Walkability and Body Mass Index

Density, Design, and New Diversity Measures

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Background: Rising rates of overweight and obesity in the U.S. have increased interest in community designs that encourage healthy weight. This study relates neighborhood walkability—density, pedestrian-friendly design, and two novel measures of land-use diversity—to residents' excess weight.

Methods: Walkable-environment measures include two established predictors—higher density and pedestrian-friendly design (intersections within 0.25 mile of each address)—and two new census-based, land-use diversity measures: the proportion of residents walking to work and the median age of housing. In 2006, weight, height, age, and address data from 453,927 Salt Lake County driver licenses for persons aged 25–64 years were linked to 2000 Census and GIS street-network information that was analyzed in 2007–2008. Linear regressions of BMI and logistic regressions of overweight and obesity include controls for individual-level age and neighborhood-level racial/ethnic composition, median age of residents, and median family income.

Results: Increasing levels of walkability decrease the risks of excess weight. Approximately doubling the proportion of neighborhood residents walking to work decreases an individual's risk of obesity by almost 10%. Adding a decade to the average age of neighborhood housing decreases women's risk of obesity by about 8% and men's by 13%. Population density is unrelated to weight in four of six models, and inconsistently related to weight measures in two models. Pedestrian-friendly street networks are unrelated to BMI but related to lower risks of overweight and obesity in three of four models.

Conclusions: Walkability indicators, particularly the two land-use diversity measures, are important predictors of body weight. Driver licenses should be considered as a source of data for community studies of BMI, as they provide extensive coverage at low cost.
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Introduction

The association between walkable environmental designs and physical activity has received substantial attention,[1,2] but fewer studies have related walkable environments to BMI (measured as weight [kg]/height[m^2]); overweight; or obesity.[3] Interest in community designs that support health is growing, given that 70.8% of men and 61.8% of women were overweight or obese in 2003–2004, with a BMI ≥25.[4] Overweight and obesity are risk factors for a range of health problems,[5] including hypertension, diabetes, and several types of cancers.[6] Increasing levels of obesity over time[7] have encouraged a search for modifiable environmental features that could prevent weight gain and its associated health problems.[8]

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Some studies have connected weight to various neighborhood walkability measures, typically assessed through census or GIS databases. Neighborhoods that are designed to support active uses, such as walking, may encourage greater physical activity and thereby help prevent overweight and obesity. Walkable neighborhoods are those designed to include the 3Ds: population **density**, pedestrian-friendly **design**, and a **diversity** of destinations.[9]

Recent research has demonstrated how these 3Ds are related to BMI, overweight, and obesity. Greater population density has been associated with fewer weight problems.[10–15] Density, although not always associated with lower BMI,[14,16,17] provides a critical mass of individuals that may encourage the development of walking destinations and may discourage exclusive reliance on cars.

Large-area measures of pedestrian-friendly neighborhood designs typically assess the density of intersections

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per area or the presence/quality of sidewalks. More pedestrian-friendly street connectivity[18,19] or accessible and high-quality sidewalks[18–20] have been associated with fewer weight problems. Pedestrian-friendly designs, although not always associated with lower BMI,[10,17] are expected to enhance walkability by making walking trips relatively short, direct, and convenient, and by slowing car traffic via multiple stopping points.

Diversity in large-scale studies is often operationalized as a broad mix of land uses, such as residential, commercial, and office. Areas with a broad mix of land uses are associated with lower weight.[10,15,17,21,22] However, diversity does not predict a lower prevalence of weight problems in studies that included nonwalkable destinations, such as factories, in the land-use–mix scores.[20,23] Thus, broadly defined land-use diversity measures that include only walkable destinations are promising indicators associated with healthy weight.

Walkability research is challenged by the limited availability of both land-use diversity and BMI data. Land-use diversity measures are often unavailable or cumbersome,[24] requiring extensive GIS data processing of parcel level (i.e., individual lot) data. This paper overcomes these limitations in two ways. First, diversity is measured with two readily available census measures—the proportion of residents who walk to work and the median age of neighborhood housing. Although only 2.9% of workers in the U.S. report that they usually walk to work,[25] and only 2% do so in this Salt Lake County sample,[26] the measure should indicate which neighborhoods have a sufficient mix of residential and employment land uses to make walking feasible and attractive. Canadian research has reported that walking to work is associated with a greater number and wider variety of destinations in the neighborhood as well as a range of other supports for walking, such as accessible pathways.[27]

Older neighborhoods should also support walkability, as they were more often designed with pedestrians in mind, while newer neighborhoods are often designed to facilitate car travel. Southworth[28] contends that post-1950s neighborhood developments separated residential from commercial land uses and designed roads to achieve the "efficient, free, and rapid flow of traffic" at the expense of pedestrian comfort. Older streets often have better and tree-shaded sidewalks; more attractive residential, work, and commercial destinations; and narrower streets that encourage drivers to slow down and make street crossing easier for pedestrians. Indeed, residents of older neighborhoods report more walking,[29] although the connection to weight is not known.

These two new proxy variables of diversity were explored and an extensive database containing BMI measures obtained from driver license records was utilized in this study. We hypothesized that neighborhoods with favorable walkability profiles (greater density, greater street connectivity, greater proportions of residents who walk to work, and older neighborhood housing) have residents with lower BMI and lower risks of overweight and obesity.

Methods

This study assessed how adult BMI varies for residents of 564 block groups (one block group was dropped due to small sample size) from the 2000 Census for Salt Lake County, Utah, which had a total population of 898,387.[26] In 2000, Salt Lake County included 295,141 occupied housing units and 467,256 employed people aged ≥16 years. Transportation on the average journey to work, which was the same for white and Hispanic employees, took about 23 minutes.[26] Census-block groups are the level of analysis for many area-level variables, because block groups are relatively small areas (i.e., typically about 1500 residents, ranging from 300 to 3000)[30] that approximate neighborhoods. Adults aged 25–64 years are included, in order to exclude young adults who have not established their post-adolescence residence and elderly adults who, once aged ≥65 years, are increasingly less likely to hold a driver license and for whom BMI has more complex associations with health.[31,32] Given research indicating that predictors of weight outcomes differ by gender,[17,18,20] gender-specific models are estimated.

Weight Measures

Measures of BMI, healthy weight, overweight, and obesity, as well as spatial location, are derived from driver licenses. The Utah Population Database (UPDB), a health-related research database, contains driver license data from the Driver License Division of the Utah Department of Public Safety. All personal information from the Driver License Division was removed before the data were provided to the investigators on this research project; this was done to protect the confidentiality of the individuals in these records. This project has been approved by the University of Utah IRB and the Utah Resource for Genetic and Epidemiologic Research.

To ensure confidentiality, the UPDB staff retains identifying address information, links driver license data (height, weight, gender, and age) to census-block groups via Universal Transverse Mercator (UTM) coordinates, and then provides researchers a data set without individual addresses. Height and weight information is converted to BMI as well as categorical measures of overweight ($25 \leq BMI < 30$) and obesity ($BMI \geq 30$) in relation to healthy weight ($18.5 \leq BMI < 25$). The total number of county records available from driver licenses equals 465,696; underweight individuals ($BMI < 18.5$) were excluded, thereby reducing the sample size to 453,927.

Data in the present study have the advantage of extensive coverage, but also have the potential limitations of self-reported weight and a time lag between the physical environment and weight measures. These weight data likely share the limitations of self-reported weight in other studies. Specifically, individuals tend to underestimate their weight,[33,34] with larger underestimates on self-reported weight for those aged ≥60 years.[35] Nevertheless, self-reported weights, such as those in the CDC Behavioral Risk Factor Surveillance System (BRFSS), have proved valuable for monitoring obesity trends in the U.S.[36] The driver license data providing BMI measures that are contained in the UPDB represent each individual's most recent renewal. Renewals are required every 10 years or after address change, name change, or loss of license; thus the data represent the most recent height and weight data from 1995 through 2005. Given self-reported weight underestimation, the time lag between census and driver license data, and the fact that adults aged 25–64 years typically gain weight over time,[37] the estimates in this study are likely underestimates of current weight. It is unlikely that self-reported weight is geographically biased.

Sociodemographic Measures

Driver license data provide individual-level age and gender. Additional block-group census variables include neighborhood racial/ethnic composition (the proportion of the block group that is Hispanic, African American, Hawaiian/Pacific Islander, and Asian); median family income; and the median age of individuals in the block group.

Walkability Measures

Measures of density and walking to work are assessed at the block-group level. Information on the median age of houses in the neighborhood is not available at the block-group level, so it is assessed at the census-tract level. For the 2000 Census, the median age of houses is based on an item that is bottom-coded for homes built in 1939 or earlier (i.e., all homes built before 1939 are in a single category). Based on Salt Lake County data from the 2000 Census, block groups average 1587 residents (range 89–5935) and census tracts average 4655 residents (range 112–8900). Pedestrian-friendly design is measured as street connectivity or the number of intersections within 0.25 mile of the resident's home. Street connectivity is derived from street centerline data from the Salt Lake County assessor's office (assessor.slco.org/cfml/GIS.cfm). The University of Utah Digitally Integrated Geographic Information Technologies (DIGIT) Lab calculated intersections within buffers that extend 0.25 mile from a point that approximates the location of the home (i.e., a 10-meter perpendicular offset from the center line of the road in front of the resident's home).

Statistical Methods

Regressions are estimated to assess how the 3Ds (density, design, and diversity), along with additional covariates, relate to BMI and the separate odds of being overweight and obese in relation to having a healthy BMI. Gender-specific linear regressions for BMI and logistic regressions for the likelihood of being overweight and obese are estimated. All estimation uses SAS software version 9.1.3, using PROC SURVEYREG and PROC SURVEYLOGISTIC. Analyses adjust for statistical dependence among observations induced by the clustering of cases within block groups.[38,39] Data were prepared in 2006 and analyzed in 2007–2008. The significance level adopted is $p \leq 0.05$.

Results

Table 1 displays descriptive statistics for the gender-specific samples. Simple correlations among the four walkability measures suggest some association, but no indication of problematic multicollinearity. The weakest relationship between predictors involves street connectivity (intersection density) and the proportion of residents who walk to work ($r = -0.005$ for men and $r = 0.017$ for women), and the strongest relationship is between population density and neighborhood housing age ($r = 0.414$ for men and $r = 0.436$ for women).

Table 1. Descriptive statistics, walkability, and BMI

	Men Aged 25–64		Women Aged 25–64	
Sample sizes				
Healthy weight (18.5–24.9 BMI)	92,368		130,033	
Overweight (25–29.9 BMI)	105,953		51,168	
Obese (≥30 BMI)	42,220		32,185	
Total analyzed	242,541		213,386	
	Mean	**SD**	**Mean**	**SD**
Weight status				
BMI, individual	26.57	4.38	25.01	5.21
Sociodemographic measures				
Median family income (in $1000s), BG	56.50	19.62	57.98	19.40
Proportion African American, BG	0.01	0.01	0.01	0.01
Proportion Hawaiian Pacific Islander, BG	0.01	0.02	0.01	0.02
Proportion Hispanic, BG	0.12	0.12	0.11	0.11
Proportion Asian, BG	0.03	0.03	0.02	0.03
Median age, BG	29.39	5.31	29.49	5.39
Age, individual	41.07	10.95	41.69	11.07
Walkability measures				
Density: population per square mile, BG	5445	3114	5341	3020
Design: intersections in 0.25 miles individual	37.87	15.71	37.80	15.65
Diversity: proportion workers walk to work, BG	0.02	0.03	0.02	0.03
Diversity: housing age (in years), tract	25.52	15.43	24.86	15.25

BG, block group

Table 2. Linear regression analyses of BMI for men and women aged 25–64

	Men: BMI (n=240,541)			Women: BMI (n=213,386)		
	B	SE	p	B	SE	p
Sociodemographic measures						
Intercept	25.455	0.136	0.000	23.869	0.248	0.000
Median family income (Δ $1000), BG	−0.012	0.001	0.000	−0.036	0.002	0.000
Proportion African American, BG	−2.411	1.603	0.133	−1.399	2.524	0.580
Proportion Hawaiian and Pacific Islander, BG	1.972	0.748	0.009	7.140	1.303	0.000
Proportion Hispanic, BG	0.975	0.219	0.000	3.819	0.396	0.000
Proportion Asian, BG	−2.303	0.622	0.000	−0.748	1.054	0.478
Median age, BG	−0.028	0.004	0.000	−0.035	0.007	0.000
Age, individual	0.08	0.001	0.000	0.101	0.001	0.000
Walkability measures						
Density: population per sq. mile, BG	−0.001	0.001	0.336	0.000	0.000	0.663
Design: intersections in 0.25 miles, individual	−0.002	0.001	0.092	0.000	0.002	0.981
Diversity: proportion workers walk to work, BG	−5.376	0.582	0.000	−6.829	1.116	0.000
Diversity: housing age, tract	−0.019	0.002	0.000	−0.015	0.003	0.000
R^2	0.051			0.08		
Model F statistic	691.25		0.000	626.38		0.000

BG, block group

Sociodemographic Measures

As shown in Table 2 (BMI as outcome); Table 3; and Table 4 (overweight and obesity as outcomes), many of the sociodemographic variables are significant in the expected directions. For both men and women, lower-income neighborhoods and neighborhoods with higher proportions of Hawaiian/Pacific Islanders and Hispanic residents are generally associated with higher individual BMI and higher odds of being overweight or obese. Neighborhoods with higher proportions of Asians are associated with significantly healthier BMI levels and lower risks of overweight and obesity for men; a greater proportion of Asian residents is associated only with lower risks of overweight for women. In addition, at the individual level, older individuals have higher BMIs and are more likely to be overweight or obese.

Some findings are unexpected. Increasing the proportion of African Americans in a neighborhood reduced the odds of obesity. The age of residents in the neighborhood is included to rule out the possibility that the age of housing simply reflected the age structure of the residents of the neighborhood. Results show, unexpectedly, that a younger average age of neighborhood residents (at the block-group level) is associated with a higher BMI and a higher risk of overweight or obesity for both men and women, controlling for all other predictors in the model.

Walkability Measures

The overall pattern of results shows stronger relationships for the new walkability measures than for the established measures of neighborhood population density and pedestrian-friendly interconnected street

Table 3. Men's risk of overweight and obesity, relative to Healthy Weight, aged 25–64 (logistic regression)

	Men Overweight vs healthy weight (n=198,321)		Men Obese vs healthy weight (n=134,588)	
	OR (95% CI)	p	OR (95% CI)	p
Sociodemographic measures				
Median family income (Δ $1000), BG	0.999 (0.998, 0.999)	0.000	0.991 (0.991, 0.992)	0.000
Proportion African-American (Δ 0.1), BG	1.000 (0.934, 1.071)	0.994	0.832 (0.757, 0.914)	0.000
Proportion Hawaiian/ Pacific Islander (Δ 0.1), BG	1.006 (0.966, 1.048)	0.760	1.125 (1.068, 1.184)	0.000
Proportion Hispanic (Δ 0.1), BG	1.032 (1.022, 1.042)	0.000	1.053 (1.039, 1.067)	0.000
Proportion Asian (Δ 0.1), BG	0.893 (0.866, 0.920)	0.000	0.867 (0.833, 0.903)	0.000
Median age, BG	0.991 (0.989, 0.993)	0.000	0.980 (0.977, 0.983)	0.000
Age, individual	1.035 (1.034, 1.036)	0.000	1.048 (1.047, 1.049)	0.000
Walkability measures				
Density: pop. per sq. mile (Δ 1000), BG	0.997 (0.993, 1.000)	0.051	0.997 (0.992, 1.001)	0.168
Design: intersections in 0.25 miles (Δ 10), individual	0.991 (0.985, 0.997)	0.004	0.988 (0.980, 0.996)	0.004
Diversity: proportion walk to work (Δ 0.025), BG	0.958 (0.950, 0.965)	0.000	0.911 (0.900, 0.922)	0.000
Diversity: housing age (Δ 10), tract	0.922 (0.915, 0.929)	0.000	0.879 (0.870, 0.889)	0.000
Pseudo R^2	0.039		0.069	

BG, block group; pop., population; sq., square

Table 4. Women's risk of overweight and obesity, relative to Healthy Weight, aged 25–64 (logistic regression)

	Women Overweight vs healthy weight (n=181,201)		Women Obese vs healthy weight (n=162,218)	
	OR (95% CI)	p	OR (95% CI)	p
Sociodemographic measures				
Median family income (Δ $1,000), BG	0.989 (0.988, 0.989)	0.000	0.979 (0.978, 0.980)	0.000
Proportion African-American (Δ 0.1), BG	0.953 (0.874, 1.039)	0.275	0.904 (0.817, 1.001)	0.053
Proportion Hawaiian/Pacific Islander (Δ 0.1), BG	1.254 (1.195, 1.317)	0.000	1.366 (1.294, 1.442)	0.000
Proportion Hispanic (Δ 10%), BG	1.122 (1.108, 1.136)	0.000	1.152 (1.136, 1.169)	0.000
Proportion Asian (Δ 10%), BG	0.954 (0.920, 0.990)	0.012	0.969 (0.928, 1.012)	0.151
Median age, BG	0.989 (0.986, 0.991)	0.000	0.980 (0.976, 0.983)	0.000
Age, individual	1.036 (1.035, 1.037)	0.000	1.049 (1.047, 1.050)	0.000
Walkability measures				
Density: pop. per sq. mile (Δ 1000), BG	1.002 (0.997, 1.006)	0.486	1.006 (1.001, 1.011)	0.026
Design: intersections in 0.25 miles (Δ 10), individual	0.993 (0.985, 1.000)	0.042	0.997 (0.989, 1.006)	0.524
Diversity: proportion walk to work (Δ 0.025), BG	0.936 (0.926, 0.946)	0.000	0.903 (0.891, 0.915)	0.000
Diversity: housing age (Δ 10), tract	0.933 (0.924, 0.942)	0.000	0.925 (0.915, 0.936)	0.000
Pseudo R^2	0.043		0.069	

BG, block group

design. Higher density yields the expected relationship of reducing the risk for overweight among men (p=0.051); other tests for the effects of density tests are insignificant, except for a counterintuitive relationship between higher neighborhood population density and greater obesity risk for women. A subsequent analysis of weight across quartiles of walkability factors, including density, reveals the expected negative relationship (p=0.039) between the top quartile of density (compared to the lowest quartile) and women's obesity odds. The unexpected overall positive relationship is attributable to the large effect of the third quartile (50th–74th percentile, p=0.002).

For pedestrian-friendly designs, the more numerous the intersections around the home within 0.25 mile, the lower the risk of overweight and obesity for men and the lower the risk of overweight for women. The pedestrian-friendly design measure of intersection density is unrelated to BMI for both men and women.

Compared to the established walkability indicators of density and street connectivity, the two new land-use diversity measures—the proportion walking to work and housing age—relate most consistently to all three outcomes. An increase in the proportion of residents in the neighborhood who walk to work is associated with a lower BMI and a lower risk of overweight and obesity for both men and women. Similarly, as the age of the housing in the neighborhood increases, BMI declines, as do the odds of overweight and obesity.

Table 5 shows how each quartile increase in a walkability factor is associated with changes in BMI based on linear regressions, using the lowest quartile as the reference group. For men, being in the top 25% of all four walkability measures—defined as highest levels of density, pedestrian-friendly street design, neighborhood age, and walking to work—is associated with approximately a 1.28-point reduction in BMI. For women, the reduction is 0.95 BMI points. For a hypothetical 6-foot, 200-pound (27.1 BMI) man, the least-walkable neighborhood would be associated with approximately 10 more pounds than the most-walkable neighborhood (190 pounds and 25.8 BMI). For a woman of the sample's average height (approximately 5 feet, 5 inches) and weight (149 pounds; 24.9 BMI), the most-walkable neighborhood would be associated with nearly 6 fewer pounds (BMI 23.9) than the least-walkable neighborhood. In addition to these "walkability reductions" in weight, a test for trend demonstrated that the effects of the two new walkability measures

Table 5. Effects on BMI across quartiles of walkability factors

		BMI	
	Percentiles	Male	Female
Density	25–49	−0.0508	−0.0770
Population per square mile,	50–74	0.0589	0.0891
BG	75–99	−0.1546	−0.1422
Design	25–49	0.0182	0.0946
Intersections in 0.25 miles,	50–74	0.0257	0.0965
individual	75–99	−0.0580	0.0090
Diversity	25–49	−0.0273	−0.1160
Proportion walk to work,	50–74	−0.1102	−0.1081
BG	75–99	−0.3592	−0.3084
Diversity	25–49	−0.1528	0.0651
Neighborhood age,	50–74	−0.2102	0.1526
tract	75–99	−0.7111	−0.5055
Total of top quartile effects	Sum of 75–99	−1.2830	−0.9471

BG, block group

increase monotonically across the quadrants (for walking to work and neighborhood age, all $p<0.001$).[40]

Conclusion

For adults living in Salt Lake County, the effects of neighborhood walkability on weight are found to be largely driven by neighborhood age and the walk-to-work measure. In addition, stronger relationships are observed for the odds of being obese than for the odds of being overweight, suggesting that obese individuals are more sensitive to the effects of neighborhood walkability. This is one of the first studies to use driver license data for place of residence and weight to explore these issues. When comparing the most- and least-walkable neighborhood quartiles, the average weight difference found here of 10 pounds for a 6-foot-tall man is comparable to the average weight loss at 1 year by participants of clinical trials of diet for weight loss.[41]

The present study confirms past research findings that pedestrian-friendly design (i.e., street connectivity) is often associated with lower BMI. However, density is most frequently insignificant, with greater density related only to lower odds of overweight for men but, unexpectedly, to greater risks of obesity for women; in both cases, the effect size is small. In addition, an increase in the proportion of African Americans in the neighborhood is related to lower odds of obesity, unlike the suggestion of national statistics.[4] In this sample, African Americans constitute fewer than 1% of the cases and have somewhat higher incomes than their national counterparts,[42] so results may not generalize to neighborhoods with a greater African-American presence or more typical income levels. In this sample, neighborhoods with more Asian residents have women with lower risks of overweight and men with lower BMI and lower risks of overweight and obesity. Studies of individuals have shown that Asians generally have lower BMI than other population groups.[43] Finally, neighborhoods with older median ages among residents have lower BMI and lower risks of overweight and obesity, controlling for other variables; however, increasing individual age is associated with higher BMI and higher risks of excess weight.

The strongest and most consistent predictors among the study's walkability indicators—walking to work and housing age—merit both consideration and additional investigation as variables relevant to BMI, overweight, and obesity. These variables are expected to reflect multiple aspects of walkability rather than measuring only the diversity of land uses. For example, Berrigan and Troiano[29] note that older housing is associated with neighborhoods that mix business with residential land uses and that have more sidewalks as well as more interconnected streets. The current analyses demonstrate a robust effect for housing age on weight outcomes, even after controlling for interconnected street forms.

The percentage of workers in a neighborhood who walk to work is typically low, averaging less than 3% in the U.S and less than 2% in Salt Lake County. Thus, walking to work by that small fraction of individuals is unlikely to be directly responsible for the lower BMI of the entire neighborhood. Rather, higher proportions of individuals who walk to work likely indicate a neighborhood with other walkability features that may encourage residents to walk more generally. The low percentage of individuals who walk to work may limit the utility of this predictor in small samples, but the strength of the associations found in the present study suggest that it is an important predictor that could prove fruitful in other studies. However, a recent study[44] found that controlling for a wide range of sociodemographic and built environment covariates reduced the relationship between older neighborhoods and walking. As with other macro-level measures of walkability, future research is needed on housing age and walking to work in order to elucidate the ways in which they relate to BMI.

Our conclusions are tempered by several study limitations. First, self-reported BMI was used, which can underestimate true BMI. Second, few individual measures were available, thus excluding other potential controls (e.g., number of years in the neighborhood, individual racial/ethnic status, commute distance). Third, the sample is based on one (albeit large) county. Finally, because the analysis is cross-sectional, it is possible that those who value healthy weight may move to walkable neighborhoods. One study of longitudinal data on adolescent BMI demonstrates that cross-sectional relationships similar to those found in the present study did not translate into longitudinal ones.[45] Accordingly, future work should assess potential selection effects using longitudinal data on adults.

Future work is also needed to develop an understanding of how indicators of walkability are interrelated, at macro and micro levels, and how they are patterned with other environmental and social features of neighborhoods. Research in this area is fairly new, and researchers are still considering a range of possible measures. Studies should examine how macro measures of walkability, such as land-use diversity, housing age, density, and street connectivity, are related to each other and to walking and weight outcomes. In addition, pedestrian-friendly design is a rich concept, likely to relate to a number of macro measures of walkability as well as micro-level measures such as physical indicators of crime safety or pleasing urban design as well as resident perceptions of the area.[46] Finally, when examining weight as an outcome variable, it would be useful to incorporate measures of the neighborhood food environment as another aspect of environmental supports for healthy behaviors.[47]

The results of the present study demonstrate the utility of two new walkability indicators and the value of using large driver license databases to investigate weight outcomes. Both advances offer the advantages of providing extensive local coverage at low cost. As research on the built environment and health outcomes grows, the next logical step is to translate findings into policy and design recommendations. By 2030, about half the buildings in the U.S. will have been built since 2000,[48] creating opportunities for evidence-based health data on community design to inform new building or redevelopment standards. Health-impact assessments, whereby health research informs policy and design, often require evidence that is both extensive and relevant to local areas where land use and building regulations take place.[49] Driver license BMI data and census walkability measures have the appeal of wide availability and local relevance.

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