

Where the Sidewalk Ends: Built Environment Decline and Depression

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Abstract

This study utilizes panel data collected in 1986 and 1989 to analyze the relationship between the quality of neighborhood sidewalks and individuals' levels of depression. Based on the well-established association between social isolation and negative mental health outcomes, we hypothesized that residents living in areas with poor sidewalks would report higher levels of depression due to limited walkability in their neighborhoods. We found that poorly maintained sidewalks were indeed associated with higher levels of depression ($p < .001$). We identified additional relationships between sidewalk quality and social integration (positive; $p < .001$) and between social integration and depression (inverse; $p < .001$). These findings carry implications for urban planners and local government finance.

Introduction

Does the quality of structures in a community contribute to an individual's mental health, particularly their likelihood of experiencing depression? If a neighborhood is plagued by sidewalks that abruptly end or are obstructed by tree roots, might this reduce residents' interactions with peers? Our research attempts to quantify the relationship between quality of sidewalks and depression to better understand the role that the built environment plays in social connectedness.

There are few, if any, existing pieces of literature which specifically explore the relationship between sidewalk quality and depression. Therefore, our motivations and hypotheses are based on a chain of assumptions drawn from prior research that examine the influence of outdoor spaces on other areas of health. In their research on environments and health, Rogowski, Freedman, & Schoeni (2006) found that the condition of one's environment influences well-being through the ability to socially interact with others. Similarly, Clarke, Ailshire, & Lantz (2009) found that individuals who reported living in communities that were not ideal or poorly maintained (e.g. deteriorating sidewalks, heavy traffic, inaccessible public transportation) also reported poorer physical health and higher rates of disability compared to those living in well-maintained communities.

Because social isolation is understood to be associated with depression and negative health outcomes (Cacioppo, Hawkley, Norman, & Berntson, 2011), we expect to identify an association between quality of sidewalk structures and depression.

Hypotheses

Using panel data from the Americans' Changing Lives study collected in 1986 and 1989, this paper analyzes how the upkeep of sidewalks in an individual's neighborhood may impact levels of depression and social integration. The impact of sidewalk quality on social integration will also be examined. The hypotheses of this study are as follows:

1. Individuals who report sidewalks as being poorly maintained will report higher levels of depression.⁶

⁶ H₀: ↓ sidewalk quality ⇒ ↑ depression

H_A: ↓ sidewalk quality ⇒ ↑ depression

2. Individuals who report sidewalks as being poorly maintained will report lower formal and informal social integration.⁷
3. Individuals who report lower formal and informal social integration will report higher levels of depression.⁸

Literature Review

Prior research has largely focused on the relationships between the built environment, physical activity, and overall mental health. However, there are a limited number of studies providing quantitative evidence of the strengths of these relationships. This is encapsulated by Araya, Dunstan, Playle, Thomas, Palmer, & Lewis (2006) who stated “[...] there has been much speculation about a possible association between the social and built environment and health, but the empirical evidence is still elusive” (p. 3072). The results from this limited 2006 study, which focused on South Wales, were consistent with other research in the field and demonstrated that there is notable variation for social cohesion and mental health between neighborhoods.

Studies on mood and wellbeing have clearly illustrated the importance of social networks on overall mental health. In their study of communities and health, Rogowski et al. (2006) found that the condition of one’s environment influences well-being. This relationship is largely driven by social interaction with others and community participation. Mollenkopf, Marcellini, Ruoppila, Flaschentrager, Gagliardi, & Spazzafumo (1997) aptly stated, “mobility becomes a fundamental prerequisite for the participation in social relations and activities” (p. 295). It is therefore reasonable to hypothesize that the mental health of an individual may be negatively impacted by living in a poorly maintained space, which may result in a higher level of isolation from others and subsequently a higher incidence of depression.

It is also reasonable to theorize that seniors or persons with mobility-limiting disabilities may be more likely to experience the negative consequences of poorly maintained sidewalks. In their 2009 study, Clarke et al. found that individuals who had limited outdoor mobility due to poor infrastructure reported poor physical health outcomes and higher rates of disability. Further, Gilderbloom & Rosentraub (1990) explained that large urban areas in Houston acted as “invisible jails” for people with disabilities and seniors because infrastructure was not accessible or accommodating to these populations (p. 271).

Weich, Blanchard, Prince, Burton, Erens, & Sproston (2002) sought to explore the relationship between depression and individual ratings of the built environment. They explained that “at a neighborhood or small area level, the built environment is likely to affect traffic, pollution, crime, and residents’ perceptions about their own safety,” all of which are factors that may influence prevalence of depression in a community (p. 432). After controlling for socioeconomic status and quality of household structure, they found that prevalence of depression was associated with poor mobility and the presence of graffiti. Though the findings of this study were localized to London and are therefore not generalizable, they support our notion that a community’s walkability may strongly inform levels of social connectedness and incidence of depression in that area.

Foster, Giles-Corti, & Knuiiman (2010) proposed that a subpar built environment could be perceived by residents as unsafe and more susceptible to crime, discouraging individuals from engaging in physical or social activities. They found evidence that this decline in physical and social activities led to a deterioration in mental health, and concluded that “planning policies that engender a shift away from

⁷ H₀: ↓ sidewalk quality $\not\Rightarrow$ ↓ social integration

H_A: ↓ sidewalk quality \Rightarrow ↓ social integration

⁸ H₀: ↓ social integration $\not\Rightarrow$ ↑ depression

H_A: ↓ social integration \Rightarrow ↑ depression

low density suburbia towards more walkable environments could benefit psychological wellbeing and physical health” (p. 1164).

Data and Methodology

This study utilizes data from the Americans’ Changing Lives (ACL) study. Data was collected by the University of Michigan and is publicly available on the Inter-university Consortium for Political and Social Science Research (ICPSR) (2018). The survey series, which began in 1986 and is ongoing, seeks to explore social relationships, life events and stressors, physical and mental health, and socio-cultural variations in Americans. In addition to these variables, the study also collects information about utilization of healthcare services, neighborhood characteristics, well-being, employment, income, and living situations for the years 1986, 1989, 1994, 2002, and 2011.

The present study uses two out of five waves of collected data. Wave 1 (collected in 1986) surveyed 3,617 participants ages 25 and older. The researchers report oversampling Black Americans and individuals over the age of 60 at twice the rate of other demographic groups because these subsets of the population were of particular interest. Wave 2 (collected in 1989) attempted to survey all participants from Wave 1 who were still living ($n = 2,867$). The rate of attrition between Waves 1 and 2 was approximately 20.7 percent. Tables 1 and 2 (Appendix A) contain demographic information about the respondents.

In an attempt to ensure that the sample was as representative as possible, participants in the original study were selected using a four-stage sampling process. First, ‘probability proportionate to size’ (PPS) methods were used to ensure that metropolitan and non-metropolitan areas were sampled proportionately. The researchers then performed a secondary PPS sampling of geographic areas within the initial PPS regions. Household units within these areas were then enumerated, and final selection of participants was accomplished by randomly selecting individuals within a sample of household units.

The key variables of interest for the present study are sidewalk quality in individuals’ communities (independent variable) and depression (dependent variable). Sidewalk quality scores were calculated using participants’ responses to the following question: “How well kept and cared for are the yards and/or sidewalks in front of structures in the neighborhood?” with possible responses ranging from 1 (‘Very poorly’) to 4 (‘Very well’).

Depression scores were calculated by summing and averaging participants’ responses to eleven out of twenty questions from the Center for Epidemiologic Studies Depression Scale (CESD-11) (Radloff, 1977). Items on this index included ‘I did not feel like eating,’ ‘I felt that everything I did was an effort,’ ‘I felt lonely,’ and ‘People were unfriendly,’ among others. Possible responses ranged from 1 (‘Hardly ever’) to 3 (‘Most of the time’). This scale in its entirety can be found in Appendix B.

Formal Social Integration Index (FSII) measured an individual’s level of social engagement in formally organized activities or events with others, such as clubs or organizations (Radloff, 1997). FSII was calculated by averaging participants’ responses to two survey questions (“How often do you attend meetings or programs of groups, clubs, or organizations that you belong to?” and “How often do you usually attend religious services?”), to which they responded on a Likert scale ranging from 1 (Never) to 6 (> once per week).

Informal Social Integration Index (ISII) measured one’s social engagement with others via informal routes, such as visiting friends, relatives, or neighbors or talking to them on the telephone. ISII was calculated by averaging participants’ responses to two survey questions (“In a typical week, about how many times do you talk on the telephone with friends, neighbors, or relatives?” and “How often do you get together with friends, neighbors, or relatives and do things like go out together or visit each other’s homes?”), to which they responded on a Likert scale ranging from 1 (Never) to 6 (> once per week).

Lower scores on Formal and Informal Social Integration Indexes indicate a lower level of social interaction with others. Participants’ depression index scores, sidewalk ratings, FSII scores, and ISII scores were standardized (to a mean of 0 and standard deviation of 1) in order to make meaningful

comparisons between individuals and aid interpretation of results. Individuals' age, sex, and race were selected as control variables.

Identification Strategy

Our hypothesis follows the regression model

$$Y_{it} = \beta_0 + \beta_1 zSidewalk_{it} + \beta_2 ZFSII_{it} + \beta_3 ZISII_{it} + X_{it} + e,$$

where Y_{it} represents the dependent variable (individual i 's standardized depression index score) in time t , β_0 is the regression coefficient, and $zSidewalk_{it}$ is the independent variable (individual i 's standardized sidewalk rating) in time t . $ZFSII_{it}$ represents individual i 's standardized Formal Social Integration Index score in time t , and $ZISII_{it}$ represents individual i 's standardized Informal Social Integration Index score in time t . X_{it} includes the control variables sex, age, and race for individual i at time t , and e represents the error term. It is important to note that this model may be limited because the researchers omitted location information from the dataset to preserve participants' privacy. As a result, clustering could not be performed.

Results

Ordinary least squares (OLS) regression was performed to identify any potential relationships between the variables of interest. Tables 3 through 5 (Appendix C) illustrate the relationships explored. The findings are explained below.

OLS analyses performed on individuals' ratings of sidewalks and their scores on the CESD-11 index indicate that individuals living in neighborhoods with poorer sidewalks were more likely to report higher levels of depression [$t(1,3284) = -12.49, p < .001$]. These findings remain significant when the control variables age, sex, and race are included in the regression model. This finding supports our first hypothesis.

OLS regression was performed to identify any potential relationship between individuals' sidewalk ratings, Formal Social Integration Index (FSII), and Informal Social Integration Index (ISII). The results indicate that individuals who rated sidewalks as lower quality were more likely to have lower levels of FSII [$t(1,3376) = 5.72, p < .001$]. Individuals who rated sidewalks as lower quality were also more likely to have lower levels of ISII [$t(1,3376) = 8.14, p < .001$]. These two findings remain significant when control variables are included in the regression model, and support our second hypothesis.

Finally, OLS regression was performed to analyze the relationship between depression, FSII, and ISII. The results indicate that individuals who have lower formal social integration with others are more likely to report higher levels of depression [$t(1,5480) = -10.36, p < .001$]. Individuals who have lower levels of informal social integration with others are also more likely to report higher levels of depression [$t(1,5484) = -8.82, p < .001$]. These findings remain significant when control variables are included in the regression model, and support our third hypothesis.

Discussion

The purpose of this study was to determine whether the quality of sidewalks in an individual's neighborhood is related to their level of depression. Using OLS regression, our findings suggest that an individual living in a neighborhood with poor sidewalks is more likely to report higher levels of depression as measured by the CESD-11. We also identified statistically significant relationships between sidewalk quality, formal and informal social integration, and depression. These findings remained significant with the inclusion of control variables (age, sex, and race) in the regression models.

The findings from this study are consistent with previous research on the relationship between the built environment and mental health. Like Weich et al. (2002), we found that a poor built environment is associated with an increased likelihood of experiencing depression. Similar to Mollenkopf et al. (1997), we also found evidence supporting the existence of a relationship between social connectedness and depression.

Limitations

These findings are limited by several factors, the first being omitted variable bias. A number of variables in addition social connectedness contribute to an individual's onset of depression, including biological differences such as genetics, brain chemistry, and hormones ("nature"). Environmental factors such as parenting style during upbringing, traumatic or stressful events, recreational use of drugs/alcohol, or the use of prescription medications ("nurture") may also play a role in the incidence or onset of depression (Mayo Clinic, 2019). For this reason, it is shortsighted to imply that an individual experiences depression solely due to lacking access to walkable sidewalks.

In addition to omitted variable bias, the sample of participants in this dataset is not representative and may have produced biased results. The original researchers stated that Black Americans and individuals over the age of 60 were oversampled due to a specific interest in these subsets. This limitation is significant because accessibility may be more or less of an issue for subsets of the total population. Additionally, geographic data was expunged from the dataset by the researchers in order to protect the privacy of survey participants, which gives rise to several problems. It is impossible to determine the geographic distribution of participants, further limiting generalizability of the findings. We were also unable to cluster using location as a fixed effect variable. Individuals living in group quarters or institutions, such as nursing homes or psychiatric facilities, as well as individuals from Hawaii and Alaska, were excluded from participating. These sampling concerns further limit generalizability of our results.

Measurement error may also limit the implications of this study, as information was self-reported by participants. Although depression is not as stigmatized as it once was, individuals from older generations may be unwilling to disclose feelings of intense sadness. Additionally, a handful of interviews in Wave 2 were completed by proxy respondents (family members, caretakers, etc.) rather than the original participants from Wave 1. Inaccurate reporting by a proxy may bias results. In addition to proxy respondents, attrition between survey Waves was approximately 20 percent. Had this proportion been primarily comprised of older respondents or those with health and mobility issues, our results would not be representative of these individuals' experiences.

Reverse causality is not a major defect of our study's primary hypothesis. Our findings suggest that poorly maintained sidewalks may contribute to depression via a social isolation pathway; however, it is reasonable and valid to state that depression does *not* cause poorly maintained sidewalks. For similar reasons, we do not believe reverse causality is present in our second hypothesis: social integration does *not* directly cause poorly maintained sidewalks. It is more likely that poorly maintained sidewalks are the result of inadequate leadership or economic conditions of a place, rather than individuals' characteristics. Admittedly, reverse causality may be present in our third hypothesis: a lack of social integration may contribute to one's level of depression, and depression may significantly reduce one's level of social integration.

Implications

Despite these limitations, the results of this study have several potential implications for the fields of policy and urban planning. Our findings broadly suggest that the physical environment of one's neighborhood may influence mental health. Due to the well-established relationship between mental and physical health, improving a population's ability to maintain their physical health may have spillover effects into mental health outcomes, and societal productivity by extension.

More narrowly, our findings may provide insight into where urban planners, state policy makers, and local council members can concentrate their efforts to produce an effective and efficient public good. The presence of well-maintained walkways in a neighborhood often positively contributes to the area's overall safety and significantly reduces vehicle collisions with pedestrians (PEDSAFE, 2019). However, the mere presence of sidewalks is not all that is important. The maintenance, accessibility, and walkability of sidewalks over time are equally as essential. A community largely benefits from having such public works features available, especially individual community members with mobility challenges. As Golden,

Conroy, Bruce, Denihan, Greene, Kirby, & Lawlor (2009) found, the relationship between loneliness, social networks, and well-being may hold a greater impact for older individuals as compared to the general population. A major barrier to social connectedness may be removed by simply ensuring that walkways are well-maintained and clear of obstacles. Local levels of government may consider these implications in their planning and maintenance of neighborhood structures.

Researchers studying this topic in the future should ensure that the sample examined is representative of the characteristics and geographic distribution of the general population. Including additional control variables, such as socioeconomic status, location, and level of mobility (disability status, type of disability, etc.), might give further insight into what factors interact heavily with neighborhood walkability. Future research might also include objective, rather than self-reported, ratings of the built environments, sidewalk quality, and other structures being analyzed.

Conclusion

In conclusion, our research identified statistically significant associations between poorly maintained sidewalks and levels of depression in individuals living in the United States. We also identified lower levels of social integration among those living in areas with poorly maintained sidewalks, and higher levels of depression in individuals with lower social integration. Further refinement of measurement techniques would be useful in establishing a causal relationship. In the absence of more sophisticated methodology, however, these findings suggest that increasing residents' ease of mobility through improvement of neighborhood structures should be prioritized by state and local policy actors.

References

- Araya, Dunstan, Playle, Thomas, Palmer, & Lewis. (2006). Perceptions of social capital and the built environment and mental health. *Social Science & Medicine*, 62(12), 3072-3083.
- Cacioppo, J. T., Hawkey, L. C., Norman, G. J., & Berntson, G. G. (2011). Social isolation. *Annals of the New York Academy of Sciences*. 1231(1), 17-22.
<https://doi.org/10.1111/j.1749-6632.2011.06028.x>
- Clarke, P., Ailshire, J. A., & Lantz, P. (2009). Urban built environments and trajectories of mobility disability: Findings from a national sample of community-dwelling American adults (1986-2001). *Social Science & Medicine*, 69(6). 964-970.
<https://doi.org/10.1016/j.socscimed.2009.06.041>
- Foster, S., Giles-Corti, B., & Knuiman, M. (2010). Neighbourhood design and fear of crime: A social-ecological examination of the correlates of residents' fear in new suburban housing developments. *Health and Place*, 16(6), 1156-1165.
- Golden, J., Conroy, R. M., Bruce, I., Denihan, A., Greene, E., Kirby, M., & Lawlor, B. A. (2009). Loneliness, social support networks, mood and wellbeing in community dwelling elderly. *International Journal of Geriatric Psychiatry*, 24(7).
<https://onlinelibrary.wiley.com/doi/abs/10.1002/gps.2181>
- Gilderbloom, J. I., & Rosentraub, S. M. (1990). Creating the accessible city. *American Journal of Economics and Sociology*, 49(3), 271-82.
- House, J. S. Americans' Changing Lives: Waves I, II, III, IV, and V, 1986, 1989, 1994, 2002, and 2011. Ann Arbor, MI: Inter-university Consortium for Political and Social Research [distributor], 2018-08-22. <https://doi.org/10.3886/ICPSR04690.v9>
- Mayo Clinic. (2019). Depression (Major Depressive Disorder).
<https://www.mayoclinic.org/diseases-conditions/depression/symptoms-causes/syc-20356007>
- Mollenkopf, H., Marcellini, F., Ruoppila, I., Flaschentrager, P., Gagliardi, C., Spazzafumo, L. (1997). Outdoor mobility and social relationships of elderly people. *Archives of Gerontology and Geriatrics*. 24(3), 295-310.
<https://www.sciencedirect.com/science/article/abs/pii/S0167494397007814>
- PEDSAFE. (2019). Sidewalks, walkways and paved shoulders. U.S. Department of

Transportation, Federal Highway Administration: Pedestrian Safety Guide and Countermeasure Selection System.

http://pedbikesafe.org/PEDSAFE/countermeasures_detail.cfm?CM_NUM=1

Radloff, L. S. (1977). The CES-D scale: a self-report depression scale for research in the general population. *Applied Psychological Measurement*, 1(3), 385-401.

<https://doi.org/10.1177/014662167700100306>. Full measure available at:

http://www.drcarnazzo.com/uploads/1/3/4/3/13437686/ces-d_depression_scale.pdf

Rogowski, J., Freedman, V., & Schoeni, R. (2006). Neighborhoods and the health of the elderly: challenges in using national survey data. Population Studies Center, University of Michigan Institute for Social Science Research. <https://www.psc.isr.umich.edu/pubs/abs/4062>.

Weich, S., Blanchard, M., Prince, M., Burton, E., Erens, B., & Sproston, K. (2002). Mental health and the built environment: Cross-sectional survey of individual and contextual risk factors for depression. *The British Journal of Psychiatry: The Journal of Mental Science*, 180, 428-33.

Appendix A

Table 1: Demographic data for Wave 1 participants

	e(count)	e(sum_w)	e(mean)	e(Var)	e(sd)	e(min)	e(max)	e(sum)
ID	3617	3617	1809	1090526	1044.282	1	3617	6543153
age	3588	3588	53.98969	310.1262	17.6104	25	99	193715
sex	3617	3617	.3754493	.234552	.4843056	0	1	1358
race	3617	3617	1.423002	.4626123	.6801561	1	5	5147
ZCESD	3486	3486	1.62e-07	1	1	-1.171548	4.008399	.0005653
zsidewalk	3557	3557	5.15e-07	1	1	-2.913454	1.019433	.0018302
ZFSII	3610	3610	2.21e-07	.9999997	.9999999	-1.417511	1.888184	.000796
ZISII	3610	3610	2.47e-08	1	1	-2.902367	1.32279	.0000892

Table 2: Demographic data for Wave 2 participants

	e(count)	e(sum_w)	e(mean)	e(Var)	e(sd)	e(min)	e(max)	e(sum)
ID	2827	2827	1794.314	1090603	1044.319	1	3617	5072527
age	2827	2827	56.44499	293.3992	17.1289	28	99	159570
sex	2827	2827	.3618677	.2310012	.4806258	0	1	1023
race	2827	2827	1.390874	.4172274	.6459314	1	5	3932
ZCESD	2750	2750	-.0001597	1.003975	1.001986	-1.130518	4.017685	-.4390975
zsidewalk	597	597	.0118108	.994416	.9972041	-2.745977	1.038849	7.051022
ZFSII	2822	2822	-.0000487	1.003792	1.001894	-1.442766	1.88187	-.1374495
ZISII	2825	2825	.001154	1.001856	1.000927	-3.071476	1.325555	3.260189

Appendix B

Center for Epidemiologic Studies Depression Scale (CES-D), NIMH

Below is a list of the ways you might have felt or behaved. Please tell me how often you have felt this way during the past week.

Week	During the Past			
	Rarely or none of the time (less than 1 day)	Some or a little of the time (1-2 days)	Occasionally or a moderate amount of time (3-4 days)	Most or all of the time (5-7 days)
1. I was bothered by things that usually don't bother me.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. I did not feel like eating; my appetite was poor.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. I felt that I could not shake off the blues even with help from my family or friends.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. I felt I was just as good as other people.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. I had trouble keeping my mind on what I was doing.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. I felt depressed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. I felt that everything I did was an effort.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. I felt hopeful about the future.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. I thought my life had been a failure.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. I felt fearful.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. My sleep was restless.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. I was happy.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. I talked less than usual.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. I felt lonely.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. People were unfriendly.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16. I enjoyed life.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. I had crying spells.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18. I felt sad.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19. I felt that people dislike me.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20. I could not get "going."	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

SCORING: zero for answers in the first column, 1 for answers in the second column, 2 for answers in the third column, 3 for answers in the fourth column. The scoring of positive items is reversed. Possible range of scores is zero to 60, with the higher scores indicating the presence of more symptomatology.

Appendix C*Table 3:* Individuals who report sidewalks as being poorly maintained will report higher levels of depression.H₀: ↓ sidewalk quality $\not\Rightarrow$ ↑ depressionH_A: ↓ sidewalk quality \Rightarrow ↑ depression

	(1)	(2)
	ZCESD	ZCESD
zsidewalk	-0.216***	-0.180***
	(0.0173)	(0.0177)
age		-0.00267**
		(0.000990)
race		0.166***
		(0.0266)
sex		-0.217***
		(0.0351)
constant	-0.00193	-0.0160
	(0.0170)	(0.0707)
<i>N</i>	3286	3273
<i>R</i> ²	0.045	0.070

* significant at $p < .05$; ** significant at $p < .01$; *** significant at $p < .001$

Table 4: Individuals who report sidewalks as being poorly maintained will report lower formal and informal social integration.

H₀: ↓ sidewalk quality ⇏ ↓ social integration

H_A: ↓ sidewalk quality ⇒ ↓ social integration

	(1)	(2)	(3)	(4)
	ZFSII	ZFSII	ZISII	ZISII
zsidewalk	0.0995*** (0.0174)	0.119*** (0.0179)	0.139*** (0.0171)	0.119*** (0.0176)
age		0.00618*** (0.000998)		-0.00327*** (0.000980)
sex		-0.155*** (0.0354)		-0.284*** (0.0348)
race		0.138*** (0.0270)		-0.164*** (0.0265)
constant	0.00233 (0.0171)	-0.457*** (0.0718)	0.0138 (0.0168)	0.519*** (0.0705)
<i>N</i>	3378	3365	3378	3365
<i>R</i> ²	0.010	0.034	0.019	0.049

* significant at $p < .05$; ** significant at $p < .01$; *** significant at $p < .001$

Table 5: Individuals who report lower formal and informal social integration will report higher levels of depression.

H₀: ↓ social integration ⇏ ↑ depression

H_A: ↓ social integration ⇒ ↑ depression

	(1)	(2)	(3)	(4)
	ZCESD	ZCESD	ZCESD	ZCESD
ZFSII	-0.137*** (0.0132)	-0.152*** (0.0131)		
age		-0.00120 (0.000768)		-0.00213** (0.000770)
sex		-0.228*** (0.0272)		-0.236*** (0.0276)
race		0.249*** (0.0202)		0.213*** (0.0205)
ZISII			-0.119*** (0.0135)	-0.116*** (0.0135)
constant	-0.0185 (0.0132)	-0.215*** (0.0563)	-0.0174 (0.0133)	-0.110 (0.0570)
<i>N</i>	5482	5469	5486	5473
<i>R</i> ²	0.019	0.059	0.014	0.049

* significant at $p < .05$; ** significant at $p < .01$; *** significant at $p < .001$