

Applying Cluster Analysis to Test a Typology of Homelessness by Pattern of Shelter Utilization: Results from the Analysis of Administrative Data

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This study tests a typology of homelessness using administrative data on public shelter use in New York City (1988–1995) and Philadelphia (1991–1995). Cluster analysis is used to produce three groups (transitionally, episodically, and chronically homeless) by number of shelter days and number of shelter episodes. Results show that the transitionally homeless, who constitute approximately 80% of shelter users in both cities, are younger, less likely to have mental health, substance abuse, or medical problems, and to overrepresent Whites relative to the other clusters. The episodically homeless, who constitute 10% of shelter users, are also comparatively young, but are more likely to be non-White, and to have mental health, substance abuse, and medical problems. The chronically homeless, who account for 10% of shelter users, tend to be older, non-White, and to have higher levels of mental health, substance abuse, and medical problems. Differences in health status between the episodically and chronically homeless are smaller, and in some cases the chronically homeless have lower rates (substance abuse in New York; serious mental illness in Philadelphia). Despite their relatively small number, the chronically homeless consume half of the total shelter days. Results suggest that program planning would benefit from application of this typology, possibly targeting the transitionally homeless with preventive and resettlement assistance, the episodically homeless with transitional housing and residential treatment, and the chronically homeless with supported housing and long-term care programs.

KEY WORDS: typology of homelessness; transitionally homeless; episodically homeless; chronically homeless.

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Historically, homelessness has been viewed as a condition that afflicts certain disaffected segments of the population, whose deviant behaviors, lifestyle preferences, and subcultural adaptations produce a nearly permanent state of disaffiliation (Bahr, 1973). The typical homeless person has been regarded as a middle-aged to older man who is frequently unemployed, often mentally ill, handicapped, or an abuser of substances, and who exhibits little or no attachment to common media of social solidarity such as family, workplace, or membership in any unions or organizations (Bahr & Caplow, 1973; Rossi, 1989a). In the 1950s and 1960s, studies of "the homeless" focused on persons living in "skid row" neighborhoods, often in single room occupancy (SRO) hotels, surviving largely on temporary work, military pensions, charity, and social insurance (Bahr, 1973).

Since the 1980s, however, attention has crystallized towards other types of homelessness. With rising inflation, rents, and unemployment in the 1970s and 1980s, many more people entered the state of being "precariously housed" (Hopper & Hamberg, 1986; Rossi, 1989a). Coincident with these trends, a decline in the cash value of public assistance, reduced eligibility for benefits, as well as cutbacks in many government housing programs and the supply of SROs, meant fewer resources were available to people who were shifting between various states of precarious housing. This led observers to attribute the increasing visibility of people living in street locations and the growing demand for shelter in the 1980s to the reduced ability of families and other social institutions to buffer people from destitution (Hopper & Hamberg, 1986).

This new wave of homelessness was accompanied by a shift in both the characteristics of homeless persons, and the nature of their experience of housing instability. Compared to those studied by researchers during the "skid-row" era, recent research has identified many more homeless women, married couples, younger people, members of minority groups, and families with children (Shlay & Rossi, 1992; Sullivan & Damrosch, 1987). These "new homeless," particularly members of homeless families, are often thought not to be saddled with as many of the deficits or personal barriers, such as mental disability, substance abuse problems, chronic unemployment, a criminal history, a physical disability, or with the aforementioned social disconnection, as were their predecessors—although they are nonetheless more likely to have such characteristics than the general population (Culhane, Averyt, & Hadley, 1996; Lehman & Cordray, 1993; Rossi, 1989b; Shinn, Knickman, & Weitzman, 1991). Equally important, researchers have also found that many, if not the vast majority of people experiencing homelessness since the 1980s, have had temporary episodes of homelessness (Burt, Piliavin, & Westerfelt, 1990; Culhane *et al.*, 1994; Shlay & Rossi, 1992; Link *et al.*, 1995), and have not, therefore, been likely

to acculturate to a "homeless lifestyle," as may have been the case for persons studied on skid row.

This changing profile of homelessness has led several researchers to investigate typologies of homeless people through the technique of cluster analysis (Rosenheck, 1995; Grigsby, Baumann, Gregorich, & Roberts-Gray, 1990; Humphreys & Rosenheck, 1995; Mowbray, Bybee, & Cohen, 1993). Analyses have pooled information on homeless experience, background characteristics, measures of social connection, and treatment variables, typically from small samples of homeless persons, in order to develop likely clusters within this population. These cluster models characterize clients based on both the intensity of the homeless experience *and* background variables. For example, Grigsby *et al.* (1990) identified four clusters, called the "recently dislocated," the "vulnerable," the "outsiders," and the "prolonged," based upon time homeless, social network size, and a level of functioning measure in 166 homeless people. Mowbray *et al.* (1993) developed a four-cluster model, categorizing the "hostile/psychotic," the "depressed," the "best functioning," and the "substance abusing," based upon measures of community living, depression, aggression, psychoticism, and substance abuse in 108 homeless people. Humphreys and Rosenheck (1995) developed four clusters, referred to as "alcoholic," "psychiatrically impaired," "best functioning," and "multiproblem," based upon measures of substance abuse, psychiatric problems, financial problems, social support problems, health status, homeless history, and legal problems in 745 homeless veterans.

These models have led to important advances in characterizations of subgroups of the homeless population in terms of mental health status, substance abuse, social networks, employment, and length of time homeless. They have also produced a more textured understanding of the various groups and the implications of their backgrounds for issues of policy and service delivery. However, these models have also had limitations. These studies have simultaneously modeled variables that may measure the causes of homelessness, the experiences of homelessness, and the effects of homelessness, creating difficulties for interpreting the source and meaning of group differences. These studies have also relied on retrospective self-report to measure the frequency and duration of homelessness episodes, a method of uncertain reliability. This uncertainty is further confounded by the reliance of this research upon cross-sectional samples of homeless persons, among whom it would be impossible to determine the length of the *current* homeless spell.

An alternative application of the cluster analysis method would test a more parsimonious, theoretically grounded model based only on homeless experience, attempting to confirm that the demographic, socioeconomic,

and treatment backgrounds of the clusters are distinct from each other and reflect the expected characteristics associated with membership in a given cluster. The utility of such an approach is suggested by the literature, which has consistently described three types of homelessness differentiated primarily by the characteristics of the homelessness experience (number of homeless episodes and length of homeless episodes; see following section). Moreover, recent longitudinal research using event history analysis techniques has suggested the existence of distinct types of shelter utilization, by rates of shelter discharge and reentry (Culhane & Kuhn, 1998). Thus, while the present study again applies the cluster analytic method to the question of homelessness typologies, the study parts from earlier research by clustering cases on shelter utilization variables only, and by subsequently validating the clusters by measuring differences among them on various background variables. This study also differs from prior research by using administrative data on homeless shelter utilization gathered by public shelter authorities in two large U.S. cities as the primary source for study variables. This permits measurement of cluster size and relative use of shelter days in a manner not available through standard cross-sectional survey research methods, while limiting *a priori* the quantity and depth of available background information.

A TYPOLOGY OF HOMELESSNESS

Attempting to account for the changing and varied faces of homelessness, a model has emerged that breaks case profiles of homelessness into chronic, episodic, and transitional patterns (Lovell, Barrow, & Struening, 1984; Morse, 1986; Fischer & Breakey, 1986; Koegel, 1987; Snow & Anderson, 1987; Rossi, 1986; Hopper, 1989; Sosin *et al.*, 1990; Jahiel, 1992). This model posits that the varying patterns of homelessness represent distinct case profiles, not only in terms of length of time homeless but also regarding the number of episodes of homelessness. This provides a more textured explanation of the intensity of homeless experience than one based either on duration or recidivism measures alone and exploratory work on the current data have indicated that such a model is necessary to classify shelter utilization patterns in these populations. Consider a brief sketch of the three homeless shelter usage patterns and the associated background characteristics described below, which for now, are hypothesized to apply to single adults without accompanying children (homeless families may fit a different typology).

The *transitionally homeless* population consists of those who generally enter the shelter system for only one stay and for a short period. They are

likely to be younger and are the least likely among the homeless to have mental health, substance abuse, or other medical problems. Such persons are probably recent members of the precariously housed population, who become homeless due to some catastrophic event (i.e., unemployment, separation, death of householder, utility disconnection, fire), and may have already exhausted the option of doubling up with friends or relatives (Weitzman, Knickman, & Shinn, 1990; Sosin *et al.*, 1990). They are forced to spend a short time in a homeless shelter before making a transition into a more stable housing arrangement, and in most cases they do not return to homelessness. Over time, persons in this cluster are expected to account for the majority of persons experiencing homelessness, given their higher rate of turnover (Burt, 1994; Culhane *et al.*, 1994; Culhane & Kuhn, in press). Such a client's shelter utilization profile would be characterized by one or very few homelessness episodes of less than a few weeks or months total.

The *episodically homeless* population comprise those who frequently shuttle in and out of homelessness, or the mediating institutions that house them (Farr, Koegel, & Burnam, 1986). Such people are also more likely to be young, but often experience medical, mental health, and substance abuse problems, and are often chronically unemployed. Much of the periods they spend outside of the shelter may be spent in hospitals, jails, detoxification centers, or on the street. Indeed, one could argue that part of the very reason that these individuals do not become chronically homeless or long-term shelter residents is their frequent exit to inpatient treatment programs, detoxification services, or to penal institutions (Culhane *et al.*, 1996). Nevertheless, these clients often find their way back to the shelters. These clients are likely to account for relatively fewer of the homeless over time than their transitionally homeless counterparts (Culhane & Kuhn, in review). Their homeless shelter utilization profile would consist of many episodes of shelter usage (even using a criterion of shelter exit of 30 days out of the system) with varying lengths of stay each time, but they are unlikely to accumulate more than a few months total of shelter use.

The *chronically homeless* population could be characterized as those persons most like the stereotypical profile of the skid-row homeless. These are people who are likely to be entrenched in the shelter system, and for whom shelters are more like long-term housing than an emergency arrangement. These clients are likely to be older than other clients, and consist of the hard-core unemployed, often suffering from disabilities and substance abuse problems (Cohen & Sokolovsky, 1989; Rossi, 1989a; Piliavin, Sosin, Westerfelt, & Matsveda, 1993). Such persons are likely to account for a far smaller proportion of the population over time than the transitionally homeless (Culhane & Kuhn, in press). Their stay profile would be characterized by fewer episodes of homeless shelter use than the episodic

group, but each episode is likely to last much longer, and, in some cases, may last many years.

These qualitative characterizations are but caricatures, but they represent the repeated observations of those experts who have experience with homeless populations. Despite the prevalence of these characterizations, there has been little effort to test them, largely because there have been few data sets of the size and scope necessary to detect firm groupings within the population of homeless shelter users. These conceptualizations have also been of limited benefit to policy and program planners, given that there is very little empirical evidence of their relative size or system resource consumption, which would be necessary for modeling effectively targeted program strategies.

METHOD

Data

Assembling a sufficiently large, longitudinal data archive of homeless shelter usage profiles in a prospective survey is extremely difficult, and retrospective surveys do not provide data of satisfactory quality for the type of cluster analysis in question. Alternatively, the present analysis takes advantage of administrative databases for tracking shelter utilization across the public shelter system of two large cities (see Culhane *et al.*, 1994, for a more detailed description). In 1986, the New York City Human Resources Administration instituted a system of client registration for all public homeless shelters for single adults. The system, called the Single Client Information Management System (SCIMS), has since collected demographic and other background profile variables for every new client who enters the system, as well as the dates of every entry into and exit out of the shelter system. As of November 11, 1995, they had collected records of 927,060 episodes for 148,834 clients. In addition to information on individual episodes of homelessness, this database includes variables for age, education, and gender, as well as indicators for mental health, substance abuse, and medical problems. It is important to note that these health indicators are based on self-report or interviewer determination. They therefore have an unknown reliability, and likely underidentify the presence of health conditions (in contrast, in Philadelphia, 9 years of local health records were merged with the shelter database to supplement the self-reported information; see Discussion below). Responses to queries regarding the presence or absence of a condition or treatment history are included in the initial intake interview, as is the option for an interviewer to make such an indi-

cation. While these data provide a systematic and universal coverage for city-funded facilities, they also exclude periods of street homelessness and the use of privately funded shelters (18% of bed total in 1992).

The New York data were processed to give all persons 3 years of exposure for shelter time, and to deal with problems of censoring of observations at both the beginning and end of the data collection period. The SCIMS database started in 1986, and many of the people who were recorded as having their first entry during the early years of the record keeping may have actually been in the shelter many times before the official registration process began. This left-censoring bias, which would cause some cases to show much less intense shelter utilization patterns than they do, could depict cases which may have had a chronic or episodic pattern as transitional cases, by missing unrecorded days and episodes. To minimize the effects of this problem, the records for anyone who was first entered into the database before 1988 are discarded. Thus, the only observations which may continue to be included with this problem would be those presumably few people who were in the shelter before 1986, and did not enter again until 1988. Similarly, to deal with right-censoring of data, which would arise when clients have different lengths of opportunity in which they could be observed as shelter clients, only clients who entered the system at least 3 years before October 1, 1995 (the end of the data) are included, thus allowing each person to have exactly 3 years of exposure to the possibility of homelessness. Fortunately, the extent of the database allows the censored records to be discarded without adverse effects on the sample size, still leaving 73,263 clients. Once the records are selected, the number of stays and total number of shelter days are collated for the first 3 years after entry into the system for each client. In this way, an equal amount of exposure for each client is observed. In keeping with other definitions of homeless episodes (Koegel & Burnam, 1994; Culhane & Kuhn, in review), higher order episodes are only considered to be distinct from previous episodes if the two stays are separated by 30 days. Stays separated by fewer than 30 days are counted only once and only days spent in the shelter are counted. Finally, both the episode and days variables are standardized to have a mean equal to zero and a variance equal to 1, thus avoiding an overwhelming effect of the days variable, which has a much higher mean and variance than the episodes variable.

A similar database was assembled for a similar client registration system maintained by the Office of Services to the Homeless and Adults (OSHA) in the City of Philadelphia from July 1, 1991 to October 1, 1995. Due to this shorter data collection period, only 2 years of data are included for the present analysis, and only 2 years of opportunity for accruing shelter stays, again to assure equal opportunity of stays for all persons. Again, the

data are left censored, in that shelter use prior to the initiation of the tracking system is not measured. These negative effects can be limited through the use of OSHA's homeless client registry, which recorded a client's first entry into the shelter from December 22, 1989 forward. Therefore, all clients who had an entry in the registry during the 19 months before the tracking system was implemented are excluded from the analysis, as are all persons entering after October 1, 1993 (to give all persons equal opportunity for 2 years of shelter). The final file consists of 6,897 clients.

The Philadelphia data set, while smaller than its New York counterpart, provides additional information since the client records for these observations have been matched to local databases on publicly reimbursed mental health and substance abuse treatment (including 9 years of data, 1985-1993, from Medicaid, community mental health programs, state hospitals, services to persons in jail, and so forth; see Culhane *et al.*, 1996), which provide much more comprehensive information on behavioral health history than would be available from self-report. In the case of both Philadelphia and New York City, analyses examine only individual homeless shelter clients, excluding for now *family* homeless databases, for which the client typology is likely to be theoretically distinct.

These analyses also, by necessity, exclude private facilities that are not tracked by the cities' public shelter authority, which Culhane *et al.* (1994) found to constitute 18% of the bed supply in New York City and 15% of the bed supply in Philadelphia. The Philadelphia data also exclude stays in the entry facility for single men, where men may cycle through for a series of one-night stays that are not tracked in the stay history file. Both of these factors would presumably produce an undercount of total days and episodes. The former would have an unknown differential impact on the various clusters, while the latter would likely reduce the number of persons in the transitional and episodic clusters.

Procedure

The method of analysis is cluster analysis, using the technique of *nearest centroid sorting* to construct unique clusters when given a set number of clusters. Although much of the obvious divisions in the shelter population's utilization profile can be understood through exploratory and descriptive analyses of stay patterns (see Culhane & Kuhn, in press), a cluster analysis provides well-defined and robust divisions between the groups in the shelter population which might not be picked up by an exploratory analysis. More important, it allows us to more readily test the reliability of the model and the appropriateness of our predetermined cluster specifica-

tions. The method employed in this model assigns a seed for each of the clusters, which begins the iterative sorting procedure as the center of each cluster. As the procedure progresses, cases are added in and the computer considers the difference between the given observation and the seed on each of two variables, squaring each difference, summing these squared differences, and taking the square root of this sum. This Euclidian distance can be examined spatially by picturing all of the observations mapped on a two-dimensional graph in terms of the two variables. Taking these Euclidian distances, the procedure allocates observations to given clusters while iteratively moving the centers of the cluster, to eventually achieve a group of clusters with the minimum sum of all the Euclidian distances between the observation points and their own cluster centers. While much more systematic the method is similar in spirit to looking at a graph of all the points and drawing circles around the main groupings on the graph. The clustering procedure produces the most closely associated model of group divisions within the constraints of the user's specification of the number of clusters and the scaling of the variables. This use of Euclidian distance means that variations in observations which are measured into the hundreds, like days (maximum 1,095 for New York, 730 for Philadelphia), can swamp the effects of a measure like stays (max. 14 for New York, 10 for Philadelphia). It was therefore necessary to rescale these variables. In this case, we rescaled the variables so that their value and variance were the same while the variation within the measure was maintained qualitatively. Both variables were rescaled such that the mean was zero and the variance was 1, although the actual values for the mean and variance of the newly scaled variables should not matter as long as the variables have the same mean and variance.

To employ the nearest centroid method, *PROC FASTCLUS* from the Statistical Application System was used. This procedure is particularly useful in such large data sets, as it employs a method for initializing the seeds for each cluster such that few iterations of the procedure are required. As seen in the next section, with such large data sets this is necessary, and it results in no loss of effectiveness in the clustering. Additionally, this procedure is relatively insensitive to outliers, which could be important in this data set (for more information on procedures of clustering, see SAS Manual; Anderberg, 1973; Sokal & Michener, 1958).

In the current model, clusters are developed specifically based upon the hypothesis of three distinct clusters of homeless shelter clients, using a two-dimensional mapping based upon number of episodes in a period versus number of cumulative shelter days in that same period. Although the imposition of a three cluster model (vs. another number of clusters) may seem arbitrary, the strong theoretical basis for the three cluster model

establishes the need to test such a model. Additionally, some kind of constraint must be specified to achieve a usable model, either in terms of some kind of criteria based on the Euclidian distance or based on number of clusters. Since we are testing a particular model and since there is no theoretical basis available for developing clustering criterion for the differences between clients' number of episodes and days, we choose to specify a distinct number of clusters. Having formed the distinct clusters, they are plotted in terms of days and episodes, distinguished by their cluster membership, and descriptive characteristics are presented to show how the size and spread of clusters. Then the clients' records are compared in cross-tabulations based upon cluster membership and important variables regarding demographic, social, and psychological background.

RESULTS

Clusters by Stay History

Testing a cluster model on the data from New York and Philadelphia revealed clusters which qualitatively fit the theoretical case profiles. The three clusters have the expected mean case profiles based on the model (Table II) and these should be discussed in further depth after assessing the reliability of the cluster solutions. Thanks to the large size of the New York data set, it is possible to conduct simple tests of reliability on subsamples of the data. The data set was divided into two subsamples, on which the same clustering procedure was conducted with seeds determined by the computer. The means of the two subsamples show that the means of days and stays between the same clusters on the different subsamples all show less than 2% difference between them (Table II). Following Rapkin and Luke (1993), a discriminant analysis was conducted on the first subsample, predicting cluster in terms of the standardized variables for days and stays. Then, to test the level of misspecification, the discriminant model from the first subsample was used to predict cluster membership on the second subsample and these predictions were compared to the solution produced by the cluster model of subsample 2 (Table II). These tests show that the clusters are robust, with 99.1% of the total observations (99.4% transitional, 96.1% chronic, 99.1% episodic) being placed in the proper clusters of subsample 2 based on the results from subsample 1.

Having established that the clusters are reliable and can be replicated, each cluster should be described in terms of the shelter pattern and the size of the group. First, regarding the New York data, Figure 1 depicts the stay profiles of each client in terms of STAYS and STAYTIME, distinguish-

Table I. Basic Tabulations of New York and Philadelphia Analysis Populations in Percentages

Variable	New York	Philadelphia
Sex		
Male	81.6	82.5
Female	18.4	17.5
Age		
<30	35.4	68.3
30–49	56.0	24.4
>50	8.6	7.2
Race		
Black	64.1	87.6
White	12.2	7.6
Hispanic	22.4	3.8
Other	1.3	1.0
Self-reported disabilities		
Mental illness	8.3	4.4
Medical illness	16.2	16.4
Drug abuse	31.0	38.2
Diagnosed disabilities		
Severe mental illness		8.0
Severe substance abuse		23.6
Other mental illness		6.7
Military veteran		9.6

Table II. Cluster Sizes and Means for Subsample Cluster Models—New York

	Transitional	Episodic	Chronic
Subsample 1			
Sample size	29,553	3,202	3,788
Average No. of episodes	1.36	4.89	2.26
Average No. of days	57.3	260.5	630.3
Subsample 2			
Sample size	29,760	3,416	3,544
Average No. of episodes	1.36	4.86	2.26
Average No. of days	57.8	265.4	634.8

ing cluster membership, and Table III shows basic measures of the cluster model. These clusters seem to correspond to the typology suggested earlier. Looking at the plot, a group resides in the lower left-hand corner of the graph, indicating transitionally homeless clients. As shown in Table II, this

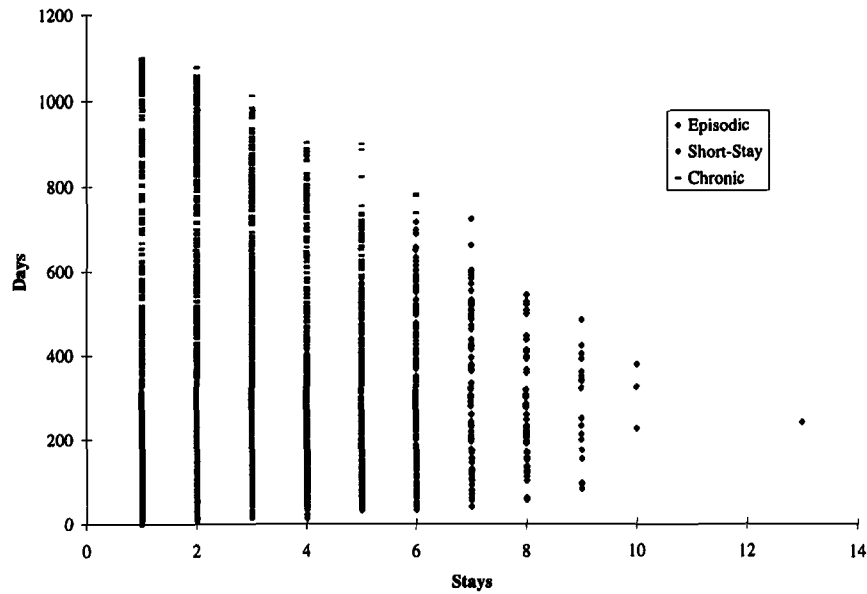


Fig. 1. Cluster distribution map—days vs. stays: New York.

Table III. Cluster Sizes and Means for Subsample Cluster Models—Philadelphia

	Transitional	Episodic	Chronic
Subsample			
Sample size	2,715	432	314
Average No. of episodes	1.19	3.82	1.51
Average No. of days	20.5	74.5	254.2
Subsample 2			
Sample size	2,700	374	362
Average No. of episodes	1.20	3.87	1.54
Average No. of days	20.4	71.6	250.5

cluster, based on measures of within-cluster standard deviation and maximum distance from the cluster seed to the farthest observation, is the smallest cluster in terms of the portion of the graph which it covers. This can also be borne out by the map, which shows that this group is relatively homogenous in terms of the number of episodes and days in the shelter, relative to the other clusters. Looking at summary statistics, these clients

experience an average of 1.4 stays over the 3-year period, for a total of 58 days on average over the 3 years. The average length of each episode, weighted by number of stays per client, is 42.4 days. Although this cluster includes the narrowest range of days and stays, they makes up a large majority of the population, comprising of 59,367 people (81.0%) of the total sample of 73,263.

In the lower right portion of the graph lie the episodic clients, with many more stays than the transitional clients, and also more days, but roughly the same number of average days per stay as the transitionally homeless. This cluster accounts for a great deal of the range on the graph in terms of number of episodes, but the range of stay lengths is more limited than with the chronically homeless clients. And although there are some episodic clients who logged over a year's worth of shelter days in the 3 years of observation, a large majority of them spent less than 1-year in the shelter. The means for the episodic cluster indicate an average of 4.9 distinct shelter episodes in 3 years (Table IV) logging a total of 264 shelter days, for an average episode length of 54.4 days. This profile represents 6,700 members of the New York sample, or 9.1%. This cluster represents clients with from 3 to 14 stays in a 3-year period, with a stay length ranging from 1 to 895 days.

In the region of the graph with many more days logged than the transitional group lies the long stay, or chronically homeless cluster, with a lower average number of stays at 2.3, but with many more days logged in the system, with a mean of 638 days total. This gives this group an average episode length of 281 days. This group also covers a great deal of ground on the graph, and although the range of the episodic cluster is wider, the within-cluster standard deviation is the greatest for this group, indicating that the variation of shelter use is wider spread. The chronic cluster's range covers an area from a lone episode to six episodes with stay lengths from 317 to 1095 days, the last figure indicating the entire span of the database. This cluster represents 7,196 clients, or 9.8% of the database.

Table IV. Cluster Statistics for Model—New York

	Transitional	Episodic	Chronic	Total
Sample size	59,367	6,700	7,196	73,263
Percentage of clients	81.0	9.1	9.8	100.0
Average No. of episodes	1.36	4.85	2.27	1.77
Average No. of days	57.8	263.8	637.8	133.6
Average days per episode	42.4	54.4	280.9	75.4
Client days	3,432,785	1,767,292	4,589,946	9,790,023
Percentage of client days	35.1	18.1	46.9	100.0
Ratio % days/% clients	0.43	1.97	4.77	1.00

This wide spread in the distribution of days of homelessness among the chronically homeless group and in episodes among the episodically homeless could mean one of two things. It may indicate that these two groups are more diverse populations because they represent such a wide range of homeless shelter experiences. Otherwise, if these groups are no more diverse in their backgrounds and experiences than the transitionally homeless, it might indicate that, at a certain extent of shelter experience, there is little heterogeneity between clients, even when the variations are on the order of hundreds of days and several episodes in only a 3-year period. This is an important issue to look at but this paper is restricted to looking at between-cluster differences. What should be noted now in terms of group utilization composition is that while the transitional population represents a vast proportion of the clients among the observation group, another way to consider a group's impact on the system is based on the number of shelter days consumed by each group. Under this measure, the numbers are more balanced. In total, all shelter users in this study population (those who entered the system in 1988 or later) used 9.8 million shelter days in the 3-year observation period. Of these days, the chronic stayers, with their longer stays, represent 4.6 million days (46.9%) compared to 3.4 million for transitional clients (35.1%) and 1.8 million (18.1%) for the episodic population. The ratio of proportionate days to proportionate users is 4.8 for the chronic, 2.0 for the episodic, and 0.43 for the transitional clusters. The chronic stayers are very heavy users of total bed days per person, and combined with the episodic group, consume two thirds of all shelter days.

Turning next to the much smaller Philadelphia database reveals a qualitatively similar pattern to the New York model. Although the shorter period of observation for this model (2 vs. 3 years) caused a difference in the magnitude of numbers of stays and days, the proportions are strikingly comparable (Table V). (These data exclude the short-stay entry facility for single men.) To test this, a discriminant analysis similar to that used to assess the reliability of the New York cluster solution was conducted to test the similarities between the cluster solution for the New York and Philadelphia data (Table III). A subsample equal in size (6,897 cases) to the Philadelphia sample was taken from the New York sample and a cluster model was then tested on this sample using the same methods. Discriminant analysis was applied to the New York cluster solution using the standardized variables and these predictions were then applied to the Philadelphia cluster solution. Table I shows the striking result that between solutions, the proportion of observations from all clusters which matched between datasets was 99.6%. Additionally, to test the internal reliability of the Philadelphia cluster solution, a subsample cross-validation was conducted as well. These results show highly similar cluster case-profiles, with

Table V. Cluster Statistics for Model—Philadelphia

	Transitional	Episodic	Chronic	Total
Sample size	5415	805	677	6897
Percentage of clients	78.5	11.7	9.8	100.0
Average No. of episodes	1.19	3.84	1.53	1.54
Average No. of days	20.4	72.8	252.4	49.3
Average days per episode	17.1	18.9	164.8	32.1
Client days	110,674	58,599	170,878	340,151
Percentage of client days	32.5	17.2	50.2	100.0
Ratio % days/% clients	0.41	1.97	5.12	1.00

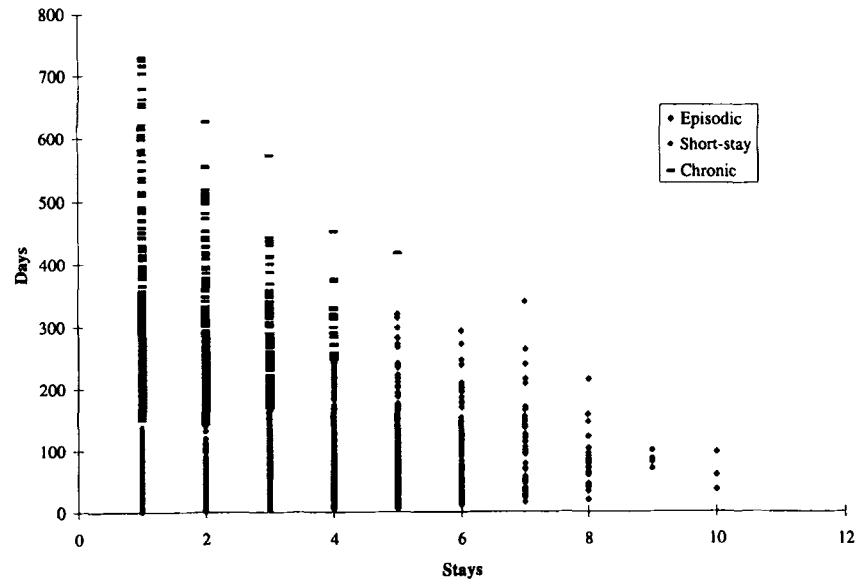


Fig. 2. Cluster distribution map—days vs. stays: Philadelphia

all values of episodes and days varying less than 2% between samples. The discriminant cross-validation (Table IV) showed a 99.3% overall match (99.8% transitional, 95.3% chronic, 100% episodic)

Looking at the qualitative picture of the cluster solution for Philadelphia, we turn to Figure 2 for the map of these clusters and Table V for the summary statistics. The transitional cluster again constitutes a vast majority of the clients, accounting for 5,415 people out of the total of the total 6,897 clients (78.5%). These clients remain in the shelter for 1.19 stays on average, logging 20.4 days of shelter time, with an average episode

length of 17.1 days. The measures of spread (Table II) and the map once again establish this as the smallest of the three clusters in terms of spread.

The episodic group, once again in the lower right portion of the graph, represents 805 people, or 11.7% of the population. These clients averaged 3.84 episodes in the system for 72.8 days, with 18.9 days per episode. Their stay patterns range from 3 to 10 stays and from 3 to 320 days. The 677 members of the chronic group (9.8% of total), in the upper left-hand corner, average only 1.53 stays, but spend an average of 252 days in the system total, with 165 days per episode. Covering the most ground spatially based on all provided measures, the members of this cluster range in shelter experience from 1 to 5 stays and from 132 to 730 days (the entire 2 years).

The intercluster breakdown of system resource consumption in terms of shelter *days* mirrors that of the New York system. Of 340,151 days, chronic stayers consume 170,878 days (50.2%), transitional stayers use 110,674 days (32.5%), and episodic clients take up 58,599 days (17.2%). The ratio of proportionate days to proportionate users by cluster is also strikingly similar to that in New York: 5.1 for the chronic, 1.5 for the episodic and 0.41 for the transitional clusters.

Clusters by Background Variables

Having established three distinct clusters of homeless shelter clients, they were compared in terms of background characteristics (Table VI and VII). This process shows that the clusters differ in background characteristics and treatment profile, thus establishing the validity of the cluster model and demonstrating the importance of understanding the different clusters in terms of their differing background. In New York, looking first at demographic variables, namely, ethnicity, gender, and age, significant results bear out when comparing ethnicity by cluster (Black/non-Black).² Not only are only a large proportion of clients Black (62.4%), but they are further overrepresented in the chronic homeless population (71.3%) and especially the episodic (73.8%). Looking at gender, the results show no significant difference between the clusters.

The age distribution shows sharp disparity between the chronic population and the other two populations. Over 1.5 times as many of the transitional and episodic clients are under age 30 as chronic stayers (36.3 vs. 23.2%). Looking at the other end of the age distribution, 13.9% of the chronic population is over age 50 compared to only 8.3% of transitional

²For the sake of simplicity, we henceforth refer to the chronic, episodic, and transitional clusters, as determined by the results of the previous section.

Table VI. Background Characteristics by Cluster: Percentage of Cluster in Given Category—New York

	% Transitional (<i>n</i> = 59,367)	% Episodic (<i>n</i> = 6,700)	% Chronic (<i>n</i> = 7,196)	Three-way χ^2 ^{2a}	Episodic vs. chronic χ^2 ^{2b}
Demographic					
Black	83.6	90.5	92.9	749.2	10.6
Male	81.5	81.8	82.3	3.2	0.6
<30 years	36.1	37.7	23.2	497.7	345.8
>50 years	8.3	6.3	13.9	309.8	221.7
Disabilities					
Mental illness (MI)	6.5	11.8	15.1	826.2	32.0
Medical	14.2	19.8	24.0	563.8	35.2
Substance abuse (SA)	28.2	40.0	37.9	613.8	6.0
SA or MI	31.8	44.9	45.4	884.8	0.4
SA and MI	2.9	6.9	7.7	605.9	3.5
MI or Medical	18.2	27.2	33.4	1115.9	64.2
MI and Medical	2.5	4.5	5.7	280.6	11.0
Medical or SA	36.0	49.1	50.3	887.8	2.0
Medical and SA	6.4	10.6	11.6	385.4	3.6
Any of three	38.4	52.6	55.4	1145.0	10.9
All three	1.3	3.0	3.3	260.5	1.4

^aChi-square tests between all three clusters have 2 degrees of freedom ($p < .05$ if $\chi^2 = 6.0$).

^bChi-square tests between episodic and chronic have 1 degree of freedom ($p < .05$ if $\chi^2 > 3.8$).

stayers and 6.3% of episodic stayers. It should be noted though, that while the tails of the age distributions for each cluster differ, the modal ages for each cluster do not differ much (32 for transitional, 31 for episodic, 34 for chronic). Additionally, a similar proportion (39, 40, 38%, respectively) of each cluster are in the 30–39 age group.

Turning to issues of behavioral health also introduces important effects. Although 30.3% of all clients report or are determined to have substance abuse problems, an even larger number of the chronically homeless (37.9%) and a significantly larger number of episodically homeless (40.0%) have a positive substance abuse indicator, compared to only 28.2% of the transitionally homeless. The results for the indicator of mental health problems show an even sharper disparity. Though only 7.8% of the transitionally homeless have a mental health indicator, this proportion rises to 11.8% for the episodically homeless and to 15.1% for chronically homeless. A similar pattern emerges for the indicator of poor medical health, where chronically and episodically homeless are on average 1.5 times as likely to report medical problems as transitionally homeless clients.

Table VI also combines the prevalence of these indicators among the clusters, presenting proportions in each cluster who report any of the given

Table VII. Background Characteristics by Cluster: Percentage of Cluster in Given Category—Philadelphia

	% Transitional (<i>n</i> = 59,367)	% Episodic (<i>n</i> = 6,700)	Chronic (<i>n</i> = 7,196)	Three-way χ^2 ^a	Episodic vs. chronic χ^2 ^b
Demographic					
Black	83.6	90.5	92.9	55.0	2.45
Male	83.1	91.7	71.1	103.0	97.6
<30 years	28.4	34.5	29.7	12.6	3.9
>50 years	7.6	6.2	9.0	4.1	4.2
Veteran	8.4	12.6	15.6	43.8	2.5
Self-reported disabilities					
Mental	3.4	6.4	5.3	18.3	0.7
Medical	14.0	18.7	28.7	98.5	19.0
Substance abuse	31.2	50.5	69.5	424.6	51.3
Treatment match disabilities					
Substance abuse (SA)	26.5	44.5	33.0	105.0	19.2
Severe mental illness (SMI)	7.8	9.9	8.6	4.1	0.7
Other mental health	6.1	7.0	12.1	28.3	10.6
SA and SMI	4.1	6.5	4.6	9.3	2.5
SA or SMI	44.0	62.6	74.9	295.5	25.6
Combined levels					
Any drug diagnosis	40.4	59.1	70.2	283.0	19.5
Both drug diagnoses	12.3	22.0	24.2	101.0	1.0
Any mental diagnosis	14.5	17.0	21.3	22.7	4.3
Both mental diagnosis	1.9	3.7	3.8	28.1	0.01
Any diagnosis	49.1	65.5	83.2	327.5	59.2

^aChi-square tests between all three clusters have 2 degrees of freedom ($p < .05$ if $\chi^2 = 6.0$).

^bChi-square tests between episodic and chronic have 1 degree of freedom ($p < .05$ if $\chi^2 > 3.8$).

difficulties along with cases of multiple diagnoses. Looking at the interaction between mental health problems and substance abuse, which are commonly thought to coincide, while 31.8% of transitional clients report either of these problems, 44.9% of the episodic cases, and 45.4% of chronic cases report at least one. Looking at the intersection of these indicators, 6.9% of episodic and 7.7% of the chronic cases are indicated with both problems, compared to only 2.9% of transitional clients. Finally, those people who report or are determined to have any of the three problems constitute 55.4% of the chronic homeless population to 52.6% of episodic cases, and a lower but still noteworthy 38.4% of the transitionally homeless population (again, indicators are not based on standardized diagnostic interviews but on self-report and interviewer determination, and are therefore likely underestimates of the prevalence of these conditions).

Although the data from Philadelphia contain far fewer observations, they do contain more detailed background variables (see Table VII). In terms of the gender breakdown of the Philadelphia system, there are many fewer women in the episodic group (8.3%) than in the transitional group (16.9%). Unexpectedly, though, women make up 28.9% of the chronic population.

The ethnic composition of the Philadelphia system also shows significant differences between the clusters, while showing the striking ethnic composition of the system. Again, the smallest percentage of Black clients exists in the transitional group, which is 83.6% Black. This compares to 92.9% of the chronic group and 90.5% of the episodic group. While there are significant differences in the number of White members in each cluster, it is clear that White people make up a very small portion of all subgroups of the Philadelphia shelter population.

Looking at the age distribution of the Philadelphia clusters, there is not much intercluster difference. Although the differences between clusters are significant, they are small, and the modal ages for the clusters are 32 for chronic and 31 for the other two clusters.

Turning to behavioral health issues, this analysis includes both shelter records (self-report or interviewer observations) and the results of matches to 9 years of public mental health and substance abuse treatment records (Medicaid, community mental health programs, state hospitals, services in jails, etc.; for more details, see Culhane *et al.*, 1996). Based on the shelter's interview indicator alone, a significant difference can be detected between clusters based on a chi-square test for mental health problems. Of the transitional group, 3.4% were indicated as having mental health problems, compared to 6.4% of the episodic homeless and 5.3% of the chronic homeless; the difference between the episodic, and chronic groups is not significant. Looking at the matches to treatment records, significance is not found regarding measures of severe mental health problems (schizophrenia and affective psychosis) (7.8% transitional, 9.9% episodic and 8.6% chronic), but the chronically homeless do show a higher rate of treatment for "other" mental health disorders (6.1% transitional, 7.0% episodic, 12.1% chronic) (all diagnostic clusters based on most frequently occurring diagnosis).

A more striking difference between clusters appears in the populations' substance abuse indicators. In the shelter's own indicator of substance abuse, there is much more evidence of substance abuse among chronic and episodic shelter clients (69.5 and 50.5%, respectively) than among transitional clients (31.2%), but a generally high rate of substance abuse pervades. Measures of substance abuse based on the treatment databases show a similarly high level but show a reversed pattern in terms of chronic versus episodic, with episodic clients having a significantly higher rate of treatment

(44.5%) than the chronic clients (33.0%). Overall, the Philadelphia population has a high rate of any behavioral health condition (treated or indicated), with 49.1% of the transitional, 65.5% of the episodic and 83.2% of the chronic having any such condition.

There is also a strongly significant result regarding medical conditions, with a gradient from the lowest percentage for transitional stayers to the highest for chronic stayers. There is also a strong military veteran status effect, showing a higher proportion of veterans among the chronic and episodic groups than among the transitional group. The results do not show a significant gradient for rates of pregnancy once variations in the female population of the clusters are controlled.

DISCUSSION

As stated in earlier sections, it is obvious that three distinct clusters can be formed from these data, since the analysis was constrained to produce three clusters. What is interesting is that these clusters formed in the expected pattern and this pattern was replicated between subsamples and between the two data sets. When these cluster solutions were compared internally and compared between the two data sets, they were found to be quite robust. We find a cluster consisting of those who used the shelter for a short time, presumably as a time to recover from a temporary emergency; a cluster of episodic clients, who move in and out of the shelters frequently, possibly alternating shelter stays with bouts of street homelessness, hospitalization, and incarceration; and a cluster of chronic stayers who rarely leave the shelter over long periods. Although the transitional cluster has by far the most members, the impact of chronic clients on the overall shelter load in the homeless shelter system strongest. Having formed these clusters as expected, with stay profiles consistent with expectations, the most interesting question asks whether these case profiles are associated with certain background characteristics. In this regard, strong, theoretically consistent results are found.

In terms of demographic factors, some consistency with common profiles of the homeless shelter populations is shown. The chronic client is more likely to be non-White, and to be much older in terms of the tails of the age distribution. The transitional and episodic are more likely to include younger persons, with the episodic more likely to include non-White persons than the transitional. The overall low proportion of White persons to use shelter in both cities is noteworthy. Perhaps equally as important, there are significant differences in the different shelter populations in terms of background characteristics, especially regarding health, mental health,

and substance abuse. The New York data show a gradient from transitional group, up to episodic, and up to chronic in terms of all of these indicators. In the case of all three indicators, the homeless population shows an above average prevalence of these indicators, but among the chronic population, the prevalence of any of these problems is very high, at 55% for New York. In Philadelphia, where more comprehensive data on behavioral health are available (actual treatment records spanning 9 years), nearly all of the chronically homeless (83%) and most of the episodically homeless (66%) have either a mental health or a substance abuse indicator or prior treatment, as do almost half of the transitionally homeless (49.1%), and in each case, substance abuse is overwhelmingly the most common condition. The models also act as an interesting test of results from earlier work on the Philadelphia data (Culhane *et al.*, 1996), which suggested the possibility that the episodically homeless population could have as high or higher prevalence of mental health and possibly substance abuse problems as the chronically homeless, since frequent hospitalizations would lend more to an episodic pattern of homelessness. The New York data contradict this suggestion, showing higher prevalence of mental illness and substance abuse among the chronic population. The Philadelphia data, which are more reliable since they are based upon treatment data rather than self-report, show support for this in terms of a significantly higher substance abuse *treatment* history among the episodic population, and no significant difference between chronic and episodic in terms of the shelter's mental illness indicator and the measure for treatment of severe mental illnesses.

The most interesting finding regarding these issues in the two systems involves mental health status. As mentioned earlier, New York's system shows a steep gradient in mental illness between the groups, whereas the differences in the Philadelphia population are not significant. The result could mean that the mental health system in Philadelphia is achieving its goal of keeping those persons with severe mental disorders who do become homeless from making a career of homelessness. An important test of these possibilities would involve looking at inpatient records following episodes of homelessness to see if there are lower rates of shelter recidivism following hospitalization (Averyt, Kuno, Rothbard, & Culhane, *in press*). The higher rate of "other mental disorders" among the chronic stayers could mean that such persons are not deemed sick or disabled enough to warrant hospitalization or to receive priority for other interventions, including residential programs, by the local mental health authority (see also Culhane, Averyt, & Hadley, *in press*).

This paper, while employing similar methods to previous cluster analyses of homelessness, is different from those other papers. While those papers were based upon small but intense retrospective studies of all kinds

of homelessness, these data are from large administrative databases covering only the sheltered population. Previous studies have tried to develop categories of homelessness based upon case history profiles and background and treatment characteristics all in the same model. This study, on the other hand, seeks to cluster only case profiles in a simple, yet theoretically based manner, and then validate whether these different case profiles have meaning in terms of demographic and treatment factors.

An important distinction of this research compared to previous applications of the cluster analysis approach is its advantage in producing clusters by both shelter days and stays variables. Looking at the cluster graphs, the apparent difference is clear in producing a more complex model. Many members of the transitional stay cluster actually logged more days than episodic clients, but none of them logged more shelter episodes. Among episodic clients, it is possible to log both more days and stays than chronic clients. So the clusters are determined jointly by days and episodes, thus giving the results much more texture than a one dimensional model. In terms of the background characteristics, the differences in levels of background indicators are by no means universally gradated in the same way as the mean stay time for each cluster, giving more meaning to the two-dimensional nature of the clusters. The most obvious example of this fact is seen in the analysis of substance-abuse treatment data in Philadelphia, where levels are similar for the chronic and transitional groups, but much higher for the episodic group. This is not surprising based on the literature which suggests that substance abusing homeless may be typified by stays in shelters frequently interrupted by stays in jail, detoxification centers, and hospitals, and who may be more likely to be involuntarily discharged from shelter for violations of shelter rules (Philadelphia has a "clean and sober" policy among shelter users).

From a policy and program-planning perspective, this study suggests that efforts designed to reduce homelessness would be more efficient and potentially more effective if they were tailored and targeted by cluster. For example, the transitionally homeless, by far the largest cluster, appear to be in less need of highly structured residential programs to reduce their residential instability, given their apparent capacity for independent living, as evinced by a relatively low level of shelter utilization and low rate of readmission. Accordingly, programs designed to assist the transitionally homeless might be less residential in emphasis (at least beyond emergency shelter), but would emphasize community-based homelessness prevention and housing transition services designed to assist persons moving between jobs or housing arrangements, and/or seeking treatment for behavioral health, problems. By intervening earlier in the process of residential instability, such efforts could also yield benefits in reducing the number of peo-

ple who go on to become episodically and chronically homeless as well. However, the sheer size of this group also raises questions about the sufficiency of the current "safety net," and about whether "homelessness prevention" should be conceived more broadly as a fundamental function of the larger system of income, employment, health and housing supports.

The needs of the episodic homeless may be more complicated in that they appear to be in need of more structured housing opportunities that include health and social support services. Such persons seem to be the logical target for transitional housing and residential treatment programs, some of which are currently targeted more generically for homeless persons. The relatively greater cost of such services and this cluster's smaller size both argue for the potential value of careful targeting for such programs. Some incentive for maintaining or even expanding such programs may be found in the savings that they might yield in terms of other system costs (hospitals, jails, street homelessness). Future research should investigate this possibility.

The chronic shelter users, though a relatively small and finite population, consume nearly half of the shelter days, and, therefore, targeted programming seems both potentially beneficial to the clients and effective in reducing shelter system costs. For this group, the shelter system is not acting in its "emergency" capacity, but is serving as a long-term housing arrangement. The appropriateness of this utilization pattern should be evaluated. For example, such persons may benefit from alternative long-term housing options, including supported housing, SROs, subsidized rental housing, and, in some cases, board and care or nursing facilities. By transferring chronic shelter stayers to other community housing programs, more emergency resources would be available for their intended function.

This study is limited by its reliance upon administrative data for recording periods of homelessness and for measuring the characteristics of shelter users. While the Philadelphia shelter records have been supplemented by 9 years of treatment records, and therefore provide more reliable indicators of health status, none of the study data are based on structured diagnostic interviews. Periods of "street homelessness" are also not captured, and may reveal that members of the episodic and transitional clusters are indeed chronically homeless but use shelters less consistently. This study was also restricted to single adults without accompanying children, so the results do not apply to persons in homeless families, who represent approximately 60% of the sheltered population in both cities. Last, this study's results were based on data from Philadelphia and New York City, and may not be generalizable to other jurisdictions, particularly smaller cities and towns. Areas that have maximum shelter stay limits also have very different results than found here (neither of these cities have maximum shelter stay limits). It is noteworthy that both of these shelter systems have evolved through a series

of local policy initiatives, laws, court enforced standards, and consent decrees that may affect the study results (see Culhane, 1992, and Culhane, Metraux & Wachter, in press, for more detailed descriptions). However, the cluster profiles in both cities share many features, despite significant differences in service system configuration and history.

Conclusion

The paths in homelessness are clearly different for the chronic, episodic, and transitional populations, as identified by the present study procedures. The shelter stay is generally but one step in a process of economic and social trauma, followed by possible recovery or continued descent. Yet the shelter stay can be an important period, since it is a time when the homeless can be reached. The transitionally homeless population, with substantially less behavioral and physical problems, have less need for highly structured residential services than populations with more such problems, and in these cases, short term support, treatment, and community placement measures may be appropriate. Additionally, populations who tend to shuttle in and out of homeless shelters for short periods should be targeted differently than the population who are permanent fixtures in shelters. Each group poses significant societal costs and obligations, and the ways in which they are addressed should reflect the differences in the needs of the respective populations.

Policy makers need to study further the needs of these different populations, and social scientists could support such efforts by investigating how these populations become homeless, and how homelessness and homeless services affect them. Because the present study is limited to the analysis of administrative data on public shelter utilization, future research should also explore the extent to which these typologies would be affected by the inclusion of homelessness experiences outside of public shelters.

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