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The Cross-sectional and Longitudinal Association between Perceived Neighborhood Walkability Characteristics and Depressive Symptoms in Older Latinos: The “¡Caminemos!” Study

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Abstract

Objectives—Evaluate the cross-sectional and longitudinal association between perceived walkability-related neighborhood characteristics (e.g., traffic safety) and depressive symptoms among community-dwelling older Latino adults.

Methods—We used baseline, 12-month, and 24-month in-person interview data collected from Latinos aged ≥60 years participating in an exercise intervention at 27 senior centers (n=570).

Results—In cross-sectional analyses, lower perceived neighborhood crime, indicative of greater neighborhood walkability, was associated with a lower odds of elevated symptoms of depression [OR=0.90; 95%CI=0.82, 0.996; $p=0.04$] after adjusting for demographic characteristics, linguistic acculturation, and medical comorbidities. Associations between Neighborhood Environment Walkability scales and incident depressive symptoms at 12- and/or 24-months were not statistically significant, but the point estimate for crime safety was consistent with cross-sectional findings [OR=0.83; 95%CI=0.64, 1.07; $p=0.16$], suggesting a protective effect for lower perceived neighborhood crime.

Discussion—Lower perceived neighborhood crime is associated with reduced presence of elevated symptoms of depression in older Latinos.

Keywords

older adults; Hispanics/Latinos; depressive symptoms; neighborhood/environment

INTRODUCTION

Epidemiologic evidence estimates the prevalence of elevated depressive symptoms in community-dwelling older adults to range from 9.9% to 40.3% (Henderson & Pollard, 1992; Saks, Tiit, Kaarik, & Jaanson, 2002; Stallones, Marx, & Garrity, 1990). Although only slightly higher rates of elevated depressive symptoms are reported for community-dwelling older Latino adults when compared to their non-Latino white counterparts, there are evident racial/ethnic disparities in acquisition of mental health services that are hypothesized to be a consequence of inadequate healthcare access and culturally entrenched barriers (e.g., mental illness-related stigma) (Blanco et al., 2007; Cook, McGuire, & Miranda, 2007; Jimenez, Cook, Bartels, & Alegria, 2013; Le Cook, McGuire, Lock, & Zaslavsky, 2010; Uebelacker et al., 2012). As a consequence, it becomes particularly important to identify the factors associated with elevated depressive symptoms in older Latino adults as even sub-threshold levels have been related to increased morbidity and mortality, reduced quality of life and increased healthcare expenditures (Beekman, Deeg, Braam, Smit, & VanTilburg, 1997; Meeks, Vahia, Lavretsky, Kulkarni, & Jeste, 2011; Schulz et al., 2000).

The recent decades have witnessed a paradigmatic shift that extends beyond examination of individual-level factors (e.g., gender, social support, and medical comorbidities) when considering psychological well-being, with movement toward a multilevel ecological perspective that considers environmental factors (Cutrona, Wallace, & Wesner, 2006; Glanz, Rimer, & Lewis, 2002; Kim, 2008; Rose, 2001). Environmental determinants of well-being may be accentuated among older Latino adults as a result of a combination of factors—e.g., reduced physical and cognitive functioning, language-related barriers, decreased comfort and ability to drive, diminishing contact with social network—all of which can lead to greater dependence on the services and amenities offered within the immediate residential neighborhood (Kawachi & Berkman, 2003; Walters et al., 2004).

Both objective (e.g., census tract data and outside observer ratings) and subjective environmental measures (i.e., individual perceptions) of neighborhood problems have been linked to elevated depressive symptoms (Kim, 2008; Mair, Diez Roux, & Galea, 2008; Paczkowski & Galea, 2010). Although there is debate as to the most effective means of assessing neighborhood indicators, perceptions of the neighborhood are thought to be more proximal to individual mental health outcomes as they have been found to mediate the relationship between objectively measured neighborhood indicators and psychological well-being (Evans-Polce, Hulbert, & Latkin, 2013; Ross & Jang, 2000).

To our knowledge, only six studies performed exclusively with older adult cohorts have explored the association between perceived neighborhood characteristics (i.e., subjective appraisal) and depressive symptoms (Ahern & Galea, 2011; Bierman, 2009; Brown et al., 2009; Hahn, Yang, Yang, Shih, & Lo, 2004; Julien, Richard, Gauvin, & Kestens, 2012; Schieman & Meersman, 2004; Yen, Rebok, Yang, & Lung, 2008). Despite differential methodological approaches, the results have been fairly consistent. Higher risk for elevated depressive symptoms is evidenced for older adults who perceived their neighborhood as low in collective efficacy and social capital (e.g., mutual help among neighbors), and higher in

neighborhood problems (e.g., crime). However, five of the six studies were cross-sectional in nature (Ahern & Galea, 2011; Brown et al., 2009; Hahn, Yang, Yang, Shih, & Lo, 2004; Schieman & Meersman, 2004; Yen, Rebok, Yang, & Lung, 2008), and only one of the cross-sectional studies targeted an older Latino adult population (Brown et al., 2009). Consequently, no study has examined the longitudinal relationship between perceived walkability-related neighborhood characteristics (e.g., traffic safety) and depression, exclusively in older Latino adults.

Using data from the ¡Caminemos! intervention study of older Latino adults, we examined cross-sectional and longitudinal associations of perceived neighborhood walkability with prevalent and incident elevated depressive symptoms. We hypothesize that older adults with positive perceptions of neighborhood characteristics associated with walkability (e.g., presence of aesthetically pleasant objects and/or scenery within the immediate neighborhood) are less likely to experience prevalent and incident elevated depressive symptoms independent of socio-demographic factors and extant medical comorbidities. This study significantly adds to the current body of knowledge as it addresses two major shortcomings: (1) minimal to no inclusion of minority or underserved older adult populations, i.e., older Latino adults, and (2) absence of longitudinal research designs needed to infer causality.

METHODS

Study Population and Data Source

The data for the current study ($n = 570$) comes from a randomized controlled trial (RCT) conducted between August 2005 and 2009, whose aim was to examine the effect of a multifaceted intervention (¡Caminemos!) to raise expectations regarding aging on subsequent physical activity levels as measured through self-report and pedometer data. The analyses for this manuscript were based on baseline, 12-month and 24-month in-person interview data collected from older Latino adults (aged ≥ 60 years) participating in the (¡Caminemos!) intervention. Eligible participants were recruited and enrolled from 27 senior centers in the greater Los Angeles region. Primary inclusion criteria for participants were as follows: Latino descent, aged 60 years or older, fluent and able to communicate in English or Spanish, and adequate cognitive functioning (measured using a six-item cognitive screening test) (Callahan, 2002). Potential participants were excluded if they reported current participation in 20 minutes or more of physical activity at least 3 days a week ($n = 164$). Of those identifying a foreign country of origin, 323 (73%) endorsed Mexican descent with the remainder primarily composed of older Hispanic/Latino adults from Central (12.2%) and South America (4.3%). Approval for the study was obtained through the Institutional Review Board (IRB) at the University of California at Los Angeles.

Measures

Self-report survey data including socio-demographic factors, psychological ill-being (i.e., depressive symptoms), perceptions of the built environment, and health-related information was collected using in-person interviews conducted by trained bilingual staff. Measurement instruments previously published in the Spanish language appropriate for Latinos of

Mexican and Central American origin that demonstrated acceptable reliability and validity were used in their published forms. Instruments for which there was not previously-tested published Spanish version were front and back translated by a certified translator.

Neighborhood/Environment Characteristics—Neighborhood characteristics—captured only during the baseline assessment period—were assessed using a shortened version of the Neighborhood Environment Walkability Scale (NEWS) (Saelens, Sallis, Black, & Chen, 2002). This 15-item instrument elicits subjective ratings of neighborhood-related attributes hypothesized to influence engagement in physical activity (i.e., transport and recreational walking). It contains subscales capturing sidewalk availability and quality, neighborhood aesthetics, traffic safety, and crime safety. A 5-point Likert scale, ranging from “strongly agree” to “strongly disagree”, is used to rate statements such as, “There are many interesting things to look at while walking in my neighborhood.” Across subscales, higher scores are indicative of greater walkability. Previous psychometric testing evidences adequate factorial, criterion, and more recently concurrent validity when evaluated against objective measures using geographic information systems (GIS) data (Adams et al., 2009). Test-retest reliability documents high overall consistency with reported correlation coefficients 0.75 across subscales.

Depression Status—Depressive symptoms were assessed at baseline, 12- and 24-months using the 5-item Geriatric Depression Scale (GDS) (M. T. Hoyle et al., 1999; T. Hoyle, Valenzuela, & Marin, 2000). The GDS has shown to be an effective screener for depression among frail community-dwelling older adults as it does not rely on somatic symptomatology which have been shown to be more appropriate for younger populations (i.e. pessimism about the future, weight loss). The 5-item scale consists of dichotomous (yes/no) response options to questions such as, “Are you basically satisfied with your life?” The GDS shows adequate convergent validity when compared to clinical diagnostic methods (i.e., clinician-based diagnosis using the Diagnostic and Statistical Manual of Mental Disorders [DSM]), with a sensitivity of 0.97 and a specificity of 0.85 (M. T. Hoyle et al., 1999). Those endorsing two or more items on the GDS were classified as screening positive for depression (M. T. Hoyle et al., 1999).

Covariates—Late-life sociodemographic measures, linguistic acculturation, and medical comorbidities were included as potential confounders. The sociodemographic factors assessed were age, sex, education, income, marital status, and linguistic acculturation. Categorical values were created for the socio-demographic factors of education (i.e., no schooling completed [reference group]; 8th grade; or some high school and above), income (i.e., <US\$5,000 [reference group]; US\$5,000 to under US\$20,000; US\$20,000 to under US\$40,000; or US\$40,000 to under US\$100,000) and marital status (i.e., never married [reference group], married, separated/divorced, or widowed). Categories for the sociodemographic factors were further reduced when conducting longitudinal analyses. Borrowing items from the original Acculturation Scale developed by Marin, Sabogal, Marin, Oterosabogal, and Perezstabile (1987), acculturation was measured using a 5-item scale inquiring about language use. Treated as a continuous measure with scores ranging from 0 to 14, a self-report questionnaire modeled after the Charlson comorbidity index was used to

capture a summary score for medical comorbidities (Katz, Chang, Sangha, Fossel, & Bates, 1996). Participants were asked whether they had any of the following medical conditions: (a) high blood pressure, (b) heart attack, (c) congestive heart failure, (d) stroke, (e) diabetes, (f) arthritis, (g) hip fracture, (h) fracture of wrist, arm or spine, (i) lung disease (e.g., asthma, emphysema, etc.), (j) liver disease, (k) cancer, (l) Parkinson's disease, (m) operation to unclog or bypass arteries of the leg, and (n) Alzheimer's disease or dementia. Finally, intervention assignment—(a; intervention arm) receiving the group-based “attribution retraining” sessions and a 1-hour exercise class; (b; control arm) receiving a series of health education lectures and a 1-hour exercise class—was included as a covariate in the longitudinal analyses.

Data Analysis

Descriptive statistics summarizing baseline characteristics for the total sample, and stratified by depression status, are reported for the socio-demographic factors, physical health index (i.e., medical comorbidities), and neighborhood/environmental characteristics. Across analyses, multiple imputation was used to replace missing values for the covariates capturing income ($n=50$) and marital status ($n=2$).

The cross-sectional association between neighborhood walkability measures—i.e., total score, walking/cycling facilities, neighborhood aesthetics, traffic safety, and crime safety—and depressive symptoms was examined using multivariate logistic regression. Conducted separately for the total NEWS scale score and individual subscales, odds ratios (ORs) and 95% confidence intervals (CIs) were estimated for the prevalence of elevated symptoms of depression (GDS ≥ 2). Two separate models were generated in addition to the unadjusted model. The first multivariate model (reduced model) adjusted for age and gender. The second multivariate model (full model) additionally considered the covariates of education, income, marital status, linguistic acculturation, and magnitude of medical comorbidities.

Treating perceived neighborhood walkability as the main exposure of interest, multivariable logistic regression was used to estimate the odds of incident elevated depressive symptoms as measured over a 2-year period. This longitudinal analysis included only the subpopulation without elevated depressive symptoms at baseline (GDS < 2), and those with available GDS scores at either 12- and/or 24-months. Incidence of elevated depressive symptomatology was defined as emergent elevated symptoms of depression at either the 12- or 24-month follow-up assessments. As before, unadjusted and separate reduced (minimally) and fully adjusted models were fitted for each neighborhood walkability measure; the latter models were additionally adjusted for intervention assignment. As few participants experienced incident depression at follow-up, i.e., main outcome of interest, resulting in a small sample size (i.e., $n=19$) with evident zero-cell counts, the socio-demographic factors capturing education ($< 8^{\text{th}}$ grade vs. some high school or greater), income ($< \text{US\$20,000}$ vs. $\text{US\$20,000}$ to under $\text{US\$100,000}$), and marital status (married vs. other [never married, separated/divorced, or widowed]), were re-categorized by collapsing classifications when conducting longitudinal analyses. Finally, sensitivity analyses were conducted to examine the effects when imputing depression status at 12- and 24-months, so as to compare to resultant estimates omitting imputation procedures for incident depression.

Cross-sectional analyses for the current study included a total of 570 older Latino adult participants. Reduction of the original sample size from 572 was a consequence of missing data across the main variables of interests, i.e., depression status (missing=1) and neighborhood walkability measures (missing=1). Longitudinal analyses sample sizes were further limited (n = 351) with exclusion of participants with elevated symptoms of depression at baseline (n=158) and those with missing GDS scores at both follow-up time points, i.e., 12- and 24-months (missing=61).

All data analysis was performed using SAS 9.1 (SAS, Inc, Cary, North Carolina).

RESULTS

Table 1 presents the baseline characteristics for the total analytic sample of older Latino adults (n = 570), along with a stratified summary by depression status. The sample was majority female (77.0%) and ranged in age from 60 to 90 years (M = 73.1, SD = 6.8). This sample was predominantly of low socioeconomic status. Overall, 59.1% had less than or equal to an 8th grade education, of which 14.4% self-reported complete absence of formal schooling. Slightly over 80% of the older adults had incomes below US\$20,000 with 17.7% reporting an annual income below US\$5,000. A total of 164 older Latino adults (28.8%) self-identified as married, with remaining participants classified into the categories of widowed (36.1%), separated/divorced (22.5%), and never married (12.6%).

Baseline data indicates that 27.7% screened positive for elevated depressive symptoms as measured using the GDS. Table 2 show the odds ratios for elevated depressive symptoms (GDS ≥ 2) for each of the five NEWS scale scores. Unadjusted, reduced (minimally) and fully adjusted models only evidenced perceived neighborhood crime to be significantly associated with elevated depressive symptoms. After adjustment for socio-demographic factors, linguistic acculturation, and number of medical comorbidities, a 1-unit increase in the NEWS subscale capturing perceived neighborhood crime, i.e., indicative of lower perceived crime and greater walkability, was associated with a 0.90 times lower odds of having elevated depressive symptoms [95%CI: 0.82, 0.996]. A higher total walkability score was marginally associated with lower odds of prevalent depressive symptoms in minimally adjusted models, that is, reduced models [OR = 0.87; 95%CI: 0.75, 1.00]; this was slightly attenuated in fully adjusted models [OR = 0.89; 95%CI: 0.76, 1.04].

Tables 3-4 present the results for the longitudinal analyses. Of the 351 participants with low levels of depressive symptoms at baseline, i.e., GDS < 2, a total of 19 (4.6%) experienced the onset of elevated depressive symptoms at 12- and/or 24-months. None of the neighborhood factors—i.e., total score [OR = 0.88; 95%CI: 0.56, 1.38], walking/cycling facilities [OR = 0.91; 95%CI: 0.66, 1.24], neighborhood aesthetics [OR = 0.97; 95%CI: 0.78, 1.20], traffic [OR = 1.16; 95%CI: 0.88, 1.51] and crime safety [OR = 0.83; 95%CI: 0.64, 1.07]—were statistically significantly associated with incident elevated depressive symptoms (see Table 4). This held true in unadjusted, reduced (minimally), and fully adjusted models. Despite the wide confidence intervals crossing the null estimate, the point estimates provide suggestive evidence that with the exception of the subscale capturing traffic safety, increased walkability may be associated with lower incidence of elevated

depressive symptoms. Older age, lower educational attainment, and higher acculturation were statistically significantly associated with higher odds of incident elevated depressive symptoms (not shown).

DISCUSSION

In cross-sectional analyses we found that older Latino adults who perceive their neighborhood as low in criminal activity are less likely to experience elevated symptoms of depression. Within the context of an intervention aimed at increasing participation in physical activity, perceptions of the neighborhood/environment were not significantly associated with incident elevated depressive symptoms. However, although the confidence intervals contained the null estimate, the point estimates for the odds ratios for incident elevated depressive symptoms suggested inverse associations with the total neighborhood walkability score as well as the walking/cycling facilities, neighborhood aesthetics, and crime safety subscales.

The current study contributes to our knowledge on the link between neighborhood characteristics and psychological ill-being by examining both cross-sectional and longitudinal associations between neighborhood walkability and depressive symptoms among racial/ethnic minorities. To our knowledge, only one other study has targeted an older Latino adult population when examining the association between neighborhood characteristics and mental health (Brown et al., 2009). Consistent with our findings, this study found an inverse relationship between neighborhood climate (i.e., positive/negative aspects of the neighborhood social environment) and psychological distress. Our findings are also consistent with previous evidence documenting constructive neighborhood factors to be associated with greater mental health. This holds true across studies exploring neighborhood problems (e.g., noise, vandalism, crime, heavy traffic, etc.), a construct similar to our measure of neighborhood walkability (Bierman, 2009; Schieman & Meersman, 2004). A consistent inverse association is evident such that, fewer neighborhood difficulties are associated with greater psychological well-being. Furthermore, results presented by Ahern and Galea (2011) suggest that the neighborhood-depression relationship is strongest for older adults, with the hypothesis that potential limitations in mobility may restrict older adults to their immediate neighborhood/environment, and that increased fragility may increase feelings of vulnerability toward negative environmental forces.

Our findings pertaining to the longitudinal association between neighborhood factors and depressive symptoms are similar to those reported by Mair et al. (2009) in that they also reported a weak inverse association between neighborhood characteristics and odds for incident depression. Lack of statistical significance when examining incident elevated depressive symptoms in our study may have resulted as a consequence of the small overall sample size ($n = 351$) and/or the limited cases of incident depression at 12- and/or 24-months ($n = 19$). It is also plausible that the “¡Caminemos!” physical activity and control group intervention could have positively impacted psychological well-being, thereby reducing the observed occurrence of depression. Had we examined the natural trajectory of older adult participants outside of the context of an intervention, a higher incidence rate may have resulted. Sensitivity analyses which imputed depression status at 12- and 24-months

and subsequently increased our sample by 61 observations resulted in similar point estimates and wide confidence intervals.

The current study makes substantial contributions to our understanding of the association between perceived walkability-related neighborhood factors and elevated depressive symptoms in Latino older adults, but the mechanistic pathway linking neighborhood walkability to elevated depressive symptoms remains unknown. In unpublished analyses we assessed whether neighborhood walkability was associated with actual participation in physical activity, and if increased engagement in physical activity—as a consequence of neighborhood-level facilitators—served to deter or alleviate symptoms of depression. Meditational testing did not support a meditational role via objectively measured (i.e., pedometer data) physical activity engagement levels, as perceived neighborhood crime was not significantly associated with physical activity. The aforementioned study of the perceived neighborhood social environment and psychological distress in older Latino adults found this relationship was mediated by perceived social support. Other possible mediating factors that should be examined in the future include neighborhood collective efficacy, perceived neighborhood social capital, and social isolation. These constructs, some of which are adversely impacted by the aging process, have been studied in the context of environmental factors and mental health, and thus may serve as mediators (Cacioppo, Hughes, Waite, Hawkley, & Thisted, 2006; Cramm, van Dijk, & Nieboer, 2013; Luo, Hawkley, Waite, & Cacioppo, 2012). However, although the mechanistic pathway is not well understood at this time, the findings for our study suggest that addressing safety concerns may need immediate attention within local neighborhoods in order to increase psychological well-being.

The present study has multiple strengths. It is one of the few studies of depressive symptoms to include a substantial number of community-dwelling urban older Latino adults. Given the geographic size of Los Angeles County and the draw of some of the senior centers where subjects were recruited it is likely that >27 neighborhoods were represented in this study, producing a heterogeneous sample of older Latino adults drawn from as far as El Monte in East Los Angeles, to Venice near the ocean, as far north as Van Nuys, and Wilmington to the south. As noted earlier, it also the first to consider the longitudinal relationship between neighborhood factors and depressive symptoms in a minority cohort of older adults. In spite of the strengths, several study limitations should be considered when interpreting the findings. Although depressive symptoms were assessed using previously tested instruments, findings may differ if clinical diagnostic guidelines were used. Also, we did not consider use of pharmacotherapy as this was not collected as part of the original parent RCT.

Longitudinal findings were gathered within the context of a physical activity intervention which may have favorably impacted psychological health, thus reducing the power to detect neighborhood-related effects. The limited sample size ($n = 351$) and the small number of incident cases ($n = 19$) may have also compromised the statistical power needed to detect an association between neighborhood walkability and incident depressive symptoms. Inclusion of objectively measured neighborhood attributes could have addressed the potential inherent bias with which psychological ill-being can impact self-reported information. Reverse causality cannot be discarded whereby participants with elevated symptoms of depression perceive their neighborhood more negatively and less conducive to walking behavior. In

addition, self-perceived neighborhood walkability was only assessed at baseline negating the ability to examine effects of longitudinal exposure across neighborhood factors and changes across time on outcomes of psychological ill-being. Attrition was also displayed among older adults who relocated.

Additional evidence is needed, but results for the current study offer reasonable support for public health interventions aimed at increasing neighborhood safety as it may positively impact psychological well-being. In a time of limited financial resources, intervening at the exosystems level (e.g., neighborhoods and local politics) may prove more cost-effective than individual-level therapies. Improvements in psychological well-being, through modification of the exosystem may further lead to improvements in physical health outcomes.

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Table 1

Baseline Descriptive Characteristics of the Sample by Depression Strata (N = 570)

Variable	Total (N = 570)	GDS < 2 (N = 412)	GDS ≥ 2 (N = 158)	p-value
Socio-demographics				
Age, <i>M</i> (Std Error)	73.1 (0.28)	73.3 (0.32)	72.7 (0.59)	0.33
Female, n (%)	439 (77.0)	315 (76.5)	124 (78.5)	0.61
Education, n (%)				
No schooling completed	82 (14.4)	49 (11.9)	33 (20.9)	<0.05
8 th grade	255 (44.7)	183 (44.4)	72 (45.6)	
Some High School or greater	233 (40.9)	180 (43.7)	53 (33.5)	
Income, n (%)				
Less than US\$5,000	101 (17.7)	62 (15.1)	39 (24.7)	<0.05
US\$5,000 to under US\$20,000	374 (65.6)	268 (65.1)	106 (67.1)	
US\$20,000 to under US\$50,000	82 (14.4)	71 (17.2)	11 (7.0)	
US\$50,000 to under US\$100,000	13 (2.3)	11 (2.7)	2 (1.3)	
Marital status, n (%)				
Never married	72 (12.6)	41 (10.0)	31 (19.6)	0.16
Married	164 (28.8)	128 (31.1)	36 (22.8)	
Separated/Divorced	128 (22.5)	91 (22.1)	37 (23.4)	
Widowed	206 (36.1)	152 (36.9)	54 (34.2)	
Acculturation, <i>M</i> (Std Error)	2.1 (0.06)	2.0 (0.06)	2.2 (0.12)	0.37
Number of Medical Comorbidities, <i>M</i> (Std Error)	2.3 (0.05)	2.2 (0.06)	2.7 (0.12)	<0.05
Neighborhood factors, <i>M</i> (Std Error)				
Total score	10.4 (0.05)	10.5 (0.06)	10.3 (0.10)	0.06
Walking/Cycling facilities	9.3 (0.07)	9.3 (0.09)	9.4 (0.13)	0.56
Neighborhood aesthetics	11.6 (0.11)	11.6 (0.12)	11.4 (0.20)	0.29
Traffic safety	12.7 (0.09)	12.8 (0.10)	12.5 (0.20)	0.22
Crime safety	8.1 (0.08)	8.3 (0.10)	7.8 (0.15)	<0.05

Depression status was measured using the Geriatric Depression Scale (GDS) screening tool.

Table 2

Adjusted Odds Ratios for the Cross-sectional Association of Neighborhood Factors and Probable Clinical Depression (GDS = 2)

	N = 570		p-value
Neighborhood /Environment	OR	95% CI	
M1: Total scale score			
Unadjusted	0.87	(0.75, 1.00)	0.06
Reduced ^a	0.87	(0.75, 1.00)	0.06
Full ^b	0.89	(0.76, 1.04)	0.14
M2: Walking/Cycling facilities			
Unadjusted	1.03	(0.93, 1.15)	0.56
Reduced ^a	1.03	(0.93, 1.15)	0.57
Full ^b	1.04	(0.93, 1.17)	0.44
M3: Neighborhood aesthetics			
Unadjusted	0.96	(0.89, 1.03)	0.29
Reduced ^a	0.96	(0.89, 1.03)	0.27
Full ^b	0.96	(0.89, 1.04)	0.34
M4: Traffic safety			
Unadjusted	0.95	(0.87, 1.03)	0.18
Reduced ^a	0.95	(0.87, 1.03)	0.17
Full ^b	0.95	(0.88, 1.04)	0.28
M5: Crime safety			
Unadjusted	0.88	(0.80, 0.97)	0.01
Reduced ^a	0.88	(0.80, 0.97)	0.01
Full ^b	0.90	(0.82, 0.996)	0.04

^aReduced model adjusted for age and sex.

^bFull model adjusted for demographic characteristics (age, sex, educational attainment, income, and marital status), linguistic acculturation, and number of chronic illnesses.

Table 3

Selected baseline characteristics for participants who did and did not develop depression (GDS = 2) over 2-year follow-up among those with GDS < 2 at baseline (n=351)

Variable	Developed depression (N = 19)	Did not develop depression (N = 332)	p-value
Socio-demographics			
Age, <i>M</i> (Std Error)	77.3 (1.60)	72.6 (0.35)	<0.05
Female, n (%)	15 (79.0)	259 (78.0)	0.92
Education, n (%)			
8 th grade	15 (79.0)	181 (54.5)	0.04
Some High School or greater	4 (21.1)	151 (45.5)	
Income, n (%)			
Less than US\$20,000	16 (84.2)	259 (78.0)	0.47
US\$20,000 to under US\$100,000	3 (15.8)	73 (22.0)	
Marital status, n (%)			
Married	7 (36.8)	106 (31.9)	0.66
Other	12 (63.2)	226 (68.1)	
Acculturation, <i>M</i> (Std Error)	2.8 (0.42)	2.0 (0.07)	0.09
Number of Medical Comorbidities, <i>M</i> (Std Error)	2.5 (0.26)	2.2 (0.07)	0.21
Neighborhood factors, <i>M</i> (Std Error)			
Total score	10.2 (0.33)	10.5 (0.07)	0.24
Walking/Cycling facilities	8.9 (0.36)	9.3 (0.09)	0.34
Neighborhood aesthetics	11.3 (0.49)	11.7 (0.1)	0.44
Traffic safety	13.1 (0.50)	12.8 (0.1)	0.62
Crime safety	7.5 (0.48)	8.3 (0.1)	0.08
Randomization Group			
Treatment	7 (36.8)	163 (49.1)	0.30
Control	12 (63.2)	169 (50.9)	

Note. GDS = Geriatric Depression Scale.

Table 4

Adjusted Odds Ratios for the Association of Neighborhood Factors and Incident Elevated Depressive Symptoms (GDS = 2)

	N = 351		
Neighborhood /Environment	OR	95% CI	p-value
M1: Total scale score			
Unadjusted	0.79	(0.53, 1.17)	0.24
Reduced ^a	0.79	(0.52, 1.19)	0.25
Full ^b	0.88	(0.56, 1.38)	0.58
M2: Walking/Cycling facilities			
Unadjusted	0.87	(0.66, 1.16)	0.34
Reduced ^a	0.86	(0.65, 1.14)	0.30
Full ^b	0.91	(0.66, 1.24)	0.55
M3: Neighborhood aesthetics			
Unadjusted	0.93	(0.77, 1.12)	0.44
Reduced ^a	0.93	(0.77, 1.13)	0.46
Full ^b	0.97	(0.78, 1.20)	0.75
M4: Traffic safety			
Unadjusted	1.06	(0.85, 1.33)	0.62
Reduced ^a	1.10	(0.86, 1.40)	0.47
Full ^b	1.16	(0.88, 1.51)	0.29
M5: Crime safety			
Unadjusted	0.81	(0.65, 1.03)	0.08
Reduced ^a	0.82	(0.65, 1.04)	0.10
Full ^b	0.83	(0.64, 1.07)	0.16

^aReduced model adjusted for age and sex.

^bFull model adjusted for demographic characteristics (age, sex, educational attainment, income, and marital status), linguistic acculturation, number of chronic illnesses, and intervention group assignment.