March 2000

Measurement Properties of the Center for Epidemiologic Studies--Depression Scale in a Homeless Population

Yin-Ling I. Wong
University of Pennsylvania, iwong@sp2.upenn.edu

Postprint version. Copyright American Psychological Association. Published in *Psychological Assessment*, Volume 12, Issue 1, 2000, pages 69-76.
Publisher URL: http://dx.doi.org/http://10.1300/J147v25n04_02

Measurement Properties of the Center for Epidemiologic Studies--Depression Scale in a Homeless Population

Abstract
The measurement properties of the Center for Epidemiologic Studies—Depression Scale (CES–D; "L. S. Radloff, 1977") were evaluated in a probability sample of homeless adults residing in a large and demographically diverse community. The findings from this investigation suggest that the CES–D is a reliable measure of depressive symptoms among homeless adults and that the factor structure of the scale replicates the factor structure found in the general population. Change in the CES–D scores was associated with change in residential status, with participants who had made a transition from homelessness to regular domicile, reporting significantly lower levels of depressive symptomatology. This result indicates the scale's sensitivity to current depressive mood, as affected by significant life events encountered by homeless persons.

Comments
Postprint version. Copyright American Psychological Association. Published in *Psychological Assessment*, Volume 12, Issue 1, 2000, pages 69-76.
Publisher URL: http://dx.doi.org/http://10.1300/J147v25n04_02

Psychological Assessment
2000, Vol. 12, No. 1, 69-76

1040-3590/00/$5.00 DOI: 10.1037//1040-3590.12.1.69

Measurement Properties of the Center for Epidemiologic Studies—Depression Scale in a Homeless Population

Yin-Ling Irene Wong
University of Pennsylvania

The measurement properties of the Center for Epidemiologic Studies—Depression Scale (CES–D; L. S. Radloff, 1977) were evaluated in a probability sample of homeless adults residing in a large and demographically diverse community. The findings from this investigation suggest that the CES–D is a reliable measure of depressive symptoms among homeless adults and that the factor structure of the scale replicates the factor structure found in the general population. Change in the CES–D scores was associated with change in residential status, with participants who had made a transition from homelessness to regular domicile, reporting significantly lower levels of depressive symptomatology. This result indicates the scale's sensitivity to current depressive mood, as affected by significant life events encountered by homeless persons.

Depression is considered an important public health problem because of its relatively high prevalence in the general population (Dean, Lin, & Ensel, 1981; Clark, Aneshensel, Frerichs, & Morgan, 1981; Eaton & Kessler, 1981; Lewinsohn, Seeley, Roberts, & Allen, 1997) and its empirically established association with suicidal attempts, prolonged social isolation, and poor physical health (Beck, Brown, & Steer, 1989; Lin & Ensel, 1989; Radloff, 1977). One of the most frequently used self-report depression symptom scales is the Center for Epidemiologic Studies—Depression Scale (CES–D; Radloff, 1977). The scale was developed for use in studies of the epidemiology of depressive symptomatology in the general population and has been shown to have desirable psychometric properties, including good internal consistency, acceptable test–retest reliability, demonstrable sensitivity to significant life events, and high correlation with clinical diagnosis of depression (Lewinsohn et al., 1997; Myers & Weissman, 1980; Radloff, 1977; Radloff & Locke, 1986; Zimmerman & Coryell, 1994).

Recent investigations have used the CES–D scale to examine the prevalence and correlates of depression in the homeless population. Using a threshold score of 16, which represents the lowest score of the upper quintile of scores of the general population, indicating the presence of possible clinical depression, these studies reported the prevalence of depression in the homeless population (45%–80%) to be between two and four times the rate in the United States general population (Koegel & Burnam, 1992; Ritchey, La Gory, Fitzpatrick, & Mullis, 1990; Robertson & Winkleby, 1996; Rossi, Fisher, & Willis, 1986). The elevated level of depressive symptoms is not an unexpected result given the profound physical deprivations and social isolation associated with the homeless condition and the high incidence of psychiatric disorders among members of this population (La Gory, Ritchey, & Mullis, 1990). A finding of significant and positive relationship between depression and suicidal thoughts in a study of homeless shelter dwellers (Schutt, Meschede, & Rierdan, 1994) nevertheless calls for the attention of policy makers and service providers to address depression as one of the most prevalent but often neglected mental health problems facing this population.

These significant findings notwithstanding, it is important to note that the psychometric appropriateness of the CES–D as a measure of depression for homeless persons has often been assumed, but rarely tested. Only one study to date reported the internal consistency of the scale in a homeless sample (La Gory et al., 1990). Given the extreme environmental stresses, it may be argued that the particular settings in which homeless persons frequent, as well as the unstable circumstances and traumatic experiences associated with day-to-day living on the streets, are potential confounding factors undermining the reliability and validity of the depression measure.

Another measurement issue involves the comparability of the factor structure of the CES–D scale between the domiciled and homeless population. Previous exploratory and confirmatory factor analyses have identified four separate, correlated latent factors of the CES–D scale in the general population: Depressed Affect, Somatic Symptoms, (Lack of) Well Being, and Interpersonal Difficulties (Gatz & Hurwicz, 1990; Hertzog, Van Alstine, Usala, Hultsch, & Dixon, 1990; Radloff, 1977; Roberts, 1980; Ross & Mirowsky, 1984). No study to date has examined the factor structure of the CES–D when used with the homeless population. To the extent that the scale's factor structure when used with the homeless population mirrors that found in the domiciled population, the comparability of depressive symptom scores of the two populations may be considered conceptually meaningful.

Furthermore, none of the published studies provided prospective data that tracked change in depressive symptoms of homeless persons over time as well as the transition of their living arrangements. In the absence of longitudinal tracking information, the extent to which depressive symptoms are associated with change in homeless–domicile status of homeless individuals remains unknown. It may be expected that homeless persons who have successfully made a transition to the domicile status are more

Correspondence concerning this article should be addressed to Yin-Ling Irene Wong, School of Social Work, University of Pennsylvania, 3701 Locust Walk, Philadelphia, Pennsylvania 19104–6214. Electronic mail may be sent to iwong@ssw.upenn.edu.

likely than those who have not to experience discernible improvement in psychological well-being.

Research Questions and Hypotheses

The purpose of this research was to conduct an assessment of the measurement properties of the CES–D scale when used with an adult homeless population. In this study, I examined the reliability and factor structure of the scale as well as the association between levels of depressive symptomatology and the homeless–domicile status of participants. Specifically, I addressed the following research questions.

1. Is the CES–D scale a reliable measure of depressive symptomatology when used with members of the adult homeless population?
2. Does the factor structure of the CES–D scale when used with members of the homeless population replicate the factor structure in the general population?
3. To what extent is change in levels of depressive symptomatology associated with change in the homeless–domicile status of homeless individuals?

In addressing Research Question 3, I tested the hypothesis that homeless individuals who made a transition from homelessness to domicile would experience a larger reduction in depressive symptoms, compared with those who did not make such a transition.

Method

Participants

Participants for this investigation were drawn from a three-wave longitudinal study designed to document the relationship between serious mental illness and the course of homelessness, and to assess the contribution of various factors that may mediate the relationship (Robertson, Piliavin, & Westerfelt, 1989). The study was conducted in Alameda County, California, between April 1991 and April 1993. This county has a substantial and demographically diverse homeless adult population, with an estimated annual prevalence of between 3,000 and 6,000 (Vernez, Burnam, McGlynn, Trude, & Mittman, 1988).

The definition of homelessness included residence during the 30 days preceding the baseline interview in one of the following locations: (a) an unconventional accommodation, including an abandoned building, car or other vehicle, or on the street; (b) a social service agency offering temporary shelter for the homeless; or (c) a hotel or motel room paid for by a voucher. The criteria of sample selection included homeless individuals, individuals who had spent the previous night sharing lodging with relatives or friends, or individuals who had stayed in their own apartment or room, but who had been homeless in the previous month. The latter criterion was adopted to include individuals who regularly cycle in and out of homelessness.

Most of the analyses in this article came from data collected from 548 homeless persons interviewed at Time 1 (T1) of the study. The 548 participants represented 97% of all the 564 individuals who were interviewed at T1 and who answered every item in the CES–D scale.[1] Analyses of the correlation of the CES–D over time and the association between homeless–domicile status and depressive symptoms were performed using data from 430 participants who participated in both T1 and Time 2 (T2) interviews. Of the 458 participants who were successfully located and reinterviewed at T2, 430 (94%) answered every item in the CES–D at both T1 and T2.[2]

Over three quarters (78%) of the T1 sample (N = 548) were male; the average age of study participants was 37.6 (see Table 1). The racial–ethnic distribution of the baseline sample was 69% African American, 21% Caucasian, and 10% Other (mostly Hispanic). About 70% of the participants graduated from high school, a percentage that is substantially higher than found in homeless populations in other communities (Shlay & Rossi, 1992), probably reflecting the higher rate of graduation from public schools in the community studied. The average length of current homeless episode among the 548 participants was 261 days; 1 in 5 participants may be classified as chronically homeless for more than 1 year. The rates of current (12 month) psychiatric and substance-abuse diagnoses of the T1 sample were as follows: 18% were diagnosed with major mental illness (including schizophrenia and major depression) or were dually diagnosed (major mental illness and substance abuse), 41% were diagnosed with substance abuse only, and 41% were without major mental illness or substance-abuse diagnosis.[3]

Members of the T2 follow-up sample and those who were lost at T2 reported similar average CES–D score at T1 (21.5 compared with 20.8). When compared with the follow-up sample, members who were lost to attrition and nonresponse to the CES–D were older, more likely to be male, more likely to be of racial and ethnic origin other than African American and non-Hispanic White, less well educated, and less likely to have any diagnosis of psychiatric disorder (see Columns 2 and 3 of Table 1).

Measures

The Center for Epidemiologic Studies—Depression Scale. The CES–D scale consists of 20 items chosen from previously validated longer depression scales including those of Beck, Ward, Mendelson, Mock, and Erbaugh (1961), Gardner (1968), Raskin, Schulterbrandt, Reatig, and McKeon (1969), and Zung (1965). Responses to items on the CES–D scale were rated using a 4-point system: 0 (*rarely or none of the time*), 1 (*some or a little of the time*), 2 (*occasionally or a moderate amount of the time*), and 3 (*most of the time*). Participants were asked how often they have experienced each of the symptoms during the previous week. Sixteen items were selected to represent negative symptoms such as depressed mood, feelings of guilt, and worthlessness and helplessness, whereas four positively worded items were included to break tendencies toward a response set and assess positive affect and sense of well being (Liang, Tran, Krause, & Markides, 1989; Radloff, 1977). These four items were reverse coded to indicate lack of well being. The possible range of scores is between 0 and 60, with a higher score indicating more symptoms of depression and a lower score indicating otherwise. A score of 16 has widely been used as a standard threshold indicating possible clinical depression (Radloff, 1977; Weissman, Sholomskas, Pottenger, Prusoff, & Locke, 1977). The factor structure of the CES–D scale is illustrated in Figure 1.

Residential status at T2. In Wave 2 of the study, participants were asked a series of structured questions about their residential arrangements subsequent to the occasion of their baseline interview. Responses to these questions provided data on the timing and duration of residential transitions experienced by participants including transition to (a) various forms of

[1] It should be noted that the nonresponse rate of the CES–D was relatively low: The response compared favorably with the rates of other community populations (McCallum, Mackinnon, Simons, & Simons, 1995; Roberts, 1980).

[2] The nonresponse rate of 458 participants who were successfully located and reinterviewed at T2 was 3% and 4% at T1 and T2, respectively.

[3] The diagnostic status of major mental illness (e.g., schizophrenia or major depression) and of substance abuse was assessed using the Diagnostic Interview Schedule, Version Three—Revised, which was based on criteria from the *Diagnostic and Statistical Manual of Mental Disorders* (3rd ed., rev; *DSM–III–R*; American Psychiatric Association, 1987). Both lifetime and current (during the past 12 months) diagnoses were made using the Diagnostic Interview Schedule computer algorithm.

Table 1
Comparison of Demographic and Background Attributes of Sample Members Who Were Reinterviewed at T2 and Sample Members Who Were Lost in Follow-Up Interviews

Variable	Sample		
	Baseline (n = 548)	Follow-up (n = 430)	Attrited (n = 118)
Age (M)	37.6	37.0	40.0*
Sex			
Female	22.1	24.9	11.7*
Male	78.0	75.1	88.4
Race–ethnicity			
African American	69.2	70.0	66.4*
Caucasian (non-Hispanic)	20.8	21.9	16.6
Other	10.0	8.0	17.0
Educational attainment			
Less than high school diploma	29.5	27.5	36.8*
High school diploma or above	70.5	72.5	63.2
Length of current homeless spell (M days)	261	259	267
Psychiatric diagnosis			
Major mental illness and dual diagnosis	17.9	19.6	11.9*
Drug or alcohol abuse	40.9	43.7	30.7
No diagnosis	41.2	36.7	57.5
CES–D score (M)	21.34	21.48	20.83
Possible depression			
Yes	63.0	63.7	60.2
No	37.1	36.3	39.8

Note. CES–D = Center for Epidemiologic Studies—Depression Scale.
* $p < .05$.

homeless locations (e.g., shelters, streets, abandoned buildings, or shanties); (b) transitional housing or treatment facilities and institutional settings (e.g., jails, prisons, or hospitals); (c) homes of relatives or friends; (d) motels, hotels, or single-room occupancy facilities (SROs) not paid for by agency vouchers; (e) and own (paid for) apartments, houses, and rooms in private dwellings.

I used a broad definition of homelessness to include residence in various forms of homeless location, in transitional housing and treatment facilities, and in institutional settings. Individuals who lived in their own apartments or houses and in motels, hotels, or SROs, as well as those who doubled-up with relatives or friends were considered domiciled. Because the CES–D scale measures current (previous week) level of symptomatology, our analysis focused on the residential status of participants during the 30 days prior to the T2 interview. I classified members of the follow-up sample into three subgroups: (a) those who were homeless all the time during the previous 30 days, (b) those who had made a transition from homelessness to domicile within the past 30 days and were domiciled at T2, and (c) those who stayed in a domicile for the entire 30-day period.

Procedures

Participants of the study were recruited using a multi-stage probability sampling plan, which selected homeless adults age 18 and above who were served by either an overnight shelter or a free meal program. First, shelters and free meal programs were sampled from strata based on size and clientele (i.e., families and single adults). Second, meal times were sampled within the sample of free meal programs. Finally, a random sample of homeless individuals was selected within shelters and food providers (Piazza & Cheng, 1993).

Twenty-nine out of a total of 80 facilities in the county were included in the study. Eighteen of the 29 sampled facilities were homeless shelters, and 11 were free meal programs. Potential participants in free meal programs were screened for their homeless status to determine their eligibility for the study. Because certain facilities and subgroups were disproportionately sampled, a weighting procedure was applied to compensate for inequalities in selection probabilities among individuals.[4]

All participants who agreed to participate in the study were asked to sign an informed consent form, and they were assured of confidentiality and offered a small honorarium to complete the initial and follow-up interviews. The overall completion rate for T1 interviews was 90%. No statistically significant differences in gender or race–ethnicity were found between those who consented and those who refused to participate in the study (Zlotnick & Robertson, 1996). The baseline interview protocol took about 2 hr to complete and contained structured questions about prior and current homelessness, physical health status, history of institutionalization, social support, social and medical service utilization, and an array of demographic and background characteristics. The interviews, which included selected sections of the Diagnostic Interview Schedule, were conducted by full-time experienced interviewers hired by the Survey Research Center of University of California at Berkeley (personal communication with Irving Piliavin, August, 1998).

Various strategies that included using stable, knowledgeable members of the local homeless population to locate participants who were still homeless; using information from participants' relatives and friends; providing additional financial incentives for participating in the follow-up study; and locating participants who had been institutionalized through information from local service agencies were used to increase sample retention. During T2 interviews, members of the follow-up sample provided information about their residential arrangements between T1 and T2, as well as updated

[4] The sampling weight adjusts for differential probabilities of selection of the facility, the day or meal, and the individual at the selected site. The sampling weight also adjusts for frequency of shelter and meal program use, for multiple section into the sample, and for recent homelessness (Piazza & Cheng, 1993).

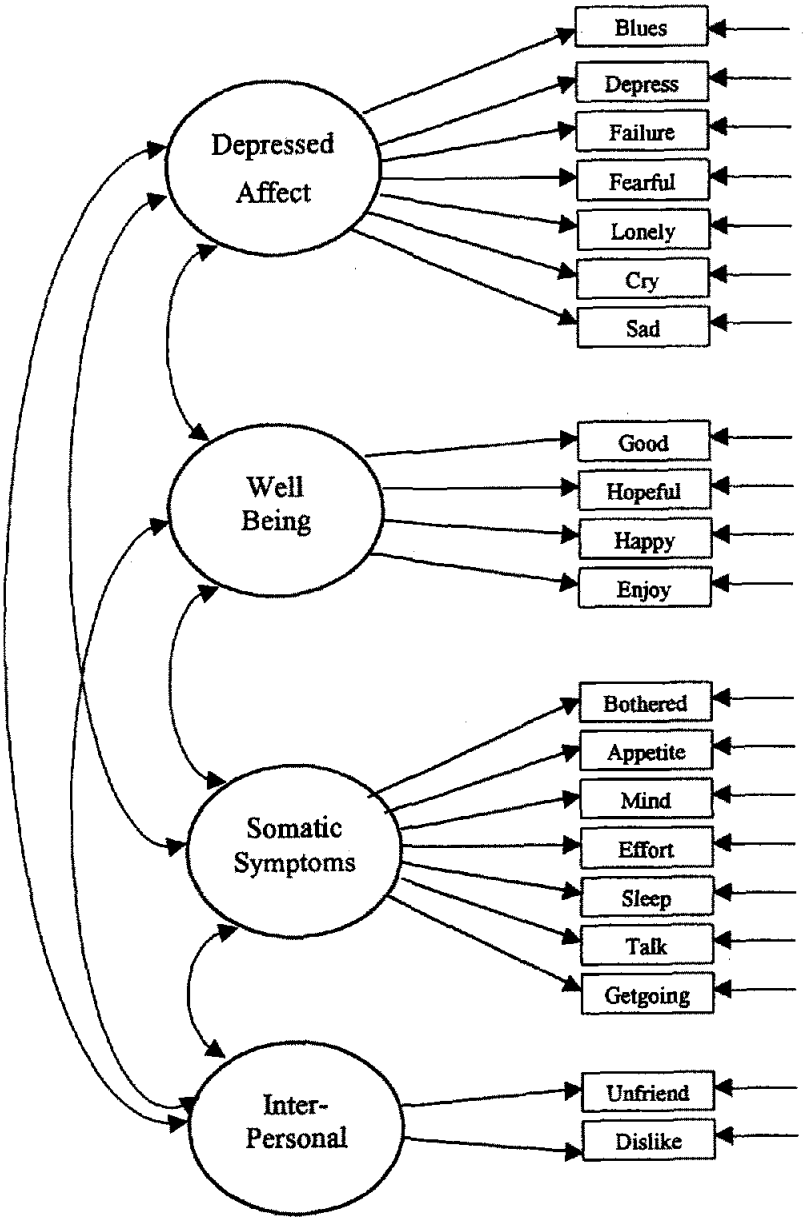

Figure 1. Four-factor model for the Center for Epidemiologic Studies—Depression Scale.

information on a set of variables similar to those collected at T1 interview. Although initially intended to take place 4 months after the T1 interview, in fact, the T2 interviews occurred at various times—ranging from 3 months to 1 year—due to search and scheduling problems.

Data Analysis

Analysis of internal consistency of the scale was performed using Cronbach's alpha (Carmines & Zeller, 1979). To ascertain whether the correlation between test and retest was moderated by test–retest interval, I performed moderated multiple regression, with test–retest interval as a continuous moderator. The intraclass correlation coefficient was calculated to take into account between-subjects and within-subject between-measure variances in repeated administrations of the CES–D scale (Bravo & Potvin, 1991; Shrout & Fleiss, 1979).

Confirmatory factor analysis was performed using LISREL 8.0 to examine the extent to which the factor structure of the CES–D replicated the factor structure found in the general population. The LISREL measurement model regresses the vector of observed variables, χ, on latent factors, ξ, through the factor loading parameter matrix, Λ, with regression residual, δ. The model is expressed in the following equation: $\chi = \Lambda\xi + \delta$.

Because χ is a vector of ordinal variables with responses classified into different ordered categories, I used the PRELIS program to calculate the polychoric correlations between items (Jöreskog & Sörbom, 1988). These coefficients, based on the 4×4 cross-classification tables of paired items against each other, estimate the theoretical correlations between sets of two

Table 2
Internal Consistency (Cronbach's α) of Center for Epidemiologic Studies—Depression Scale (CES–D) at T1 and T2

CES–D items	Sample: Baseline (n = 548)	Sample: Follow-up (n = 430)
Total	.89	.89
Depressed affect	.84	.85
Well-being	.69	.71
Somatic symptoms	.73	.73
Interpersonal	.64	.74

Note. The total CES–D includes all 20 items of the scale.

normally distributed unobserved continuous variables underlying the 4-point ordinal response scales (McCallum, Mackinnon, Simons, & Simons, 1995). The four-factor model was fitted using the method of generally weighted least squares with a correct weight matrix (Jöreskog & Sörbom, 1991). The generally weighted least squares method is asymptotically distribution free, yielding more accurate estimates of standard errors and model fit than the maximum likelihood techniques.

Analysis of the association between homeless–domicile status and levels of depressive symptomatology was conducted using one-way analysis of variance test and information from the T2 sample. The alpha in the statistical tests reported was adjusted to control for family-wise error using the Bonferroni procedure.

Results

Reliability of the CES–D Scale

Table 2 shows the internal consistency for the full CES–D scale and its four dimensions. Values for the Cronbach's alpha (α =.89) for the 20-item scale at both T1 and T2 indicate that the internal consistency estimates for the CES–D scale were of sufficient magnitude for research purpose. The Cronbach's alpha coefficients ranged between .64 and .85 for the instrument's four dimensions at T1 and T2. Previous research on the reliability of the CES–D scale in community and psychiatric populations reported internal consistency reliabilities, ranging from .85 to .90 (Ensel, 1986; Radloff, 1977; Roberts, 1980). La Gory et al.'s (1990) study of a homeless sample in Alabama reported a Cronbach's alpha of .89.

The Pearson correlation coefficient of T1 and T2 CES–D scores for the follow-up sample was .56. Moderated multiple regression result with test–retest interval as a continuous moderator did not indicate any confounding period effect between administrations of the CES–D scale. The Pearson correlation coefficient was within the range—between .45 and .70—reported in one of the first studies to validate and norm the CES–D scale in community and psychiatric populations (Radloff, 1977). The intraclass correlation coefficient for the total scale score, which takes into account within-subject variance, was .53.

Confirmatory Factor Analysis

Confirmatory factor analysis indicates that a four-factor model with the pattern of loadings constrained to the same pattern specified in previous research on domiciled community populations fits the data very well, with $\chi^2(164, N = 548) = 458.93$, goodness-of-fit index = 0.95, normed fit index = 0.90, and comparative fit index = 0.93. The item factor loadings, displayed in Table 3, are all statistically significant at the .05 level. As indicated in Table 4, the relationship between the Depressed Affect and the Somatic Symptoms Factors reached near-perfect correlation and is noticeably higher than the correlation found in studies for the general population (Hertzog et al., 1990; McCallum et al., 1995).

Table 3
Factor Loadings of the Four-Factor Model

Items	Depressed Affect	Lack of Well Being	Somatic Symptoms	Interpersonal Difficulties
I felt that I could not shake off the blues	.76	0	0	0
I felt depressed.	.87	0	0	0
I thought my life had been a failure.	.76	0	0	0
I felt fearful.	.80	0	0	0
I felt lonely.	.79	0	0	0
I had crying spells.	.74	0	0	0
I felt sad.	.86	0	0	0
I felt that I was just as good as other people.	0	.49	0	0
I felt hopeful about the future.	0	.63	0	0
I was happy.	0	.83	0	0
I enjoyed life.	0	.84	0	0
I was bothered by things	0	0	.72	0
I did not feel like eating; my appetite was poor.	0	0	.73	0
I had trouble keeping my mind on what I was doing.	0	0	.79	0
I felt that everything I did was an effort.	0	0	.37	0
My sleep was restless.	0	0	.73	0
I talked less than usual.	0	0	.52	0
I could not get "going."	0	0	.75	0
People were unfriendly.	0	0	0	.64
I felt that people disliked me.	0	0	0	.88

Note. Confirmatory-factor-analysis results from LISREL 8.0. All zero loadings were fixed by hypothesis. All nonzero parameter estimates were significant at the .05 level (Bonferroni adjusted).

Table 4
Correlations of Center for Epidemiologic Studies—Depression Scale Item Factor: Four-Factor Model

Factor	Depressed Affect	Lack of Well Being	Somatic Symptoms	Interpersonal Difficulties
Depressed Affect	—			
Lack of Well Being	.85	—		
Somatic Symptoms	.97	.82	—	
Interpersonal Difficulties	.70	.54	.69	—

Note. Confirmatory factor analysis results from LISREL 8.0. $N = 548$.

I fit a three-factor model with a combined factor of Depressed Affect and Somatic Symptoms, as well as several second-order models, to evaluate the ability of a single second-order depression factor to account for variances among the first-order factors (Hertzog, 1989; Hertzog et al., 1990). None of these models yielded significantly better fit than the four-factor model. The confirmatory-factor-analysis results suggest that the factor structure of the CES–D scale when used with members of the homeless sample is similar to the factor structure found in the general population.

Homeless–Domicile Status and Levels of Depressive Symptomatology

Past research has shown that the CES–D scale, as a measure of depressive symptoms, is sensitive for identifying participants who experience significant life events (Radloff, 1977). An important and positive life event for members of the homeless population is that of leaving the streets and procuring stable domicile.

Table 5 shows change in CES–D scores by participants' residential status at T2. There was an average reduction of 4.2 points in the depressive-symptom scores from T1 to T2 for 430 participants of the follow-up sample. All three groups—as indicated by their residential status at T2—reported a reduction of symptoms between T1 and T2, which may in part be attributable to the effect of regression to the mean (Lin & Ensel, 1984). Nevertheless, members of the three groups differed significantly in the magnitude of symptom reduction experienced. As hypothesized, participants who were homeless all the time during the past 30 days before T2 interviews experienced the least improvement in depressive symptoms. However, somewhat unexpectedly, the group that reported the largest gain was composed of participants who had recently made a transition from homelessness to a regular domicile. The difference in improvement in depressive symptoms between the two domiciled groups was, however, not statistically significantly adjusted for Bonferroni correction.

Discussion

This is the first validation study of the psychometric properties of the CES–D scale as applied to the homeless adult population. The overall results support the CES–D as a reliable instrument for measuring depressive symptomatology experienced by the study participants. The internal-consistency reliability of the 20-item

Table 5
Test–Retest Mean Center for Epidemiologic Studies—Depression Scale (CES–D) Scores by Residential Status at T2

Residential status at T2	*N*	*M*	*SD*
CES–D1			
Homeless all the time in last 30 days	268	21.85	12.44
Domiciled for less than 30 days	19	21.21	11.77
Domiciled for the entire 30-day period	143	20.81	12.26
Total sample	430	21.48	12.16
CES–D2[a]			
Homeless all the time in last 30 days	268	18.95	12.85
Domiciled for less than 30 days	19	10.80	12.35
Domiciled for the entire 30-day period	143	15.12	9.81
Total sample	430	17.32	12.14
Change score[a]			
Homeless all the time in last 30 days	268	−2.90	11.73
Domiciled for less than 30 days	19	−10.41	13.40
Domiciled for the entire 30-day period	143	−5.70	9.74
Total sample	430	−4.16	11.22

Note. Significance levels were adjusted using a Bonferroni correction. Overall $p < .05$; $p < .025$ for each comparison. T2 = Time 2.
[a] The differences between the homeless group and the two domiciled groups were significant at $p < .025$. The difference between participants who made transition to domicile for less than 30 days and those who stayed domiciled for the entire 30 days was not significant at $p < .025$.

scale (α = .89) is of sufficient magnitude for research purposes and is similar to the internal-reliability consistencies reported in other studies of community and psychiatric populations as well as one study of homeless persons in Alabama.

The findings of correlation between repeated measurements over time indicate acceptable test–retest reliability, and again, the correlation coefficients were within the range revealed in other studies using domiciled and psychiatric populations. Another encouraging result is that the correlation between test and retest scores was not affected by variation in time intervals between administrations of the CES–D scale.

Confirmatory factor analysis results replicate the four-factor solution for the CES–D items, which has been consistently found in the general population. Consistent with Hertzog et al.'s (1990) validation study of the CES–D in two older populations, the present analysis demonstrates high intercorrelation among the four latent factors. However, unlike Hertzog et al.'s findings, the current study does not find evidence for a single second-order depression factor to account for variances among the first-order factors. Given the similarity in factor structure, it may be argued that the comparability of depressive symptoms between the homeless and the domicile population is justified. As indicated in this investigation, the prevalence of depression among members of our study sample falls within the range reported in prior studies and is about three times the rate in the general population.

Consistent with our research hypothesis, change in the CES–D scale scores was associated with change in the homeless–domicile status of study participants. To be specific, homeless persons who had obtained regular domicile at T2 reported significant reduction in depressive symptoms, yielding a mean CES–D score that is closer to the norm of the general population (Clark et al., 1981; Coyle & Roberge, 1992; Husaini, Neff, Harrington, Hughes, & Stone, 1980; Radloff, 1977). This study, therefore, demonstrated a desirable property of the CES–D scale that has been documented in studies of the general population—that is, the scale's sensitivity to current mood state, as affected by life events encountered by the participants (Radloff, 1977, p. 397).

It should be noted that our results are confined to a population of service-using homeless adults in a demographically diverse and predominantly urban community. Although the sociodemographic profile of our participants does not differ significantly from other homeless populations in the United States (Shlay & Rossi, 1992), the high school graduation rate of our participants is remarkably higher and bears close resemblance to the rate reported in the general population. The question of the extent to which the results from the study may be generalizable to other homeless populations, therefore, needs to be addressed in future research.

In summary, the findings from this research provide evidence in support of the applicability of the CES–D scale for measuring depressive symptoms in the adult homeless population, as it has been found to be case for the domiciled general population. The CES–D scale has shown psychometric properties comparable to those found in the general population. The scale scores are also sensitive to change in homeless–domicile status of homeless people.

References

American Psychiatric Association. (1987). *Diagnostic and statistical manual of mental disorders* (3rd ed., rev.).Washington, DC: Author.

Beck, A. T., Brown, G., & Steer, R. A. (1989). Prediction of eventual suicide in psychiatric inpatients by clinical ratings of hopelessness. *Journal of Consulting and Clinical Psychology, 57*, 309–310.

Beck, A. T., Ward C. H., Mendelson, M., Mock, J., & Erbaugh, J. (1961). An inventory of measuring depression. *Archives of General Psychiatry, 4*, 561–571.

Bravo, G., & Potvin, L. (1991). Estimating the reliability of continuous measures with Cronbach's alpha or the intraclass correlation coefficient: Toward the integration of two traditions. *Journal of Clinical Epidemiology, 44*, 381–390.

Carmines, E. G., & Zeller, R. A. (1979). *Reliability and validity assessment*. Newbury Park: CA: Sage.

Clark, V. A., Aneshensel, C. S., Frerichs, R. R., & Morgan, T. M. (1981). Analysis of effects of sex and age in response to items on the CES–D Scale. *Psychiatry Research, 5*, 171–181.

Coyle, C. P., & Roberge, J. J. (1992). The psychometric properties of the Center for Epidemiological Studies—Depression Scale (CES–D) when used with adults with physical disabilities. *Psychology and Health, 7*, 69–81.

Dean, A., Lin, N., & Ensel, W. M. (1981). The epidemiological significance of social support systems in depression. In R. G. Simmons (Ed.), *Research in community and mental health* (pp. 77–109). Greenwich, CT: JAI Press.

Eaton, W. W., & Kessler, L. G. (1981). Rates of symptoms of depression in a national sample. *American Journal of Epidemiology, 114*, 528–538.

Ensel, W. M. (1986). Measuring depression: The CES–D Scale. In N. Lin, A. Dean, & W. M. Ensel (Eds.), *Social support, life events, and depression* (pp. 51–70). New York: Academic Press.

Gardner, E. A. (1968). *Development of a symptom check list for the measurement of depression in a population.* Unpublished manuscript.

Gatz, M., & Hurwicz, M. -L. (1990). Are old people more depressed? Cross-sectional data on Center for Epidemiological Studies Depression Scale factors. *Psychology and Aging, 5*, 284–290.

Hertzog, C. (1989). Using confirmatory factor analysis for scale development and validation. In M. P. Lawton & A. R. Herzog (Eds.), *Special research methods for gerontology* (pp. 281–306). New York: Baywood.

Hertzog, C., Van Alstine, J., Usala, P. D., Hultsch, D. F., & Dixon, R. (1990). Measurement properties of the Center for Epidemiological Studies Depression Scale (CES–D) in older populations. *Psychological Assessment, 2*, 64–72.

Husaini, B. A., Neff, J. A., Harrington, J. B., Hughes, M. D., & Stone, R. H. (1980). Depression in rural communities: Validating the CES–D Scale. *Journal of Community Psychology, 8*, 20–27.

Jöreskog, K. G., & Sörbom, D. (1988). *PRELIS: A program for multivariate data screening & data summarization—a preprocessor for LISREL.* Mooresville, IN: Scientific Software International.

Jöreskog, K. G., & Sörbom, D. (1991). *LISREL 7: A guide to the program and applications.* Chicago: SPSS.

Koegel, P., & Burnam M. A. (1992). Problems in the assessment of mental illness among the homeless: An empirical approach. In M. J. Robertson & M. Greenblatt (Eds.), *Homelessness: A national perspective* (pp. 77–99). New York: Plenum Press.

La Gory, M., Ritchey, F. J., & Mullis, J. (1990). Depression among the homeless. *Journal of Health and Social Behavior, 31*, 87–102.

Lewinsohn, P. M., Seeley, J. R., Roberts, R. E., & Allen, N. B. (1997). Center for Epidemiological Studies Depression Scale (CES–D) as a screening instrument for depression among community-residing older adults. *Psychology and Aging, 12*, 277–287.

Liang, J., Tran, T. V., Krause, N., & Markides, K. S. (1989). Generational differences in the structure of the CES–D Scale in Mexican Americans. *Journal of Gerontology: Social Sciences, 44*(3), 110–120.

Lin, N., & Ensel, W. M. (1984). Depression-mobility and its social etiology: The role of life events and social support. *Journal of Health and Social Behavior, 25*, 176–188.

Lin, N., & Ensel, W. M. (1989). Life stress and health: Stressors and resources. *American Sociological Review, 54*, 382–399.

McCallum, J., Mackinnon, A., Simons, L., & Simons, J. (1995). Measurement properties of the Center for Epidemiological Studies Depression Scale: An Australian community study of aged persons. *Journal of Gerontology: Social Sciences, 50B*(3), S182–189.

Myers, J. K., & Weissman, M. M. (1980). Use of a self-report symptom scale to detect depression in a community sample. *American Journal of Psychiatry, 137*, 1081–1084.

Piazza, T., & Cheng, Y. -T. (1993). *Sample design for the study of the Alameda County residents.* Berkeley, CA: University of California, Survey Research Center.

Radloff, L. S. (1977). The CES–D Scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement, 1*, 385–401.

Radloff, L. S., & Locke, B. Z. (1986). The community mental health assessment survey and the CES–D Scale. In M. M. Weissman, J. K. Myers, & C. E. Ross (Eds.), *Community surveys of psychiatric disorders* (pp. 177–189). New Brunswick, NJ: Rutgers University Press.

Raskin, A., Schulterbrandt, J., Reatig, N., & McKeon, J. (1969). Replication of factors of psychopathology in interview, ward behavior, and self-report ratings of hospitalized depressives. *Journal of Nervous and Mental Disease, 148*, 87–96.

Ritchey, F. J., La Gory, M., Fitzpatrick, K. M., & Mullis, J. (1990). A comparison of homeless, community-wide, and selected distressed samples on the CESD—Depression Scale. *American Journal of Public Health, 80*, 1384–1386.

Roberts, R. E. (1980). Reliability of the CES–D Scale in different ethnic contexts. *Psychiatry Research, 2*, 125–134.

Robertson, M. J., Piliavin, I., & Westerfelt, H. (1989). *Mental illness, service use, and homeless careers.* Unpublished grant proposal.

Robertson, M. J., & Winkleby, M. A. (1996). Mental health problems of homeless women and differences across subgroups. *Annual Review of Public Health, 17*, 311–336.

Ross, C. E., & Mirowsky, J. (1984). Components of depressed mood in married men and women. *American Journal of Epidemiology, 119*, 997–1004.

Rossi, P. H., Fisher, G. A., & Willis, G. (1986). *The condition of the homeless of Chicago.* Amherst, MA: Social and Demographic Research Institute.

Schutt, R. K., Meschede, T., & Rierdan, J. (1994). Distress, suicidal thoughts, and social support among homeless adults. *Journal of Health and Social Behavior, 35*, 134–142.

Shlay, A. B., & Rossi, P. H. (1992). Social science research and contemporary studies of homelessness. *Annual Review of Sociology, 18*, 129–160.

Shrout, P. E., & Fleiss, J. L. (1979). Intraclass correlations: Uses in assessing rater reliability. *Psychological Bulletin, 86*, 420–428.

Vernez, G., Burnam, M. A., McGlynn, E. A., Trude, S., & Mittman, B. S. (1988). *Review of California's program for the homeless mentally disabled.* Santa Monica, CA: RAND Corporation.

Weissman, M. M., Sholomskas, D., Pottenger, M., Prusoff, B. A., & Locke, B. Z. (1977). Assessing depressive symptoms in five psychiatric populations: A validation study. *American Journal of Epidemiology, 106*, 203–214.

Zimmerman, M., & Coryell, W. (1994). Screening for major depressive disorder in the community: A comparison of measures. *Psychological Assessment, 6*, 71–74.

Zlotnick, C., & Robertson, M. J. (1996). Sources of income among homeless adults with major mental disorders or substance use disorders. *Psychiatric Services, 47*, 147–151.

Zung, W. W. K. (1965). A self-rating depression scale. *Archives of General Psychiatry, 12*, 63–70.

Received March 9, 1999
Revision received September 7, 1999
Accepted October 21, 1999 ■