

The Obesity Epidemic in the United States

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OBESITY AS AN EPIDEMIC: INCIDENCE AND PREVALENCE OF OBESITY ACROSS THE POPULATION

AN epidemic is defined as a disease or condition with rapid spread, growth, or development that simultaneously affects many individuals in a community or a population. Obesity, having a body mass index (BMI) greater than or equal to 30, fits this definition and has emerged in less than a quarter century as a global epidemic ignoring race/ethnicity, sex, age, and socio-economic and international boundaries. Overweight is defined as having BMI greater than or equal to 25 or greater. (These definitions are arbitrary, but give us a stable basis to make comparisons.) According to the World Health Organization (WHO), over one billion adults worldwide are overweight, of whom at least 300 million are obese. WHO estimates that the current prevalence of obesity ranges from below 5% in China, Japan, and certain African nations; to over 75% in urban Samoa. Even in countries with a relatively low prevalence of obesity, such as China, prevalence in some cities now approaches 20% (1).

The United States is a leading country in the proportion of the population that is overweight. An estimated 129.6 million people in the United States age 20-74, or 64%, are overweight, of whom 30% qualify as obese. If the population of the United States continues to gain weight at the present rate, the prevalence of obesity in the United States will approach 40% within the next five years. Comparing recent data to historical data on obesity and overweight gives a picture of the epidemic.

RACE/ETHNICITY, SEX, AND AGE

The most recent National Health and Nutrition Examination Survey, conducted from 1999–2000 (see Table 1), reveals disparities in overweight and obesity by race/ethnicity and age, and these disparities differ for women and men. Both overweight and obesity are notably high among non-Hispanic black women. Obesity is also high among Hispanic women. The prevalence of overweight exceeds 70% among both Hispanic women and men. The lowest prevalence of overweight is among black men and white women. The prevalence of overweight and obesity increases with advancing age until the sixth decade, when it begins to decline. The prevalence of overweight is highest among men age 65–74, and lowest among women age 20–34. The prevalence of obesity is highest among women age 65–74 and lowest among men 75 and older.

Compared to the 1976–80 NHANES data, the percentage of overweight men and women has increased by 27% and 48%, respectively, while the percentage of obese men and women has increased by 166% and 62% respectively. Thus, men now surpass women in prevalence of obesity as well as overweight. The greatest increase in obesity, however, was seen among white non-Hispanic men, up 124%. By age group, the greatest obesity increase was 171% among men age 20–34; the lowest increase was 80% among women age 65–74.

TABLE 1
Percent of Population that are Overweight/Obese,
by Race/Ethnicity and Gender (NHANES)

	1999–2000			1976–80	
	<i>Non-Hispanic Black</i>	<i>Non-Hispanic White</i>	<i>Hispanic</i>	<i>Overall</i>	<i>Overall</i>
<i>Women</i>					
Overweight*	78.0%	57.5%	71.8%	62.0%	42.0%
Obese	50.8%	30.6%	40.1%	27.7%	17.1%
<i>Men</i>					
Overweight*	60.1%	67.5%	74.4%	67.0%	52.9%
Obese	28.8%	27.7%	29.4%	34.0%	12.8%

*includes obese

SOCIOECONOMIC STATUS

Studies have also shown disparities in overweight and obesity based on socioeconomic status (SES), particularly among women (2). Irrespective of race/ethnicity, obesity is 50% more prevalent among women of lower SES status (3) than among women of higher SES. Men of low or high SES are about equally likely to be obese (4).

CHILDREN

Especially alarming is the increase in overweight among children. About 9 million children in the US, or 15% of children aged 6–19, are overweight.¹ From 1976–80 to 1999–2000, the prevalence of overweight in children age 6–11 increased 114% from 7% to 15%, and in adolescents age 12–19 from 5% to 15%—almost three times the rate of two decades ago. Data for children and adolescents from NHANES III (1988–94) and the National Heart, Lung, and Blood Institute Growth and Health Study reveal patterns of disparity in overweight in children by race/ethnicity and sex for the most part similar to those seen among adults.

HEALTH CONSEQUENCES

Obesity has been linked to an increased risk of chronic disease, disability, death, and decreased productivity and quality of life (5,6). Overweight and obese individuals are at an increased risk of: hypertension, hypercholesterolemia, Type II diabetes, coronary artery disease, congestive heart failure, stroke, gallstones, gout, osteoarthritis, obstructive sleep apnea and other respiratory problems, pregnancy complications, poor reproductive health (such as menstrual irregularities, infertility, irregular ovulation) and psychological disorders (such as depression, eating disorders, distorted body image, and low self-esteem). Several cancers—breast, endometrial, prostate and colon cancer—are firmly associated with overweight. Deaths in the US attributable to poor diet and physical inactivity rose by 33% over the past decade, while deaths due to other causes declined (7). In 2000, an estimated 400,000 deaths were related to obesity (8). If correct, only tobacco use contributed to more preventable deaths (approximately 435,000). Given current trends, obesity is expected soon to overtake tobacco as the leading preventable cause of death (9).

1. The United States does not apply the term 'obese' to children.

TABLE 2

Aggregate Medical Spending, in Billions of Dollars, Attributable to
Overweight and Obesity, by Insurance Status and Data Source,
1996–1998 (17)

<i>Insurance Category</i>	<i>Overweight (including obesity)</i>		<i>Obesity</i>	
	MEPS (1998)	NHA (1998)	MEPS (1998)	NHA (1998)
Out-of-pocket	\$7.1	\$12.8	\$3.8	\$6.9
Private	\$19.8	\$28.1	\$9.5	\$16.1
Medicaid	\$3.7	\$14.1	\$2.7	\$10.7
Medicare	\$20.9	\$23.5	\$10.8	\$13.8
Total	\$51.5	\$78.5	\$26.8	\$47.5

NOTE: Calculations based on data from the 1998 Medical Expenditure Panel Survey merged with the 1996 and 1997 National Health Interview Surveys, and health care expenditures data from National Health Accounts (NHA). MEPS estimates do not include spending for institutionalized populations, including nursing home residents.

Childhood obesity and its future consequences will severely affect disease burden, quality of life, and health care costs. Obesity in childhood increases the likelihood of heart disease and stroke before age 30 (10). If current trends continue, approximately one-third of all children, and one-half of black and Hispanic children born in 2000 will develop diabetes. This translates into approximately 50 million people in the United States who are likely to develop diabetes by 2050. Consequently, as these overweight children become adults, the US health care system can expect to see a dramatic increase in the physical complications associated with diabetes, such as amputations, blindness, kidney failure, heart attacks (11).

COSTS OF OBESITY

Obesity is associated with high medical, psychological and social costs (12,13). Direct health care costs stemming from obesity, e.g., preventive [sic], diagnostic, and treatment services, account for approximately 7% of medical expenditures in the United States (14). Approximately half of these costs in the United States are covered by government health services programs, Medicaid and Medicare (15). The Centers for Disease Control and RTI International estimated United States direct medical expenditures in 2003 attributable to obe-

sity at \$75 billion. Total human capital costs are estimated at a staggering \$157 billion per year (16).

FACTORS CONTRIBUTING TO THE EPIDEMIC

Simply stated, obesity results from an energy imbalance—caloric intake in excess of calories expended by physical activity and metabolic processes. This imbalance has underlying causes. Obesity reflects complex interactions between genetic, metabolic, cultural, environmental, socioeconomic and behavioral factors. Behavioral factors include sedentary lifestyles and consumption of excess calories, and reflect environmental factors that influence behaviors and thus energy intake and energy output. The built environment (e.g., sidewalks and transportation systems) can encourage or discourage physical activity, and the food environment (e.g., food availability and marketing) can encourage or discourage consumption.

Physical activity

Physical activity reduces the risk for heart attack, colon cancer, diabetes, and high blood pressure, and may reduce the risk for stroke. It helps control weight; contributes to healthy bones, muscles, and joints; reduces symptoms of anxiety and depression; and is associated with fewer hospitalizations, physician visits, and medications (18).

Most adults in the United States do not get the amount of physical activity that is recommended in order to provide such health benefits (see Table 3). As of 2001, 15% of adults in the United States engaged regularly in vigorous physical activity during leisure time. Only 22% of adults engaged regularly in sustained physical activity of any intensity, and more than 25% were not active at all in their leisure time. Physical inactivity is more prevalent among women than men, among blacks and Hispanics than whites, among older than younger adults, and among lower incomes and less educated adults. Between 1990 and 1998, the prevalence of adults who engaged in physical activity remained relatively constant (19).

Insufficient physical activity is not limited to adults. Despite many mandated state physical education programs, only about one-half of US children participate in some form of vigorous physical activity. Although enrollment in physical education in schools increased from 1991 (48.9%) to 2001 (57.1%), daily participation in high school physical education classes dropped from 41% in 1991 to 32% in

TABLE 3
Percent of Adults in US Reporting Levels of Physical Activity, by Age, and by Race/Ethnicity, 2001 (20)

	<i>Age</i>					<i>Race/Ethnicity</i>			
	<i>18-24</i>	<i>25-34</i>	<i>35-44</i>	<i>45-65</i>	<i>>65</i>	<i>White</i>	<i>Black</i>	<i>Hispanic</i>	<i>Other</i>
						<i>Non-Hispanic</i>	<i>Non-Hispanic</i>		
Recommended	55.7	49.6	47.0	41.9	36.8	48.2	35.3	38.9	42.2
Insufficient	33.4	38.9	41.0	41.2	34.9	38.6	39.6	36.5	39.8
Inactive	10.9	11.5	12.1	16.8	28.3	13.2	25.2	24.6	18.0
No Leisure-Time Physical Activity*	20.7	23.2	24.3	27.7	34.2	22.5	34.7	39.8	28.1

RECOMMENDED physical activity: moderate-intensity activity ≥ 30 minutes each time, ≥ 5 days per week, or vigorous-intensity activity ≥ 20 minutes each time, ≥ 3 days per week, or both.

INSUFFICIENT physical activity: >10 minutes per week of moderate or vigorous-intensity lifestyle activities, but less than the recommended level of activity.

INACTIVITY: ≤ 10 minutes per week of moderate or vigorous-intensity lifestyle activity.

NO LEISURE-TIME PHYSICAL ACTIVITY: no reported leisure-time physical activity (i.e., any physical activity or exercise such as running, calisthenics, golf, gardening, or walking).

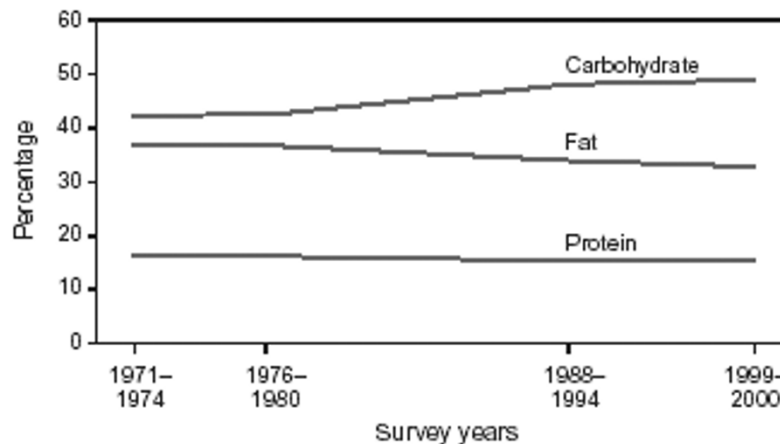
2001 (21), and daily participation for more than 20 minutes in physical education classes decreased from 34% in 1991 to 22% in 1997 (22). Participation in all types of physical activity declines strikingly as age and grade in school increases (23).

Watching television contributes to overweight in children. American children watch, on average, 19 hours and 40 minutes of TV per week—more than a thousand hours each year. Black teens watch 40 percent more primetime TV and nearly twice as much daytime TV as other teens (24). Watching TV is sedentary, and reduces available playtime. Moreover, each year it exposes child viewers to an average of 40,000 advertisements, many promoting junk food and fast food. In short, the more TV children watch, the more likely they are to be overweight (25).

Food consumption

In addition to physical activity, overall calorie consumption plays a pivotal role in the epidemic. Between 1971–1974 and 1999–2000, average daily energy intake increased from 2,450 kilocalories (kcal) to 2,618 kcal for men and from 1,542 kcal to 1,877 kcal for women. USDA food consumption survey data indicate that the increased energy intake was attributable primarily to an increase in carbohydrate intake (26) (see Table 4), with a 62.4-gram increase among

TABLE 4
Percentage of Kilocalories from Macronutrient Intake among
Adults Ages 20–74, by Survey Years NHANES 1971–2000



women and a 67.7-gram increase among men. The percentage of kcal from carbohydrate increased, from 42.4% to 49.0% for men, and from 45.4% to 51.6% for women.

Total fat intake increased by 6.5g among women and decreased by 5.3g among men. The percentage of kilocalories from total fat decreased from 36.9% (13.5% saturated) to 32.8% (10.9% saturated) for men and from 36.1% (13.0% saturated) to 32.8% (11.0% saturated) for women. However, given that absolute fat intake actually increased, this is an artifact of the increase in the total kilocalories consumed (27). Fat, which increases the palatability of food, is converted into body fat far more efficiently than carbohydrates and proteins, thus contributing more readily to weight gain. The percentage of kilocalories obtained from protein barely changed, from 16.5% to 15.5% for men and from 16.9% to 15.1% for women.

The latest available national dietary data confirm that the described trends in energy intake continue and primarily reflect increased carbohydrate intake (28). Survey data indicate that consumption of food away from home—with concomitant increased energy consumption from salty snacks, soft drinks, and pizza, plus increased portion sizes—are responsible for the observed increase in energy intake (29,30). Meanwhile, only 19% of adult men and 27% of adult women in the US eat the recommended five or more servings of fruits and vegetables each day (31).

Increases in consumption of “junk” food—high caloric food with minimal nutritional value, especially soft drinks—are thought to contribute substantially to the epidemic among children. Children and adolescents are eating more food away from home, drinking more soft drinks, and snacking (eating between regular meals) more frequently. More than 60% of young people eat too much fat, and fewer than 20% eat the recommended five or more servings of fruits and vegetables each day (32). American children now obtain over 50% of their calories from fat and added sugar (32% and 20%, respectively). One study monitored the intake of sugary drinks such as soda, sweetened tea and fruit drinks and tracked the body mass index of 548 children with an average age of 11. The researchers found that for every additional serving per day of soft drinks consumed, the risk of becoming obese increased by 50%. Controlling for physical activity and other diet choices, the relation between obesity and drinking sugary drinks remained (33). Another study found that children who drank more than 12 ounces of sweetened drinks per day gained significantly more

weight than children who drank less than six ounces a day. Tellingly, children who drank more sweetened drinks *did not concomitantly reduce* their intake of other foods and beverages (with the exception of milk), and, therefore, the more they consumed, the greater their daily caloric intake and the greater their weight gain (34).

THE FOOD ENVIRONMENT

Current patterns of energy intake reflect an environment where energy-dense food is both abundant and ubiquitous. Agricultural production in the United States is subsidized, and farms in the United States produce more food than can be consumed healthily by the population. Such an abundance of food leads to lower prices, especially for foods that are less expensive to produce. As an example, the last two decades have seen a dramatic increase in production of high fructose corn syrup, now the least expensive sweetener, and the predominant ingredient in most snack foods and virtually all soft drinks. This increase in corn syrup production parallels the increase in obesity. Researchers have observed, moreover, that this ingredient does not seem to trigger satiety, thus allowing over-consumption of soft drinks without compensating by consuming less of other foods (35). Despite the abundance of most foods, poorer people may have less access to healthier foods, and/or choose less expensive energy dense foods on the basis of price.

Fast food is ubiquitous and has reshaped diets in the United States. Like the rise in corn syrup production, the rise in fast food consumption has also paralleled the rise in obesity. Between 1977 and 1995, the percentage of meals and snacks eaten at fast food restaurants doubled (36). Portion sizes and, accordingly, energy intake for specific food types increased markedly. The greatest increases were for food consumed at fast food establishments. Portion sizes increased both inside and outside the home between 1977 and 1996 for all categories except pizza. Specifically, the average energy intake and portion size of salty snacks increased by 93 kcal (from 28.4 to 45.4 grams), soft drinks by 49 kcal (387.4 to 588.4 ml), hamburgers by 97 kcal (161.6 to 198.4 grams), french fries by 68 kcal (87.9 to 102.1 grams), and Mexican food by 133 kcal (178.6 to 226.8 grams) (37).

MARKETING

In 2000, consumers in the United States spent \$661.1 billion on food (excluding imports and seafood). At the same time, estimated marketing costs for domestic farm foods alone totaled \$537.8 billion. Adver-

tising expenditures rose 258% from 1980 to 2000 with food service and food retailers contributing the largest increases in advertising spending (38). Much of this marketing has been directed at children and adolescents. (For a more detailed consideration of the issue of food marketing to children, see Susan E. Linn's article in this special section.)

Marketers are interested in children and adolescents as consumers because they spend billions of their own dollars annually, influence hundreds of billions more in household food purchases, and are future consumers. It is estimated that adolescents in the United States spend \$140 billion a year. Children under twelve years of age spend another \$25 billion but may influence an additional \$200 billion of spending per year (39). Marketers have perfected techniques to market to children and adolescents. Those techniques include: in-school marketing through vending machine placement, billboards, and company sponsored materials and events; product placements; kids' clubs; the internet; toys and products with food brand logos; and youth-targeted promotions.

The school environment has a powerful influence on children's eating behaviors (40,41). Most US children attend school and, thus, schools offer an excellent marketing opportunity for food companies. In the past, nutrition was taught at school in home economics courses. Today, approximately one out of every five schools contains a fast-food outlet (42), and food advertisements are delivered at school through in-school media, vending machines and fast food outlets, and food-company sponsored events and materials.

About 12,000 schools, or about 38% of middle and high schools in the US (8.3 million students) are connected to Channel One, a 12-minute current events program that carries two minutes of commercials. About 70% of the 45 food commercials shown on Channel One during a one month period were for food products with high caloric value and minimal nutritional value including: fast foods, soft drinks, chips and candy. A hidden cost, estimated at \$1.8 billion per year, is the amount of school time this advertising wastes (43).

Food companies also bombard children with their product image by placing vending machines in schools. Approximately 19 out of 20 high schools and 60% of elementary schools have vending machines that sell soda. More than 70% of high schools sell chocolate candy and other sugary snacks in vending machines (44). Many schools have

agreements with particular food companies to sell their products exclusively. Soft drink companies pay school districts large sums for “pouring rights”—exclusive arrangements to sell their products. Unfortunately, with constrained budgets, school officials rely on food marketing in schools for revenue for school programs.

CONCLUSION

Obesity has only recently been identified as an epidemic cause of disease. Although the environment conducive to the emergent epidemic has been evolving over two to three decades, only now is the severity of the problem apparent. We might achieve a relatively rapid reversal with appropriately targeted interventions. More likely, sustained and concerted public health action will be needed to turn the tide of this new threat to health. Given the multiple and divergent causes of the epidemic, solutions will need to be equally varied and comprehensive.

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SUMMARY

We describe the epidemic of obesity in the United States: escalating rates of obesity in both adults and children, and why these qualify as an epidemic; disparities in overweight and obesity by race/ethnicity and sex, and the staggering health and economic consequences of obesity. Physical activity contributes to the epidemic as explained by new patterns of physical activity in adults and children. Changing patterns of food consumption, such as rising carbohydrate intake—particularly in the form of soda and other foods containing high fructose corn syrup—also contribute to obesity.

We present as a central concept, the food environment—the contexts within which food choices are made—and its contribution to food consumption: the abundance and ubiquity of certain types of foods over others; limited food choices available in certain settings, such as schools; the market economy of the United States that exposes individuals to many marketing/advertising strategies. Advertising tailored to children plays an important role.