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ORIGINAL PAPER

Cost-Savings Associated with Reductions in Public Service Utilization with Provision of Permanent Supported Housing in Midsized City in the United States

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Abstract
Severe and persistent mental illnesses are frequently associated with homelessness and extensive use of public services. Cost savings after the provision of permanent supportive housing (PSH) have been examined in large metropolitan areas but not in medium-sized communities. Administrative and clinical data were collected to determine use of public services, such as use of emergency services, inpatient psychiatric and medical services, and correctional facilities, in the year preceding and the year subsequent to placement in PSH. Costs of the housing and the utilized services were also calculated. Ninety-one subjects were in housing first (HF) programs and 19 were in treatment first (TF) programs. Overall there was a net cost savings of over $1.2 million or $6134/consumer/year of PSH. Nearly all cost savings were in reduced service utilization which implies prevention of both medical and psychiatric morbidity. In HF the average per patient cost savings ($21,082.12) was not significantly greater than TF ($12,907.29; $p = 0.33$). Provision of PSH in a mid-sized city provides significant cost savings.

Keywords Cost · Cost-savings · Savings · Homelessness · Permanent supported housing · Housing first · Emergency services · Public services

Individuals with severe and persistent mental illness frequently experience severe social stressors, particularly homelessness. The US Department of Housing and Urban Development (HUD) estimated that in 2010, up to 46% of homeless adults living in shelters had a diagnosis of a serious mental illness and/or a substance use disorder [1]. In a study of 500 homeless individuals in 3 urban settings in Canada, almost 93% met diagnostic criteria for a psychiatric disorder; of these, 27.2% were diagnosed with schizophrenia or psychosis, and 70% reported drug dependence [2].

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The impact of homelessness among vulnerable individuals with serious mental illnesses (SMI) is a major public health concern [2]. Access and use of psychiatric and medical outpatient services are severely limited in this population due to lack of connection to a healthcare system and issues related to homelessness, such as lack of a telephone [2]. As a result, homeless individuals with SMIs rely on costly emergency and inpatient services to obtain needed healthcare [3]. Lam and colleagues [3] reviewed all emergency department visits during 2012 in an urban "safety net" hospital (p. 608), and found that among people with psychiatric disorders, homelessness contributed to a 28% increase in the likelihood of an ED revisit, and a 38.2% increase in likelihood of hospital readmission. In some cases, patients with mental health and substance use disorders are readmitted to the hospital due to housing instability rather than illness exacerbation [4].

Permanent supportive housing (PSH) programs have been designed to provide the most vulnerable, chronically homeless individuals the dignity of private housing and the ability to gain needed support services that are instrumental to recovery [5–7]. Provision of PSH is often designated as either a Treatment First (TF) or Housing First (HF) model. The TF model is recovery driven and guided by "treatment readiness," in which eligibility for housing requires the consumer's active participation in treatment and adherence to psychiatric and/or substance use treatment [8]. In contrast, the HF model uses a consumer-driven model, in which the consumer has immediate access to permanent housing regardless of adherence to treatment. HF models do include supportive community, health and social services [7], such as Assertive Community Treatment.[9] HF models are considered a "harm reduction" [5, p., 549] approach, and have been instrumental in reducing chronic homelessness. Of the two models, the HF model has greater potential of reducing recurrence in homeless SMI patients.

A variety of HF approaches have been implemented to support the housing needs of people diagnosed with serious mental illnesses. These include scattered or congregate housing with external or on-site supportive services [9]. But nearly all variants follow the general structure of the first HF program, Pathways to Housing, Inc., established in New York City in 1992 [10].

The use of HF models has demonstrated several positive outcomes for consumers and the healthcare system. For example, research suggests that HF improves perceptions of quality of life for adults with serious mental illnesses, including satisfaction with quality of living situation, family relationships, and adequacy of financial resources [7]. O'Campo and colleagues [11] compared outcomes in participants who received a HF intervention, combined with Assertive Community Treatment services ($n = 97$) to compared to treatment as usual (TAU, i.e., no provision of housing) participants ($n = 100$). Findings suggest that the HF group had stable housing 73.6% of the time during the 24-month follow up, compared to 27.8% for the TAU group, representing a 45.8% increase in housing stability for the HF group [11].

Early studies examining the HF model found that it was associated with significant cost savings [12, 13]. Potential cost reduction for mental health services was instrumental in United States Federal policy development to pursue the goal of eliminating homelessness [14]. However, subsequent studies in wider samples of homeless populations suggested that cost savings may not be as robust as initially anticipated [14, 15]. Some of this may be related to long-term costs of housing in successful programs and reduced fidelity to the model over time [16]. Additional data are required from multiple settings to fully understand the possible discrepancy. Specifically, data from smaller cities implementing the HF model are required. Cities with populations less than one million average around 400 homeless individuals per 100,000 population, whereas larger cities have an average of over 600 homeless individuals

per 100,000 [17]. Additionally, larger cities tend to have more resources, which does not seem to impact general health [18]. A retrospective mirror image examination of consumers participating in PSH was conducted to determine if provision of housing is associated with reduction in resource utilization in a mid-sized city.

Materials and Methods

The data were collected by a non-profit organization that provides housing and supportive services for persons experiencing severe mental illness, co-occurring mental health and substance use disorders, and homelessness in Louisville, Kentucky, a city of under 1 million inhabitants. The goal was to assess the comparative savings associated with participation in PSH utilized either a HF model of PSH (HF-PSH) or a TF model of PSH (TF-PSH).

Consumers were identified by administrative staff. All consumers participating in HF-PSH were invited to the study and offered a token reimbursement for their efforts for participation (a US$ 10 grocery gift card for participation). They only had to allow access to their records for research purposes. Service utilization data were obtained for 110 participants.

Requirements for participation in the PSH programs were a diagnosis of severe mental illness (SMI), agreement to have 30% of monthly disability income to go towards rent, and chronic homelessness. Chronic homelessness was defined by Unites States Department of Housing and Urban Development (HUD) standards [19]: a person with a disability that is continuously homeless for at least a year or a person with disability that has 4 periods of homelessness in the past 3 years. There were no minimum requirements to participate in treatment or to receive supported services; although, they were required to have a case manager and a minimum of one monthly contact, additional services were available to each consumer should they want them. Many consumers were eligible to receive Medicaid at time of entry or gained eligibility of Medicaid at the time of the implementation of the Affordable Care Act (35 had Medicaid, 9 had Medicare, one had both, 1 had private insurance, 5 had no insurance, and information was not available for the remainder).

Existing program data were used to track service utilization during the year before and year after PSH entry to assess how use of services changed. Patients were either in a HF program or a TF program, with the caveat that our TF are more accurately defined as “treatment centered approaches” that incorporate some elements of HF. Administrative data available from local public hospital emergency department, state psychiatric facility, correctional facilities, and total inpatient and outpatient visits were used to create a database of identifying information for recruited consumers. This data included information about the consumers’ dates of encounters with each of these entities as well as type, duration, and cost of services received. Data were then aggregated respective to each consumer’s unique date of entry into housing to compare utilization of these services for each consumer’s year before entering housing (Year 1) and the year immediately following entry to housing (Year 2). This was also the case for participants in supported housing for longer time periods (mainly in the TF group) which may have introduced a lower service error, but one that would have been mirrored in the year before and after provision of housing. Costs were based on average cost of service provided in 2015 US dollars.

The primary outcome measures were the differences in the cost of services before and after provision of PSH in the group as a whole and in the HF and TF groups. Comparisons of specific items were secondary outcome measures. Paired t-tests were used for same group

comparisons (i.e., before and after PSH), and unpaired t-tests were used for across group analysis (i.e., HF vs. TF). Bonferroni correction was applied to secondary measures only. Power analysis was performed on nonsignificant primary outcome measures to determine if the sample size was adequate.

Results

Of an initial study population of 128 patients, 18 were excluded due to not meeting study entry criteria (i.e., being homeless by HUD definition, or non-participation in PSH), the remaining 110 participants were included in the study. Ninety-one (82.7%) were in HF, and 19 (17.3%) were in TF programs. There were 70 men (63.6%, 58 [52.7%] in HF), and 40 women (36.4%, 30 [27.3%] in HF) including 3 transgender male to female. Among the entire population 65 were white (59.1%; 54 [59.3%] in HF) and 45 African-Americans (41%, 37 [40.7%] in HF. Thirty-three were diagnosed with schizophrenia (14 in HF), 8 were diagnosed with schizoaffective disorder (3 in HF), 25 with bipolar disorder (22 in HF), 23 with major depression (all in HF), 4 with Post Traumatic Stress Disorder (PTSD; 3 in HF), 1 each with obsessive compulsive disorder and generalized anxiety disorder (both in HF), and 26 had an unknown diagnosis (25 in HF). The majority had Medicaid (53, 42 in HF) and Medicare (15, 11 in HF), some had both (4, 1 in HF), or none (15, 14 in HF), one had private insurance (in HF); and 22 insurance status was unknown (all in HF).

Participants resided in the housing for periods of time ranging from 0 days to 25.2 years. The mean time in housing for participants was 3.1 years, but only the costs of the year immediately prior to PSH and the first year of PSH were calculated.

As a group, participation in PSH was associated with reduction in service utilization of $ 20,098.73 per patient per year. Most of that is driven by emergency room and inpatient costs (Table 1), which together account for $ 2,301,530.79 in savings compared to year one expenses. When this is corrected for the estimated cost of providing the housing ($ 1,536,033.15) the net savings per patient per year is $ 6134.00.

Similarly, total costs (without correcting for costs of housing) dropped significantly at 53% for subjects receiving HF before and after treatment (Mean $ 55,860 ± *SEM* 10,120 before PSH to $ 26,126 ± 6084 after PSH, $p = 0.0017$, $t = 3.23$). However, the decline of 76% in the cost of service utilization for subjects in TF was not significant ($ 12,848 ± *SEM* 7110 before PSH to $ 3058 ± 1263 after PSH, $p = 0.17$, $t = 1.43$). This latter lack of difference is due to

Table 1 Service Utilization costs before and after PSH for all subjects ($n = 110$)

Type of Care	Year 1: Before PSH Entry		Year 2: After PSH Entry		
	Cost	Days	Cost	Days	Cost Change
Inpatient	$ 3,055,232.50	865	$ 1,533,068.15	470	$ 1,522,164.35
Outpatient	$ 299,744.63	182	$ 413,993.84	146	-$ 114,249.21
ER	$ 1,566,779.24	728	$ 787,412.80	353	$ 779,366.44
Corrections	$ 57,582.91	855	$ 34,003.71	503	$ 23,579.20
Total	$ 4,979,339.28		$ 2,768,478.50		$ 2,210,860.78
Estimated Cost PSH					$ 1,536,033.15
Net Savings					$ 674,827.63

inadequate power in the TF group (power = 0.29 for the 19 in the TF group; 57 subjects required for power of 0.8).

While the savings (prior to correction for housing costs) is greater for HF clients ($ 29,734 ± *SEM* 9210) than with TF client ($ 19,943 ± 20,357), this difference is not significant (t = 0.98, df = 107, p = 0.33; see Table 2). The actual savings per client while factoring the cost of housing were $ 15,770 for HF and $ 5979 for TF per client annually. None of the items we examined (inpatient costs, outpatient service costs, corrections costs, emergency department [ED] visit costs) were different between HF and TF either before or after PSH, with the exception of the cost of ED services before PSH (Table 1). After a Bonferroni correction, that difference became nonsignificant.

A power analysis was performed on the total pre and post PSH service utilization in subjects utilizing HF or TF. A total sample of 63 to achieve high level of power of 0.8.

It should be noted that there were costs that could not be obtained. For example, a high percentage of the participants who were jailed received medical services in jail. The daily cost for that jail time was estimated to be three times higher than the general population. While Corrections identified all of the participants who received medical services or were on a medical unit, they did not give us the number of days out of their total stay for which it applied so we included data as regular jail cost.

Discussion

In the current examination of costs and savings associated with implementation of PSH programs in a medium-sized city utilizing a retrospective mirror image design, there is a documentation of a reduction in costly public services for individuals with a SMI and homelessness (Table 1). This reduction in service utilization was seen in subjects participating in either HF or TF but reached statistical significance only in HF subjects (Table 2). This is similar to observations noted in larger American cities that employ a HF approach [12, 13]. The replication of this, in our population strongly suggests that PSH can provide cost savings when employed in an SMI population.

However, when we compared HF-PSH and TF-PSH, we were unable to document a significant difference (Table 2). Subjects in HF-PSH showed a more dramatic and significant decline in costs (annual savings of $ 15,770 in first year after housing), compared to those in TF-PSH (annual savings of $ 5979 in first year after housing). We utilized a retrospective

Table 2 Means (± SEM) of costs of services for the years before and after PSH in subjects receiving HF (n = 90) or TF (n = 19)

Type of Care	Year 1: Before Entry			Year 2: After Entry		
	HF	TF	*P* (t)	HF-PSH	TF-PSH	*P* (t)
Inpatient	$ 25,448.00 (8702.00)	$ 10,075.00 (6533.00)	0.2 (1.32)	$ 17,918.00 (5783.00)	$ 845.00 (845.00)	0.2 (1.35)
Outpatient	$ 2933.00 (675.00)	$ 1884.00 (786)	0.5 (0.69)	$ 4416.00 (1504)	$ 871.90 (449.70)	0.28 (1.08)
ER	$ 17,228 (3314.00)	$ 856.50 (363.40)	0.03 (2.26	$ 8561.00 (2250.00)	$ 888.90 (651.30)	0.12 (1.56)
Corrections	$ 265.30 (81.8)	$ 447.10 (447.10)	0.5 (0.68)	$ 126.10 (71.77)	$354.40 (253.80)	0.2 (1.18)
Total	$ 55,860.00 (1010.00)	$ 12,848.00 (7110.00)	0.57 (1.93)	$ 26,126.00 (6084.00)	$ 3058.00 (1263.00)	0.09 (1.73)

There are no significant differences between the two groups; only pre-PSH emergency department (ED) evaluations are significantly different, but that significance is lost after Bonferroni correction

mirror image design because we did not have the resources to do prospective randomized assignment. However, there are problems with this design.

A recent review found that studies utilizing a mirror pre-post design, such as the current study, tended to show a cost savings (all 15 studies), while randomized studies tended to show an increase in services and costs (3 out of 4 studies) [15]. In all randomized trials, a significant cost reduction is seen in both the HF group and the control treatment as usual group. This may reflect a regression to the mean phenomenon, or may reflect the consequence of study participation itself. Additionally, recruiting subjects who are not high service utilizers is sometimes associated with an increase in service utilization due to the supportive component of HF [15]. This difference may be related to the selection process in the different types of studies. Subjects naturally enrolled into a pre-post study design are usually identified on the basis of need, as was the case in the current study. Thus, they have a high likelihood to experience a reduction in service utilization. In other words, the discrepancy between the naturalistic studies and the randomized studies highlights the importance of selection as opposed to random assignment. The selection process itself is an important variable in ensuring that PSH produces an overall cost savings or morbidity prevention.

A similar phenomenon is seen in studies of subjects with substance abuse. Since the cost of services associated with substance abuse treatment is frequently less than the morbidity of substance use, demonstrating cost savings is more unlikely [14].

The current study did not examine any subjective or quality of life (QoL) outcomes. Other studies have demonstrated that QoL is improved with housing [3, 7, 20].

Quantitative analyses do not provide insight as to how PSH impacts the consumers' lives. Future studies need to include qualitative measures and the personal narratives of consumers in order to understand how PSH impacts their decision-making process and subsequent service utilization. Further analysis will also need to include the number and type of supported services consumers are using. In addition, cost savings need to be evaluated beyond Year 1 in order to establish sustainability.

Limitations

There are costs and savings that are not included in the current analysis. These include the costs of medical provider charges (we only used hospital charges), outpatient care (we only had access to outpatient *programs,* such as partial hospital programs or intensive outpatient programs), and costs of medications (which can be significant). Additionally, there are costs associated with police interventions (i.e., the cost associated with an officer answering a call or arresting a subject), court and legal costs (that occur with each arrest and probation), shelters (since subjects in housing no longer use shelters), and costs associated with accessing government services such as food stamps. Other hidden costs probably exist. Furthermore, there is great variance in the data. This is because some subjects required a lot of services while other utilized none of the services we measured. Additionally, a few participants (particularly those in TF group) had been in supported housing for a long time, which may have reduced our ability to access all utilized services. Power for some of the secondary analyses,

particularly for the HF versus TF was reduced by sample size in the TF group and the variance in service utilization among the subjects.

Conclusions

Provision of PSH to severely mentally ill citizens provided significant cost savings, estimated at $ 6134 per subject per year. Only HF-PSH showed significant total savings as opposed to TF-PSH, but there was no significant difference between the two models of PSH. These data are consistent with significant prevention of medical, psychiatric, and social distress prevention with the HF model, in particular, and the provision of PSH in general. The data suggests that provision of housing reduces the cost of services in mid-sized cities as has been previously documented in larger American cities.

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Compliance with Ethical Standards

Potential Conflicts of Interest Dr. Rif El-Mallakh has research funding from Galen Pharmaceuticals. He is on the speakers' bureaus of Indivior, Janssen, Otsuka, Sunovion, Takeda, and Teva. None of the other others have any potential conflicts of interest to report.

Research Involving Human Participants and/or Animals This work was reviewed, approved, and overseen by the Institutional Review Board.

Informed Consent All subjects provided informed consent, after reading the form and having all their questions answered.

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