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Research Informing Policies & Practices
for Healthy Youth

How Zoning and Land Use Laws Influence Community Walkability and Healthy Food Access

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Acknowledgments

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Study Purpose

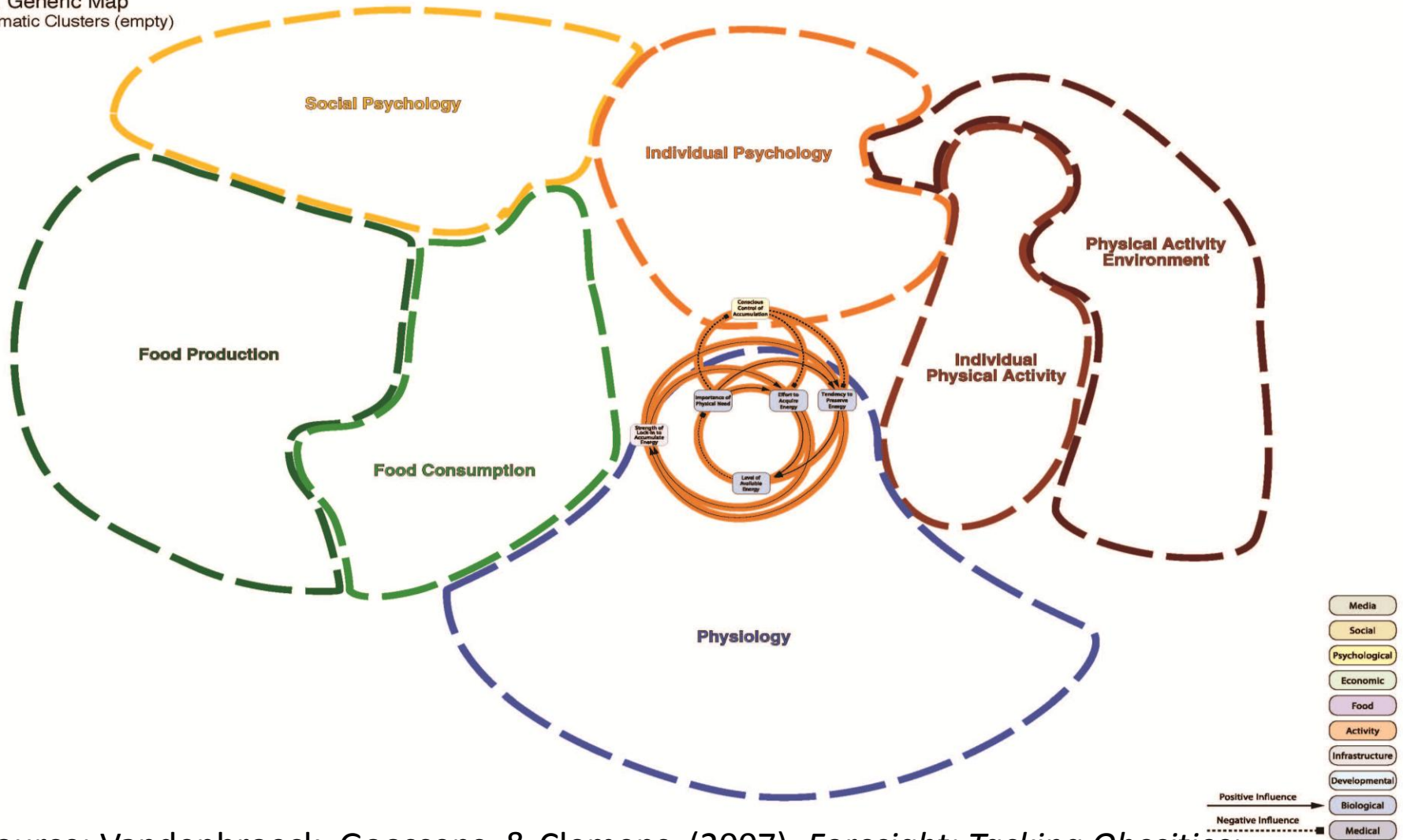
- To examine the association between zoning and land use laws and:
 - Community walkability
 - Healthy food outlet density
- Ultimate goal is to examine the influence of zoning and land use laws on the environment and adolescent behaviors and obesity

Background and Significance

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Obesity Systems Map Framework

Full Generic Map
Thematic Clusters (empty)



Source: Vandebroek, Goossens, & Clemens. (2007). *Foresight: Tackling Obesities: Future Choices – Obesity System Atlas*.

Available: <http://www.bis.gov.uk/assets/bispartners/foresight/docs/obesity/11.pdf>

Zoning and Land Use Laws as Facilitators of Physical Activity and Healthy Food Access

- Zoning and land use laws have been identified as **potential policy strategies** to influence the built environment.
- **Street-scale and community-scale urban design.**
- Zoning can be used to **encourage or prohibit food stores** in poorer neighborhoods; **permit farmers' markets** in zones that otherwise may be considered “food deserts;” require dedicated urban land for **community gardens**; and **allow or disallow mobile vending**; or to **restrict the density of food outlets** such as fast food restaurants.



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Study Methods

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Data Sources—Zoning Data

- Zoning, land use, and related laws and policies were collected from 154 BTG-COMP catchment areas
 - Laws analyzed for required provisions
 - Markers of walkability, bikeability, complete streets
 - Zoning/permitted uses for “healthy” food outlets
 - Laws coded by trained coders

Data Sources—Street Segment Data

- Street segment: Two, facing sides of a street block
- Segments proportionately divided into 3 sampling strata based on street type:
 1. Streets within 2-mile buffer of catchment school
 2. Residential streets
 3. Arterial streets
- Random sample of street segments for each catchment
 - Based on proportion of population aged 0-17 associated with nearest census block to the street segment and overall proportion of street segments in each strata
- Street segment data weighted to account for probability of selection

Data Sources—Street Segment Audit Tool

BTG-COMP • STREET SEGMENT OBSERVATION FORM • 2010				SITE ID: _____			
SEGMENT ID :				COMPLETION CODE			
ADDRESS RANGE:				COMPLETED — CODE MODE <input type="radio"/>			
				PARTIALLY COMPLETED — CODE MODE AND DISP <input type="radio"/>			
				NOT STARTED — CODE MODE AND DISP <input type="radio"/>			
				NOT ELIGIBLE — CODE DISPOSITION <input type="radio"/>			
				NOT ELIGIBLE — No such segment/address <input type="radio"/>			
DATE _____, 2010				MODE OF COMPLETION — CODES 01, 02 ONLY			
START TIME _____ AM _____ PM				Completed by Walking <input type="radio"/>			
END TIME _____ AM _____ PM				Completed by Driving <input type="radio"/>			
STAFF 1 _____ STAFF 2 _____				Completed by Walking and Driving <input type="radio"/>			
STREET ADVERTISING				DISPOSITION CODE — CODES 02, 03 ONLY			
Segment has relevant ads and Section E is filled out <input type="radio"/>				Temporarily not accessible <input type="radio"/>			
Segment has no ads at all — NO SECTION E <input type="radio"/>				Not safe <input type="radio"/>			
Segment has other, irrelevant ads — NO SECTION E <input type="radio"/>				Asked to leave <input type="radio"/>			
NOTES:				Ran out of time <input type="radio"/>			
				Other (SPECIFY): <input type="radio"/>			
A. LAND USES							
A1. Scan both sides of the street for presence of:		NO	YES, ONE SIDE	YES, BOTH SIDES	A3. Natural Features		NO YES
a. Housing — Single family	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	a. Large body of water - lake, river, ocean	<input type="radio"/>	<input type="radio"/>
b. Housing — Multifamily	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	b. Small body of water - pond, stream	<input type="radio"/>	<input type="radio"/>
c. Housing — Mobile homes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	c. Mountain or canyon	<input type="radio"/>	<input type="radio"/>
d. Public/Civic	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	A4. Physical Activity Venues	NO YES	
e. Office/Professional	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	a. Indoor commercial PA facility	<input type="radio"/>	<input type="radio"/>
f. Institutional	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	b. Park with exercise/sport facilities/equip	<input type="radio"/>	<input type="radio"/>
g. Service	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	c. Park with sign, no equipment	<input type="radio"/>	<input type="radio"/>
h. Retail	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	d. Stand-alone playing court	<input type="radio"/>	<input type="radio"/>
i. Industrial/Manufacturing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	e. Stand-alone playing field	<input type="radio"/>	<input type="radio"/>
j. Recreation/Leisure/Fitness	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	f. School /school yard (K through University)	<input type="radio"/>	<input type="radio"/>
k. Public Parking	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	g. Golf Course	<input type="radio"/>	<input type="radio"/>
l. Public Space	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	h. Beach	<input type="radio"/>	<input type="radio"/>
m. Agricultural	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	i. Outdoor pool	<input type="radio"/>	<input type="radio"/>
n. Undeveloped	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	j. Off-road trail	<input type="radio"/>	<input type="radio"/>
o. Vacant Building or Lot	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	A5. Do any buildings have...?	NO YES	
p. Other, describe below	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	a. Bars on windows	<input type="radio"/>	<input type="radio"/>
A2. Parking facilities		NO	YES		b. Broken/boarded up windows	<input type="radio"/>	<input type="radio"/>
a. On-street angled or parallel	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		c. Graffiti/tagging	<input type="radio"/>	<input type="radio"/>
b. Small lot (30 or fewer spaces)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		d. Yard debris	<input type="radio"/>	<input type="radio"/>
c. Medium to large lot/garage/structure	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		DESCRIBE A1p:		

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B. TRAFFIC AND PEDESTRIANS									
B1. Street Type				B6. Intersection and crossing					
Through-street <input type="radio"/>				a. Traffic light <input type="radio"/>					
Dead end or cul-de-sac with pedestrian thru-way <input type="radio"/>				b. Pedestrian signal at traffic light <input type="radio"/>					
Dead end or cul-de-sac without thru-way <input type="radio"/>				c. Stop sign <input type="radio"/>					
B2. Number of lanes of vehicular traffic _____				d. Marked crosswalk <input type="radio"/>					
B3. Traffic features				NO	YES	C. SIGNAGE			
a. Traffic circle/roundabout/rotary <input type="radio"/>				<input type="radio"/>	<input type="radio"/>	C1. Signage			
b. Speed hump/table <input type="radio"/>				<input type="radio"/>	<input type="radio"/>	a. Bicycle crossing	<input type="radio"/>		
c. Median with traffic island <input type="radio"/>				<input type="radio"/>	<input type="radio"/>	b. Other bicycle-related signage	<input type="radio"/>		
d. Curb extension/bulb-out <input type="radio"/>				<input type="radio"/>	<input type="radio"/>	c. Pedestrian crossing	<input type="radio"/>		
B4. Designated bike lanes				NO	ONE SIDE	BOTH SIDES	d. Children at play/special population <input type="radio"/>		
a. Designated by lines or reflectors* <input type="radio"/>				<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	C2. Special speed limit (00 IF NONE) _____		
b. Designated by physical barrier* <input type="radio"/>				<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	D. AMENITIES AND LITTER		
B5. Is/Are there any...?				NO	ONE SIDE	BOTH SIDES	D1. Aesthetics		
a. Street shoulders* <input type="radio"/>				<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	a. Neighborhood or community sign <input type="radio"/>		
b. Curbs* <input type="radio"/>				<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	b. Garden, flower bed, planter <input type="radio"/>		
c. Street or sidewalk lighting <input type="radio"/>				<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	c. Art, statue, or monument <input type="radio"/>		
d. Sidewalks (IF NO, SKIP 1-5)* <input type="radio"/>				<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	D2. Amenities		
1. Street and sidewalk buffer* <input type="radio"/>				<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	a. Public trash can <input type="radio"/>		
2. Continuous sidewalks <input type="radio"/>				<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	b. Street dispenser/vending machine <input type="radio"/>		
3. Sidewalk continuous at both ends between segments <input type="radio"/>				<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	c. Bench or other seating <input type="radio"/>		
4. Curb cuts or ramps missing at crossing points <input type="radio"/>				<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	d. Drinking fountain <input type="radio"/>		
5. Sidewalk shade* <input type="radio"/>				<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	e. Bicycle parking <input type="radio"/>		
NOTES:				WEATHER		D3. Transit facilities			
				Sunny	<input type="radio"/>	a. Bus stop	<input type="radio"/>		
				Overcast	<input type="radio"/>	b. Light rail or trolley stop	<input type="radio"/>		
				Rain	<input type="radio"/>	c. Bench or covered shelter at transit	<input type="radio"/>		
				Snow	<input type="radio"/>	D4. How much garbage/litter is on the street segment?			
				Fog	<input type="radio"/>			NONE	A LITTLE
				Other	<input type="radio"/>			SOME	A LOT
					<input type="radio"/>			<input type="radio"/>	<input type="radio"/>

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Data Sources—Food Outlet Data

- Food Outlets (Supermarkets, F&V outlets, Farmers Markets)
 - Obtained from Dun & Bradstreet and InfoUSA based on zip code and SIC/NAICS codes
 - Telephone screening to verify businesses
 - On-site observation identified additional food outlets
 - Farmers' markets obtained from USDA
 - Supermarkets were defined as stores that sold fresh meat, 4+ cash registers, and at least 2 of the following service counters: bakery, deli, and meat dept/butcher.

Index/Measure Development-Walkability

- Zoning Walkability Index (0-18)
 - Σ strength of policy markers
 - walkability+crosswalks+bike lanes+bike parking+trails+complete streets/context sensitive design
 - Strength scores: 0=none; 1=encouraged; 2=some districts/zones encouraged/some required; 3=all districts/zones required
- Street Segment Walkability Index (0-16)
 - Comprised of 10 variables from the street observation form (a subset of the street segment analysis that Sandy will present next)
 - Σ proportion of streets in a community with:
 - Sidewalks (SW), SW buffers, SW/street lighting, continuous SW in the segment, continuous SW between segments, SW shade, any crosswalks, any bike lanes, any bike parking, any off-road trail

Index/Measure Development—Food Analyses

- Zoning Indicator
 - Healthy Food Outlet Indicator= Proportion of the catchment population exposed to any healthy zoning:
 - Supermarket
 - Farmers' market
 - F&V stand
 - F&V cart
- Healthy Food Outlet Density
 - $\Sigma(\text{super}+\text{FV mkt}+\text{Farm Mkt})/\text{area_sq mi}$

Analytic Methods

- Univariate, descriptive statistics on prevalence
- Multivariate analyses:
 - Generalized Linear Models with gamma distribution and log link
 - Food analysis: output as a rate ratio
 - All models clustered on site, controlling for race/ethnicity, region, urbanicity , population density or sprawl, and median household income
- Analyses conducted with STATA v. 12 using svy commands to account for survey design with sampling weights

Results

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Summary Statistics: Policy Predictors and Observational Outcomes

Measure	Range	Mean	95% CI
Policy predictor			
Walkability index	0-16	5.16	4.49-5.84
Healthy food outlet zoning/permitted use	0-1	0.68	0.60-0.75
Observational Outcomes			
Walkability Index	0-12.11 (Max: 16)	2.69	2.17-3.21
Healthy Food Outlet Density (per sq. mil)	0-5.76	0.28	0.18-0.38

Factors Influencing Healthy Food Outlet Density

Predictor	rate ratio	rate ratio	rate ratio
Healthy food outlet permitted use	1.111**	1.158**	1.134**
Majority Black	5.593***	7.189***	6.841***
Majority Hispanic	5.736***	7.433***	0.487+
Majority Mixed Race/Ethnicity	1.630+	1.381	1.966
Med. Household Income Low	0.763	0.566+	0.851
Median Household Income Mid	0.693	0.678	0.818
Midwest	0.441*	0.472+	0.410*
Northeast	0.921	1.240	0.846
South	0.469*	0.480*	0.418**
Urban	11.33***		12.94***
Suburban	9.652***	1.316	9.410***
Rural		0.186***	
Maj Black * Urban			0.742
Maj. Hispanic * Urban			4.838**
Maj Black * Suburban			0.338***
Maj. Hispanic * Suburban			27.06***
Maj Mixed * Urban			0.707
Maj. Mixed * Suburban			0.615
Total Population (Catchment)	1.000	1.000*	1.000
Constant	0.0145***	0.0594***	0.0119***

*** p<0.001, ** p<0.01, * p<0.05, + p<0.10

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Factors Influencing Community Walkability

Predictors	Coefficient	Coefficient
Zoning walkability index	0.154***	0.154***
Suburban	0.775**	0.771**
Rural	-0.836**	-0.834**
Majority Black	1.083**	1.078**
Majority Hispanic	0.429	0.415
Majority Mixed	0.663**	0.656**
Med. Household Inc. Low	0.202	0.205
Northeast	-0.651+	-0.658+
Midwest	-0.199	-0.204
South	-1.070**	-1.072**
Pop. Density	3.19e-05+	
Sprawl		0.243+
Constant	-0.319	-0.220

*** p<0.001, ** p<0.01, * p<0.05, + p<0.10

Conclusions, Next Steps, and Contacts

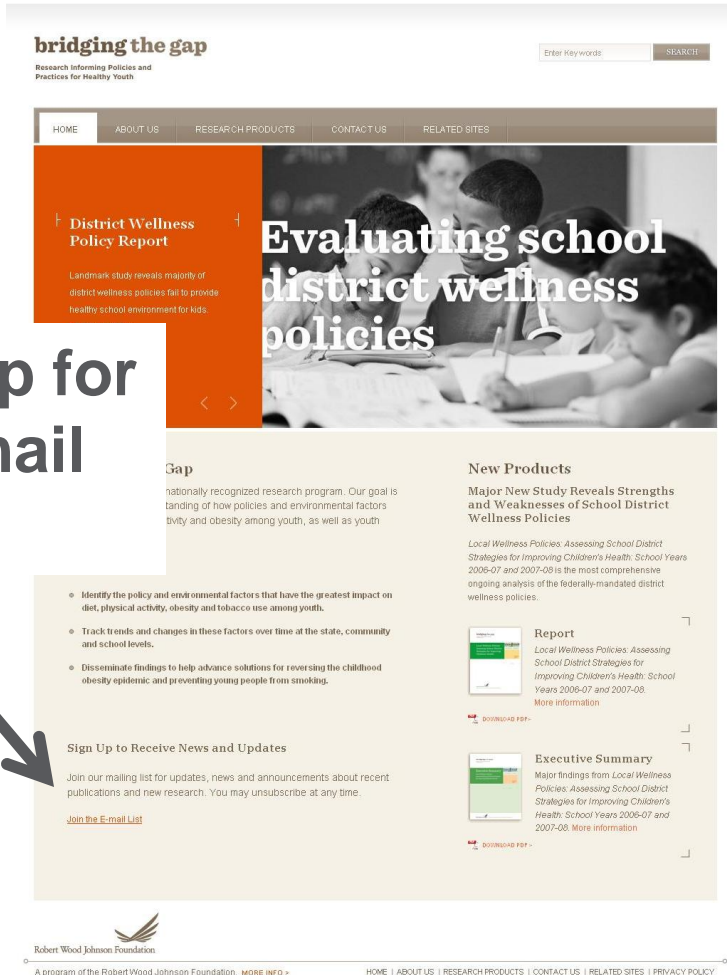
Conclusions

- “If you zone for it, they will come”
 - Zoning for walkability → more walkable communities
 - Zoning/permitted uses for healthy food access → more healthy food outlets per sq. mile

Next Steps

- Conducting analyses with multiple years of data
- Linking to adolescent physical activity
- Linking to adolescent BMI
- Larger study currently examining relationship and impact of zoning for walkability, walkable communities, and physical activity

For more information: www.bridgingthegapresearch.org



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