

SESSION III: THE CHALLENGE OF OVER-NUTRITION AND OBESITY

October 14, 2005 - 9:00 a.m. to Noon

The Challenge of Over-Nutrition and Obesity

DR. WILLIAM DIETZ

Director, Division of Nutrition and Physical Activity
National Center for Chronic Disease Prevention and Health Promotion

Thank you, Cathy. It really is a great pleasure and an honor to be here, and I'm grateful to the organizing committee for inviting me. And it's particularly wonderful to be here to celebrate Dr. Gupta's success as a potential model for one who has successfully addressed the issues of hunger internationally. His work represents a challenge to those of us in this country who hope to achieve the same impact on obesity.

The topic of my lecture I've modified a bit, because I thought it was important to begin to bridge the gaps here between undernutrition and overnutrition. I've taken as the theme of my lecture, the similarities and the potential differences between these two problems.

I think that one of the points that we need to make from this title slide is that we can no longer comfortably talk about malnutrition and assume that people know what we're saying. Malnutrition is a generic term, in my view, that encompasses both under and overnutrition. Furthermore, with respect to overnutrition, I think we have to make clear that this is more than a nutritional problem – it really has to do with energy balance. Therefore the energy expenditure side of this relationship is just as important as the energy intake side, and the balance equation offers two avenues for intervention.

The first point is that there are lots of similarities with respect to the populations affected by under and overnutrition and obesity. In both cases, women are more affected than men. In the United States, as we'll see, the prevalence among Caucasian women is 30%, but among African-American women and Mexican-American women, the prevalence is considerably higher. There are very substantial disparities, just as there are with respect to some of the micronutrient deficiencies in the developing world.

The ethnic differences are often class-related with respect to undernutrition, but in women, as I said, 30% of Caucasian women, 40% of Mexican-American women, 50% of African-American women are obese. Obesity is only class-related in Caucasian women where there is an inverse relationship between social class and obesity. In the African-American and Mexican-American population, the relationship between obesity and socioeconomic status is much flatter than it is among Caucasian women.

Children in both cases are especially vulnerable. To the earlier question, only about 25% of obese adults in this country were obese children. But there is a disproportionate effect of childhood onset overweight on severe adult obesity. About half of all adults with a body mass index greater than 40, which is about a hundred pounds overweight, were overweight prior to

eight years of age. So although only a minority of adults who are obese were overweight as children, there is more severe obesity among those who were overweight as children.

In both the case of undernutrition and obesity, there is a very sizable disease and financial burden, and we'll come back to that in a moment.

Interestingly enough, in both undernutrition and obesity, early breastfeeding appears to protect against subsequent nutritional problems, particularly in young children, although the long-term impacts of this are less certain.

Food insecurity in undernutrition plays a very significant role in the pathogenesis of this disease. In obesity this role is much less certain. I published a case about 15 years ago of a young adolescent girl who had an association of her obesity with food insecurity. The first check of the month – this was a welfare family – the first check of the month went for rent, and by mid-month, before the second check arrived, this family was food insecure and hungry. To avoid hunger in her daughter, this mother was feeding her daughter pasta with either margarine or oil to keep her from being hungry. Addressing that problem reduced her child's obesity. However, in national surveys, there's not a consistent relationship of food insecurity and obesity.

But the response of industry here, I think, is particularly important, and I'd like to move now to the strategies that the United States has employed, which have involved industry in the solution to the undernutrition problems as a potential model or lead into how we should consider the role of industry in the response to overnutrition.

These are three examples that I'm going to discuss: iodine deficiency, pellagra, which is niacin deficiency, and neural tube defects as a consequence of folic acid deficiency. One of the most important points here is that these are single-nutrient deficiencies and therefore much more responsive to interventions that rely on food fortification, which provides a model for undernutrition the world over.

Now, with respect to iodine deficiency, we know that this was associated with a very substantial burden of disease in this country at the turn of the century, not just the reduced intellectual performance, which affected a substantial number of people, but goiter and cretinism. This disease burden is not a surprise to this audience which is intimately familiar with the effects of iodine deficiency in the developing world. But, interestingly enough, the iodization of salt in the United States began in 1924, and it began because of the recognition of Morton Salt that they could gain a marketing edge by promoting salt iodization as a product which would make children smarter. As this ad says, *Brilliance for little minds, strength for little bodies*, based on this product. This was a voluntary action, but it had a very profound effect on prevalence of iodine deficiency in the United States. These are data in trends in goiter prevalence in Michigan. Notice that between 1924 and 1929 there were very substantial declines in goiter. Today as a result of salt iodization, iodine deficiency disease or goiter in the United States is largely a consequence of hormonal abnormalities of the thyroid, not of a nutrient deficiency disease.

The second instructive effort has to do with the elimination of pellagra by the fortification of flour with niacin. Pellagra was a disease which was widespread in the southern United States in which people had a predominantly corn-based diet that was deficient in an essential amino acid. And at the beginning of World War II, I'm told – and I haven't been able to document this figure

– that 30% of all recruits in the United States were ineligible for the draft by virtue of a nutritional deficiency disease, and pellagra was one of those diseases.

The Defense Department, in response to this recognition, asked the National Academy of Sciences to form the Food and Nutrition Board, which still exists today and of which Cathy was a former chair. One of the first actions of that board was to call for the fortification of flour with niacin and other nutrients, and this graph shows the results. Now, interestingly enough, in the South, voluntary fortification of flour was already occurring with niacin. But as I said, one of the first acts of the Food and Nutrition Board was to declare a mandatory fortification of flour with niacin. When that was introduced prior to World War II, there was a very prompt decline in both the deaths attributable to pellagra – and it was the eighth leading cause of death in the Southern United States – and a very substantial decline in symptomatic pellagra, which was characterized by skin lesions, diarrhea and dementia.

In contrast to the Morton Salt experience, this was the first mandatory requirement for food fortification in the United States. Although that regulation ended at the end of the war, companies continued to fortify flour.

The final example is neural tube defects, and this is the most recent example that we have of the impact of nutrient deficiency disease elimination through fortification of the food supply. Folic acid deficiency during the first trimester of pregnancy is associated with an increased frequency of neural tube defects, and it's been known since the early 1990's that the addition of folic acid in the food supply or supplementation of women prior to pregnancy substantially reduced the prevalence of neural tube defects.

In the mid-1990s the FDA, in response to a growing demand, mandated that the wheat flour supply of the United States be fortified with folic acid. The results were striking, as shown in this graph. There was a very prompt decline in the frequency of neural tube defects that actually began with voluntary fortification before the regulation was enforced in 1999.

Now, characteristic of all of these experiences was that they involved a single nutrient deficiency, and that the response involved both a voluntary and a regulatory approach. All of these solutions were aimed at changing the food supply to address a significant nutritional problem.

Internationally, as we heard yesterday and the next three slides show, there is a wide consensus that fortification or supplementation with micronutrients is a reasonable strategy that offers a high return on investment. The vitamin and mineral damage report released two years ago by UNICEF and MI is one of those which points out the high prevalence of nutritional deficiency diseases around the world. The World Bank ratings showed that fortification strategies, particularly iron fortification, had the lowest cost for daily adjusted life years. Finally, the Copenhagen Consensus Conference which brought together a number of Nobel Prize winners, labeled the provision of micronutrients as the second-most cost-effective strategy internationally to begin to address these problems.

But industry has played a key role. Obviously in this issue, these changes in the food supply would not have occurred without either the voluntary or regulatory engagement of industry. In addition, industry bears the cost of this intervention, unless it's somehow subsidized through the

population. The most recent international initiative, which I think represents a model for how this can be achieved, is the public/private partnership around the flour fortification initiative, which was alluded to yesterday. This is an initiative which involves the Centers for Disease Control and groups like UNICEF but also involves some of the model companies like Cargill or flour millers, who are the people that are engaged and need to be engaged if this is an issue that's going to succeed.

But what can industry do, and what has it done, and what should it continue to do? Well, as we heard yesterday, new product development is an essential strategy and one which industry can embrace and has had a major impact on nutritional deficiency diseases. Industry can help make the case for fortification of the food supply, both in terms of recognizing the success of this strategy as well as providing the data and helping to support the argument that this represents a good return on investment.

But an important strategy is the business-to-business contacts which have promoted, in the case of flour fortification, active engagement of flour millers around the world, and have led to a very substantial commitment on the part of millers, even in the absence of a regulatory framework, to invest in flour fortification, particularly in the Middle East.

Interestingly enough, in many places of the world, industry is the group calling for regulation of food fortification, because it levels the playing field. It eliminates the risk that an individual industry has to take in terms of increasing the cost of its product by making this a mandatory strategy and therefore leveling the playing field.

But finally, industry has much more experience than the public sector in marketing and promoting these types of strategies. We heard again yesterday the importance of social marketing to create a demand for the products. Now, many of these strategies that have been applied successfully to undernutrition and nutritional deficiency diseases, I would argue, can be applied to overnutrition. And I'll come back to that in a moment.

The global prevalence of obesity has increased rapidly. These are largely developed countries, but in the developing world where data are available, every country that has longitudinal data is showing an increase in the presence of obesity. Although the United States is repeatedly pointed to as the leader in obesity in the world, a somewhat ignominious distinction, there are other countries which have a higher prevalence than the United States, most notably Kuwait, Saudi Arabia and East Germany, or the former East Germany.

In the same country, obesity and undernutrition may coexist in different parts of the population, but often within the same individual. Increasingly there are children who are stunted who are also obese, and this poses, as has been repeatedly emphasized during this whole symposium, a major challenge.

Governor Huckabee showed these maps earlier today. I think they demonstrate quite nicely how rapidly obesity has increased in the United States. I just wanted to make one point about the difference in the prevalence estimates that he showed versus those which I quoted to you earlier. These data are from the Behavior Risk Factor Surveillance System, which is a telephone-based survey in which people self-report their heights and weights. And like most people in this audience, people tend to over-report their height and under-report their weight, which leads to a

spuriously elevated estimate of prevalence. The numbers that Governor Huckabee showed you were based on self-report data. But actual data in adults, suggest that 30% of adults are obese by this criteria.

Also, about 16% of children and adolescents are overweight. Now, I need to explain that difference as well. The term "overweight" applies to children and adolescents whose body mass index is greater than the 95th percentile for children of the same age and gender. In a young adult, a BMI at the 95th percentile is a BMI of 30. So these definitions between children and adolescents and adults are concordant. But the term we use is overweight rather than obesity because it's a much more acceptable term.

The consequences of obesity in adults are widely recognized. Those of greatest importance and those, as you'll see in a moment, of greatest cost are those related to cardiovascular disease risk factors. Obese adults have higher levels of cholesterol, lower levels of HDL cholesterol, higher levels of LDL cholesterol, and higher levels of triglyceride. They also have increased blood pressure, all of which contributes to an increased risk of heart disease. There's also an increased risk of cancer. There is also an increased risk of type II diabetes. And with the epidemic of obesity in the United States, there is an epidemic of diabetes, which follows closely on the heels of the epidemic of obesity.

These are maps using self-reported diabetes cases, and you can see that the country has transformed in terms of the prevalence of type 2 diabetes, just as it did with respect to obesity. Estimates that were published a year or so ago suggest that one third of all children born in the year 2000 are likely to develop type 2 diabetes during their lifetime.

Type 2 diabetes is now occurring in children and adolescents in the United States - it's a disease that has not previous been seen. This slide shows in a superimposed fashion the time course required for people who have onset of diabetes at different ages to develop kidney disease. The curves are superimposable. But think of the difference for the onset of renal disease in an individual who, let's say, is 65 years of age. In the 15-year period in which 25% or so of the population develops diabetes, the likelihood is that that 65-year-old will die of some cause other than type 2 diabetes or the kidney disease associated with it. In contrast, the 15-year-old who develops type 2 diabetes by age 30, may have significant renal disease and may shortly thereafter develop blindness or the amputations that are the consequence of the microvascular disease associated with type 2 diabetes.

So as this wave of obesity moves through the pediatric population into the adult population, not only are we going to be seeing more severe disease in adulthood but we're going to be seeing more adverse consequences of this disease in adulthood. And as Governor Huckabee mentioned this morning, this is a costly problem, and we need to look at this problem in the context of the national medical costs. Now, I think it's important again to emphasize that we need to talk about medical costs because we don't have a healthcare system, we have a disease care system. And what we need to invest in, as the governor so articulately mentioned, is a healthcare system rather than a disease care system. What we know best are the costs that we're spending on disease.

As Governor Huckabee mentioned, General Motors is a major proponent of the need to control chronic disease rates. In January of last year, the chairman and CEO of General Motors pointed

out that \$1500 of the cost of each new car that rolls off their line is spent on medical care for their employees. That cost impairs our international competitiveness.

The next article that came out consistent with this, pointed to the very substantial U.S. trade deficit, which in part is accounted for by the lack of competitiveness or the higher prices that we charge as a result of the money that our corporations are spending on medical care.

That amounted to about 15% of our gross domestic product this year, but a projection for the year 2014 is that medical costs will account for 19% of our gross domestic product. That is a level of spending that we cannot sustain.

So the solution for obesity, in my view, is tightly linked to the medical expenses that characterize our disease care system and offers really an opportunity that we haven't had for at least a hundred years, to begin investing in prevention efforts that are focused both on diet and reductions in inactivity.

Now, what are those costs? The costs that most people point to are the costs of illness, and those costs are substantial. This is one estimate that Graham Colditz published in 1998 that suggested that both direct and indirect costs were about a hundred billion dollars per year. Other costs have estimated that these may be actually closer to a hundred billion in direct costs. About half of those costs are borne by Medicare and Medicaid. So at some level in the system, we are already paying for these costs, and these are not costs that are likely to diminish.

In addition, a recent paper in *Health Affairs* pointed out that the majority of those costs could be linked to these ten diseases. All ten of these diseases are associated with obesity, i.e. heart disease, some pulmonary conditions, cancer, and hypertension. There is an increased association of trauma associated with obesity, as are cerebral vascular disease, arthritis, diabetes and back problems. Therefore, the argument needs to be made and recognized that obesity is driving chronic disease costs, and chronic disease costs are driving medical costs. That's the rationale for the investment in prevention.

But from the employer's point of view, there are additional costs, and these are not as well measured. For example, it is known that obese individuals miss more work, about twice as much work as non-obese individuals, and that there appears to be a reduction in the productivity of obese individuals at work, although this is not a cost that has been accurately or widely replicated. There appears to be an increased cost of injuries on the job associated with obesity, because overweight and obese people can't move as efficiently and are therefore more likely to be put in harm's way.

Finally, there are very substantial costs of disabilities. To give you one idea of how those might be expressed, this is one study of the effects of obesity on health and disability among 50- to 69-year-old women with severe obesity, about a BMI greater than 35, which affects roughly 10% of the female population in the United States; 40% of these women report poor health, and they have on average two chronic conditions per person; 21% have a significant limitation in their activities of daily living; and 45% report that this condition limits their work. All of these support the notion that the costs of disability, productivity, and absenteeism are likely to be very substantially greater among obese individuals and therefore contribute disproportionately to their costs.

Now, how do we begin to approach this problem? As I said, in contrast to undernutrition, which is a single nutrient deficiency, this is a disease of excess. And it's one characterized by both increased food intake and reduced physical activity. There is no single intervention that is likely to be effective, nor are interventions limited to medical settings likely to have a major impact – just as with undernutrition in the developing world.

It's quite clear that a multidimensional approach across multiple settings is what we're going to have to employ if we're going to be successful at such a broad cultural problem. I'm not going to talk further about the interventions within schools, worksites and communities, given the time limitations – although I hope we'll have adequate time during the discussion for questions related to schools, worksites and communities. But coming back to the analogy with undernutrition, I wanted to focus on the potential contribution of industry broadly defined with respect to obesity.

One of the first things that I think is critical particularly for the food industry is the well-recognized relationship that exists between energy requirements and both levels of physical activity and weight.

It's well known that if you're more physically active, you can eat more. However, physical activity as a single intervention is not going to reduce the obesity epidemic. It's going to reduce some of the comorbidities associated with obesity, but in very careful studies, physical activity has a limited impact on weight. Nonetheless, the stance of many companies that are actively engaged in the obesity epidemic is to focus on increases in physical activity. I'm not discounting the importance of that focus, because it certainly will have an impact on the diseases associated with obesity. But it is not likely to reverse the obesity epidemic.

Likewise, if one looks to the figure on the right, there is a direct relationship of energy requirements and body weight. The more you weigh, the more food you need to eat just to maintain yourself at that new weight. One of the impacts of that relationship on the food industry has been that, as people gain weight, they eat more. I don't for a minute believe that the food industry is creating the obesity epidemic to sell more food. But the paradigm of growth of the food industry has been to sell more food for less money.

That paradigm will have to change with weight loss, because as people lose weight, they need less food. And that means that the paradigm in which growth has been based on volume has to change to growth based on quality, or less volume at the same price.

I think we're beginning to see beginning of an industry response based on that approach, but it is not yet well developed. However, in my view, this is a very essential recognition from the basic science side that says – as people lose weight, they're going to need less food. And for industry to continue to grow, they're going to have to have some strategies that come to terms with that recognition.

Now, what other things can industry do? Well, recognize the threat. This is a threat not just to our youth but to our adults and one which has already, as I think I've demonstrated, had a profound impact on our international competitiveness.

As with undernutrition, I suspect business-to-business contacts around this issue to engage business in a positive way are going to be more effective than public or governmental

interventions, that businesses, as with food fortification, will bear the cost of some of these interventions.

An important strategy for businesses of all types, not just the food industry, is to become model worksites. Worksites are to adults as schools are to children. They're places where people spend a lot of time and consume substantial proportions of their daily caloric intake. Businesses and worksites need to be more helpful places for people to work, where choices of physical activity and choices of healthful foods are more readily available and benefit packages are negotiated which provide effective care for overweight and obese individuals.

New product development can play a major role. Industry can both create and meet consumer demand, and I think we're already seeing developments in that arena. Creative packaging is an unexplored area, and Brian Wansink has done a number of studies which demonstrate that the way a product is packaged leads to satiety. For example, if you are provided a certain amount of juice in a narrow, thin glass, you think you are actually getting much more than that same amount of juice in a flat, broad glass. Finally, industry has a much greater capacity than government to do research on consumer demand and consumer perception. These data have historically been proprietary, but in my view there are elements of these data that can and should be shared in order to create a more positive environment around this issue.

So like undernutrition, industry's engagement in this issue is essential. I don't think we're going to make progress unless industry does become engaged. A focus on physical activity without a concomitant focus on how to address reductions in dietary intake as a way of achieving weight management are essential. But I think that the opportunities for an investment here in better nutrition and physical activity will have very broad effects on our society, not only in terms of the quality of life but also in reducing the very substantial medical costs that we're now facing.

Thank you.