Impact of Permanent Supportive Housing on the Use of Acute Care Health Services by Homeless Adults

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Objectives: **This analysis examined the impact of permanent supportive housing on the use of acute care public health services by homeless people with mental illness, substance use disorder, and other disabilities.** ***Methods:*** **The sample consisted of 236 single adults who entered supportive housing at two San Francisco sites, Canon Kip Community House and the Lyric Hotel, between October 10, 1994, and June 30, 1998. Eighty percent had a diagnosis of dual psychiatric and substance use disorders. Administrative data from the city's public health system were used to construct a retrospective, longitudinal history of service use. Analyses compared service use during the two years before entry into supportive housing with service use during the two years after entry.** ***Results:*** **Eighty-one percent of residents remained in permanent supportive housing for at least one year. Housing placement significantly reduced the percentage of residents with an emergency department visit (53 to 37 percent), the average number of visits per person (1.94 to .86), and the total number of emergency department visits (56 percent decrease, from 457 to 202) for the sample as a whole. For hospitalizations, permanent supportive housing placement significantly reduced the likelihood of being hospitalized (19 to 11 percent) and the mean number of admissions per person (.34 to .19 admissions per resident).** ***Conclusions:*** **Providing permanent supportive housing to homeless people with psychiatric and substance use disorders reduced their use of costly hospital emergency department and inpatient services, which are publicly provided. (*Psychiatric Services* 57:XXXXXXX, 2006)**

Chronic homelessness in severely mentally ill and substance-abusing populations is a serious problem in the United States. Research demonstrates the persistent association of homelessness with increased morbidity, mortality, and victimization (1–3). Studies have also shown that homeless individuals with a diagnosis of concurrent mental and substance use disorders have more frequent use of emergency department and inpatient hospital services (4,5). The costs associated with the health consequences of chronic homelessness fall disproportionately on municipal and state governments. One promising approach to stemming these costs involves expanding the availability of permanent supportive housing. This article examines the impact of supportive housing on use of emergency department and inpatient services at a large urban public hospital by formerly homeless people with diagnoses of mental and substance use disorders.

Past research suggests that supportive housing can offset certain costs associated with chronic homelessness. Research evaluating the New York–New York (NY/NY) Supportive Housing Initiative found that provision of supportive housing to homeless individuals with serious mental illnesses sharply reduced residents' use of services in eight public systems (6). Compared with members of a matched control group, clients in supportive housing showed reductions in service that were so substantial that cost savings nearly offset the entire $19,000 annual program cost. More recently, an evaluation of a joint Departments of Housing and Urban Development–Veterans Affairs program demonstrated that providing permanent supportive housing to homeless veterans resulted in better housing outcomes than intensive case management alone or standard care (7). Although the net costs of supportive housing in this program exceeded those in the NY/NY program, the cost per additional day housed compared favorably with other widely used psychiatric interventions. Finally, a smaller evaluation of the Connecticut Supportive Housing Demonstration Program found that adults with mental illness who were formerly homeless decreased use of acute, expensive health services after supportive housing placement (8).

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Although research has associated supportive housing with decreased service use, it is currently unclear whether such benefits extend to residents who abuse substances. The NY/NY program required clients to have made progress toward recovery from addictive or psychiatric problems before receiving supportive housing. In contrast, the Department of Housing and Urban Development–Veterans Affairs housing program had no sobriety or treatment requirements, and researchers found that residential stability persisted for a subgroup of people who abused substances. Other studies, however, have reported that substance abuse negatively affects residential stability for formerly homeless adults with mental illness who participate in housing programs, in part because relapses may be grounds for eviction (9–12).

One promising approach to providing supportive housing to people who abuse substances is the "low-demand" model, which does not require participation in treatment services or abstinence from drug or alcohol use as a condition of residency. Comparing this supportive housing model with a sobriety and treatment requirement model, researchers found that residents in a low-demand housing model had better housing outcomes without worsening symptoms of substance use or psychiatric disorders (13).

This article focuses on a similar low-demand program in San Francisco, California, for homeless individuals with a dual diagnosis. It extends previous researchers' focus on housing outcomes to include service use outcomes. Specifically, this study tested hypotheses that receipt of supportive housing is associated with residential stability, reduced use of emergency department services, and reduced use of inpatient hospital services. In addition, it examined the mediating effects of substance abuse on service use outcomes. Analyses compared service use during the two years before supportive housing entry with use during the two to three years after entry. Case-control analyses were performed on a subsample of 100 people who received housing immediately (case group) and 25 people who were randomly assigned to a waiting list and entered supportive housing one year later (control group).

Methods

The sample included all 236 formerly homeless, disabled, single adults with disabilities who entered supportive housing at two San Francisco sites, Episcopal Community Services' Canon Kip Community House and Conard House's Lyric Hotel, between October 10, 1994, and June 30, 1998.

Program description and eligibility criteria

Canon Kip Community House and the Lyric Hotel are supportive housing programs funded in part through the U.S. Housing and Urban Development Shelter Plus Care program. Canon Kip opened in October 1994 and has 104 units. The Lyric opened in April 1997 and has 57 units. Both buildings house residents in single-room-occupancy units and couple rent subsidies with an array of on-site services provided by a local interagency collaborative, including case management, psychiatric care, health care, and vocational training. Property management and clinical services staff at both buildings use a low-demand approach, in which all service receipt is voluntary and abstinence from drug or alcohol use is not a requirement of residency.

Individuals were eligible to receive housing at either residence if they were living on the street or in a shelter and had at least two of the following disabilities: substance use disorder, mental illness (axis I or axis II diagnosis), and HIV-AIDS. To qualify for residence in the Lyric, one of the disabilities had to be a diagnosis of an axis I mental illness. A small proportion of Canon Kip units (nine units, or 9 percent) were allocated to individuals with only one diagnosis. A clinician confirmed all diagnoses in writing, and a social worker certified homeless status.

Sample recruitment

The San Francisco Department of Human Services allocated subsidized units at both residences through a housing lottery. An eight-month open-enrollment period preceded the time when units first because available, during which outreach workers went to local shelters, street sites, and food lines to enroll as many eligible homeless individuals as possible. Workers documented eligibility status and obtained the contact information of a person who could locate enrollees if they were chosen to receive the housing subsidy.

The final waiting lists included nearly 3,000 eligible individuals. To distribute units impartially, the Department of Human Services used a computer program to randomly assign each person a waiting list number and then awarded the subsidies to those with numbers at the top of the waiting list. Thereafter, as residents moved out or died, individuals on the waiting list were chosen to occupy the units in order of their randomly assigned number.

Data sources and measures

Data on residents' service use between October 1992 and August 2000 were extracted from three administrative data sets. The San Francisco General Hospital and Community Health Network management information system provided comprehensive billing records for all general medical and psychiatric inpatient stays and emergency department visits to San Francisco's only public hospital. Each record included presenting diagnosis, procedures performed, presence and type of health insurance, total charges, and housing status at time of treatment. The San Francisco Department of Human Services provided demographic and diagnostic information about residents at the time of enrollment in the waiting list and at the time they moved into supportive housing. They also provided information on veteran status, employment, receipt of public benefits (Supplemental Security Income, Social Security Disability Insurance, general assistance, and veterans benefits), living situation immediately before move-in (street, shelter, or transitional housing), and if applicable, the date and context of exit from supportive housing. Commu-

nity Substance Abuse Services provided a history of drug treatment by modality.

Administrative data were aggregated to create a longitudinal service history for each study participant. Pre- and postintervention periods were constructed by using the individual's move-in date plus and minus six-month increments.

All study participants completed informed consent procedures when entering supportive housing, permitting researchers to access their city-provided health and substance use service records. All procedures were reviewed and approved by the institutional review board at the University of California, Berkeley.

Data analysis

The first analysis focused on the two years before and the two years after residents' initial move-in date, broken into six- and 12-month increments. For a smaller subsample (N=199) we extended the analysis to three years after the move-in date.

Residential stability was assessed by measuring the percentage of residents still living in their unit one year and two years after move-in. For the smaller subsample, stability was also assessed three years after move-in. Differences in housing retention by whether participants had substance use disorder or mental illness were assessed with the chi square test.

Changes in the probability of one or more service encounters were assessed by using McNemar's test statistic. Paired t tests were used to assess changes in the mean number of service encounters before and after move-in per 12 and 24-month period. Changes in the mean number of service encounters per six-month period were analyzed by using repeated-measures analysis of variance with time of measurement as a within-subjects factor.

The original study design did not include a control group. Organizing data in relation to move-in date, such that each participant served as his or her own historical control, compensated in part for this design flaw. To establish the stability of service use before and after move-in and to rule out regression to the mean as an explanation for pre-post changes, we compared the four six-month periods before move-in to the six six-month periods after move-in.

Because homeless people were randomly selected for supportive housing placement, we were able to construct a control group (N=25) for a subset of participants at Canon Kip Community House. The case group for this analysis included the first 100 residents who entered during the program's first year, all of whom were randomly assigned to the top of the waiting list. The control group included 25 individuals with slightly lower waiting-list numbers who entered supportive housing during the program's second year. Because most first-year residents (80 residents, or 80 percent) entered housing within the program's first three months, their first year in housing was roughly coterminous with the control group's first year before housing. Thus we compared service use between two groups of homeless single adults with disability, all of whom were interested in and eligible for supportive housing. Members of the case group were randomly assigned to immediate housing placement, and those in the control group were randomly assigned to continued homelessness. We aggregated service use indicators into year 1 (prehousing for both the case and control group) and year 2 (posthousing for the case group and prehousing for the control group).

We used linear regression to model the mean difference in the number of service encounters between years 1 and 2 for the case and control groups. The main independent variable of interest was a dummy variable indicating receipt of supportive housing in year 2 (housing, 1, and no housing, 0). Before running the regression, we compared participants in the case and control groups on demographic and disability-related variables and tested for statistically significant differences by using the chi square test for categorical variables and the t test for continuous variables. We retained in the model all variables on which the two groups differed, using a criterion of an F with a p value less than .10 for inclusion (or t test for a single variable). These variables were race, veteran status, treatment for heroin addiction during the previous two years, living in a shelter when enrolled for supportive housing, and living in a short-term treatment facility when enrolled for supportive housing.

We also included variables that were conceptually important, either on the basis of prior research or clinical expectations. These were age, gender, exited supportive housing, diagnosis variables (mental illness, substance use disorder, HIV, and single diagnosis only), one interaction term between substance use disorder and mental illness, and three interaction terms—between housing and mental illness, housing and substance use disorder, and housing and HIV. Following the NY/NY study, we included previous level of emergency service use to control for two possibilities: first, that previous service use levels would affect the magnitude of pre-post change, and second, that previous service use would affect the probability of subsequent service use (6). With the exception of interaction terms, all variables were entered simultaneously. The four interaction terms were each entered separately; the final model included only one that was statistically significant.

Results

Study participants were primarily male (173 participants, or 73 percent). More than half were African American (126 participants, or 53 percent), 76 (32 percent) were white, 18 (8 percent) were Latino, 11 (5 percent) were Native American, and five (2 percent) were Asian. The median age was 43, and the mean±SD age was 44±8.7. At the move-in date, all participants had been homeless for at least eight months, and most had been homeless much longer. Using city public health system data, we identified 139 participants (59 percent) as being homeless two to eight years before their move-in date. Participants entered supportive housing from shelters (152 participants, or 64 percent), the streets (68 participants, or

29 percent), or short-term treatment facilities (16 participants, or 7 percent).

All participants had documented disabilities at the time of move-in. Most (178 participants, or 75 percent) had diagnoses of both substance use and mental disorders, 16 (7 percent) had diagnoses of both substance use disorder and HIV, four (2 percent) had diagnoses of both mental disorder and HIV diagnoses, and 11 (5 percent) had triple diagnoses of HIV, substance use disorder, and mental disorder. A small proportion of participants had single diagnoses only: nine (4 percent) had substance use disorder, and 11 (5 percent) had mental disorder. Diagnosis data were missing for seven participants (3 percent). In total, 214 (91 percent) were given a diagnosis of current or past substance use disorder, 204 (86 percent) were given a diagnosis of mental illness, and 31 (13 percent) were given a diagnosis of HIV-AIDS.

A total of 192 participants (81 percent) stayed in supportive housing for at least one year, 149 (63 percent) stayed at least two years, and of the subset of participants with three years of data (N=199), 95 (48 percent) stayed at least three years. There were no significant differences in retention at year 1 or year 2 by substance use disorder, mental illness, or concurrent substance use disorder and mental illness (results not shown).

Nearly all study participants (224 participants, or 95 percent) used publicly funded health services in San Francisco during the 24 months before moving into supportive housing.

Table 1 describes study participants' emergency department visits and inpatient admissions at San Francisco's public hospital for two 12-month increments before they moved into supportive housing (13 to 24 months before move-in and one to 12 months before move-in) and two 12-month increments after moving into supportive housing (one to 12 months after move-in and 13 to 24 months after move-in). Between the one-to-12-month period before move-in and the one-to-12-month period after move-in, participants showed significant declines in the percentage with any emergency department visit (from 53 to 37 percent), mean number of emergency department visits (from 1.94 to .86 visits per resident), and total number of emergency department visits (56 percent decrease, from 457 to 202). Across these two time periods, participants also showed significant declines in the percentage with an inpatient admission (19 to 11 percent), mean number of inpatient admissions (.34 to .19 admissions per resident), and total number of inpatient admissions (45 percent decline, from 80 to 44). No statistically significant differences were found on any measure of emergency department or inpatient use between consecutive pre–move-in periods (13 to 24 months before move-in and one to 12 months before move-in) or post–move-in periods (one to 12 months after move-in and 13 to 24 months after move-in).

Table 1 also shows emergency department visits and inpatient admissions stratified by type of service (medical versus psychiatric). When the data were stratified, study participants showed statistically significant declines in three measures of emergency department use: the percentage with any medical emergency department visit, mean number of medical emergency department visits, and mean number of psychiatric emergency department visits. There were no changes in measures of inpatient admissions when the data were stratified by type of service, resulting in part because of low sample size.

For a subsample of 199 residents, we analyzed emergency department visits and inpatient admissions for 36 months after move-in for six-month increments. Figure 1 shows a pattern of uniformly high emergency department use during the four six-month periods before move-in, followed by lower emergency department use during the six six-month periods after move-in. Figure 2 shows a similar pattern for inpatient admissions. The main effect of time of measurement was significant for both mean emergency department visits and inpatient admissions. Tests of within-subjects contrasts showed a significant decrease in both mean emergency department visits ($F=16.96$, $df=1, 198$, $p<.001$) and mean inpatient admissions ($F=4.42$, $df=1, 198$, $p<.05$) from one to six months before move-in to one to six months after move-in. There were no significant changes in emergency department visits or inpatient admissions between consecutive pre–move-in or post–move-in periods.

Finally, we conducted case-control analyses of individuals randomly assigned to immediate supportive housing placement (100 participants in the case group) or a waiting-list condition (25 participants in the control group). Figure 3 shows that in univariate analysis, participants in the case group experienced significant decreases between year 1 and year 2 in both the probability of any emergency department visit and mean number of emergency department visits. Participants in the control group experienced no significant changes on either of these measures. Measures of inpatient use did not change significantly for either group, although participants in the case group experienced nonsignificant decreases in the probability of an inpatient stay (17 participants, or 17 percent, to nine participants, or 9 percent) and mean inpatient days (.24 compared with .15), whereas participants in the control group experienced nonsignificant increases in both measures (two participants, or 8 percent, compared with four participants, or 16 percent).

Multivariate analysis showed that observed differences in emergency department use persisted after the analysis controlled for baseline differences between groups (Table 2). Also significant were substance use disorder and substance use disorder by receipt of housing. Combined, the effect of the substance use disorder variable and the substance use disorder by receipt of housing variable was .30. Additional significant variables in the model were veteran's status, number of emergency department visits in year 1, and exit from supportive housing during year 1. No differences in inpatient use were found in multivariate analysis.

Table 1

Use of public services before and after receipt of supportive housing among 236 homeless adults with mental illness, substance use disorder, and other disabilities

Variable	Before receipt of housing				After receipt of housing				Test statistic[a]	df[†]	p
	13–24 months before		1–12 months before		1–12 months after		13–24 months after				
	N	%	N	%	N	%	N	%			
Emergency department use											
All emergency services											
Participants who used services	104	44	125	53	87	37	83	35	χ^2=13.32	1	<.001
Visits per resident (mean±SD)	1.82±26		1.94±.23		.86±.11		.97±.12		t=5.16	235	<.001
Total number of visits	430		457		202		228		F=26.59	1, 235	<.001
Medical emergency services											
Participants who used services	92	39	113	48	73	31	73	31	χ^2=16.60	1	<.001
Visits per resident (mean±SD)	1.49±.24		1.60±.20		.65±.09		.79±.11		t=5.08	235	<.001
Total number of visits	351		378		154		186		F=25.82	1, 235	<.001
Psychiatric emergency services											
Participants who used services	35	15	40	17	26	11	28	12	χ^2=3.18	1	ns
Visits per resident (mean±SD)	.33±.07		.33±.06		.20±.04		.18±.04		t=2.06	235	.04
Total number of visits	79		79		48		42		F=4.25	1, 235	.04
Inpatient hospitalizations											
All hospital stays											
Participants with hospital stays	38	16	45	19	26	11	26	11	χ^2=6.89	1	.009
Number of stays per resident (mean±SD)	.30±.06		.34±.06		.19±.04		.22±.05		t=–2.42	235	.02
Total number of hospital stays	71		80		44		52		F=5.85	1, 235	.02
Medical hospital stays											
Participants with hospital stays	24	10	26	11	17	7	19	8	χ^2=2.70	1	ns
Number of stays per resident (mean±SD)	.19±.05		.19±.04		.11±.03		.17±.05		t=1.88	235	ns
Total number of hospital stays	46		45		26		40		F=3.54	1, 235	ns
Psychiatric hospital stays											
Participants with hospital stays	24	7	21	9	14	6	9	4	—	1	ns
Number of stays per resident (mean±SD)	.11 ±.03		.15±.04		.08±.02		.05±.02		t=1.75	235	ns
Total number of hospital stays	25		35		18		12		F=3.06	1, 235	ns

[a] The χ^2 for McNemar's test was used for changes in correlated proportions between 12 months before and 12 months after, the t test was used for changes in means between 12 months before and 12 months after, and the F test was used for significant effect of time between 12 months before and 12 months after in repeated measures analysis of variance.

[†] df=106

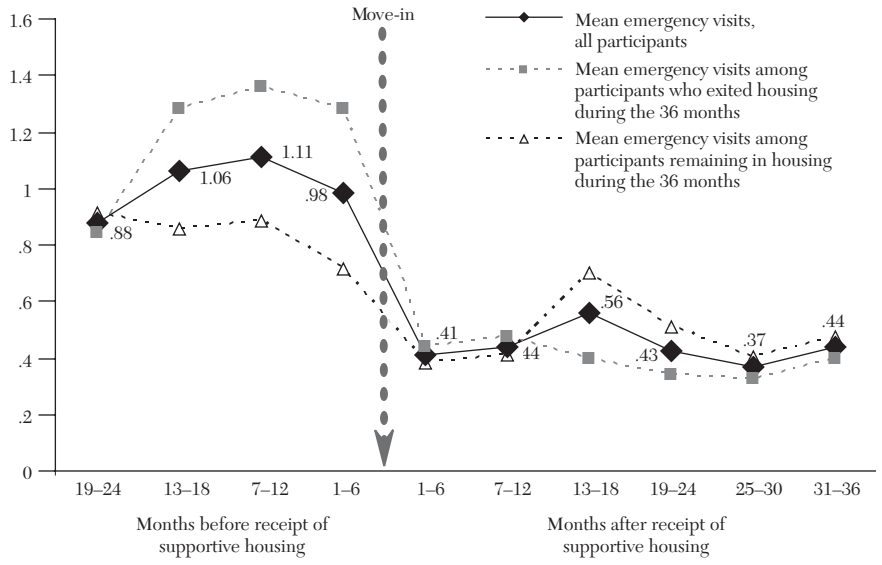
Discussion

A majority of homeless adults in this study achieved residential stability in supportive housing, despite the high prevalence (91 percent) of substance use disorder. The one-year and two-year retention rates (81 and 63 percent) are similar to those previously reported (9,11,14), and they support findings from the Housing and Urban Development–Veterans Affairs study that even in the absence of sobriety requirements, supportive housing provides substantial housing stability for clients with a diagnosis of substance use disorder. However, unlike previous studies, we found no relationship between substance use disorder and housing retention outcomes (9–12). This may be due to the relatively small proportion (9 percent) of participants without substance use disorder in our sample.

We also found significant effects of supportive housing placement on the percentage with any emergency department visit, average number of

Figure 1

Mean number of emergency department visits per six-month period among 199 homeless adults with mental illness, substance use disorder, and other disabilities[a]



[a] Significant effect of time across all ten periods; F=3.82, df=9, 190, p<.001

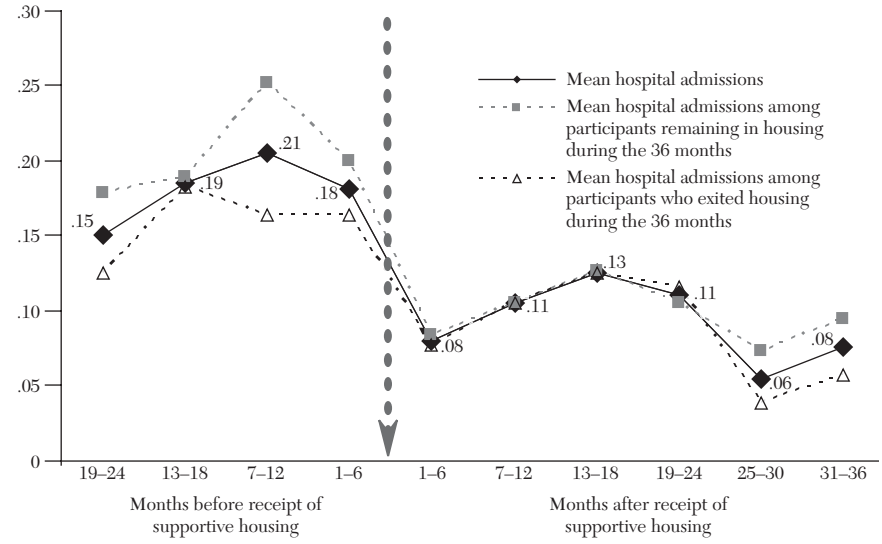
visits per person, and total number of emergency department visits for the sample as a whole. Supportive housing also reduced the probability of hospitalization and mean number of admissions per person. Case-control analyses showed significant declines in the percentage with any emergency department visit and the mean number of emergency department visits for participants in the case group but not for those in the control group. In addition, multivariate analysis of participants in the case group and those in the control group demonstrated an increase in emergency department visits associated with exiting supportive housing, suggesting that service use reductions are tied directly to remaining in housing. We were unable to detect statistically significant changes in inpatient use—a finding that may be explained by the small sample. Sample size limitations also precluded our ability in case-control analysis to analyze changes in medical and psychiatric emergency department visits separately.

Similar to the results of previous studies, our results showed that after the analyses controlled for all other factors, the reduction in emergency department visits associated with receipt of housing was lower for participants with substance use disorder than for those without substance use disorder. The small number in our control group in our case-control model (N=25) and the small number of participants who did not abuse substances (22 participants, or 9 percent) limited our ability to fully explore what drives these differences. More quantitative and qualitative research is needed to understand the moderating effect of substance use disorder on the reduction in emergency department use among permanent supportive housing residents. Nevertheless, our finding of significant, though reduced, drops in service use in the 91 percent of residents with a diagnosis of substance use disorder extends findings from the NY/NY study by demonstrating that clients offered supportive housing while actively using substances can reduce service use.

Our findings suggest that part of the cost of supportive housing may be offset by relieving the cost burden of homeless adults with disability on public systems of care. We estimate that the service reductions reported in this study translate into public cost reductions of $1,300 per person moving into permanent supportive housing per year for the first two years after move-in, offsetting at least 10 percent of the estimated annual cost of supportive housing in San Francisco (15). These savings do not approach the high cost offset reported in the NY/NY study. However, our study focused on only one of the eight health, shelter, and corrections systems included in that study and consequently excluded a broader range of service data that may

Figure 2

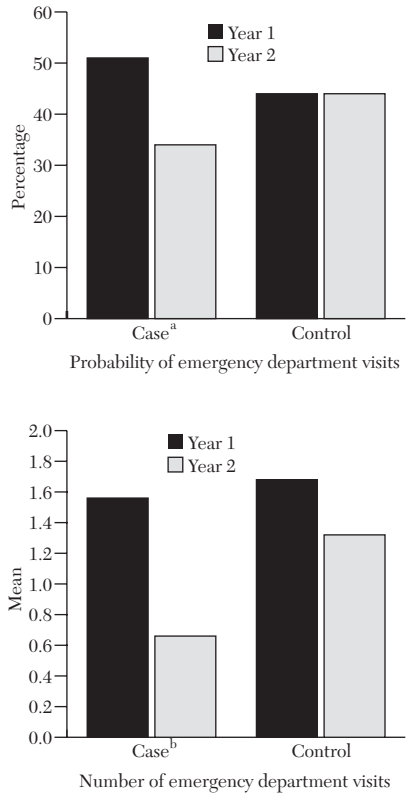
Mean number of hospital admissions per six-month period among 199 homeless adults with mental illness, substance use disorder, and other disabilities[a]



[a] Significant effect of time across all ten periods; F=2.32, df=9, 190, p<.05

Figure 3

Changes in emergency department use from year 1 to year 2 among 100 participants in the case group who received supported housing in year 1 and 25 participants in the control group who did not receive supported housing until year 2



[a] Significant change between year 1 and year 2; χ^2=6.56, df=1, p=.01

[b] Significant change between year 1 and year 2; t=–3.36, df=99, p<.01

Table 2

Case-control model of predictors of change in the number of emergency department visits from year 1 to year 2 among 100 participants in the case group who received supported housing in year 1 and 25 participants in the control group who did not receive supported housing until year 2[a]

Measure	Coefficient	SE	t	p
Regression constant	7.65	1.96	3.91	<.001
Differences between groups	–7.07	1.29	–5.47	<.001
Age	.00	.00	.56	ns
Male	.01	.32	.02	ns
Veteran status	–.84	.38	–2.19	<.05
Race (reference African American)				
White	–.14	.30	–.47	ns
Latino	–.93	.56	–1.65	ns
Asian	–.55	.99	–.56	ns
Native American	–.02	.78	–.02	ns
Living situation at enrollment (reference street)				
Shelter	–.17	.33	–.51	ns
Short-term treatment facility	–.14	.55	–.26	ns
Treatment for heroin addiction[b]	–.26	.48	–.54	ns
Exit from housing in year 1	.84	.42	2.02	<.05
Number of emergency department visits in year 1	–.83	.05	–16.52	<.001
Mental illness diagnosis	–.21	.60	–.35	ns
Substance use disorder diagnosis	–6.62	1.43	–4.64	<.001
HIV diagnosis	–.09	.49	–.18	ns
Single diagnosis	–.54	.79	–.69	ns
Housed × substance use disorder diagnosis	6.56	1.33	4.92	<.001

[a] Adjusted R^2=.73, df= 18, 106

[b] Receipt of treatment in the 24 months before year 1

have increased cost savings. In addition, we omitted quality-of-life measures that may have justified additional costs.

This study was limited by its nonexperimental, case-control design and its reliance on administrative data collected for nonresearch purposes. In addition, we were unable to identify which components of supportive housing may have driven the observed decreases in service use—housing, on-site services, or both (7,16,17). However, our methods were less costly than those used in the NY/NY initiative, totaling $55,000 compared with $450,000 for the NY/NY analysis (18). These methods are thus more accessible to communities interested in examining their own patterns of expenditure and weighing the benefits of developing long-term solutions to homelessness.

Conclusions

Despite its limitations, this study associated supportive housing placement with significant reductions in crisis service use. It showed that supportive housing can accomplish a number of specific policy goals, namely ending homelessness by providing a stable residential setting and reducing emergency department and inpatient hospital use in populations with mental illness and substance use disorder who lived largely on the streets (13,19). As such, it demonstrated that public hospital savings can offset part of the costs of providing supportive housing to this population.

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