Assessing Hispanic/Latino and Non-Hispanic White Social Determinants of Obesity Among a Community Sample of Residents in the Rural Southeast US

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Abstract

Employing an ecological approach, we sought to identify social determinants of obesity among Hispanics/Latinos and non-Hispanic whites living in the Southeast US. Data on social determinants of obesity (individual, family, community and cultural/contextual) were collected from 217 participants [106 Hispanics/Latinos; 111 non-Hispanic whites]; height and weight were objectively measured. We compared prevalence of overweight and obese between ethnic groups and BMI values within each group by social determinants. Hispanics had a 1.9-fold increase (OR 1.93, 95% CI: 1.05–3.55) in overweight prevalence compared to non-Hispanic whites after adjusting for age and gender. We found positive estimates between unfavorable family-level determinants and BMI among Hispanic/Latinos. In contrast, non-Hispanic whites who reported unfavorable neighborhood characteristics had higher BMI's. Findings highlight the need for targeted approaches for the prevention and control of obesity.

Keywords

Hispanic/Latino; Obesity; Social determinants of health; Obesogenic environment; Health disparity

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Introduction

U.S. Hispanics/Latinos experience a high burden of obesity, a risk factor for multiple chronic health conditions and increased medical expenditures [1]. For adults living in the U.S., the prevalence of obesity is 47% among Hispanics/Latinos compared with 38% among non-Hispanic whites [2]. Hispanic/Latino immigrants often arrive in the U.S. at a healthy weight; however, time in the U.S. and changes in lifestyle behaviors are associated with weight gain [3–5]. Growing evidence suggests that social and environmental factors also influence obesity [6], including social support for healthy behaviors [7], access to safe physical activity opportunities [8] and healthy food options [9]. Geographical differences in rates of obesity, such as the high rates observed in the Southern U.S., may be attributable to sub-optimal social and environmental factors (e.g. obesogenic environments) [10]. Thus, Hispanic/Latinos who live in obesogenic environments may be more prone to weight gain.

Social determinants of health (SDoH), defined as the economic, environmental, political and social conditions in which people live, are responsible for a major part of health inequity worldwide [11]. Multiple SDoH have been associated with obesity, with the effects of the built/structural environment well established in the literature [6]. Similarly, socioeconomic status has consistently been linked to higher obesity rates [12], driven largely by limited access to education and material resources [13]. Social networks (e.g. the people in one's life), [14] as well as social capital and collective efficacy at the interpersonal and neighborhood levels, are correlated with obesity [15]. These determinants are multi-systemic; thus, studies that employ an ecological approach to understand SDoH provide valuable insights into factors that contribute to risk for obesity, especially among U.S. Hispanic/Latino immigrants [16].

This is important because the U.S. Hispanic/Latino population is increasing [17], particularly in the proportion of Hispanics/Latinos living in emerging Hispanic/Latino communities. Historically, immigrants from Mexico and Central and South America have settled in states such as California, Florida, Illinois and Texas however, individuals are increasingly immigrating to emerging communities. Emerging communities are defined as those where Hispanic/Latino populations are growing but have not achieved institutional power or recognition [18]. Seven states with the largest percent increase in their Hispanic/Latino populations are found in a band across the southeastern U.S. that are considered emerging communities [19]. A growing body of research demonstrates that Hispanic/Latino immigrants living in these emerging communities face distinct barriers when it comes to healthy lifestyles. This includes underdeveloped social networks, isolation and discrimination, and limited access to health education programs and quality health services [20–23], all factors that have been linked to obesity. Hispanic/Latino immigrants who find themselves in emerging communities, such as Alabama where rates of obesity are high [24], may be at risk for accelerated weight gain and heightened diabetes risk.

Recognizing the need to conduct ecological studies to identify social determinants of obesity, researchers developed the Community Energy Balance (CEB) framework [25]. This framework was developed to guide research on the social determinants of health and obesity that specifically incorporates cultural and contextual factors relevant to racial/ethnic

minority communities and immigrants to the U.S (Fig. 1). Using the CEB as a guide, we developed a survey to identify social determinants of obesity among Hispanics/Latinos and non-Hispanic whites living in a rural, Alabama community. The city of Albertville was selected based on its sizable Hispanic population relative to other areas of Alabama [26].

Methods

Study Design

A population-based cross-sectional survey was administered to residents in Albertville, Alabama identified using a cluster sampling approach. The study was reviewed and approved by the institution's review board.

Identification and Recruitment of Participants

Participants were recruited from Albertville, a rural community located in Marshall County in Northeastern Alabama. As of the 2010 U.S. Census, Albertville had a population of 21,160 with Hispanics/Latinos comprising roughly 28% of the population [26]. To be included, potential participants had to be a resident living in an Albertville Census block group selected for participation, self-identify as Hispanic or non-Hispanic white, be 19 years of age or older at time of survey, and able to speak English or Spanish.

Based on power calculations, the goal was to recruit 200 participants, with roughly 50% Hispanic/Latino respondents. To ensure ethnic representativeness, participants were recruited using an area-based stratified random sampling approach [27]. First, we divided Albertville into four non-overlapping strata based on Census block group by Hispanic household proportion: blocks with < 10% Hispanic households, 10–30%, 30–50%, and 50%. We then randomly selected block groups within each stratum, oversampling the two strata with higher proportions of Hispanic households. Interviewers were given a block map and a starting address. Using a systematic random sampling interval based on the CASPER toolkit [28], interviewers approached Nth house until the proposed number of surveys per block were completed (N varied as a function of block population and proposed surveys per block). Door-to-door recruitment was conducted between June and December 2013. Data were collected on weekdays and weekends to avoid bias toward individuals who did not have full-time employment or non-traditional work schedules. Trained bilingual staff obtained written informed consent, assessed eligibility, collected physiologic measures, and administered the survey.

Measures

Body Mass Index, kg/m^2 (BMI)—Height and weight were measured at the in-person survey using standard procedures and equipment. Weight was collected using the Homedics SC-540 LCD Scale and recorded in kilograms. Height was measured using the Seca 214 Portable Stadiometer and recorded to the nearest millimeter. Weight in kilograms was divided by height in meters squared to derive BMI.

Social Determinants of Health—Using the CEB framework as a guide, we selected measures representing social determinants of health related to obesity (see Table 1),

including individual, family, community and cultural/contextual determinants. Domains are listed in Table 1, along with sources of the scales used and how responses to scale items were categorized for analysis purposes [29–39]. Cut-points for the Perceived Stress Scale (PSS) and Centers for Epidemiologic Studies Depression Scale (CES-D) were based on previous recommendations in the literature [37, 38]. Note that many measures, particularly interpersonal and community level measures, did not have validated cut-points documented. Since our intent was to compare within and between Hispanics/Latinos and non-Hispanic whites, we employed a median split approach to classify these measures into low vs high for comparisons (see Table 1 for specific measures and cut-points utilized).

Statistical approach

Analyses were conducted using SAS version 9.4 (SAS Institute, Cary, NC). All analyses took into account stratified recruitment and controlled for clustering by block using the survey procedures in SAS 9.4. We characterized the population using descriptive statistics and compared Hispanics/Latinos to non-Hispanic whites using chi-square tests for categorical measures. Means and standard deviations are reported for continuous measures (e.g. BMI, individual, family, community level and cultural/contextual determinants). Since these measures were not normally distributed in our sample, we report p-values where we log transformed values and tested for differences between ethnic groups using generalized linear regression. Logistic regression was used to compare the prevalence of overweight (BMI 25–29.9 kg/m^2) and obesity (BMI 30 kg/m^2) between Hispanic and non-Hispanic whites, adjusting for age and gender. Mean log BMI values within each ethnic group were compared by individual, family, community, and cultural/contextual factors using generalized linear models. To examine social determinant risk factors of obesity (BMI 30 kg/m^2), we compared determinants among individuals with obesity to those without obesity, stratified by ethnic group and adjusted for age and gender. Estimates are reported as odds ratios (OR) with 95% confidence intervals (95% CI).

Results

Characteristics of the study sample overall and by ethnic group are presented in Table 2. Hispanics/Latinos were roughly 10 years younger at the time of assessment compared to non-Hispanic whites, were less likely to hold a high school education, and were less likely to have health insurance. In terms of health behaviors and other determinants, Hispanics/Latinos engaged in fewer minutes of sedentary behavior and reported stronger family cohesion than non-Hispanics whites. Hispanics/Latinos had smaller social networks, reported lower neighborhood cohesion, and less civic trust than non-Hispanic whites. Hispanics/Latinos were more likely to be overweight compared to non-Hispanic whites (OR 1.93, 95% CI: 1.05–3.55) after adjusting for age and gender (Fig. 2).

Figure 3 shows mean BMI values by social determinants within ethnic groups. BMI did not differ across levels of most determinants within each respective ethnic group. However, Hispanics/Latinos who were less aware of physical activity resources in their community had higher log BMI values (p's < 0.05) than Hispanics/Latinos who reported more awareness of resources. Non-Hispanic whites who reported consuming less than 5

servings of fruits and vegetables per day, more frequent depressive symptoms, and more family encouragement had significantly higher BMI's (p's < 0.05).

Outside of these few significant findings, there were no statistical differences in BMI across other determinants within each ethnic group. However, visual inspection of the plots in Fig. 3 indicate that effects of determinants on BMI vary strikingly depending on ethnicity. For instance, unfavorable family/interpersonal determinants were indicative of a higher BMI for Hispanics/Latinos with the opposite effect seen in non-Hispanic whites. Conversely, favorable neighborhood determinants (e.g. cohesion, trust) were indicative of a higher BMI among Hispanics/Latinos and the opposite effect among non-Hispanic whites.

Determinants for increased risk of obesity (BMI 30 kg/m^2) by ethnic group are presented in Table 3. Hispanics/Latinos who reported more frequent perceived discrimination were three times as likely to be obese compared to those who reported less perceived discrimination (OR 3.01, 95% CI: 1.25–7.22). No other significant factors emerged.

Discussion

In this examination of the social determinants of obesity among Hispanics/Latinos and non-Hispanic whites living in a rural community, we found that the prevalence of obesity was similar, the prevalence of overweight was higher, and the determinants of obesity varied by ethnic groups. More frequent reporting of perceived discrimination was associated with obesity among Hispanics/Latinos. We also found positive associations, albeit not statistically significant, between unfavorable family determinants and BMI/obesity among Hispanic/Latinos. In contrast, non-Hispanic whites who reported unfavorable neighborhood characteristics had higher BMI's and were more at risk for obesity. Findings highlight that social determinants of obesity vary based on ethnicity and sometimes in unexpected ways. Preliminary findings should be validated in a larger sample moving forward, but they suggest potentially targeted approaches to the prevention and control of obesity.

The association observed such that Hispanics/Latinos in our sample who frequently reported perceived discrimination were more likely to be obese than Hispanics/Latinos that did not report frequent discrimination; are in line with other investigations. A recent study found that more frequent perceived discrimination was associated with BMI and central adiposity in a group of Hispanic adults [40]; similar findings have been reported among other minorities [41, 42]. Our positive estimates here suggested that, while not significant, Hispanics who reported unfavorable family determinants were more likely to be obese. While the traditional value of familism (dedication to family) is a characteristic of the Hispanic culture, associations with weight loss and obesity have been mixed [43–45], in part, due to varied measurement approaches. Further, Hispanics/Latinos who had fewer social networks and less knowledge about physical activity resources were more likely to be obese. Social networks have been associated with weight loss among Hispanics/Latinos, although the size and composition of networks can have either positive or negative effects [46, 47]. Social capital (a concept that includes social network size and quality among other factors) has also been linked to obesity risk [48]. Acknowledging perceived discrimination,

harnessing the protective mechanisms of family support, and bolstering social networks and capital may be potential intervention targets for Hispanics/Latinos with obesity.

Interestingly, Hispanics/Latinos who reported more neighborhood cohesion and civic trust had higher BMI's and were more at risk for obesity than those who reported less cohesion/ trust and more disorder, which seems counter-intuitive. In fact, one recent study found an association between cohesion and lower BMI in Hispanics [49]. Our findings may represent the clustering of Hispanics/Latinos in communities (such as Albertville) where cultural factors of cohesion and trust are fostered, along with other cultural factors such as food choices, cooking styles, and family sedentary behaviors that may promote obesity [50]. Cultural factors have been speculated to contribute to the Hispanic paradox, a well-documented phenomenon where Hispanics/Latinos with high risk factors exhibit lower rates of poor health outcomes [51].

Our results highlight the importance of examining how family factors and social networks are associated with obesity risk among Hispanics/Latinos to inform intervention targets to reduce disparities in health. As seen in our study, there were different findings based on ethnic group, providing insight into how to culturally adapt or develop targeted interventions [52] to mitigate obesity. The CEB framework emphasizes the need to address cultural-contextual interactions that influence an individual's energy balance [25]. The framework provides researchers with information and strategies to design interventions that acknowledge the role of contextual facilitators and barriers to shaping obesity-related health behaviors. Suggestions for fostering social capital include developing community physical activities (e.g. walking clubs) and encouraging advocacy for healthier environments [53]. Family targets include promoting effective parenting strategies and structural aspects of the home environment to influence food choices, food availability, and physical activity [54, 55].

Reported findings should be interpreted within the context of several limitations. Our sample size was small for risk factor analysis, and findings should be validated in a larger cohort. Our Hispanic/Latino sample was considerably younger than the non-Hispanic whites in our study, introducing age bias. While we controlled for age in most analyses, interpretations of estimates should be viewed with caution. Further, we limited our study to Hispanic/ Latino and non-Hispanic whites; including other races would have allowed for additional comparisons across other at-risk groups [2]. Another limitation, common in studies that survey community level attributes, is the lack of standardized and validated measures of social and neighborhood level determinants making direct comparisons between studies difficult. Many of the scales used in this study do not report psychometric properties and have not been used across multiple studies or populations. Our small sample was limited to a specific community in a rural, Southeastern state, making widespread generalizability problematic. Lastly, our counter-intuitive findings may be unique to our sample, context, or measures; validation of our results are needed.

Despite these limitations, our study has several strengths that should be emphasized. Our study provides much needed data regarding social determinants and obesity risk among Hispanic/Latino adults living in the U.S. and in emerging communities more specifically, regardless of power or direction of estimates. Our approach was effective in identifying

potential differences in determinants of obesity risk between Hispanics/Latinos and non-Hispanic whites in the Southeastern U.S. Consistent with calls to use both an etic and emic approach, reporting these types of data will help move the field towards standardization of social determinant measures that are sensitive to context and racial/ethnic group. Additionally, our sampling method allowed us to successful recruit a balanced sample in a community study and therefore minimized selection bias. Lastly our study utilized the CEB framework to systematically assess determinants across multiple systems that contribute to obesogenic environments.

Conclusion

Overall, we find that associations between social determinants of health and obesity varied by ethnic group in our study. Perceived discrimination, unfavorable family factors and small social networks were determinants for Hispanics/Latinos obesity but not for non-Hispanic whites, warranting further exploration. Nonetheless, it is important to stress that these findings are a preliminary step. Future work should query a larger, more representative sample of Hispanics and explore concepts using standardized measures.

Acknowledgements

Conflict of Interest

All authors have no conflicts of interest or financial relationships relevant to this article to disclose. All sources of funding had no role in study design; collection, analysis, and interpretation of data; writing the report; or the decision to submit the report for publication.

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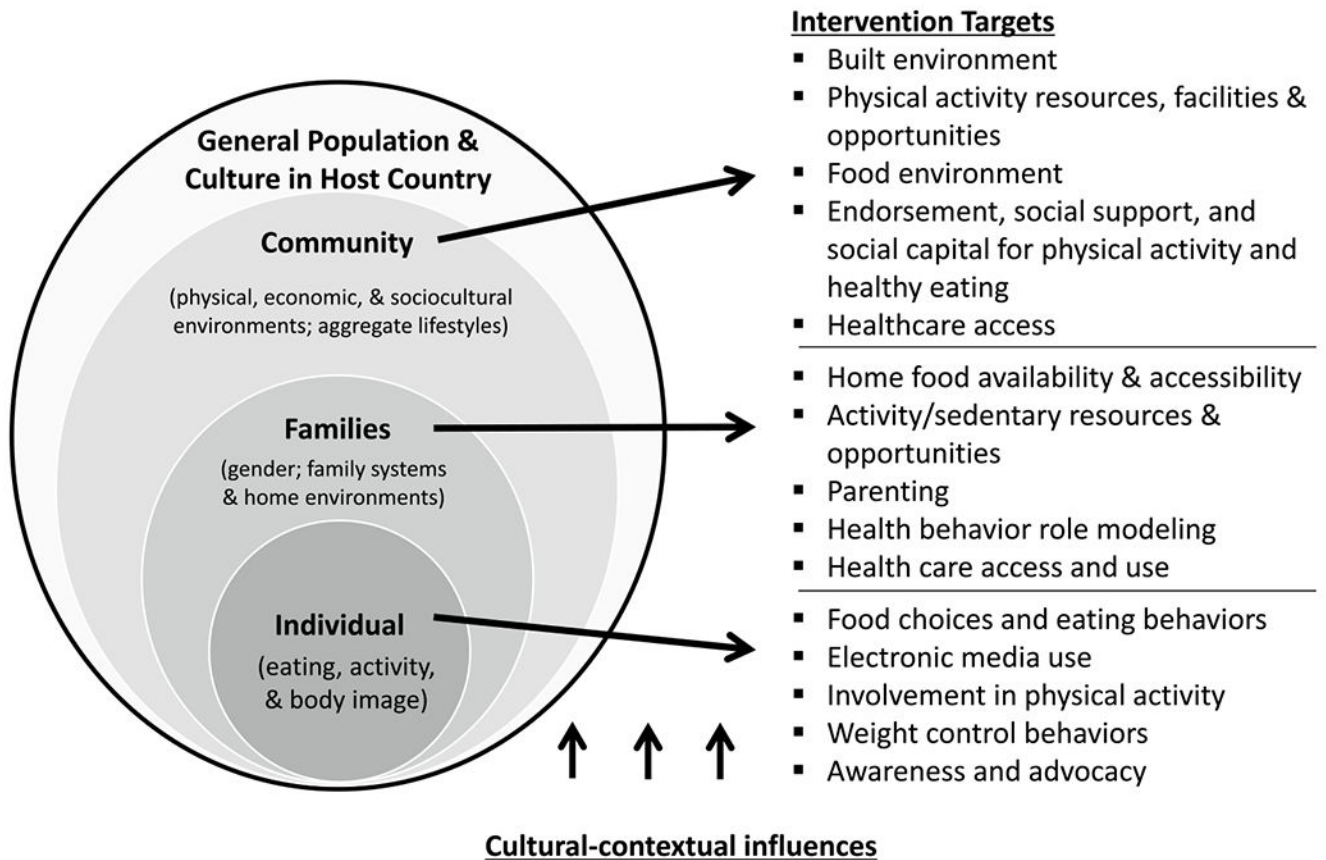
Fig. 1.
Community Energy Balance Framework, adapted from Kumanyika et al. [25]
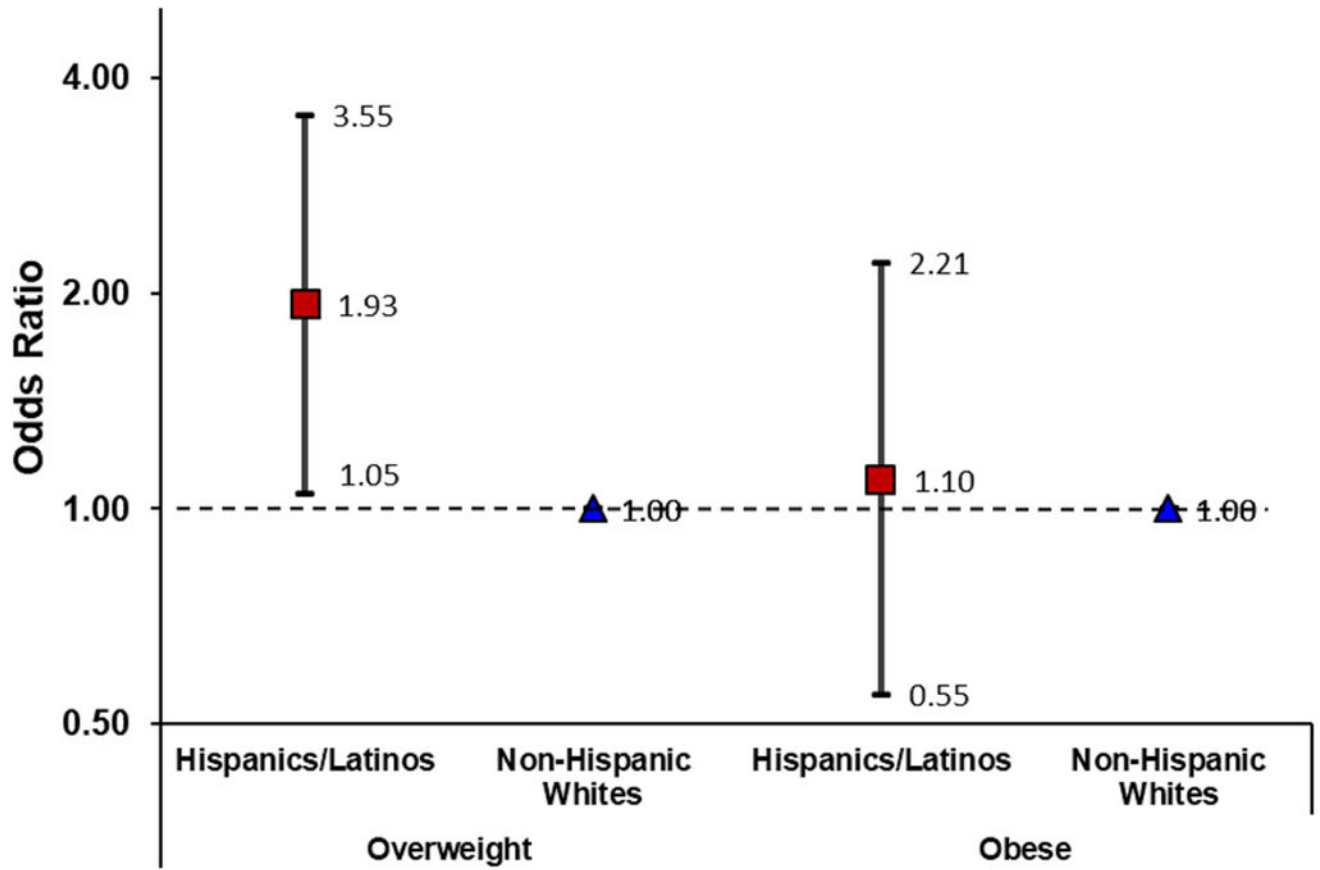
Fig. 2.
Prevalence of overweight and obesity among Hispanics/Latinos compared to non-Hispanic whites, adjusted for age and gender
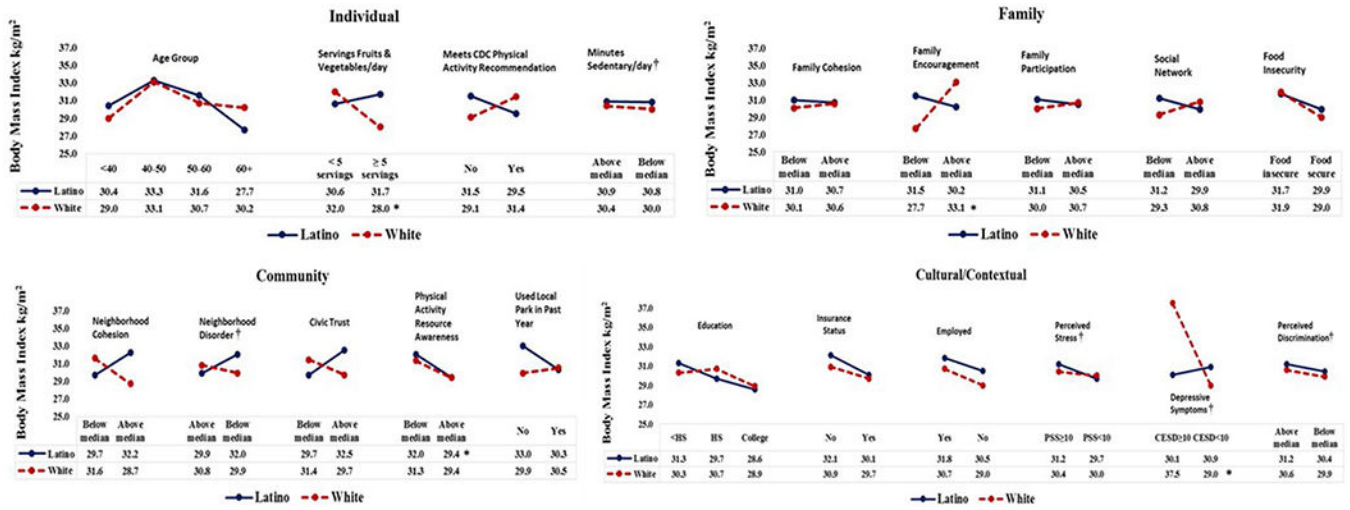
*: Within groups difference p<0.05; †: Lower score is better; HS: High school; PSS: Perceived stress scale; CESD: Centers for Epidemiologic Studies Depression scale

Fig. 3.
Mean BMI values by social determinants within each Community Energy Balance level, stratified by ethnicity

Table 1

Social determinant of health measures assessed based on the Community Energy Balance (CEB) framework

CEB Level	Domain	Measure (# of items)	Categorization of measure
Individual			
	Demographic		
	Age	Self-reported age at time of survey (1 item)	Continuous years
	Gender	Self-reported gender (1 item)	Male/Female
	Health behaviors		
	Diet	Rapid food screener, fruit and vegetable consumption section. [29] (7 items)	< 5 servings/day; ≥ 5 servings/day
	Physical activity	Global physical activity questionnaire [30] (15 items)	<150 min/day; ≥150 min/day
	Sedentary behavior	Global physical activity questionnaire [30] (1 items)	Total minutes sedentary per day; low vs high based on median split
Families	*Family cohesion*	Family Adaptability and Cohesion Evaluation Scale (FACES III), Family cohesion subscale [31] (10 items)	Scale of 10–50; low vs high based on median split with higher scores indicating more cohesion
	Social support for physical activity and healthy eating		
	Family encouragement	Sallis Social Support and Eating Habits/Exercise surveys, family encouragement items [32] (5 items)	Scale of 1–5; low vs high based on median split with higher scores indicating more encouragement
	Family participation	Sallis Social Support and Eating Habits/Exercise surveys, family participation items [32] (5 items)	Scale of 1–5; low vs high based on median split with higher scores indicating more participation
	Social network size	Name generator of up to 5 people with close relationship to participant, count of names [33] (1 item)	Scale of 0–5; low vs high based on median split with higher scores indicating more people in social network
	Food insecurity	USDA Food security short form [34] (6 items)	Scale of 0–6; 0 to 1 = food secure; 2–6 = food insecure
Community	Neighborhood cohesion	Project on Human Development in Chicago Neighborhoods Community Survey [35] (5 items)	Scale of 1–5; low vs high based on median split with higher scores indicating more neighborhood cohesion
	Neighborhood disorder	Ross–Mirowsky Perceived Neighborhood Disorder Scale [36] (15 items)	Scale of 10–45; low vs high based on median split with higher scores indicating more disorder
	Civic trust	Project on Human Development in Chicago Neighborhoods Community Survey [35] (5 items)	Scale of 1–5; low vs high based on median split with higher scores indicating more civic trust
	Physical activity opportunities	Awareness of Resources in the Community for Physical Activity (1 item – list resources) [33] Used local park in last year (1 item)	Variable number; low vs high based on median split with higher scores indicating more awareness Yes/No
Cultural/ contextual	*SES*		

CEB Level	Domain	Measure (# of items)	Categorization of measure
	Education	Highest education obtained (1 item)	< High School, High School, > High School
	Employment	Currently working (1 item)	Yes/No
	Insurance status		
		Participant has health insurance (includes VA benefits, Medicaid or Medicare) (1 item)	Yes/No
	Mental health		
	Stress	Perceived Stress Scale (PSS) [37] (10 items)	score of 10; < score of 10 higher scores indicate more frequent report of perceived stress
	Depressive Symptoms	Centers for Epidemiologic Studies Depression Scale (CES-D) [38] (10 items)	score of 10; < score of 10; higher scores indicate more frequent report of depressive symptoms
	Perceived discrimination	Perceived Discrimination Scale, Daily Discrimination Subscale [39] (9 items)	Scale of 0–45; low vs high based on median split with higher scores indicating more perceived discrimination

Table 2

Characteristics of the study sample overall and by ethnic group

	All participants, N = 217	Latino, n = 106	White, n = 111	P-value
	Mean (SD)	**Mean (SD)**	**Mean (SD)**	
Age at assessment	40.9 (21.4)	34.6 (11.8)	46.9 (18.9)	**<0.001**
BMI, kg/m²	30.5 (8.3)	30.8 (6.3)	30.3 (8.3)	0.67
Length time in US	–	14.18 (6.8)	–	–
	N (%)	**N (%)**	**N (%)**	
Sex				**0.25**
Male	80 (36.9)	43 (40.6)	37 (33.3)	
Female	137 (63.1)	63 (59.4)	74 (66.7)	
Education				**<0.001**
Less than HS	95 (44.0)	74 (69.8)	22 (19.8)	
HS	98 (45.4)	28 (26.4)	70 (63.1)	
College degree	23 (10.6)	4 (3.8)	19 (17.1)	
Employment				**0.03**
Employed	123 (56.7)	68 (64.2)	55 (49.5)	
Unemployed	94 (43.3)	38 (35.8)	56 (50.5)	
Insurance status				**0.001**
Yes	107 (49.3)	26 (24.5)	84 (75.7)	
No	110 (50.7)	80 (75.5)	27 (24.3)	
Marital status				0.85
Single/divorced	106 (48.8)	51 (48.1)	55 (49.5)	
Married/live together	111 (51.2)	55 (51.9)	56 (50.5)	
BMI category				**0.01**
Normal	35 (16.1)	9 (8.5)	26 (23.4)	
Overweight	87 (40.1)	49 (46.2)	38 (34.2)	
Obese	95 (43.8)	48 (45.3)	47 (42.3)	
	Mean (SD)	*Mean (SD)*	*Mean (SD)*	*p-value*
Individual[*]				
Servings fruits and vegetables/day	2.3 (2.2)	2.2 (2.3)	2.4 (1.9)	0.12

	All participants, $N = 217$	Latino, $n = 106$	White, $n = 111$	P-value
	Mean (SD)	**Mean (SD)**	**Mean (SD)**	
Physical activity, min/day	124.9 (136.7)	112.4 (119.4)	137.0 (146.6)	0.10
Sedentary time, min/day	209.1 (203.7)	158.0 (183.5)	258.0 (185.8)	**<0.001**
Family[*]				
Family cohesion	38.5 (9.0)	41.3 (8.6)	35.8 (7.9)	**<0.001**
Family encouragement	2.2 (1.0)	2.3 (1.0)	2.1 (0.9)	0.26
Family participation	1.9 (0.7)	2.0 (0.8)	1.8 (0.8)	0.13
Social network size	3.2 (2.1)	2.6 (1.4)	3.7 (1.8)	**<0.001**
Food insecurity	1.6 (0.6)	1.6 (0.6)	1.5 (0.8)	0.75
Community[*]				
Neighborhood cohesion	3.4 (1.0)	3.2 (0.7)	3.5 (1.1)	**0.03**
Neighborhood disorder	24.9 (8.7)	25.4 (6.7)	24.3 (9.6)	0.29
Civic trust	24.0 (5.3)	22.8 (3.5)	25.2 (5.6)	**<0.001**
Physical Activity resources	7.9 (2.7)	7.8 (2.4)	8.1 (2.6)	0.39
Cultural/contextual[*]				
Perceived Stress Scale	14.9 (9.0)	15.0 (6.7)	14.9 (9.9)	0.94
CES-D	5.5 (4.2)	5.3 (3.1)	5.8 (4.7)	0.37
Perceived Discrimination	7.9 (8.4)	8.1 (8.9)	7.8 (8.1)	0.80

Bold values represent significance of $p < 0.05$

SD Standard deviation;

[*] based on the Community Energy Balance (CEB) framework

Table 3

Social determinants of obesity risk (BMI ≥ 30 kg/m^2), stratified by ethnicity and adjusted for age and gender

Determinant	Hispanics/Latinos Odds Ratio (95% CI)	P-value	Non-Hispanic Whites Odds Ratio (95% CI)	P-value
Interpersonal/family				
Family cohesion				
Above median	1.00		1.00	
Below median	1.66 (0.67–4.10)	0.27	0.65 (0.33–1.26)	0.20
Family encouragement				
Above median	1.00		1.00	
Below median	1.83 (0.87–3.85)	0.11	0.19 (0.08–0.44)	**<0.001**
Family participation				
Above median	1.00		1.00	
Below median	0.99 (0.49–2.00)	0.98	0.57 (0.28–1.16)	0.12
Social Network size				
Above median	1.00		1.00	
Below median	1.31 (0.52–3.28)	0.56	0.60 (0.28–1.31)	0.20
Food insecurity				
Food insecure	1.17 (0.53–2.60)	0.69	1.06 (0.47–2.41)	0.89
Food secure	1.00		1.00	
Community/contextual				
Neighborhood cohesion				
Above median	1.00		1.00	
Below median	0.84 (0.36–1.96)	0.68	1.49 (0.74–2.98)	0.26
Discrimination				
Above median	3.01 (1.25–7.22)	**0.01**	0.83 (0.35–1.99)	0.68
Below median	1.00		1.00	
Neighborhood disorder				
Above median	0.59 (0.29–1.21)	0.15	0.91 (0.40–2.10)	0.83
Below median	1.00		1.00	
Civic trust				

Determinant	Hispanics/Latinos	P-value	Non-Hispanic Whites	P-value
	Odds Ratio (95% CI)		**Odds Ratio (95% CI)**	
Above median	1.00		1.00	
Below median	0.77 (0.33–1.80)	0.54	0.72 (0.30–1.72)	0.45
Physical activity resources				
Above median	1.00		1.00	
Below median	1.20 (0.45–1.03)	0.71	0.98 (0.49–1.99)	0.96
Used park in last year				
Yes	1.00		1.00	
No	0.87 (0.28–2.68)	0.80	0.80 (0.32–1.99)	0.63