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Constructing and identifying predictors of frailty among homeless adults—A latent variable structural equations model approach

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ABSTRACT

Homeless urbanites are a heterogeneous population with unique health and social service needs. The study examined situational, behavioral, health-related and resource indicators in terms of their direct impact on frailty, hypothesized as a latent variable. Using structural equation modeling (SEM), a model was tested with 150 homeless men and women, ages 40–73, from three homeless day center drop-in sites on Skid Row and one residential drug treatment (RDT) facility that works with homeless parolees and probationers. In bivariate analyses with the latent construct frailty, months homeless ($p < 0.01$), female gender ($p < 0.05$), education ($p < 0.05$), comorbid conditions ($p < 0.001$), nutrition ($p < 0.001$), resilience ($p < 0.001$), health care utilization ($p < 0.01$), and falls ($p < 0.001$) were significantly associated with frailty. In the final path model, significant predictors of frailty included educational attainment ($p < 0.01$), comorbid conditions ($p < 0.001$), nutrition ($p < 0.001$), resilience ($p < 0.001$), and falls ($p < 0.01$). These findings will serve as a foundation for future nurse-led, community-based initiatives that focus on key predictors of frailty among the homeless and the development of interventions.

1. Introduction

Frailty, a public health challenge, may be a significant issue among homeless and disenfranchised populations in urban and rural cities across the United States (U.S.). Defined as an accumulation of deficits (Rockwood & Mitnitski, 2007, 2011) across physical, psychological, and social domains (Gobbens, van Assen, Luijkx, & Schols, 2011), this phenomenon may be a major contributor to disability, morbidity, and premature mortality. For decades, frailty has been written about and characterized; a seminal paper identifies frailty as a clinical syndrome with specific hallmark characteristics (Fried et al., 2001) such as shrinking, weakness, exhaustion, slowness, and low activity. While other authors focus on signs, and disease classifications, often leading to adverse outcomes (Mitnitski, Mogilner, MacKnight, & Rockwood, 2002).

Los Angeles, a large metropolis denoted as the homeless capital of the U.S., faces consistently high rates of homelessness. On any given night, over 40,000 homeless adults are on the streets (Morrison, 2011). Similar to domestic and international aging trends, homeless adults are similarly aging and experts believe will double within the next several decades (Brown, Kiely, Bharel, & Mitchell, 2011; DiMassa, 2008; Kushel, 2012; Los Angeles Services Housing Administration [LAHSA], 2011; Sermons & Henry, 2010). Based on current trends of homelessness in Los Angeles, the population is aging; in particular, data reveal over one third are over 55 years of age (LAHSA, 2011) and frailty may be a significant issue.

Frailty among vulnerable populations has not been studied widely; however, homeless populations may have a lifetime of risk factors for frailty which may encompass poor nutrition (Baggett et al., 2011; Sprake, Russell, & Barker, 2013), chronic diseases such as hypertension (Child, Bierer, & Eagle, 1998) and diabetes (Scott et al., 2013), along with the aging of the population (LAHSA, 2011), histories of incarceration (Tejani et al., 2013), gang-related activities and substance abuse which may lead to adverse outcomes.

Previous frailty models have been aptly described and focus on physiological, biological and molecular exploratory frameworks (Bergman et al., 2004; Fried & Walston, 2003). In fact, at the nucleus of many models is a decline in physiological reserve which

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leads to adverse outcomes (Bergman et al., 2004); models particularly focused on frailty among homeless populations have not been devised. Further, varied measurement instruments are used, along with definitions. One definition identifies frailty as an accumulation of deficits which includes signs, symptoms and disease classifications (Mitnitski et al., 2002); while another indicates frailty is composed of shrinking, weakness, exhaustion, slowness, and low activity (Fried et al., 2001).

Frailty has been studied among community dwelling older adults (Bollwein et al., 2013) in Germany (Saum et al., 2012), Brazil (de Andrade et al., 2013; Vieira et al., 2013), Montreal (Au et al., 2011) and the U.S. (Fried et al., 2001) to name a few. Among older community dwelling adults, frailty prevalence has been found to be approximately 7%; predictors of frailty among community dwelling older adults included being African American, having lower education and income, poorer health, and greater comorbid disease and disability (Fried et al., 2001). Using the same frailty measure, Brown, Kiely, Bharel, and Mitchell (2012) studied geriatric syndromes among homeless adults and found that the prevalence of frailty was 16%. Among older homeless adults, alcohol and drug use problems, having less than a high school education, diabetes and arthritis, and difficulty with activities of daily living was associated with an increased number of geriatric syndromes, one of which was frailty (Brown, Kiely, Bharel, & Mitchell, 2013). Authors contend that homeless populations evidence unique risk factors for geriatric syndromes, one of which is frailty; in particular, those who have one geriatric syndrome should be screened for others, such as cognitive impairment, functional impairment, falls, sensory impairment and urinary continence (Brown, Kiely, Bharel, & Mitchell, 2013). Authors acknowledge that evidence of frailty in homeless populations in general, and as demonstrated more recently among older homeless adults, has further strengthened the case for the need to conduct our study of frailty specifically among the older homeless adult group and to propose interventions which may include screening for geriatric syndromes and clinical case management (Brown, Kiely, Bharel, & Mitchell, 2013).

Thus, the purpose of our study was to test a latent variable, "frailty" which encompasses physical, psychological and social domains and then utilize SEM to assess the relative impact of predictors among a sample of 150 homeless adults in Los Angeles, CA. This study will enable a better understanding of frailty among homeless adults in order to help identify areas for intervention.

2. Methods

2.1. Design, sample and site

Cross-sectional data were collected from a sample of 150 homeless men and women in Los Angeles from February to May 2012. This study was approved by the University Human Subjects Protection Committee. Homeless men and women comprised the sample ($N = 150$; 50% female) and were found eligible if they were: (a) aged 40 or over; (b) free of evidence of acute psychotic hallucinations and psychosis; (c) English-speaking; and (d) homeless. Participants were recruited from three homeless day center drop in sites on Skid Row and one RDT facility which provides temporary shelter for homeless adults on parole or probation within the same perimeter.

2.2. Procedures

Community-based partnerships were established by the principal investigator (PI) upon obtaining UCLA Human Subjects Institutional Board approval. There were four community-based sites in the Skid Row expanse; one of which was a women's center, another had a dedicated women's day center, the third worked with women and the RDT site worked with women as well as men. Flyers were posted in common day center sites during the recruitment period, and numerous announcements were made in day centers by the PI. After further discussion, if interest continued, a brief screening questionnaire to assess birth year, homelessness status, and sleeping arrangements in the previous night. Upon determination of eligibility, the PI set an appointment with the potential participant and subsequently completed informed consent in a quiet screened area of each facility. Each participant session lasted one hour and thirty minutes. During that time, the PI administered the questionnaires and other assessments. At the completion of session, each participant was compensated with a $25 gift card to a commercial grocery store or food vendor.

2.3. Measures

The instrumentation was composed of a number of measures chosen based on the Frailty Framework among Vulnerable Populations (FFVP) and carefully selected in terms of not overlapping with the outcome. Antecedent indicator factors were included situational, behavioral, health related and resource factors.

2.4. The structural model

The variables in this study are guided by the hypothesized FFVP, a theoretical framework which serves as a guide in working with hard-to-reach populations. The model itself was developed by the investigator and adapted from the Integrated Conceptual Model of Frailty (Gobbens et al., 2011), the Working Framework for Understanding frailty (Bergman et al., 2004) and biological models of frailty (Fried & Walston, 2003). Variables within the framework are based on empirical research and they were explicitly developed for this study

The indicators present in this study include situational, behavioral, and health-related and resource factors. Situational factors include *race/ethnicity*, *gender*, *income*, *education*, *marital status*, *homelessness*, while behavioral factors include *alcohol and illicit drug use*, *smoking*, *health care utilization* and *nutrition*. Health-related factors include *comorbid conditions*, such as hypertension, diabetes, hepatitis and HIV. In addition, resource factors include resilience. These variables are illustrated as contributing factors to physical, psychological and social frailty domains. Examining the relationships between these factors will contribute to the emerging body of literature about antecedents to frailty among homeless adults in an effort to understand pathways for nurse-led interventions.

2.5. The hypothesized model

Fig. 1 illustrates how specific **situational factors**, i.e. race/ethnicity, gender, income and education may influence frailty. While it is difficult to report frailty prevalence rates due to the variety of measures used, one study found that using the five-item Fried frailty index among a sample of 247 homeless adults, age 50–69, that the prevalence of frailty was 16% (Brown et al., 2012). Findings from another study using the same measure revealed that women, African Americans, those with lower education and income were more likely to be frail compared to those who do not have these characteristics ($p < 0.001$) (Fried et al., 2001). Among Latin American older men and women, findings revealed that women were more likely to be frail when compared to men (Alvarado, Zunzunegui, Beland, & Bamvita, 2008).

Illicit drug and alcohol use and smoking are prevalent **behavioral factors** among homeless adults (Gomez, Thompson,