

Obesity in the 21st Century

The United States is in the midst of an epidemic of obesity. Children and adults alike are increasing in girth at rapid rates. In the past four decades, the prevalence of childhood overweight, characterized by a body mass index greater than the norm for the 85th percentile, has risen by nearly 4-fold and continues to rise with each year (Ogden et al. 2002).

Fifteen percent of children today are overweight according to the most recent national survey (Ogden et al. 2002). Our national goal for Healthy People 2010 (U.S. Public Health Service 2000) is to halt this increase and reduce childhood overweight to a baseline level of 5%, the prevalence nearly three decades ago in the 1970s. Much work remains to be done if we are to achieve this goal. A better understanding of the etiology of this growing epidemic is necessary to prevent and combat obesity.

Obesity begins early; obesity in childhood is a strong predictor of obesity in adulthood (Dietz and Gortmaker 2001). According to a recent survey by the New York City Department of Health and Mental Hygiene, 21% of New York City kindergartners are obese (New York City Department of Health and Mental Hygiene 2003).

Minorities are disproportionately affected. Studies on obesity consistently report a higher prevalence of obesity in African Americans and Mexican Americans compared with the white, non-Hispanic population. In the National Health and Nutrition Examination Survey (NHANES) 1999–2000, 23.6% of non-Hispanic blacks and 23.4% of Mexican American adolescents were overweight, a startling near-doubling increase (from 13.4% and 13.8%, respectively) in the past decade (Ogden et al. 2002). This contrasts markedly with the prevalence of overweight in non-Hispanic whites of 12.7%.

The etiology of obesity is multifactorial. Poor diet and physical inactivity cause overweight and obesity. This imbalance between food intake and energy expenditure is determined, in large part, by the socioeconomic context. Although obesity is affected by interaction between multiple genes and the environment, the genetic pool is not changing rapidly; it is the environmental and social context that has changed and caused the epidemic (Clement and Ferre 2003).

Obesity has serious, long-term consequences. The incidence of type II diabetes has increased in U.S. children in parallel with the rising prevalence of obesity (Rocchini 2002). Hypertension, hypercholesterolemia, heart disease, asthma, mental health concerns (e.g., depression and low self-esteem), and orthopedic disorders have all been linked to obesity (American Academy of Pediatrics 2003). However, obesity is the single major health problem in the United States that is rapidly becoming worse (Sturm 2002).

This issue of *Environmental Health Perspectives* is devoted to children's environmental health, the foundation of which lies in the understanding that a child's physical and social environment is a fundamental determinant of his or her health and well-being [World Health Organization (WHO) 2003]. The knowledge that complex interactions exist between the environment and human health is not new. Indeed, one of Hippocrates' aphorisms was "for, in general, you will find the forms and dispositions of mankind to correspond with the nature of the country." As the field of pediatric environmental health grows as a specialty, so does the body of research by leading scientists and clinicians who seek to further our understanding of the impact of environmental exposures on the development of childhood illnesses such as obesity.

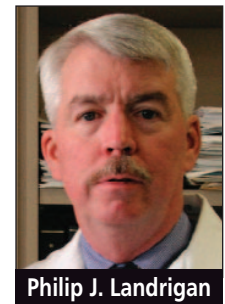
Although malnutrition in developing countries is widely recognized to be a product of environmental factors, the impact of the



Maida P. Galvez



Thomas R. Frieden



Philip J. Landrigan

environment on overnutrition in industrialized societies is just beginning to reach our awareness. The built environment encompasses the entire range of structural and social elements that make up the fabric of a community: housing, roads and walkways, stairways, density, transportation networks, shops, markets, parks, public amenities, and public spaces (Weich et al. 2003). The structural features of the urban built environment—its enormous size, its large and densely clustered population, its social institutions, its psychosocial stressors, its economy, its rapid pace, its violence, the configuration of its streets, parks, schools, and play spaces—all affect children's health, growth, and development. The adverse effects of the urban environment are especially magnified in low-income, predominantly minority communities, where crowded streets, lack of outdoor play spaces, limited access to fresh and healthy food, substandard housing, and disproportionately high levels of exposure to chemical contaminants all contribute to substantial and well-documented disparities in child health [Centers for Disease Control and Prevention (CDC) 2003; Jackson 2003].

Further exploration of the impact of the environment on everyday behaviors is critical to understanding the current rising trends in obesity. In the United States and other developed countries, we ride in cars instead of walking. We eat fast food for convenience and maximize portions for the added value. Our major modes of entertainment are primarily sedentary: television, cinema, computer surfing, and video games (Hill et al. 2003). We have adapted into a technologically savvy society, and our physical form has adapted along with it. This is a global problem. The WHO has declared overweight as one of the top 10 health risks in the world and one of the top 5 in developed nations (WHO 2002).

The choices Americans make account for obesity being seen as a problem of the individual; although an individual follows a pattern of unhealthy choices, obesity is not simply a consequence of unfortunate individual choice. Americans today are overwhelmingly influenced by environmental exposures that promote poor dietary habits and less-active lifestyles. According to Nestle and Jacobson (2000), advertising, pricing, packaging, and availability all encourage Americans to eat more food, not less. The design of neighborhoods promotes using motor vehicles rather than walking. Too many cities and towns have no sidewalks and no safe bicycle paths (Frumkin 2002). Obesity is not only a problem of the individual but also a problem rooted in neighborhoods and schools, modes of transportation, local food availability, food advertising to children, and governmental policies. Changes to federal agricultural policy, to the WIC Program (Special Supplemental Food Program for Women, Infants, and Children), and to economic and tax incentives could lead to many people making healthier dietary choices.

Environmental risk factors that may influence our everyday behaviors include increased exposure to high-calorie fast foods, "junk" foods, and refined sugars. Low-income families must often depend on smaller stores that have a limited selection of fresh foods, often at higher cost. For example, the presence of a single supermarket within a census tract was associated with a 32% increase in fruit and vegetable intake compared with neighborhoods without supermarkets (Morland et al. 2002a). Supermarkets have two times the amount of

healthy foods as neighborhood grocery stores and four times the number of these foods as convenience stores (Sallis et al. 1986). Yet there are four times as many supermarkets located in white neighborhoods as in black neighborhoods (Morland et al. 2002b). The implications of this include the need to address factors in the local food environment at both the individual level when recommending dietary changes, and at the community level when addressing deficiencies in the local food environment.

As with dietary choices, physical activity may also be influenced by the built environment. Lack of access to playgrounds, a dearth of organized sports activities, and concerns for physical safety that lead parents to keep their children indoors may further increase the risk of childhood obesity. This is compounded by inadequate physical education in schools. Increased television viewing, which may be a marker of an increasingly sedentary lifestyle, is now widely recognized as a risk factor for childhood obesity (Dietz and Gortmaker 1985). However, television use can be decreased, and this decrease can reduce childhood obesity (Robinson 1999), giving hope that we can successfully address this behavioral issue.

Improved access to recreational facilities is associated with higher levels of participation in vigorous activity regardless of socioeconomic status (Sallis et al. 1990). Disadvantaged areas tend to have fewer recreational facilities, raising concerns that access is a barrier to physical activity and that some communities may be at higher risk (MacIntyre et al. 1993). This reinforces the role of the built environment as a potentially modifiable risk factor for physical inactivity.

The possibility also exists that certain chemicals with the ability to disrupt endocrine function may interact with genetic and environmental factors to influence somatic growth and obesity (Bhathena and Velasquez 2002; Howdeshell et al. 1999; Rubin et al. 2001). This may be the result of alteration of important regulatory systems such as the hypothalamic–pituitary axis. This is an area that merits further study.

Recognizing the contribution of the environment to this growing epidemic is just the beginning. Further work is needed to develop and implement strategies to prevent and control obesity. Identifying and addressing environmental determinants of obesity in research studies provide a unique opportunity to institute change on a population-wide level and is a promising avenue of exploration (Srinivasan et al. 2003).

The 2001 Surgeon General's Call to Action to Prevent and Decrease Overweight and Obesity (U.S. Department of Health and Human Services 2001) declared this a national priority and called on individuals, families, communities, schools, businesses, organizations, the media, the health care system, and the government to work together toward a unified vision for a healthier America. With the high and rising rates of morbidity and mortality due to obesity, the lost productivity, the impact on quality of life, and the burden on our health care system dollars—an estimated \$117 billion in the year 2000—it is a problem that is too costly to ignore.

Maida P. Galvez

Department of Community and Preventive Medicine
Mount Sinai School of Medicine
New York, New York
E-mail: maida.galvez@mssm.edu

Thomas R. Frieden

New York City Department of Health and Mental Hygiene
New York, New York
E-mail: tfrieden@health.nyc.gov

Philip J. Landrigan

Department of Community and Preventive Medicine
Mount Sinai School of Medicine
New York, New York
E-mail: phil.landrigan@mssm.edu

Maida P. Galvez is a fellow in the Pediatric Environmental Health Fellowship program at Mount Sinai School of Medicine established by the Ambulatory Pediatric Association.

Thomas R. Frieden is commissioner of the New York City Department of Health and Mental Hygiene.

Philip J. Landrigan is the Ethel H. Wise Professor and chair of the Department of Community and Preventive Medicine, and director of the Center for Children's Health and the Environment at the Mount Sinai School of Medicine.

REFERENCES

- American Academy of Pediatrics. 2003. Prevention of pediatric overweight and obesity. *Pediatrics* 112(2):424–430.
- Bhathena SJ, Velasquez MT. 2002. Beneficial role of dietary phytoestrogens in obesity and diabetes. *Am J Clin Nutr* 76:1191–1201.
- CDC. 2003. Second National Report on Human Exposure to Environmental Chemicals. NCEH Pub No 02-0716. Atlanta, GA:Centers for Disease Control and Prevention.
- Clement K, Ferre P. 2003. Genetics and the pathophysiology of obesity. *Pediatr Res* 53(5):721–725.
- Dietz WH, Gortmaker SL. 1985. Do we fatten our children at the TV set? Obesity and television viewing in children and adolescents. *Pediatrics* 75:807–812.
- . 2001. Preventing obesity in children and adolescents. *Annu Rev Public Health* 22:337–353.
- Frumkin H. 2002. Urban sprawl and public health. *Public Health Rep* 117(3):201–217.
- Hill JO, Wyatt HR, Reed GW, Peters JC. 2003. Obesity and the environment: where do we go from here? *Science* 299:853–855.
- Howdeshell KL, Hotchkiss AK, Thayer KA, Vandenberg JG, Vom Saal FS. 1999. Exposure to bisphenol A advances puberty. *Nature* 401:763–764.
- Jackson, RJ. 2003. The impact of the built environment on health: an emerging field. *Am J Public Health* 93(9):1382–1384.
- MacIntyre S, MacIver S, Sooman A. 1993. Area, class and health: should we be focusing on places or people? *J Soc Policy* 22(2):213–243.
- Morland K, Wing S, Diez Roux A. 2002a. The contextual effect of the local food environment on residents' diets: the Atherosclerosis Risk in Communities Study. *Am J Public Health* 92(11):1761–1767.
- Morland K, Wing S, Diez Roux A, Poole C. 2002b. Neighborhood characteristics associated with the location of food stores and food service places. *Am J Prev Med* 22(1):23–29.
- Nestle M, Jacobson MF. 2000. Halting the obesity epidemic: a public health policy approach. *Public Health Rep* 115:12–23.
- New York City Department of Health and Mental Hygiene. 2003. Obesity begins early: findings among elementary school children in New York City. NYC Vital Signs 2(5):1–2. Available: <http://home.nyc.gov/html/doh/pdf/survey/survey2003-childobesity.pdf> [accessed 9 September 2003].
- Ogden CL, Flegal KM, Carroll MD, Johnson CL. 2002. Prevalence and trends in overweight among US children and adolescents, 1999–2000. *JAMA* 288:1728–1732.
- Robinson TN. 1999. Reducing children's television viewing to prevent obesity: a randomized controlled trial. *JAMA* 282(16):1561–1567.
- Rocchini AP. 2002. Childhood obesity and a diabetes epidemic. *N Engl J Med* 346:854–855.
- Rubin BS, Murray MK, Damassa DA, King JC, Soto AM. 2001. Perinatal exposure to low doses of bisphenol A affects body weight, patterns of estrous cyclicity, and plasma LH levels. *Environ Health Perspect* 109:675–680.
- Sallis JF, Hovell MF, Hofstetter CR, Elder JP, Hackley M, Caspersen CJ, et al. 1990. Distance between home and exercise facilities related to frequency of exercise among San Diego residents. *Public Health Rep* 105(2):179–185.
- Sallis JF, Nader R, Atkins J. 1986. San Diego surveyed for heart healthy foods and exercise facilities. *Public Health Rep* 101:216–218.
- Srinivasan S, O'Fallon LR, Deary A. 2003. Creating healthy communities, healthy homes, healthy people: initiating a research agenda on the built environment and public health. *Am J Public Health* 93(9):1446–1450.
- Sturm R. 2002. The effects of obesity, smoking, and drinking on medical problems and costs. *Health Aff* 21(2):245–253.
- U.S. Department of Health and Human Services. 2001. The Surgeon General's Call to Action to Prevent and Decrease Overweight and Obesity. Rockville, MD:U.S. Department of Health and Human Services, Office of the Surgeon General. Available: <http://www.surgeongeneral.gov/topics/obesity/calltoaction/CalltoAction.pdf> [accessed 9 September 2003].
- U.S. Public Health Service. 2000. Healthy People 2010—Summary of Objectives. Available: http://www.healthypeople.gov/document/html/volume2/19nutrition.htm#_Toc490383121 [accessed 9 September 2003].
- Weich S, Burton E, Blanchard M, Prince M, Sproston K, Erens B. 2001. Measuring the built environment: validity of a site survey instrument for use in urban settings. *Health Place* 7:283–292.
- WHO. 2002. World Health Report 2002. Reducing Risks, Promoting Healthy Life. Geneva:World Health Organization.
- . 2003. Making a Difference: Indicators to Improve Children's Environmental Health. Summary. Geneva:World Health Organization. Available: <http://www.cepis.ops-oms.org/bvsana/fulltext/Summary.pdf> [accessed 9 September 2003].