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Community Audit of Social, Civil, and Activity Domains in Diverse Environments (CASCADDE)

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Abstract

There are currently no direct observation environmental audit tools that measure diverse aspects of the obesity-related environment efficiently and reliably in a variety of geographical settings. The goal was to develop a new instrument to reliably characterize the overall properties and features of rural, suburban, and urban settings along multiple dimensions. The Community Audit of Social, Civil, and Activity Domains in Diverse Environments (CASCADDE) is an iPad-based instrument that incorporates global positioning system coordinates and photography and is comprised of 214

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Author contributions:

Nau and Glass designed the instrument and oversaw data collection. Knapp and Glass prepared the manuscript and conducted data analysis. Brandau developed study materials, pilot tested the instrument, collected data and had manuscript input. Hirsch and Bailey-Davis provided technical input on the instrument and contributed to the manuscript. Schwartz oversaw field staff and contributed to the interpretation of data and writing of the manuscript.

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items yielding 7 summary indices. A comprehensive spatial sampling strategy, training manual, and supporting data analysis code were also developed. Random geospatial sampling using GIS was used to capture features of the community as a whole. A single auditor collected 510 observation points in 30 communities (2013–2015). This analysis was done in 2015–2016. Correlation coefficients were used to compare items and indices to each other and to standard measures. Multilevel unconditional means models were used to calculate intraclass correlation coefficients (ICC) to determine if there was significant variation between communities. Results suggest that CASCADDE measures aspects of communities not previously captured by secondary data sources. Additionally, 7 summary indices capture meaningful differences between communities based on 15 observations per community. Community audit tools such as CASCADDE complement secondary data sources and have the potential to offer new insights about the mechanisms through which communities affect obesity and other health outcomes.

INTRODUCTION

In recognition of the social, physical, and food-related features of the environment linked to risk of obesity, the term “obesogenic environment” was coined in the late 1990s.^{1, 2} While progress has been made in the measurement of obesogenic environments,^{3–8} many studies have used either secondary data sources such as census or commercial establishment registries,^{9–15} and/or resident-reported surveys of environmental features.^{8, 16, 17} Secondary data are often inaccurate (especially a single source)^{18, 19} and do not usually include information on important social variables such as incivilities or social cohesion.²⁰ Surveys are costly, time-consuming,²¹ and vulnerable to same-source bias.²² Direct observation environmental audit tools have emerged as complements to surveys and secondary data. This includes systematic social observation (SSO), a method that places a trained observer on-site to gather detailed information about social and environmental conditions not captured in other methodologies.^{23–26}

The ‘gold standard’ community audit tool for systematic social observation was developed by the Project on Human Development in Chicago Neighborhoods (PHDCN).^{9, 25} This tool is resource intensive, impractical outside urban areas, and does not collect information relevant to the food or physical activity environments. A 2010 review of direct neighborhood observation tools found that most were used solely in urban contexts, with little attention to rural areas.⁹ Instruments varied in domains measured, methodological detail provided, time per observation, method of selection of observation sites, and number of observations collected per community.⁹ Additionally, many tools were paper-based, which requires duplicate data entry and may lead to data entry errors.

Other tools are designed for urban settings, are domain specific, or do not include systematic social observation: the SSO adapted from the PHDCN by the LA-FANS project,²⁷ the Minnesota Irvine Inventory,²⁸ Neighborhood Inventory for Environmental Typology (NifETy),²⁹ the Systematic Pedestrian and Cycling Environmental Scan (SPACES) tool,³⁰ and Brownson’s survey approach for assessing activity friendliness.³¹

Several community audit tools have been developed for rural areas. Evenson developed a community assessment for rural and urban communities as part of the Pregnancy Infection

and Nutrition (PIN3) study.³² The Rural Active Living Assessment (RALA)³³ is designed for evaluation of walkability in rural settings, but does not assess social variables.

In summary, no existing audit tool includes both systematic social observation for social dimensions as well as food and physical activity features of obesity-related environments. Some tools are too resource intensive for practical use. Most are designed for urban areas; those designed for rural areas are not appropriate for higher-density communities. Other tools lack adequate manuals and/or spatial sampling strategies. There is need for a community audit tool that addresses these shortcomings and efficiently characterizes key obesity-related features of the environment across multiple domains, in a variety of geographic settings. This paper will describe the development, implementation and testing of the Community Audit of Social, Civil, and Activity Domains in Diverse Environments (CASCADDE).

METHODS

CASCADDE was developed for an ongoing study of community determinants of obesity in children in the Geisinger Health System in 37 counties in Pennsylvania, characterized by a diversity of community types, from urban census tracts to boroughs with gridded street networks and rural townships, small towns, and suburban developments.³⁴ The present analysis was undertaken in 2015 and 2016. Communities were operationalized using non-overlapping census boundaries as *a) census tracts* (in metropolitan statistical areas), and minor civil divisions, further distinguishing *b) townships* (large areas of lower density) and *c) boroughs* (smaller areas with intermediate population density). CASCADDE was developed to measure obesity-related aspects of the environment not captured in secondary data for a substudy of 434 children from 30 diverse communities from whom data were gathered during in-home interviews.

CASCADDE was developed by adapting components of previous instruments including the Duplin County Vanguard Center Systematic Social Observations Study,²⁴ the PIN3 project,³² the PHDCN,³⁵ the RALA,³³ and the Analytic Audit Tool (AAT).^{25, 31–33} Items were added during the pilot phase to capture the social and built environment more comprehensively than previous surveys. Items were selected to fill gaps in available secondary data sources, and to ensure adequate capture of information in seven key domains: physical activity promoting features, physical environment features that promote safety, aesthetic quality, social cohesion for physical activity, barriers to physical activity, commercial and civic intensity, and incivilities.

Several key essential design features guided the design. This instrument needed to be administered by a trained observer in no more than 15 minutes per observation, and accommodate observation of rural communities using a radial observation area centered on a fixed point. The tool was implemented on an iPad to speed data collection, reduce data entry, and to combine geotagging, photography, and map-based apps (software available from authors on request). Questions were selected to maximize features that could be directly observed and decision rules for observing and recording were created. Contingencies for

safety hazards were built, and a range of variables pertaining to environmental conditions such as visual obstacles, time and date, and weather conditions were collected.

Spatial sampling strategy

The goal was an instrument that could reliably characterize the properties of diverse communities along multiple dimensions. This required a geospatial sampling strategy to capture meaningful between-community variation. Master Address File/Topologically Integrated Geographic Encoding and Referencing (MAF/TIGER) system line files were used for 30 communities in the study area. Secondary or local roads that were at least 50% within the target community, at least 20 feet long, and had a road name in the database were eligible for selection.

The average “block” in our GIS was 0.2 miles. Road segments 0.2 miles or shorter were assumed to be part of an urban street grid and were classified as “block faces.” Roads greater than 0.2 miles were assumed to be non-gridded road networks most common in rural areas and were further split into 0.25-mile segments, so that random selection of road segments would not over-represent the more numerous block faces in densely populated areas. Twenty points were randomly selected in each community, along with 5 extra sites to accommodate the need to avoid dangerous or inaccessible sites.

In-field procedures

To facilitate reproducibility, an instruction and training manual was developed and refined as CASCADDE was piloted (Appendix 2). The manual covers field preparation, safety, selection of observation points, and instructions for observation. For items that involve the rater’s assessment of conditions, descriptions of each category were included in the iPad tool and example photographs were included in the manual. The iPad-based manual can be searched and accessed while entering data. The auditor was provided with a GeoPDF map of sampled points for each community and instructed to visit each point by car. Using a GPS-equipped iPad and the Avenza Systems GeoPDF Map App, the auditor could see his/her GPS location as a dot on the custom field survey map and easily navigate to the sampled observation point.

On both block faces and street segments, the auditor stood in front of the house closest to the mid-point of the sampled road, visually surveying a radius of 0.1 miles using a laser range finder to verify the radius and recording obstacles.

Data collection accommodations

If no house was visible from the observation point, the auditor was instructed to use a randomly generated “direction-list” to face either north or west and to use a randomly generated ‘turn-list’ to find the first house that could serve as an observation anchor. If the observer moved within 0.2 miles of the next sampled segment or if the observer crossed the community boundary, an abbreviated audit was completed.

If the observation point was too dangerous to stop and exit the car due to lack of safe parking (the modal reason), heavy traffic, construction, or other reason, the auditor noted the

type of danger and conducted a drive-by audit (a complete audit conducted from inside the car). If the observation point was entirely inaccessible, or there was no house on the street segment, the auditor used the next available extra observation point.

Number of sampled points

A preliminary analysis was conducted to determine the optimal number of observation points per community necessary to produce stable means. Based on previous studies, 20 observation points per community was chosen initially.²⁷ Twenty observations points were gathered for three urban census tracts, one rural township, and one suburban borough. Key indices were calculated by community using all observations, then for randomly chosen samples of 10, 12, 15, and 17 points; means and variances were recalculated and compared. Findings showed that 15 points provided stable estimates with little additional precision gained with more points.

Validity and Reliability

Construct validity was assessed by examining Spearman correlations among the key variables as well a standard Walk Score and census variables (population density and a previously validated measure of community socioeconomic deprivation³⁶). Additionally, correlations were examined between summary metrics and three measures of community obesity: mean BMI z-score (BMIz), percent of children with BMIz at or above the 85th percentile, and percent of children with BMIz at or above the 95th percentile. Each measure represents the community average of the average of one randomly selected BMIz per year for children ages 10–15 between 2008 to 2012 (collection of these BMI data has been previously described³⁶). To evaluate the consistency of multiple observations within communities, a multilevel (unconditional means) model was estimated to decompose the total variance into between- and within-community sources. This allowed computation of intraclass correlation coefficients (ICC) for the key variables that address whether there is significant variability at the community level. If ICC was below 5%, this indicated that communities do not differ in meaningful ways, and that most variability was within communities.²⁵ Additionally, models were adjusted by place type (census tract, township, borough) to evaluate whether between-community variation persisted after accounting for community type.

RESULTS

Data were collected in 30 communities by a single auditor over a 27-month period from 2013 to 2015. All observations were collected between 5:30am and 4:30pm during daylight hours. Data were gathered in every month except February; weather conditions were noted. A total of 510 observations were made with between 14 and 21 observations per community (Table 1). Communities differed by area, population density, Walk Score®, and socioeconomic deprivation.³⁶ Each observation took 10 minutes on average to complete (SD=4.6). The auditor was unable to safely conduct a complete assessment in 230 (45%) sampled points, primarily due to lack of safe parking options (98%). In 16% of cases, the auditor was concerned about the possibility of negative responses to the observation process from bystanders. In some cases he was approached and asked not to observe or was

monitored by vigilant neighbors. While this may introduce some selection bias, systematic observation in natural settings will sometimes arouse suspicion. The problem was most acute in townships where inability to stop safely occurred in 71% of sampled observation points. However, in 98% of cases where the auditor could not stop, a 'drive-by' audit was completed using similar procedures from inside the car.

CASCADDE yields seven indices based on *a priori* combinations of indicators and six stand-alone items from 214 total items (Table 2 and Appendix 1). Indices were created by summing across indicators after insuring equal weighting in response options, with higher values indicating greater levels of the variable (Appendix 3). Significant differences were observed across place type for all indices except social cohesion for physical activity. Census tracts were highest in commercial and civic activity and incivilities and lowest in aesthetic quality. Boroughs scored highest in physical activity promoting features, environmental features promoting safety, and lowest on barriers to physical activity. Townships were highest in aesthetic quality and barriers to physical activity.

Table 3 shows Pearson correlation coefficients between CASCADDE indices, auditor ratings, existing constructs, and community obesity outcomes. As expected, physical activity promoting features was correlated with Walk Score ($r=0.39$; $p<0.001$), environmental features promoting safety ($r=0.711$; $p<0.001$), and the auditor rating of walkability ($r=0.574$; $p<0.001$), and inversely correlated with barriers to physical activity ($r=-0.484$; $p<0.001$). Social cohesion for physical activity was strongly associated with the auditor rating of favorableness of the area for children's play ($r=0.801$; $p<0.001$) and recreation for teens and adults ($r=0.705$; $p<0.001$). Barriers to physical activity was inversely correlated with environmental safety features ($r=-0.672$; $p<0.001$), Walk Score ($r=-0.491$; $p<0.001$) and auditor rating of walkability ($r=-0.450$; $p<0.001$). Commercial and civic activity was positively correlated with Walk Score ($r=0.566$; $p<0.001$). Incivilities was negatively associated with aesthetic quality ($r=-0.489$; $p<0.001$), and weakly negatively associated with the social cohesion ($r=-0.181$; $p<0.001$) and commercial and civic activity indices ($r=0.172$; $p=0.001$). Population density and community socioeconomic deprivation were associated with all indices in the expected direction except social cohesion.

The bottom panel of Table 3 presents Pearson correlations between key indices and obesity. Community mean BMIz, percent of children with BMIz at or above the 85th percentile, and above the 95th percentile were all negatively correlated with aesthetic quality and positively correlated with commercial/civic activities and incivilities. Community obesity was not significantly correlated with physical activity promoting features, barriers to physical activity, environmental features promoting safety, and social cohesion for physical activity.

The ICCs for seven key indices ranged from 13% (social cohesion for physical activity) to 37% (environmental features promoting safety) (Table 4). With the exception of social cohesion for physical activity, all ICCs were 20% or higher suggesting that, on average, these 30 communities varied significantly. After adjustment for place type (Table 4, right panel) reductions in ICCs were observed for physical activity promoting features, barriers to physical activity, environmental features promoting safety and commercial and civic activity index, but not for aesthetic quality, social cohesion for physical activity or incivilities.

DISCUSSION

CASCADDE is a new spatial sampling strategy and community audit tool that captured meaningful place-level variation in obesity-related community features. Key innovations included: a) applicable to urban, suburban, and rural communities; b) measures multiple domains; c) iPad-based data collection to increase efficiency and reduce data errors; d) integration with web-based applications, camera, GPS, data transfer and security; e) brief observation time; f) a replicable geospatial sampling procedure; and g) a detailed training manual. CASCADDE utilizes tablet and web-based technologies that have become increasingly inexpensive in recent years, making this tool efficient and cost-effective. CASCADDE joins other community audit tools that have differing features and that can be combined and customized.

Correlation of indices and items in CASCADDE and existing secondary data such as Walk Score, population density, and socioeconomic deprivation suggested that CASCADDE measures novel aspects of communities that complement secondary data. For example, social cohesion for physical activity, aesthetic quality, and incivilities each had moderate or low correlation with population density, Walk Score, and community socioeconomic deprivation. These indices captured distinct aspects of communities and may provide new information about obesity-related features of communities.

Several CASCADDE indices, particularly aesthetic quality, commercial and civic activity, and incivilities, were correlated with adolescent obesity metrics. Seven indices were created based on *a priori* theory about domains of the obesity-related environment and were not created to maximize prediction of BMI in these communities. This work was guided by several lines of previous theory including community disorder^{37, 38}, collective efficacy^{39–41}, as well as our work showing that psychosocial hazards act as risk regulators of health behavior^{42, 43}. Thus, correlations between BMI and our indices further support the construct validity of CASCADDE. Two indices with the highest correlations with BMI, aesthetic quality and incivilities, are challenging to capture using traditional secondary data sources that do not include on-site observation⁴⁴. This suggests the utility of the community audit to gather novel metrics. Our measure of aesthetic quality assesses upkeep, maintenance and appearance of the area; this is inconsistent with the definition found in the environmental design field. With only 30 communities, correlations with average BMI are a relatively crude and underpowered method of testing associations. A more comprehensive test of associations between measured domains and obesity risk remains to be done.

Weather conditions or season and time of year may have affected CASCADDE observations. This will be evaluated in later analyses. A single auditor carried out the observations described here; additional work is needed to evaluate the inter- and intra-rater reliability of this tool and to evaluate further the training protocols. Community audit tools like this one require careful attention to auditor training that is needed to maintain the reliability of the tool. Access to programming resources, GIS and researcher input are also suggested.

Communities varied by place type, community socioeconomic deprivation, population, and geographic size. However, all observations took place in Pennsylvania. Given wide

variability in place types measured, this tool may transport well to other communities. We believe that researchers will find CASCADDE to be a useful measurement tool to adapt to a variety of geographic settings and health outcomes. As with all such instruments, the appropriateness and relevance of a given variable or index must be determined by the researcher.

CASCADDE introduces a spatial sampling strategy that can be used in both urban and rural areas, and could be adapted for use with other tools. A fixed point of observation, instead of a walking or moving audit, was used to maximize the precision and reliability of CASCADDE observations in both rural and urban settings. However, that the auditor was not able to stop safely to conduct an observation on foot in 45% of sampled locations. This was greater than expected and was especially important in rural townships, which are generally low density and often along busy roads with limited parking and stopping options. In most instances, the auditor was able to complete most of the instrument by conducting a drive-by audit or was able to move to one of the available extra sampling points with no loss of precision or sample size. This procedure is practical and easily implemented.

Community audit tools such as CASCADDE complement and expand upon secondary data sources describing communities and have the potential to offer new insights about the mechanisms through which communities affect health. The CASCADDE tool measures multiple obesity- and health-related domains using efficient methods of sampling and data collection.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1

Characteristics of sampled communities and CASCADDE observations

Characteristic	All	Census tracts	Boroughs	Townships
Communities, N (%)	30	9 (30%)	11 (37%)	10 (33%)
Population density, population/sq. mi, 2010 (SD)	3530 (3528)	7010 (2886)	3595 (2796)	334 (197)
Area, square miles, Mean (SD)	8.7 (11)	0.8 (0.7)	3.6 (3)	21.0 (11)
Walk Score, Mean (SD)	40.4 (25.5)	53.7 (12.7)	53.4 (22.6)	15.9 (16.3)
Community socioeconomic deprivation (CSD), 2010, Mean (SD)	1.3 (3.8)	3.4 (3.1)	2.6 (2.5)	-2.0 (3.4)
Observation Points, N	510	185	155	170
Setting:				
Rural	70 (14%)	0 (0%)	7 (4%)	63 (37%)
Urban	187 (37%)	55 (35%)	82 (44%)	50 (29%)
Other	253 (50%)	100 (65%)	96 (52%)	57 (34%)
Time per observation, minutes, Mean (SD)	10.0 (4.5)	11.1 (5.9)	9.9 (4.0)	9.1 (3.3)
Observations made during bad weather, N (%) ^a	80 (16%)	20 (13%)	19 (10%)	41 (24%)
Observation conducted from inside car, N (%)	230 (45%)	53 (29%)	56 (36%)	121 (71%)
Observation point chosen to replace inaccessible segment	55 (11%)	12 (7%)	15 (8%)	28 (16%)

^aDefined as rain, snow or fog during observation as recorded by the auditor.

Table 2

CASCADDE indices and stand-alone items by community type

Index	Num items	Sample of included ^a items	All Observations Mean (SD) [MIN-MAX] Median (n = 510)	Observations in Census Tracts Mean (SD) (n=185)	Observations in Boroughs Mean (SD) (n=155)	Observations in Townships Mean (SD) (n=170)	P-value ^b
CASCADDE Indices^c							
Physical Activity Promoting Features	27	Recreational facilities Sidewalks Bikelanes Flat terrain Playgrounds	4.7 (3.4) [-3.5 – 20.0] 4.0	5.3 (3.1)	5.9 (3.6)	2.9 (2.5)	<0.001
Aesthetic Quality	25	Street Conditions Litter Landscaping Abandoned homes	2.6 (5.1) [-10.0 – 13.0] 2.0	1.1 (4.7)	3.0 (5.5)	3.1 (5.0)	0.0004
Social Cohesion to Promote Physical Activity	27	Evidence of social gatherings outside Porches/terraces Children's play equipment outside	4.8 (3.4) [-5.0 – 18.0] 5.0	4.6 (3.5)	5.0 (3.6)	4.5 (3.4)	0.4314
Barriers to Physical Activity	15	Public lighting Terrain Traffic Construction	1.6 (1.6) [0.0 – 8.0] 1.0	1.2 (1.0)	1.0 (1.2)	2.5 (1.8)	<0.001
Environmental Features that Promote Safety	27	Number of lanes Traffic lights Speed bumps Sidewalk conditions	7.8 (3.6) [-3.5 – 15.0] 8.5	8.8 (2.8)	9.0 (3.4)	5.5 (3.4)	<0.001
Commercial and Civic Intensity	33	Parking Commercial establishments Public facilities Public transportation	2.9 (2.2) [0.0 – 17.5] 3.0	3.8 (1.7)	3.5 (2.2)	1.5 (1.8)	<0.001
Index of Incivilities	27	Litter Public Housing Mobile homes Grates/bars on windows Vacant lots Abandoned buildings	0.9 (1.1) [0.0 – 5.5] 0.50	1.2 (1.3)	1.0 (1.2)	0.5 (0.8)	<0.001
Auditor Ratings^d							
Walkability Rating	1	How strongly do you agree or disagree with the following statement? "This segment is safely walkable."	2.8 (0.5) [1.0 – 4.0] 3.0	2.9 (0.5)	2.9 (0.4)	2.7 (0.6)***	<0.001

Index	Num items	Sample of included ^a items	All Observations Mean (SD) [MIN-MAX] Median (n = 510)	Observations in Census Tracts Mean (SD) (n=185)	Observations in Boroughs Mean (SD) (n=155)	Observations in Townships Mean (SD) (n=170)	P-value ^b
Aesthetics Rating	1	How strongly do you agree or disagree with the following statement? "This segment is aesthetically pleasing."	2.4 (0.6) [1.0 – 4.0] 2.0	2.2 (0.5)	2.4 (0.6)	2.4 (0.6)	<0.001
Destination Rating	1	How strongly do you agree or disagree with the following statement? "There are several places that I would want to walk to."	2.1 (0.3) [1.0 – 3.0] 2.0	2.1 (0.3)	2.1 (0.4)	2.0 (0.2)	<0.001
Daily tasks rating	1	How strongly do you agree or disagree: "People could accomplish some of their daily activities by walking in this segment"	2.1 (0.3) [1.0 – 3.0] 2.0	2.1 (0.3)	2.1 (0.4)	2.0 (0.2)	<0.001
Play rating	1	Rate how favorable this location is for children to play outside?	2.7 (0.7) [1.0 – 4.0] 3.0	2.6 (0.6)	2.7 (0.7)	2.7 (0.7)	<0.001
Recreation rating	1	Rate how favorable this location is for outdoor recreation for teenagers and adults (such as playing soccer, Frisbee etc.)	2.2 (0.6) [1.0 – 4.0] 3.0	2.0 (0.6)	2.2 (0.6)	2.2 (0.7)	<0.001

^aThe full CASCADDE instrument is available as an online supplement.

^bFor continuous response items, an ANOVA test for equality of means of observations in Census Tracts, Boroughs, and Townships was used. For the items on a four-point Likert scale, a chi-squared test of independence was used. Boldface indicates statistical significance ($p < 0.05$).

^cAll indices are continuous response scales.

^dThe auditor was instructed to rate the area within .1 miles for the following items on a Likert scale ranging from 1 ("Strongly disagree") to 4 ("Strongly agree").

Table 3
Evaluation of construct validity using correlations among key indices and related constructs

	Physical activity promoting features	Aesthetic quality	Social cohesion for physical activity	Barriers to physical activity	Environmental features to promote safety	Commercial and civic intensity	Incivilities
CASCADDE INDICES							
Physical activity promoting features	1.000						
Aesthetic quality	0.410 **	1.000					
Social cohesion for physical activity	0.592 **	0.552 **	1.000				
Barriers to physical activity	-0.484 **	-0.093 *	-0.300 **	1.000			
Environmental features to promote safety	0.711 **	0.350 **	0.462 **	-0.672 **	1.000		
Commercial and civic activities	0.377 **	-0.137 **	-0.069	-0.167 **	0.300 **	1.000	
Incivilities	0.058	-0.489 **	-0.181 **	-0.041	0.012	0.172 **	1.000
CASCADDE AUDITOR RATINGS							
Walkability Rating	0.574 **	0.326 **	0.415 **	-0.450 **	0.705 **	0.009	-0.079
Aesthetics Rating	0.338 **	0.905 **	0.475 **	-0.064	0.274 **	-0.170 **	-0.403 **
Destination Rating	0.499 **	0.165 **	0.176 **	-0.085	0.189 **	0.414 **	0.029
Daily tasks rating	0.379 **	0.132 **	0.053	-0.089 *	0.157 **	0.520 **	0.032
Play rating	0.516 **	0.518 **	0.801 **	-0.216 **	0.359 **	-0.265 **	-0.211 **
Recreation rating	0.539 **	0.449 **	0.705 **	-0.129 **	0.205 **	-0.207 **	-0.227 **
RELATED CONSTRUCTS							
Population density	0.281 **	-0.158 **	-0.003	-0.347 **	0.356 **	0.323 **	0.252 **
Walk Score	0.394 **	-0.175 **	-0.070	-0.491 **	0.453 **	0.566 **	0.245 **
CSD	0.283 **	-0.168 **	0.000	-0.297 **	0.304 **	0.361 **	0.210 **
COMMUNITY OBESITY							
Mean BMIz	0.016	-0.608 **	-0.344	-0.146	-0.004	0.407 *	0.628 **
% 85 th BMI Percentile	0.0580	-0.565 **	-0.279	-0.191	-0.034	0.406 *	0.586 **
% 95 th BMI Percentile	0.163	-0.554 **	-0.322	-0.241	0.137	0.514 **	0.710 **

(p) 0.01
indicates statistical significance
**
*
(p) 0.01
indicates statistical significance
**
*

Table 4

Intraclass correlation coefficients (ICC) to evaluate variance within vs. between communities with and without place type

	MODEL 0: Unconditional means				Model 0.5: Adjusting for place type				ICC Change:
	<i>N Used</i>	<i>Estimate</i>	<i>Std. Error.</i>	<i>P^a</i>	<i>Estimate</i>	<i>Std. Error.</i>	<i>P^a</i>	<i>Is place type significant?</i>	
Physical activity promoting features	BETWEEN	510	2.69	0.851	0.0008	0.89	0.390	0.011	ALL 3 ARE SIG
	WITHIN		8.83	0.570	<0.001	8.83	0.570	<0.001	
	ICC		23.4%			9.2%			-14.2%
General aesthetic quality	BETWEEN	510	6.66	2.058	0.0006	6.45	2.082	0.001	PT NOT SIG
	WITHIN		20.16	1.301	<0.001	20.17	1.302	<0.001	
	ICC		24.8%			24.2%			-0.6%
Social cohesion for physical activity	BETWEEN	510	1.541	0.581	0.004	1.66	0.635	0.0045	PT NOT SIG
	WITHIN		10.715	0.692	<0.001	10.71	0.692	<0.001	
	ICC		12.6%			13.4%			0.8%
Barriers to physical activity	BETWEEN	510	0.584	0.183	0.0007	0.11	0.061	0.0339	BOTH ARE SIG
	WITHIN		1.861	0.120	<0.001	1.86	0.120	<0.001	
	ICC		23.9%			5.7%			-18.2%
Environmental features that promote safety	BETWEEN	510	4.86	1.412	0.0003	2.19	0.733	0.0014	BOTHER ARE SIG
	WITHIN		8.41	0.543	<0.001	8.40	0.542	<0.001	
	ICC		36.6%			20.7%			-15.9%
Commercial & Civic intensity	BETWEEN	510	1.28	0.392	0.0006	0.24	0.124	0.0251	BOTH ARE SIG
	WITHIN		3.61	0.233	<0.001	3.61	0.233	<0.001	
	ICC		26.1%			6.3%			-19.8%
Index of inclivilities	BETWEEN	510	0.279	0.089	0.0008	0.21	0.074	0.0021	BOTH ARE SIG
	WITHIN		1.008	0.065	<0.001	1.01	0.065	<0.001	
	ICC								

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MODEL 0: Unconditional means					Model 0.5: Adjusting for place type				
<i>N Used</i>	<i>Estimate</i>	<i>Std. Error.</i>	<i>p^a</i>	<i>Estimate</i>	<i>Std. Error.</i>	<i>p^a</i>	<i>Is place type significant?</i>	<i>ICC Change:</i>	
	21.6%			17.4%				-4.2%	
ICC									

Boldface indicates statistical significance (p<0.05)