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A Prospective Study of the Associations Among Housing and Cost of Services for a Homeless Population

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Abstract

Objective: The complex needs of homeless populations result in use of a wide range of services and high costs for housing programs and psychiatric and medical care. Allocation of resources is often not congruent with assessed needs. A series of cost-congruence hypotheses was developed to test assumptions that needs are associated with resources provided for appropriate services in homeless populations.

Methods: 255 homeless individuals were followed over two years and categorized according to housing status over time. Detailed individual information was obtained at baseline and follow-up data one and two years later. Extensive agency-derived and self-reported service costs for specific service types (medical, psychiatric, substance use, homeless maintenance and amelioration) were derived, and individual service-use data were collected. Multiple regression models were used to test service cost hypotheses regarding housing status (consistently housed, housed late, lost housing, consistently homeless) and service-congruent needs.

Results: Medical and psychiatric service-use costs and homeless maintenance costs varied among housing groups. As expected, serious mental illness predicted psychiatric service costs, and

alcohol (but not cocaine) use disorders predicted substance abuse-service costs. Serious mental illness also predicted substance abuse-service costs, acute behavioral health care costs, and total costs.

Conclusions: This study followed a homeless cohort prospectively and provided estimates of agency-derived costs of service use for a large number of agencies. This research increases the understanding of patterns of service use in a homeless population and informs the provision of services appropriate to the complex needs of this difficult-to-serve population.

Background

The complex needs of homeless populations and the various services provided for them yield high costs for housing programs, psychiatric and substance-abuse treatment, and medical care. Estimated costs of these services may top \$50,000 per person annually.^{1,2,3} Research demonstrates that many individuals move in and out of housing, some repeatedly. Sixty percent of emergency shelter stays last <1 month, 60% of transitional housing stays last <6 months, and permanent supportive housing typically lasts <5 years.⁴ This research group has shown the importance of changes in housing status and its relation to substance abuse.⁵ Because homeless service needs do not necessarily remain constant over time, costs related to these services are likely to also vary. For example, attaining stable housing should eliminate further costs for sheltering.

For homeless populations, greater service costs may not necessarily reflect better outcomes. One possible reason is supported by a recent study⁶ demonstrating that homeless people perceive benefit from service use if there is a sense that it is appropriate to accept social support from others and the service is considered helpful. In this case, receiving a specific service is less about meeting the needs that the service was designed to help meet, and more about an individual's general satisfaction. The individual's satisfaction is not typically considered and measured as an effectiveness outcome in research. Consequently, costs of services accrued would not be congruent with effectiveness. Additionally, there is no consensus on how attaining housing affects service-use costs. In contrast to this team's research,^{7,8} Larimer's group³ found that attaining housing was associated with reduced medical care costs.

A consequence of providing services insufficiently matched to the assessed problems of a population is the generation of costs without necessarily contributing to improved outcomes. This issue is not about outcomes related to costs but rather whether allocation of resources is congruent with assessed needs. Given the highly disproportionate substance use and psychiatric care needs in the homeless population, it is logical to examine whether service costs are congruent with these specific treatment needs. Therefore, a series of cost-congruence hypotheses was developed to test assumptions that needs are associated with resources provided for appropriate services in homeless populations. These hypotheses are: 1) attainment of stable housing is associated with lower costs for homeless maintenance and amelioration services, 2) attainment of stable housing is associated with higher medical care costs, 3) alcohol and cocaine use disorders are associated with higher substance abuse-

service costs, and 4) serious mental illness is associated with higher acute psychiatric and behavioral care costs.

The purpose of this study was to examine two related issues: the association of changes in housing status with changes in costs of specific services used and the association of specific service needs with costs, testing the cost-congruence hypotheses delineated above. Because little is known about how costs for services change with the temporal evolution of housing status in homeless populations, this study empirically tested the above cost-congruence hypotheses regarding these relationships in prospective two-year longitudinal data collected from a systematically-selected homeless sample in St. Louis, Missouri.

Methods

This NIDA-funded study was approved in advance by the Institutional Review Boards of the participating academic centers. Participants provided written informed consent.

Sample

For this study, homelessness was defined as having spent the previous 14 nights without one's own place, such as in a public shelter or in some other unsheltered location or on the streets and having no current fixed address. Individuals who had resided during this period in flophouses or cheap motels were included if they had been otherwise unhoused for <30 days. Additionally, individuals who had stayed in a public shelter or unsheltered location during the last 14 days were included only if they had stayed <1/2 of those days temporarily with friends or relatives or in single-room-occupancy facilities. Participants meeting this definition of homelessness were systematically recruited from shelter beds and street routes from 1999–2001 from shelter and street locations using procedures previously described,^{8,9,10} and tracked for two years.¹¹ There were no disincentives and participants received \$20 for their interview. Those eligible had 92% participation. Detailed in-person interviews were completed at both one and two years after the baseline interview by 255 (68%) of baseline study participants. No significant baseline demographic differences were detected between those re-interviewed versus not re-interviewed over two years.

Measures

At baseline, participants completed structured interviews including sociodemographic sections of the National Comorbidity Study interview,¹² the substance abuse sections of the Composite International Diagnostic Interview-Substance Abuse Module for *DSM-III-R*,¹³ the Diagnostic Interview Schedule for *DSM-IV*,¹⁴ and the Homeless Supplement to the Diagnostic Interview Schedule.¹⁵ These interviews elicited detailed lifetime history and recency of symptoms and disorders, substance use patterns, and amounts and types of services used during the previous year.

At both the one- and two-year interviews, participants provided detailed information on their housing status and the amounts and types of services they used during the previous year. Participants were considered stably housed at the end of each year if they had been housed in their own place for the previous 30 days and most of the past year.

Agencies delivering services to this homeless sample provided service-use and cost data. The 23 participating agencies represented four primary service agency types: medical centers, mental-health treatment facilities, substance-abuse treatment facilities, and homeless shelters. Using structured instruments that were standardized across agencies, study participants' service-use and cost data were collected from agencies for the two follow-up years. Agency-collected service-use data were combined with the self-report service-use data from interviews of the homeless individuals.⁸ This method of data collection contributes to the literature in two main ways. First, the cost estimates reflect the social value of resources used for each service,¹⁶ rather than the gross average cost per participant or reimbursed amount per service from billing records. Second, because service-use data from two sources are combined, cost estimates are more likely to be complete.

Creation of variables

Details of the development and definition of service-use and cost variables for this study are provided elsewhere.⁸ The main service-use categories in this analysis are medical, psychiatric, substance use, homeless maintenance and amelioration, and total services. Medical services included Medicaid, Medicare, insurance data and utilization data from service providers. These data were not limited to our specific collaborating agencies. Homeless amelioration services are interventions to help homeless people move from homelessness to stable housing, including housing services and job and vocational services. Homeless maintenance services are intended to improve life during homelessness, including shelter and food. Additionally, psychiatric and substance abuse services together were divided into subcategories of acute behavioral health services and outpatient behavioral health services for certain analyses.

Based on stable housing status (i.e., housed in one's own place for the previous 30 days and for most of the past year) determined separately for both follow-up years, four main housing patterns over the course of the study were possible: 1) *consistently housed* (obtained stable housing in the first follow-up year and maintained stable housing in the second year), 2) *housed late* (did not obtain stable housing in the first year but obtained stable housing in the second year), 3) *lost housing* (obtained stable housing in the first follow-up year but no longer stably housed in the second year), and 4) *consistently homeless* (did not achieve stable housing in either follow-up year). Additional variables were created to represent lifetime diagnoses of alcohol use disorder, cocaine use disorder, and serious mental illness (representing lifetime diagnoses of schizophrenia, bipolar disorder, or major depression) as determined through baseline interviews.

Data analysis

Service-use data were aligned and cleaned in a Microsoft Excel spreadsheet, then imported into SAS (Version 9.3, SAS Institute, Cary, NC) and merged with individual interview data in SAS for analysis. Missing data were imputed using previously described methods.⁸ Service-use costs were compared among pairs of housing groups in bivariate analyses using nonparametric Wilcoxon Mann-Whitney U tests (PROC NPAR1WAY in SAS) to accommodate instances of non-normal data (Figure 1). Because six comparisons were made among pairs of housing groups for each variable, the alpha value used to define

statistical significance was set at .008 (i.e., .05/6). These comparisons were repeated using linear regression models, with overall results consistent with the nonparametric testing results. Because nonparametric testing of multivariate models is not possible, the consistent results from these two different methods support the use of multiple regression models for multivariate analysis. Generalized linear models were estimated in SAS using PROC GLM to predict service-use costs (dependent variable for each service type in separate models) by housing group (independent variable), controlling for need and demographic (sex, age, minority group membership, years of education, married status) variables (independent covariates entered simultaneously with other variables in the model) (Table 1). In these multivariate models, square-root transformation was applied to the cost data to address positive skew.

Results

Detailed baseline characteristics of this sample of 255 homeless individuals have been previously reported.^{5,8} To summarize, the sample was predominantly African-American (77%) and male (73%) with a high school education on average (60%). Many had a lifetime history of “legal trouble” (64%), alcohol use disorder (59%), cocaine use disorder (45%), or serious mental illness (32%).

Figure 1 shows costs over the two study years by service-use category among the four housing groups. The group that did not obtain stable housing until the second year had the highest total service-use costs (\$6,545 ± \$17,595), followed closely by the group that was housed in both years (\$15,634 ± \$23,279). The most costly category overall was the medical-services category (\$6,029 ± \$13,394). The cost of the next most expensive overall category, psychiatric services (\$3,305 ± \$6,973), was significantly lower (Wilcoxon S=75,636, p<.001). Costs of psychiatric services were marginally greater than costs of substance abuse services (\$2,004 ± \$4,961; Wilcoxon S=68,238, p=.051).

Medical-service costs were highest among the group that was consistently housed in both years (\$10,922 ± \$22,130 vs. \$4,835 ± \$9,921 for all others; Wilcoxon S=7,585, p=.012) and lowest among those stably housed in the first year but not in the second year (\$1,295 ± \$2,007 vs. \$6,566 ± \$14,020 for all others; Wilcoxon S=2,377, p=.008). Psychiatric-service costs were lowest among the group that was consistently housed in both years (\$1,181 ± \$2,055 vs. \$3,823 ± \$7,626 for all others; Wilcoxon S=5,598, p=.074) and highest among those not stably housed until the second year (\$5,090 ± \$8,515 vs. \$2,707 ± \$6,288 for all others; Wilcoxon S=9,515, p=.007). Substance abuse-service costs did not vary among the housing groups. Most psychiatric- and substance abuse-service costs were for acute behavioral care (\$3,114 ± \$7,693), and these costs were greater for those who remained unhoused in one or both years (\$3,575 ± \$8,217) compared to those consistently housed (\$1,224 ± \$4,598; Wilcoxon S=5,133, p=.001). Those who did not obtain stable housing until the second year had higher homeless-maintenance costs than those who were stably housed in both years. Figure 1 also shows significant differences in costs in all pairwise comparisons of the four housing groups by each type of service use.

Table 1 summarizes significance findings of model testing of service-use costs for each service type (dependent variables, one model per each) predicted by need variables, housing group, and demographic control variables. Consistent with the bivariate models, medical and psychiatric service-use costs and homeless-maintenance costs varied significantly among housing groups, although substance-abuse service costs and homeless-amelioration services did not. As expected, serious mental illness predicted psychiatric-service costs, and alcohol-use disorders (but not cocaine-use disorders) predicted substance-abuse service costs. Serious mental illness also predicted substance-abuse, acute behavioral-health, and total costs. Women had higher homeless-amelioration costs (\$965±\$3,259 vs. \$2±\$20), higher outpatient behavioral-health costs (\$890±\$1,634 vs. \$290±\$774), and higher total costs (\$15,928±\$21,204 vs. \$12,383±\$15,484) than men.

Discussion

This study is the first to our knowledge to follow a homeless cohort prospectively and calculate agency-derived cost estimates reflecting resource use per service. Follow-up over a two-year period allowed examination of how obtaining, retaining, and losing housing from year to year affected service-use costs during the natural progression of homelessness.

This study found that medical-service costs were highest among those consistently housed in both years and lowest among those stably housed in the first year but not in the second year. One possible explanation is that those with chronic and severe medical problems who require costly services may be able to obtain housing through additional resources available for people with disabling medical conditions. It also may be that those with housing tend to have greater access to medical care.

Psychiatric- and acute behavioral-health service costs showed an opposite relationship with stable housing. Psychiatric-service costs were lowest among those consistently housed in both years and highest among those not stably housed until the second year. Similarly, acute behavioral-health costs were lowest for those consistently housed in both years relative to all three other patterns of housing status. Perhaps services addressing psychiatric morbidity do not facilitate acquisition of housing. Perhaps the nature of psychiatric illness does not necessarily lead to service utilization even when stable housing is obtained. This study examined data on various services directly addressing homeless-maintenance needs. Not unexpectedly, those who did not obtain stable housing until the second year had higher homeless-maintenance costs than those stably housed in both years.

As further discussed below, the cost-congruence hypotheses predicted that the group that never attains stable housing will have the highest overall service-use costs and those who attain stable housing the lowest. The findings, however, demonstrated a much different pattern, largely attributed to higher medical costs among those who attained stable housing. This team has previously postulated that obvious acute needs (e.g., psychiatric illness and literal homelessness) may create barriers to meeting chronic needs.⁸

In contrast, findings of this study supported the cost-congruence hypotheses regarding costs of medical services, homelessness services, psychiatric- and mental-health services,

and substance-use services appropriate to these service needs. Results of multivariate analyses further demonstrated that factors not logically congruent also sometimes predicted costs. Such examples are the associations of housing group with psychiatric services (as noted above), serious mental illness with substance-use services, alcohol-use disorder with outpatient behavioral-health services, and serious mental illness with overall costs. Additionally, women had greater costs than men in three models (homeless-amelioration costs, total costs, and outpatient behavioral-health costs). Although the congruence hypotheses were generally supported by the findings, understanding the larger cost picture requires application of more nuanced and complex behavioral models to this study's specific patterns of findings.

Although the findings agree with the services literature documenting the complexity of homelessness, they do not necessarily agree with the conclusion that housing leads to lower societal costs.³ This difference in findings may in part reflect methodological differences. Prior studies intervening by providing housing and then estimating costs may not have adequately accounted for the two-way relationship between housing and service use. Further, these intervention studies compared housed groups with those remaining homeless post-intervention, not accounting for the well-documented phenomenon of movement in and out of homelessness over time—findings that this team has demonstrated to be significantly associated with overall service use.^{5,7}

Although this study has significant methodological strengths (probability sample, longitudinal data collection, agency-based cost derivation), it also has limitations. The relatively modest analytic sample size (N=255) may have limited power to detect effect sizes. A larger sample might have revealed more subtle interactions among individual needs and appropriate costs. As noted elsewhere,⁸ this study's cost data collection did not include criminal justice costs—a significant cost driver in other studies.¹⁷ Additionally, it is suspected that, had follow-up continued for longer than two years, further significant findings would have emerged. Perhaps housing needs to be in place for more than one to two years before true cost increases or decreases are fully realized. It may also be the case that cost increases are associated primarily with a small number of high-cost service utilizers. It may be that important information can be gained by focused analysis of high-cost outliers. Further, the cross-sectional sample provides a relative overrepresentation of homelessness chronicity and thus the findings are especially pertinent to more chronic homeless population groups. Finally, a proportion of the self-report service-use data was not prospective to the collection of the housing-status data within a single year of the data set.

The findings provide important information to help direct future research. To understand costs over time, studies may need larger samples and examination of costs over longer periods. Studies collecting data over shorter periods may risk inclusion of costs incurred for acute conditions and fail to capture costs associated with periodic acute exacerbations of chronic conditions. This point is of particular relevance for studies examining immediate cost consequences of interventions for specific acute conditions.

Future research is needed to address how societal costs change with housing status, both on aggregate and across agencies. The post-housing cost findings suggest societal costs

may increase in aggregate and there may be cost-shifting among agencies. Even if future research indicates that providing services to people in need to improve their outcomes does not always save money, detailed and accurate estimates of costs are critical to understanding which agencies require how much of scarce service resources.

The findings also suggest the need to consider the potential for preventive-health services as part of the care provided to homeless persons. Here and in another publication,⁸ this team has postulated that increased medical costs occur with ignoring asymptomatic chronic conditions in preference to addressing acute needs. In the broader homelessness literature, the relative risk of death is considerably higher than in the general population,¹⁸ consistent with current study findings (five known deaths over the course of the study).¹¹ Including medical services as part of routine homelessness care may decrease medical-service costs and improve outcomes related to both mortality and morbidity.

Conclusions

This study followed a homeless cohort prospectively and provides agency-derived service-use costs. This research contributes to understanding of the pattern of service use in homeless populations and can help to provide services more in line with this population's complex needs.

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References

1. Gilmer TP, Stefancic A, Ettner SL, et al.: Effect of full-service partnerships on homelessness, use and costs of mental health services, and quality of life among adults with serious mental illness. *Archives of General Psychiatry*, 67(6), 645–652, 2010 [PubMed: 20530014]
2. Basu A, Kee R, Buchanan D, and Sadowski LS: Comparative cost analysis of housing and case management program for chronically ill homeless adults compared to usual care. *Health Services Research*, 47(1 pt 2):523–43, 2012 [PubMed: 22098257]
3. Larimer ME, Malone DK, Garner MD, et al.: Health care and public service use and costs before and after provision of housing for chronically homeless persons with severe alcohol problems. *Journal of the American Medical Association*, 301(13):1349–57, 2009 [PubMed: 19336710]
4. The United States Department of Housing and Urban Development: The 2010 Annual Homeless Assessment Report to Congress, 2010
5. North CS, Eyrich-Garg KM, Pollio DE, and Thirthalli J: A prospective study of substance use and housing stability in a homeless population. *Social Psychiatry and Psychiatric Epidemiology*; 45(11):1055–1062, 2010 [PubMed: 19816646]
6. Christian J, Clapham D, Thomas S, and Abrams D: The relationship between well being, future planning and intentions to utilise intervention programmes: what can be learned from homeless service users. *International Journal of Housing Policy*, 12(2):159–82, 2012
7. Pollio DE, Spitznagel EL, North CS, Thompson S, and Foster DA: Service use over time and achieving stable housing in a mentally ill homeless population, *Psychiatric Services*. 51(12):1536–1543, 2000 [PubMed: 11097650]
8. Fuehrlein BS, Cowell AJ, Pollio DE, Cupps LY, Balfour ME, and North CS: Deriving costs of service use among an urban homeless population. *Journal of Substance Abuse Treatment*, accepted for publication, 2013

9. Smith EM, North CS and Spitznagel EL: A systematic study of mental illness, substance abuse, and treatment in 600 homeless men. *Annals of Clinical Psychiatry*, 4:111–20, 1992
10. Smith EM, North CS and Spitznagel EL: Alcohol, drugs and psychiatric comorbidity among homeless women: an epidemiologic study. *Journal of Clinical Psychiatry*, 54:82–7, 1993
11. North CS, Black M, and Pollio DE: Predictors of successful tracking over time in a homeless population. *Social Work Research*, 2012
12. Kessler RC, McGonagle KA, Zhao S, et al.: Lifetime and 12-month prevalence of DSM-III-R psychiatric disorders in the United States. *Archives of General Psychiatry*, 51:8–19, 1994 [PubMed: 8279933]
13. Cottler L and Compton W: Advantages of the CIDI family of instruments in epidemiological research of substance use disorders. *International Journal of Methods in Psychiatric Research*, 3:109–19, 1993
14. Robbins L, Cottler L, Bucholz K, and Compton W: Diagnostic interview schedule for the DSM-IV (DIS-IV). Washington University, St. Louis, 1995
15. North CS, Eyrich KM, Pollio DE, et al.: The homeless supplement to the diagnostic interview schedule: test-retest analyses. *International Journal of Methods in Psychiatric Research*, 13(3):184–191, 2004 [PubMed: 15297902]
16. Cowell AJ, Pollio DE, North CS, et al.: Deriving service costs for a clubhouse psychosocial rehabilitation program. *Administration and Policy in Mental Health and Mental Health Services Research*, 30(4), 323–340, 2003 [PubMed: 12870558]
17. Poulin SR, Maguire M, Metraux S and Culhane DP: Service use and costs for persons experiencing chronic homelessness in Philadelphia: a population-based study. *Psychiatric Services*, 61(11):1093–8, 2010 [PubMed: 21041347]
18. Beijer U, Andreasson S, Agren G, and Fugelstad A: Mortality and causes of death among homeless women and men in Stockholm. *Scandinavian Journal of Public Health*, 39:121–127, 2011

Figure 1.
Adjusted costs by service type among housing groups over two years

Table 1.

Multivariate model significance testing of cost as a dependent variable in separate models for each service type

Costs by service type (model significance)	Independent variables*	F	df	p
Medical ^a	Housing group	4.10	3	.007
Psychiatric ^b	Housing group	3.24	3	.023
	Serious mental illness	10.57	1	.001
Substance abuse ^c	Alcohol use disorder	5.36	1	.022
	Serious mental illness	3.84	1	.051
Homeless maintenance ^d	Housing group	3.98	3	.009
Homeless amelioration ^e	Female sex	17.37	1	<.001
Total of above ^f	Serious mental illness	4.75	1	.030
	Female sex	4.07	1	.045
Acute behavioral health ^g	Serious mental illness	7.48	1	.007
Outpatient behavioral health ^h	Female sex	19.96	1	<.001
	Age	5.36	1	.022
	Alcohol use disorder	4.84	1	.029

* only variables that significantly predict costs are listed

^aF=2.25, p=.013^bF=3.02, p<.001^cF=1.84, p=.048^dF=1.67, p=.083^eF=3.38, p<.001^fF=2.80, p=.002^gF=2.39, p=.008^hF=3.37, p<.001