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Neighborhood Environment and Metabolic Risk in Hispanics/ Latinos from the Hispanic Community Health Study/Study of Latinos

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Abstract

Introduction: The current study examines associations of neighborhood environments with BMI, HbA1c, and diabetes across 6 years in Hispanic/Latino adults.

Methods: Participants from the Hispanic Community Health Study/Study of Latinos San Diego site (n=3,851, mean age=39.4 years, 53.3% women, 94.0% Mexican heritage) underwent assessment of metabolic risk factors and diabetes status (categorized as normoglycemia, prediabetes, and diabetes) at baseline (2008–2011) and approximately 6 years later (2014–2017). In the Study of Latinos Community and Surrounding Areas Study (SOL CASAS) ancillary study (2015–2020), participant baseline addresses were geocoded and neighborhoods were defined using 800-meter circular buffers. Neighborhood variables representing socioeconomic deprivation, residential stability, social disorder, walkability, and greenness were created using Census and other public databases. Analyses were conducted in 2020–2021.

Results: Complex survey regression analyses revealed that greater neighborhood socioeconomic deprivation was associated with higher BMI (β=0.14, $p<0.001$) and HbA1c levels (β=0.08, $p<0.01$) and a higher odds of worse diabetes status (i.e., having prediabetes versus normoglycemia, and diabetes versus prediabetes; OR=1.25, 95% CI=1.06, 1.47) at baseline. Greater baseline neighborhood deprivation also related to increasing BMI (β=0.05, $p<0.01$) and worsening diabetes status (OR=1.27, 95% CI=1.10, 1.46), while social disorder related to increasing BMI levels (β=0.05, $p<0.05$) at Visit 2. There were no associations of expected protective factors walkability, greenness, or residential stability.

Conclusions: Neighborhood deprivation and disorder were related to worse metabolic health in San Diego Hispanic/Latino adults of mostly Mexican heritage. Multilevel interventions emphasizing individual and structural determinants may be most effective in improving metabolic health among Hispanic/Latino populations.

INTRODUCTION

In 2018, people of Hispanic/Latino ethnicity were 70% more likely to be diagnosed with diabetes and 1.3 times more likely to die from diabetes than their non-Hispanic White counterparts.[1] The Hispanic Community Health Study/Study of Latinos (HCHS/SOL), a prospective cohort of 16,415 Hispanic/Latino adults, showed an overall diabetes prevalence of 16.9%, which varied from a low of 10.2% in those of South American heritage and 18.3% in those of Mexican heritage.[2] Thirty-six percent of the HCHS/SOL population met American Diabetes Association criteria for prediabetes,[3] and 42.4% of women and 36.5% of men met criteria for obesity.[4]

Social and structural determinants of health, including neighborhood environments, are key drivers of health inequities experienced by Hispanic/Latino and other ethnic and racial minority groups.[5] Owing in part to the influence of historical and contemporary institutional racism on neighborhood environments and housing quality, individuals from ethnic and racial minority groups are more likely to reside in neighborhoods characterized by high deprivation, with few resources for optimal health.[6–8] In turn, adverse neighborhood features, such as socioeconomic deprivation, crime, noise, and social disorder, and favorable characteristics, including walkability, mixed land use, greenness, and social cohesion, relate to physical activity patterns and risk of obesity, metabolic syndrome, and diabetes (albeit not unequivocally).[9–12] The pathways through which neighborhood environments impact metabolic health are multifaceted.[9–11,13–16] More deprived and disordered neighborhoods may lack safe places to exercise, obtain quality health care, and purchase healthy foods, while exposing residents to air pollution and other toxins. Crime and safety concerns and visual cues of disorder could augment physiological arousal, contributing to metabolic dysregulation and inflammation, while degrading healthy behaviors and well-being. Conversely, protective neighborhood features (e.g., walkability, greenness, and residential stability) could encourage active transport and leisure activity, reduce pollutants, foster social cohesion and capital, and help reduce stress and mental fatigue.

Importantly, few prospective studies have examined associations of neighborhood environments with diabetes incidence or risk.[9,10] Research concerning racially and ethnically diverse U.S. samples also is limited. The few studies in Hispanic/Latino samples have shown that neighborhood socioeconomic deprivation[17–19] and perceptions of neighborhood problems or cohesion[17,20] relate to metabolic health, but studies were limited by mostly cross-sectional designs, and self-report or census-tract indicators of neighborhood environments, which lack precision compared with radial buffers specific to one's home. Finally, few studies simultaneously considered multiple risk and protective neighborhood features in relation to metabolic health.[9–12]

To begin to address these gaps in the literature, the current study examines associations of neighborhood environment risk and protective factors with BMI, HbA1c, and diabetes status at baseline and 6 years later, in Hispanic/Latino adults of primarily Mexican heritage. It is hypothesized that greater neighborhood socioeconomic deprivation and social disorder, as well as lower walkability, greenness, and residential stability, would be associated with: (1) higher BMI and HbA1c levels and worse diabetes status (i.e., having prediabetes versus normoglycemia, and diabetes versus prediabetes) at baseline and (2) increases in BMI and HbA1c levels and worsening diabetes status 6 years later.

METHODS

Study Population

The HCHS/SOL is a prospective cohort of 16,415 Hispanic/Latino adults aged 18–74 years at screening. The current study focused on data collected in the San Diego field center. The San Diego target population was from the South Bay region, which is bordered by the Pacific Ocean and San Diego Bay to the West, and the U.S.–Mexico border to the South. The region includes a mix of residential neighborhoods, commercial areas, businesses, shipyards, and recreation areas.

The HCHS/SOL methods and sampling have been described.[21] Participants attended a baseline exam (2008–2011), were followed annually by telephone for identification of clinical events, and attended a second exam approximately 6 years after baseline (2014–2017, n=11,623). Methods for the SOL CASAS ancillary study (2015–2020) have been reported.[22] Baseline residential addresses were geocoded for n=3,851 San Diego participants (of 4,086 enrolled at baseline) and neighborhood environments were derived as described in the Measures section. The current study included all participants with geocoded addresses and baseline metabolic data (analytic sample, *n*=3,851). Participating institutions obtained IRB approval and all participants provided written informed consent. The current analyses were conducted in 2020 and 2021.

Measures

The SOL CASAS defined neighborhood environments using 800-meter circular buffers around participants' homes.[22] Principal components analysis (PCA) was used to create composite scores for neighborhood socioeconomic deprivation, social disorder, and residential stability using data from the Census and other public sources. PCAs were conducted using SPSS Statistics, version 27.0. Socioeconomic deprivation (i.e., relatively low SES of the neighborhood) was a composite of the following percentages: adults without high school diploma, adults unemployed, rented households, crowded households, households in poverty, low-income households (≤$30,000/year), female-headed households with children, households receiving public assistance, and population with public health insurance. Social disorder (i.e., neighborhood characteristics that signal an absence of social order and control) consisted of: per capita liquor stores, crime rates, vacant households, and vacant land. Residential stability (i.e., movement of residents in and out of a neighborhood) included the percentage of the population in same residence 1 year ago and population aged <18 years. Greenness (i.e., presence of tree canopy and other vegetation) was operationalized as the Normalized Difference Vegetation Index[23] using satellite imagery. A walkability index (i.e., support for pedestrian activity) was a composite of intersection density, net residential density, and retail density.[24] Appendix Table 1 provides details about the neighborhood variables, including data sources, timepoints, and the results of PCAs.

Clinical examinations included assessment of height and weight and fasting blood draw for assay of fasting plasma glucose (FPG) and HbA1c. A 2-hour oral glucose tolerance test was conducted if FPG was ≤150 mg/dL and there was no known diabetes. A central laboratory conducted all assays.[25] Self-reported diabetes diagnoses were determined at yearly phone interviews. Diabetes status was categorized as: (1) diabetes=FPG ≥126 mg/dL/2-hour oral glucose tolerance test ≥200 mg/dL/HbA1c ≥6.5% (48 mmol/mol), self-reported diabetes, taking glucose-lowering medication, or all of these; (2) prediabetes=FPG 100–125 mg/dL/2-hour oral glucose tolerance test 140–199 mg/dL/HbA1c 5.7%–6.4% (39–47 mmol/mol); and (3) normoglycemia=all others.

Sociodemographic factors were self-reported at baseline. Moving status was determined based on address reported at baseline and Visit 2. Medication usage was ascertained at baseline and Visit 2.

Statistical Analysis

Descriptive analyses and bivariate correlations among neighborhood variables were calculated in SPSS Statistics, version 27.0 using complex survey procedures. Descriptive statistics for neighborhood variables were calculated both for San Diego County block groups overall, and for block groups in SOL CASAS. Primary analyses were conducted using the maximum likelihood robust estimation procedure in MPlus, version 7.4,[26] which uses both complete and partial cases and produces unbiased estimates under various missing data conditions.[27] All reported statistics were weighted to account for disproportionate selection and bias due to differential nonresponse at the household and individual levels at baseline and Visit 2. The adjusted weights were calibrated to the 2010 Census characteristics by age, sex, and Hispanic/Latino heritage. Analyses also accounted for cluster sampling and use of stratification in selection.

Linear (BMI, HbA1c) and ordinal (3-level diabetes status) analyses tested associations between neighborhood variables at baseline and metabolic variables at baseline and Visit 2. Neighborhood variables were standardized (mean=0, SD=1) to facilitate comparison of coefficients. For ordinal models assessing diabetes status, under the proportional odds assumption, the OR estimates the association of the exposure with the odds of worsening diabetes status, from normal to prediabetes, or from prediabetes to diabetes. All reported *p*-values are from 2-sided statistical tests, with $p<0.05$ considered statistically significant.

Analyses tested effects of each neighborhood variable while controlling for age, sex, education, income, place of birth and duration of U.S. residence (born in U.S. 50 states/District of Columbia or not and time in the U.S. 50 states/District of Columbia), and, for prospective associations, time between visits and whether the participant moved residences. Neighborhood socioeconomic deprivation was additionally adjusted for in models examining walkability, residential stability, social disorder, and greenness to determine effects of these variables over and above deprivation. HbA1c models further adjusted for glucose-lowering medications. For prospective models of BMI and HbA1c, the baseline value for the outcome was included, for analysis of residualized change. Models examining change in diabetes status excluded participants with diabetes at baseline. Sensitivity analyses were conducted for prospective models in the subpopulation that did not move residences (*n*=2,851).

RESULTS

Table 1 presents descriptive statistics for participant characteristics. Approximately half the population was female and lacked health insurance, and about 2/3 had incomes <$40,000/year. At baseline, average BMI and HbA1c were 29.1 kg/m^2 and 5.7%; 34.1% and 14.9% of the population had prediabetes and diabetes, respectively. At Visit 2, average BMI was 29.7 kg/m^2, HbA1c was 5.9%, 35.4% had prediabetes, and 27.4% had diabetes.

In analyses of missing data (not shown), there were no differences between the participants whose addresses could not be geocoded (*n*=235) and those in the current study (*n*=3,851) on age, sex, education, income, and place of birth/duration of U.S. residence. Those who did not complete Visit 2 (*n*=1,090), compared with those who did (*n*=2,761), tended to be male (38.1% vs 30.3%), born in the U.S. 50 states/District of Columbia (38.4% vs 28.2%), and younger (mean age=35.84 vs 41.19 years).

Appendix Table 2 shows descriptive statistics for the neighborhood variables. The SOL CASAS cohort resided in 158 of 1,791 San Diego County block groups. Relative to San Diego County, the SOL CASAS block groups had greater mean deprivation and residential stability, and similar mean social disorder, walkability, and greenness. For all neighborhood variables other than greenness, the degree of variability in SOL CASAS block groups was considerably lower than San Diego County block groups.

Appendix Table 3 displays correlations among the neighborhood variables. Neighborhood socioeconomic deprivation was positively correlated with walkability (r =0.60) and negatively correlated with greenness (r= −0.69). Walkability and greenness were inversely associated (r= −0.66). Other associations were smaller but statistically significant.

At baseline, higher socioeconomic deprivation was positively associated with BMI and Hb1Ac levels (Table 2) (p<0.01 for both) and a higher odds of worse diabetes status (Table 3) (p<0.01). No other neighborhoods variables related to BMI, HbA1c, or diabetes status at baseline.

Both greater socioeconomic deprivation and social disorder were related to increasing BMI over time (Table 4) (p<0.05 for both associations). Unexpectedly, greater neighborhood deprivation related to decreases in Hb1Ac across time (p<0.05).

The authors suspected this unpredicted association might reflect confounding with medication status, as the populations residing in more deprived neighborhoods had higher HbA1c levels at baseline and may have been more likely to have diabetes newly identified at their HCHS/SOL baseline exam. Thus, a post hoc sensitivity analysis was conducted, repeating this model excluding individuals who initiated medication between baseline and Visit 2. The association of neighborhood deprivation with Visit 2 HbA1c was no longer statistically significant in this analysis (β= −0.03, p=0.67).

As shown in Table 3, greater neighborhood socioeconomic deprivation related to a higher odds of worsening diabetes status at Visit 2 (p<0.05). No other significant associations were observed.

Appendix Tables 4 and 5 show sensitivity analyses examining changes in BMI, HbA1c, and diabetes status in the sample who did not move residences. The magnitude and pattern of the neighborhood effects were largely consistent with those in the complete sample.

DISCUSSION

Consistent with prior research, including limited studies among Hispanic/Latino adults,[17–19] the current study found that greater neighborhood socioeconomic deprivation—a household buffer–based composite of census variables such as poverty, unemployment, and crowding—was associated with higher metabolic risk indicated by BMI, HbA1c, and diabetes status. This study also adds to the smaller body of prospective evidence by showing that higher neighborhood deprivation and social disorder predicted adverse changes in metabolic risk (increasing BMI, worsening diabetes status) over time. By contrast, effects of hypothesized protective factors—residential stability, greenness, and walkability—were not statistically significant in this study.

Unexpectedly, there was an association of greater neighborhood deprivation with decreases in HbA1c over time. However, sensitivity analyses suggested medication initiation may account for this spurious association. Possibly, people residing in higher-deprivation neighborhoods lacked preventive healthcare access and were more likely to learn of glucose dysregulation at baseline when they received results and referral. Additionally, as the Affordable Care Act was initiated around the conclusion of HCHS/SOL baseline, participants may have had improved access to health care for treatment of conditions like prediabetes or diabetes. Improved healthcare access may have been more common for people living in deprived areas, or the change in medication status may have had a more robust effect given the significant positive association between neighborhood deprivation and HbA1c levels at baseline.

The effects of neighborhood deprivation and disorder on metabolic risk were observed even in the context of low personal SES in the HCHS/SOL San Diego cohort, with 31.4% having household incomes ≤$20,000/year and 28% with less than a high school education. Furthermore, the cohort resided in areas with a higher deprivation level relative to the larger San Diego County, so the range on this variable was restricted. Other HCHS/SOL analyses have shown a graded, inverse association of income and education with cardiometabolic risk and diabetes prevalence.[2,28,29] The additional contextual effects of neighborhood deprivation and social disorder were small, but they show a compounding impact of adverse social determinants across multiple levels of the ecological model among people of Hispanic/ Latino ethnicity.

The lack of protective effects of walkability and greenness with metabolic outcomes were unexpected, as these variables have been related to lower obesity and diabetes risk in many prior studies.[10,11] In part, these unexpected findings may reflect confounding of these variables with socioeconomic deprivation, which was a robust predictor of metabolic health and appeared to overshadow potentially protective effects of other variables. Further, as noted previously, fewer studies have focused on neighborhood environmental characteristics, including walkability and greenness, in Hispanics/Latinos, and the limited prior studies in ethnically/racially diverse populations have produced inconsistent results. In the Multi-Ethnic Study of Atherosclerosis, which included participants of Hispanic/Latino, Chinese, Black/African American, and non-Hispanic White ethnicity and race from multiple U.S. locations, moving to a more walkable neighborhood was associated with increased walking and decreased BMI over approximately 6 years.[30] However, another Multi-Ethnic Study of Atherosclerosis analysis showed that walkability did not relate to cardiometabolic risk factors cross-sectionally, and changes in walkability scores did not relate to changes in cardiometabolic risk factors across 6 years.[31] By contrast, another Multi-Ethnic Study of Atherosclerosis study showed that residents' perceptions of neighborhood walking environment predicted incident diabetes across 10 years.[32] Associations within ethnic and racial groups were not examined in these studies. A study in Ontario, Canada that explored the intersection of immigration status, ethnicity and race, and place found most groups living in highly walkable areas had reduced prediabetes incidence, but the strength and direction of the walkability effect varied by ethnicity and race.[33] Effects of walkability persisted with control for area deprivation and personal education, but individual income was not controlled.[33] In a large study of Medicare beneficiaries in Miami, Florida, higher levels of greenness were related to lower diabetes prevalence.[34] This effect was consistent across Hispanic/Latino, non-Hispanic White, and Black/African American participants in lower-income neighborhoods, and, among Hispanic/Latino adults only, in middle-income neighborhoods, but was not observed in higher-income neighborhoods. Although these analyses controlled for neighborhood income, they did not control for individual SES, which could have led to residual confounding. Given mixed findings and inconsistent methods across studies, additional research is needed to explore the potential protective effects of neighborhood built environment factors like walkability and greenness among diverse populations residing in larger geographic areas, while controlling for both individual and neighborhood SES, to determine effects beyond these known influences.

In ethnic and racial minority groups, neighborhoods of residence are influenced by the impact of structural racism, which has shaped where people live and the quality and resources of their neighborhoods.[7] Emerging studies examining whether changing such environments can improve health and reduce inequities show promising results. For example, interventions focused on greening vacant land have reduced depression,[35] and reductions in violent crime increased safety perceptions among area residents.[36] A recent systematic review concluded that housing and blight remediation and greening vacant land reduces violent crime in affected areas, with limited evidence suggesting that reducing alcohol outlets may mitigate crime.[37] Additional research is needed to determine the effectiveness of such interventions for reducing inequities in diabetes and related disorders, and the authors recommend such research among Hispanics/Latinos.

Limitations

The target population was from a focused geographic area, and variability in environmental exposures was limited. The degree of change in BMI over time was small, with levels already high on average at baseline. The study did not address duration of residence and how neighborhood environments changed. Further, 28% of participants moved between visits, although sensitivity analyses in non-movers suggested a similar pattern of results as in the overall sample. These limitations are likely to reduce power to establish effects of neighborhood influences. On the other hand, the study could not account completely for effects of endogeneity and compositional effects resulting from self-selection into neighborhoods and the fact that healthier and more affluent individuals are more likely to reside in more affluent, well-resourced neighborhoods.[38,39] Analyses controlled for individual variables that might contribute to such effects (e.g., SES, acculturation proxies) but unmeasured confounders may be present. This study did not investigate pathways that may explain how neighborhood variables affect metabolic health, and future research in this area is needed to inform prevention and intervention efforts. Finally, 94% of participants were of Mexican heritage, and findings cannot be assumed to generalize to other heritage populations or outside of the San Diego area.

CONCLUSIONS

Rates of diabetes continue to rise and disproportionately affect people of Hispanic/Latino ethnicity.[40] Despite conclusive evidence that intensive behavior change programs can reduce metabolic risk, little progress has been made in effectively translating such programs to the populations that would benefit most.[41,42] The current study adds to the evidence that diabetes risk reflects more than individual factors, and that attention to social determinants is needed to effectively address health inequities and rising diabetes rates.[5,41] Multilevel intervention approaches emphasizing individual as well as neighborhood and structural determinants are likely to be most effective in improving metabolic health among Hispanic/Latino and other ethnic and racial minority populations.

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Appendix

Appendix

Appendix Table 1.

Neighborhood Environment Composite and Index Variables

Composite or index	Variables (source/s)	PCA results (composites) or reference (indices)
Socioeconomic deprivation	Composite of the following percentages: (1) Adults 25 years or older with no high school diploma; (2) Adults who are unemployed; (3) Households defined as crowded (more than one person per room); (4) Households living below the poverty line; (5) Households on public assistance; (6) Population receiving public health insurance; (7) Percent of households earning $30,000 per year or less; (8) Percent of households that rent; (9) Percent of female headed households with dependent children. (Calculated to census block group and then averaged to the egocentric neighborhood; 1–7, 5-year estimates of the 2009–2013 American Community Survey; 8–9, 2010 Census)	PCA was conducted and both 1 and 2 factor solutions were examined. The 1-component was determined to be a better fit for the data (eigenvalue=4.78; variance accounted for=53%), as the eigenvalue for a potential second component was small (1.11) and the component accounted for only a small amount of additional variance. The socioeconomic deprivation variable (i.e., single component) was derived based on each variable's factor loading, which ranged from 0.52 to 0.85, and standardized to have a mean of 0 and SD of 1 (i.e., z-score) based on all block groups in San Diego County.

Composite or index	Variables (source/s)	PCA results (composites) or reference (indices)
Social disorder	Composite of: (1) Number of offsite retail liquor stores per 100,000 residents (2012 California Alcohol and Beverage Control); (2) Part 1 crime[a] per 10,000 residents (2012 San Diego Automated Regional Justice Information System); (3) Part 2 crime[b] per 10,000 residents (2012 San Diego Automated Regional Justice Information System); (4) Percent of households that are vacant (2010 Census); and (5) Percent of the census block group with vacant land (2008 San Diego Association of Governments).	PCA was conducted and both 1 and 2 factor solutions were examined. The 1-component was determined to be a better fit for the data (eigenvalue=1.88; variance accounted for=38%), as the eigenvalue for a potential second component was small (1.07) and the component accounted for only a small amount of additional variance. The social disorder variable (i.e., single component) was derived based on each variable's factor loading, which ranged from 0.45 to 0.79, and standardized to have a mean of 0 and SD of 1 (i.e., z-score) based on all block groups in San Diego County.
Residential stability	Composite of: (1) Percent population under 18; (2) Percent population in the same residence 1 year ago (2010 Census).	PCA was conducted and both 1 and 2 factor solutions were examined. The 1-component was determined to be a better fit for the data (eigenvalue=1.31; variance accounted for=65%), as the eigenvalue for a potential second component was small (0.69). The residential stability variable (i.e., single component) was derived based on each variable's factor loading, which was 0.81 for both variables, and standardized to have a mean of 0 and SD of 1 (i.e., z-score) based on all block groups in San Diego County.
Greenness	Normalized Difference Vegetation Index (NDVI) calculated using Google Earth Engine. The NDVI indicates the difference between near-infrared (which vegetation reflects) and red light (which vegetations absorbs) to quantity the presence and density of trees and other vegetation, with scores ranging from −1 to +1 and higher levels indicating more dense vegetation. (2010 annual composite Landsat satellite imagery; Landsat 7 Collection 1 Tier 1 data at 30m resolution).	Robinson NP, Allred BW, Jones MO, Moreno A, Kimball JS, Naugle DE, et al. A Dynamic Landsat Derived Normalized Difference Vegetation Index (NDVI) Product for the Conterminous United States. Remote Sensing 2017;9(8):863.
Walkability	Index, summed z scores of: (1) Intersection density; indicates connectivity of streets; facilitates walking access between destinations; defined as the number of intersections in buffer. (Data from the San Diego Association of Governments, 2013); (2) Retail density, % of land use in buffer that is retail, indicates more destinations to walk toward (San Diego Association of Governments, 2008); (3) Net residential density, housing units/acre of residential land use in buffer (2010 Census).	Frank LD, Sallis JF, Saelens BE, Leary L, Cain K, Conway TL, et al. The development of a walkability index: application to the Neighborhood Quality of Life Study. Br J Sports Med 2010;44(13):924–933.

[a]Part 1 Crime = Total of aggravated assault, armed robbery, arson, burglary, murder, rape, larceny, vehicle theft, strong arm robbery.

[b]Part 2 Crime = Total of simple assaults, rape attempts, child and family, fraud, sex crimes, forgery, embezzlement, vandalism, gambling, deadly weapons, malicious mischief, narcotic, other non-criminal, other part 2 crimes.

PCA, Principal Components Analysis.

Appendix

Appendix Table 2.

Descriptive Statistics for Neighborhood Variables by Block Groups in San Diego County and SOL CASAS

Neighborhood variable/Source	N block groups	Mean	SD	Min	Max	Percentiles 25	50	75
Socioeconomic deprivation								
San Diego County	1,791	0	1	−1.92	4.12	−0.72	−0.29	0.47
SOL CASAS	158	0.78	0.77	−0.87	2.01	0.18	0.92	1.35
Residential stability								
San Diego County	1,791	0	1	−5.36	2.14	−0.50	0.21	0.68
SOL CASAS	158	0.54	0.31	−2.09	0.95	0.44	0.61	0.72
Social disorder								
San Diego County	1,791	0	1	−0.84	9.51	−0.54	−0.30	0.16
SOL CASAS	158	−0.03	0.55	−0.59	2.78	−0.36	−0.17	0.15
Walkability								
San Diego County	1,791	6.34	3.95	−0.98	35.19	3.93	5.80	8.02
SOL CASAS	158	6.33	1.77	−0.41	10.19	5.22	5.95	7.24
Greenness								
San Diego County	1,791	0.23	0.08	−0.25	0.46	0.19	0.23	0.28
SOL CASAS	158	0.20	0.05	0.12	0.32	0.17	0.19	0.24

SOL CASAS, Study of Latinos Community and Surrounding Areas Study

Appendix

Appendix Table 3.

Weighted Means (95% CI) and Bivariate Correlations Among Neighborhood Environment Composite and Index Variables

Variable	Mean (95% CI)	Walkability	Residential stability	Social disorder	Greenness
1. Socioeconomic deprivation	0.76 (0.58, 0.95)	**0.60** *	0.03	0.04	**−0.69** *
2. Walkability	−0.14 (−0.33, 0.04)		**−0.20** *	**0.20** *	**−0.66** *
3. Residential stability	0.57 (0.52, 0.61)			**−0.44** *	**0.22** *
4. Social disorder	−0.05 (−0.13, 0.03)				**−0.25** *
5. Greenness	0.21 (0.20, 0.22)				

Notes: Boldface indicates statistical significance (*$p<0.001$).

Appendix

Appendix Table 4.

Associations Between Neighborhood Environment Variables and Diabetes Status at Visit 2, for Non-Movers (n=1,283)

Neighborhood exposure variable	OR (95% CI)
Socioeconomic deprivation	**1.32** ** **(1.11, 1.57)**
Walkability[a]	1.08 (0.88, 1.33)
Residential stability[a]	0.77 (0.42, 1.41)
Social disorder[a]	0.92 (0.61, 1.41)
Greenness[a]	1.25 (0.03, 50.40)

Notes: OR represents the association of a neighborhood exposure variable with the odds of increasing a category in diabetes status (i.e., worsening status from normoglycemia to prediabetes, or from prediabetes to diabetes). Boldface indicates statistical significance (***p*<0.01). All models adjust for age, sex, education, income, place of birth/duration of U.S. residence, and years between visits 1 and 2.

[a]Additionally adjusts for neighborhood socioeconomic deprivation.

Appendix

Appendix Table 5.

Associations Between Neighborhood Environment Variables and BMI and Hba1c at Visit 2, Non-Movers

	BMI (N=1,603)			HbA1c[b] (N=1,184)		
Neighborhood variable	B	(95% CI)	β	B	(95% CI)	β
Socioeconomic deprivation	**0.50**	**(0.18, 0.82)**	**0.07** **	−0.04	(−0.13, 0.05)	−0.02
Walkability[a]	0.01	(−0.30, 0.31)	0.00	−0.03	(−0.11, 0.06)	−0.02
Residential stability[a]	0.33	(−0.37, 1.02)	0.01	−0.05	(−0.55, 0.46)	−0.01
Social disorder[a]	0.89	(−0.09, 1.86)	0.05	−0.18	(−0.07, 0.42)	0.04
Greenness[a]	1.20	(−0.81, 6.21)	0.01	−0.32	(−2.72, 2.09)	−0.01

Notes: Columns show unstandardized regression coefficients (B), 95% CIs of these coefficients, and standardized regression coefficients (βs). βs are expressed in SD units and can therefore be interpreted as an indicator of effect size. Boldface indicates statistical significance (***p*<0.01). All models adjust for age, sex, education, income, place of birth/duration of U.S. residence, years between baseline and visit 2, and the baseline level of the respective outcome variable, to examine residualized change.

[a]Additionally adjusts for neighborhood socioeconomic deprivation.

[b]HbA1c models additionally adjust for use of glucose-lowering medication at visit 2.

REFERENCES

1. Villarroel MA, Blackwell DL, Jen A. Tables of Summary Health Statistics for U.S. Adults: 2018 National Health Interview Survey. National Center for Health Statistics; 2019.
2. Schneiderman N, Llabre M, Cowie CC, et al. Prevalence of diabetes among Hispanics/Latinos from diverse backgrounds: the Hispanic Community Health Study/Study of Latinos (HCHS/SOL). Diabetes Care. 2014;37(8):2233–2239. 10.2337/dc13-2939. [PubMed: 25061138]
3. Avilés-Santa ML, Pérez CM, Schneiderman N, et al. Detecting prediabetes among Hispanics/Latinos from diverse heritage groups: does the test matter? Findings from the Hispanic Community Health Study/Study of Latinos. Prev Med. 2017;95:110–118. 10.1016/j.ypmed.2016.12.009. [PubMed: 27956225]

4. Isasi CR, Ayala GX, Sotres-Alvarez D, et al. Is acculturation related to obesity in Hispanic/Latino adults? Results from the Hispanic Community Health Study/Study of Latinos. J Obes. 2015;2015:186276. 10.1155/2015/186276. [PubMed: 25893114]

5. Hill-Briggs F, Adler NE, Berkowitz SA, et al. Social determinants of health and diabetes: a scientific review. Diabetes Care. 2021;44(1):258–279. 10.2337/dci20-0053.

6. Bailey ZD, Krieger N, Agénor M, Graves J, Linos N, Bassett MT. Structural racism and health inequities in the USA: evidence and interventions. Lancet. 2017;389(10077):1453–1463. 10.1016/S0140-6736(17)30569-X. [PubMed: 28402827]

7. Churchwell K, Elkind MSV, Benjamin RM, et al. Call to action: structural racism as a fundamental driver of health disparities: a presidential advisory from the American Heart Association. Circulation. 2020;142(24):e454–e468. 10.1161/CIR.0000000000000936. [PubMed: 33170755]

8. Bullard R, ed. Growing smarter: Achieving livable communities, environmental justice, and regional equity. MIT Press; 2007. 10.7551/mitpress/3375.001.0001.

9. Dendup T, Feng X, Clingan S, Astell-Burt T. Environmental risk factors for developing type 2 diabetes mellitus: a systematic review. Int J Environ Res Public Health. 2018;15(1):78. 10.3390/ijerph15010078.

10. den Braver NR, Lakerveld J, Rutters F, Schoonmade LJ, Brug J, Beulens JWJ. Built environmental characteristics and diabetes: a systematic review and meta-analysis. BMC Med. 2018;16:12. 10.1186/s12916-017-0997-z. [PubMed: 29382337]

11. Chandrabose M, Rachele JN, Gunn L, et al. Built environment and cardio-metabolic health: systematic review and meta-analysis of longitudinal studies. Obes Rev. 2019;20(1):41–54. 10.1111/obr.12759. [PubMed: 30253075]

12. Malambo P, Kengne AP, De Villiers A, Lambert EV, Puoane T. Built environment, selected risk factors and major cardiovascular disease outcomes: a systematic review. PLoS One. 2016;11(11):e0166846. 10.1371/journal.pone.0166846. [PubMed: 27880835]

13. Diez Roux AV, Mair C. Neighborhoods and health. Ann N Y Acad Sci. 2010;1186(1):125–145. 10.1111/j.1749-6632.2009.05333.x. [PubMed: 20201871]

14. Beulens JWJ, Pinho MGM, Abreu TC, et al. Environmental risk factors of type 2 diabetes-an exposome approach. Diabetologia. 2022;65(2):263–274. 10.1007/s00125-021-05618-w. [PubMed: 34792619]

15. James P, Banay RF, Hart JE, Laden F. A review of the health benefits of greenness. Curr Epidemiol Rep. 2015;2(2):131–142. 10.1007/s40471-015-0043-7. [PubMed: 26185745]

16. Hartig T, Mitchell R, de Vries S, Frumkin H. Nature and health. Annu Rev Public Health. 2014;35:207–228. 10.1146/annurev-publhealth-032013-182443. [PubMed: 24387090]

17. Wong MS, Chan KS, Jones-Smith JC, Colantuoni E, Thorpe RJ Jr., Bleich SN. The neighborhood environment and obesity: understanding variation by race/ethnicity. Prev Med. 2018;111:371–377. 10.1016/j.ypmed.2017.11.029. [PubMed: 29197530]

18. Garcia L, Lee A, Zeki Al Hazzouri A, Neuhaus JM, Moyce S, Aiello A, et al. Influence of neighbourhood socioeconomic position on the transition to type II diabetes in older Mexican Americans: the Sacramento Area Longitudinal Study on Aging. BMJ Open. 2016;6(8):e010905. 10.1136/bmjopen-2015-010905.

19. Garcia L, Lee A, Zeki Al Hazzouri A, Neuhaus J, Epstein M, Haan M. The impact of neighborhood socioeconomic position on prevalence of diabetes and prediabetes in older Latinos: the Sacramento Area Latino Study on Aging. Hisp Health Care Int. 2015;13(2):77–85. 10.1891/1540-4153.13.2.77. [PubMed: 26078026]

20. McCurley JL, Gutierrez AP, Bravin JI, et al. Association of social adversity with comorbid diabetes and depression symptoms in the Hispanic Community Health Study/Study of Latinos Sociocultural Ancillary Study: a syndemic framework. Ann Behav Med. 2019;53(11):975–987. 10.1093/abm/kaz009. [PubMed: 30951585]

21. Lavange LM, Kalsbeek WD, Sorlie PD, et al. Sample design and cohort selection in the Hispanic Community Health Study/Study of Latinos. Ann Epidemiol. 2010;20(8):642–649. 10.1016/j.annepidem.2010.05.006. [PubMed: 20609344]

22. Gallo LC, Carlson JA, Sotres-Alvarez D, et al. The Hispanic Community Health Study/Study of Latinos Community and Surrounding Areas Study: sample, design, and procedures. Ann Epidemiol. 2019;30:57–65. 10.1016/j.annepidem.2018.11.002. [PubMed: 30551973]

23. Robinson NP, Allred BW, Jones MO, et al. A dynamic landsat derived Normalized Difference Vegetation Index (NDVI) product for the conterminous United States. Remote Sens (Basel). 2017;9(8):863. 10.3390/rs9080863.

24. Frank LD, Sallis JF, Saelens BE, et al. The development of a walkability index: application to the Neighborhood Quality of Life Study. Br J Sports Med. 2010;44(13):924–933. 10.1136/bjsm.2009.058701. [PubMed: 19406732]

25. Sorlie PD, Avilés-Santa LM, Wassertheil-Smoller S, et al. Design and implementation of the Hispanic Community Health Study/Study of Latinos. Ann Epidemiol. 2010;20(8):629–641. 10.1016/j.annepidem.2010.03.015. [PubMed: 20609343]

26. Muthén LK, Muthén BO. Mplus. Los Angeles: Muthén & Muthén; 2006.

27. Enders CK. Applied missing data analysis. New York: Guilford Press; 2010.

28. Khambaty T, Schneiderman N, Llabre MM, et al. Elucidating the multidimensionality of socioeconomic status in relation to metabolic syndrome in the Hispanic Community Health Study/Study of Latinos (HCHS/SOL). Int J Behav Med. 2020;27(2):188–199. 10.1007/s12529-020-09847-y. [PubMed: 31933127]

29. Daviglus ML, Talavera GA, Aviles-Santa ML, et al. Prevalence of major cardiovascular risk factors and cardiovascular diseases among Hispanic/Latino individuals of diverse backgrounds in the United States. JAMA. 2012;308(17):1775–1784. 10.1001/jama.2012.14517. [PubMed: 23117778]

30. Hirsch JA, Diez Roux AV, Moore KA, Evenson KR, Rodriguez DA. Change in walking and body mass index following residential relocation: the Multi-ethnic Study of Atherosclerosis. Am J Public Health. 2014;104(3):e49–e56. 10.2105/AJPH.2013.301773.

31. Braun LM, Rodríguez DA, Evenson KR, Hirsch JA, Moore KA, Diez Roux AV. Walkability and cardiometabolic risk factors: cross-sectional and longitudinal associations from the Multi-Ethnic Study of Atherosclerosis. Health Place. 2016;39:9–17. 10.1016/j.healthplace.2016.02.006. [PubMed: 26922513]

32. Christine PJ, Auchincloss AH, Bertoni AG, et al. Longitudinal associations between neighborhood physical and social environments and incident type 2 diabetes mellitus: the Multi-Ethnic Study of Atherosclerosis (MESA). JAMA Intern Med. 2015;175(8):1311–1320. 10.1001/jamainternmed.2015.2691. [PubMed: 26121402]

33. Fazli GS, Moineddin R, Chu A, Bierman AS, Booth GL. Neighborhood walkability and pre-diabetes incidence in a multiethnic population. BMJ Open Diabetes Res Care. 2020;8(1):e000908. 10.1136/bmjdrc-2019-000908.

34. Brown SC, Lombard J, Wang K, et al. Neighborhood greenness and chronic health conditions in Medicare beneficiaries. Am J Prev Med. 2016;51(1):78–89. 10.1016/j.amepre.2016.02.008. [PubMed: 27061891]

35. South EC, Hohl BC, Kondo MC, MacDonald JM, Branas CC. Effect of greening vacant land on mental health of community-dwelling adults: a cluster randomized trial. JAMA Netw Open. 2018;1(3):e180298. 10.1001/jamanetworkopen.2018.0298. [PubMed: 30646029]

36. Garvin EC, Cannuscio CC, Branas CC. Greening vacant lots to reduce violent crime: a randomised controlled trial. Inj Prev. 2013;19(3):198–203. 10.1136/injuryprev-2012-040439. [PubMed: 22871378]

37. Kondo MC, Andreyeva E, South EC, MacDonald JM, Branas CC. Neighborhood interventions to reduce violence. Annu Rev Public Health. 2018;39(1):253–271. 10.1146/annurev-publhealth-040617-014600. [PubMed: 29328874]

38. Ross CE, Mirowsky J. Neighborhood socioeconomic status and health: context or composition? City Community. 2008;7(2):163–179. 10.1111/j.1540-6040.2008.00251.x.

39. Oakes JM. The (mis)estimation of neighborhood effects: causal inference for a practicable social epidemiology. Soc Sci Med. 2004;58(10):1929–1952. 10.1016/j.socscimed.2003.08.004. [PubMed: 15020009]

40. Centers for Disease Control and Prevention. National Diabetes Statistics Report, 2020. Atlanta, GA: Centers for Disease Control and Prevention, HHS; 2020.

41. Haire-Joshu D, Hill-Briggs F. The next generation of diabetes translation: a path to health equity. Annu Rev Public Health. 2019;40(1):391–410. 10.1146/annurev-publhealth-040218-044158. [PubMed: 30601723]

42. Siminerio LM, Albright A, Fradkin J, et al. The National Diabetes Education Program at 20 years: lessons learned and plans for the future. Diabetes Care. 2018;41(2):209–218. 10.2337/dc17-0976. [PubMed: 29358463]

Table 1.

Cohort Characteristics at Baseline (2008–2011) and Visit 2 (2014–2017): HCHS/SOL and SOL CASAS, San Diego, California

Variable	n	Weighted % or Weighted M (95% CI)
Sociodemographic factors (Baseline)		
Age, years	3,851	39.4 (38.4, 40.4)
Female, %	3,851	53.3 (50.8, 55.8)
Less than high school education, %	3,831	28.3 (25.2, 31.5)
Income, %	3,851	
<$10,000	422	9.5 (7.6, 11.7)
$10,001–$20,000	971	23.1 (20.0, 26.7)
$20,001–$40,000	1,352	33.8 (30.9, 36.8)
$40,001–$75,000	676	20.3 (17.6, 23.3)
>$75,000	232	9.3 (6.4, 13.2)
Not reported	198	4.1 (3.3, 5.0)
Health insurance, %	3,829	47.1 (43.3, 50.9)
Place of birth/duration of U.S. residence, %	3,831	
Born in U.S. 50 states or DC	668	21.3 (18.2, 24.8)
Born outside U.S. 50 states/DC and duration of U.S. residence ≥10 years	2,273	46.9 (43.8, 50.1)
Born outside U.S. 50 states/DC and duration of U.S. residence <10 years	892	31.8 (29.0, 34.6)
Metabolic factors		
Baseline		
BMI, kg/m^2	3,842	29.1 (28.7, 29.5)
HbA1c, %	3,827	5.7 (5.7, 5.8)
Diabetes status, %	3,851	
Normoglycemia	1,648	51.0 (47.9, 54.1)
Pre-diabetes	1,413	34.1 (31.5, 36.7)
Diabetes	790	14.9 (13.3, 16.7)
Visit 2		
BMI, kg/m^2	2,794	29.7 (29.2, 30.2)
HbA1c, %	2,810	5.9 (5.8, 6.0)
Diabetes status, %	2,858	
Normoglycemia	810	37.2 (34.5, 40.0)
Pre-diabetes	1,026	35.4 (33.0, 37.9)
Diabetes	1,022	27.4 (24.9, 30.0)
Moving status	3,648	
Moved between Baseline and Visit 2	1,067	27.5 (24.6, 30.6)
Did not move between Baseline and Visit 2	2,581	72.5 (69.4, 75.4)
Time between Baseline and Visit 2	2,860	6.23 (6.17, 6.30)

HCHS/SOL, Hispanic Community Health Study/Study of Latinos; SOL CASAS, Study of Latinos Community and Surrounding Areas Study

Table 2.

Cross-sectional associations between neighborhood environment variables and BMI and HbA1c at baseline; HCHS/SOL and SOL CASAS, San Diego, CA

	BMI (N=3817)			HbA1cb (N=3667)		
Neighborhood Variable	**B**	**(95% CI)**	**β**	**B**	**(95% CI)**	**B**
Socioeconomic deprivation	**1.08**	**(0.66, 1.49)**	**0.14** ***	**0.08**	**(0.04, 0.12)**	**0.06** ***
Walkability[a]	−0.14	(−0.50, 0.21)	−0.02	−0.01	(−0.05, 0.04)	−0.01
Residential stability[a]	0.52	(−0.34, 1.37)	0.02	−0.01	(−0.16, 0.15)	0.00
Social disorder[a]	0.13	(−0.33, 0.58)	0.01	−0.01	(−0.07, 0.06)	0.00
Greenness[a]	0.33	(−9.34, 9.91)	0.01	−0.91	(−2.20, 0.38)	−0.04

Notes: Columns show unstandardized regression coefficients (B), 95% CIs of these coefficients, and standardized regression coefficients (βs). βs are expressed in SD units and can therefore be interpreted as an indicator of effect size. Boldface indicates statistical significance (****p*<0.001). All models adjust for age, sex, education, income, and place of birth/duration of U.S. residence.

[a]Additionally adjusts for neighborhood socioeconomic deprivation.

[b]HbA1c models additionally adjust for use of glucose-lowering medication at baseline.

HCHS/SOL, Hispanic Community Health Study/Study of Latinos; SOL CASAS, Study of Latinos Community and Surrounding Areas Study

Table 3.

Associations Between Neighborhood Environment Variables and Diabetes Status at Baseline and Visit 2; HCHS/SOL and SOL CASAS, San Diego, California

	Diabetes status at Baseline (n=3,826)	**Diabetes status at Visit 2[b] (n=2,131)**
Neighborhood variable	**OR (95% CI)**	**OR (95% CI)**
Socioeconomic deprivation	**1.25 * (1.06, 1.47)**	**1.27 ** (1.10, 1.46)**
Walkability[a]	0.95 (0.83, 1.09)	1.13 (0.96, 1.33)
Residential stability[a]	0.81 (0.55, 1.17)	0.92 (0.59, 1.45)
Social disorder[a]	1.03 (0.90, 1.08)	0.958 (0.67, 1.35)
Greenness[a]	0.33 (0.02, 7.38)	0.42 (0.02, 9.85)

Notes: OR represents the association of a neighborhood exposure variable with the odds of increasing a category in diabetes status (i.e., worsening status from normoglycemia to prediabetes, or from prediabetes to diabetes). Boldface indicates statistical significance (**p*<0.05; ***p*<0.01). All models adjust for age, sex, education, income, place of birth/duration of U.S. residence.

[a]Additionally adjusts for neighborhood socioeconomic deprivation.

[b]Models examining diabetes status at Visit 2 exclude participants with diabetes at baseline and additionally adjust for years between Baseline and Visit 2 and moving status between Baseline and Visit 2.

HCHS/SOL, Hispanic Community Health Study/Study of Latinos; SOL CASAS, Study of Latinos Community and Surrounding Areas Study

Table 4.

Prospective Associations Between Neighborhood Environment Variables at Baseline and BMI and HbA1c at Visit 2; HCHS/SOL and SOL CASAS, San Diego, California

	BMI (N=2,637)			HbA1c[b] (N=1,932)		
Neighborhood variable	**B**	**(95% CI)**	**β**	**B**	**(95% CI)**	**β**
Socioeconomic deprivation	**0.35**	**(0.11, 0.58)**	**0.05** **	**−0.07**	**(−0.13, −0.01)**	**−0.04** *
Walkability[a]	0.21	(−0.05, 0.46)	0.03	0.03	(−0.03, 0.09)	0.02
Residential stability[a]	0.30	(−0.18, 0.79)	0.01	0.06	(−0.25, 0.36)	0.01
Social disorder[a]	**0.31**	**(0.23, 1.52)**	**0.05** *	−0.03	(−0.17, 0.16)	0.00
Greenness[a]	0.54	(−3.59, 4.67)	0.01	−0.52	(−1.87, 0.83)	−0.02

Notes: Columns show unstandardized regression coefficients (B), 95% CIs of these coefficients, and standardized regression coefficients (βs). βs are expressed in SD units and can therefore be interpreted as an indicator of effect size. Boldface indicates statistical significance (*$p<0.05$; **$p<0.01$). All models adjust for age, sex, education, income, place of birth/duration of U.S. residence, years between baseline and visit 2, moving status between baseline and visit 2, and the baseline level of the respective outcome variable (to examine residualized change).

[a]Additionally adjusts for neighborhood socioeconomic deprivation.

[b]HbA1c models additionally adjust for use of glucose-lowering medication at visit 2.

HCHS/SOL, Hispanic Community Health Study/Study of Latinos; SOL CASAS, Study of Latinos Community and Surrounding Areas Study