Is the environment causing obesity? Taking action to reverse an epidemic

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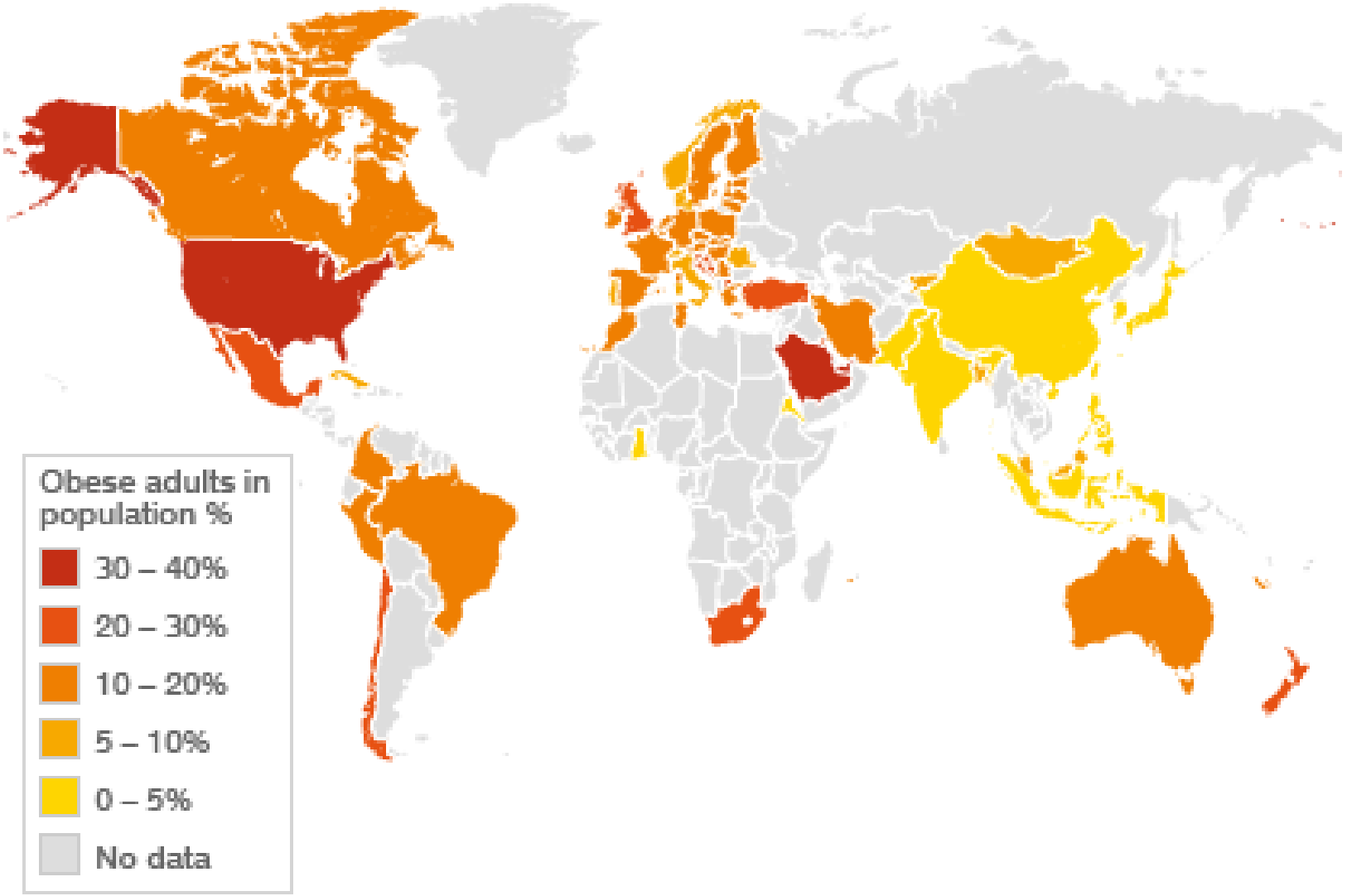
Outline

- Ecologic Model of Obesity
- Case 1. Neighborhood Streets
- Case 2. Physical Activity Resources
- Case 3. Food Environment
- Conclusions

THE GLOBAL OBESITY PROBLEM



An obese adult is classified as having a Body Mass Index equal to or greater than 30

SOURCE: World Health Organization, 2005

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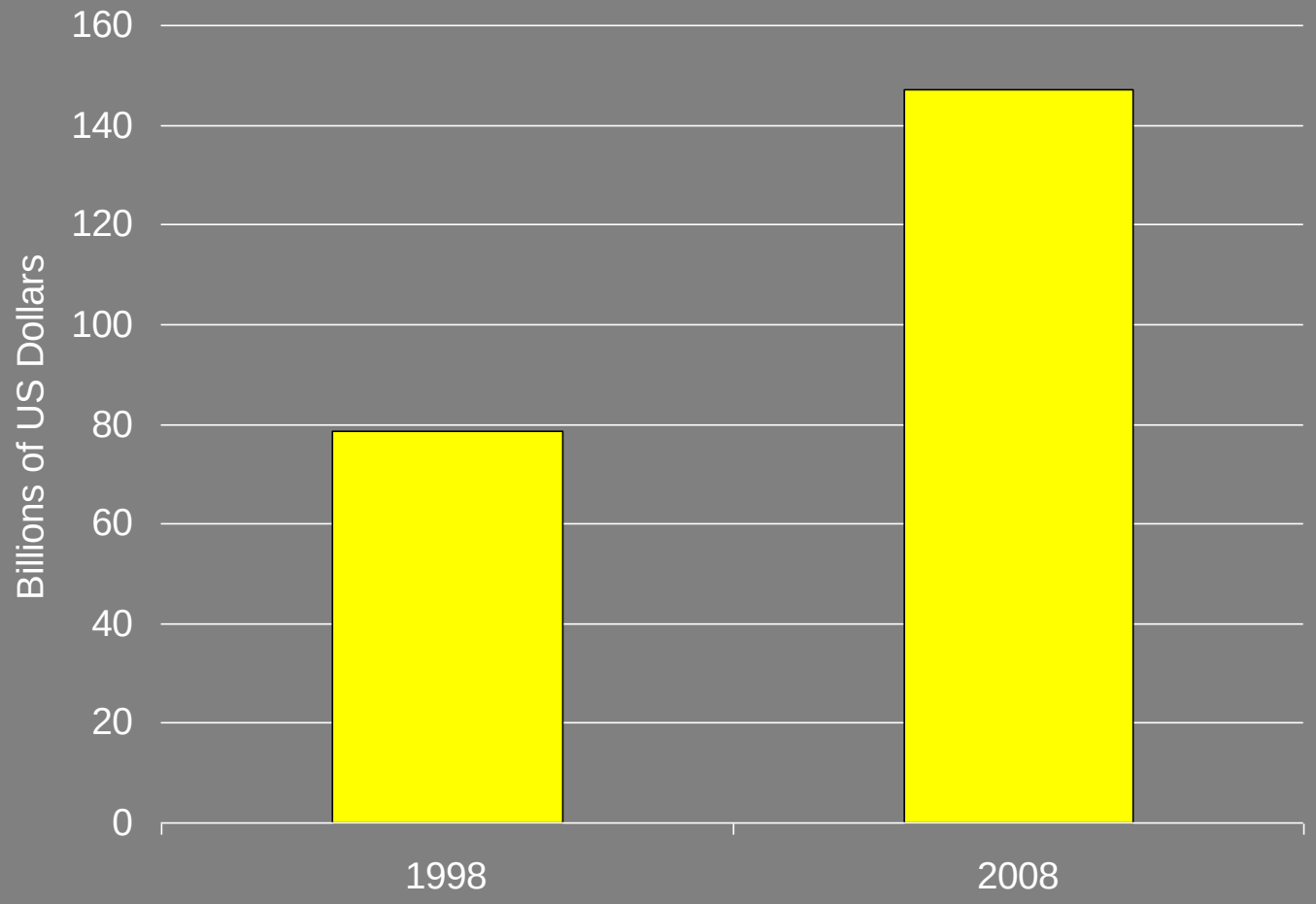
Estimated Costs of Obesity



Finkelstein EA, Trogdon JG, Cohen JW, Dietz W. *Annual medical spending attributable to obesity: payer- and service-specific estimates. Health Aff (Millwood). 2009;28(5):w822–w831, pmid:19635784.*

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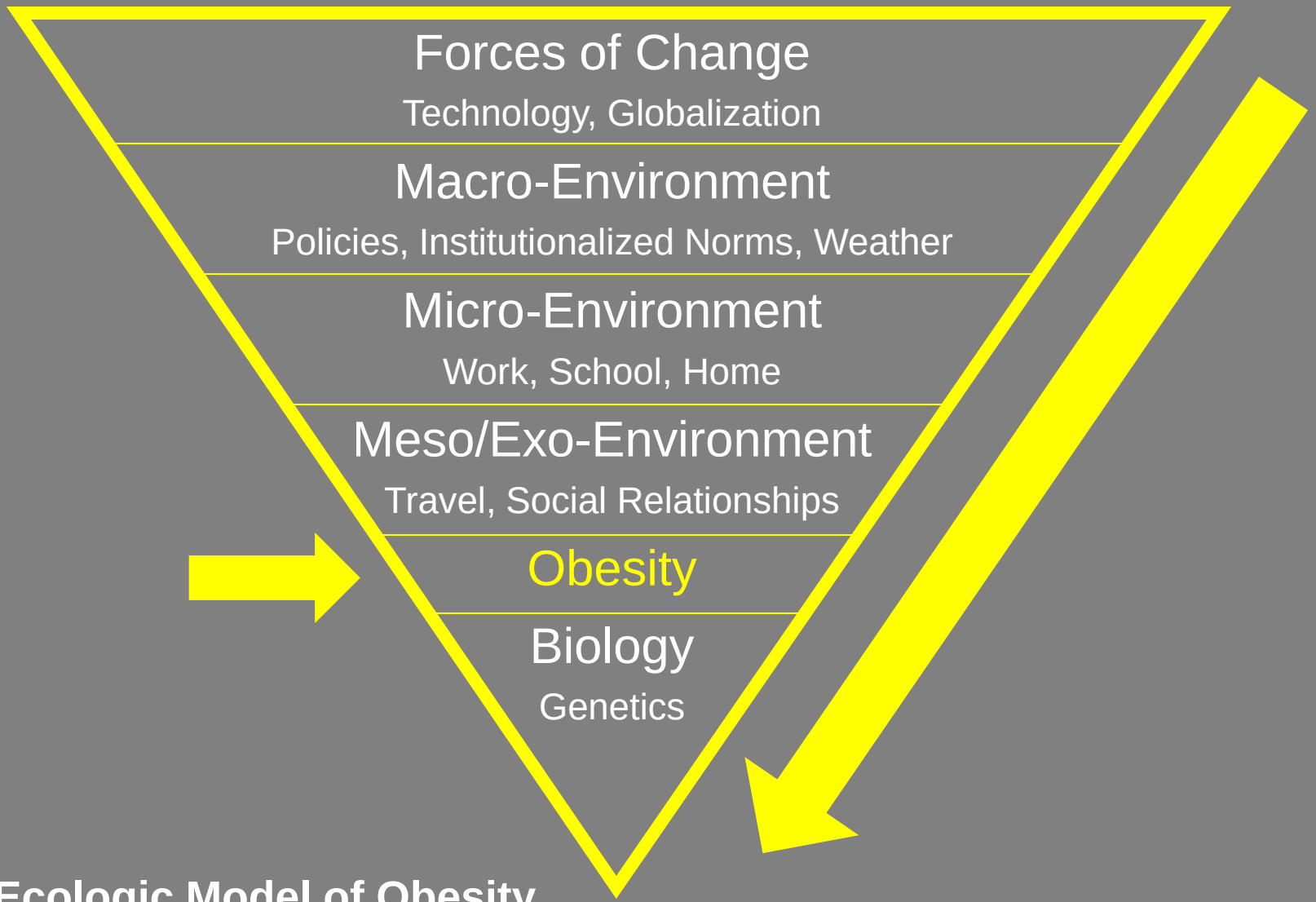
Obesogenic Environment?

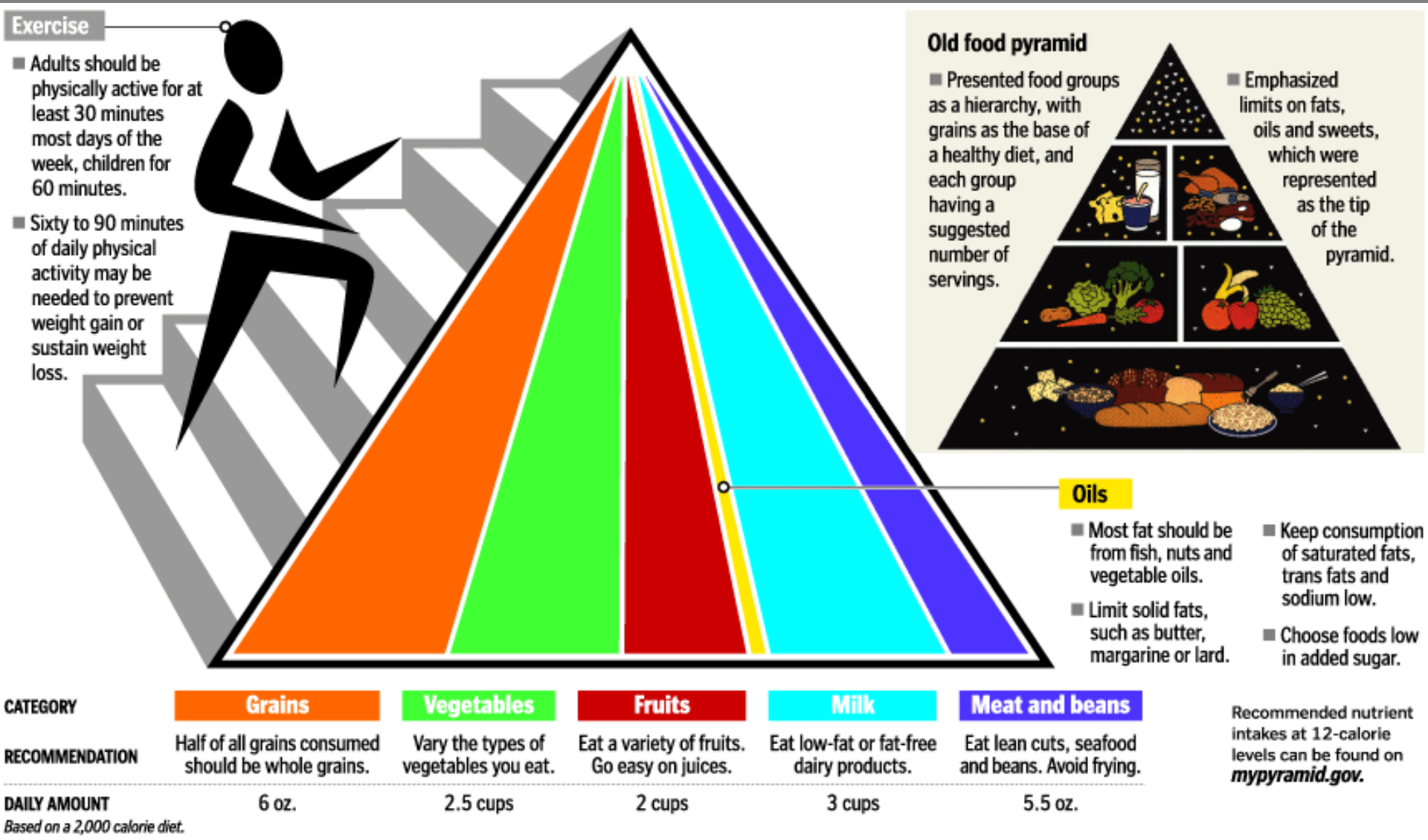
Obese + Genic = Something that creates or leads to obesity



Ecologic Model of Obesity

Lee RE, McAlexander KM, Banda JA. *Reversing the Obesogenic Environment.* Champaign, IL: Human Kinetics; 2011.

Individual Choices?



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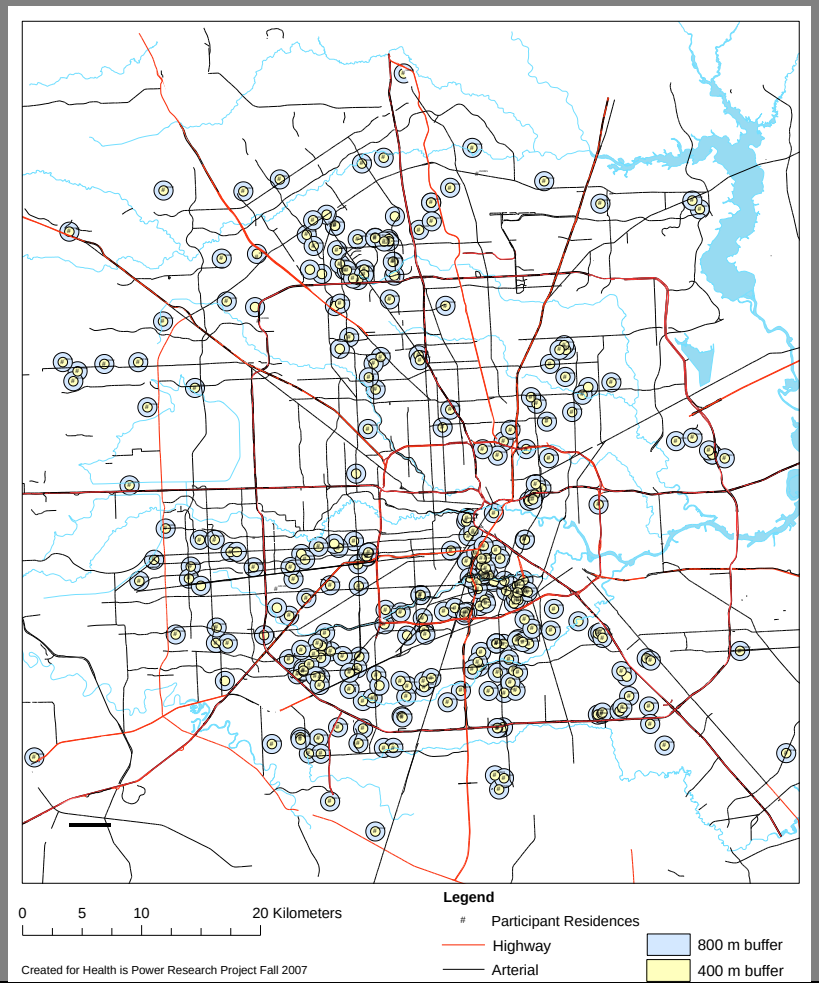
Defining Neighborhoods

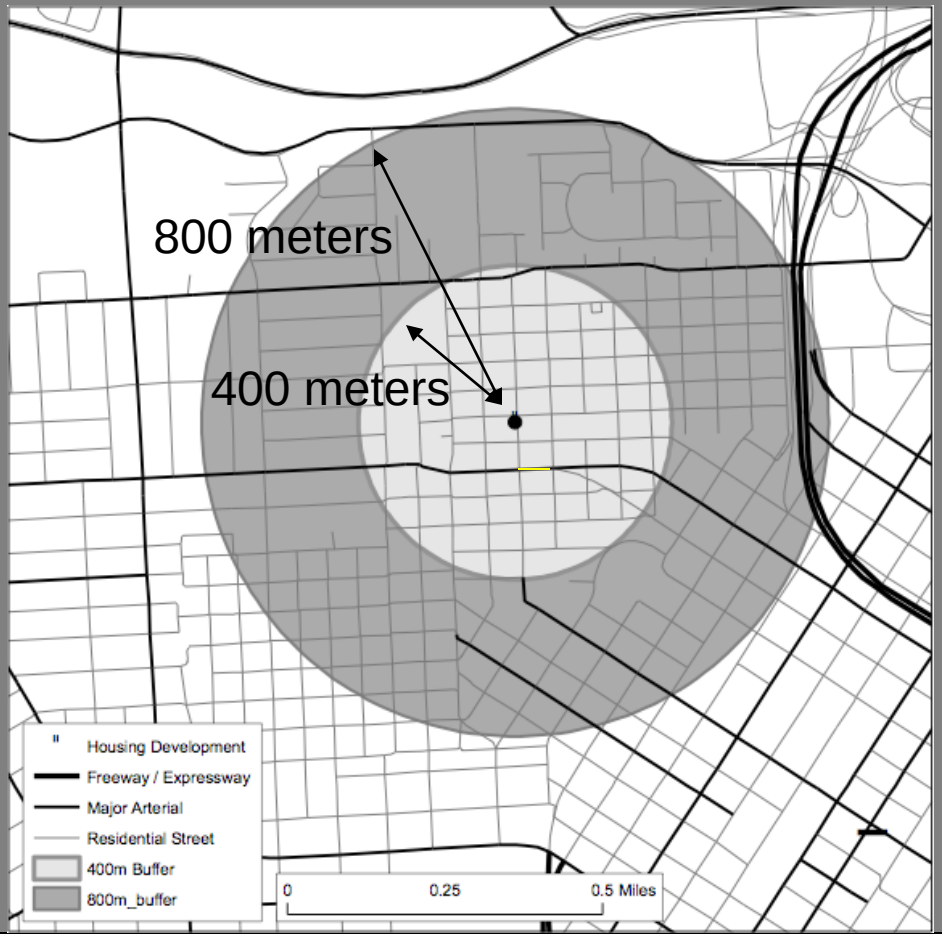
- Geographic Information Systems (GIS)
- Boundaries
  - Buffers
  - Streets
  - Census geography
  - School Locations



Parmenter BM, McMillan T, Cubbin C, **Lee RE**. Developing Geospatial Data Management, Recruitment, and Analysis Techniques for Physical Activity Research. *Urban and Regional Information Systems Association Journa*l. 2008; 20(2): 13-19.

Defining Neighborhoods

- Radial buffer
- All arterials
- 25% of residentials
- Street segments



McMillan TM, Cubbin C, Parmenter B, Medina AV, Lee RE. Neighborhood sampling: how many streets must an auditor walk? 2010, 7:20
http://www.ijbnpa.org/content/7/1/20

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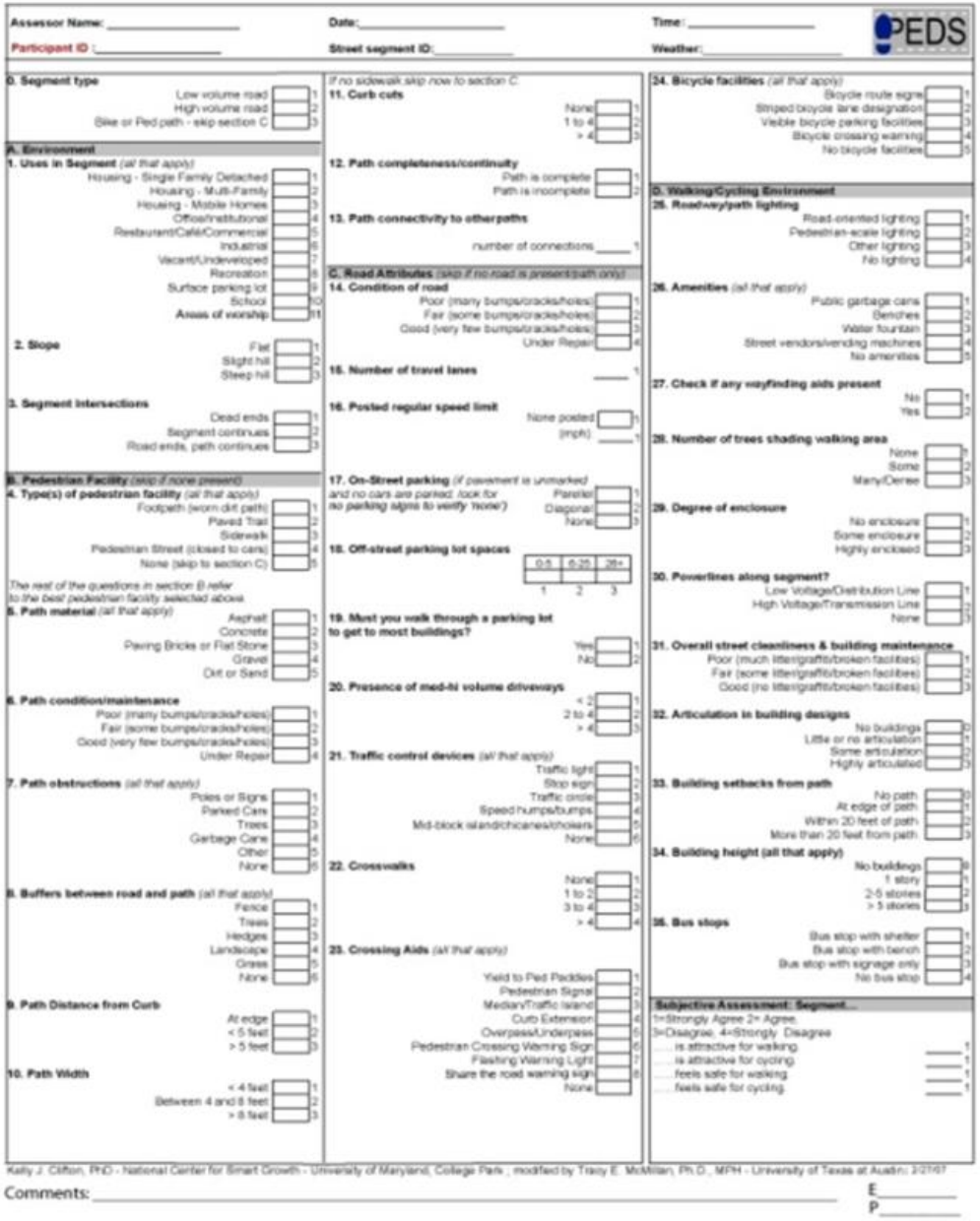
Neighborhood Assessment

Pedestrian Environment Data Scan (PEDS)

McAlexander KM, Mama SK, Medina AV, O'Connor DP, Lee RE. Concordance and correlates of direct and indirect built environment measurement among minority women. *Am J Health Promot*, 2011. In press.



Assessor Name: _____ Date: _____ Time: _____ PEDS

Participant ID: _____ Street segment ID: _____ Weather: _____

0. Segment type
Low volume road 1
High volume road 2
Bike or Ped path - skip section C 3

A. Environment

1. Uses in Segment *(all that apply)*
Housing - Single Family Detached 1
Housing - Multi-Family 2
Housing - Mobile Homes 3
Office/Institutional 4
Restaurant/Café/Commercial 5
Industrial 6
Vacant/Undeveloped 7
Recreation 8
Surface parking lot 9
School 10
Areas of worship 11

2. Slope
Flat 1
Slight hill 2
Steep hill 3

3. Segment Intersections
Dead ends 1
Segment continues 2
Road ends, path continues 3

B. Pedestrian Facility *(skip if none present)*

4. Type(s) of pedestrian facility *(all that apply)*
Footpath (worn dirt path) 1
Paved Trail 2
Sidewalk 3
Pedestrian Street (closed to cars) 4
None (skip to section C) 5

The rest of the questions in section B refer to the best pedestrian facility selected above.

5. Path material *(all that apply)*
Asphalt 1
Concrete 2
Paving Bricks or Flat Stone 3
Gravel 4
Dirt or Sand 5

6. Path condition/maintenance
Poor (many bumps/cracks/holes) 1
Fair (some bumps/cracks/holes) 2
Good (very few bumps/cracks/holes) 3
Under Repair 4

7. Path obstructions *(all that apply)*
Poles or Signs 1
Parked Cars 2
Trees 3
Garbage Cans 4
Other 5
None 6

8. Buffers between road and path *(all that apply)*
Fence 1
Trees 2
Hedges 3
Landscape 4
Grass 5
None 6

9. Path Distance from Curb
At edge 1
< 5 feet 2
> 5 feet 3

10. Path Width
< 4 feet 1
Between 4 and 8 feet 2
> 8 feet 3

If no sidewalk skip now to section C

11. Curb cuts
None 1
1 to 4 2
> 4 3

12. Path completeness/continuity
Path is complete 1
Path is incomplete 2

13. Path connectivity to other paths
number of connections _____ 1

C. Road Attributes *(skip if no road is present/path only)*

14. Condition of road
Poor (many bumps/cracks/holes) 1
Fair (some bumps/cracks/holes) 2
Good (very few bumps/cracks/holes) 3
Under Repair 4

15. Number of travel lanes _____ 1

16. Posted regular speed limit
None posted 1
(mph) _____ 1

17. On-Street parking *(if pavement is unmarked and no cars are parked, look for no parking signs to verify 'none')*
Parallel 1
Diagonal 2
None 3

18. Off-street parking lot spaces

0-5	6-25	26+
1	2	3

19. Must you walk through a parking lot to get to most buildings?
Yes 1
No 2

20. Presence of med-hi volume driveways
< 2 1
2 to 4 2
> 4 3

21. Traffic control devices *(all that apply)*
Traffic light 1
Stop sign 2
Traffic circle 3
Speed humps/bumps 4
Mid-block island/chicanes/chokers 5
None 6

22. Crosswalks
None 1
1 to 2 2
3 to 4 3
> 4 4

23. Crossing Aids *(all that apply)*
Yield to Ped Paddles 1
Pedestrian Signal 2
Median/Traffic Island 3
Curb Extension 4
Overpass/Underpass 5
Pedestrian Crossing Warning Sign 6
Flashing Warning Light 7
Share the road warning sign 8
None

24. Bicycle facilities *(all that apply)*
Bicycle route signs 1
Striped bicycle lane designation 2
Visible bicycle parking facilities 3
Bicycle crossing warning 4
No bicycle facilities 5

D. Walking/Cycling Environment

25. Roadway/path lighting
Road-oriented lighting 1
Pedestrian-scale lighting 2
Other lighting 3
No lighting 4

26. Amenities *(all that apply)*
Public garbage cans 1
Benches 2
Water fountain 3
Street vendors/vending machines 4
No amenities 5

27. Check if any wayfinding aids present
No 1
Yes 2

28. Number of trees shading walking area
None 1
Some 2
Many/Dense 3

29. Degree of enclosure
No enclosure 1
Some enclosure 2
Highly enclosed 3

30. Powerlines along segment?
Low Voltage/Distribution Line 1
High Voltage/Transmission Line 2
None 3

31. Overall street cleanliness & building maintenance
Poor (much litter/graffiti/broken facilities) 1
Fair (some litter/graffiti/broken facilities) 2
Good (no litter/graffiti/broken facilities) 3

32. Articulation in building designs
No buildings 0
Little or no articulation 1
Some articulation 2
Highly articulated 3

33. Building setbacks from path
No path 0
At edge of path 1
Within 20 feet of path 2
More than 20 feet from path 3

34. Building height (all that apply)
No buildings 0
1 story 1
2-5 stories 2
> 5 stories 3

35. Bus stops
Bus stop with shelter 1
Bus stop with bench 2
Bus stop with signage only 3
No bus stop 4

Subjective Assessment: Segment...
1=Strongly Agree 2= Agree
3=Disagree, 4=Strongly Disagree
... is attractive for walking _____ 1
... is attractive for cycling _____ 1
... feels safe for walking _____ 1
... feels safe for cycling _____ 1

Kelly J. Clifton, PhD - National Center for Smart Growth - University of Maryland, College Park ; modified by Tracy E. McMillan, Ph.D., MPH - University of Texas at Austin; 3/27/07

Comments: _____ E_____ P_____

Clifton KJ, Livi Smith A, Rodriguez D. The Development and Testing of an Audit for the Pedestrian Environment. Landscape and Urban Planning. 2007, 80(1-2):95-110.

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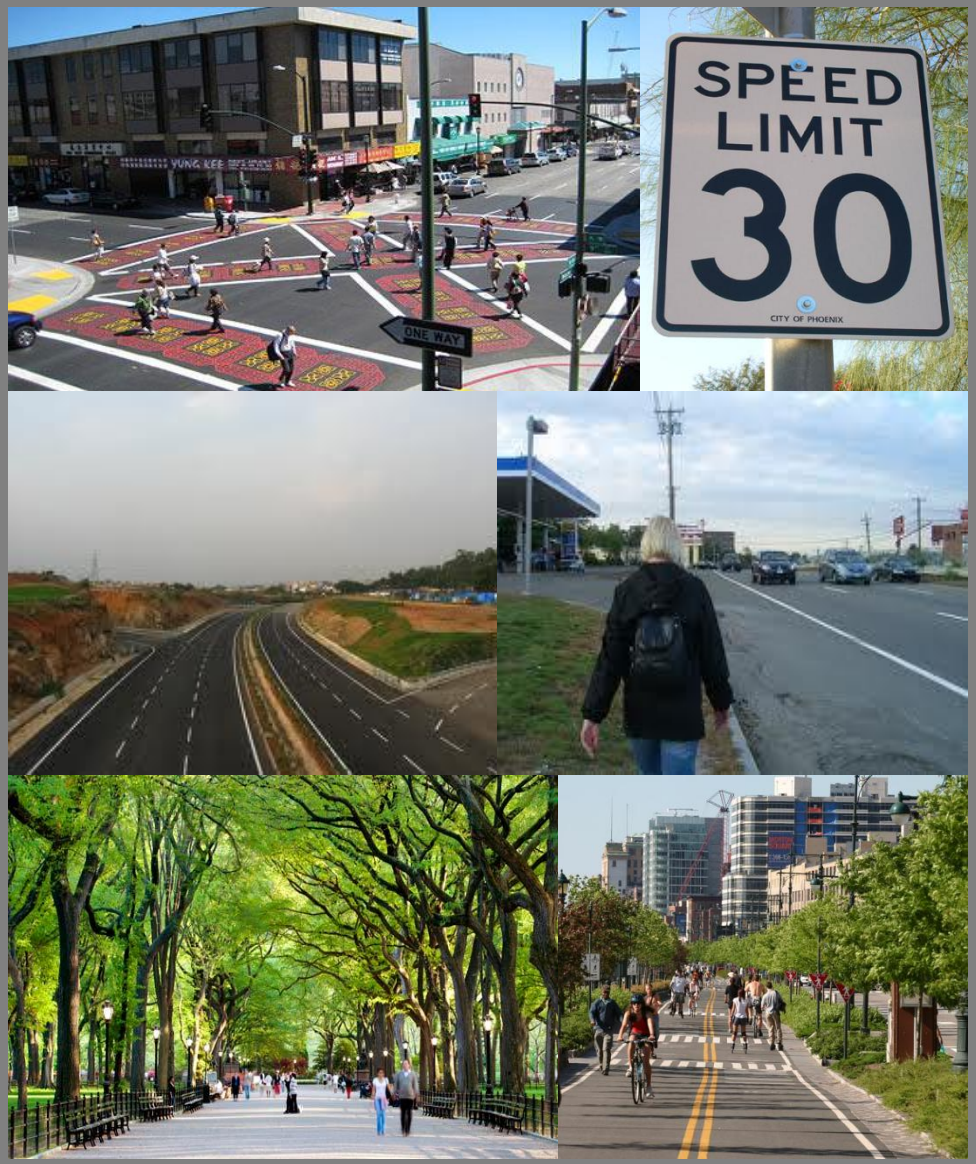
PEDS Data

- Pedestrian sidewalk connections
- Traffic speed limit
- Vehicle lanes
- Safety for walking
- Attractiveness for walking
- Safety for bicycling
- Attractiveness for bicycling



Lee RE, Mama SK, McAlexander KP, Adamus H, Medina AV. Neighborhood factors and physical activity in African American public housing residents. *J Phys Act Health*. 2011 Jan;8 Suppl 1:S83-90.

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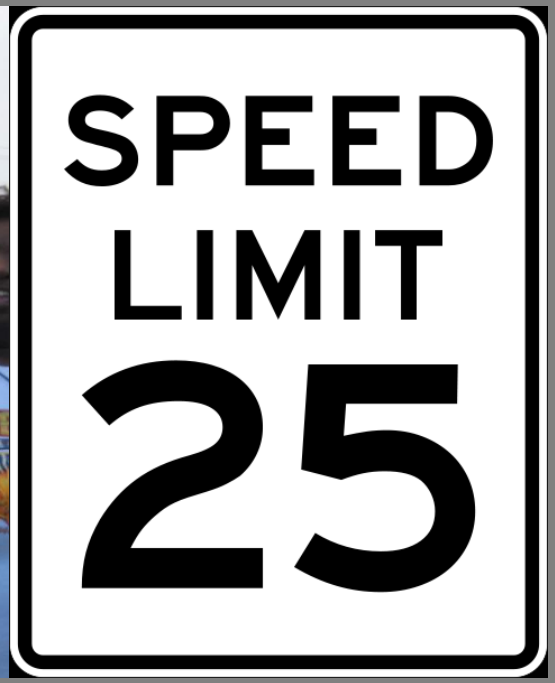
Neighborhood and Physical Activity

Slower posted speed limits associated with more physical activity among low income African Americans living in public housing in Houston



Lee RE, Mama SK, McAlexander KP, Adamus H, Medina AV. Neighborhood factors and physical activity in African American public housing residents. *J Phys Act Health*. 2011 Jan;8 Suppl 1:S83-90.

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Neighborhood Attractiveness

People who live in neighborhoods that are attractive for bicycling tend to do more physical activity

Lee RE, Mama SK, Medina AV, Ho A. Neighborhood Factors Influence Physical Activity Among Community Dwelling African American and Hispanic or Latina Women. Paper presented at the Active Living Research Conference, San Diego, CA, 2011.

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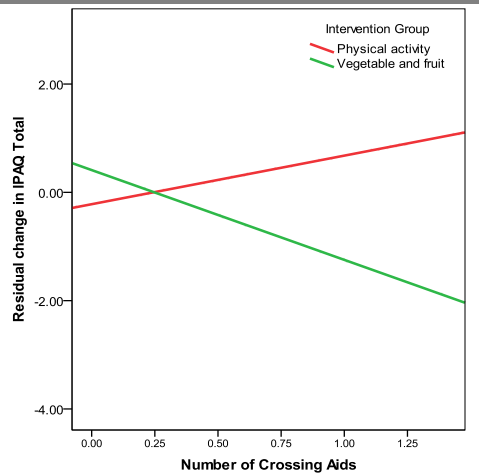
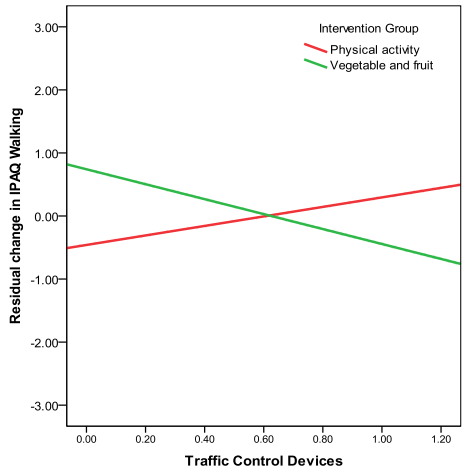
Combining Individual Approaches and Environment?

Women participating in a physical activity intervention who lived in neighborhoods with more crossing aids and traffic control devices increased their physical activity, while those in the comparison did not.





Lee RE, Mama SK, Medina AV, Ho A. Neighborhood Factors Influence Physical Activity Among Community Dwelling African American and Hispanic or Latina Women. Paper presented at the Active Living Research Conference, San Diego, CA, 2011.

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Neighborhood Streets

- Programs to increase physical activity are more effective in supportive neighborhoods
- More supportive neighborhoods can help reduce obesity

Lee RE, Mama SK, Medina AV, Ho A. Neighborhood Factors Influence Physical Activity Among Community Dwelling African American and Hispanic or Latina Women. Paper presented at the Active Living Research Conference, San Diego, CA, 2011.

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Physical Activity Resources

Physical activity opportunities in low socioeconomic status neighbourhoods

Increased availability of neighbourhood physical activity resources can help to promote physical activity among residents, even in very low socioeconomic status neighbourhoods.[1] Residents of low-income, government subsidised, public housing have extremely low rates of physical activity and high rates of obesity, in part driven by lack of neighbourhood physical activity resources.[2–4] Federal and State Policies governing features and amenities in public housing developments themselves can help to ameliorate this situation.[5] Contrasted here are one public housing development in a lower income neighbourhood (top; median household income = $9766) with frequently used physical activity resources located on the housing development property and one public housing development in a higher income neighbourhood (bottom; median household income = $70 833) with no physical activity resources on the property. Despite location in a much lower socioeconomic status neighbourhood, physical activity resources and opportunities for residents are significantly better compared to those in the higher socioeconomic status neighbourhood.

R E Lee,[1] S K Mama,[1,2] J A Banda,[3] L G Bryant,[4] K P McAlexander[1]

[1] Texas Obesity Research Center, Health and Human Performance, University of Houston, Texas, USA; [2] University of Texas School of Public Health, Houston, USA; [3] University of South Carolina, Columbia, USA; [4] University of Texas MD Anderson

Figure 1 Physical activity resources in public housing in lower SES neighbourhoods (top) and higher SES neighbourhoods (bottom).

Lee RE, Mama SK, Banda JA, Bryant LG, McAlexander KP. Physical activity opportunities in low socioeconomic status neighbourhoods. *J Epidemiol Community Health*. 2009 Dec;63(12):1021.

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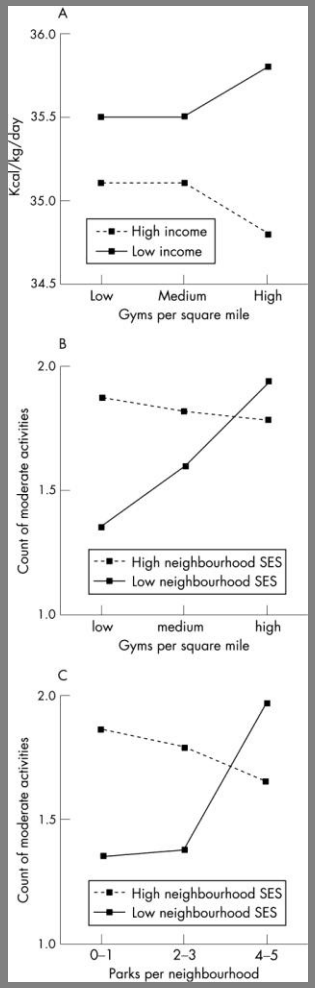
Physical Activity Resources



As gyms per square mile increased, energy expenditure increases for low income, but not for high income women

As gyms and parks per square mile increased in low SES neighborhoods, number of moderate physical activities increased

Lee RE, Cubbin C, Winkleby M. Contribution of neighborhood SES and physical activity resources to physical activity among women. *J Epi Comm Health.* 2007 Oct;61(10):882-90.

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Physical Activity Resources

Physical Activity Resource Assessment (PARA)

Lee RE, Booth KM, Reese-Smith JY, Regan G, Howard HH. The Physical Activity Resource Assessment (PARA) instrument: evaluating features, amenities and incivilities of physical activity resources in urban neighborhoods. *Int J Behav Nutr Phys Act*. 2005. 14;2:13.

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1) **Date** _____ 2) **Data col** _____ 3) **HD/PA Resource ID** _____

4) **Time**
start:_____
stop:_____

5) **Phone Call**
departure:_____
arrival:_____

6) **Type of Resource**
1 fitness club **2** park
3 sport facility **4** trail
5 community center **6** church
7 school
8 combination _____

7) **Approximate Size:** **1** sm **2** med **3** lg

8) **Capacity (indoor)** _____

9) **Cost**
1 Free
2 Pay at the door
3 Pay for only certain programs
4 Other _____

10) **Hours** a) open _____ b) close _____

11) **Signage** – Hours yes ☐ no ☐

12) **Signage** – Rules yes ☐ no ☐

Feature	Rating				Amenity	Rating			
13) Baseball field	0	1	2	3	26) Access Points	0	1	2	3
14) Basketball courts	0	1	2	3	27) Bathrooms	0	1	2	3
15) Soccer field	0	1	2	3	28) Benches	0	1	2	3
16) Bike Rack	0	1	2	3	29) Drinking fountain	0	1	2	3
17) Exercise Stations	0	1	2	3	30) Fountains	0	1	2	3
18) Play equipment	0	1	2	3	31) Landscaping efforts	0	1	2	3
19) Pool > 3 ft deep	0	1	2	3	32) Lighting	0	1	2	3
20) Sandbox	0	1	2	3	33) Picnic tables shaded	0	1	2	3
21) Sidewalk	0	1	2	3	34) Picnic tables no-shade	0	1	2	3
22) Tennis courts	0	1	2	3	35) Shelters	0	1	2	3
23) Trails – running/biking	0	1	2	3	36) Shower/Locker room	0	1	2	3
24) VB courts	0	1	2	3	37) Trash containers	0	1	2	3
25) Wading Pool < 3 ft.	0	1	2	3					

Incivilities	Rating				Incivilities	Rating			
38) Auditory annoyance	0	1	2	3	44) Graffiti/tagging	0	1	2	3
39) Broken glass	0	1	2	3	45) Litter	0	1	2	3
40) Dog refuse	0	1	2	3	46) No grass	0	1	2	3
41) Dogs Unattended	0	1	2	3	47) Overgrown grass	0	1	2	3
42) Evidence of alcohol use	0	1	2	3	48) Sex paraphernalia	0	1	2	3
43) Evidence of substance use	0	1	2	3	49) Vandalism	0	1	2	3

Comments:

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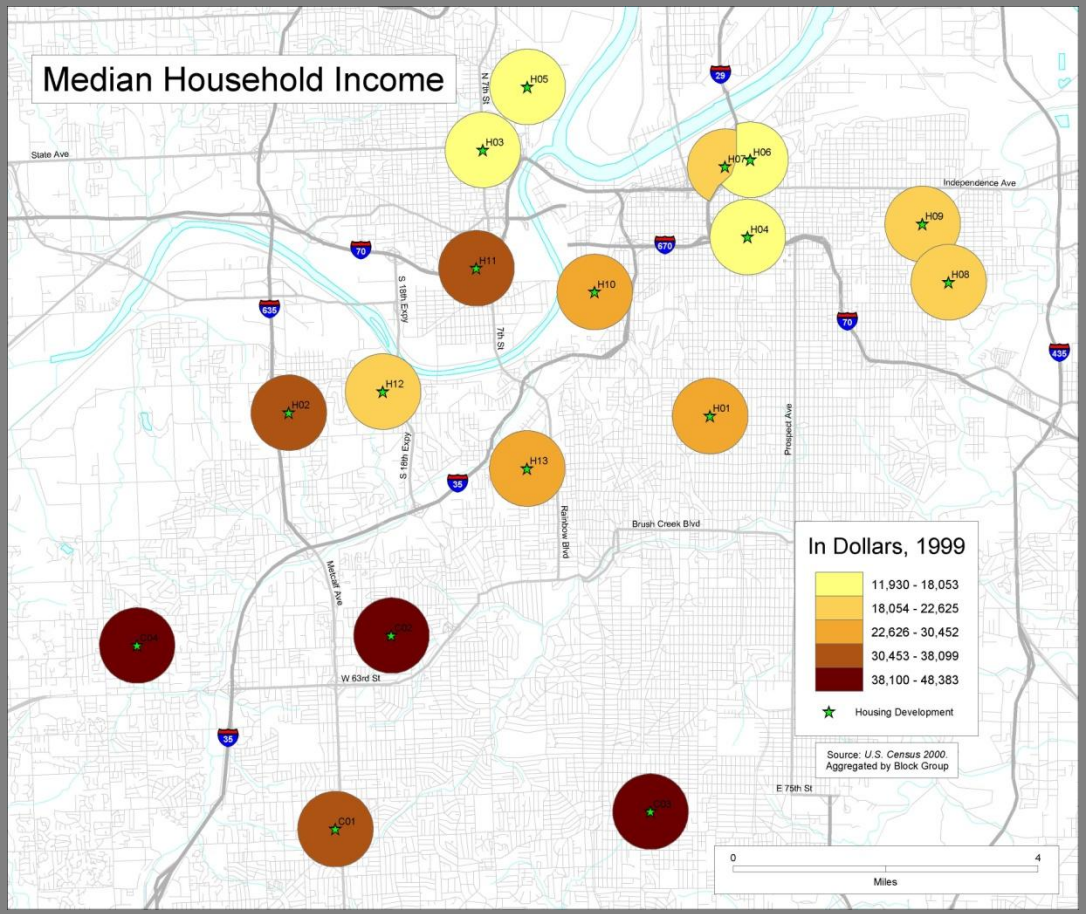
Physical Activity Resources



Lee RE, Booth KM, Reese-Smith JY, Regan G, Howard HH. The Physical Activity Resource Assessment (PARA) instrument: evaluating features, amenities and incivilities of physical activity resources in urban neighborhoods. *Int J Behav Nutr Phys Act*. 2005. 14;2:13.

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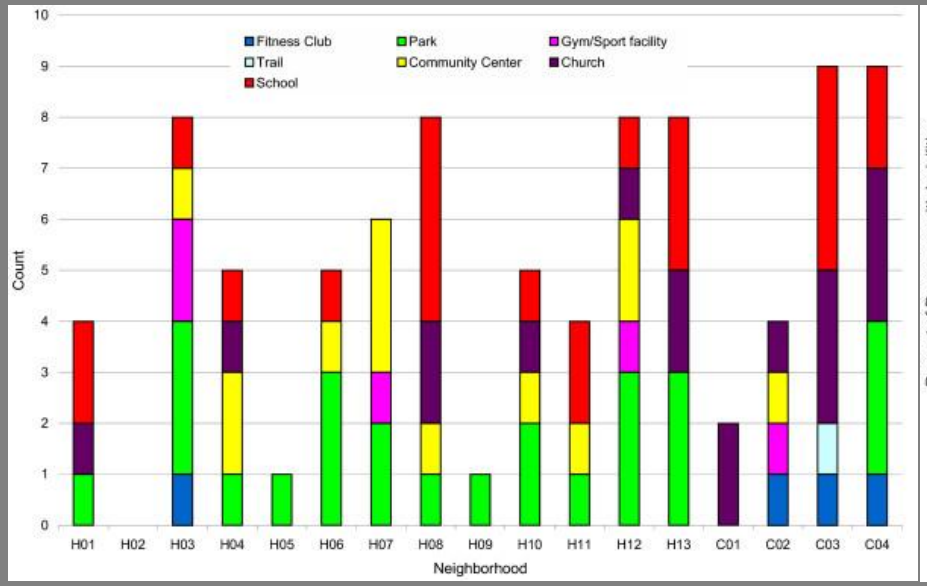

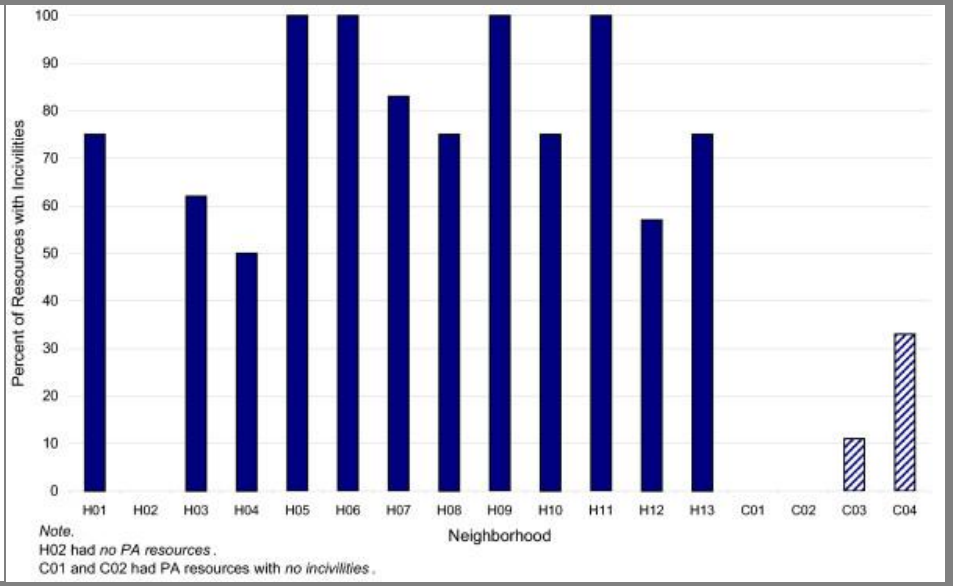

- Most common resources were parks, schools, community resources
- Wide variability in resource availability
- Many, many more incivilities in low SES neighborhoods

Lee RE, Booth KM, Reese-Smith JY, Regan G, Howard HH. The Physical Activity Resource Assessment (PARA) instrument: evaluating features, amenities and incivilities of physical activity resources in urban neighborhoods. *Int J Behav Nutr Phys Act*. 2005. 14;2:13.

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Physical Activity Resources

- More physical activity resources of better quality may increase likelihood of meeting physical activity recommendations.
- The greater the amenities and fewer the incivilities in the local physical activity resources, the lower the prevalence of obesity among residents.

McAlexander KM, Banda JA, McAlexander JW, Lee RE. Physical activity resource attributes and obesity in low-income African Americans. J Urban Health. 2009 Sep;86(5):696-707.

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Food Environment

- Food Stores Assessment (FSA)
- Restaurant Assessment Tool (RAT)

Food Store Assessment

1) Date _____ 2) Data Coll. ____ 3) Store # _____ 4) Open 24 hrs?___

5) **Store Type** *(circle)* 1 supermarket 2 grocery 3 convenience 4 liquor/convenience 5 pharmacy 6 other (video)

Store Appearance *(circle all that apply)* 6) trash outside 7) dirt on floors 8) dirt elsewhere 9) foul odors 10) workers unclean

Vending Machines – Exterior
11) Drinks a) # __ b) Rating: 1 2 3
12) Food a) # __ b) Rating: 1 2 3

Vending Machines – Interior
13) Drinks a) # ___ b) Rating: 1 2 3
14) Food a) # ___ b) Rating: 1 2 3

Food-related Ad Features - For the numbered Sign and Vending Machine categories, list the number of each which advertises/contains brands below:

	a) Coke	b) Pepsi	c) Frito	d) Mars	e) Nab.	f) Nest	g) Tom	h) Wrig	i) Host	j) **** Other
15) Signs <3ft. ext.										
16) Bilingual ext.										
17) Signs <3 ft. int.										
18) Bilingual interior										
19) Sev Signs/Same										
20) >Piece of paper										
21) ≤Piece of paper										
22) Display by cntr.										
23) Vend. Drink ext.										
24) Vend. Food ext.										
25) Vend. Drink int.										
26) Vend. Food int.										

**** **i) Other** (above): Enter # from above 24) -33), and write in Brand(s).
#: ___) Brand(s)

Food Product	a) Sale? (Y = 1)	b) Rating			c) Cost/Unit
27) Salad/lettuce (dark)	1	1	2	3	/lb.
28) Green Beans	1	1	2	3	/lb.
29) Carrots	1	1	2	3	/lb.
30) Greens	1	1	2	3	/lb.
31) Sweet Potatoes	1	1	2	3	/lb.
32) Apple	1	1	2	3	apc.
33) Orange	1	1	2	3	apc.
34) Banana	1	1	2	3	apc.
35) Milk-Lowfat	1	1 = Outdated			½ gal.
36) Milk-Nonfat	1	1 = Outdated			½ gal.
37) Milk-Soy (plain)	1	1 = Outdated			½ gal.
38) Eggs	1	1 = Outdated			/doz.
39) Whole Wheat Bread	1	1 = Outdated			/loaf
40) Ground Beef (lean)	1	1 = Outdated			/lb.
41) Skinless Chicken Breast	1	1 = Outdated			/lb.
42) Canned Tuna in Water	1	----------			/6 oz.
43) Frozen (Light) Meal	1	----------			1 pkg
44) Vanilla Froz. Yogurt	1	----------			/pt
45) Cereal-Cheerios (pln)	1	----------			10 oz.
46) Cereal-Fruit Loops	1	----------			10 oz.
47) Bottled Water (lowest)	1	----------			1Liter
48) Unsweetened Juice	1	----------			2 qt
49) Cola	1	----------			1 Liter
50) Potato Chips (Plain Flavor)	1	----------			13 ½ oz.
51) M & M's (Plain)	1	----------			3.27 oz.

Comments:

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Lee RE, Heinrich KM, Medina AV, Regan GR, Reese-Smith JY, Jokura Y, Maddock JE. A picture of the healthful food environment in two diverse urban cities. *Environ Health Insights.* 2010; 4: 49–60.

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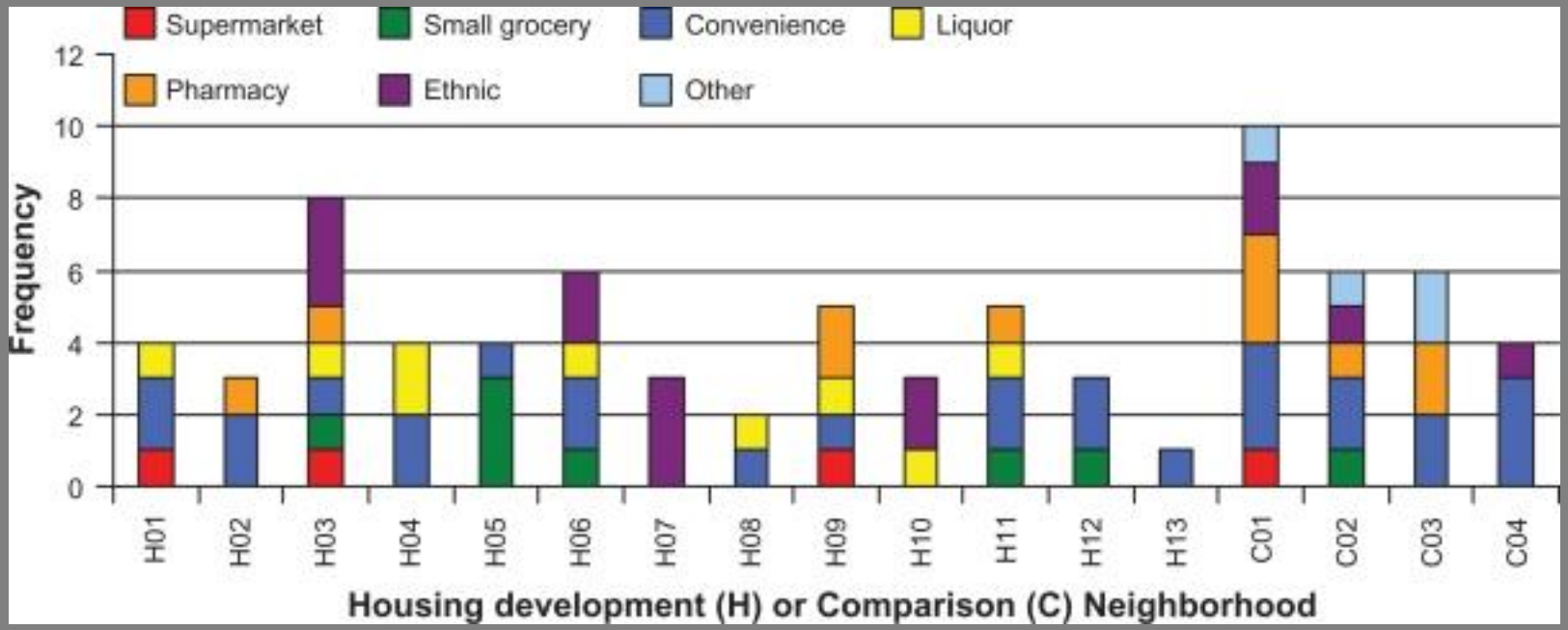
Store Types in Low SES Neighborhoods



Most commonly available stores were convenience and liquor stores

Lee RE, Heinrich KM, Medina AV, Regan GR, Reese-Smith JY, Jokura Y, Maddock JE. A picture of the healthful food environment in two diverse urban cities. *Environ Health Insights.* 2010; 4: 49–60.

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Store Types in Low SES Neighborhoods

Convenience stores and liquor stores sell convenience foods

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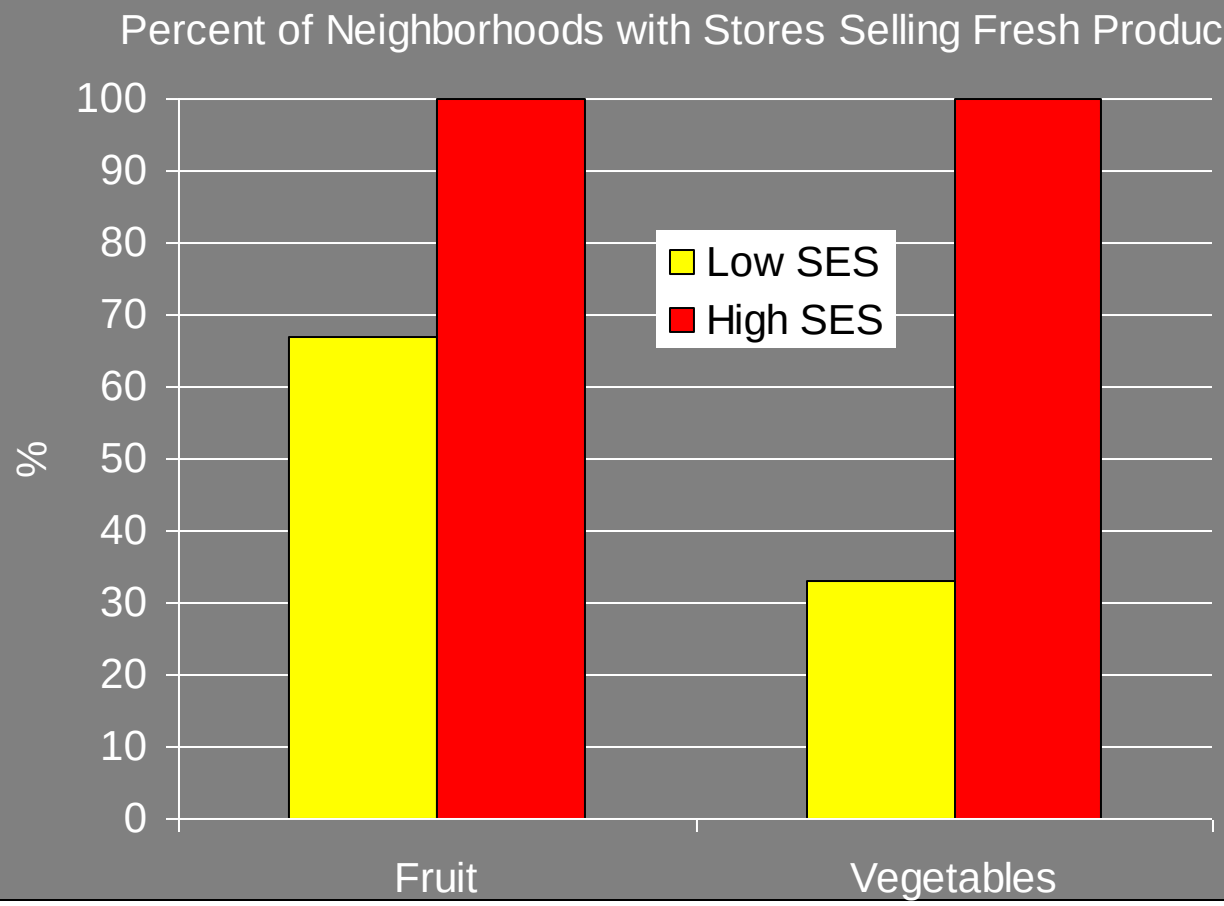
Stores and Fresh Produce



Most lower SES neighborhoods had only one store that sold fresh produce

Lee RE, Heinrich KM, Medina AV, Regan GR, Reese-Smith JY, Jokura Y, Maddock JE., 201Lee RE, Heinrich KM, Medina AV, Regan GR, Reese-Smith JY, Jokura Y, Maddock JE. A picture of the healthful food environment in two diverse urban cities. *Environ Health Insights*. 2010; 4: 49–60.

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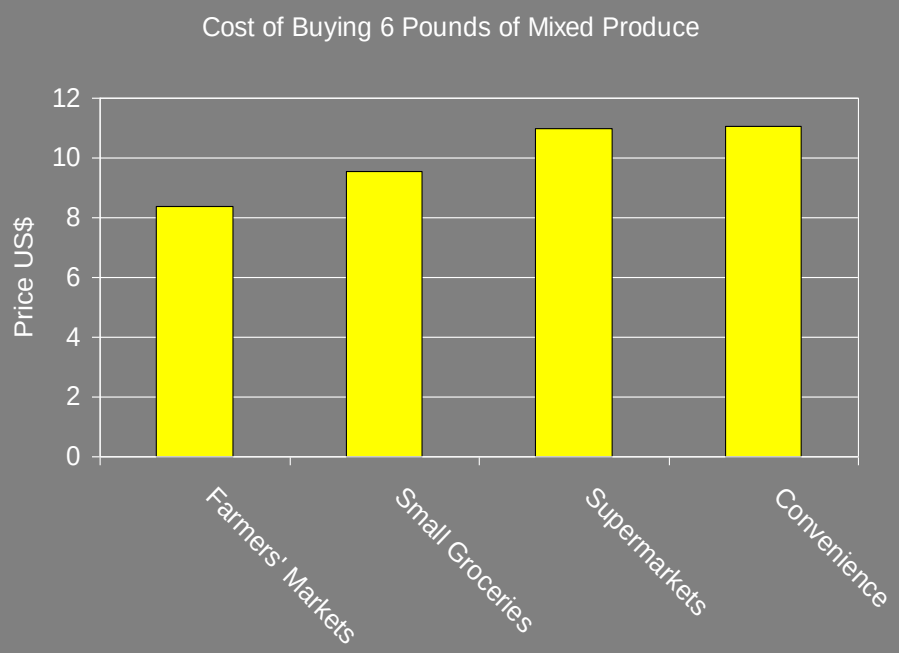
Price of Products



- Cost of buying one pound each of apples, carrots, green peppers, onions, oranges, and tomatoes
- 32% more expensive to shop at convenience stores compared to farmers markets

Lee RE, Heinrich KM, Medina AV, Regan GR, Reese-Smith JY, Jokura Y, Maddock JE., 201Lee RE, Heinrich KM, Medina AV, Regan GR, Reese-Smith JY, Jokura Y, Maddock JE. A picture of the healthful food environment in two diverse urban cities. *Environ Health Insights*. 2010; 4: 49–60.

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Retail Point of Purchase

- Supermarkets and farmers markets increase access to fruits and vegetables
- Challenging to maintain healthful dietary habits depending on neighborhood of residence

Lee RE, Heinrich KM, Medina AV, Regan GR, Reese-Smith JY, Jokura Y, Maddock JE., 201Lee RE, Heinrich KM, Medina AV, Regan GR, Reese-Smith JY, Jokura Y, Maddock JE. A picture of the healthful food environment in two diverse urban cities. *Environ Health Insights*. 2010; 4: 49–60.

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Outline

- Ecologic Model of Obesity
- Case 1. Neighborhood
- Case 2. Physical Activity Resources
- Case 3. Food Environment
- Conclusions

Obesogenic Neighborhoods?

- Obesogenic refers to something that fosters obesity
- Many neighborhoods, particularly in low SES areas, obesogenic
- People who reside in deprived neighborhoods often report less physical activity and poorer dietary habits and greater obesity
- Context is important for determining behavior, health and supporting individually targeted obesity control efforts

What can we do?

- Larger, more representative and longitudinal studies
- Better coordination between practitioner recommendations and neighborhood realities
- Policy changes that foster health promoting neighborhoods
- Relatively simple changes can make a lifetime of difference

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Questions?

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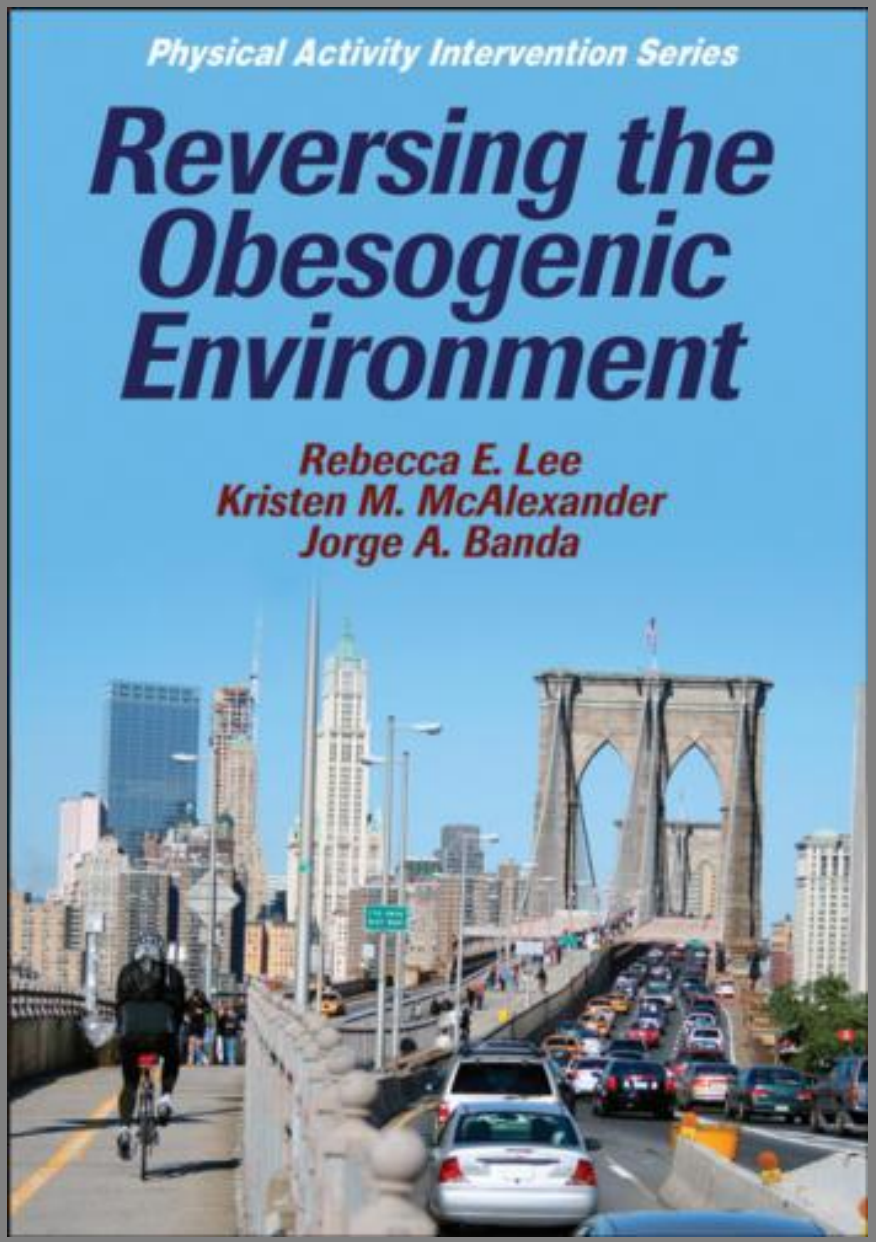

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