Healthcare Access and Utilization

The Behavioral Model for Vulnerable Populations: Application to Medical Care Use and Outcomes for Homeless People

Lillian Gelberg, Ronald M. Andersen, and Barbara D. Leake

Objectives. (1) To present the Behavioral Model for Vulnerable Populations, a major revision of a leading model of access to care that is particularly applicable to vulnerable populations; and (2) to test the model in a prospective study designed to define and determine predictors of the course of health services utilization and physical health outcomes within one vulnerable population: homeless adults. We paid particular attention to the effects of mental health, substance use, residential history, competing needs, and victimization.

Methods. A community-based probability sample of 363 homeless individuals was interviewed and examined for four study conditions (high blood pressure, functional vision impairment, skin/leg/foot problems, and tuberculosis skin test positivity). Persons with at least one study condition were followed longitudinally for up to eight months.

Principal Findings. Homeless adults had high rates of functional vision impairment (37 percent), skin/leg/foot problems (36 percent), and TB skin test positivity (31 percent), but a rate of high blood pressure similar to that of the general population (14 percent). Utilization was high for high blood pressure (81 percent) and TB skin test positivity (78 percent), but lower for vision impairment (33 percent) and skin/leg/foot problems (44 percent). Health status for high blood pressure, vision impairment, and skin/leg/foot problems improved over time. In general, more severe homeless status, mental health problems, and substance abuse did not deter homeless individuals from obtaining care. Better health outcomes were predicted by a variety of variables, most notably having a community clinic or private physician as a regular source of care. Generally, use of currently available services did not affect health outcomes.

Conclusions. Homeless persons are willing to obtain care if they believe it is important. Our findings suggest that case identification and referral for physical health care can be successfully accomplished among homeless persons and can occur concurrently with successful efforts to help them find permanent housing, alleviate their mental illness, and abstain from substance abuse.

Key Words. Homeless persons, health services utilization, health status, mental disorders, substance abuse

Current efforts to reduce benefits of Medicare, Medicaid, and other welfare programs at both the federal and state levels serve to refocus our attention on the health needs of vulnerable populations who are at higher risk for disease and injury (Aday and Awe 1997). Vulnerable populations include minorities; undocumented immigrants; children and adolescents; mentally ill, chronically ill, and disabled persons; the elderly; and impoverished and homeless persons (Aday 1993). Applying models of health services utilization to such groups can be especially helpful in identifying the particular challenges each faces in obtaining needed services and may provide insights into maintaining or improving their health status. In this article, we present the Behavioral Model for Vulnerable Populations, a major revision of the Behavioral Model (Andersen 1968, 1995), a leading model employed to explain the use of health services. The Behavioral Model for Vulnerable Populations was designed to include domains especially relevant to understanding the health and health-seeking behavior of vulnerable populations.

We apply this revised model to one such population: homeless persons, who arguably experience more problems emanating from social ills than any other vulnerable population. Typically encountered problems include mental illness; substance abuse; physical illness; victimization, including physical, sexual, and emotional abuse; social isolation; competing needs; and inadequate or overcrowded housing (Gelberg 1996). These problems exacerbate the health care needs of the homeless and limit their ability to obtain care.

This article focuses specifically on predicting physical health and the use of health services for homeless adults. In comparison to the general population, the homeless have higher prevalence rates of physical morbidity (Wright, Weber, Rossi, et al. 1987; Gelberg et al. 1990) as well as mortality (Alstrom, Lindelius, and Salum 1975). Despite their poorer physical health, homeless adults are less likely than the general adult population to use

---

This work was partially supported by a grant (to LG and RMA) from the Agency for Health Care Policy and Research (R01 HS06696), "Physical Health and Medical Care in a Homeless Cohort," and by a grant to the RAND Corporation from the National Institute of Mental Health (R01 MH64121), "Course of Homelessness Among the Mentally Ill." Dr. Gelberg is a Robert Wood Johnson Foundation Generalist Physician Faculty Scholar.

Address correspondence to Lillian Gelberg, M.D., M.S.P.H., Associate Professor, UCLA Dept. of Family Medicine, 50-071 CHS, Box 951683, Los Angeles, CA 90095-1683. Ronald M. Andersen, Ph.D. is Wasserman Professor, UCLA School of Public Health, Dept. of Health Services and Dept. of Sociology; Barbara D. Leake, Ph.D. is Senior Statistician, UCLA Schools of Nursing and Medicine. This article, submitted to *Health Services Research* on July 23, 1998, was revised and accepted for publication on January 15, 1999.

outpatient medical services; however, they are more likely to be hospitalized, often for a preventable condition (Fischer, Shapiro, Breakey, et al. 1986). Further, the majority of homeless adults state that they have not obtained needed medical care in the previous year (Gelberg et al. 1990; Robertson and Cousineau 1986). These data suggest that homeless persons may encounter major obstacles to obtaining needed medical services.

The data analyzed in this report are from the UCLA Homeless Health Study. We examine determinants of the study sample's seeing a clinician for four conditions and the impact of that care on their health status. The conditions examined were high blood pressure (systolic and diastolic pressures), functional vision impairment (near and far), skin/leg/foot problems (subjective and objective), and positive findings on the tuberculosis (TB) skin test (TB skin test positivity). These conditions were selected to be monitored for several reasons: they are prevalent in homeless populations; they represent a range from largely asymptomatic (high blood pressure and TB skin test positivity) to symptomatic (skin/leg/foot problems and vision impairment); they represent significant long-term morbidity to the individual and costs to society, if untreated; and they represent problems for which curative and symptomatic treatments are available. Conclusions of this article focus on the utility of the Behavioral Model for Vulnerable Populations in understanding health services use by homeless adults and on the value of the model in understanding improvement in the health status of these persons.

THEORETICAL FRAMEWORK

The original Behavioral Model was developed in the late 1960s to assist in understanding why people use health services (Andersen 1968, 1995). The model suggested that use is a function of a predisposition by people to use health services, factors that enable or impede such use, and people's need for care (Andersen 1968, 1995).

Over time, the Behavioral Model has undergone revisions and updates (Aday and Awe 1997; Andersen 1995). Phase 2, developed in the 1970s, included elaboration of the measures of health services use specific to particular conditions and episodes of illness and to consumer satisfaction. A third phase, which evolved during the last decade, recognized changes in personal practices and the maintenance and improvement of health status as explicit outcomes and goals of health services delivery. It also recognized the dynamic nature of the Behavioral Model, with outcomes influencing

subsequent predisposition, enabling resources, need, and health behaviors (Andersen 1995).

A revised and expanded Behavior Model for Vulnerable Populations is called for because the factors that make homeless and other populations vulnerable might also affect their use of health services and their health status (Aday 1993, 1994; Gelberg 1996; Rew 1996). Figure 1 portrays the Behavioral Model for Vulnerable Populations. This model represents an adaptation of the Behavioral Model that includes factors to consider when studying the use of health services and health outcomes of vulnerable populations. Some of the categories will need to be tailored to specific vulnerable populations when the model is applied to them. As in the original Behavioral Model, the *Predisposing, Enabling,* and *Need* components of this model predict personal health practices, including the use of health services. A major addition is our look at the impact of utilization on health status outcomes. While most models of health services utilization stop at utilization, with this study we were able to examine the effect of realized access (i.e., utilization) on health outcomes. Health status is both an outcome as well as a determinant of use (in the latter case it is labeled need). Health outcomes also include patient satisfaction and compliance.

The Behavioral Model for Vulnerable Populations can be divided into traditional and vulnerable domains. The latter were added to the Behavioral Model as we expanded it for relevance in studying homeless and other vulnerable populations. Vulnerable domains focus on social structure and enabling resources.

The *Predisposing Traditional domain* includes demographic characteristics, such as age, gender, and marital status; health beliefs; and social structure. The latter includes social structure characteristics such as ethnicity, education, employment, and family size. The *Predisposing Vulnerable domain* includes social structure characteristics, such as acculturation, immigration status, and literacy; childhood characteristics (e.g., foster care, group home placement, abuse and neglect history, and parental illness); residential history (dwelling or lack thereof); living conditions (e.g., running water, sewers, heat and air-conditioning, electricity, lead paint, and unsafe structures); mobility (moves between communities and dwellings); criminal behavior and prison history; victimization; mental illness; psychological resources (e.g., mastery, coping, self-esteem, cognitive ability, developmental delay); and substance abuse.

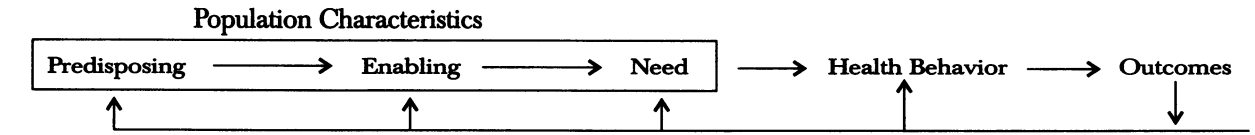
The *Enabling Traditional domain* includes personal/family resources, such as regular source of care, insurance status, and income. Community resources include residence; region; and health services resources, such as

volume (physician-population ratio, hospital-bed-population ratio), distribution, financing, price, entry, structure, and process of care. The *Enabling Vulnerable domain* includes personal/family resources, such as receipt of public benefits, competing needs, and availability and use of information sources. The community resources construct includes community crime rates and the availability of social services.

The *Need Traditional domain* includes self-perceptions (perceived need) and objective evaluations (evaluated need) of general population health conditions. The *Need Vulnerable domain* includes perceptions and evaluated need regarding conditions of special relevance to vulnerable populations, such as tuberculosis, sexually transmitted diseases, premature and low-birthweight infants, and acquired immunodeficiency syndrome (AIDS). When predicting the use of mental health or substance abuse services and related outcomes, mental illness and substance abuse would also be in this domain, rather than in the predisposing domain. Further, a clinician's evaluation of patients may be affected by the patients' vulnerable status. Similarly, patients' perceptions of their health may be related to their vulnerable status. The *Personal Health Practices Traditional domain* includes diet, exercise, self-care, tobacco use, and adherence to care. This domain also includes the use of health services. The *Personal Health Practices Vulnerable domain* includes food sources and hygiene and unsafe sexual behaviors. The *Outcomes domain* transcends the traditional and vulnerable domains and includes perceived and evaluated health status and satisfaction with care.

Research to date is limited regarding the impact of compelling issues of vulnerability on the health and use of health services of homeless populations. Three key problems, other than the obvious lack of a home, characterize the homeless population: mental illness, substance abuse, and competing needs. Mental illness and psychological distress among homeless persons are associated with worse physical health, greater hospitalization rates for physical health problems, and more barriers to obtaining medical care (Ropers and Boyer 1987; Gelberg and Linn 1988, 1989). Similarly, homeless alcoholics are more likely to have poor physical health status and to have been injured (Gelberg and Leake 1993). Further, homeless persons with more competing needs are less likely to have a regular source of care and are more likely to perceive barriers to obtaining care. Therefore, competing needs may affect homeless persons' receipt of preventive care or of care early in the course of an illness when more severe and costly stages of disease might be prevented (Gelberg et al. 1997).

Figure 1: The Behavioral Model for Vulnerable Populations



Traditional Domains

Demographics
- Age
- Gender
- Marital status
- Veteran status

Health Beliefs
- Values concerning health and illness
- Attitudes toward health services
- Knowledge about disease

Social Structure
- Ethnicity
- Education
- Employment
- Social networks
- Occupation
- Family size
- Religion

Personal/Family Resources
- Regular source of care
- Insurance
- Income
- Social support
- Perceived barriers to care

Community Resources
- Residence
- Region
- Health services resources

Perceived Health
- General population health conditions

Evaluated Health
- General population health conditions

Personal Health Practices
- Diet
- Exercise
- Self-care
- Tobacco use
- Adherence to care

Use of Health Services
- Ambulatory care
- Inpatient care
- Alternative healthcare
- Long-term care

Traditional/ Vulnerable Domains

Health Status
- Perceived health
- Evaluated health

Satisfaction with Care
- General satisfaction
- Technical quality
- Interpersonal aspects
- Coordination
- Communication
- Financial aspects
- Time spent with clinician
- Access/Availability/ Convenience
- Continuity
- Comprehensiveness
- Administrative hassle

Vulnerable Domains

Social Structure
- Country of birth
- Acculturation/Immigration/Literacy

Sexual orientation

Childhood characteristics
- Residential history/Homelessness
- Living conditions
- Mobility
- Length of time in the community
- Criminal behavior/Prison history
- Victimization
- Mental Illness
- Psychological resources
- Substance abuse

Personal/Family Resources
- Competing needs
- Hunger
- Public benefits
- Self-help skills
- Ability to negotiate system
- Case manager/Conservator
- Transportation
- Telephone
- Information sources

Community Resources
- Crime rates
- Social services resources

Perceived Health
- Vulnerable population health conditions

Evaluated Health
- Vulnerable population health conditions

Personal Health Practices
- Food sources
- Hygiene
- Unsafe sexual behaviors

HYPOTHESES

Use of Health Services by the Homeless

1. The homeless will be more likely to seek services for conditions that have a more immediate impact (skin/leg/foot problems, vision impairment) than for conditions with less immediate, but more serious long-term consequences (high blood pressure, TB exposure).
2. Predisposing and Enabling Vulnerable domains will be important supplements to Predisposing and Enabling Traditional domains in explaining the use of services by homeless persons: conditions that contribute to their disadvantaged status will generally impede their use of services.
3. As in the general population, the health needs of the homeless that relate to our specific study conditions will be important factors in explaining their use of services for those conditions.
4. Predisposing and Enabling Vulnerable domains will be relatively more important in explaining the use of health services for conditions with less apparent consequences than for conditions with immediate impact.

Outcome of Study Conditions Among the Homeless

5. Predisposing and Enabling Vulnerable domains will be important supplements to Predisposing and Enabling Traditional domains in explaining outcomes for the study conditions: conditions that contribute to the disadvantaged status of homeless persons will generally be negatively related to a good outcome.
6. Homeless people receiving health services for their conditions will experience better outcomes than those not receiving services.

METHODS

THE SAMPLE

The sample for the UCLA Homeless Health Study is a subset of the sample for the RAND Course of Homelessness Study conducted in 1990 and 1991 (Principal Investigators: M. A. Burnam and P. Koegel). As described elsewhere (Koegel and Burnam, 1991; Koegel, Burnam, and Morton 1996),

the RAND study obtained a representative sample of 1,548 homeless adults from the Skid Row and Westside areas of Los Angeles using a probability sampling plan. Individuals were considered to be homeless if, at some point in the past 30 days, they had spent at least one night in (a) a setting that was either defined as a temporary shelter, a location not designed for shelter, or an impermanent arrangement for which they did not pay; or (b) a program for homeless individuals that defined stays as temporary. Persons who were currently in their own dwelling places, but who had not been there for each of the past 30 days, were included to avoid excluding those who regularly spend the latter part of the month on the streets or in shelters.

From the RAND baseline sample, a stratified subsample of 485 persons was randomly selected for longitudinal follow-up. The UCLA Homeless Health Study began one year after selection of this subsample. Of the 389 persons active in the RAND panel at this point, 363 were available and agreed to participate. An attrition/refusal analysis indicated that participants with serious mental problems, the newly homeless, and those with a history of substance dependence were more likely to participate in the UCLA study.

DATA COLLECTION

Wave 1 of the UCLA Homeless Health Study was based, in part, on interviews conducted by trained lay interviewers who followed a structured protocol. Respondents were informed about the nature of the study and signed a consent form prior to participation. Interviews lasted approximately 21 minutes and were conducted in a variety of settings considered convenient by the participants, including the study's field office and outdoor locations. Respondents were also provided with a limited physical examination (31 minutes) and a tuberculosis tine skin test. Participants received $5 for completing the health interview, physical examination, and TB skin test. They also received an additional $5 for returning to have their TB test read.

Respondents were followed longitudinally if they were determined to have any one of the study conditions. For skin/leg/foot problems, only their specific problem (e.g., boils) was followed. Respondents were re-contacted at most twice (Wave 2 and Wave 3), approximately four months apart, to determine if they had sought medical care and to assess whether they still had their study condition(s). If a condition was deemed to be "cured" at Wave 2, the respondent was no longer followed for that condition. Respondents in Waves 2 and 3 were interviewed regarding their general health and use of health services, and their condition-specific health status and use of health services. A condition-specific focused physical examination was also conducted to

assess the status of the study condition(s) discovered at Wave 1. Respondents were reimbursed $5 for each of the Wave 2 (22-minute interview, 15-minute physical examination) and Wave 3 (14-minute interview, 11-minute physical examination) follow-ups.

Health data were collected by specially trained interviewers on a form designed specifically for this study. The interviewer training and assessment has been described in detail elsewhere (Kleinman et al. 1996). At the close of the physical examination, interviewers discussed the results with respondents and told them that they should seek medical care for any study conditions discovered. Participants who needed care were given a letter to take to a medical professional and a list of medical facilities in their area that treated homeless persons at little or no cost.

Blood Pressure Testing. Respondents had their blood pressure taken twice. They were referred to a clinician for high blood pressure if their second systolic blood pressure was at least 140 mm Hg or their second diastolic blood pressure was at least 90 mm Hg.

Functional Vision Testing. Functional vision was tested with normal correction in place (glasses or contact lenses), as previously described (Kleinman et al. 1996). Respondents were referred for medical care if the near or far vision in their worst eye was 20/50 or greater. Chart readings were analyzed as number of Snellen lines.

Exam for Skin/Leg/Foot Problems. The physical examination also included skin, leg, and foot problems. Because the examination was conducted under field conditions, only those areas not covered by clothing were examined. Therefore, in addition to the physical examination findings, persons could be referred for skin/leg/foot problems they reported during the interview component of the health study. Examination procedures and referral criteria are described in detail by Kleinman et al. (1996).

Tuberculosis Skin Testing. At the close of the physical examination, participants were asked to consent to a TB skin test that was planted and read 48–72 hours later by the lay interviewers. Those who consented were given a purified protein derivative tine skin test (Lederle Laboratories 1980), as described elsewhere (Gelberg et al. 1997). Skin tests were considered positive if the injection site had a vesicle or a total induration greater than or equal to 2 mm, equivalent to 5–9 mm induration of a Mantoux test (Lederle Laboratories 1980); 88 percent returned for a skin test reading. As with the other conditions, persons who tested positive on the skin test were encouraged to seek care and were given a list of nearby medical facilities. In addition, follow-

up information was requested in a letter to be completed by their medical provider (Gelberg et al. 1997).

RESPONSE RATE

Among persons interviewed for the health study, 70 did not have the physical examination and 130 did not have a tuberculosis skin test result.

Among persons referred for medical care for one of the study conditions at Wave 1, 27 percent were lost to follow-up and did not have utilization data at Wave 2 or 3. Those with conditions at Wave 1 who had follow-up utilization data differed from those who did not have such data, at the .05 level, on some, but not on the majority, of the predictor variables listed in Table 1. Those followed up were more likely to be female, African American, and chronically mentally ill. They were also more likely to have an income over $300 per month, a prison history, a place to sleep other than limited shelter (e.g., abandoned buildings, vehicles), a greater feeling of personal safety, a history of homelessness more often in their lifetime, longer periods of homelessness, and more social support. They did not differ on the other variables in Table 1.

ANALYTICAL VARIABLE MEASURES

Independent variables representing domains of our model came from the RAND cross-sectional survey or Wave 1 of the UCLA Health Study and are listed in Table 1. Outcome variables were measured in the UCLA Health study follow-ups (Wave 2 or Wave 3, not shown). These variables are summarized below.

Predisposing Predictors

Demographic variables used in this article were age and gender. Variables describing social structure included ethnicity, education, employment status, homeless history, length of residence in Los Angeles, mental health status, substance use, criminal history, and victimization. Homeless history included the predominant type of place used for sleeping during the previous month, length of homelessness, and number of times homeless.

Chronic mental illness, chronic alcohol dependence, and chronic drug abuse were used to assess mental health status and substance use. These measures were based on the Diagnostic Interview Schedule (Robins et al. 1981) and were derived by an algorithm described elsewhere (Koegel and Burnam 1988). We also assessed the frequency of alcohol and drug use during the past 30 days, and the lifetime history of a psychiatric hospitalization.

Table 1: Characteristics of Wave 1 Sample in the UCLA Homeless Health Study ($N = 363$)

Variables	*Unweighted* N *	%	*Mean*	*s.d.*	*Median*	*Range*
PREDISPOSING						
Traditional Domain						
Age (years)			38.2	9.8	37	18–70
Male		80.2				
African American		55.9				
Education (years)			11.5	2.8	12	0–18
Working, past 30 days		42.9				
Vulnerable Domain						
Prison history, ever		60.6				
Crime victim, past 30 days		24.1				
Skid Row vs. Westside†		67.5				
Number times homeless, ever			3.1	2.9	2	1–11
Number months homeless, lifetime			42.2	51.0	24	1–312
Modal shelter type, past 30 days						
Shelter or institution		21.8				
Limited shelter		11.8				
Outdoors		37.7				
Traditional housing		28.7				
Chronic mental illness		26.3				
Hospitalized for mental illness, ever		13.4				
Chronic alcohol dependence		59.2				
Chronic drug dependence		40.1				
Heavy alcohol use, past 30 days‡	331	29.1				
Drug use, past 30 days	339	27.2				
ENABLING						
Traditional Domain						
Regular source of care						
None		55.7				
Hospital outpatient dept.		12.5				
Emergency room		9.9				
Community clinic/Private doctor		21.9				
Insured		34.1				
Income, past month ($)			462.9	725.4	300	0–7,002
Income > $300, past month		50.1				
Social support§			1.7	0.7	1.5	0.3–4.2
Vulnerable Domain						
Current public benefits		61.4				
Competing needs, past 60 days**			2.7	0.9	2.8	1–4
Personal safety, past few days††			5.1	1.5	5	1–7
NEED						
Traditional/Vulnerable Domain						
Any restricted activity days, past 3 months		34.9				
Any functional limitations, past 3 months		32.3				

continued

Variables	*Unweighted* N *	*%*	*Mean*	*s.d.*	*Median*	*Range*
General health‡‡			2.9	1.3	3	1–5
Total number of study conditions§§			1.0	0.9	1	0–4
Less worry re condition, past 3 months***						
High blood pressure	36		2.8	1.3	3.5	1–4
Functional vision impairment	121		2.9	1.3	4	1–4
Skin/Leg/Foot problem	142		2.7	1.2	3	1–4
TB tine test positivity	71		3.9	0.6	4	1–4
Condition restriction, past 3 months†††						
High blood pressure	36		4.5	0.9	5	1–5
Functional vision impairment	121		4.2	1.3	5	1–5
Skin/Leg/Foot problem	142		4.2	1.2	5	1–5
TB tine test positivity	71		5.0	0.3	5	1–5
High blood pressure (≥ 140/90 mm Hg)		14				
BP ≥ 140 mm Hg; Systolic	227	11	120.9	18.6	117	81–194
BP ≥ 90 mm Hg; Diastolic	276	10	72.6	13.6	72	49–119
Functional vision impairment, worst eye		37				
Far vision ≥ 20/50; No. of Snellen lines	290	29	6.6	2.1	7	1–11
Near vision ≥ 20/50; No. of Snellen lines	293	23	3.6	2.3	3	1–10
Skin/Leg/Foot problems		36				
Number of subjective problems	358		0.4	0.8	0	0–7
Any problem		31				
Number of objective problems	288		0.4	0.8	0	0–5
Any problem		27				
Total number of subjective + objective problems	358		0.8	1.3	0	0–11
TB tine test positivity	233	31				

Note: Analyses are weighted; *N*s are unweighted.

*Unweighted *N* is 363 unless otherwise specified.

†Area of city respondent sampled from.

‡Three or more drinks per average day.

§Social support, 5-point scale: 1 = none of the time, 2 = sometimes, 3 = rarely, 4 = most of the time, 5 = all of the time.

**Competing needs, 4-point scale: 1 = usually, 2 = sometimes, 3 = rarely, 4 = none of the time.

††Personal safety, 7-point scale: 1 = terrible, 2 = unhappy, 3 = mostly dissatisfied, 4 = mixed, 5 = mostly satisfied, 6 = pleased, 7 = delighted.

‡‡General health, 5-point scale: 1 = excellent, 2 = very good, 3 = good, 4 = fair, 5 = poor.

§§Number of the four study conditions, baseline (high blood pressure, functional vision impairment, skin/leg/foot problems, TB tine test positivity).

***Worry about condition, among respondents referred for medical care of that condition. Most worry about skin, leg, or foot problems, among those with these problems; 4-point scale: 1 = a great deal, 2 = somewhat, 3 = a little, 4 = not at all.

†††Condition restriction, among respondents referred for medical care for that condition. Greatest restriction for skin, leg, or foot problems among respondents with such problems; 5-point scale: 1= all of the time, 2 = most of the time, 3 = some of the time, 4 = a little of the time, 5 = not at all.

Enabling Predictors

Individual enabling characteristics included health insurance and income. Nonfinancial "enablers" included regular source of care, receipt of public benefits, and competing needs. In the community-level enabling domain, we assessed the area of the city in which the respondent lived (Skid Row or the suburban Westside) and respondents' perceptions of personal safety.

Need Predictors

Measures of perceived physical health status included self-rated general physical health (5-point scale), and whether or not the respondent had a restricted activity day or functional limitation (Ware and Sherbourne 1993) during the past three months. Worry and restriction during the prior three months were measured for each condition based on the amount of worry (4-point scale) and restriction (5-point scale) experienced due to the condition. Measures of evaluated need were based on Wave 1 findings for each study condition and on the number of study conditions.

Utilization Outcomes

Use of condition-specific health services was defined as having seen a clinician for the specific study condition between baseline and either the Wave 2 or Wave 3 follow-up. To reduce respondent burden, we did not ask about use of services for components of conditions (e.g., near versus far vision impairment or objective versus subjective skin/leg/foot problems).

Condition-specific Health Outcomes

Condition-specific health outcomes were measured at the latest follow-up (either Wave 2 or Wave 3). Blood pressure and functional vision impairment outcomes were measured as at baseline. Outcomes for skin/leg/foot problems were measured by the total number of problems reported in the interview (subjective) and the total number of problems found on examination (objective). Tuberculosis did not have an outcome measure because we lacked the resources to measure its severity objectively.

DATA ANALYSIS

Participants in the UCLA Homeless Health Study were assigned weights for data analysis, as described elsewhere (Gelberg, Panarites, Morgenstern, et al. 1997). All *N*s presented are unweighted, and all analyses presented are weighted.

Since few respondents had more than one subjective or objective skin/leg/foot problem at follow-up, both subjective and objective skin/leg/foot outcomes were dichotomized into any problem versus no problem. Unadjusted associations between predictors and outcome variables were assessed with Pearson correlations. Changes in variables over time were examined with paired *t*-tests.

Multivariable techniques included multiple least squares linear regression and multiple logistic regression. Correlations between predictor variables were examined to check for multicollinearity. Missing values for some continuous predictors were replaced with their sample means. Regressions were not performed for blood pressure because of the small overall sample with follow-up information as well as unstable estimates due to the even smaller numbers of persons who were referred but did not see a clinician ($N = 7$).

Because the sample sizes for our multivariable analyses were relatively small, variable selection techniques were used. All variables significant at the .05 level in correlation analyses were entered into stepwise backward analyses controlling, except in the case of TB, for condition-specific baseline severity in the utilization runs and for condition-specific baseline severity and utilization in the outcome runs, and findings were confirmed with stepwise forward analyses. To enhance our measure of severity of skin/leg/foot problems, in addition to controlling for the number of baseline problems, we also controlled for worry and perceived restriction. Variables significant at the .05 level in the stepwise runs were entered into full model runs.

RESULTS

CHARACTERISTICS OF THE HOMELESS

Table 1 describes this homeless sample. The traditional predisposing variables indicate a sample that was relatively young, male, and minority dominated. Their average educational level (11.5 years) was less than that of the general population, and a substantial minority (43 percent) had worked in the last 30 days.

Turning to the predisposing domain of the vulnerable, we see that the majority had a prison history and one-quarter had been crime victims. Two-thirds lived on Skid Row in Los Angeles. Most had experienced multiple episodes of homelessness amounting to several years, and the modal current type of "residence" was living outdoors. Chronic mental illness was common and large proportions experienced chronic alcohol and drug dependence.

The traditional enabling variables show that the majority had no regular source of care (only 4 percent used a private doctor) and only one-third were covered by health insurance. Reported income was low: one-half had a monthly income of $300 or less, and the mean monthly income was only $463. Three-fifths received some public benefits, and most reported relatively little social support. Our enabling measures of the vulnerable suggest that 42 percent of these homeless people experienced "competing needs" and that 26 percent had some fear for their personal safety.

Traditional need measures suggest high levels in this sample. One-third reported a restricted activity day during the past three months and, similarly, one-third reported functional limitations. Thirty-six percent of the sample reported fair or poor health, as compared to 10 percent of the general population (National Center for Health Statistics 1997: 181).

The sample had, on average, one of the four study conditions. They were generally not worried about being TB skin test positive. However, about 40 percent worried somewhat or a great deal about having the other three conditions. The majority did not report any restriction in activity due to a condition, but restrictions were reported with some frequency for vision impairment and skin/leg/foot problems. Fourteen percent had high blood pressure: 11 percent according to the systolic reading and 10 percent according to the diastolic reading. The vision examination showed that 37 percent had functional vision impairment in their worst eye: 29 percent had far vision and 23 percent had near vision in need of correction. About 36 percent had a skin/leg/foot problem according to our interview or examination: 27 percent had skin/leg/foot problems according to our objective measures and 31 percent had such problems according to the subjective measures. Among those tested in Wave 1, 31 percent had a positive TB skin test.

THE USE OF HEALTH SERVICES IN RESPONSE TO CONDITIONS

A relatively small number (37) were referred for high blood pressure. With respect to Hypothesis 1 regarding the utilization of medical care after referral: of the 27 from whom we got follow-up information regarding whether they actually obtained medical care, the great majority (81 percent) reported seeing a clinician between the baseline and follow-up surveys. A much larger number (121) were referred for functional vision impairment. We obtained follow-up utilization data on 96 of these. The proportion who actually saw a clinician (33 percent) was much smaller than the proportion who sought care for high blood pressure. More people were referred for skin/leg/foot problems (142)

than for any of the other conditions. Of the 121 individuals for whom we have subsequent utilization information, 44 percent obtained clinical care. Finally, we discovered 83 persons with positive TB skin tests, and obtained follow-up utilization data on 71 of these cases. Seventy-eight percent of these persons obtained clinical care.

With respect to Hypotheses 2–4, unadjusted relationships between the predisposing, enabling, and need factors and reported receipt of care revealed that few variables were significantly correlated with care-seeking in response to high blood pressure. Among the predisposing variables, all of the significant findings were in the traditional domain. Obtaining care for high blood pressure was significantly correlated with older age (the strongest finding), being African American, and not working in the last 30 days. No enabling variables (in either the traditional or vulnerable domains) were significantly associated with obtaining care. Among the need variables, greater worry about high blood pressure and a higher diastolic reading led to more use of services.

A number of variables were significantly associated with the use of services in response to vision impairment. Among the predisposing factors, older age and being male led to greater use. One predisposing factor from the vulnerable domain was also significant: those reporting more months being homeless were more likely to obtain care for their vision impairment. One enabling variable was significant: those without current public benefits were more likely to obtain vision care. The need variables significantly associated with obtaining vision care were no functional limitation, more worry about the vision impairment, and worse far vision.

Some traditional predisposing factors were significantly associated with obtaining care for skin/leg/foot problems. These were older age, not being African American, and having less formal education. However, more of the predisposing variables representing the domain of the vulnerable proved to be significantly related to obtaining care for such problems. These measures included a prison background, more months of homelessness experienced, most common residence in a homeless shelter during the past 30 days, and recreational drug use. No enabling variables were significantly related to obtaining care. Among the need variables, persons with a restricted activity day and a greater number of the other study conditions were significantly more likely to obtain care for their skin/leg/foot problems.

In the bivariable analyses, few predictor variables were significantly associated with obtaining care in response to a positive TB tine test. All of the variables that were significant came from the predisposing vulnerable domain. More likely to obtain care were homeless people who had not been

crime victims, who lived on Skid Row rather than the Westside, and who had chronic alcohol dependence.

In terms of multivariable analyses for Hypotheses 2–4, Table 2 presents the multiple logistic regression results for receipt of service in response to functional vision impairment, a skin/leg/foot problem, and a positive TB tine test. The results for functional vision impairment suggest the importance of the following variables for predicting vision-related service use: older age (predisposing), not currently receiving public benefits (enabling), not having a functional limitation, worrying more about their vision, and having worse far vision at baseline (need).

For skin/leg/foot problems, independent predictors of obtaining care included a longer time homeless and more commonly residing in a shelter during the previous month. Restricted activity days and the total number of study conditions also predicted the use of services. However, condition-specific measures of the severity of skin/leg/foot problems, which were forced into the final model, were not significant.

The multivariable model for care-seeking in response to a positive TB tine test included only two variables: not having been a crime victim and having chronic alcohol dependence.

OUTCOMES FOLLOWING RECEIPT OF SERVICE

All conditions improved significantly during the course of the study, with the exception of diastolic blood pressure, which showed no statistically significant change (although the direction of the change revealed improvement). Systolic pressure improved by an average of 17 mm Hg ($\bar{x}$ 159 to 142.3 mm Hg.). On average, near vision improved by 1 Snellen line ($\bar{x}$ 7.1 to 6.1), and far vision improved by 1.2 Snellen lines ($\bar{x}$ 9.1 to 7.9). For skin/leg/foot problems, persons with subjective ($\bar{x}$ 1.5 to 0.5) or objective ($\bar{x}$ 1.4 to 0.5) problems had on average one fewer problem by the end of the study.

With respect to Hypotheses 5 and 6, Tables 3 and 4 show the multivariable analysis results for vision and skin/leg/foot outcomes. Controlling for baseline severity, the models for near and far vision impairment show that the use of health services between the baseline and the follow-up surveys was significantly associated with better far, but not better near, vision at follow-up. Predisposing and enabling variables predictive of better far vision included more months homeless, living on the Westside as opposed to Skid Row, and having a community clinic or private physician as a regular source of care. Predisposing and enabling variables predictive of better near vision included not using alcohol heavily and fewer competing needs.

Table 4 displays the models for two measures of skin/leg/foot problems. The first was based totally on the self-reports of the respondents (subjective report). The second was based totally on the observations of the interviewers (objective report). Receipt of services was a significant predictor for the self-reported outcome, but not for the objective report. In particular, receipt of services was associated with worse self-reported skin/leg/foot status in the follow-up surveys. None of the need variables measured at baseline (worry, restrictiveness of condition, or number of skin/leg/foot problems) was significant in the final model for either the subjective or the objective finding of problems at follow-up. Significant predisposing and enabling predictors of better self-reported skin/leg/foot status at follow-up were being male, not using drugs, and having a community clinic or private physician as a regular source of care. Significant predisposing and enabling predictors of better skin/leg/foot status at follow-up, according to objective reports, were the presence of chronic mental illness, the absence of chronic alcohol dependence, and having a community health center as a regular source of care.

CONCLUSIONS

The four study conditions were prevalent among our sample of homeless adults. Two-thirds had a study condition, with nearly one-third having vision impairment, skin/leg/foot problems, and a positive TB skin test. High blood pressure was the least prevalent condition. In general, the magnitude and effects of the conditions selected in this study warrant attention concerning determinants of health services use in response to them and concerning outcomes of treatment.

Our study documents that the newly added categories to the Behavioral Model for Vulnerable Populations should be considered in studies of the health of disadvantaged populations. Residential history, mental health, substance abuse, victimization history, and competing needs do affect the use of health services and health outcomes.

Turning to our hypotheses concerning the use of health services by the homeless, our findings supported some of these hypotheses, but not others. In our first hypothesis, we had expected that homeless persons would be more likely to seek care for problems that are symptomatic and have an immediate impact on their ability to function in their deprived living conditions: skin/leg/foot problems and vision impairment. However, about

Table 2: Multiple Logistic Regression Results for Utilization of Health Services for Monitored Conditions Among Homeless Adults

	Utilization					
	Functional Vision Impairment (N = 96)		*Skin/Leg/Foot Problems (N = 121)*		*TB Tine Test Positivity (N = 71)*	
Variables	*Odds Ratio*	*95% CI*	*Odds Ratio*	*95% CI*	*Odds Ratio*	*95% CI*
PREDISPOSING						
Traditional Domain						
Age	1.07	(1.01, 1.13)*				
Vulnerable Domain						
Crime victim, past 30 days					0.15	(0.04, 0.59)**
Number of months homeless			1.03	(1.01, 1.05)**		
Modal shelter type: shelter or institution			3.84	(1.43, 10.29)**		
Chronic alcohol dependence					5.78	(1.51, 22.17)**
ENABLING						
Vulnerable Domain						
Current public benefits	0.14	(0.04, 0.51)**				
NEED						
Traditional/Vulnerable Domain						
Any restricted activity days, past 3 months			8.96	(3.30, 24.33)***		
Any functional limitations, past 3 months	0.19	(0.05, 0.68)**				
Number of monitored conditions†			1.93	(1.07, 3.48)*		
Less worry about condition‡	0.47	(0.28, 0.79)**				

Less condition restriction[§]			1.10	(0.72, 1.67)
Functional far vision, worst eye (No. of Snellen lines)	2.34	(1.44, 3.80)***		
Total number of subjective and objective skin/leg/foot problems			1.08	(0.75, 1.56)

Notes: *$p < .05$; **$p < .01$; ***$p < .001$. Analyses are weighted; *N*s are unweighted. Models include variables significant at $p \leq .05$ in bivariate analyses. In this table, we show only significant predictors and the control variable of baseline severity for vision impairment and skin/leg/foot problems.

[†]Number of the four study conditions, baseline (high blood pressure, functional vision impairment, skin/leg/foot problems, TB tine test positivity).

[‡]Worry about condition, past three months, 4-point scale (1 = a great deal to 4 = not at all); most worry about skin, leg, or foot problems among those with these problems.

[§]Condition restriction, past three months, 5-point scale (1 = all of the time to 5 = not at all); greatest restriction for skin, leg, or foot problems among those with these problems.

Table 3: Multiple Linear Regression Results for Vision Outcomes Among Homeless Adults with Baseline Vision Impairment

	Final Functional Far Vision (N = 61)		*Final Functional Near Vision (N = 59)*	
Variables	*B*	*S.E.*	*B*	*S.E.*
PREDISPOSING				
Vulnerable Domain				
Heavy alcohol use, past 30 days†			1.48	0.52**
Number of months homeless, lifetime	−0.02	0.01*		
Skid Row vs. Westside‡	1.38	0.59*		
ENABLING				
Traditional Domain				
Regular source of care from community clinic/Private doctor	−1.35	0.42**		
Vulnerable Domain				
Fewer competing needs§			−0.69	0.25**
NEED				
Traditional/Vulnerable Domain				
Functional vision, worst eye (No. of Snellen lines)				
Far vision	0.69	0.17***		
Near vision			0.76	0.15***
UTILIZATION OF HEALTH SERVICES				
Received Care for Specific Condition	−0.91	0.40**	0.74	0.52

Notes: $*p < .05$; $**p < .01$; $***p < .001$. Analyses are weighted; *N*s are unweighted. Models include variables significant at $p \leq .05$ in bivariate analyses. In this table, only significant predictors and the control variables of baseline severity and condition-specific health services use are shown.

†≥ three drinks per average day.

‡Area of city respondent sampled from.

§Competing needs, past 60 days, 4-point scale (1 = usually to 4 = none of the time).

four-fifths of these homeless adults obtained care for conditions that were generally asymptomatic but that had potentially serious long-term consequences (high blood pressure and TB skin test positivity). In contrast, fewer than half obtained care for vision impairment and skin/leg/foot problems. Thus, based on our findings, we must revise this hypothesis to suggest that homeless persons will be more likely to seek care for conditions that have a less immediate, but longer-term, effect and that are of greater salience in the mind of the general public. Possibly we underestimated homeless persons in their knowledge of, and concern for, the potential long-term impact of serious chronic conditions. While their skin and vision symptoms might have

Table 4: Multiple Logistic Regression Results for Final Skin/Leg/Foot Problems Among Homeless Adults

	Any Self-Report Skin/Leg/Foot Problem (N = 99)		*Any Objective Report Skin/Leg/Foot Problem (N = 61)*	
Variables	*B*	*S.E.*	*B*	*S.E.*
PREDISPOSING				
Traditional Domain				
Male	−1.78	0.59**		
Vulnerable Domain				
Chronic mental illness			−1.79	0.85*
Chronic alcohol dependence			2.01	0.88*
Drug use, past 30 days	1.79	0.63**		
ENABLING				
Traditional Domain				
Regular source of care from community clinic/Private doctor	−1.42	0.60*	−3.09	1.00**
NEED				
Traditional/Vulnerable Domain				
Less condition restriction†	−0.23	0.24	−0.19	0.39
Number of subjective skin/leg/foot problems	−0.08	0.46		
Number of Objective skin/leg/foot problems			1.13	0.67
UTILIZATION OF HEALTH SERVICES				
Received Care for Specific Condition	1.58	0.54**	0.86	0.76

Notes: *$p < .05$; **$p < .01$; ***$p < .001$.

Analyses are weighted; *N*s are unweighted. Models include variables significant at $p \leq .05$ in bivariate analysis. In this table, only significant predictors and control variables of baseline severity and condition-specific health services use are shown.

†Condition restriction, past three months, 5-point scale (1 = all of the time to 5 = not at all); greatest worry for skin, leg, or foot problems among those with these problems.

diminished their ability to function, they may have been coping or at least getting by. They also might have felt that they could treat such conditions on their own. Self-treatment may have been particularly efficacious for near vision impairment since reading glasses are readily available in local stores.

Our second hypothesis was supported by our data: predisposing and enabling domains of the vulnerable were important supplements to traditional predisposing and enabling variables in predicting use of care. These variables include residential history and length of time homeless—for skin/leg/foot problem; public benefits—for vision impairment; and substance abuse and victimization—for TB skin test positivity. Also, we were surprised to find

that mentally ill persons were able to gain access to the system and to negotiate their way through it as well as any other homeless individuals. Further, in contrast to the increased use of services for skin/leg/foot problems by persons living in shelters, persons who commonly slept in traditional housing had utilization as limited as those who spent their nights on the streets or in places not meant for shelter. Perhaps this is because traditional housing is often located in areas that do not have services designed for homeless and impoverished persons. Some shelters either have on-site health services or provide referral and/or transportation to healthcare facilities. Likewise, the homeless people with skin/leg/foot problems in our study were more likely to get care if they had been homeless longer. Such individuals are more likely than the newly homeless to have greater knowledge and awareness of available services for the homeless, as well as methods to travel to locations offering these services. The lack of many significant associations with utilization from the predisposing and enabling variable domains for high blood pressure in part reflects the limited number of cases with utilization information ($N = 27$) and the lack of variation in seeking care.

Our third hypothesis was that measures of need for the specific study conditions would be important predictors of obtaining care. This hypothesis was supported for high blood pressure since diastolic pressure was positively correlated with obtaining relevant care. Support for the hypothesis also comes from the multivariable findings for functional vision impairment, where people who worried more about their vision and had worse far vision were more likely to obtain care. However, for skin/leg/foot problems, neither restriction because of the condition nor the total number of such problems was significantly related to seeking care. It is possible that these negative results are due to insensitivity in our measures of need. Alternatively, homeless persons may be skeptical that a visit will help these types of problems, regardless of severity.

Our fourth hypothesis, that the predisposing and enabling domains of the vulnerable would be more important for explaining the outcomes for conditions with less apparent impact (high blood pressure, TB test positivity) than for those with immediate impact (skin/leg/foot problems, vision impairment) had mixed support. These vulnerable domains were important for understanding less use of care for TB (crime victim, alcoholism) and vision impairment (public benefits), but also for the greater use of care for skin/leg/foot problems (months homeless, shelter residence). For high blood pressure, none of the predisposing or enabling variables representing the

vulnerable domains were significantly correlated with the use of services by the respondents.

Our fifth hypothesis, that predisposing and enabling domains of the vulnerable would be important supplements to traditional domains in explaining health outcomes for our study conditions received support. Most of the significant predisposing and enabling variables were from the vulnerable domain. However, we had expected that conditions that might exacerbate the problems of being homeless would be associated with worse outcomes. Alcohol abuse, drug use, competing needs, and living on Skid Row (in contrast to the suburban beach communities of the Westside) did predict worse outcomes. However, longer periods of homelessness and mental illness predicted better outcomes. These findings may suggest that in the homeless environment mental health problems may not always lead to worse health outcomes. Rather, experience in coping with some problems may lead to improved mechanisms for coping with others.

Our final hypothesis, that homeless people who saw a clinician for their conditions would experience better outcomes than those not doing so, received mixed support. In support of the hypothesis was the finding that those people with far vision impairment who obtained care had significantly better far vision at follow-up than did those who did not seek care. However, contrary to our hypothesis, those with self-reported skin/leg/foot conditions who obtained care reported significantly worse outcomes than those who had not sought care. Although we controlled for the number of skin/leg/foot problems and for self-reported worry and restriction in activity, it is still possible that many of those who did not seek professional treatment had conditions that did not require it. It is also possible that some people were sensitized to and labeled as having skin/leg/foot problems at baseline or after obtaining care. In obtaining care, they might have had expectations of a cure when, in reality, limited treatment or compliance—or the adverse conditions of climate and hygiene they faced after obtaining help—meant that no such cure was forthcoming, and that more negative self-reports of their skin/leg/foot status would result at follow-up.

Thus, we might need to revise our hypothesis to state that the use of care may not have a major impact on health outcomes for the homeless given the harshness of their environment and the current state of healthcare available to them. Further studies with larger samples are needed to clarify the effect of services, and specific types of services, on health outcomes among people who are homeless. Better care in the form of community health centers may be required to effectively treat them. In a previous study, we found

that community health centers funded specifically for the homeless only treated half of their area's homeless population according to clinic directors' estimates (Doblin, Gelberg, and Freeman 1992). This finding may reflect lack of capacity; however, it may also have been due to the reluctance of homeless persons to seek services.

LIMITATIONS

This study is limited by several factors.

1. Because of attrition, selection bias is a potential problem and our sample may not be completely representative of the homeless population in our two study communities. However, because this was a probability study, and we knew the characteristics of the original sample, we were able to adjust the sampling weights for attrition and selection using regression techniques. Following homeless persons who do not have a stable address or phone number over time is a very difficult task. The methods of this study were the most sophisticated to date, and resulted in what we believe is a quite acceptable attrition rate.
2. As in all interviews, our self-report measures are limited by reporting bias. However, we have found that homeless adults are fairly accurate in their reports of having made an ambulatory visit (Gelberg and Siecke 1997). Further, this study was unique in having clinical variables from physical examination and TB skin testing to supplement the interview data.
3. Our findings are limited by the small sample sizes of individuals with any given condition and with each of the predisposing, enabling, and need characteristics.
4. Our utilization results were based on simple yes/no questions about whether services had been received. Had we measured the type of facility or clinician from which respondents obtained care, we might have found different results. However, we were able to control for their regular source of care, and found that respondents whose regular source was a community clinic or private physician often had better health outcomes.
5. We were not able to observe adherence with recommended treatment. Perhaps utilization of services would have shown greater

impact on health status outcomes had we been able to control for adherence to prescribed care.

6. Our clinical data were collected by lay interviewers, not by clinicians. This might have resulted in measurement bias. However, the extensive training and reliability testing of our interviewers and their use of a highly structured form for clinical data collection should have minimized such bias.
7. The skin/leg/foot problem severity measure may not have been very sensitive. Some problems might have resolved on their own while others might have been extremely difficult to treat.
8. Respondents were followed only if they had a problem, and we do not know to what degree improvement in blood pressure and skin/leg/foot problems represented simple regression to the mean. Further, longer follow-ups may be necessary to accurately determine outcomes of care.
9. Some of the predictors measured at baseline may have changed by the time the health study started, as well as during the course of it.
10. This study may not be generalizable to other areas of Los Angeles or the United States. However, the addition of a suburban area to the downtown Skid Row area (customary of most studies of the homeless) enhances our generalizability.

FUTURE RESEARCH

We hope that future research will extend the findings of our study.

1. The Behavioral Model for Vulnerable Populations should be tested on other segments of the homeless population (e.g., children), as well as on other vulnerable populations.
2. Future studies testing components of the Behavioral Model for Vulnerable Populations need sufficiently large sample sizes to ensure adequate power. Studies that include patient satisfaction and adherence to prescribed treatment among the homeless are also needed.
3. Our study was limited to the use of health services and health outcomes for four conditions. Future work could expand this effort by understanding other conditions and exploring in detail the reasons why homeless persons obtain healthcare.
4. Future research with larger samples is needed to determine if community health centers with expertise in caring for the homeless

do have a more positive effect on health outcomes than hospital outpatient departments and emergency rooms. Further, we need to understand more fully the characteristics of community health centers that predict better outcomes (e.g., expertise in caring for homeless populations, greater visit lengths, integrated services, and continuity of care).

IMPLICATIONS

Clinicians providing care to homeless populations must pay attention to the unique aspects of living conditions and lifestyle that may affect the health outcomes of homeless persons and impede their utilization of care. Up front, such patients should be assessed for their living situation, health insurance and income status, drug and alcohol use, mental health status, competing needs, and victimization history. These factors should be strongly considered by clinicians in devising an evaluation and treatment plan that will be feasible and effective given the limitations of homeless patients' life situations. This might not be possible in many traditional health settings, but money is being devoted to financing increased visit length in health services designed for the homeless (Health Resources and Services Administration 1998).

Health planners will find it encouraging that the vast majority of homeless persons with high blood pressure and positive TB skin tests obtained initial medical attention when provided with referral resources in the community.

At the onset of this study, we did not know whether it was possible to remediate the physical health conditions of homeless adults without at the same time addressing their overwhelming problems of mental illness, substance abuse, and lack of housing. Our study demonstrates that homeless persons will go for care if they regard a condition as serious. We also found that we can motivate the homeless to seek medical care even though they have mental illness, are abusing substances, and lack permanent housing.

In general, utilization of services did not consistently lead to better health outcomes in this study. It could be that existing health services are not sufficient to overcome the major influence and barriers created by the extreme deprivation of the homeless living conditions and lifestyle. Notwithstanding, we did find that having a community clinic or private physician as a regular source of care was a predictor of improved health status for far vision impairment, as well as for subjective and objective skin/leg/foot problems. Many community health center services for the homeless are currently

funded by the Health Care for the Homeless Program (HCH). This program provides primary care to homeless persons, in conjunction with assessments and community linkages to needed social, mental health, and drug treatment services. While currently there are 128 HCH grantees nationally, with 500 clinic sites, as noted previously, they only serve 50 percent of the homeless population (Doblin, Gelberg, and Freeman 1992). In the case of our sample, only one-fifth were accessing such facilities.

This study employed a cost-effective clinical data collection system that was designed for use by lay interviewers. Our utilization findings suggest that a modified or scaled-down version of this system might be usefully employed by public health departments and outreach programs as a practical way of screening homeless persons to identify their health problems and of getting them into facilities that specialize in the care of homeless persons while their symptoms are still relatively benign.

During the current transitional period when medical care for the poor (including the homeless) is increasingly coming under the auspices of managed care systems, it is important to consider the particular needs of vulnerable populations in planning their access to these systems, and to monitor their access on an ongoing basis. Based on our findings, it is not clear whether Medicaid-eligible homeless persons will fare better or worse under state Medicaid managed care systems. However, O'Connell, Lozier, and Gingles (1997) have noted that adaptations to clinical care needed by homeless persons, such as provider sensitivity to the unique issues of homelessness, flexibility in service location, and broad access to integrated services, are generally discouraged by managed care. Gatekeeping mechanisms designed to ration physical, mental, and substance abuse treatment services may lead homeless adults to further avoid seeking care in the early stages of illness if the care-seeking process becomes more arduous or time-consuming. Moreover, the uninsured homeless, whose numbers are increasing due to welfare reform (Children's Defense Fund and the National Coalition for the Homeless 1998) may find it particularly difficult to obtain non-urgent care, even if they wish to do so.

ACKNOWLEDGMENTS

The authors are very grateful to the following for their tremendous assistance during the design and conduct of this research and the preparation of this manuscript: Robert Brook, M. Audrey Burnam, Naihua Duan, Michele

Hamilton, Lawrence Kleinman, Paul Koegel, Carol Mangione, Robert Mohr, Christopher Panarites, Judy Perlman and the RAND Survey Research Group, Richard Strick, Ellen Silk, Steven Spronz, and Richard Usatine. We thank Lederle Laboratories for donating the TB tine skin tests to this study. A special thanks to the homeless individuals who participated in this study with the hope that their effort would go toward improving the health of the overall homeless population.

REFERENCES

Aday, L. A. 1994. "Health Status of Vulnerable Populations." *Annual Review of Public Health* 15: 487–509.

———. 1993. *At Risk in America: The Health and Health Care Needs of Vulnerable Populations in the United States.* San Francisco: Jossey-Bass, Inc.

Aday, L., and W. Awe. 1997. "Health Services Utilization Model." In *Handbook of Health Behavior Research, Vol. I. Determinants of Health Behavior: Personal and Social,* edited by D. Gochman. New York: Plenum Publishing Co.

Alstrom, C. H., R. Lindelius, and I. Salum. 1975. "Morality Among Homeless Men." *British Journal of Addiction* 70 (3): 245–52.

Andersen, R. 1995. "Revisiting the Behavior Model and Access to Care: Does It Matter?" *Journal of Health and Social Behavior* 36 (1): 1–10.

———. 1968. Behavior Models of Families' Use of Health Services. Research Series No. 15. Center for Health Administration Studies, University of Chicago.

The Children's Defense Fund and the National Coalition for the Homeless. 1998. Washington, DC: The National Coalition for the Homeless.

Doblin, B., L. Gelberg, and H. Freeman. 1992. "Patient Care and Professional Staffing Patterns in McKinney Act Clinics Providing Primary Care to the Homeless." *Journal of the American Medical Association* 267 (5): 698–701.

Fischer, P., S. Shapiro, W. Breakey, J. Anthony, and M. Kramer. 1986. "Mental Health and Social Characteristics of the Homeless: A Survey of Mission Users." *American Journal of Public Health* 76 (5): 519–24.

Gelberg, L. 1996. "The Homeless." In *Changing the U.S. Health Care System: Key Issues in Health Services, Policy, and Management,* edited by R. M. Andersen, T. H. Rice, and G. F. Kominski, pp. 273–301. San Francisco: Jossey-Bass Publishers.

Gelberg, L., T. C. Gallagher, R. M. Andersen, and P. Koegel. 1997. "Competing Priorities as a Barrier to Medical Care Among Homeless Adults in Los Angeles." *American Journal of Public Health* 87 (2): 217–20.

Gelberg, L., and B. D. Leake. 1993. "Substance Use Among Impoverished Medical Patients: The Effect of Housing Status and Other Factors." *Medical Care* 31 (9): 757–66.

Gelberg, L., and L. Linn. 1989. "Psychological Distress Among Homeless Adults." *Journal of Nervous and Mental Disease* 177 (5): 291–95.

———. 1988. "Social and Physical Health of Homeless Adults Previously Treated for Mental Health Problems." *Hospital and Community Psychiatry* 39 (5): 510–16.

Gelberg, L., L. S. Linn, R. P. Usatine, and M. H. Smith. 1990. "Health, Homelessness, and Poverty." *Archives of Internal Medicine* 150 (11): 2325–30.

Gelberg, L., C. Panarites, H. Morgenstern, B. Leake, R. Andersen, and P. Koegel. 1997. "Tuberculosis Skin Testing Among Homeless Adults." *Journal of General Internal Medicine* 12 (1): 25–33.

Gelberg, L., and N. Siecke. 1997. "Accuracy of Homeless Adults' Self-Reports." *Medical Care* 35 (3): 287–90.

Health Resources and Services Administration. 1998. *Health Care for the Homeless Directory.* Bethesda, MD: U.S. Dept. of Health and Human Services.

Kleinman, L. C., J. Perlman, H. Freeman, and L. Gelberg. 1996. "Homing In on the Homeless: Assessing the Physical Health of Homeless Adults in Los Angeles County Using a Novel Method to Obtain Physical Exam Data in a Survey." *Health Services Research* 31 (5): 533–49.

Koegel, P., and A. Burnam. 1991. *The Course of Homelessness Study.* A Funded Proposal. Rockville, MD: National Institute of Mental Health.

———. 1988. "Alcoholism Among Homeless Adults in the Inner City of Los Angeles." *Archives of General Psychiatry* 45 (11): 1011–18.

Koegel, P., A. Burnam, and S. Morton. 1996. "Enumerating Homeless People: Alternative Strategies and Their Consequences." *Evaluation Review* 20 (4): 378–403.

Lederle Laboratories. 1980. *Tuberculin, Old Tine Test and Tuberculin, Purified Protein Derivative Tine Test PPD.* Pearl River, NY: Lederle Laboratories.

National Center for Health Statistics. 1997. *Health, United States, 1996–97 and Injury Chartbook,* page 181. Hyattsville, MD: NCHS.

O'Connell, J., J. Lozier, and K. Gingles. 1997. *Increased Demand and Decreased Capacity: Challenges to the McKinney Act's Health Care for the Homeless Program.* Nashville, TN: National HCH Council.

Rew, L. 1996. "Health Risks of Homeless Adolescents: Implications for Holistic Nursing." *Journal of Holistic Nursing* 14 (4): 348–59.

Robertson, M., and M. Cousineau. 1986. "Health Status and Access to Health Services Among the Urban Homeless." *American Journal of Public Health* 76 (5): 561–63.

Robins, L. N., J. E. Helzer, J. Croughan, and K. S. Ratcliff. 1981. "The NIMH Diagnostic Interview Schedule: Its History, Characteristics, and Validity." *Archives of General Psychiatry* 38 (4): 381–89.

Ropers, R., and R. Boyer. 1987. "Homelessness as a Health Risk." *Alcohol Health and Research World* 11 (1): 38–90.

Ware J., and C. Sherbourne. 1993. "The RAND 36-Item Health Survey 1.0." *Health Economics* 2 (2): 217–27.

Wright, J. D., E. Weber, P. H. Rossi, J. A. Lam, and J. W. Knight. 1987. *Homelessness and Health.* Washington, DC: McGraw-Hill Healthcare Information Center.