Published in final edited form as:

J Immigr Minor Health. 2017 April ; 19(2): 237–245. doi:10.1007/s10903-016-0383-5.

Utilitarian and Recreational Walking Among Spanish-and English-Speaking Latino Adults in Micropolitan US Towns

Mark P. Doescher¹, Chanam Lee², Brian E. Saelens^{3,4}, Chunkuen Lee², Ethan M. Berke⁵, Anna M. Adachi-Mejia⁶, Davis G. Patterson⁷, and Anne Vernez Moudon⁸

¹Stephenson Cancer Center and Department of Family and Preventive Medicine, University of Oklahoma Health Sciences Center, 800 NE 10th Street, SCC 5031, Oklahoma City, OK 73104, USA

²Department of Landscape Architecture and Urban Planning, College of Architecture, Texas A&M University, College Station, TX, USA

³Seattle Children's Research Institute, Seattle, WA, USA

⁴Department of Pediatrics, School of Medicine, University of Washington (UW), Seattle, WA, USA

⁵Department of Family and Community Medicine, The Geisel School of Medicine at Dartmouth, Lebanon, NH, USA

⁶Department of Pediatrics, The Geisel School of Medicine at Dartmouth, Lebanon, NH, USA

⁷Department of Family Medicine, WWAMI Rural Health Research Center, University of Washington, Seattle, WA, USA

⁸Department of Urban Design and Planning, College of Built Environments, University of Washington, Seattle, WA, USA

Abstract

Background—Walking among Latinos in US Micropolitan towns may vary by language spoken.

Methods—In 2011–2012, we collected telephone survey and built environment (BE) data from adults in six towns located within micropolitan counties from two states with sizable Latino populations. We performed mixed-effects logistic regression modeling to examine relationships between ethnicity-language group [Spanish-speaking Latinos (SSLs); English-speaking Latinos (ESLs); and English-speaking non-Latinos (ENLs)] and utilitarian walking and recreational walking, accounting for socio-demographic, lifestyle and BE characteristics.

Results—Low-income SSLs reported higher amounts of utilitarian walking than ENLs ($p = 0.007$), but utilitarian walking in this group decreased as income increased. SSLs reported lower amounts of recreational walking than ENLs ($p = 0.004$). ESL–ENL differences were not significant. We identified no statistically significant interactions between ethnicity-language group and BE characteristics.

Correspondence to: Mark P. Doescher.

Electronic supplementary material The online version of this article (doi:10.1007/s10903-016-0383-5) contains supplementary material, which is available to authorized users.

Discussion—Approaches to increase walking in micropolitan towns with sizable SSL populations may need to account for this group’s differences in walking behaviors.

Keywords

Physical activity; Ethnicity; Rural populations; Environment design; Public health

Background

Latinos (used in this study to indicate Latinos and Hispanics; see “Methods”) are driving population growth in micropolitan areas of the United States (US) [1]. This population growth underscores the pressing need to understand Latino health behaviors, including walking, in these locations. Walking is the most frequent type of physical activity reported by US adults [2–4], and is associated with an array of benefits, including greater longevity [5–7] and reduced chronic disease [5, 6, 8–11]. It is inexpensive, accessible and more likely to be sustained than other types of physical activity [12]. US adults who reside in nonmetropolitan locations, which include micropolitan areas, walk less [13] and engage in less total physical activity [14, 15] than their metropolitan-residing counterparts. However, research on walking in towns in micropolitan areas has not focused on race or ethnicity and thus far no studies have evaluated Latino walking in this setting.

Among the types of walking, utilitarian walking (e.g., walking for transport to routine destinations, such as worksites or schools) has been identified as a critical element underpinning sustainable lifestyle changes in studies examining metropolitan residents [16, 17] and may be an effective means of achieving recommended physical activity levels when incorporated into one’s daily routine [18–20]. Research on utilitarian walking by Latinos is limited, but one study using national, predominately metropolitan, data showed that walking for errands decreased as English-language proficiency increased [21]. A study in San Diego county reported that non-leisure time walking was negatively associated with living in the US 12 years and being US-born [22]. However, neither of these studies specifically explored whether these relationships held among Latinos living in micropolitan or other nonmetropolitan locations.

Recreational walking in the neighborhood (a form of leisure-time physical activity) can be another key component of achieving recommended levels of physical activity [23, 24], and could be especially important in locations that contain few destinations conducive to utilitarian walking, but may contain recreational amenities, such as parks and trails, that can promote recreational walking. Research using national, predominately metropolitan, data shows that Latinos were less likely to engage in leisure-time walking than non-Latinos [4, 25] and they were less likely to meet national recommendations for physical activity [26]. Other studies using national data indicate that leisure-time physical activity, including walking, among Latinos increased with English language usage [21] and this finding held for Latinas, including Mexican–American women, in North Carolina [27] and Mexican–Americans nationally [28]. As is the case for utilitarian walking, these studies did not concentrate on micropolitan or other nonmetropolitan populations.

Walking is influenced by neighborhood design and land use patterns [16, 29]. The role of the built environment (BE) on walking has been most clearly demonstrated in metropolitan environments, but recent work shows that aspects of the BE are significantly associated with walking among residents of micropolitan towns [13, 30]. Micropolitan towns comprise 10 % of the US population and many are characterized by rapid growth [31]. They are located in more isolated locations than the cities and suburbs of metropolitan areas, but contain at least one cluster of 10,000–49,999 persons [31]. Compared to metropolitan areas, micropolitan towns have smaller residential and commercial cores which define geographic concentrations of population and employment. Still, the BE of these towns can support walking as it often encompasses aggregations of residences in proximity to employment and retail locations and parks in which daily life occurs. Walkable locations in micropolitan towns are similar to those in metropolitan locations and characterized by medium-to-high population density, a mix of land uses (e.g., residences, shops, worksites), high street connectivity (e.g., traditional blocks), and presence of pedestrian infrastructure (e.g., sidewalks) [13, 32]. Yet very little is known about BE-walking relationships among Latinos in micropolitan communities.

We examined utilitarian and recreational walking among adult predominately Spanish-speaking Latinos (SSLs), predominately English-speaking Latinos (ESLs) and English-speaking non-Latinos (ENLs) in a sample of six micropolitan towns in Texas and Washington. We posited that compared to ENLs, SSLs would be more likely than ENLs to engage in utilitarian walking but less likely to engage in the recreational form of this activity. In contrast, we posited that ESLs and ENLs would report similar amounts of utilitarian and recreational walking. Moreover, we explored whether socio-demographic and BE measures modified or mediated differences in walking behaviors among these language/ethnic groups. Because the socio-demographic and environmental influences on walking may differ for the utilitarian and recreational forms of this activity, separate analyses were conducted for each type of walking behavior.

Methods

Participants

The “small town walking” (STW) study collected telephone survey and BE data during 2011–2012 from adult residents of nine small, micropolitan towns located in New Hampshire, New York, Texas and Washington State [13]. Eligibility criteria included: age 18 years or older; residence at the address for at least 1 year; and ability to walk without special equipment for at least 5 min. Persons who spoke languages other than English or Spanish were excluded.

Data Collection

For this study, the six STW towns located in Texas and Washington were examined, as the three towns located in the Northeast had small Latino populations. Four criteria were used to select STW towns: (1) sufficient population (> 10,000) to contain businesses and services needed for daily living; (2) presence of residential areas located within a 1-km walk to businesses and services that could allow walking for routine activities; (3) diversity of

socioeconomic levels to enable examination of walking across a range of income and housing environments (e.g., single family homes, large and small apartment complexes); and (4) availability of parcel-level data that could be entered into a geographic information system (GIS) to characterize the BE of the town. The Latino proportion of the population in each of the town ranged from 14.8 to 43.4 % (2010 Census Bureau data). Appendix 1 (supplementary material) is a table that summarizes characteristics of these towns and compares them to Houston and Seattle, the largest city in each study state.

We randomly sampled parcels within census blocks that together contained 80 % of the town population, as the most populated census blocks were more likely to be “walkable” than sparsely populated ones [32]. We created a list of addresses from these parcels, from which reverse telephone look-up yielded 15,276 land-line phone numbers; of these, 7121 were invalid (e.g., disconnected or business numbers), which left 8155 numbers for recruitment.

When multiple eligible persons were present in the selected household, one person was randomly selected. Potential respondents received an advance letter (English on one side and Spanish on the other) and a maximum of nine call-backs. Calls to households in which no one spoke English, referred the household contact to a survey administrator who spoke Spanish fluently. The survey required roughly 20 min for completion and was available in English and Spanish through certified translation. A total of 53 potential participants who lacked sufficient proficiency in English or Spanish to provide consent or answer the survey questions were excluded. A total of 1405 surveys (223–247 per town) were completed with a response rate of 17.2 % of potentially reachable numbers. A total of 121 of these (8.6 % of the surveys) were administered in Spanish. All respondents provided informed consent and received \$10 for participating. Procedures and materials were approved by the Institutional Review Boards at the University of Washington, Dartmouth College and Texas A&M University.

Measures

Survey—Content included questions from validated surveys from peer-reviewed research including the International Physical Activity Questionnaire [33], the Walkable and Bikable Communities Project [34] and the Neighborhood Environment Walkability Scale [35]. Other survey items sources included the National Health Interview Survey [36], the Behavioral Risk Factor Surveillance System [37], and the Rural Active Living Perceived Environment Support Scale [38]. The source of each of our survey questions is provided in Appendix 2 in supplementary material. Questions were refined through pilot testing. Specific measures included: demographics [age in years, sex, marital status, number of children in the home, type of housing (single family home vs. multi-unit dwelling)]; socioeconomic status (household income, educational attainment, employment status); ethnicity-language group categorized as English-speaking non-Latino (ENL—nearly all of whom were white), SSL (Latinos who completed the Spanish language version of the survey), and ESL (Latinos who completed it in English). For ease of reading, we have opted to use the term, “Latino”, throughout this report, although the survey question recording ethnicity asked each participant to specifically identify whether she or he was Latino or Hispanic; health status [height and weight converted to body mass index (BMI), difficulty in walking, overall health

perception]; lifestyle behaviors (screen time, frequency and duration of walking for utilitarian and recreational purposes; non-walking physical activity); and perceived BE characteristics (crosswalks and pedestrian light signals, sidewalks, traffic speed, shade, lighting, unattended dogs, other safety conditions, and destinations, such as coffee shops, trails/paths) (Appendix 3 in supplementary material).

The walking frequency and average duration questions were used to estimate minutes per week engaged in utilitarian and recreational walking. Those variables were calculated from responses to items querying how many times per month respondents walked from their homes to specific destinations such as grocery stores, banks, and restaurants (for utilitarian walking) or walked at recreational locations such as neighborhood streets, trails and malls (for recreation walking), and how many minutes these walking trips lasted. For analyses, walking for each measure was dichotomized as “high” (≥ 150 min/week) or “low” (<150 min/week, including none). The survey is included as Appendix 4 in supplementary material.

GIS Data (Objective BE Environment)—Spatial data were obtained for each town from national, regional and local governments; proprietary data providers; tourism and recreation agencies; aerial photos; and on-line maps. Detailed protocols and definitions were created to ensure valid and consistent measures across all towns. Domains included: generalized land use; residential density; employment density; destination land use; transportation infrastructure; economic environment; regional location; and natural environment (Appendix 3 in supplementary material). Spatial measures (e.g., street intersection density) were calculated for the area within 1 km from the home of each respondent. Buffers were created using the “sausage” buffer technique based on the street network around a respondent’s home [39]. All proximity measures were calculated as the street-network distance from a respondent’s home to a given location up to 2 km along the road network.

Analysis—We used two-level mixed-effect logistic regression models to identify predictors of each dependent variable—utilitarian walking and recreational walking. Multivariate modeling involved sequential steps: (1) construction of a “base model” incorporating survey-based socio-demographic and self-reported neighborhood measures that achieved a significance level of $p < 0.05$; (2) adding each GIS variable individually to the base model and testing for significance at the $p < 0.05$ level; (3) adding all significant ($p < 0.05$) GIS domain variables identified in step 2 to the base model; and (4) development of the “final model” that retained all significant variables identified in step 3. Within these steps, variables were added one at a time using a forward selection modeling strategy. To control for the fact that the order of items could influence which variables remained in the final model, after finishing the forward selection procedure, we forced all dropped variables back into the model and checked for their significance and whether their inclusion influenced the other variables or overall model fit. The effect of town-level clustering, which was significant in the base models and therefore accounted for by using the mixed-effect model, was not significant in the final models for either type of walking. We tested for significant ($p < 0.05$) statistical interaction between the ethnicity-language measure and each significant covariate in the final models. Statistical analyses were conducted using STATA version 12.0.

Results

Across the towns, 19 % of participants reported utilitarian walking for 150 min/week. This percentage varied significantly by ethnicity-language group with 28.1 % of SSLs, 20.0 % of ESLs and 17.8 % of ENLs ($p < 0.022$) reporting this level of utilitarian walking (Table 1). Across the towns, 24 % reported recreational walking for 150 min/week and this percentage also varied significantly by ethnicity-language group with 10.7 % of SSLs, 23.2 % of ESLs and 25.8 % of ENLs reporting this amount of recreational walking ($p < 0.001$).

Table 1 also shows that SSLs were younger and more likely to be married than the other groups. They reported less income and lower educational attainment, but were more likely to be employed than the other groups. A higher proportion of SSLs were overweight or obese. ESLs had intermediate values on several of the socio-demographic measures, such as age, educational attainment and income.

Table 2 presents findings from the multivariate logistic regression model predicting the odds of achieving high (150 min/week) versus low (<150 min/week) amounts of utilitarian walking. The difference between SSLs, ESLs and ENLs as a main effect was no longer statistically significant. Socio-demographic and lifestyle characteristics significantly associated with utilitarian walking included: income [odds ratio (OR) 0.82; 95 % confidence interval (CI) 0.77–0.93; BMI > 30] (OR 0.43; CI 0.27–0.71; ref. BMI < 25), number of days per week engaged in non-walking physical activity (OR 1.13; CI 1.05–1.22); and reporting any non-utilitarian recreational walking (OR 1.53; CI 1.38–1.69). Self-reported BE characteristics significantly associated with utilitarian walking included: presence of crosswalks and pedestrians signals (OR 1.57; CI 1.08–2.27); unattended dogs (OR 1.92; CI 1.30–2.84); presence of a coffee place (OR 1.58; CI 1.08–2.29); and availability of a park/natural recreational area in the neighborhood (OR 1.73; CI 1.11–2.69). Significant objective BE domains included presence of manufacturing land use (OR 1.67; CI 1.13–2.45) and presence of a post office (OR 1.64; CI 1.08–2.49).

For utilitarian walking, multivariate models testing for statistical interaction between the language-ethnicity measures and main effects revealed a statistically significant interaction between language-ethnicity and income level ($p = 0.004$) (Fig. 1). The decreasing probability of utilitarian walking as income increased was most pronounced among SSLs.

Table 3 presents findings from the recreational walking multivariate model. Compared to ENLs, a lower proportion of SSLs reported recreational walking of 150 min/week (OR 0.39; CI 0.20–0.74), but the difference between ENLs and ESLs was not statistically significant (OR 0.90; CI 0.52–1.68). Additional significant socio-demographic and lifestyle characteristics associated included: female sex (OR 1.48; CI 1.11–1.97); increasing age (OR 1.01 per year; CI 1.00–1.02); reporting any difficulty in walking (OR 0.31; CI 0.14–0.66); number of days per week engaged in non-walking physical activity (OR 1.08; CI 1.02–1.16); and reporting any non-recreational utilitarian walking (OR 1.69; CI 1.53–1.88). Self-reported environmental characteristics significantly associated with recreational walking included: having no one with whom to walk (OR 0.67; CI 0.47–0.96); having inadequate

sidewalks or road shoulders (OR 0.57; CI 0.40–0.82); and availability of a trail, park or track in the neighborhood (OR 2.02; CI 1.47–2.79). Transportation infrastructure was the only objective BE domain that was significantly associated with recreational walking, which was lowest in neighborhoods in which arterial streets comprised 20 % or more of the total street length (OR 0.36; CI 0.20–0.66). For recreational walking, interactions between language-ethnicity and other measures were not statistically significant.

Discussion

Utilitarian walking is the most frequent type of non-leisure time physical activity among US adults [40]. We observed that SSLs in our sample of micropolitan towns reported more utilitarian walking than the other groups, which is consistent with the literature [21, 22]. Yet only about one-quarter of SSLs, and only one-fifth of ESLs and ENLs reported utilitarian walking for 150 min/week. We further observed that as income levels increased, utilitarian walking among SSLs declined more steeply than it did for the other language-ethnicity groups. Among all language-ethnicity groups, only SSLs with annual income levels below \$25,000 reported regular utilitarian walking at a proportion (roughly one-third) that was similar to the estimated 37 % of the US population classified as regular walkers [41], as defined by the public health recommendation of engaging in at least 150 min/week of moderate-intensity physical activity, such as walking [42].

Travel for utilitarian purposes may shift from walking to driving as immigrants gain income and relocate to higher income neighborhoods further from town centers. In our sample, low-income Spanish-speaking Latinos were more likely than others to live in close proximity to employment centers, such as light manufacturing facilities, and locations in which the streets were highly connected. Higher rates of utilitarian walking among low-income SSLs may also reflect unaffordability of driving to work or the inability to obtain driver licenses among the subset of respondents who were undocumented immigrants, as most states, including Texas, do not issue licenses to undocumented persons [43].

Our findings for recreational walking among Latinos in micropolitan towns also were consistent with the literature examining leisure time physical activity among Latinos [4, 21, 27, 28]. We observed that fewer SSLs than ENLs engaged in recreational walking, even after controlling for other factors. Only about one-tenth of SSLs reported recreational walking despite this groups' relative proximity to trails, parks and schools. The low uptake of recreational walking among SSLs may reflect less time for walking or other underlying factors not measured in our study, such as physical demands at work [44]. Because recreational walking may be a more viable option than utilitarian walking in those locations within micropolitan towns that contain relatively few utilitarian destinations, research is needed to better understand why SSLs are relatively unlikely to participate in recreational walking.

We did not identify statistically significant interactions between language-ethnicity and the BE measures. This indicates that BE characteristics in micropolitan towns that influence walking may increase uptake in Latinos and non-Latinos alike. Importantly, we found that some environmental features, such as pedestrian-friendly street infrastructure (e.g.,

crosswalks, pedestrian signals) and destination locations (e.g., parks, post offices) are conducive to utilitarian walking and other features (e.g., sidewalks or road shoulders, trails or paths) are positively associated with recreational walking. This suggests that micropolitan towns could leverage their existing infrastructure to increase both types of walking among SSLs, ESLs and ENLs.

Limitations

This study is not able to differentiate Latinos and Hispanics, nor was it designed to be able to identify subgroups within this broad ethnic classification, such as Mexican–Americans who may be more likely to engage in leisure time physical activity than other US Latino/Hispanic subgroups [45]. The sampling frame is not representative of all US micropolitan towns, but included towns from two geographic regions with large numbers of Latinos, a range of socio-demographic characteristics, and sufficient populations to support walkable environments. While data were missing for income and BMI more often than for the other measures, the proportion of respondents with missing data on these measures did not vary materially across the three language-ethnicity groups. We were not able to determine the prevalence of land line telephones by town, but acknowledge that walking may vary systematically between those with or without land line telephones. Alternatives, such as door-to-door or cell-phone-based approaches, were prohibitively expensive. To minimize the possibility of overlooking unmeasured confounders, existing literature guided the collection of data on a range of a priori control variables, including seasonality by conducting the surveys during months when temperatures would be conducive to walking (early spring in Texas and later in the season in Washington). Future research would be needed to examine psychosocial factors, such as depression, that might influence walking, as these factors were not examined in the present study.

Respondents may have over-reported walking behaviors. In a New York City comparison of reported versus measured physical activity, over-reporting occurred for all socio-demographic groups, but was greater for Latinos, males and those with low incomes [46]. The extent to which such potential over-reporting of physical activity by Latinos in New York City can be applied to Latinos in micropolitan towns is not known.

Moreover, we acknowledge that the aggregate time engaged in all forms of walking and physical activity may have important health implications. Ham and Ainsworth analyzed national accelerometry data and reported that Mexican–American adults were more active than non-Hispanic Blacks and Whites [47]. Gay and Buchner further analyzed the same sample to demonstrate that the higher total activity level was due to occupational activity, particularly among those in lower income households [44]. However, our survey did not collect data on physical activity at work or overall physical activity. Instead, the survey questions were constructed to identify socio-demographic, lifestyle and BE factors associated with utilitarian walking and also those associated with recreational walking, positing that factors important for each type of walking might be different. Further research using accelerometry or other valid data collection methods is needed to characterize total activity among Latinos in micropolitan settings.

New Contribution to the Literature

We observed that English-speaking Latinos and non-Latinos had similar walking patterns, while the patterns for Spanish-speaking Latinos were different, which suggests that interventions to increase walking in micropolitan towns may require different approaches for those who speak Spanish compared to those who speak English. However, we also found that BE factors known to be related to utilitarian and recreational walking in urban environments, such as the presence of crosswalks and pedestrian signals and the availability of parks, trails and paths are significant as main effects in micropolitan towns regardless of language spoken or ethnicity. Increased attention to the micropolitan town BE could lead to increases in walking among Latinos, which could improve the health status of residents of micropolitan towns in the US.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

References

1. US Department of Agriculture. [Accessed on 20 Jan 2015] Editor's Pick 2014, #6: Rural Hispanic population growth mirrors national trends. <http://ers.usda.gov/data-products/chart-gallery/detail.aspx?chartId=50419&ref=collection&embed=False&widgetId=0>
2. Simpson ME, Serdula M, Galuska DA, et al. Walking trends among U.S. adults: the Behavioral Risk Factor Surveillance System, 1987–2000. *Am J Prev Med.* 2003; 25(2):95–100. [PubMed: 12880875]
3. Kruger J, Ham SA, Berrigan D, Ballard-Barbash R. Prevalence of transportation and leisure walking among U.S. adults. *Prev Med.* 2008; 47:329–34. [PubMed: 18445507]
4. Dai S, Carroll DD, Watson KB, Paul P, Carlson SA, Fulton JE. Participation in types of physical activities among US adults—National Health and Nutrition Examination Survey 1999–2006. *J Phys Act Health.* 2015; 12(Suppl 1):S128–40. [PubMed: 26083795]
5. Orsini N, Mantzoros CS, Wolk A. Association of physical activity with cancer incidence, mortality, and survival: a population-based study of men. *Br J Cancer.* 2008; 98(11):1864–9. [PubMed: 18506190]
6. Gregg EW, Gerzoff RB, Caspersen CJ, Williamson DF, Narayan KM. Relationship of walking to mortality among US adults with diabetes. *Arch Intern Med.* 2003; 163(12):1440–7. [PubMed: 12824093]
7. Lee IM, Paffenbarger RS Jr. Associations of light, moderate, and vigorous intensity physical activity with longevity. The Harvard Alumni Health Study. *Am J Epidemiol.* 2000; 151(3):293–9. [PubMed: 10670554]
8. Hu FB, Stampfer MJ, Colditz GA, et al. Physical activity and risk of stroke in women. *JAMA.* 2000; 283(22):2961–7. [PubMed: 10865274]
9. Manson JE, Greenland P, LaCroix AZ, et al. Walking compared with vigorous exercise for the prevention of cardiovascular events in women. *N Engl J Med.* 2002; 347(10):716–25. [PubMed: 12213942]
10. McTiernan A, Kooperberg C, White E, Wilcox S, Coates R, Adams-Campbell LL, Woods N, Ockene J. Recreational physical activity and the risk of breast cancer in postmenopausal women: the Women's Health Initiative Cohort Study. *JAMA.* 2003; 290(10):1331–6. [PubMed: 12966124]
11. Feskanich D, Willett W, Colditz G. Walking and leisure-time activity and risk of hip fracture in postmenopausal women. *JAMA.* 2002; 288(18):2300–6. [PubMed: 12425707]
12. Hillsdon M, Thorogood M, Antiss T, Morris J. Randomized controlled trials of physical activity promotion in a free-living populations: a review. *J Epidemiol Community Health.* 1995; 49:448–53. [PubMed: 7499985]

13. Doescher MP, Lee C, Berke EM, Adachi-Mejia AM, Lee CK, Stewart O, Patterson DG, Hurvitz PM, Carlos HA, Duncan GE, Moudon AV. The built environment and utilitarian walking in small U.S. towns. *Prev Med*. 2014; 69:80–6. [PubMed: 25199732]
14. Patterson PD, Moore CG, Probst JC, Shinogle JA. Obesity and physical inactivity in rural America. *J Rural Health*. 2004; 20(2):151–9. [PubMed: 15085629]
15. Centers for Disease Control and Prevention (CDC). Self-reported physical inactivity by degree of urbanization—United States, 1996. *Morb Mortal Wkly Rep*. 1998; 47(50):1097–100.
16. Saelens BE, Sallis JF, Frank LC. Environmental correlates of walking and cycling: findings from the transportation, urban design, and planning literature. *Ann Behav Med*. 2003; 25(2):80–91. [PubMed: 12704009]
17. Frumkin, H., Frank, L., Jackson, R. Urban sprawl and public health: designing, planning, and building for healthy communities. Washington: Island Press; 2004.
18. Haskell WL, Lee M, Pate R, Powell K. Physical activity and public health: Updated recommendation for adults from the American College of Sports Medicine and the American Heart Association. *Med Sci Sports Exerc*. 2007; 39:1423–34. [PubMed: 17762377]
19. Frank L. Economic determinants of urban form: resulting tradeoffs between active and sedentary forms of travel. *Am J Prev Med*. 2004; 27(3 Suppl):146–53. [PubMed: 15450625]
20. Seigel P, Brackbill P, Heath G. The epidemiology of walking for exercise: implications for promoting activity among sedentary groups. *Am J Pub Health*. 1995; 85:706–10. [PubMed: 7733433]
21. Berrigan D, Dodd K, Troiano RP, Reeve BB, Ballard-Barbash R. Physical activity and acculturation among adult Hispanics in the United States. *Res Q Exerc Sport*. 2006; 77(2):147–57. [PubMed: 16898271]
22. Martinez SM, Arredondo EM, Roesch S, Patrick K, Ayala GX, Elder JP. Walking for transportation among Latino adults in San Diego County: who meets physical activity guidelines? *J Phys Act Health*. 2011; 8(7):898–906. [PubMed: 21885880]
23. Owen N, Humpel N, Leslie E, Bauman A, Sallis JF. Understanding environmental influences on walking: review and research agenda. *Am J Prev Med*. 2004; 27(1):67–76. [PubMed: 15212778]
24. Sugiyama T, Leslie E, Giles-Corti B, Owen N. Physical activity for recreation or exercise on neighbourhood streets: associations with perceived environmental attributes. *Health and Place*. 2009; 15:1058–63. [PubMed: 19473867]
25. Abraído-Lanza AF, Chao MT, Flórez KR. Do healthy behaviors decline with greater acculturation? Implications for the Latino mortality paradox. *Soc Sci Med*. 2005; 61(6):1243–55. [PubMed: 15970234]
26. Centers for Disease Control and Prevention. Prevalence of regular physical activity among adults—United States, 2001 and 2005. *Morb Mortal Wkly Rep*. 2007; 56(46):1209–12.
27. Evenson KR, Sarmiento OL, Ayala GX. Acculturation and physical activity among North Carolina Latina immigrants. *Soc Sci Med*. 2004; 59(12):2509–22. [PubMed: 15474205]
28. Crespo CJ, Smit E, Carter-Pokras O, Andersen R. Acculturation and leisure-time physical inactivity in Mexican American adults: results from NHANES III, 1988–1994. *Am J Public Health*. 2001; 91(8):1254–7. [PubMed: 11499114]
29. Duncan M, Spence J, Mummery W. Perceived environment and physical activity: a meta-analysis of selected environmental characteristics. *Int J Behav Nutr Phys Act*. 2005; 2:11. [PubMed: 16138933]
30. Frost SS, Goins RT, Hunter RH, Hooker SP, Bryant LL, Kruger J, Pluto D. Effects of the built environment on physical activity of adults living in rural settings. *Am J Health Promot*. 2010; 24(4):267–83. [PubMed: 20232609]
31. U.S. Census Bureau. 2010 Census Special Reports, Patterns of Metropolitan and Micropolitan Population Change: 2000 to 2010, C2010SR-01. U.S. Government Printing Office; Washington, DC: 2012.
32. Lee C, Moudon AV, Courbois JYP. Built environment and behavior: spatial sampling using parcel data. *Ann Epidemiol*. 2006; 16(5):387–94. [PubMed: 16005246]

33. Craig CL, Marshall AL, Sjöström M, Bauman AE, Booth ML, Ainsworth BE, Pratt M, Ekelund U, Yngve A, Sallis JF, Oja P. International physical activity questionnaire: 12-country reliability and validity. *Med Sci Sports Exerc.* 2003; 35(8):1381–95. [PubMed: 12900694]
34. Moudon AV, Lee C, Cheadle AD, Garvin C, Rd DB, Schmid TL, Weathers RD. Attributes of environments supporting walking. *Am J Health Promot.* 2007; 21(5):448–59. [PubMed: 17515010]
35. Saelens BE, Sallis JF, Black JB, Chen D. Neighborhood-based differences in physical activity: an environment scale evaluation. *Am J Public Health.* 2003; 93:1552–8. [PubMed: 12948979]
36. [Accessed on 3 January 2016] National Health Interview Survey. <http://www.cdc.gov/nchs/nhis.htm>
37. The Behavioral Risk Factor Surveillance System (BRFSS). [Accessed on 3 January 2016] <http://www.cdc.gov/brfss/>
38. Umstadtd MR, Baller SL, Hennessy E, Hartley D, Economos CD, Hyatt RR, et al. Development of the rural active living perceived environmental support scale (RALPESS). *J Phys Act Health.* 2012; 9(5):724–30. [PubMed: 21946157]
39. Forsyth A, Van Riper D, Larson N, Wall M, Neumark-Sztainer D. Creating a replicable, valid cross-platform buffering technique: the sausage network buffer for measuring food and physical activity built environments. *Int J Health Geogr.* 2012; 11:14. [PubMed: 22554353]
40. American Community Survey. [Accessed on 3 January 2016] American Community Survey 1-Year Estimates, Table S0801. 2012. http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_12_1YR_S0801&prodType=table
41. Berrigan D, Carroll DD, Fulton JE, Galuska DA, Brown DR, Dorn JM, Paul P. Vital signs: walking among adults—United States, 2005 and 2010. *Morb Mortal Wkly Rep.* 2012; 61(31):595–601.
42. Department of Health and Human Services (US). 2008 physical activity guidelines for Americans: be active, healthy, and happy!. Rockville (MD): HHS; 2008. www.health.gov/paguidelines [Accessed on 16 April 2014]
43. National Conference of State Legislators. [Accessed on 24 February 2015] States Offering Driver's Licenses to Immigrants. Nov 5. 2014 <http://www.ncsl.org/research/immigration/states-offering-driver-s-licenses-to-immigrants.aspx>
44. Gay JL, Buchner DM. Ethnic disparities in objectively measured physical activity may be due to occupational activity. *Prev Med.* 2014; 63:58–62. [PubMed: 24589439]
45. Neighbors CJ, Marquez DX, Marcus BH. Leisure-time physical activity disparities among Hispanic subgroups in the United States. *Am J Public Health.* 2008; 98(8):1460–4. [PubMed: 18048795]
46. Lim S, Wyker B, Bartley K, Eisenhower D. Measurement error of self-reported physical activity levels in New York City: assessment and correction. *Am J Epidemiol.* 2015; 181(9):648–55. [PubMed: 25855646]
47. Ham SA, Ainsworth BE. Disparities in data on Healthy People 2010 physical activity objectives collected by accelerometry and self-report. *Am J Public Health.* 2010; 100:S263–8. [PubMed: 20147669]

Fig. 1. Predicted probability of high amount of utilitarian walking by language spoken-ethnicity and income category. Adjusted for sociodemographic, lifestyle, self-reported environmental and objective environmental factors listed in Table 1

Table 1

Unadjusted relationship between ethnicity-language group and selected characteristics among adults in six small nonmetropolitan towns, 2010–2011

Characteristic (no. with missing data)	Ethnicity-language			p value
	Spanish-speaking/Latino (121)	English-speaking/Latino (95)	English-speaking/non-Latino (1189)	
Walking				
Percent with 150 min/week utilitarian walking (missing 0)	28.1	20.0	17.8	0.022
Percent with 150 min/week recreational walking (missing 0)	10.7	23.2	25.8	0.001
Socio-demographics				
Mean age (missing 7)	41.8	50.0	59.7	<0.001
Percent female (missing 0)	67.8	66.3	60.0	0.136
Household income (missing 105) (%)				
\$25,000	54.4	30.0	19.6	
\$25,001–\$50,000	37.8	31.3	26.6	
\$50,001–\$100,000	7.8	23.8	40.3	
>\$100,000	0.0	15.0	13.5	<0.001
Educational attainment (missing 2) (%)				
<High school	62.2	13.8	3.4	
High school or GED	20.0	36.3	18.9	
Some college/associate deg.	15.6	35.0	32.4	
College graduate	2.2	8.8	25.5	
Graduate school	0.0	6.3	19.8	<0.001
BMI (missing 78)				
<18	0.0	2.2	1.1	
18–25	21.7	26.1	34.5	
>25–30	48.9	47.8	38.6	
>30	29.4	23.9	25.7	0.042
Percent married (missing 8)	79.3	62.8	65.9	0.008
Percent employed status (missing 0)	68.6	43.2	55.3	0.001
Percent in single-family home (missing 0)	68.6	80.0	90.5	<0.001

Table 2

Adjusted relationship between selected characteristics and “high” (≥ 150 min/week) versus “low” (<150 min/week) amount of utilitarian walking among adults in six small nonmetropolitan towns, 2010–2011

Characteristic	Odds ratio	95 % confidence interval
<i>Socio-demographic and lifestyle measures</i>		
Language-ethnicity		
English-speaking, Non-Latino	Reference	
English-speaking, Latino	1.05	(0.53, 2.08)
Spanish-speaking, Latino	1.40	(0.73, 2.69)
Income (9 ordinal categories)	0.85	(0.77, 0.93) ***
Body mass index (BMI)		
<25.0	Reference	
25–30	0.95	(0.65, 1.40)
>30 or higher	0.43	(0.27, 0.71) **
Days/week with 30 or more minutes of physical activity (excluding walking)	1.13	(1.05, 1.22) **
Weekly hours of recreational walking	1.53	(1.38, 1.69) ***
<i>Reported built environment measures in neighborhood</i>		
Presence of crosswalk or pedestrian signal to help walkers cross busy intersections	1.57	(1.08, 2.27) *
Any unattended dogs	1.92	(1.30, 2.84) **
Any coffee place(s)	1.58	(1.08, 2.29) *
Any park or natural recreation area	1.73	(1.11, 1.69)
<i>Objective built environment measures in neighborhood</i>		
Any generalized manufacturing land use	1.67	(1.13, 2.45) *
Any post office in neighborhood	1.64	(1.08, 2.49) *

* $P < 0.05$;

** $P < 0.01$;

*** $P < 0.001$

Table 3

Adjusted relationship between selected characteristics and “high” (≥ 150 min/week) versus “low” (<150 min/week) amount of recreational walking among adults in six small nonmetropolitan towns, 2010–2011

Characteristic	Odds ratio	95 % confidence interval
<i>Socio-demographic and lifestyle measures</i>		
Language-ethnicity		
English-speaking Non-Latino	Reference	
English-speaking Latino	0.90	0.52, 1.58
Spanish-speaking Latino	0.39	0.20, 0.74 **
Female sex	1.48	1.11, 1.97 **
Age (continuous)	1.01	1.00, 1.02 *
Any difficulty walking	0.31	0.14, 0.66 **
Days per week with 30 or more minutes of physical activity (excluding walking)	1.08	1.02, 1.15 *
Weekly hours of utilitarian walking	1.69	1.53, 1.88 ***
<i>Reported built environment measures in neighborhood</i>		
Having no one with whom to walk	0.67	0.47, 0.96 *
Inadequate sidewalks or shoulders on roads a problem	0.57	0.40, 0.82 **
Any trail, park or path	2.02	1.47, 2.79 **
<i>Objective built environment measures in neighborhood</i>		
Percentage of streets comprised of inter-neighborhood arterials (%)		
0	Reference	
>0–10	0.57	0.40, 0.81 **
>10–20	0.52	0.36, 0.75 ***
>20	0.36	0.20, 0.66 **

* $P < 0.05$;

** $P < 0.01$;

*** $P < 0.001$