

The conundrum of diabetes and obesity, and the built environment: from evidence to policy

Paolo Vineis

BSc on global health

19 November 2012

Outcome

The content of this topic will discuss:

- How and why is obesity spreading all over the world? Is it genetic or environmental? What are the main hypotheses?
- What are the relationships between diabetes and obesity? Do the two diseases completely overlap epidemiologically or not? Is the epidemiology of diabetes different in Asia vs. other continents?
- What is the built environment and some examples of research
- Preventive measures to reduce obesity

Learning Outcomes

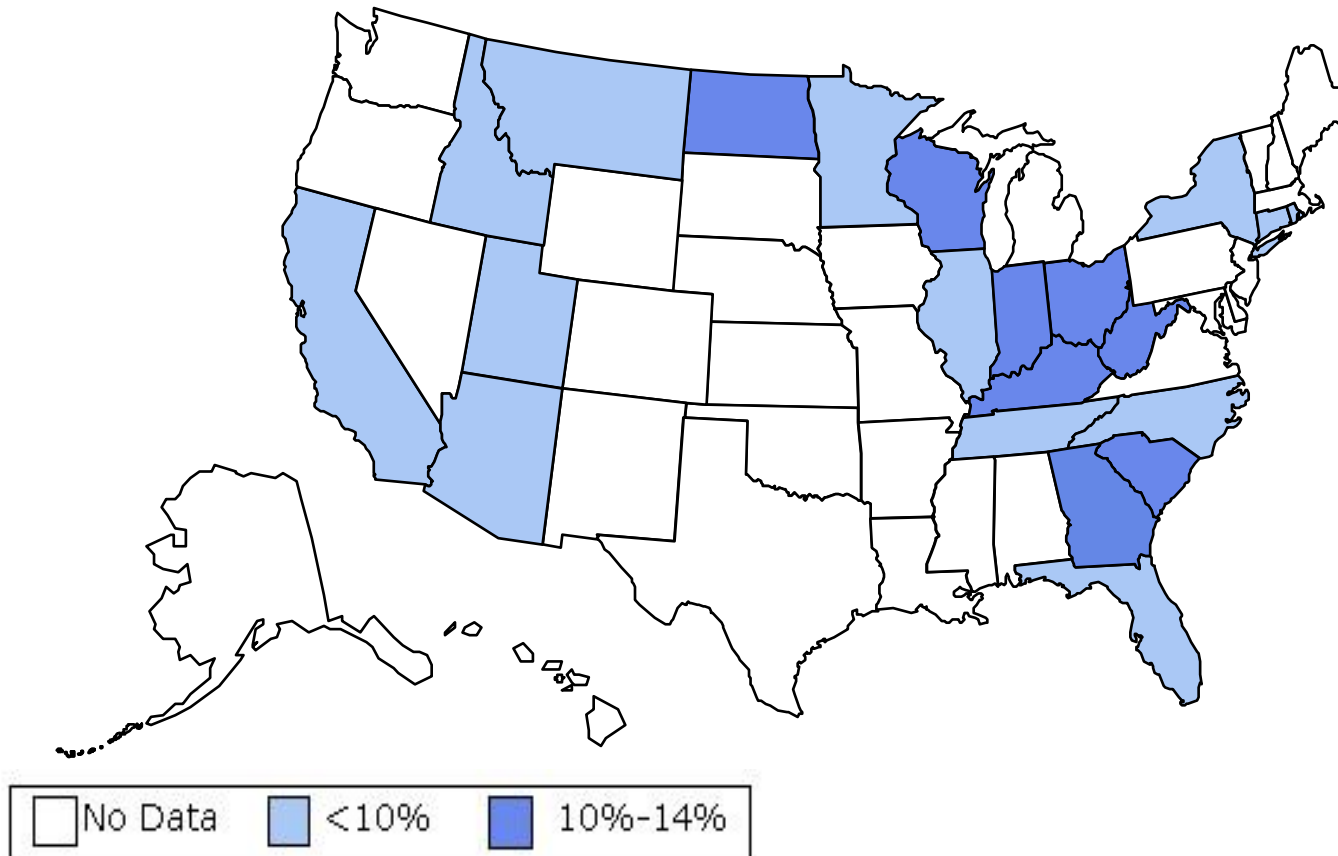
By the end of the learning activities in this session you will:

- Be able to describe the epidemic of obesity and diabetes and the main scientific hypotheses
 - Be able to describe the total burden of disease attributable to obesity and diabetes
 - Be able to describe the main characteristics associated with the concept of built environment
- Be able to discuss potential policies to tackle the epidemic

Obesity Trends* Among U.S. Adults

1985

(*BMI ≥ 30 , or ~ 30 lbs overweight for 5'4" woman)

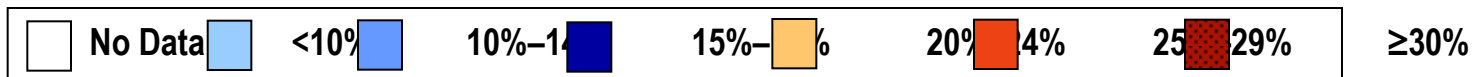
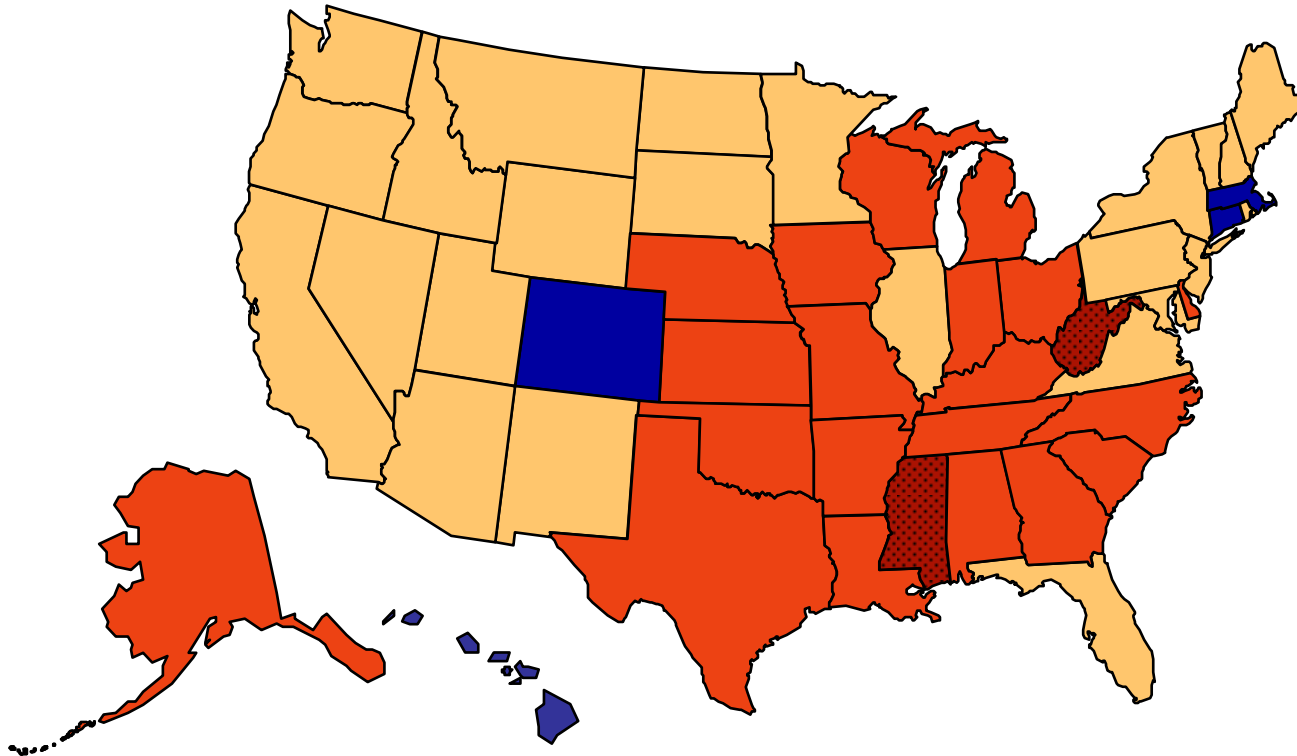


Source: Mokdad A H, et al. *J Am Med Assoc* 1999;282:16, 2001;286:10.

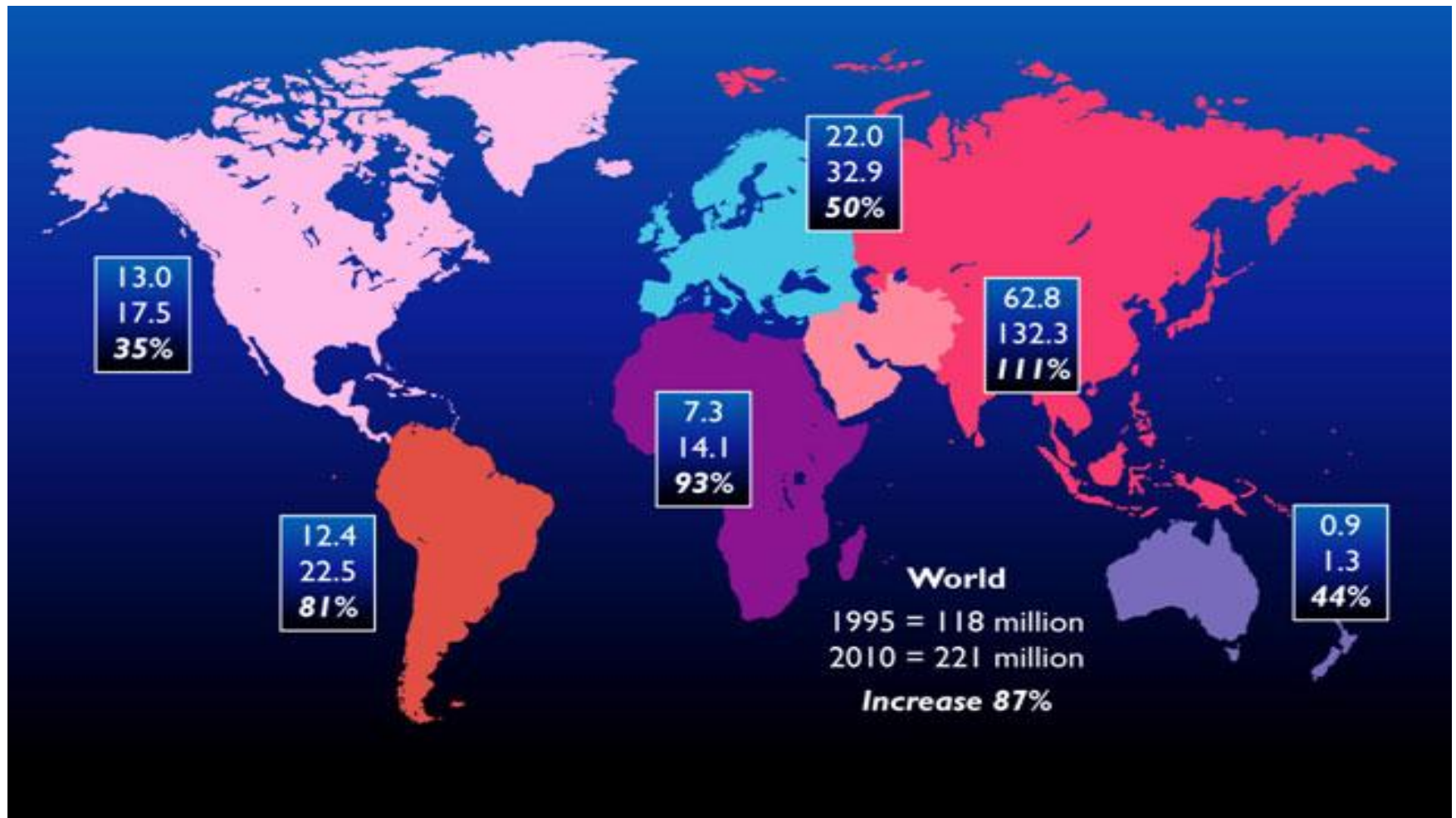
Obesity Trends* Among U.S. Adults

BRFSS, 2006

(*BMI ≥ 30 , or ~ 30 lbs. overweight for 5' 4" person)



Global projections for the diabetes epidemic: 1995-2010

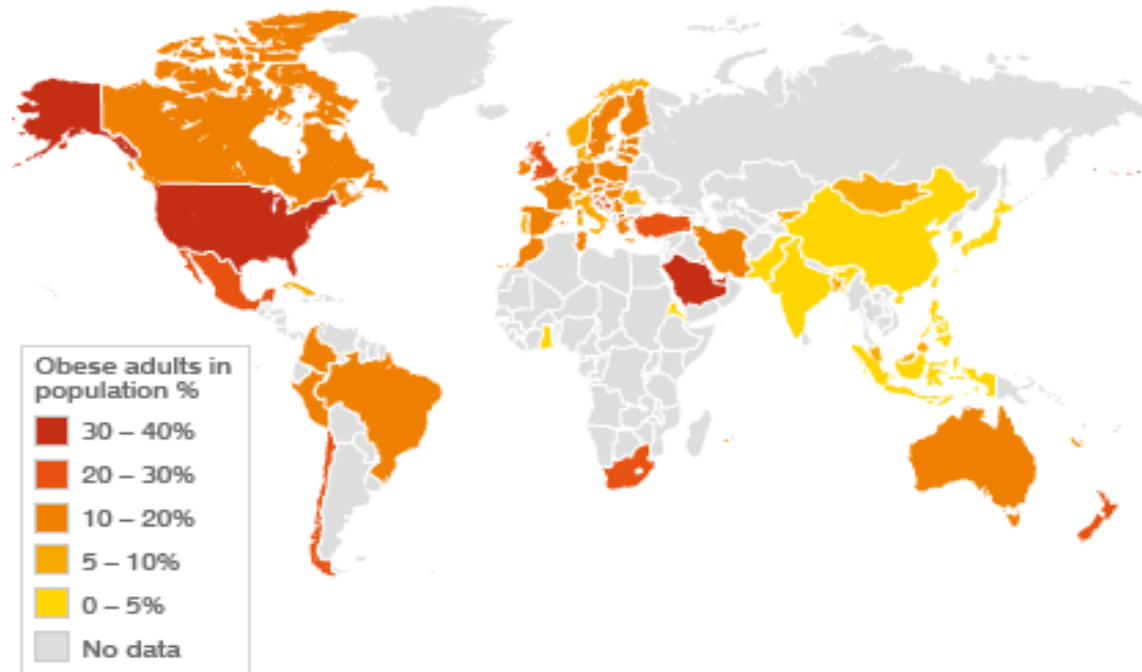


Normal weight: $< 25 \text{ kg/m}^2$

Overweight: $[25-30[\text{ kg/m}^2$

Obesity: $\geq 30 \text{ kg/m}^2$

THE GLOBAL OBESITY PROBLEM

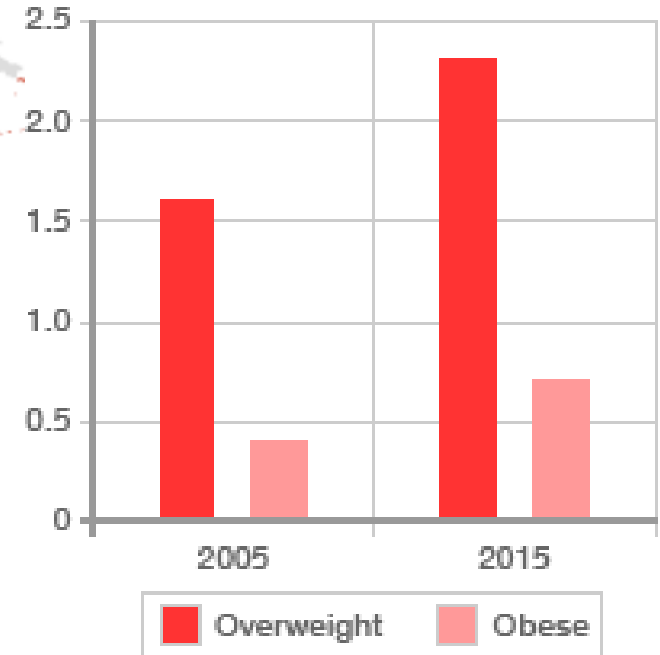


An obese adult is classified as having a Body Mass Index equal to or greater than 30

SOURCE: World Health Organization, 2005

GLOBAL OBESITY FORECAST

World population (billions)



SOURCE: World Health Organization, 2005

Urbanization, economic growth, technological changes for work, leisure,
& food processing, mass media growth

Receding Famine

- starchy, low variety, low fat, high fiber
- labor-intensive work/leisure

MCH deficiencies,
weaning disease,
stunting

Degenerative Disease

- increased fat, sugar, processed foods
- shift in technology of work and leisure

obesity emerges,
bone density problems

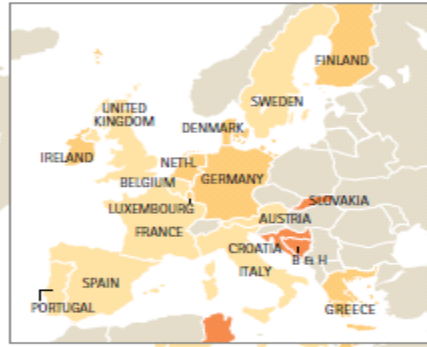
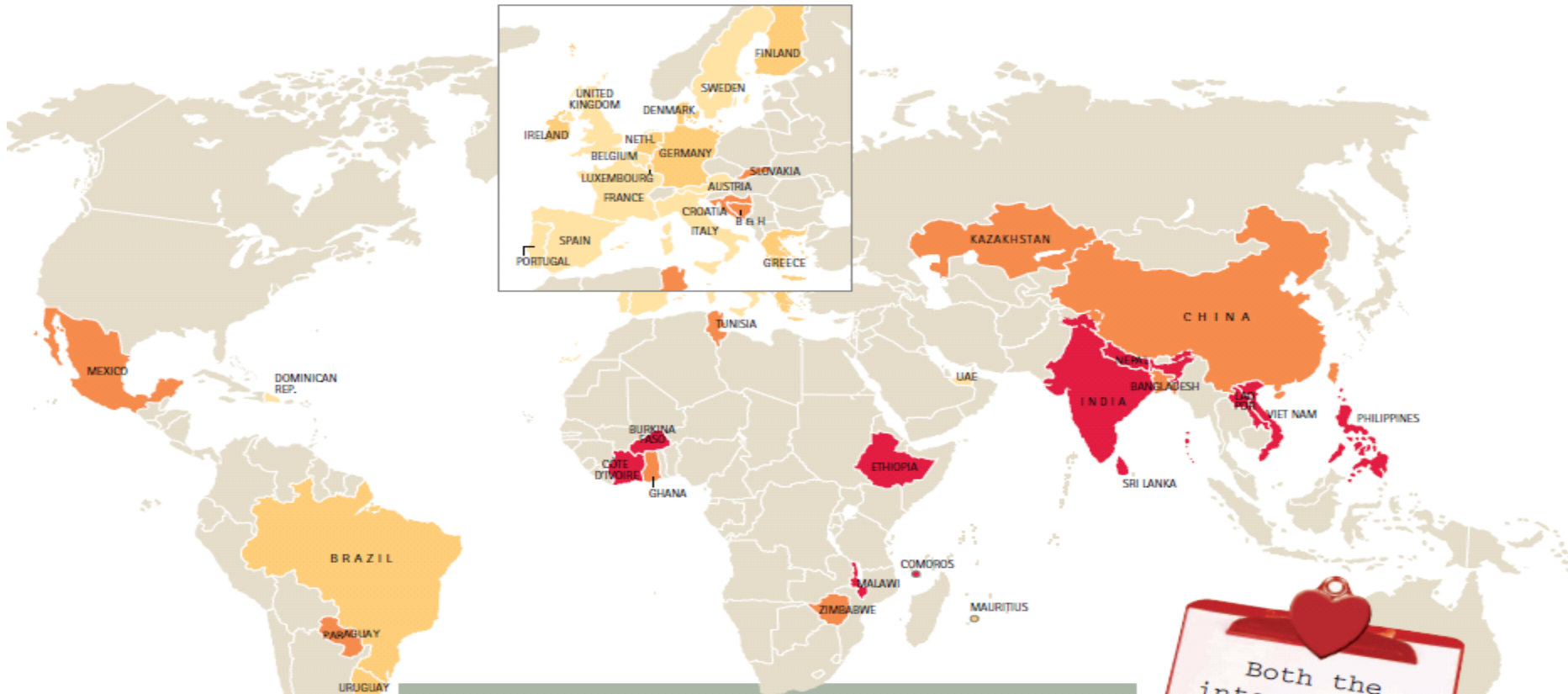
Accelerated life expectancy,
shift to increased DR-NCD,
increased disability period

Behavioral Change

- reduced fat, increased fruit, veg, CHO, fiber
- replace sedentarianism with purposeful changes in recreation, other activity

reduced body fatness,
improved bone health

Physical activity level around the world



Physical activity levels

Energy expenditure per week in work, leisure and transport
MET-mins
2002-2003
1 MET is the amount of energy expended while sitting quietly at rest

 6000 and above	 below 1300
 3500-5999	 no data
 1300-3499	

Both the intensity and duration of exercise are important in reducing deaths from coronary heart disease.

Source: WHO

Physical inactivity according to social class

Physical inactivity by social class in India

Percentage of time spent seated, at work or in spare time, by people aged 25 years and above in two Indian villages 1993–1995



♥ male
♥ female



Neighborhood Built Environment Resources and Obesity

Research conducted by Andrew Rundle, Columbia
University, New York



Overweight and Obesity In America 2003-2004

NHANES data suggest that 32.2% of adults are obese and 34.1% are overweight.

Some “back of a napkin” calculations by CDC suggest:

- **In 2000, 350 million gallons of jet fuel was required to transport the additional weight gained between 1990 and 2000.**
- **Cost: \$1.1 billion**
- **Additional CO₂ emissions: 3.8 million tons**

Built Environment Defined

Built Environment:

“...encompasses all buildings, spaces and products that are created, or modified, by people. It includes homes, schools, workplaces, parks/recreation areas, greenways, business areas and transportation systems.... It includes land-use planning and policies that impact our communities in urban, rural and suburban areas.” NIEHS 2004

Almost all of NYC represents built environment. There are a few nature preserves in the City, but almost all of the green space was built.

Built Environment and Obesity: The Central Idea

- **Built environments provide a context in which physical activity and nutritional behaviors occur.**
- **Built environments can be supportive, inhibitive or neutral towards physical activity and healthy diets.**
- **Neighborhood variation in built environment characteristics influence physical activity and diet and, in turn, body size.**

Key Built Environment Constructs

Walkability indices:

A set of urban design characteristics that promote pedestrian activity and private automobile independence.

Recreational Environment:

Availability and quality of parks, trails and ball fields. Availability of commercial recreational and exercise facilities.

Food Environment:

Availability of supermarkets, fruit and vegetable markets, fast food outlets, farmer's markets, etc.

Walkability

Low walkability neighborhoods are often discussed in reference to urban sprawl.

Low walkability is typified by:

- **Low population density**
- **Poor access to public transit**
- **Little pedestrian activity**
- **Car dependence**
- **Little mixing of residential and retail/commercial land uses**



Measuring the Built Environment

- **Geographic Information System (GIS) used as a frame work for linking data through spatial coordinates.**
- **Built environment data is retrieved from NYC government sources, commercial databases, and field surveys.**
- **Human data on body size, diet and physical activity is available from surveys and studies.**
- **The GIS system can calculate built environment metrics for study subject's "neighborhoods".**

What is a “neighborhood”?

- **This is an extensively debated question that hasn't been resolved.**
 - **Geographic vs. conceptual space**
 - **Continuous vs. fragmented space**
 - **Bounded by administrative lines or by socio-demographic lines**
- **In research it is generally operationalized, with Census tracts and Zip codes commonly used to define a study subject's neighborhood.**

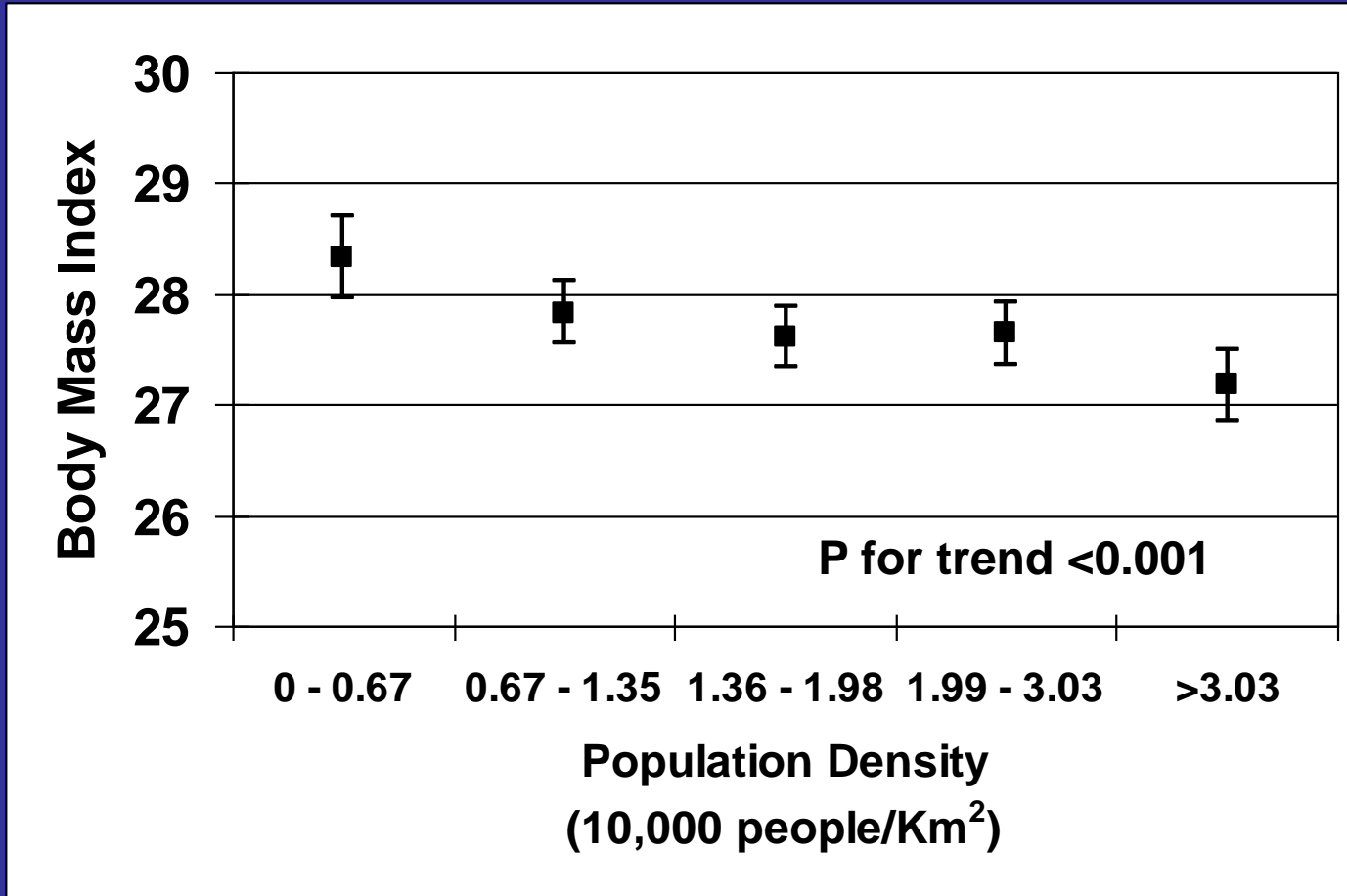
New York Cancer Project

- **A 2000-2002 health survey of residents of New York City and the surrounding area, during which height and weight were measured.**
- **13,102 subjects were geocoded to addresses within New York City.**
- **92% of residential census tracts in the City are represented.**
- **37% overweight, 28% obese.**

Analytical Approach for Built Environment Measures

- **Multilevel models with people nested in Community Districts (West Harlem, China Town, Upper West Side), Tracts or Zip Codes.**
- **Control for:**
 - **Individual demographics** - age, gender, race/ethnicity, education
 - **Neighborhood demographics** - % Black, % Hispanic, % poverty
 - **Urban design** – population density, access to public transit, and percent of building space that is commercial

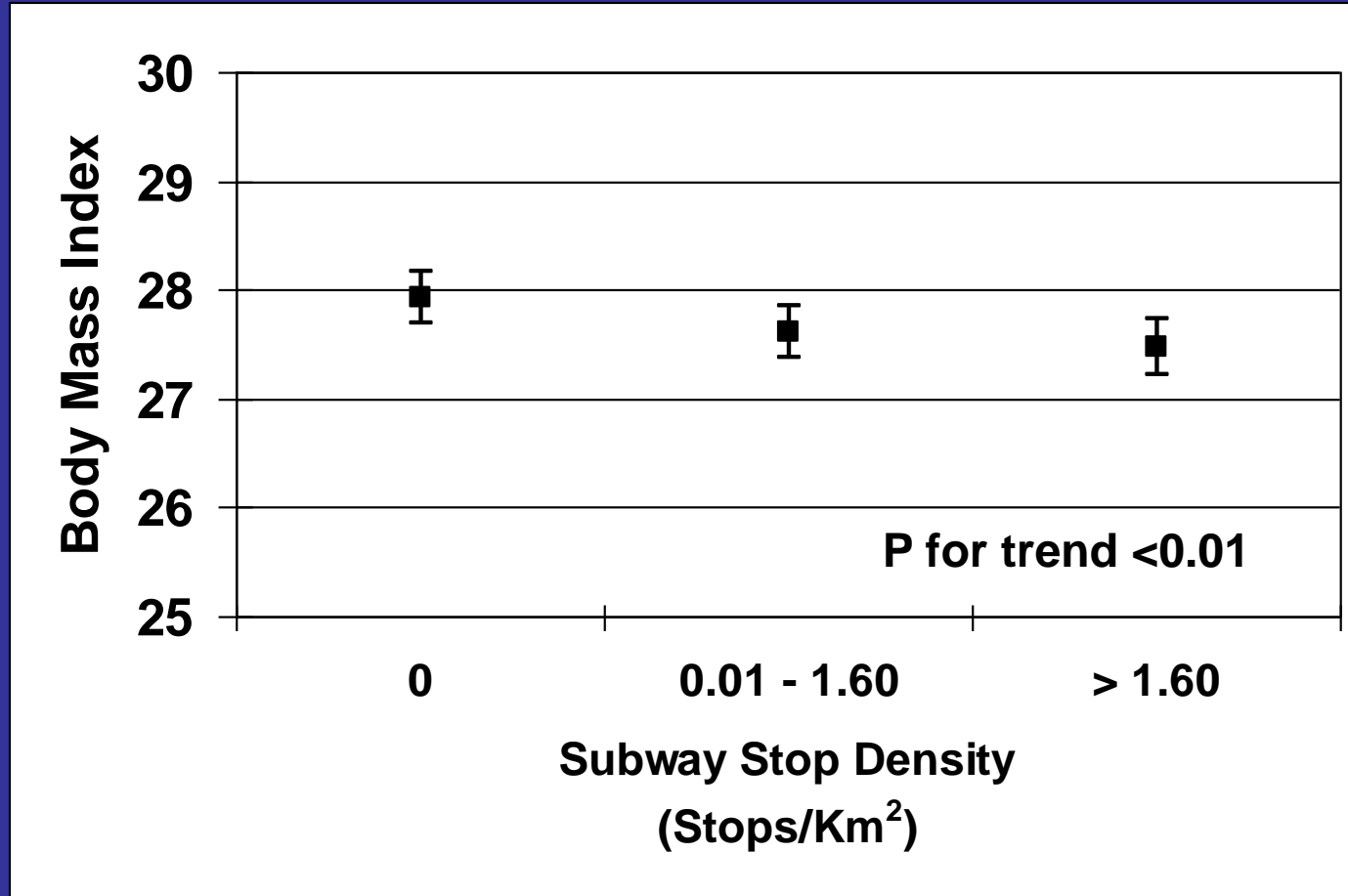
Mean¹ BMI and Population Density



1. Adjusted for individual age, race, gender and education, neighborhood poverty, % Black, and % Hispanic.

[Rundle et al., 2007)

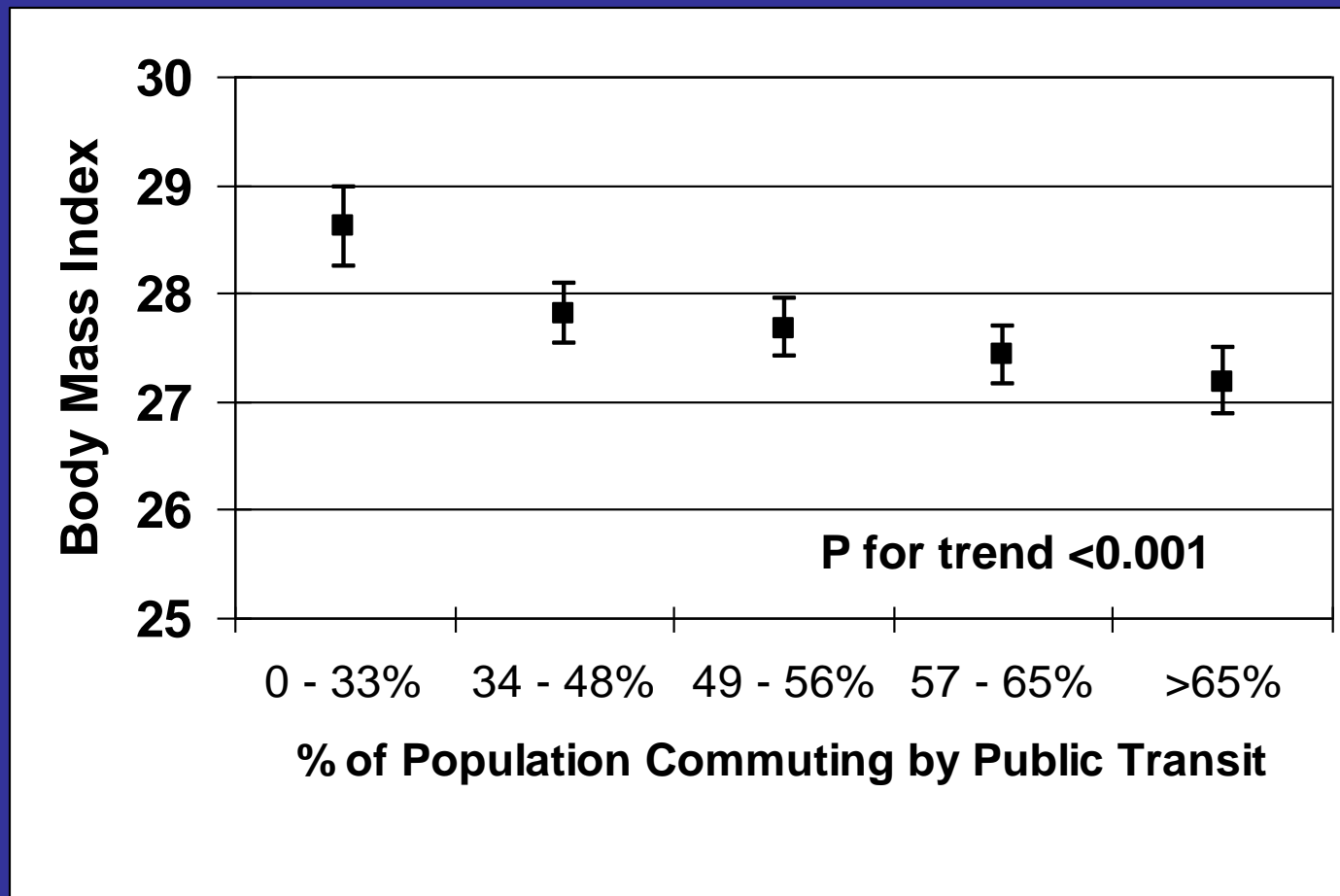
Mean¹ BMI and Access to Public Transit



1. Adjusted for individual age, race, gender and education, neighborhood poverty, % Black, % Hispanic, bus-stop density.

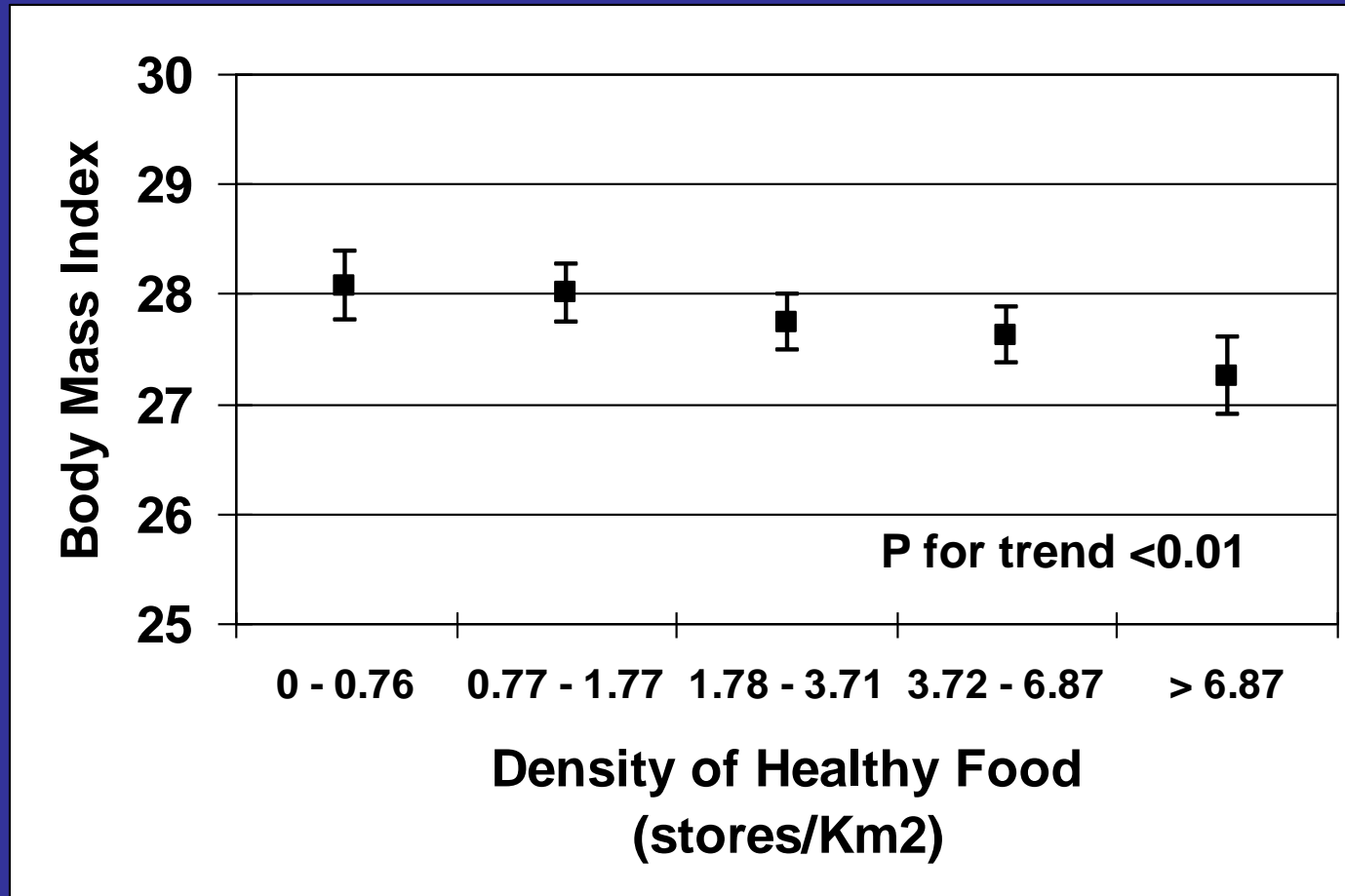
[Rundle et al., 2007)

Mean¹ BMI and Use of Public Transit



1. Adjusted for individual age, race, gender and education, neighborhood poverty, % Black, and % Hispanic.

Mean¹ BMI and Access to Healthy Food Choices



1. Adjusted for individual age, race, gender and education, neighborhood poverty, % Black, % Hispanic, population density, BMI unhealthy, and BMI neutral food choices.

[Rundle et al., submitted

2007)

- **Obesity and climate change**
(Climate and Health Council:
www.climateandhealth.org)
- **Most interventions aimed at preventing obesity and lack of physical exercise also influence CO2 emissions:**
 - **more walking and cycling, drive less**
 - **use less energy at home**
 - **influence food menus at work**
 - **eat less meat ...**

Systematic review of long-term lifestyle interventions to prevent weight gain and morbidity in adults.

[Brown T](#), et al, Obesity Reviews 2009

A systematic review of controlled trials of lifestyle interventions in adults with a body mass index of less than 35 kg m⁻² with at least 2 years of follow-up was carried out.

Eleven of 39 comparisons produced significant improvement in weight between groups at 2 years or longer with mean difference weight change ranging from -0.5 to -11.5 kg.

Effective interventions included a **600 kcal/day deficit diet/low-fat diet** (with and without meal replacements), **low-calorie diet, Weight Watchers diet, low-fat non-reducing diet, diet with behaviour therapy, diet with exercise, diet with exercise and behaviour therapy.**

Adding meal replacements (Slimfast bars) to a low-fat diet (with and without exercise and behaviour therapy) produced significant improvement in weight.

Strategies in the UK in a nutshell

see also the **NICE** guidelines:

<http://www.nice.org.uk/Guidance/CG43>

Information

A key role for governments in combating obesity identified by WHO in the Global Strategy on Diet, Physical Activity and Health is that they provide 'accurate and balanced information' to the general population regarding diet and nutrition as well as physical activity.

The UK regulator, **Ofcom**, has banned advertising of High Fat, Salt or Sugary substances in or around programmes made for children (including pre-school children and up to 15)

<http://www.ofcom.org.uk/media/mofaq/bdc/foodadsfaq/>.

This junk food advertising ban has been criticized as being too weak given many children watch programming that is not specifically for children. Furthermore, a call had been made by public health advocates for a total ban on junk food advertising on television before 9 p.m. For maximum effect, comprehensive bans which include other forms of media should be enacted.

Labelling

The UK Food Standards Agency has recommended that a **'traffic light'** front of labeling system be adopted by food manufacturers .

This has not been adopted by all manufacturers and the existence of **multiple labeling systems** has created inconsistency in the provision of consumer information.

The evaluation of the impact of current labeling systems on consumer purchasing behaviour, among other things, is currently underway.

(New government's policy? Devolution? Role of FSA?)

Initiatives in schools

Healthy School Schemes have the principal objective of providing healthy environments for students which go beyond diet and physical activity.

Throughout the UK, there have been efforts to improve the nutritional quality and standards of school meals. This began with an initiative in Scotland which was subsequently followed by action in the other countries.

Further, in its obesity strategy, the English government has indicated that schools will be expected to **develop 'healthy lunchbox policies'** in order to ensure that those who do not eat school lunches consume healthy food .

Built environment and transport

The English government is investing in '**Healthy Towns**' by working with selected towns and cities on improving their infrastructure and using whole-town approaches to promoting physical activity . Further, there is recognition of the need to provide environments conducive to individuals engaging in physical activity (making spaces more accessible for walking and cycling) within cities and to also promote and make use of the countryside.

Goals

In 2004, the English government set a target 'to halt the year-on-year increase in obesity among children by 2010.

In October 2007, the government abandoned this target and has now set a new target to reduce the prevalence rate to levels in 2000 by 2020.

In 2000, the overweight and obesity prevalence rates for 2–10 year olds were 26.6% and 13.4%, respectively.

However, if current trends persist (**as evidence suggests**) by 2010, 32% of 2–10 years old will be overweight (including obese) and 18% will be obese (Musingarimi, 2009).

Physical activity

England has set the ambitious target of having 70% of adults meet the recommended levels of activity (at least 30 min of moderate physical activity 5 days a week) by 2020.

In 2006, 40% of men and 28% of women met the recommended levels of physical activity.

Marion Nestle, Lancet, August 2006, Pages 564-565

Lang (**City University London**): analysis of publicly available reports and websites produced by the world's 25 largest (by sales) food corporations—ten manufacturing, ten retailing, and five food service—ranging in annual sales from US\$11 billion (Burger King) to \$256 billion (Wal-Mart).

The report tabulates these companies' positions on 28 questions, among them: “Is there a policy specifically focused on children and food marketing?”; “Is there a commitment on sugar?”; “Is there a commitment on portion size?”; and “Is there a specific policy on nutrition claims?” The answers to these and the rest, alas, are mostly “**No**”.

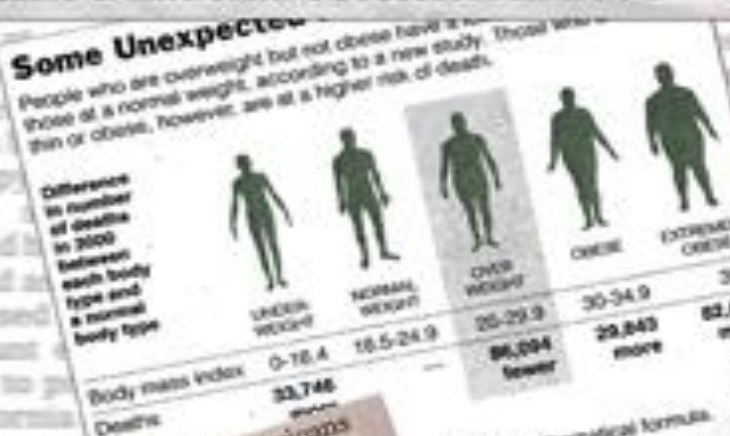


Company	Sales (US\$ billion)	Advertising (US\$ billion)	Statements
Coca-Cola (USA)	21	2.2	The company exists to benefit and refresh everyone it touches.
ConAgra (USA)	14.5	..	We touch the lives of many, many people. This brings with it a special sense of responsibility, one we take to heart.
Danone (France)	18	1.2*	Helps people around the world grow, live better and get more out of life through tastier, more varied and healthier food products—every day.
Kraft (USA)	32	1.6	Our vision is about meeting consumers' needs and making food an easier, healthier, more enjoyable part of life.
PepsiCo (USA)	29.3	1.7	Our health and wellness initiatives...strengthen our commitment to contribute to the well-being of our consumers.
Unilever (UK, Netherlands)	29.7*	7.2 (includes non-food)*	We meet everyday needs for nutrition, hygiene and personal care with brands that help people feel good, look good and get more out of life.
Ahold (Netherlands)	65.8*	0.456*	As we see the focus on health and well-being to be a major, sustained consumer trend, we want to be a leader in this area, or even have a genuine impact on the overweight/obesity issue going forward.
Carrefour (France)	12.1*	..	Aims to set the benchmark in modern retailing for the protection of health, consumer safety and the environment.
Kroger (USA)	51.1	0.667*	Our mission is to be a leader in the distribution and merchandising of food, health, personal care and related consumable products and services.
McDonald's (USA)	51.3 (includes franchises)	0.723	McDonald's cares about the well-being issues that are so important to many of our customers.

The New York Times

The Year of Obesity

Our perennial interest in losing weight became a national obsession in 2004



Dr. Mark Mattson, a rail-thin researcher at the National Institute on Aging who is an expert on caloric restriction as a means of prolonging life, said it was not clear that eating fewer calories meant weighing so little, since some people eat very little and never get so thin. In any event, while caloric restriction may extend life, Dr. Mattson said, "there's certainly a point where you can overdo it with caloric restriction, and we

Some warn that obesity is still a major health concern.

don't know what that point is." Some statisticians and epidemiologists said that the study's methods and data were exemplary and that the authors — Dr. Williamson and Katherine M. Flegal of the disease control centers, and Dr. Barry I. Graubard and Dr. Mitchell H. Gail of the cancer institute — were experienced and highly regarded scientists.

THE WALL STREET JOURNAL

Today one-third of Americans are not just overweight but obese. That's why the issue got more attention in 2004 than ever before from health experts, government agencies and the media—including TIME and ABC

using the mathematical formula
 $(\text{WEIGHT IN POUNDS} / (\text{HEIGHT IN INCHES})^2) \times 703$

Washington Post

Americans flocked to see Super Size Me, Morgan Spurlock's documentary about what happens when you eat nothing but McDonald's food for a month. Now McD...
MyPyramid.gov

Body Fat a Key to Reducing Risk Factors in Obese Men

Overweight or obese men must decrease their body fat, no matter how physically fit they are, to avoid having risk factors of cardiovascular disease, according to a new study in the journal.

Researchers at the University of Colorado at Boulder found that, in men, the amount of body fat is a predictor of cardiovascular risk factors such as high blood pressure, abnormal cholesterol, and insulin resistance.

Demetra Christou and colleagues led 135 men ages 30 to 79 with

Steps to a Healthier You

MyPyramid.gov