VIEWPOINT

Lifespan Weighed Down by Diet

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Since the end of the Civil War until the late 20th century, lifespan increased rapidly in the United States, a tremendous public health triumph brought about by a more dependable food supply, improved sanitation, and advances in medical care. In 1850, life expectancy among whites was an estimated 38 years for men and 40 years for women. These numbers nearly doubled by 1980, to 71 years for men and 78 years for women. With the start of the obesity epidemic in the late 1970s, this trend began to slow, leading some to predict that life expectancy would decline in the United States by the mid-21st century.[1]

Preliminary data from the Centers for Disease Control and Prevention (CDC) provide new evidence in support of this prediction.[2] Age-adjusted death rates for the first 9 months of 2015 increased significantly compared with the same period in 2014, most notably involving causes of death related to obesity. In relative terms, mortality rates increased in 1 year by 1% for heart disease, 1% for diabetes, 3% for chronic liver disease, 4% for stroke, and 19% for Alzheimer disease. Although these data are preliminary and could change, the new rates potentially signal a looming social and economic catastrophe that demands a comprehensive national strategy to more effectively address obesity and other chronic diet-related disease.

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Obesity and poor-quality diet predispose to all of the major chronic diseases, but these risks have been mitigated over the past few decades by an increasingly powerful and expensive array of treatments. To delay disease progression, millions of individuals in the United States depend on medications to lower levels of cholesterol, blood pressure, and blood glucose; surgical procedures to open or bypass blocked arteries; and dialysis.

The data from the latest CDC report suggest that a tipping point has been reached beyond which technological advances may no longer compensate. Indeed, higher-resolution data show that this trend has probably been under way for years. Between 1961 and 1983, life expectancy increased in a relatively consistent fashion throughout the United States, and no county had a significant decline. However, between 1983 and 1999, life expectancy decreased significantly for men in 11 counties and for women in 180 counties.[3] Of particular concern, counties that showed relative or absolute declines in life expectancy corresponded closely to those most severely affected by the obesity epidemic (ie, counties located predominately in the Southeast and Midwest). This downward trend in longevity will almost certainly accelerate as the current generation of children—with higher body weights from earlier in life than ever before—reaches adulthood. Modern medical care may prevent premature death among adults who develop obesity at age 45 years, diabetes at 55 years, and heart disease at 65 years, but the public health implications are likely vastly greater if this sequence of events were initiated in childhood.

In addition to the health-related effects, the economic effects of obesity-related disease are substantial and predicted to worsen. Direct medical costs associated with obesity among noninstitutionalized adults have been estimated to have reached $190 billion annually in 2005, an amount that does not include losses from lower worker productivity.[4] These expenditures and the lost tax revenue from lower productivity will increase the national budget deficit; strain the resources of Medicaid, Medicare, and private insurers; and adversely affect investment in the US social infrastructure (such as education, research, and transportation).

Although many factors influence body weight, the obesity epidemic is, at least in part, related to the confluence of uncertain science and special interests. For years, the public health approach to obesity has been based on the notion that "all calories are alike" and weight loss will result from simply eating less and being more active. This way of thinking implicitly places primary responsibility on individuals to control their calorie balance, while exonerating the food industry from aggressively marketing low-quality products. If all calories are alike, then a person could consume sugary beverages and other unhealthful foods as long as that person consumes less of other foods or gets more exercise. However, exceedingly few people can maintain long-term weight loss through calorie restriction because of antagonizing physiological responses, including increasing hunger level and slowing metabolic rate over time.[5]

Contrary to the conventional perspective, recent research has shown that food affects hunger, hormones, and even genetic expression in ways that cannot be explained by consideration of caloric balance alone. For example, energy expenditure decreased by 325 kcal per day among volunteers in a crossover study who consumed a low-fat diet compared with when they consumed a calorie-matched low-carbohydrate diet.[6] In other words, the type of calories consumed may affect the number of calories burned. A difference of this magnitude, if persistent, could explain a substantial proportion of the obesity epidemic, even without a change in food intake. In

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cohort studies, sugary foods, refined grain products, and other high-glycemic load carbohydrates have been associated with weight gain[7] and diabetes risk, whereas calorie-dense high-fat foods like nuts, dark chocolate, and olive oil show the opposite relationships.

Long-term trials to adequately test alternatives to the "calorie in, calorie out" approach to weight control are lacking. In contrast to drug studies, no company stands to profit directly from basic nutrition research (and industry sponsorship would raise important concerns about conflicts of interest). In 2015, the National Institutes of Health spent $900 million on obesity research,[8] approximately, as some suggest, the cost of bringing just one drug to market. In this funding environment, many clinical diet studies are limited by inadequate sample size, short duration, high dropout rates, and other design weaknesses.

Consequently, the public health approach to obesity remains focused on advice that has changed little in the last century. For instance, the first recommendation among the newly released 2015 Dietary Guidelines for Americans[9] is to "Choose . . . an appropriate calorie level to help achieve and maintain a healthy body weight." The food industry takes advantage of this confusion, by lobbying against sensible regulations—for example, to tax sugary beverages and limit advertising targeting children—with its political influence.

The trends in the recent preliminary CDC data may not persist or worsen. Nevertheless, multiple lines of evidence point to the rapidly increasing toll of obesity-related chronic disease and underscore the need for a comprehensive national strategy that puts public health over special interests and politics as usual.

High-quality, independent research must be part of this strategy, and Congress should substantially increase the National Institutes of Health budget for obesity-related research. But meaningful action does need not to await new scientific discoveries. With the consumption of *trans*-fats declining, added sugars and other highly processed carbohydrates comprise the most harmful components of the food supply. National policies are needed that shift away from low-quality commodities like corn and wheat and instead encourage production of high-quality proteins, fruits and vegetables, legumes, nuts, and other whole foods. Sensible reforms involving taxes, subsidies,[10] and national nutrition assistance programs could help make these nutritious foods more accessible and affordable. In addition, greater investment in schools must be made so that they can serve high-quality meals to children and offer regular physical education and after school recreation opportunities. Children must be protected from predatory advertising—the first amendment does not protect the right of food companies to market demonstrably unhealthful products to minors. Parents must also assume greater responsibility by limiting exposure to foods with poor nutritional value, encouraging physical activities for their children, and educating them and themselves about good health habits.

Health care professionals can model healthful behaviors and dedicate time during routine office visits to discuss diet. In addition, citizens can vote in 2 ways: with the ballot, for politicians who place priority on food policies in the public interest; and also with the fork. With every food purchase, the food industry can be incentivized to market healthful food instead of commodity-based industrial products.

Taking these actions now may forestall another prediction: children today will lead shorter, less healthful lives than their parents as a result of the obesity epidemic.

ARTICLE INFORMATION

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REFERENCES

1. Olshansky SJ, Passaro DJ, Hershow RC, et al. A potential decline in life expectancy in the United States in the 21st century. *N Engl J Med*. 2005;352(11):1138-1145.

2. Quarterly Provisional Estimates. Crude and age-adjusted death rates for all causes: 2014—Quarter 3, 2015. National Vital Statistics System, Vital Statistics Rapid Release Program. http://www.cdc.gov/nchs/products/vsrr/mortality-dashboard.htm. Updated February 24, 2016. Accessed March 3, 2016.

3. Ezzati M, Friedman AB, Kulkarni SC, Murray CJ. The reversal of fortunes: trends in county mortality and cross-county mortality disparities in the United States. *PLoS Med*. 2008;5(4):e66.

4. Cawley J, Meyerhoefer C. The medical care costs of obesity: an instrumental variables approach. *J Health Econ*. 2012;31(1):219-230.

5. Ludwig DS, Friedman MI. Increasing adiposity: consequence or cause of overeating? *JAMA*. 2014;311(21):2167-2168.

6. Ebbeling CB, Swain JF, Feldman HA, et al. Effects of dietary composition on energy expenditure during weight-loss maintenance. *JAMA*. 2012;307(24):2627-2634.

7. Mozaffarian D, Hao T, Rimm EB, Willett WC, Hu FB. Changes in diet and lifestyle and long-term weight gain in women and men. *N Engl J Med*. 2011;364(25):2392-2404.

8. National Institutes of Health, Research Portfolio Online Reporting Tools. Estimates of funding for various research condition, and disease categories (rCDC). https://report.nih.gov/categorical_spending.aspx. Accessed March 3, 2016.

9. US Department of Agriculture. *2015-2020 Dietary Guidelines for Americans*. 8th ed. http://health.gov/dietaryguidelines/2015/guidelines/. Published December 2015. Accessed March 3, 2016.

10. Mozaffarian D, Rogoff KS, Ludwig DS. The real cost of food: can taxes and subsidies improve public health? *JAMA*. 2014;312(9):889-890.