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Research Informing Policies & Practices
for Healthy Youth

Does Zoning for Healthy Food Access Increase the Availability of Healthy Food Outlets?

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Acknowledgments

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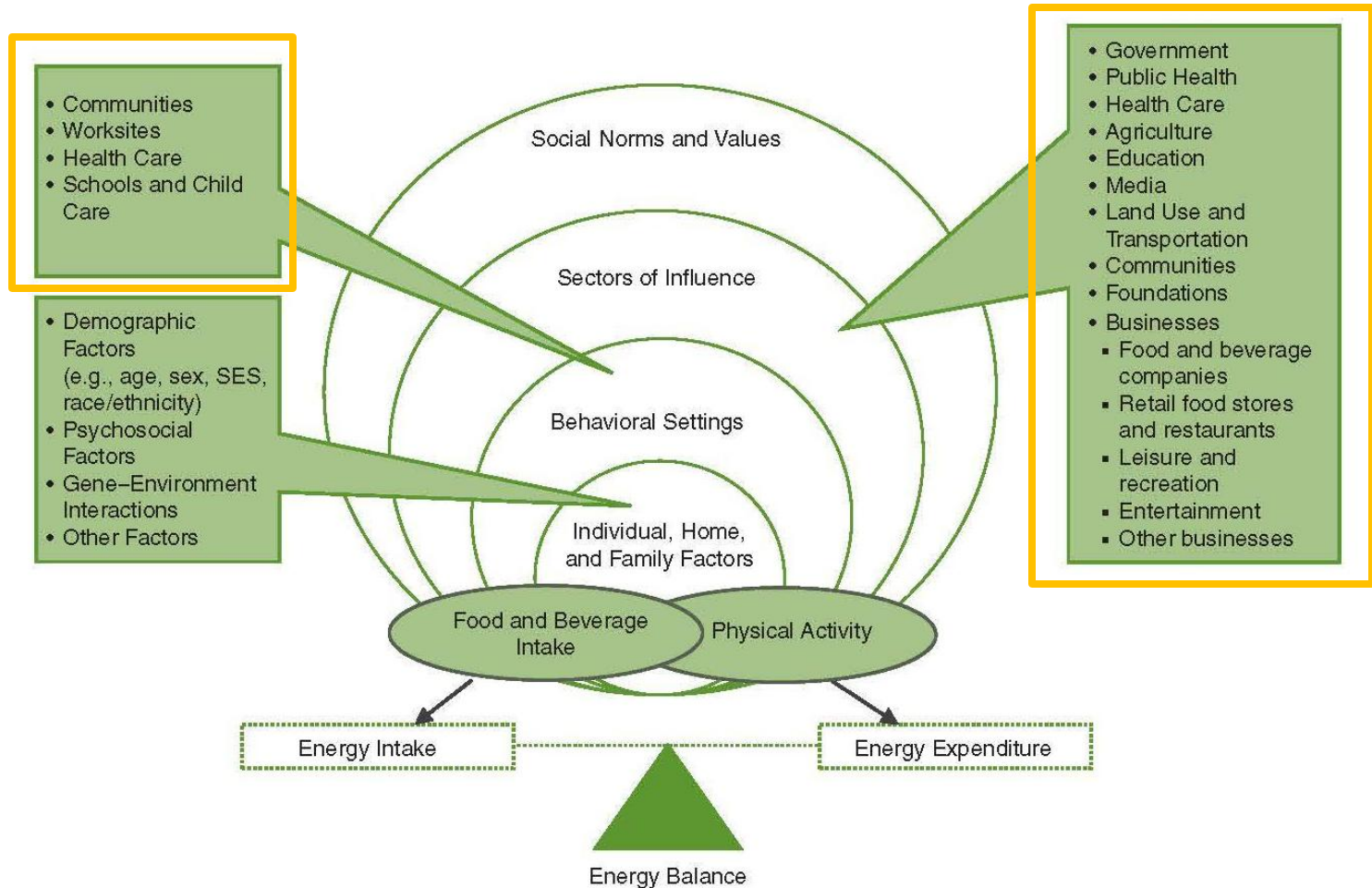
The research presented is funded by grants from the Robert Wood Johnson Foundation

Study Purpose

- To examine the association between permitted uses for healthy food outlets as outlined in community zoning codes and density of healthy food outlets in the community

Factors influencing the food environment and obesity

Levels and Sectors of Influence on Obesity



5 SOLUTIONS FOR CHANGING OUR COMMUNITIES

INTEGRATE PHYSICAL ACTIVITY EVERY DAY IN EVERY WAY.



STRENGTHEN SCHOOLS AS THE HEART OF HEALTH.

MARKET WHAT MATTERS FOR A HEALTHY LIFE.



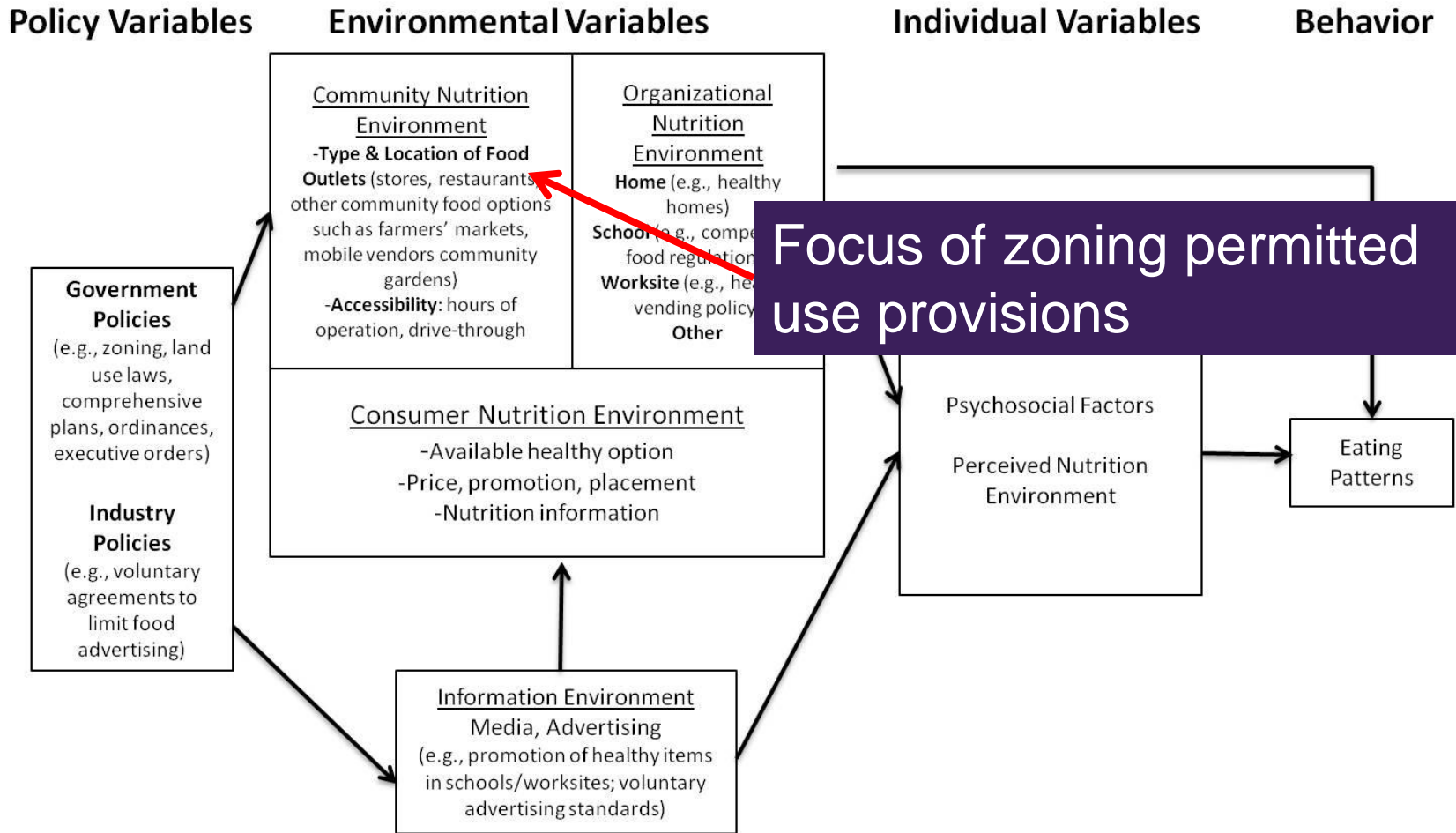
ON THEIR OWN, ANY ONE OF THESE FIVE SOLUTIONS MIGHT HELP SPEED UP PROGRESS IN PREVENTING OBESITY, BUT TOGETHER, THEIR EFFECT WOULD BE REINFORCED, AMPLIFIED, AND MAXIMIZED.

ACTIVATE EMPLOYERS AND HEALTH CARE PROFESSIONALS.



MAKE HEALTHY FOODS AVAILABLE EVERYWHERE.

Policy and Environmental Influences on Eating Behaviors



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Source: Adapted from Glanz et al., *Am J Health Pr*, 2005[7]

Relationship between zoning and healthy food outlets

- One study (Mayo, Pitts, Chriqui, *Prev Chron Dis*, in press) has examined the relationship between county and municipal zoning for healthy food outlets and accessibility to such outlets in 13 rural North Carolina counties
 - Healthful food zoning and the number of fruit and vegetable outlets were positively correlated ($r = 0.66$, $P = .01$)
 - Qualitative data indicated strict enforcement versus lack of enforcement of zoning regulations influenced implementation of the zoning codes

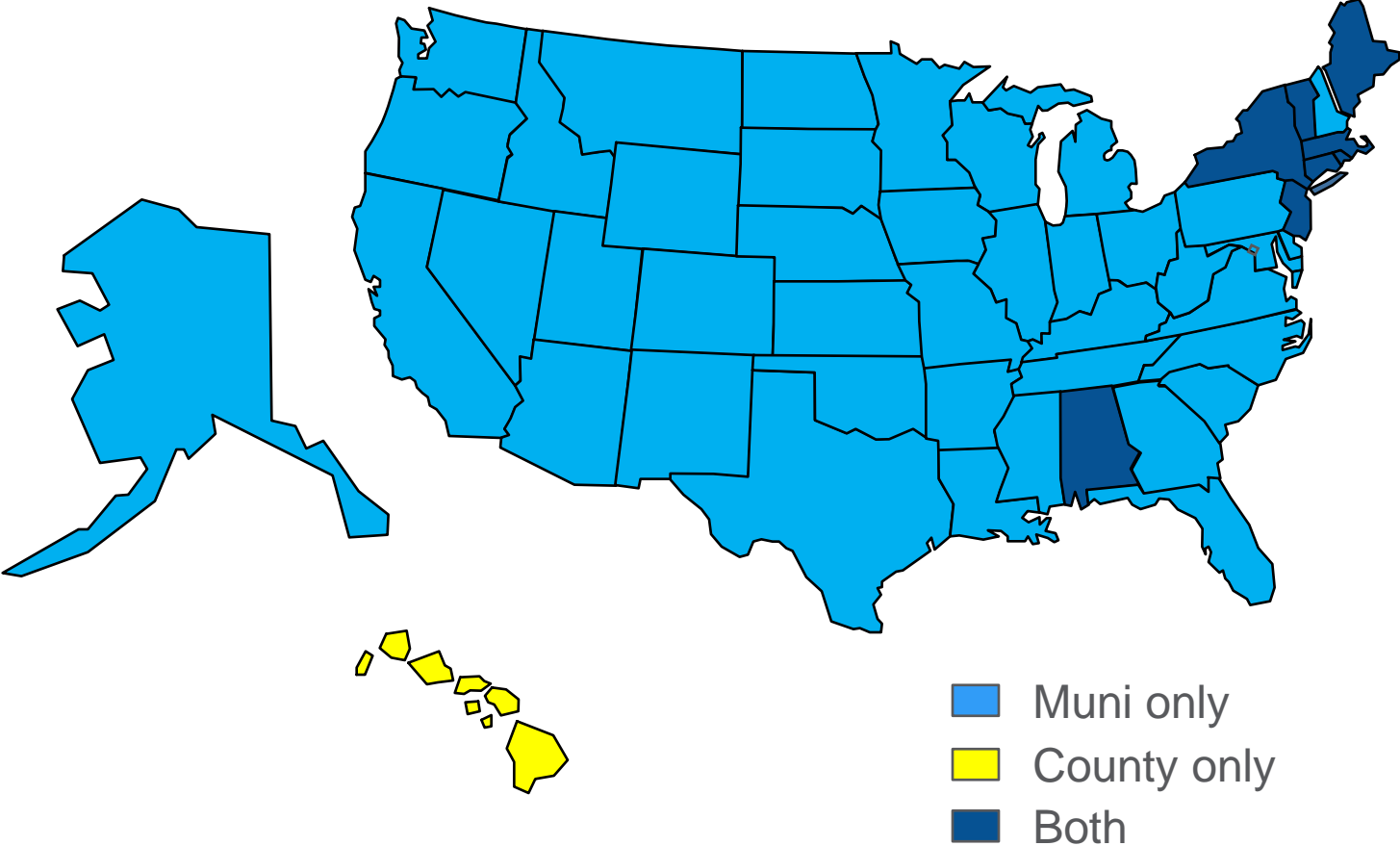
Zoning as a Tool to Influence the Food Environment

Zoning and its relationship to public health

- Zoning, subdivision regulation, and building codes are exercises of the states' police powers under the 10th Amendment
- Zoning authority granted to county and municipal governments by states to promote the health, safety, morals, and general welfare of their citizenry
- Traditional, Euclidian zoning establishes land use zones/districts based on use and density
 - The protection of public health lies at the heart of zoning –zoning offers a regulatory scheme to address public health problems caused by urbanization (Schilling and Linton, Am. J. Prev. Med. (2005))

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State-delegated zoning authority to counties and municipalities



Zoning and Land Use Laws as Strategies to Support Food Environments

- Zoning/land use laws include approved uses (i.e., permitted, conditional, accessory, prohibited) for different types of outlets
 - Supermarkets
 - Grocery stores
 - Fruit & vegetable markets, stores
 - Fruit & vegetable stands
 - Fruit & vegetable carts
 - Mobile food vendors/trucks
 - Farmers' markets
 - Community gardens
 - Restaurants
 - Convenience stores

Zoning for Permitted Uses

17.42.10 PERMITTED USES

A. Primary Uses Permitted Outright - Residential

1. Attached row houses existing prior to adoption of this Code;
2. Duplexes existing prior to adoption of this Code;
3. Residential Care Facility;
4. Residential dwellings attached to a commercial business;
5. Single Attached (Zero Lot Line, 2 Units) existing prior to adoption of this Code;
6. Single Detached existing prior to adoption of this Code;
7. Single Detached (Zero Lot Line) existing prior to adoption of this Code.

B. Primary Uses Permitted Outright – Commercial in buildings with up to 30,000 square feet of gross floor area and without drive-through facilities:

1. Retail uses, including but not limited to:
 - a. Automotive trailer, recreational vehicle, motorhome;
 - b. Convenience market/store;
 - c. Eating and drinking establishment including fast-food restaurants but excluding drive-up/drive-through uses;
 - d. Grocery store or supermarket;
2. Service and professional businesses and organizations, including but not limited to:
 - a. Athletic club, indoor recreation, or entertainment;
 - b. Automotive repair and service;
 - c. Commercial day care facility;
 - d. Community services;
 - e. Education facility (e.g., pre-school, school, college);
 - f. Financial institution;
 - g. Medical facility (e.g., clinic, hospital, laboratory);
 - h. Professional or general business office;
 - i. Self-service storage;
 - j. Social organization;

Source: Oregon City, Oregon, Municipal Code § 17.42.10

17.42.10 PERMITTED USES

A. Primary Uses Permitted Outright - Residential

1. Attached row houses existing prior to adoption of this Code;
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6. Single Detached existing prior to adoption of this Code;
7. Single Detached (Zero Lot Line) existing prior to adoption of this Code.

B. Primary Uses Permitted Outright – Commercial in buildings with up to 30,000 square feet of gross floor area and without drive-through facilities;

1. Retail uses, including but not limited to:
 - a. Automotive trailer, recreational vehicle, motorcycle sales and rental;
 - b. Convenience market/store;
 - c. Eating and drinking establishment including fast-food and high-turnover sit down restaurants but excluding drive-up/drive-through uses;
 - d. Grocery store or supermarket;
2. Service and professional businesses and organizations, including but not limited to:
 - a. Athletic club, indoor recreation, or entertainment;
 - b. Automotive repair and service;
 - c. Commercial day care facility;
 - d. Community services;
 - e. Education facility (e.g., pre-school, school, college);
 - f. Financial institution;
 - g. Medical facility (e.g., clinic, hospital, laboratory);
 - h. Professional or general business office;
 - i. Self-service storage;
 - j. Social organization;

Source: Sandy City, Oregon, Municipal Code § 17.42.10

Study Methods

Data Sources—Zoning Data

- 154 secondary school catchments where a national sample of secondary school students were enrolled in Spring-Summer 2010
 - Compiled zoning codes from 360 county and municipal jurisdictions overlapping the catchments
 - Analyzed zoning codes for permitted/conditional uses for healthy food outlets: supermarkets, farmers' markets , fruit & vegetable stands, and fruit & vegetable carts
 - Latter two were proxies for fruit & vegetable outlets
 - Trained coders (all with MUPP or master's level MUPP grad students)
 - Reliability conducted on pilot sample using 2009 data and yielded >90% percent agreement\

Food Code/Policy Audit Form

BTG-COMP - FOOD CODE/POLICY AUDIT FORM 2010 Observation ID _____ Site ID _____

ZONE/DISTRICT	v if Zone/ District Present (from BE Form)	C. Access to Healthy Foods												Notes on Ca. Farmer's/Seasonal Markets:
		C1. Item Addressed			C2. Permitted Use			C3. Conditional Use			C4. Prohibited Use			
		Y	N	NA	Y	N	NA	Y	N	NA	Y	N	NA	

- a. Farmer's/Seasonal Markets**
- Commercial
 - Downtown district
 - Mixed-use
 - New urbanist
 - Ped.-oriented dev.
 - Ped.-oriented district
 - Planned unit dev. (PUD)
 - Public/civic/gvt/ use
 - Recreation
 - Residential
 - School/ed. districts
 - Shopping district
 - Transect zones/districts
 - Trad. neighborhood dev. (TND)
 - Transit-oriented dev.(TOD)
 - Applies to all districts/zones
- b. Green/Fresh F&V Carts**
- Commercial
 - Downtown district
 - Mixed-use
 - New urbanist
 - Ped.-oriented dev.
 - Ped.-oriented district
 - Planned unit dev. (PUD)
 - Public/civic/gvt/ use
 - Recreation
 - Residential
 - School/ed. districts
 - Shopping district
 - Transect zones/districts
 - Trad. neighborhood dev. (TND)
 - Transit-oriented dev. (TOD)
 - Applies to all districts/zones

BTG-COMP - FOOD CODE/POLICY AUDIT FORM 2010 Observation ID _____ Site ID _____

Date: ___/___/2010 State: _____ Community: _____ State FIPS: _____ County FIPS: _____ Place FIPS: _____

Policy Document Name: _____

Community Type of Government (select all that apply):
 Region 1 Other (specify) 5
 County 2 Specify: _____
 Municipality 3
 CDP 4

Policy Source (select all that apply):
 On-line code publisher 1 Other (specify) 6
 Other code publisher 2 Specify _____
 Community web site 3 No policy (verified) 7
 Planning/Zoning office web site 4 Missing (non-responder) 9
 Community mail 5

Total Coding Time (in hours/mins): _____ Hrs _____ Mins _____

Coder ID: _____

ZONE/DISTRICT	v if Zone/ District Present From BE Form	A. FOOD STORE PROVISIONS																							
		A1. Store Type Addressed			A2. Permitted Use			A3. Conditional Use			A4. Prohibited Use			A5. Fresh F&V Options Reg.			A6. Candy Product Placement			A7. Outward facing labels for poor nutrient foods			A8. Contiguous floor space for products meeting certain nutritional reqs.		
		Y	N	NA	Y	N	NA	Y	N	NA	Y	N	NA	Y	N	NA	Y	N	NA	Y	N	NA	Y	N	NA
a. Supermarkets																									
1) Commercial		1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0
2) Downtown district		1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0
3) Mixed-use		1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0
4) New urbanist dev./district		1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0
5) Pedestrian-oriented development		1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0
6) Pedestrian-oriented district		1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0
7) Planned unit development (PUD)		1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0
8) Public/civic/gvt/ use districts		1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0
9) Recreation		1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0
10) Residential		1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0
11) Schools/education districts		1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0
12) Shopping district (see protocol)		1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0
13) Transect zones/districts		1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0
14) Trad. neighborhood dev. (TND)		1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0
15) Transit-oriented dev. (TOD)		1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0
16) Applies to all zones/districts		1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0
b. Grocery Stores																									
1) Commercial		1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0
2) Downtown district		1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0
3) Mixed-use		1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0
4) New urbanist dev./district		1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0
5) Pedestrian-oriented development		1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0
6) Pedestrian-oriented district		1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0
7) Planned unit development (PUD)		1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0
8) Public/civic/gvt/ use districts		1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0
9) Recreation		1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0
10) Residential		1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0
11) Schools/education districts		1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0
12) Shopping district (see protocol)		1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0
13) Transect zones/districts		1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0
14) Trad. neighborhood dev. (TND)		1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0
15) Transit-oriented dev. (TOD)		1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0
16) Applies to all zones/districts		1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0

Final 12/10/10

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Page 1

The food policy instrument evaluated the extent to which food outlets are permitted in ordinances. These are a few pages from The BTG-COMP Food Code/Policy Audit Form. It examines food outlet uses (e.g. supermarkets, grocery stores, convenience stores, general retail stores, fast-food restaurants, formula restaurants, farmer's markets, fruit and vegetable carts, mobile food vendors, urban agriculture or community gardens, and produce stands) across 20 different zones/districts.

Data Sources—Food Outlet Data

- Food store lists from Dun & Bradstreet and InfoUSA
 - Telephone screening to verify operational and appropriate store type classification since prior research (Han et al., 2012) indicated bias in food outlet classification in commercial business lists
- On-the-ground observations of food outlets in 154 catchments to supplement business lists
- Store Types:
 - **Supermarkets:** sold fresh meat, at least two service counters (i.e., a butcher/meat department, deli, or bakery), and at least 4 cash registers.
 - **Fruit and vegetable stores:** identified post hoc by name among stores not classified in the study as supermarkets or grocery stores
 - **Farmers' Markets:** obtained from USDA

Measure Development

- Zoning Indices
 - Healthy food outlet zoning permitted use measure (0-1; log transformed to 0-10)
 - **Yes** if zoning code contained any permitted uses for any of the “healthy” food outlets of interest (supermarkets, farmers’ markets , fruit & vegetable stands, and fruit & vegetable carts)
 - Healthy food outlet permitted use index (0-4)
 - Σ of number of healthy food outlets permitted:
Supermarket+farmers’ market + fruit & veg stand + fruit & veg cart
 - Required scores included: mix of required and encouraged provisions; all districts/zones required
 - Both indices weighted for the population in the jurisdictions overlapping each catchment
- Outlet Index (0-1; log-transformed to 0-100)
 - Proportion of the number of healthy food outlets within the catchment per square mile

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Analytic Methods

- Multivariate analyses:
 - Generalized Linear Models with gamma distribution and log link using rate ratios as the outcome measure
 - All models clustered on site, controlling for catchment-level race/ethnicity, region, urbanicity, sprawl, and median household income
- Analyses conducted with STATA v. 12 using svy commands to account for survey design with sampling weights
- N=152 catchments for multivariate analyses
 - 2 catchments missing zoning data

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Results

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Summary Statistics--1

Variable	%/Mean	95% CI	
Zoning index (0-10)	1.44	1.12	1.77
Zoning permitted use (1/0)	7.73	6.96	8.49
Healthy food outlet density	0.38	0.20	0.56
Sprawl	0.03	-0.20	0.26
>66% white (ref)	0.61	--	--
>50% black	0.03	--	--
>50% Hispanic	0.24	--	--
Mixed race/ethnicity	0.11	--	--
Urban	0.27	--	--
Suburban	0.43	--	--
Rural (ref)	0.30	--	--

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N=152 catchments in 2010

Summary Statistics--2

Variable	%
Median household income-low	33.55
Median household income-mid	32.89
Median household income-hi (ref)	33.55
West region (ref)	24.69
Northeast region	17.81
Midwest region	22.37
South region	35.14

Influence of Healthy Outlet Zoning on Healthy Food Outlet Density

Variable-	Predictor: Any Healthy Zoning Permitted		
	RR	95% CI	
Zoning Permitted Use	1.16	1.07	1.26
>66% black	2.42	1.35	4.36
>50% Hispanic	1.61	0.80	3.24
Mixed race	A 10% increase in the proportion of the catchment exposed to healthy food outlet zoning → 16% more healthy food outlets in the catchment		
MHH inc			
MHH inc			
Midwest	0.51	0.34	0.77
Northeast	0.70	0.48	1.03
South	0.49	0.32	0.75
Urban	7.27	4.25	12.43
Suburban	6.05	3.96	9.25
Sprawl	1.84	1.18	2.88
Constant	0.02	0.01	0.04

Influence of Healthy Outlet Zoning on Healthy Food Outlet Density

Variable-	Predictor: Any Healthy Zoning Permitted			Predictor: Healthy Zoning Index		
	RR	95% CI		RR	95% CI	
Zoning	1.16	1.07	1.26	1.23	1.05	1.42
>66% black	2.42	1.35	4.36	3.04	1.16	7.96
>50% Hispanic	1.61	0.80	3.24	1.90	0.87	4.12
Mix	A 10% increase in the proportion of the catchment exposed to healthy food outlet zoning → 16% more healthy food outlets in the catchment					
MH	AND 10% increase in healthy outlet zoning permitted uses → 23% more healthy food outlets in the catchment					
MH						
Mid						
Nor						
Sou						
Urban	7.27	4.25	12.43	10.06	5.90	17.17
Suburban	6.05	3.96	9.25	7.34	4.87	11.06
Sprawl	1.84	1.18	2.88	1.59	1.01	2.50
Constant	0.02	0.01	0.04	0.04	0.03	0.07

Summary, Next Steps, and Contacts

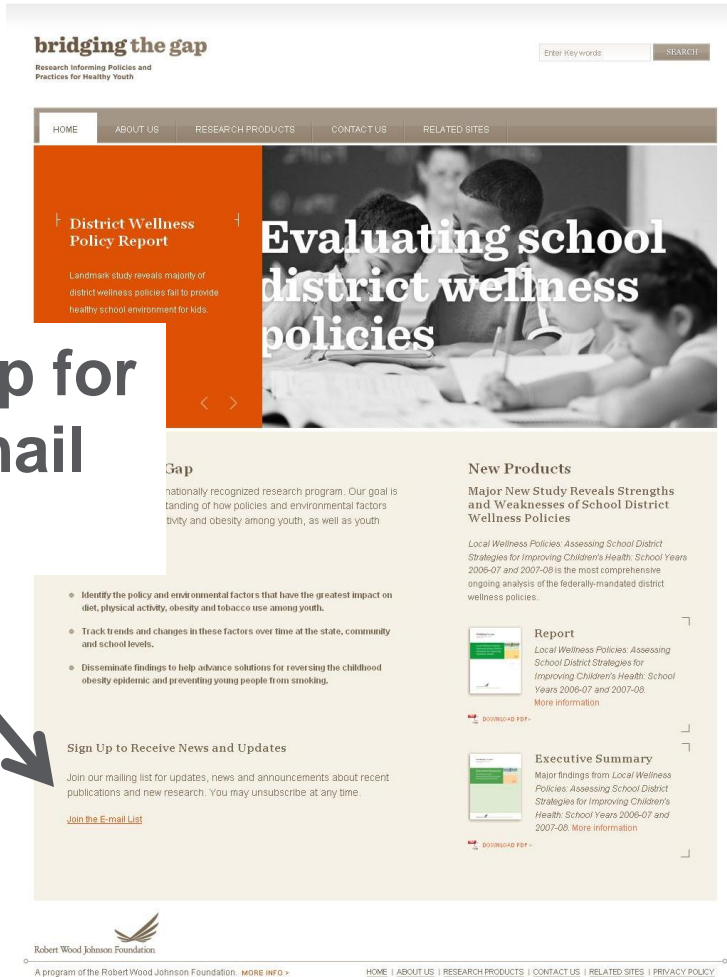
Summary

- “If you zone for it, they will come”
 - Zoning for healthy food outlets is being implemented in communities
 - Specifically permitting healthy food outlets (including F&V outlets) is associated with increased availability of such outlets
 - Opportunities exist for communities to revise their zoning/land use laws to specifically permit outlets selling fruits and vegetables

Next Steps

- Add additional years of data (2010-2012)
- Rerun mediation models to link to adolescent fruit and vegetable consumption and obesity, respectively

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