



## Pathways from neighborhood poverty to depression among older adults

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### ABSTRACT

The pathways through which neighborhood poverty can affect resident depression are still unknown. We investigated mechanisms through which neighborhood poverty may influence depression among older adults. Participants were drawn from the New York City Neighborhood and Mental Health in the Elderly Study II, a 3-wave study of adults aged 65–75 ( $n=3,497$ ) at baseline. Neighborhood poverty and homicide were associated with depressive symptoms at follow-up waves (RR:1.20, 95%CI: 1.05, 1.36; RR: 1.09, 95%CI: 1.02, 1.17, respectively). Homicide accounted for 30% of the effect of neighborhood poverty on depressive symptoms. Neighborhood exposure to violence may be a key mechanism through which neighborhood poverty influences depression among older adults.

### 1. Introduction

Depression is a common disorder, affecting 120 million people worldwide (Mathers et al., 2008). It is currently the third leading cause of global disease burden and projections suggest that by 2030 unipolar depressive disorders will grow to be the leading cause of global disease burden (Mathers et al., 2008). Depression among older adults is particularly concerning (Kessler et al., 1994; Beekman et al., 1999; Djernes, 2006), as it is associated with increased disability, physical illness, cognitive decline, and reduced overall quality of life and satisfaction (Palsson and Skoog, 1997; Lenze et al., 2001; Charney et al., 2003).

A number of studies suggest that the physical and social environments in which people live have an important influence on their mental health (Evans, 2003; Truong and Ma, 2006; Aneshensel et al., 2007; Galea et al., 2007; Yen et al., 2009). In particular, studies have consistently linked negative neighborhood-level economic characteristics such as poverty, disadvantage, inequality, and residential instability to higher risk of depression and depressive symptoms (Ross, 2000; Silver et al., 2002; Latkin and Curry, 2003; Kubzansky et al., 2005; Galea et al., 2007; Beard et al., 2009). Older adults may be especially susceptible to depression due to neighborhood poverty because they are on average less mobile than their younger counterparts. Limited mobility makes older adults more dependent on local amenities and services and on local sources of social support

(LaGrange et al., 1992; Whitley and Prince, 2005). Indeed, multiple studies found that older adults living in neighborhoods with higher rates of poverty had higher rates of depression (Ostir et al., 2003; Kubzansky et al., 2005; Aneshensel et al., 2007; Beard et al., 2009).

However, the pathways through which neighborhood poverty can shape older adult depression are still unknown. There may be individual level and neighborhood level mechanisms through which neighborhood poverty impacts depression. There are two potential pathways at the individual level through which neighborhood poverty may influence depression. First, people who live in poor neighborhoods are exposed to more stressful life events, such as unemployment (McLeod and Kessler, 1990) and direct experiences of victimization and witnessing violence (Sampson et al., 1997). Further, stressful life events have been linked to depression among older adults (Kraaij et al., 2002). For example, a study among older adults found that those suffering from financial hardships were more likely to be depressed compared to older adults with fewer financial hardships (Krause, 1987). Second, poor neighborhoods may lack amenities that are supportive of social organization and social engagement, such as churches and community centers (Altschuler et al., 2004; Kim, 2008). A lack of social organization and social engagement can lead to isolation, which has also been shown to increase the risk of depression (Glass et al., 2006; Echeverría et al., 2008). For example, results from a cohort study of approximately 2000 older adults aged 65 years and older from the New Haven Established Populations for the

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Epidemiologic Study of the Elderly found that social engagement was associated with lower depression scores after adjustment for various demographic characteristics, physical activity, and functional status.

There are also several pathways at the neighborhood level through which poverty can influence older adult depression. First, neighborhoods characterized by higher levels of poverty have lower levels of social cohesion and social control and higher levels of crime and physical disorder (Krivo and Peterson, 1996; Sampson et al., 1997; Cohen et al., 2003). Higher levels of crime and physical disorder may generate fear and stress among residents, while lower levels of cohesion and control can result in reduced trust and potentially hamper efforts to reduce crime and physical disorder (Sampson and Groves, 1989; Sampson and Laub, 1990). Additionally, lower levels of social cohesion and social control can hinder the social support necessary to cope with the fear and stress induced by higher levels of crime and physical disorder (Sampson and Groves, 1989; Sampson and Laub, 1990). Fear and stress are known causes of depression (Hammen, 2005). Second, areas of increased poverty often also have less access to green space and lower levels of walkability. Lower levels of social cohesion, green space, and walkability, and higher levels of crime and physical disorder have all been shown to increase the risk of depression in general and among older adults (Sampson et al., 2002; Latkin and Curry, 2003; Whitley and Prince, 2005; Berke et al., 2007; Curry et al., 2008; Echeverria et al., 2008; Lee and Maheswaran, 2011). One cross-sectional analysis among adults aged 45–84 found that lower levels of aesthetic quality and lower levels of social cohesion were associated with higher average depression scores for men and women, controlling for age, income, education, and race/ethnicity. Additionally, higher levels of violence were also associated with higher average depression scores (Mair et al., 2009). In addition, a study of men aged 65 and older found a significant association between neighborhood walkability and depressive symptoms after adjustment for income, physical activity, education, smoking status, living alone, age, ethnicity, and chronic disease (Berke et al., 2007).

These individuals and neighborhood factors that impact depression can be explained by a stress-vulnerability model in which environmental factors can potentially work in three ways: 1) by directly influencing the likelihood of experiencing personal stressors (e.g. unemployment, violence, fear, physical disorder); 2) by providing resources to cope with such stressors (e.g. amenities that are supportive of social organization and social engagement); or 3) by influencing the effect of individual-level factors (e.g. an increase of crime may lead to a perceived unsafe environment which in turn increases depressive symptoms).

Understanding the links between neighborhood poverty and depression is critical if we are to identify intervention targets to reduce rates of depression among older adults. If for example, the relationship between neighborhood poverty and depression is explained by increased crime, interventions aimed at lowering levels of crime may also help reduce the risk of depression. To our knowledge, no previous longitudinal study has examined potential mediators of the relationship between neighborhood poverty and depression among older adults. Previous cross-sectional studies found that a variety of neighborhood level factors such as socioeconomic composition, racial composition, demographic composition, and the physical and social environment influence older adult health (Yen et al., 2009). In addition, while a majority of the cross-sectional studies found that neighborhood-level SES was the most consistent and strongest predictor of a variety of outcomes, including depression, a majority of them did not examine the specific neighborhood features or individual features that may aid in understanding the influence of neighborhood SES on health. In cross-sectional studies it is difficult to ascertain the directionality of the relationship between neighborhood poverty and health; a longitudinal framework is better suited to establish a temporal pathway and thus examine whether specific neighborhood and individual features mediate the effect of neighborhood poverty on

depression. Hence, building on previous cross-sectional studies, this study aimed to examine the direct and indirect associations between neighborhood-level poverty and subsequent depressive symptom severity among older adults using longitudinal data from the New York City Neighborhood and Mental Health in the Elderly Study II (NYCNAMES II). We hypothesized that higher levels of neighborhood poverty would increase risk for depressive symptom severity. Additionally, we hypothesized that the relationship between neighborhood poverty and depression would be mediated by various individual and neighborhood-level factors, including stressful life events, household income, social engagement, homicide rate, neighborhood physical and social disorder, walkability, and green space.

## 2. Methods

### 2.1. Study participants

Study participants were drawn from the New York City Neighborhood and Mental Health in the Elderly Study II (NYCNAMES II), a 3-year longitudinal study of elderly residents, 65–75 years of age, of New York City (NYC). Data collection spanned from June 2011 to November 2013. Detailed methods used to sample study participants have been described elsewhere (Mooney et al., 2015; Joshi et al., 2016). Briefly, census tracts in NYC were divided into 16 strata, representing a broad range of racial-ethnic mix, household income, and walkability. Within each stratum, participants were sampled from a geocoded telephone list from InfoUSA. Each telephone number in each neighborhood had an equal probability of being selected. Interviews were conducted using a computer-assisted telephone interview and the DOT interviews two samples. At wave 1, 3497 individuals were interviewed, follow-up rates for wave 2 and wave 3 were 78% and 67%, respectively. This study focused on the 2023 subjects with complete data for all 3 waves of follow-up. The study was approved by the Institutional Review Boards of Columbia University, New York Academy of Medicine and Abt SRBI.

### 2.2. Measures

#### 2.2.1. Outcome: Depression

Past month depression symptom count was measured using the Patient Health Questionnaire (PHQ-9), a 9-item symptom severity rating scale for depression (Spitzer et al., 1999). The PHQ-9 has excellent internal consistency, test–retest reliability, and construct validity (Martin et al., 2006) and has also been found to produce similar results when administered on the telephone. For the analysis, a depressive symptom severity score, ranging from 0 to 27, was estimated at baseline, wave 2, and wave 3 of the study.

#### 2.2.2. Exposure: Neighborhood poverty

Subject's addresses were geocoded using GeoSupport and DCP-Lion, geocoding applications developed by the New York City Department of City Planning. We defined a study participant's neighborhood as a 1-kilometer (km) network buffer, or the area an individual could cover walking 1-km along the pedestrian-accessible street network from his or her home address. Neighborhood poverty was defined as the percent of households in each participant's 1-km network buffer living below the federal poverty level using the American Community Survey 5-year estimates from 2006 to 2010.

#### 2.2.3. Mediators

**2.2.3.1. Neighborhood-level.** We tested several potential neighborhood-level mediators, including self-reported and recorded measures of neighborhood safety and disorder (i.e. homicide rate, perception of safety, pedestrian and bicyclist injuries and fatalities, neighborhood physical disorder), self-reported measures of

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