Obesity…Be Dammed!: What It Will Take to Turn the Tide

David Katz, MD, MPH, FACPM, FACP

In the United States, obesity is not only epidemic, but arguably the gravest and most poorly controlled public health threat of our time.[1,2,3] Some 65-80% of adults in the US are overweight or obese, defined as a body mass index (BMI) at or above 25kg/m.[2,4] The increasingly global economy has rendered obesity an increasingly global problem, with the United States the putative epicenter of an obesity pandemic.[5,6,7] Rates of obesity are already high and rising in most developed countries, and lower but rising faster in countries undergoing a cultural transition.[8] In China, India and Russia, the constellation of enormous population, inadequate control of historical public health threats such as infectious disease, and the advent of epidemic obesity and attendant chronic disease represents an unprecedented challenge.[9-11]

Since the 1970's the number of children in the United States who are overweight has increased dramatically.[12] Despite a conservative definition of overweight in children based on the 95th percentile for age- and sex-adjusted Body Mass Index (BMI), at least 15% (over 9 million) of children aged 6-19 in the population at large are considered overweight.[12,13] The prevalence of overweight among some ethnic minority groups is higher; over 23% of Mexican American children aged 6-19 are overweight and approximately 20% of 6-11 year old and 24% of 11-19 year old non-Hispanic black children are overweight.[12] The prevalence of overweight among Native-Americans has been estimated at 30%.[14] Overall, the number of children who are overweight has tripled over the past two decades.[15]

The health consequences of obesity are potentially dire in children and adults alike. Obesity in adulthood has been associated with increased incidence of cardiovascular disease,[16-18] type 2 diabetes[19,20] and most cancers.[21,22] More than two thirds of children 10 years and older who are obese will become obese adults and it is reasonable to assume that they will suffer from similar consequences.[23] In fact, obesity in children has been linked to higher risk of developing hypertension,[24,25] hypercholesterolemia,[26] hyperandrogenemia,[27]

David L. Katz, MD, MPH, FACPM, FACP, is Adjunct Associate Professor in Public Health, and Director of the Prevention Research Center at the Yale University School of Medicine. Katz is board-certified in Internal Medicine and Preventive Medicine/Public Health. Twice recognized by the Consumer Research Council of America as one of the country's top physicians in Preventive Medicine, Katz is an internationally recognized authority on obesity and weight management, nutrition, and the prevention of chronic disease.

gallstones,[28] hepatitis[29,30] and other disorders. Adults who were obese as children have increased mortality and morbidity independent of adult weight.[31,32] Obesity during adolescence increases rates of cardiovascular disease,[17,33-35] and diabetes[33] in adulthood in both men and women. In men, obesity in adolescence is also associated with increased all-cause mortality and mortality from colon cancer.[33,36]

The incidence of type 2 diabetes in the pediatric population parallels the increase in pediatric obesity.[37] One in four overweight children between the ages of 6 and 12 has impaired glucose tolerance[38] and childhood obesity is associated with an increased risk of hyperinsulinemia[26] and insulin-resistance, a prediabetic state.[27] Children aged 5-17 who are above the 95th percentile for weight are 13 times as likely to have hyperinsulinaemia when compared to children above the 85th percentile.[39]

Obese children also suffer psychosocial consequences from being overweight. Obesity diminishes children's quality of life severely, to levels of children diagnosed with cancer, as indicated by questionnaires validated to capture health-related quality of life.[40] Many have poor self-esteem[41,42] and are subjected to teasing, discrimination and victimization and may be socially excluded outside of the home.[43,44] In third-grade girls, BMI was shown to be associated with depressive symptoms.[45] These psychological factors can jeopardize children's ability to perform in school.[46-48]

Projections are uncertain, but include the prospect of our children living less long than we as a direct consequence of epidemic obesity.[49-54] More reliable are statistics suggesting that children growing up in the United States today will suffer more chronic disease and premature death from eating poorly and lack of exercise than from exposure to tobacco, drugs, and alcohol combined (*http://www.cdc.gov/nchs/data/series/sr_10/sr10_216.pdf; accessed 5/04*).

The link between obesity and mortality has been a matter of discord.[55-57] Until rather recently, data from the Centers for Disease Control and Prevention were used to support the assertion that as many as 400,000 premature deaths each year in the US alone could be ascribed to overweight and obesity.[58] This has since been refuted, defended, derided, and debated without evident closure.[59]

The resolution of this matter is that it cannot be fully resolved with current data, and it doesn't truly matter. Obesity very rarely, if ever, causes death directly. To the extent it contributes to premature death, it does so by contributing to chronic diseases, such as diabetes, heart disease, and cancer, that generally manifest over years to decades. Thus, attribution of death to obesity is nearly always inferential and readily overlooked, because the causal pathway involved is lengthy, and obesity is a distant, 'upstream' factor.

This doesn't matter for several reasons. First, it may be that obesity is not causing premature death to the extent once thought because medical advances so effectively prevent such deaths. These advances do not prevent disability and disease, however, which leads to the second issue: regardless of the number of years obesity is taking out of life it is indisputably taking life, and quality of life, out of years. There is little if any dissent regarding the associations between obesity and cardiovascular disease,[60,61] cancer[60,62]

and diabetes.[63,64] And since these constitute leading causes of death in the United States,[65,66] it seems rather far-fetched that obesity can be entirely exonerated of lethal influence. We needn't wait for unanimity on the body count to assert this, any more than we should wait for Oklahoma to become beach front property before accepting, and confronting, the reality of global warming.[67,68]

A Rationale for Irrational Behavior

We may, then, reasonably make the case that as individuals, a population, and even a species, we are ostensibly eating ourselves to death. Less contentiously, we are overeating ourselves- and under-doing ourselves- into states of chronic disease. Why would a putatively intelligent species do such a thing?

Because we can. There are many explanations one might invoke, from the low cost of food, to its energy density, to stress, hectic schedules, technology, and advertising. But it all comes back to the most fundamental explanation of all. Animals- including we- tend to get fat when circumstances allow. Circumstances have never so generously allowed for obesity as they now do.

Our ancestors adapted to a world of scarce calories, and high levels of physical activity.[69-72] The anthropology literature consistently refers to the cycles of 'feast and famine' that characterized most of human history. In such a world, eating when palatable calories were available made constant sense for calories were very inconstantly accessible. Similarly, in such a world, being sedentary when circumstance permitted was a prudent conservation of energy, and doubtless a welcome indulgence.

Thus, one may suggest that human beings, adapted to withstand exertion and the threat of starvation, have no native defenses against caloric excess. Nature never tested us with this problem before. Furthermore, we have no native defenses against the lure of the couch, either. Animals in nature run after what they want to eat, and away from what wants to eat them. There is little running otherwise. Exercise is a modern concept, invented for a world where physical activity in the form of work, and mere survival, is increasingly expendable.

Human beings in a modern world of fast food restaurants, vending machines, elevators and video games are as out of place as polar bears would be in the Sahara Desert. Our adaptations are to a world of scarce calories rather than scarce warmth, and thus it is food energy we soak up and retain with noteworthy efficiency. Transport us from our native savannahs to the modern suburbs, and we find ourselves floating in a sea of tasty calories. And in it we continue to soak up and retain food energy as we have always done. But whereas it always fostered our survival before, in a world of caloric excess it threatens if not our survival, at least our health.

The modern epidemiology of the Pima Indians serves to illustrate this point. The Pimas are a tribe of Native Americans indigenous to the 4 corners region of Arizona, New Mexico, Colorado, and Utah. The American Pimas branched off from the mother tribe in Mexico some 1500 years ago, and have been living in the desert ever since. Their native lifestyle in-

cluded walking long distances across the desert for water, and subsisting on the low-calorie, low-fat, low-sugar, high-fiber flora of the desert, including mesquite and the tepary bean.

Until roughly the middle of the 20th Century, the Pimas' health was unremarkable. Around that time, new government programs brought them indoor plumbing and access to the typical American diet. The Pimas quite rapidly went on to develop the highest rates of obesity and diabetes of any population on the planet (having since been surpassed by one or two others).[73,74] The change in their health was so extreme that a branch office of the National Institute for Diabetes, Digestive & Kidney Diseases of the NIH was set up in Arizona to study the Pimas.

Decades of research culminated in rather self-evident conclusions. The Pimas are a uniquely fuel-efficient people. Specifically, they have a very low resting energy expenditure, or basal metabolic rate.

This was a foregone conclusion. Only the most fuel-efficient people could subsist on mesquite and tepary beans while walking long distances each day. Only the most fuel-efficient people could grow and reach adulthood under such circumstances. And only the most fuel-efficient could possibly procreate under such conditions. And since those who do not procreate make notoriously poor ancestors, we may be confident that today's Pimas are all the offspring of highly fuel-efficient stock.

Suddenly plunged into a sea of calories and technology, the Pimas fuel-efficiency turned against them, subjecting them to epidemic obesity and diabetes. The general population has now achieved a rate of overweight of 65% or more over several more decades. The differences in susceptibility to obesity and its sequelae between the Pima Indians and the population at large are of degree, rather than kind.

Epidemic Obesity: Complex Simplicity

The persistence and progression of the obesity epidemic despite control efforts may suggest an underlying complexity that need not be invoked. Human beings store body fat as a survival mechanism; it is a way of using excess calories available today as fuel tomorrow when calories may not be available. Since we now have an excess of calories available every day, we accumulate fat that is never burned as fuel. The result is obesity. We gain weight when calories 'in' exceed calories 'out.' The disturbance in energy balance responsible for obesity is fundamentally simple.

Calories in are, of course, quite straight forward; they come exclusively from the food we ingest. Calories out are more complicated. We burn calories as fuel for physical activity, and to support growth and development until physical maturity is reached. We waste some calories as heat (referred to as the thermogenic effect of food), because energy utilization is never completely efficient. And we of course use calories to sustain basic body processes, or basal metabolism. This is referred to as Resting Energy Expenditure (REE). REE accounts for 60%-70% of total energy expenditure, physical activity and heat generation roughly 15% each.[75-77]

Weight regulation, admittedly, involves a great deal of complex physiology. Literally dozens of genes have been identified

that play some role in weight regulation, and hundreds are under investigation.[78-81] An intricate array of neurochemicals communicating among fat cells, the hypothalamus, and the gastrointestinal tract regulate appetite, and satiety.[82-84] But nothing fundamental in human physiology, and certainly nothing fundamental in the human genome, has changed over just the past few decades during which epidemic obesity has emerged. Human physiology is substantially the same as it ever was. The modern, and obesigenic environment is the same as it never was before. In the span of less than a single century, we have gone from a world of no cars, to one that enjoys digital photos sent via satellite from rovers on Mars. Is it any surprise culture, let alone genes, have failed to keep up?

The US produces some 3800 calories a day, after export, for every man, woman, and child in the country; and elaborate marketing effectively peddles these excess calories to us. the continuous advent of new technology continuously reduces the necessary energy expenditure of a typical day. Powerful forces thus conspire to create the energy imbalance that propagates obesity.

Simple, But Not Easy

The basic simplicity of obesity regrettably does not imply an easy solution to the crisis. On the contrary, all of human evolutionary biology, the profit incentive of large companies, and the basic momentum of technological advance all conspire against us. Accounting for obesity is anything but complicated. Controlling and reversing it will be anything but easy.

But for it even to be plausible, we must first overcome a confederacy of dangerous diversions. Prominent among these has been a parade of fad diets, offering quick-fix weight loss promises to desperate adults. First, scientific evidence that fat restriction offered compelling health benefits[85-87] led to a national preoccupation with 'cutting fat.' Many turned form high-fat, high-calorie, nutrient-poor foods, to low-fat, high-calorie, nutrient-poor foods, perhaps best represented by 'Snackwell' cookies. As a population, we cut dietary fat in a rather dysfunctional way, and grew ever fatter.

This created a great opportunity for iconoclasts who could claim that fat restriction had been a mistake all along (rather than acknowledging we had gone about it all wrong). Reviving a low-carbohydrate diet he espoused in the 1970's, Dr. Robert Atkins rose to the head of this class with the publication of his "New Diet Revolution" in 1992. The "low carb" era, which seems now to be waning if not expiring outright[88-90] recapitulated the follies of low-fat history. Rather than turn from sugar and white flour to more wholesome, less processed foods, the population turned from low-fat, high-calorie processed foods, to low-carbohydrate, high-calorie processed foods. A case of "déjà vu, all over again" was concurrent with ever rising rates of national obesity.

Sequential preoccupations with the elimination of a macronutrient class may have delayed more productive responses to the worsening epidemic of obesity. Eating well for sustainable health and weight control never has been, is not, and never will be about deciding which of only three main nutrient classes (carbohydrate, protein, and fat) to abandon. Eating well for

lasting health and weight control, for all members of a family, always has been, is, and always will be about making good choices within each nutrient category. This very position is rather explicit in the 2005 Dietary Guidelines for Americans.[91]

Yet another diversion comes in the parsing of nutritional fine points by academics. Perhaps the most salient example of this has been defense of competing dietary pyramids.[92,93] The Harvard Medical School, for example, offered up a 'Mediterranean' food pyramid as an alternative to the both venerable and much maligned USDA food pyramid,[94,95] which itself has since evolved.[96,97] Obscured by this competition was the widespread consensus among nutrition experts about fundamentals of healthful eating. Namely, there is little debate about the merits of a diet rich in whole grains, vegetables, fruit; moderate in fat and protein; restricted in saturated fat, trans fat, salt, sugar, and refined starch. The typically much-hyped discord among academic nutrition experts has always discouraged a dedicated commitment to healthful eating by a public that can then claim, disingenuously or not, to be confused about what healthful eating means.[98-100] Some tips for healthful eating that are subject to minimal controversy among reputable nutrition authorities are:

- Reduce trans fat
- Reduce saturated fat
- Reduce sodium
- Increase fruits and vegetables
- Increase whole grains
- Reduce refined starches and simple sugars
- Replace "bad" fats with "good"
- Increase fiber
- Increase micronutrients
- Control portion size and total calories
- Increase physical activity

(*Katz DL. TIME Magazine / ABC News Summit on Obesity; Williamsburg, VA: June, 2004*)

Another potential diversion forestalling an all-out effort to control obesity through lifestyle change is the perennial hope for a wonder-drug. This is driven in part by the recognition that whereas all diets work for short term weight loss, no diet to date has worked with any consistency for long term weight maintenance.[101]

Pharmacotherapy is certainly warranted for managing certain cases of obesity, and advances in drug therapy may offer greater benefits. But the notion that obesity can be reversed at the population level through phamacotherapeutic advance seems a misguided fantasy. First, the prospect of most adults and a large percentage of children taking drugs routinely and perhaps permanently to control weight is somewhat distasteful. Second, the costs would almost certainly be prohibitive. Third, the history of pharmacotherapy for obesity has been quite disappointing, and this may be a precautionary tale.

But fourth and finally, obesity is unlike most conditions treated with medications. A body gaining weight when excess calories are available for consumption is behaving normally. Efforts to curtail such weight gain with drugs are not efforts to correct an anomaly in human physiology, but rather to deconstruct and reconstruct its normal operations at the core. Advances in pharmacotherapy, like advances in surgery, will serve the weight management

needs of individual patients. But looking in this direction for a population-level solution is ill advised.

When the Going Gets Tough

There is little argument that regular physical activity is vital to both health and weight control. Yet there has never been a definitive, randomized trial to prove that assignment to differing levels of activity predicts variation in weight and health. Nor is such a trial likely, or needed. In the aggregate, the evidence supporting a role for physical activity in both health and weight management is quite convincing. Rather than debating 'whether' or 'what,' we are left to wrestle with 'how,' and 'how much.'

Oddly, although the evidence characterizing fundamentals of a healthful[94,102-111] and weight controlling[87,112-129] diet is also abundant and convincing, we have thus far failed to acknowledge consensus in a way the public finds persuasive. Instead of focusing on 'how' to make a healthful, weight-controlling diet more accessible to all, we have continued to debate the relative merits of different diets- including fad approaches at odds with mainstream thinking.[7,130] This would be rather like refusing to commit resources to the promotion of physical activity until alternatives to physical activity had been assessed for comparable benefit. It seems unlikely that any who favor studies of diets at odds with the consensus view on healthful eating would favor studies of all the ways there are to be sedentary to see if, perhaps, one of them is as good for us as being physically active. This apparent double standard is a barrier to the effective cultivation of population-level commitment to the fundamentals of healthful eating, a dietary pattern supported by a robust confluence of evidence.[104,105,107,111,129,131-136,72,137,138]

Scientific reviews of dietary intake for optimal health do not necessarily demonstrate complete agreement on all points at all times, but the consensus about fundamentals is really quite convincing. Diets rich in fruits, vegetables and whole grains; restricted in animal fats and trans fat from processed foods; limited in refined starches and sugar; providing protein principally from lean sources; and offering fat principally in the form of monounsaturated and polyunsaturated oils are linked to good health.[102-104] When it comes to diet and optimal health, legitimate debate really is limited to variations on this basic theme, not departures from it.

Modern scientific study of optimal human nutriture and anthropological estimates of our native intake levels, have converged with remarkable consistency[69,144,145] The implication is that until or unless research methods answer all our questions, our native diet is a robust model for filling in gaps. The dietary pattern that results is shown in Table 2. This constitutes a basic 'theme' of healthful eating on which there may certainly be practiced some reasonable variation. But to deny the theme is no more reasonable than to refute the health benefits of physical activity.

Actions & Accountability

At the International Congress on Obesity in Sydney, Australia, in September of

Table 2. Recommended Dietary Pattern for Optimal Health & Weight Control

Adapted from: Katz DL. The Way to Eat. Sourcebooks, Inc. Naperville, IL. 2002

NUTRIENT CLASS/NUTRIENT		RECOMMENDED INTAKE
Carbohydrate, predominately complex		Approximately **55-60%** of total calories
Fiber, both soluble and insoluble		At least **25 grams per day,** with additional potential benefit from up to 50 grams per day
Protein, predominantly plant-based sources		Up to **20%** of total calories
Total Fat	***Types of Fat***	Not more than 30%, and preferably 20-25% of total calories
	Monounsaturated Fat	10% of total calories
	Polyunsaturated Fat	10% of total calories
	Omega-3 and Omega-6 Fat	1:1 to 1:4 ratio
	Saturated Fat & Trans Fat (Partially Hydrogenated Fat)	Ideally, less than 5% of total calories
Sugar		Less than 10% of total calories
Sodium		Up to 2400 mg per day
Cholesterol		Less than 300 mg a day
Water		8 glasses a day/64oz/2liters
Alcohol, moderate intake if desired		Up to one drink a day for women Up to two drinks a day for men
Calorie level		Adequate to achieve & maintain a healthy weight. See **Resource 9** for details.
Physical Activity / Exercise		Daily moderate activity for 30 minutes Strength training twice weekly

2006, it was announced that for the first time in history, there are more overfed than hungry Homo sapiens on the planet. The implications for obesity management are both clear and compelling. A universal, preventive approach is warranted, as the entire population- indeed the species- is in the 'at risk' group.

The challenge of obesity control is not about 'what;' it is about 'how.' How can we enable an increasingly overweight population to resist the obesigenic forces conspiring against it?

There are two reasonable approaches. One is to reengineer the modern environment so that its obesigenicity is attenuated. The second is to better exploit native human intelligence and resourcefulness, and empower individuals and families with knowledge, skills, and strategies necessary to resist fixed obesigenic elements of the modern landscape.

These approaches are both achievable to some degree and will likely both be required. There is a limit to how far either can go alone. Some environmental reforms seem much more plausible than others. We may, for example, construct sidewalks more consistently in neighborhoods of the future. It seems improbable that having devised snow blowers, leaf blowers, and tractors, we will ever renounce them and return to rakes, shovels, and ploughs.

How much can be achieved through a focus on the environment and how much through empowering individuals is a matter worthy of dedicated attention. To strike the right balance will require recognition that the approaches are complementary, rather than competitive. Current opinion tends to be divisive and polarized, with some proponents of "personal responsibility" and others of "environmental determinism." We would be well served by measures that tell us who is sufficiently empowered to take control of their weight, and who is not. If responsibility comes with power,[146,147,148] the corollary is that empowerment is prerequisite to taking responsibility. Divisive rhetoric all too often conceals the middle path of reasoned consensus from all concerned.

For example, we cannot expect a hard-working single parent earning minimal wage in a city neighborhood to have the same potential to manage her weight through "personal responsibility" as a highly educated, well paid suburbanite.[149,150,151] The playing field of opportunity is not level, and that calls for policy interventions. Many reasonable approaches have been espoused.[152-155]

We should also acknowledge the hypocrisy in telling children to eat well and be active, then sending them to schools that provide vending machine junk food, but not physical education.[156,157] Those who contend that parental or personal responsibility should carry the day despite these environmental temptations might consider the implications of generalizing the principle. Perhaps children should be encouraged, but not required, to attend school and tempted each morning by alternatives, such as buses to the circus, zoo, or beach. Were we to treat what we feed the minds of children as we have treated what we feed their bodies, this might well be the prevailing standard.

School policies are rapidly evolving across the nation to raise nutrition standards[158-161] and a number of promising programs are emerging to teach children about nutritional health and weight con-

trol.[162-166] Multidisciplinary programs include physical activity, but school officials are still prone to lament the lack of time for physical education due in part to the stipulations of the 'No Child Left Behind' legislation.[167] But if the school day is a round hole and time-honored approaches to physical education a square peg, surely human resourcefulness is up to the task of redrilling the one, or whittling the other. For example, perhaps elementary school teachers could be trained to guide their classes through a 5-minute aerobic routine during each session of the day.[168] Such an approach might serve to dissipate the native restlessness of young children, enhance the behavioral environment in the classroom, and improve academics, while allowing for the accumulation of 40 minutes or so of fitness-enhancing activity for student and teacher alike over the course of the day.

There is comparable opportunity to empower individuals and households through innovation. Simply noting that the challenge of eating well is more about 'how' than 'what' may be of some use.[169] Of potentially greater utility is the detailed elucidation of little known barriers to weight control, and the strategies that serve to overcome them.

One example is sensory specific satiety, the very well researched tendency to become full faster when flavor varieties are limited, and to stay hungry longer when flavors are available in greater variety at any one time.[170] The most universally familiar representation of this phenomenon is feeling stuffed at the end of a holiday meal, but still finding room for dessert. Rather than the proverbial hollow leg or extra stomach, this extra room actually is provided courtesy of the hypothalamus, where specialized cells respond to specific taste categories. When eating shifts from salty turkey to sweet pecan pie, a new appetite center is activated, and hunger resumes.

This is of profound significance in a world awash in highly processed foods. First, a wide variety of foods is available almost constantly. Second, a variety of flavors is designed into individual foods, perhaps as a willful attempt by the food industry to manipulate appetite. Commercial breakfast cereals routinely contain nearly as much salt as salty snack items. Sauces, dressing and condiments that taste salty routinely contain sugar in quantities to rival dessert items. Processed foods of every variety contain artificial flavor enhancers. Efforts by the food industry to combined flavors for maximal effect on the appetite center were described in an expose published in the Chicago Tribune in January of 2006 (*http://www.chicagotribune.com/news/specials/chi-oreos-specialpackage,1,7094476.special?coll=chi-news-hed*). Many other food industry practices, and cultural patterns, that influence dietary intake are addressed in a recent book.[171]

Viewed dispassionately, epidemic obesity is the perhaps inevitable consequence of a veritable flood-tide of obesigenic factors that have accumulated and converged to make an abundance of calories constantly and temptingly available, while reducing ever further both vocational and recreational physical activity. To hold back flood waters requires a complete dam. No one sandbag, brick, or branch will make any discernible difference at all. But every dam begins with a first sandbag, brick, or branch, and could not accomplish its in-

tended purpose without them. This, in part, explains why epidemic obesity has thus far proven intractable. A defense commensurate with the threat has not yet been constructed.

What would be the anti-obesity analogue of the Hoover Dam? A comprehensive system of reforms in knowledge, behavior, policies, and the environment. We need schools that provide nutrition education, serve only food that conforms to what is being taught, and make a place for physical activity as a part of every day. The remedy for the native rambunctiousness of children is recess, not Ritalin.

We need clinicians trained to provide weight management counseling that is effective, efficient, and compassionate; and an insurance system that will reimburse those who use behavior modification science to counsel artfully. We need physical activity breaks to be a standard part of the work day- and perhaps financial incentives for the pursuit of health when it is not, alas, its own incentive.

We need food labels for dummies that enable consumers to know, at a glance, what choices are best, and when to step away from the box so no one gets hurt. Every neighborhood needs to provide recreational facilities and sidewalks, and new neighborhoods should be designed so that it makes sense to get around them by foot, rather than car. We need social engineering to give us back time to prepare food at home, or ways to eat out that offer good nutrition at low cost. We need new-age tools, such as www.healthydiningfinder.com, to empower our navigation through the challenges of the modern nutritional landscape.

We need to make use of stairs rather than elevators the social norm. We need to overhaul the food supply and eliminate the category of 'junk' food. We need to subsidize the sale of fresh fruits and vegetables. We need truth in advertising and controls on food marketing to children. We need to educate families about how to practice good nutrition, and good physical activity together. It should once again be possible for children to walk and bike to school. And while a place in our barricade may be reserved for bariatric surgery and drugs such as rimonabant, it must be in a small and isolated corner.

Accountability for these actions is shared. Many anti-obesity policy initiatives warrant and require government intercession. These include policies related to the built environment; food marketing; public sector insurance benefits; school food standards; food subsidies; and more. The academic community should accept responsibility for separating debate about nutritional fine points from the expression of consensus about fundamentals. The clinical community should establish and enforce basic standards in lifestyle counseling. And ultimately, as more useful policies are adopted and more resources are made available, individuals and families must accept responsibility for making use of them. The control of obesity will ultimately require a balance between public policy, and personal effort.

Conclusions

In a report on the prevention of childhood obesity, the Institute of Medicine has offered a useful array of policy recommendations (*Institute of Medicine. Preventing*

Childhood Obesity: Health in the Balance. September 30, 2004), while a more recent report indicates that much of the work is still undone (*Institute of Medicine. Progress in Preventing Childhood Obesity: How do We Measure Up? September 13, 2006*). There are several reasons for relatively slow uptake of the policy recommendations proffered by the IOM, and others (*Nestle M, Jacobson MF. Halting the obesity epidemic: a public health policy approach. Public Health Rep. 2000;115:12-24*).

First, obesity control requires an array of coordinated actions, but there is no coordinating entity. Many of the actions needed to contain academic obesity, such as school nutrition policies, zoning regulations, food marketing, and pricing incentives fall within the purview of the government. Others, such as media representations, clinical counseling, insurance benefits, and social marketing are substantially outside the government's control. Ultimately, the use of information regarding dietary choices and physical activity must be put to use by individuals. While the personal choices of individuals will generally fall outside the purview of public policy, the flow of information and resources to empower those choices falls within. The US Secretary of Health, or perhaps a designated appointee in the position of "obesity czar," should be accountable for the coordinated implementation of obesity control strategies needed to empower individuals.

For this to occur, we will need to recognize the magnitude of the obesity crisis and overcome our general reticence toward governmental regulation. We will need to acknowledge conflicts of interest that preclude reliance on market forces, such as the need for an overweight population to eat less, and the desire of the food industry to sell more. We will need to confront the paradox that obesity, due to its health toll, is objectionable, even though its root causes- an abundance of desirable food and the opportunity to be sedentary- historically are not. The greatest obstacle to obesity control is ambivalence.

Obesity trends will not change appreciably until the aggregation of obesity control strategies is commensurate with and opposite to the aggregation of obesigenic elements in modern society. This means that even when actions against epidemic obesity are robust, evidence of success will initially be sparse. Evidence of success is a potent stimulus to policy reform, whereas its absence is a potential impediment for failing to reward investment of effort or resources. There is thus a need to focus on intermediate outcomes, such as changes in dietary pattern or activity level, as early measures of success in obesity control. Effects on weight patterns in the population will be discernible only after a delay that allows for the gradual accumulation of necessary, but independently insufficient, contributions to a comprehensive array of obesity control program, policies, and practices.

While simple to explain, epidemic obesity will be anything but easy to fix. We must overcome the propensity of our genes, the propulsive force of culture and some 6 million years of gathering momentum. The task is daunting, but possible. Each useful policy, program, or strategy implemented will function like one sandbag in a levee. When we have stacked enough strategies together, the flood tide of obesity will be turned.

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