

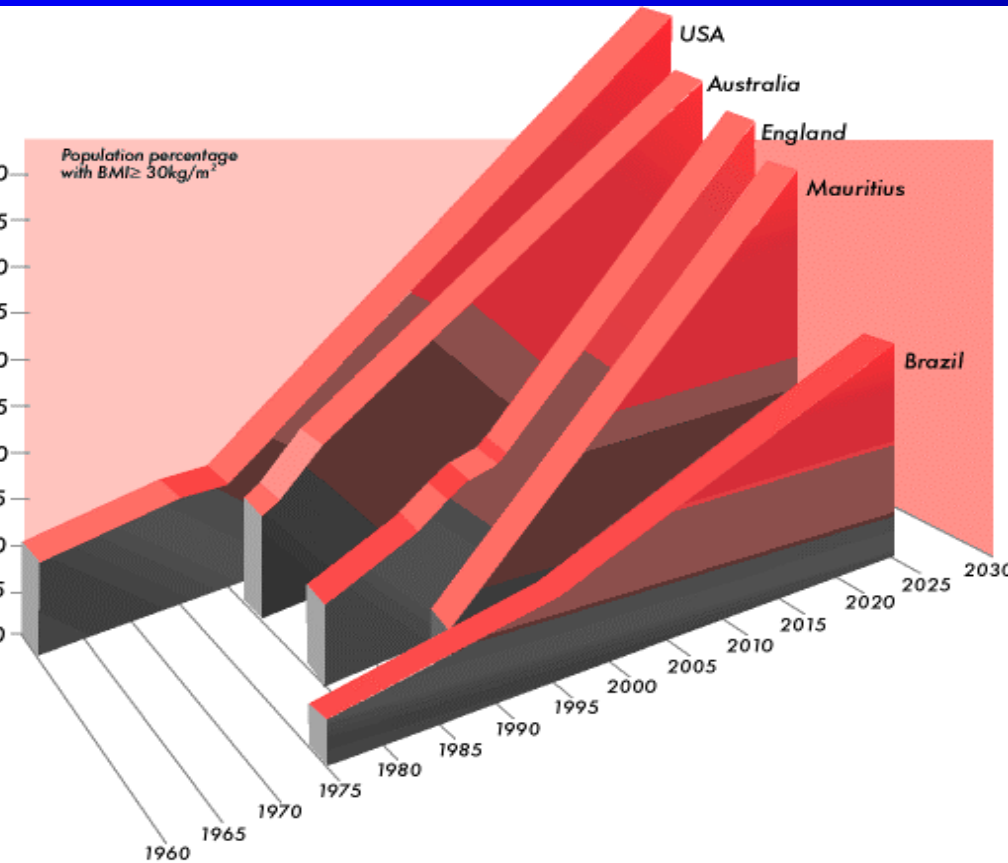


Childhood Overweight/Obesity and the Built Environment

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Mid America Heart Institute and
University of Missouri-Kansas City

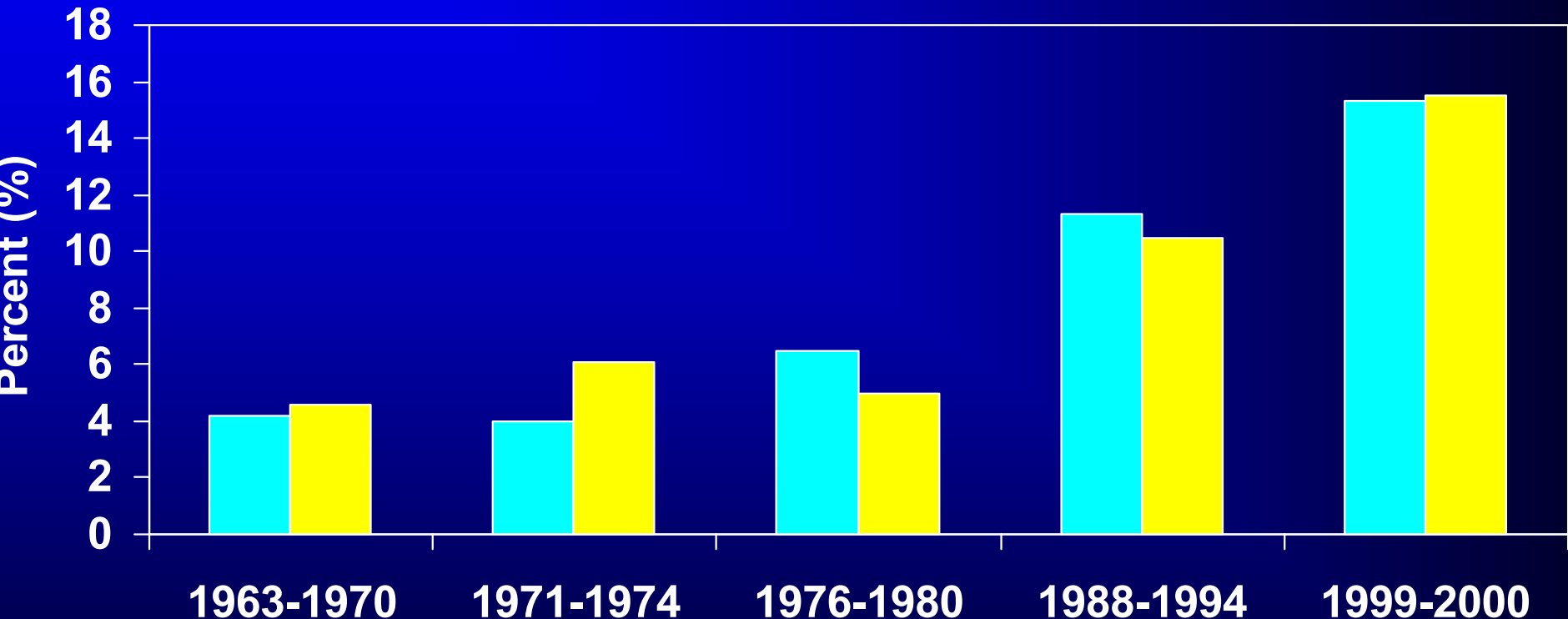
The Global Obesity Epidemic



- ↑ risk of morbidity and mortality
400,000 deaths per year
- ↑ health costs to patient and health care system > \$100 billion
- ↑ absentee rates and employer costs
- Discrimination: social, workplace
- SES disparity: Poor and minorities shoulder greater obesity burden

Prevalence of Overweight Children and Adolescents in the United States

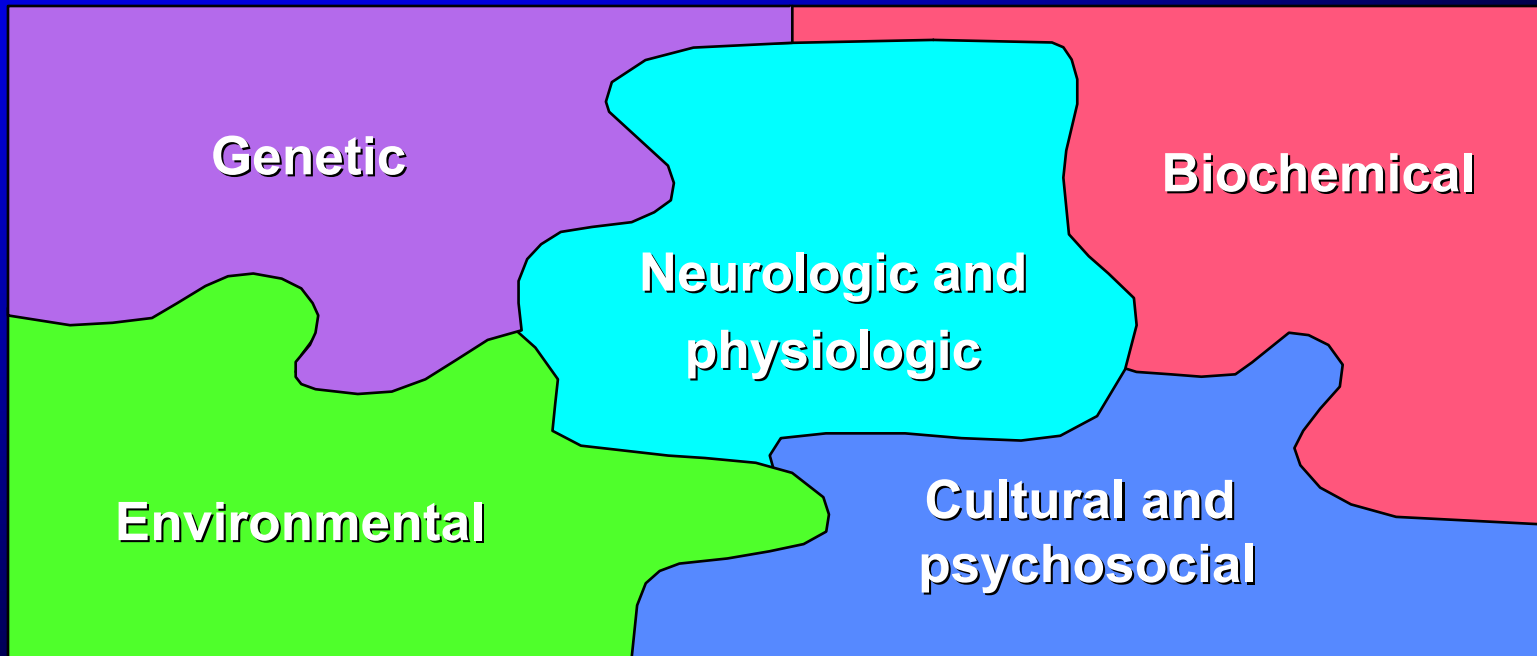
■ 6-11 years of age ■ 12-19 years of age



Centers for Disease Control and Prevention, National Center for Health Statistics, National Health Statistics, National Health and Nutrition Examination Survey, Hispanic Health and Nutrition Examination Survey (1982-84), and National Health Examination Survey (1963-65 and 1966-70).

Etiology of Obesity: Complex Interrelated Factors

- The ideal approach to obesity control will address all factors



¹Thomas PR, ed. *Weighing the Options*. Wash DC: Natl Acad Press; 1995:2.

²Williamson DF. *N Engl J Med*. 1999;341:1140.

³Koplan JP, Dietz WH. *JAMA*. 1999;282:1579.

Obesity is an Environmental Issue

(Poston & Foreyt, 1999, *Atherosclerosis*)

- Obesity is a relatively recent public health concern
- Obesity is virtually nonexistent among hunter-gatherers
- Populations that transition to “westernized lifestyles” experience significant and predictable increases in risk for the “diseases of civilization”

The “Toxic Environment”

- Increased food intake
 - Portion size
 - Macronutrient composition

- Decreased Physical Activity
 - Technology
 - Work and family

THE NATION'S NEWSPAPER

USA TODAY

NO. 1 IN THE USA . . . FIRST IN DAILY READERS

STUFFING OF USA

Why fast food is getting bigger



What's the answer? Colorful-sized fast food for all the '80s now.

COVER STORY

Portion sizes and fat content 'out of control'

'Consumers talk a good story but buy the nastiest products they can find'

By Bruce Thomas
USA TODAY

Things are getting scary out in the fast-food jungle. Not just the competition. The food, too. Especially the food.

► It's full of fat. A Triple Decker pizza at Pizza Hut has more fat coating between its layers than a stick-and-a-half of butter.

► It's loaded with calories. A Double Gulp drink at Tallboys — which otherwise with the equivalent of 3.3 cans of cola — can have more calories than three Hershey bars.

► It's gargantuan. A Movie Meal at Del Taco Mexican fast-food chain weighs almost 4 pounds — a tad more than the Manhattan White House.

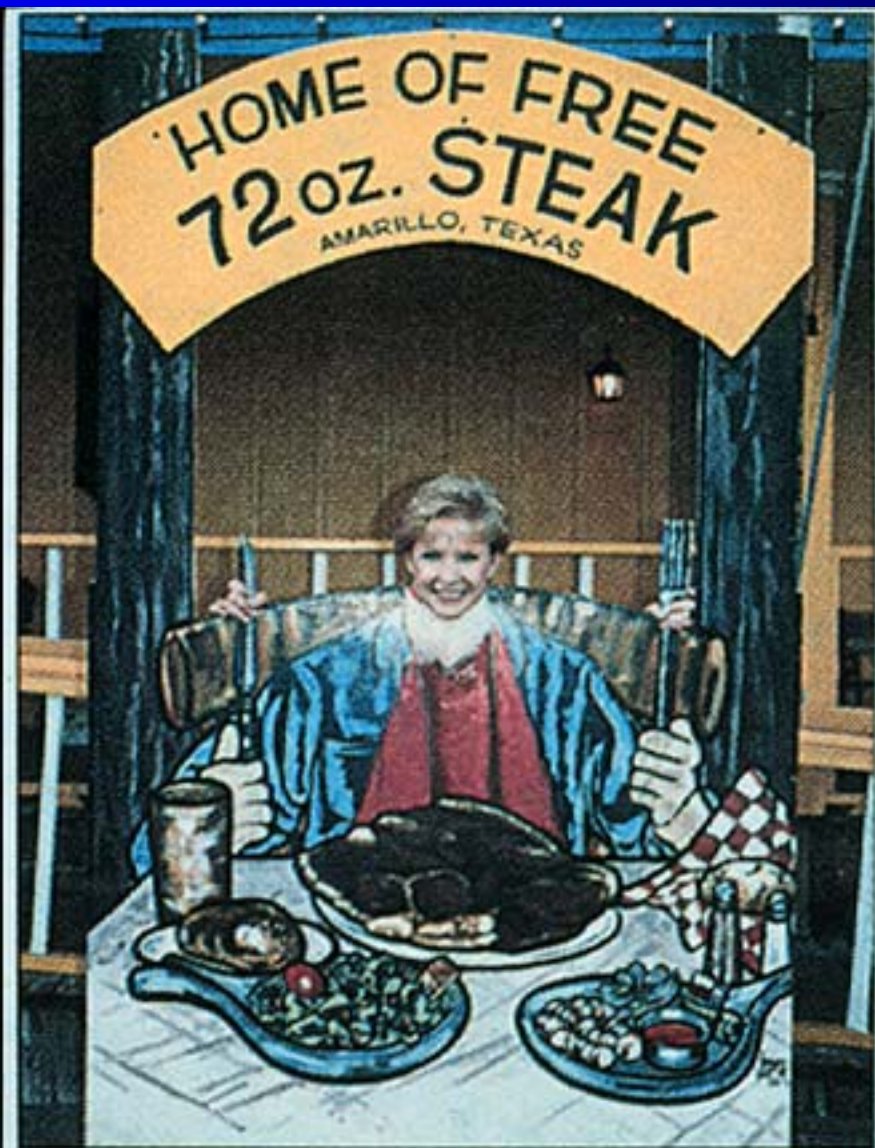
Make you wanna order two, doesn't it? We are expanding our way into a frightening new world of fast-food dining. And there's no turning back. By one estimate, nearly 25% of the \$97 billion consumers spent on fast food last year went for items promoted as the best of large or size of extra — often including — ingredients.

"Consumers talk a good story about wanting to eat healthy," says fast-food consultant Bob Sirodelman, "but when they go out for fast food they buy the nastiest products they can find."

Fast-food sales will likely rise 6% this year to more than \$183 billion, thanks in large part to bigger, nastier products that are luring repeat business, says Ron Paul, president of Technomic, a restaurant research firm. "If you build it, they will come," he quips.

Americans begin to feel far less squeamish about eating gargantuan portions of fast food three years ago when news-

Please see COVER STORY next page ►



At the Big Texan, a 72-ounce steak is free to anyone who eats it in an hour.

The Morning Commute: Then



**300 Calories Per
Hour**

The Morning Commute: Now



**< 25 Calories Per
Hour**

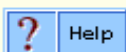


What is the Built Environment?

- The built environment has been defined as comprising urban design, land use, transportation systems, and patterns of human activity (Handy et al., 2002)
 - Land Use (industrial or residential)
 - Buildings (housing, schools, workplaces)
 - Public Resources (parks, museums)
 - Zoning Regulations
 - Transportation Systems
- What is the body of evidence with respect to the built environment and childhood obesity?

Ovid MEDLINE(R)

<1966 to April Week 1 2004>



Search History	Results	Display
Body Mass Index/ or Body Weight/ or Obesity/ or overweight.mp. or Adipose Tissue/	196240	Display
children.mp. or Child/	981509	Display
childhood.mp.	79246	Display
2 or 3	999638	Display
1 and 4	19703	Display
Health Facility Environment/ or Environment Design/ or City Planning/ or built environment.mp. or "Facility Design and Construction"/	8941	Display
5 and 6	2	Display

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- Bioethics
- Cancer
- Complementary Medicine
- History of Medicine
- Space Life Sciences

Studies Examining the Built Environment and Obesity in Adults

■ Adults

● Indirect Measures of the Built Environment

- ◆ Ellaway A, Anderson A, Macintyre S. Does area of residence affect body size and shape? *Int J Obes Relat Metab Disord*. Apr 1997;21(4):304-308.
- ◆ van Lenthe FJ, Mackenbach JP. Neighborhood deprivation and overweight: the GLOBE study. *Int J Obes Relat Metab Disord* 2002; 26:234-240.
- ◆ Cubbin C, Hadden WC, Winkleby MA. Neighborhood context and cardiovascular disease risk factors: the contribution of material deprivation. *Ethn Dis* 2001;11:687-700.
- ◆ Lee RE, Cubbin C. Neighborhood context and youth cardiovascular health behaviors. *Am J Public Health* 2002;92:428-436.

Studies Examining the Built Environment and Obesity in Adults

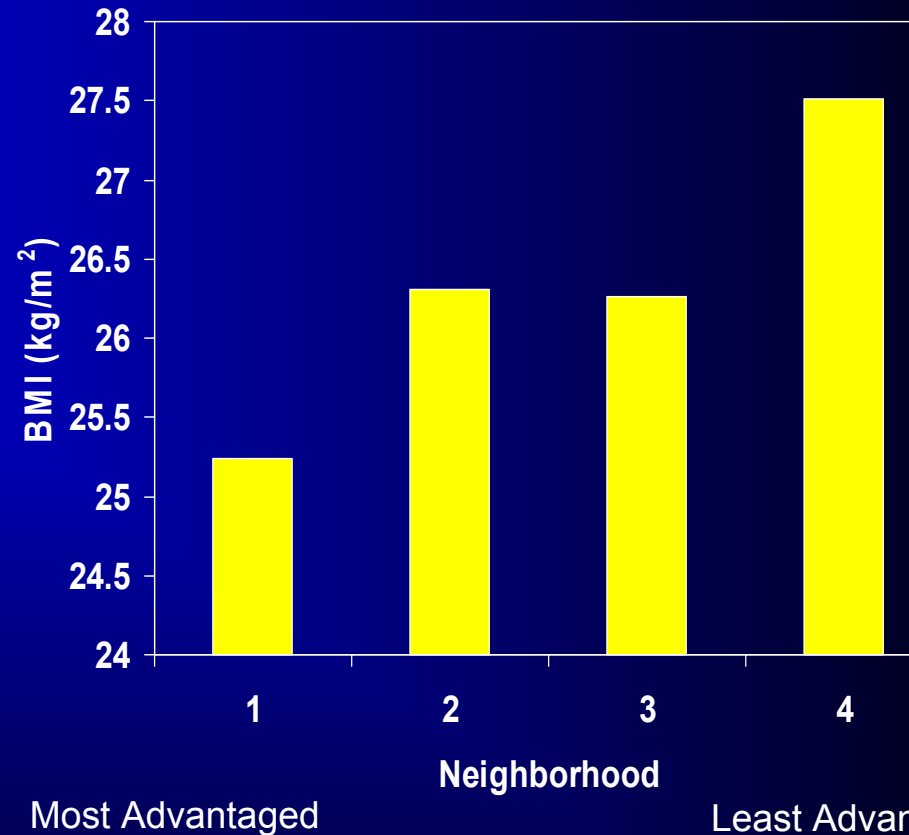
■ Adults

- Includes Direct Measures of the Built Environment

- ◆ Saelens BE, Sallis JF, Black JB, Chen D. Neighborhood-based differences in physical activity: an environment scale evaluation. *Am J Public Health* 2003;93:1552-1558.
- ◆ Giles-Corti B, Macintyre S, Clarkson JP, Pikora T, Donovan RJ. Environmental and lifestyle factors associated with overweight and obesity in Perth, Australia. *Am J Health Promotion* 2003;18:93-102.
- ◆ Poston, W.S.C., Haddock, C.K., Hughey, J., Dill, P.L., Taylor, J.E., Ahluwalia, H.K., Bowles, D., Eaton, P., Ahluwalia, J.S., & Foreyt, J.P. (April, 2002). Obesity and the environment: A tale of two Kansas Cities. Presentation at the Society of Behavioral Medicine's Twenty-Third Annual Scientific Sessions, Washington, D.C. (Rapid Submission).
- ◆ Frank LD, Andresen MA, Schmid TL. Obesity relationships with community designs, physical activity, and time spent in cars. *Am J Prev Med* In press.
- ◆ Ewing R, Schmid T, Killingsworth R, Zlot A, Raudenbush S. Relationship between urban sprawl and physical activity, obesity, and morbidity. *Am J Health Promotion* 2003;18:47-57.
- ◆ Morland K, Wing S, Diez Roux A, Poole C. Neighborhood characteristics associated with the location of food stores and food service places. *Am J Prev Med* 2002;22(1):23-29.

Ellaway et al. (1997)

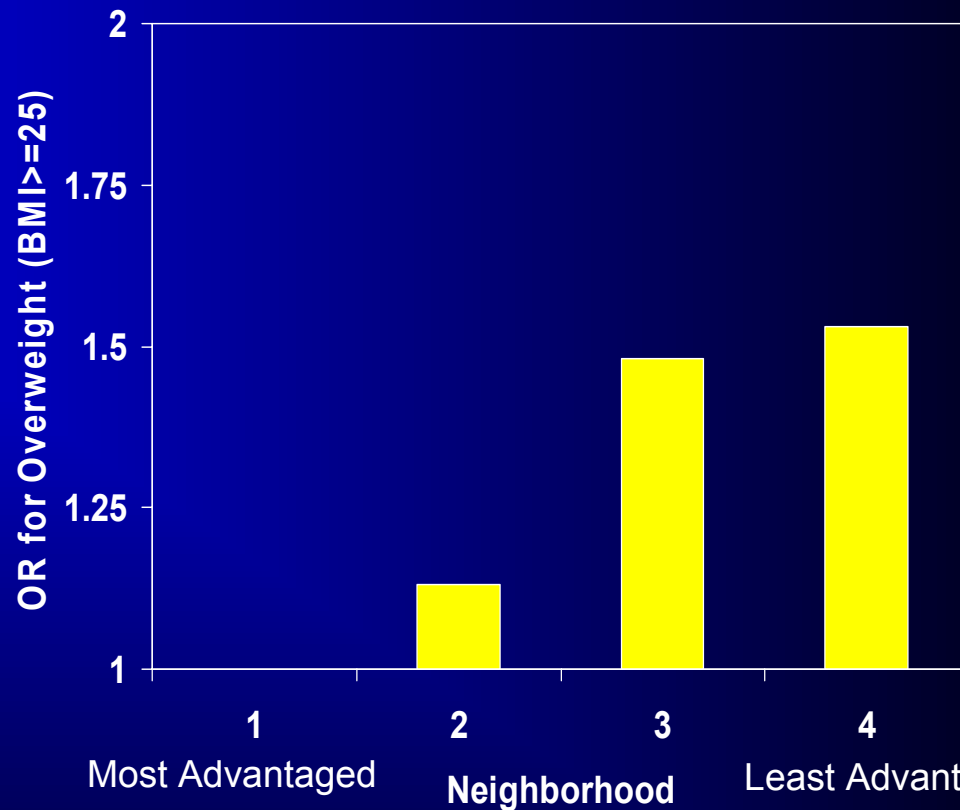
- Environments stratified by SES indicators may have differential impacts on obesity prevalence
- Four neighborhoods stratified by material deprivation (an index of social class, unemployment, car ownership, and crowding) were examined
- Residents (N=691) were assessed by interview (actual weight and height, wc, and whr)



van Lenthe et al., 2002

Neighborhoods were ranked based on: (1) the percentage of subjects with primary school as highest attained educational level per neighborhood; (2) the percentage of subjects in occupational class V (unskilled manual workers) per neighborhood; and (3) the percentage of unemployed subjects per neighborhood

- 8,897 adult participants were assessed by questionnaire (self-reported heights and weights)

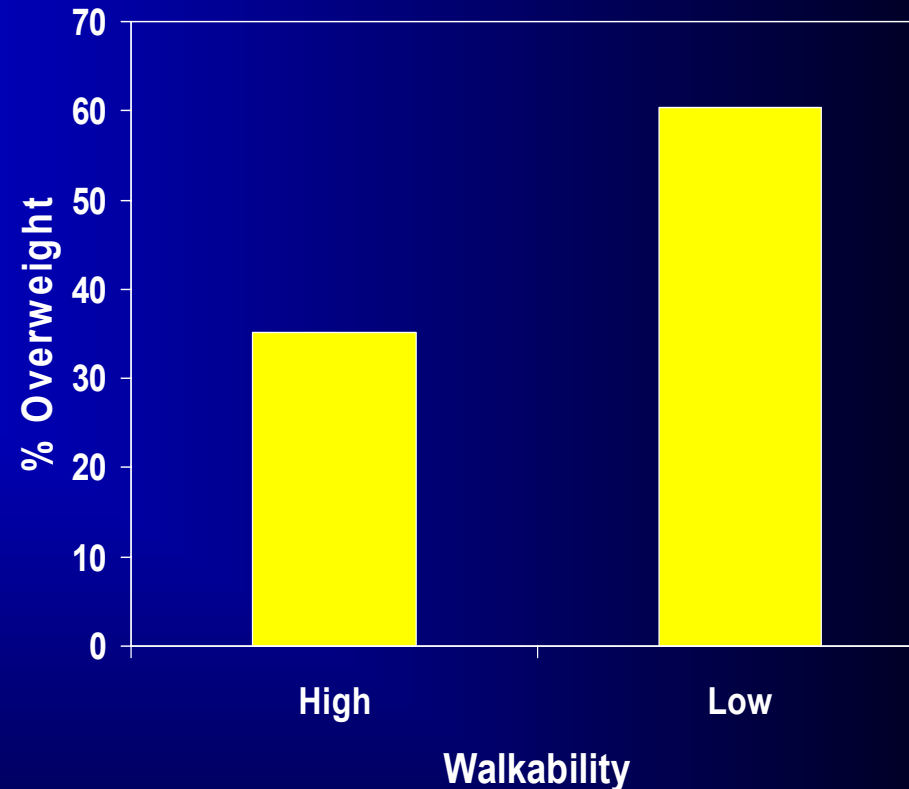


Other Adult Studies with Indirect Measures

- Similar results were demonstrated by
 - Cubbin C, Hadden WC, Winkleby MA. Neighborhood context and cardiovascular disease risk factors: the contribution of material deprivation. *Ethn Dis* 2001;11:687-700.
 - ◆ **Neighborhood deprivation associated with increased BMI in among African American women**
 - Lee RE, Cubbin C. Neighborhood context and youth cardiovascular health behaviors. *Am J Public Health* 2002;92:428-436.
 - ◆ **Low neighborhood SES associated with health behaviors leading to obesity (i.e., poor dietary habits)**

Saelens et al., (2003)

- Cross-sectional study of two neighborhoods stratified by “walkability” were evaluated
- Walkability was defined as a function of residential density, mixed land use, and street connectivity
- Adult residents (N=107) were assessed by telephone interview (self-reported weight and height)
- Residents in the high walkability neighborhood had lower BMIs (25.4 vs. 27.3, $p=ns$)



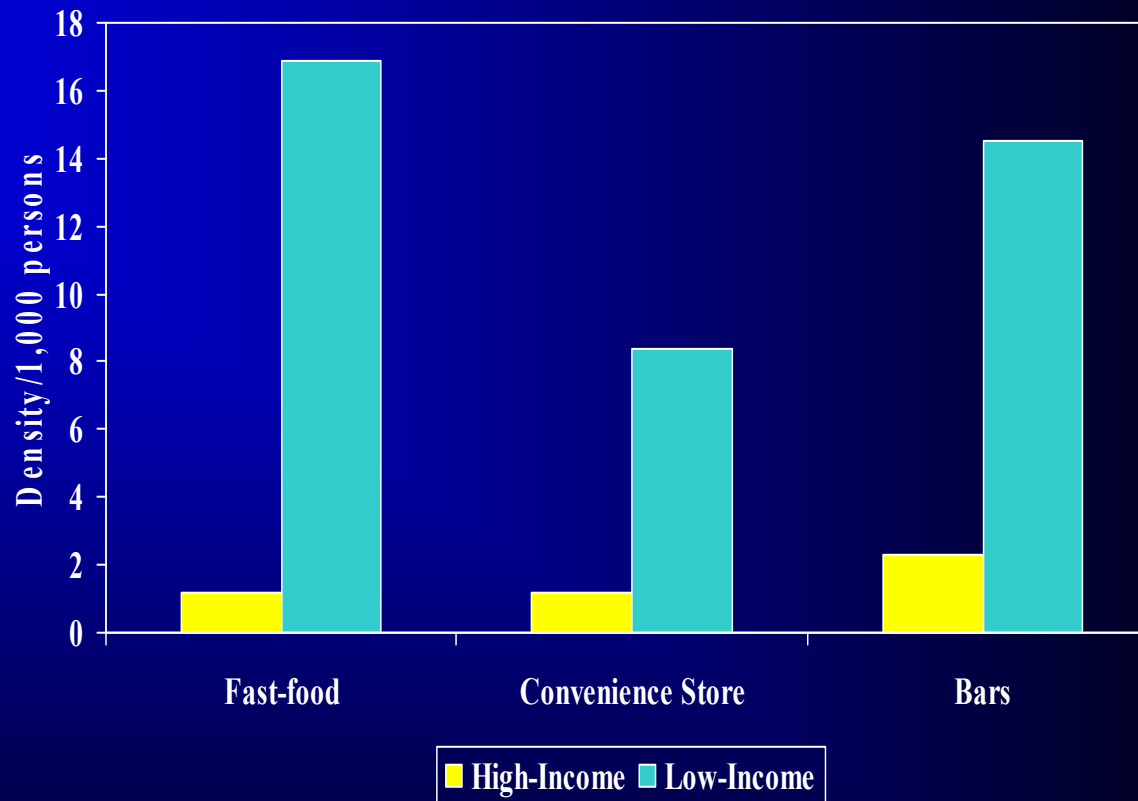
Giles-Corti et al., (2003)

- A cross-sectional survey and environmental scan of Perth, Australia
- Participants were healthy adults who were surveyed (N=1803) (self-reported weight and height)
- Study examined both direct and indirect measures of the built environment
- After controlling for all variables in model (including BE), area SES was not associated with overweight or obesity

BE Characteristics	Overweight Risk	Obesity Risk
<u>Type of Street</u>		
-Cul-de-sac	1.00	1.00
-Highway	4.24	1.24 (ns)
<u>Sidewalks</u>		
-Both sides	1.00	1.00
-None	1.40	1.69 (ns)

Density of Environmental Factors Contributing to a “Toxic” Obesity Environment*

- A cross-sectional survey of low- and high- median income block groups
- We surveyed 3,550 parcels (2,333 homes) in the low-income block-group and 1,450 (1,282 homes) in the high-income block-group and 117 household, examining both direct and indirect measures of the built environment
- Obesity prevalence, after direct standardization was 19.3% and 34.6% in high vs. low income block groups



*Poston, W.S.C., et al.. (April, 2002). Obesity and the environment: A tale of two Kansas Cities. Presentation at the Society of Behavioral Medicine's Twenty-Third Annual Scientific Sessions

Frank et al., (In Press)

- A cross-sectional survey of metropolitan Atlanta (SMARTRAQ Study)
- Participants were healthy adults who were surveyed (N=10,898) (self-reported weight and height)
- Direct measures of the built environment included street network, census, regional land use, and county level Tax Assessor's data
- LR used to evaluate risk of $BMI \geq 30$

<u>BE Characteristics</u>	Obesity Risk
Land use mix	0.878
Connectivity	NS
Net residential density	NS
<u>Demographics</u>	
Age	1.012
Education	0.923
Income	0.945
Black Male	1.36
Black Female	1.45
White Female	0.418

Other Adult Studies with Direct Measures

- Ewing R, Schmid T, Killingsworth R, Zlot A, Raudenbush S. Relationship between urban sprawl and physical activity, obesity, and morbidity. *Am J Health Promotion* 2003;18:47-57.
 - A country sprawl index (i.e., density, land use mix, centering, and street accessibility) was associated in a cross-sectional study with BMI (i.e., less sprawl resulting in greater BMI and obesity using self-reported height and weight), obesity prevalence, and minutes walked

Other Adult Studies with Direct Measures

- **Morland K, Wing S, Diez Roux A, Poole C.**
Neighborhood characteristics associated with the location of food stores and food service places. *Am J Prev Med* 2002;22(1):23-29.
 - **Did not assess obesity or weight.**
 - **Found neighborhood SES differences in the distribution of food service and sales providers**
 - ◆ Fewer bars/taverns in wealthier vs. low-income areas
 - ◆ More supermarkets in wealthier vs. low-income areas

Studies Examining the Built Environment and Obesity in Children

■ Children

● Only Indirect Measures of the Built Environment

- ◆ Kinra S, Nelder RP, Lewendon GJ. Deprivation and childhood obesity: A cross-sectional study of 20,973 children in Plymouth, United Kingdom. *J Epidemiol Community Health* 2000;54:456-460.

● Includes Direct Measures of the Built Environment

- ◆ Burdette HL, Whitaker RC. Neighborhood playgrounds, fast food restaurants, and crime: relationships to overweight in low-income preschool children. *Prev Med* 2003; 38:57-63.
- ◆ Edmonds J, Baranowski T, Baranowski J, Cullen KW, Myres D. Ecological and socioeconomic correlates of fruit, juice, and vegetable consumption among African-American boys. *Prev Med* 2001;32:476-481.

Kinra et al. (2000)

- A cross-sectional study of childhood obesity and area SES
- Children (N=20,973) were surveyed (actual weights and heights)
- Greater material deprivation, using census derived data, was associated with greater obesity risk

Table 3 Crude and age adjusted odds ratio for obesity by Townsend score quarters: boys and girls

<i>Townsend score</i>	<i>Crude OR</i>	<i>Age adjusted†</i>		
		<i>OR</i>	<i>95% CI</i>	<i>p value</i>
<i>Boys</i>				
1	1	1		
2	1.13	1.12	0.87 to 1.45	0.374
3	1.40	1.39	1.08 to 1.77	0.010
4	1.29	1.29	1.00 to 1.65	0.049
<i>Girls</i>				
1	1	1		
2	1.13	1.14	0.88 to 1.49	0.319
3	1.11	1.10	0.84 to 1.43	0.478
4	1.39	1.39	1.08 to 1.80	0.011

*1=least deprived quarter, 4=most deprived quarter. †Test for trend: boys (p=0.017), girls (p=0.018).

Burdette et al. (2004)

- A cross-sectional study of childhood obesity and direct measures of environmental obesity risk factors (e.g., playgrounds and fast food restaurants)
- Children (N=7,020) were surveyed (actual weights and heights)
- Childhood overweight was not associated with proximity to playgrounds or fast food

Mean (\pm SD) distance from child residence to nearest playground and fast food restaurant by child BMI percentile

	BMI \geq 95th percentile	BMI < 95th percentile	<i>P</i> value ^a	BMI \geq 85th percentile	BMI < 85th percentile	<i>P</i> value
Playground distance (miles)	0.31 (\pm 0.21)	0.31 (\pm 0.22)	0.77	0.31 (\pm 0.21)	0.31 (\pm 0.22)	0.32
Fast food restaurant distance (miles)	0.70 (\pm 0.40)	0.69 (\pm 0.38)	0.91	0.69 (\pm 0.39)	0.70 (\pm 0.38)	0.43
<i>N</i>	645	6375		1485	5535	

^a Compares group means by *t* test statistics.

Other Child Studies with Direct Measures

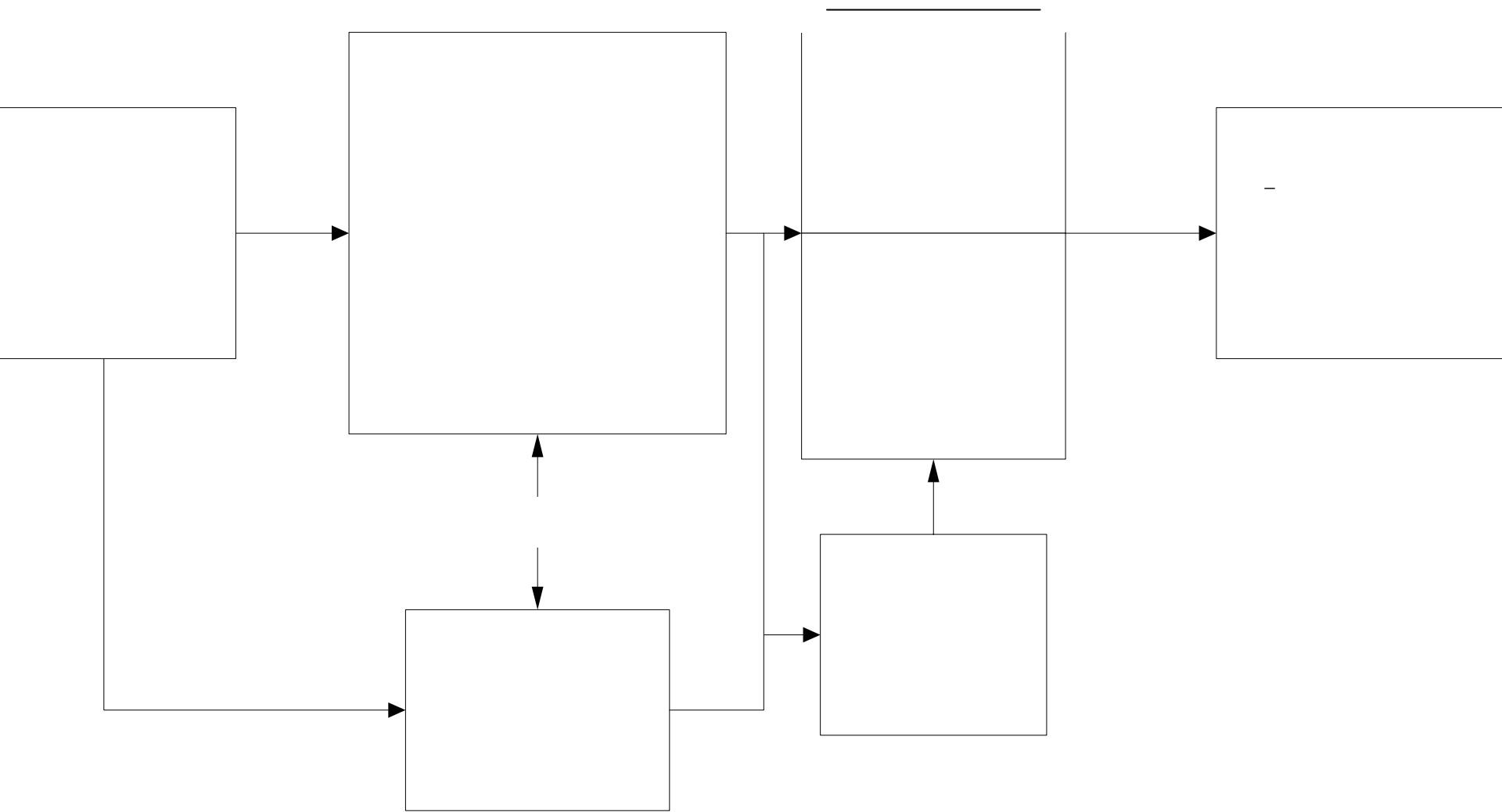
- **Edmonds J, Baranowski T, Baranowski J, Cullen KW, Myres D. Ecological and socioeconomic correlates of fruit, juice, and vegetable consumption among African-American boys. *Prev Med* 2001;32:476-481.**
 - **Did not assess obesity or weight**
 - **Evaluated relationship between household income and fruit, juice, and vegetable consumption among African American boys**
 - **Found that median household income was significantly correlated with restaurant fruit availability**

Obesity and the Built Environment

■ Behavioral Ecologic Model

- Assumes interaction between physical and social contingencies to explain and influence behavior
- Density of models and social contingencies influence group and individual behaviors
- Environment can impact health directly and indirectly
- Addresses “black box” problem of previous epi studies

Our Environmental Model of Obesity











Obesity and the Built Environment

■ Research Issues

- Few studies available specifically on children
 - ◆ **Many studies use existing data or build on on-going research**
- Address “black box” problem of previous epidemiologic studies with indirect measures of environment
 - ◆ **Census indicators (e.g., area SES)**
 - ◆ **Phone books**
- Little consistency on how to best measure the BE and outcomes often measured using less optimal methods (e.g., self-reported weight)

Obesity and the Built Environment

- Research Issues
 - Complex statistical analysis issues
 - ◆ **Appropriate unit of analysis (e.g., mixed vs. simple models)**
 - ◆ **Spatial statistics**
 - Risk factors and intervention targets may be different for adults and children
 - Risk and protective factors may vary in complex and unexpected ways
 - ◆ **Sprawl, connectivity, and accessibility**
 - ◆ **Institutional density and/or proximity**

The End

