatric patients had hospital stays that ran more than a month longer than the two weeks generally required to stabilize an acutely psychotic patient. These patients stayed an average of 84 days and accounted for 69 percent of all the days of hospitalization for psychiatric reasons among the homeless patients. Better access to supportive housing for these patients could reduce hospital stays by as many as 70 days per admission. Seventy days in a general-hospital psychiatric unit, even at a rate of \$250 per day for subacute care, costs \$17,500, whereas a unit of supportive housing with social services for an entire year costs \$12,500 in New York City.<sup>19</sup>

The development of more low-cost housing in the city might also reduce hospital stays, especially among patients undergoing surgery, who are currently kept in the hospital for follow-up care, and patients admitted for medical conditions that can be treated in ambulatory settings. Finally, treatment programs for substance abuse, or at least interventions to reduce the health risks associated with substance abuse, are services critically needed by New York City's homeless that could help reduce hospitalization.

Investment in housing and other services for the homeless will require a major allocation of public resources. Yet, as our study suggests, given the current costs of homelessness borne by the health care system and probably also by other social institutions, these services may represent a more cost-effective as well as a more humane approach to the problem of homelessness.

Supported by a grant from the United Hospital Fund of New York.

*We are indebted to Jan Blustein, M.D., Ph.D., Howard Bloom, Ph.D., and Stuart Kirk, D.S.W., for their thoughtful comments on the manuscript; to Dennis Culhane, Ph.D., for his expertise regarding New York City's homeless population; to David Schwartz, M.D., for consultation on the medical problems of homeless persons; to Pai Tao Wu Chen for assistance with data analysis; and to the many staff members of New York City's public hospitals who assisted us with the study.*

## REFERENCES

1. Jencks C. The homeless. Cambridge, Mass.: Harvard University Press, 1994.
2. Rossi PH. Down and out in America: the origins of homelessness. Chicago: University of Chicago Press, 1989.
3. Committee on Health Care for Homeless People. Homelessness, health, and human needs. Washington, D.C.: National Academy Press, 1988.
4. Hibbs JR, Benner L, Klugman L, et al. Mortality in a cohort of homeless adults in Philadelphia. *N Engl J Med* 1994;331:304-9.
5. Breakey WR, Fischer PJ, Kramer M, et al. Health and mental health problems of homeless men and women in Baltimore. *JAMA* 1989;262:1352-7.
6. Ropers RH, Boyer R. Perceived health status among the new urban homeless. *Soc Sci Med* 1987;24:669-78.
7. Brickner PW, Scharer LK, Conanan B, Elvy A, Savarese M, eds. Health care of homeless people. New York: Springer Publishing, 1987.

8. Wright JD, Weber E. Homelessness and health. Washington, D.C.: McGraw-Hill's Health Care Information Center, 1987.
9. Struening EL, Padgett DK. Physical health status, substance use and abuse, and mental disorders among homeless adults. *J Soc Issues* 1990;46:65-81.
10. Gelberg L, Linn SL. Assessing the physical health of homeless adults. *JAMA* 1989;262:1973-9. [Erratum, *JAMA* 1989;262:3132.]
11. Brickner P, ed. Under the safety net: the health and social welfare of the homeless in the United States. New York: W.W. Norton, 1990.
12. Rosenheck R, Gallup P, Frisman LK. Health care utilization and costs after entry into an outreach program for homeless mentally ill veterans. *Hosp Community Psychiatry* 1993;44:1166-71.
13. Epstein AM, Stern RS, Weissman JS. Do the poor cost more? A multihospital study of patients' socioeconomic status and use of hospital resources. *N Engl J Med* 1990;322:1122-8.
14. Billings J, Zeitel L, Lukomnik J, Carey TS, Blank AE, Newman L. Impact of socioeconomic status on hospital use in New York City. *Health Aff (Millwood)* 1993;12(1):162-73.
15. SAS/STAT user's guide, version 6. 4th ed. Vol. 2. Cary, N.C.: SAS Institute, 1989.
16. Sweeney RE, Ulveling EF. A transformation for simplifying the interpretation of coefficients of binary variables in regression analysis. *Am Stat* 1972;26(5):30-2.
17. HRA facts: August 1995. New York: New York City Human Resources Administration, 1995.
18. Kennedy R. Doors that offer hope may shut. *New York Times*. October 4, 1997:B1.
19. Holloway L. With new purpose and look, SRO's make a comeback. *New York Times*. November 10, 1996:A1.