

**Proceedings of the
Roundtable on Understanding
The Paradox of Hunger
And Obesity**

**Food Research and Action Center
November 22, 2004**

<u>Table of Contents</u>	<u>Page Number</u>
Acknowledgements	3
Introduction	4
Purpose of the Roundtable	5
Roundtable Agenda	7
Major Points from the Roundtable	9
Roundtable Summary: Speakers, Panelists, and Discussions	13
Appendix A: List of Attendees with Contact Information	36
Appendix B: Biographical Information on Speakers	45
Appendix C: Roundtable Papers	47
A Snapshot of Food Insecurity and Hunger in the U.S.: Conceptualizing, Defining, and Measuring U.S. Hunger and Food Insecurity Lynn Parker, Food Research and Action Center	47
A Snapshot of the Obesity Problem in the U.S., with a Focus on Low-Income and Minority Populations Pat Crawford, Dr PH, RD, Center for Weight and Health, University of California at Berkeley	56
The Relationship Between Hunger and Obesity: What Do We Know and What Are the Implications For Public Policy Christine M. Olson, PhD, RD, Cornell University	74
Research Needs to Better Understand the Relationship Between Hunger and Obesity and to Develop Sensitive and Effective Policy Solutions Sonya Jones, University of Tennessee	83
Environmental Barriers and Solutions to Gaining Access to the Essentials of Nutritional Health in Low-Income Communities Maria Boyle, MS, RD, Sarah Stone-Francisco, MPH, Sarah E. Samuels, DrPH, Samuels and Associates	91

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INTRODUCTION

More and more attention is being paid to the obesity epidemic, its causes and consequences, and potential solutions. This is a very positive development, but nobody has yet focused adequately – in academic research or otherwise – on obesity’s ties to food insecurity. This has left a critical vacuum in the policy analysis, activities and campaigns of anti-hunger advocates; in the public understanding of the seriousness of obesity for the poor and what can and should be done about it; in the strategies of anti-obesity stakeholders; and in the scientific literature.

Moreover, because the coexistence of hunger and obesity for the poor in this affluent nation, and within the same households and individuals, seems counterintuitive, some have suggested that the obesity epidemic is evidence that hunger and poverty are no longer significant problems in the U.S., that if people are obese they cannot be hungry, that obesity is a result of their inadequate grasp of personal responsibility, and that the availability of federal nutrition programs is actually a major cause of obesity. While the evidence contradicts each of these points, this kind of argument can be seductive for the media and some politicians, especially at a time when too many Americans think hunger is gone and poverty exists in only a few small corners of our country, and when the tide seems to be swelling to push food insecurity off the radar screen of national policy. Although these propositions cannot be supported by scientific data or reasoned argument, the problem of obesity easily can become a weapon against the poor and against the nutrition programs that have protected them from even deeper food deprivation.

The enormous increase in obesity in the U.S., and the associations that have been discovered between food insecurity and obesity, should lead anti-hunger advocates and policymakers to better understand the linkages and to incorporate efforts to reduce obesity and improve the healthfulness of people’s diets into the traditional anti-hunger efforts and interventions that seek to expand availability and participation in the nation’s nutrition programs.

Poverty, food insecurity and the federal nutrition programs touch the lives of a majority of Americans. Thirty six million of us are food insecure, up from 31 million in 1999. Research shows that over time 42% of us will experience poverty before age 50, and 60% by age 75. More than one-third of children are poor over any ten year period of time. Half of the infants in the U.S. are WIC participants, and one-half of our children receive food stamps during some time in their childhood. Half of adults between 20 and 64 years participate in the Food Stamp Program during that age range, and 75% of African Americans receive food stamp benefits sometime during their adulthoods. And, more than half of U.S. children participate in the School Lunch Program. Thus, food insecurity and poverty are

central to many American lives, and the nutrition programs are on the front line of U.S. anti-obesity policy.

Hunger and food insecurity have very negative consequences for both individuals and whole families. Food-insecure individuals and households who are also obese face additional negative consequences, especially because they are poor. Both of these health issues must be dealt with in order to improve the overall health status of poor households in the U.S.

PURPOSE OF THE ROUNDTABLE

The purpose of this one-day roundtable was to bring together leading researchers in the hunger and obesity area with local, state, and national anti-hunger and anti-poverty advocates who are committed to the reduction of hunger and obesity among poor households. At this meeting, close to 50 researchers, advocates, national organization and government agency representatives, and funders worked together to: exchange information and strategies about the connection between food insecurity and obesity; discuss effective and sensitive national, state and local solutions; and identify promising areas for additional research.

The meeting consisted of five solicited papers with panelists' comments:

- A Snapshot of Food Insecurity and Hunger in the U.S.
- A Snapshot of the Obesity Problem in the U.S., With A Focus on Low-Income and Minority Populations
- The Relationship Between Hunger and Obesity: What Do We Know and What Are the Implications For Public Policy
- Environmental Barriers and Solutions to Gaining Access to the Essentials of Nutritional Health in Low-Income Communities
- Research Needs to Better Understand the Relationship Between Hunger and Obesity and to Develop Sensitive and Effective Policy Solutions

and one panel discussion:

- Solutions to Obesity Among the Poor and Food Insecure - - the Role of Anti-Hunger Advocates Can Play in Catalyzing and Implementing These Solutions along with discussions among attendees.

The roundtable agenda and “Major Points from the Roundtable” follow. The list of attendees is in Appendix A. Bios of the speakers can be found in Appendix B and the full papers are in Appendix C.

It is our hope that the information in these proceedings will help readers to: understand the findings and current consensus on the implications of research on the associations between food insecurity and obesity, and poverty and obesity; respond to questions from and critiques by reporters, interest groups, and policy-makers; and assist in developing plans of action at the local, state, and national levels that join relevant

information, themes and activities concerning obesity, and public health with anti-hunger efforts. The full Roundtable Summary incorporates major parts from the papers and additional comments made by speakers, panelists, and other attendees.

Agenda

ROUNDTABLE ON UNDERSTANDING THE PARADOX OF HUNGER AND OBESITY

November 22, 2004

8:00-8:30 **Continental breakfast**

8:30-9:00 **Welcome, opening remarks, and introductions**—Jim Weill and Lynn Parker, FRAC; and Terry Bazzarre, Robert Wood Johnson Foundation

9:00-9:45 **Hunger and Obesity: the current situation**

Moderator: Geri Henchy, FRAC

Speaker: Lynn Parker, FRAC

Topic: A Snapshot of Food Insecurity and Hunger in the U.S.

Speaker: Patricia Crawford, Center on Weight Realities, U.C. Berkeley

Topic: A Snapshot of the Obesity Problem in the U.S., With A Focus On Low-Income and Minority Populations

9:45-10:00 **BREAK**

10:00 – 11:30 **The Paradox of Hunger and Obesity**

Moderator: Lynn Parker, FRAC

Speaker: Christine Olson, Cornell University

Topic: The Relationship Between Hunger and Obesity: What do we know and what are for implications for public policy?

Panelists: Katherine Alaimo, Michigan State University; Lucia Kaiser, UC Davis

11:30-12:30 **Lunch in Cafeteria**

12:30-1:30 The Environment, Obesity, and Poverty: Issues and Answers

Moderator: Crystal FitzSimons, FRAC

Speaker: Sarah Samuels, Samuels and Associates

Topic: Environmental Barriers and Solutions to Gaining Access to the Essentials of Nutritional Health in Low-Income Communities

Panelists: Hannah Burton, Food Trust, Philadelphia; LaDonna Redmond, Chicago Food System Collaborative

1:30-2:40 Solutions to Obesity Among the Poor and Food Insecure; the Role Anti-Hunger Advocates Can Play in Catalyzing and Implementing These Solutions

Moderator: Nicole Woo, FRAC

Panelists: Toni Liquori, Community Food Resource Center, New York City (school-based solutions); Paula James, Contra Costa Child Care Council (solutions in child care); Kim Perry, DC Hunger Solutions and Dianne Radigan, Children's Hunger Alliance (role of anti-hunger advocates)

2:40-2:55 Break

2:55-4:00 Research Needs In Hunger and Obesity

Moderator: Vivica Kraak, Food and Nutrition Board

Speaker: Sonya Jones, University of Tennessee

Topic: Research Needs to Better Understand the Relationship Between Hunger and Obesity and to Develop Sensitive and Effective Policy Solutions

Panelist: Barbara Laraia, University of North Carolina

Other Panelists and Speakers: Discussion

4:00-4:15 Closing Comments

MAJOR POINTS FROM THE ROUNDTABLE

Food Insecurity in the U.S.: Who it affects, how many, what are its consequences

- Food insecurity in the United States is defined as the inability to meet basic food needs because of lack of resources to buy food. According to the U.S. Department of Agriculture, as of 2003 23 million adults and 13 million children live in food insecure households.
- In general, food insecurity showed a gradual downward trend from 1995 to 1999 and then began to move up again.
- Those disproportionately affected by food insecurity are: households with incomes below the poverty level; households with children, headed by a single woman; and Black and Hispanic households.
- Food insecurity is a process that is “managed” by the household. Generally, quality is reduced first, then quantity. Generally, adults reduce their food intake first, attempting to spare the children.
- Food insecurity has been shown to have harmful effects on learning, development, productivity, physical and psychological health, body weight and family life.

Obesity in the U.S.: Who it affects, how many, and its consequences

- According to the most recent national data, sixty-five percent of adults are overweight or obese, and 30 percent are obese. Men are more likely to be overweight than women, but women are more likely to be obese than men. Among children 6-19 years old, 31 percent are at risk of overweight and 16 percent are overweight. Unlike adults, rates for males and females are similar for children.
- The period between 1960 and 1980 showed little change in rates of overweight and obesity for adults or children. However, in the next 20 years, these rates increased drastically for all age groups, suggesting that changes in the environment promoting overconsumption and/or reduction in activity occurred.
- The prevalence of adult overweight and obesity is higher among Hispanics and African-Americans than among non-Hispanic Whites. Women are more likely to be overweight and obese than men among Hispanics, Whites, and especially African Americans.
- As with adults, the prevalence of overweight is higher among African American and Hispanic children compared to White children.
- Rates of overweight are higher for adults of low socioeconomic status. Men with incomes below poverty are slightly less likely than men with higher incomes to be overweight, and slightly more likely to be obese. Women living below the poverty level, on the other hand, are much more likely to be overweight or obese than women with higher incomes.

- Among children, socio-economic status does not predict prevalence of overweight or obesity.
- Obesity has become an increasingly important medical problem for children and adults alike. Of special concern is Type 2 diabetes, which is related to overweight and has increased dramatically in children. If trends do not change, one in three children born in the U.S. in the year 2000 will have diabetes at some time in their lives. These medical problems are of most concern for ethnic minorities and low-income individuals, who have more limited access to health care.

The Relationship Between Hunger, Food Insecurity and Obesity

- Relatively little is known about why low-income women in the U.S. are more likely to be obese. Food insecurity may be a possible explanation, since quite a few research studies now demonstrate higher prevalences of overweight and obesity among food insecure compared to food secure women. (Generally, this relationship has not been seen in men and children.)
- A number of researchers have theorized about potential mechanisms for the association between food insecurity and obesity, including an association between food insecurity and binge-like eating; cyclical food deprivation patterns in mothers that could result in overeating when adequate food becomes available; preoccupation with food and eating resulting from food restriction and deprivation; lack of fruit and vegetable consumption due to their higher per calorie cost and lack of availability in low-income areas; and the decreased cost per calorie of added sugar and fats.
- Past deprivation, as in the case of Latino mothers, may negatively affect mothers' relationships to their children in the food arena - - causing them to feel that their children should "clean their plates" and/or be indulged when it comes to food "treats."
- The link between obesity and food insecurity may be caused by a third factor that contributes to both the risk of obesity and food insecurity in adulthood - - socioeconomic disadvantage in childhood. This is suggested by a number of studies showing socioeconomic disadvantage in early life to be positively associated with increased obesity and food insecurity in young adulthood. If this research holds up, this should lead those concerned about obesity to work to improve the economic lives of low-income households.
- The impact of the stress of poverty and its related effects may have physiological as well as psychological and behavioral impacts. Recent neurobiological research shows strong effects of stress on the release of hormones that can lead to central adiposity, i.e., the unhealthy storage of excess fat in the center of the body, which in turn acts physiologically to

relieve the effects of further stress. Thus, food deprivation in early life may set one up to be overweight later in life.

- Discrimination against obese women in education, employment, and wages may be contributing to the obesity epidemic and increasing the chances that families will experience food insecurity. This is because if women lack education and adequately reimbursed employment, their households are more likely to be poor and food insecure. Both poverty and food insecurity in women are associated with obesity.

Implications for Nutrition Programs of the Relationship Between Hunger, Food Insecurity and Obesity

- Because of the obvious impact of food deprivation on eating patterns, it seems even more critical to ensure regular and consistent access to nutritious meals through the child nutrition programs.
- Health, nutrition, and food programs need to recognize that the majority of the women they serve are overweight or obese, and also may currently be, or were at some time, food insecure.
- Since maternal obesity is one of the strongest indicators of obesity in children, support of programming for mothers is key to obesity prevention. WIC, the Food Stamp Nutrition Education Program, and the Expanded Food and Nutrition Education Program all can be helpful in preventing excessive weight gain during pregnancy.

Environmental Barriers and Solutions to Nutritional Health in Low-Income Communities

- No single factor is the primary cause of increasing rates of overweight and obesity; rather it is a constellation of factors. Among low-income households they may include: little access to healthy food in communities where supermarkets are not available; the lack of affordability of healthy foods; and the kinds of foods sold in competition with the school nutrition programs to raise additional funds for underfunded schools. These factors also include the lack of safe and pleasant places for physical activity in low-income neighborhoods and reduced spending on physical education in schools. In addition, many low-income people lack access to basic health care, or even if it is available, it is of lower quality. Low-income families also face the additional emotional pressures of low-wage work, inadequate and long distance transportation, poor housing, and neighborhood violence.
- Potential solutions include: policies mandating improvements in foods that are sold on school campuses; state physical education standards that are adequately funded; and elimination of advertising to children while in school. Communities can improve foods served and sold in schools; work to increase the availability of full-service grocery stores, community

gardens, and farmers markets; improve the quality of food sold in corner stores; develop physical activity programs; and establish zoning and design ordinances that limit fast food outlets and liquor stores and provide more green space, playing fields, and lighting.

Research Issues and Policy Solutions

- It is important at the national level to understand better the phenomenon of the relationship between food insecurity and hunger. This will require longitudinal research, with well thought-out conceptual frameworks (or plausible mechanisms) and appropriate analytical strategies.
- Obesity may be present in low-income households for three different reasons: the reasons that affect all households; the reasons for obesity in some low-income households; and finally, the impact of food insecurity on the development of obesity.
- Household food insecurity may be an umbrella term that covers multiple etiologies, depending on the characteristics and history of the household. This may affect the nature of the relationship between hunger and obesity in a household.
- Whatever the etiology or the conceptual framework used, the policies that flow from most understandings of the food insecurity/obesity link among low-income women include the importance of continuing high quality federal nutrition programs with improved funding, and the alleviation of food insecurity. Anti-hunger and anti-obesity advocates, practitioners and policymakers, working together, can create and implement programs and policies that will improve the health of individuals, families, and communities.

ROUNDTABLE SUMMARY

Hunger and Food Insecurity in the United States (a summary of the written paper and oral presentation by Lynn Parker on “A Snapshot of Food Insecurity and Hunger in the U.S.)

In the late 1960’s a group of physicians funded by the Field Foundation visited the poorest areas of the U.S. - - pockets of poverty in Appalachia, the Southeast, and the Southwest - - and examined the nutritional health of low-income children. The doctors reported seeing nutritional problems that they would have expected to find in poor, developing nations, but not in the United States. National nutrition survey data confirmed these findings - - in biochemical measures (i.e., blood values for nutrients), physical measurements (such as heights and weights) for certain groups of children, and in dietary survey results.

During the years that followed, the existing federal nutrition programs expanded significantly in scope, and new programs were added to reach different ages of children in various settings.* These programs had enormous success in reducing dramatically the poverty-related nutritional deficiency diseases of the past.

The kind of hunger we typically see in the United States today is generally different from what we saw in the past - - it is a chronic, cyclical inadequacy in household food supplies and resources for the purchase of an adequate diet. During the early 1980s, community-based organizations, public health professionals, and local government officials first voiced the need to bring the increase in this kind of food insufficiency to the attention of public officials in some kind of scientific manner so that public officials could not ignore or deny that there was a real problem at the local level that required a serious and prompt response.

Over the years, a number of surveys and survey questions have been developed to measure this kind of food insufficiency, or what is now called “food insecurity,” separate from the traditional measures of dietary intake, blood chemistry and anthropometrics. The last major step in conceptualizing and measuring what was eventually to be called “food insecurity” was the development in the early 1990s of the 18-question food security module by the Bureau of Census and the U.S. Department of Agriculture for the inclusion in the Current Population Survey (CPS). This has become the “gold standard” of

* This significantly expanded (but still imperfect) safety net for low-income families includes the Food Stamp Program, WIC, School Breakfast and Lunch, the Summer Food Service Program, the Child and Adult Care Food Program for children in Head Start, child care centers, family child care, afterschool programs and shelters, and the Emergency Food Assistance Program (TEFAP), which supports the network of food banks, food pantries, soup kitchens and shelters.

hunger and food insecurity measures, and is based on the lessons learned in the development of the surveys, indices and scales that came before.

This survey, which has been carried out on an annual basis since 1995, classifies each household into one of three categories: food secure, food insecure without hunger, and food insecure with hunger. Food secure households show no or minimal evidence of food insecurity. Households that are food insecure without hunger make adjustments to household management, including reducing the quality of their and their children's diets and beginning to reduce adults' food consumption, and express concerns about the availability of food due to financial constraints. Households that are food insecure with hunger have reduced food intake to the point that adults and/or children in the household have experienced hunger: i.e., cutting the size of or skipping meals, feeling hungry but not eating, losing weight, and not eating for whole days.

What We Know About the Prevalence and Nature of Food Insecurity and Hunger in the U.S.

- Food insecurity is a process that is “managed” by the household through a variety of functional and disfunctional means. Quality is reduced first, then quantity. As researchers who developed the scale put it, “In this process, households first note serious inadequacy of their food supply, feel anxiety about the sufficiency of their food to meet basic need, and make adjustments to their food budget and food served. As the situation becomes more severe, adults experience reduced food intake and hunger, but they spare the children this experience. In the third state, children also suffer reduced food intake and hunger and adults' reductions in food intake are more dramatic.”
- In the 2003 food security survey (the latest data available as of this writing), USDA reports that 11.2 percent of households (12.6 million households) were food insecure, and 3.5 percent (3.9 million) were food insecure with hunger.
- Food insecure households included 23 million adults and 13 million children, a total of 36 million individuals. Households with hunger, a segment of all food insecure households, included 6.6 million adults and 420,000 children.
- Those affected most by food insecurity are: households with incomes below the poverty line; households with children and headed by a single woman; and Black and Hispanic households. Other characteristics that put households at increased risk of food insecurity are: having children; living in central cities or rural areas, and living in the South and West.
- In general, food insecurity showed a gradual downward trend from 1995 to 1999 with the lowest rate being 10.1 percent of households in 1999, and then began to move up again - - to 10.5 in 2000, 10.7 in 2001, 11.1 in 2002 and 11.2 in 2003.

- Research is beginning to show that the mental and physical changes that result from food insecurity have harmful effects on learning, development, productivity, body weight, physical and psychological health, and family life. For example, children from food insecure households are more likely to have poorer health status, making them less able to resist illness and more likely to become sick and hospitalized. These children are less able to learn in school, resulting in lower grades and test scores. Research is also beginning to show associations between food insecurity and depression among adolescents and women.

Obesity in the U.S.: How is it measured and who does it affect? (a summary of the written paper and oral presentation by Patricia Crawford on “A Snapshot of the Obesity Problem in the U.S. with a Focus on Low-Income and Minority Populations”)

Since 1960, nationally representative data from the National Health and Nutrition Examination Survey (NHANES) have been used to monitor the national prevalence of overweight and obesity. Overweight and obesity are measured by using a calculation of Body Mass Index (BMI) based on weight and height. BMI values for adults are categorized as underweight, normal, overweight, or obese. Children’s overweight and obesity are measured by calculating BMI-for-age, using weight, height, age and standardized growth charts. Children are categorized as underweight, at risk of overweight (instead of “overweight”) and overweight (instead of “obese”).

Obesity has become an epidemic in the United States (we have three times the obesity rate of the rest of the world), and it is poised to become the nation’s leading health problem. Obesity rates are climbing rapidly in every state. Individuals of both genders, varied ages, and all ethnic groups are affected, but unequally.

According to the most current NHANES data (1999-2002), 65 percent of adults were either overweight or obese, and 30 percent were obese. Men were more likely to be overweight than women, but women were more likely to be obese than men.

Among children 6 through 19 years, 47 percent were overweight or at risk of overweight - - 16 percent were overweight. Among 2 to 5 year olds, over 32 percent were overweight or at risk - - 10 percent were overweight. Unlike adults, rates for boys and girls were similar.

Trends in Obesity

The period between 1960 and 1980 showed little change in the rates of overweight and obesity for adults or children. However, in the following 20 years

these rates increased drastically, for men and women, and children and adolescents, suggesting that changes in the environment promoting overconsumption of calories and/or reduction in energy expenditure occurred during this time period. Also during this time period, the rates increased significantly more for children (three times) than adults (two times), suggesting factors associated with these increases were equally (or more) potent for children. The children's increase began in the 1970s, and the adult increase followed in the 1980s.

Current data show that as adults age, their weight increases - - up to age 60 - - and then remains relatively stable after that. Since the increase in childhood risk of overweight and overweight is a relatively new phenomenon, it is not clear whether we will see similar trends among these children as they age, which, if true, will result in a very large number of extremely obese adults in the 40-59 year age range in the future.

Racial, ethnic and socioeconomic variations in overweight and obesity

Race/ethnicity

The prevalence of adult overweight and obesity is higher among Hispanics (32.8 percent) and African-Americans (38.4 percent) than among Whites (30.7 percent). As with adults, the prevalence of overweight is higher among African American (20 percent) and Hispanic (22 percent) children compared to White (13.6 percent) children. According to smaller studies of Native Americans, Native Americans appear to have the highest obesity rates. Native American children have twice the rates of overweight as White children (32 percent vs. 13.6 percent).

Trends in overweight and obesity (or, among children, risk of overweight and overweight) from 1988 to 2000 showed greater increases in African-American and Hispanic children and adults compared to Whites. In fact, the increase in rates appears to have slowed down somewhat for white children and adults.

Gender

Women are more likely to be overweight and obese than men, and this is true for all racial and ethnic groups as well. African American women are almost twice as likely to be overweight or obese as men. Men in each racial and ethnic group appear to be equally as likely to be obese (around 27 to 28 percent), while women's obesity rates vary - - 33 percent of White women, 49 percent of Black women, and 38.4 percent of Mexican American women.

Socioeconomic

Overall, rates of overweight are highest for adults of low socioeconomic status. But that disguises differences by gender and age. Men with incomes below the poverty line are slightly less likely than men with higher incomes to be overweight, although they are slightly more likely to be obese. Women living below poverty are much more likely to be overweight and obese than women with higher incomes.

Among children, the differences are even less clear cut, and vary a great deal by age, gender, and income. When disaggregated by race and ethnicity, in some cases low-income youth are more likely to be overweight or obese, and in other instances less likely. Among white boys and girls, as income increases the risk for obesity decreases, but among other racial and ethnic groups, higher income does not necessarily predict lower levels of obesity. For example, overweight is higher among Hispanic boys in middle and high-income families than in low-income families. Asian boys have lower rates of overweight at low and high incomes, compared to those with middle-level incomes. The rate of overweight among African American boys varies very little by family income. The prevalence of overweight among African American girls is lowest for those from middle income families and highest for girls from families with low and high income. Asian girls have lower overweight prevalence overall, while Hispanic girls at all incomes have high rates of overweight.

As a result of the obesity epidemic, much higher rates of serious diseases in youth and adults are anticipated. This will be particularly true for racial and ethnic minorities and low-income individuals, who have limited access to health care. The potential future impact of this situation is likely to be devastating.

Health Impacts of Obesity

Obesity has become an increasingly important medical problem for children and adults alike. Obesity increases the risk of pulmonary complications (sleep apnea and asthma), osteoarthritis, negative psychological consequences, diabetes, cardiovascular disease, hypertension and some forms of cancer. Even among children, overweight and risk of overweight are associated with increased risk for Type 2 diabetes, pulmonary complications, hypertension, early puberty and psychological problems such as depression.

One of the greatest public health concerns right now is the dramatic increased risk of diabetes among children. It is one of the fastest growing diseases of childhood, resulting in a shorter potential lifespan for these children, and increased risk of kidney problems, heart disease, and eye problems later in life. If we don't change what is causing this increased risk, or find other

interventions, there will be a one in three chance of children born in the year 2000 having diabetes at some time during their lives.

The economic consequences of the obesity epidemic, not surprisingly, are high, both directly through costs of prevention, diagnosis and treatment related to obesity, and indirectly through income loss and absenteeism.

The Relationship Between Hunger, Food Insecurity, and Obesity (a summary of the written paper and oral presentation by Christine Olson on “The Relationship Between Hunger and Obesity: What Do We Know and What are the Implications for Public Policy”)

Poverty is linked to overweight and obesity, especially among White women. Relatively little is known about why low-income women in the U.S. are more likely to be obese. Food insecurity may be a possible explanation for how being poor increases weight. Six recent research studies have demonstrated higher prevalences of overweight and obesity among food insecure compared to food secure low-income women. (Generally, the relationship has not been seen in men and children.)

The mechanisms for this association between food insecurity and higher prevalences of overweight and obesity among women have not been established, but some plausible suggestions have been made. Based on their research, a number of researchers have theorized about potential mechanisms.

One suggested mechanism relates to two different sets of research findings: that mothers go without food when food and money for food are limited in order to ensure that their children have something to eat; and that there is an association between food insecurity and a binge-like pattern of eating, a “feast-famine” eating pattern. For this mechanism, researchers have suggested that mothers faced with the cyclical nature of food insecurity in many low-income households may eat more calories when food is available. This idea is supported by research that shows that food deprivation can result in overeating when food becomes available, and in cognitive, emotional and behavioral changes that could lead to obesity over time. Another potential mechanism that is discussed in the literature is lower consumption of fruits and vegetables among the food insecure. The reasoning behind this suggested mechanism is that food insecure women depend on lower cost per calorie, energy-dense foods (such as refined grains, added sugar and fats) when resources for food are low. The consumption of these less expensive, energy-dense foods, rather than more expensive per calorie, less energy-dense fruits and vegetables, could contribute to a higher risk of obesity. However, overconsumption of more high fat/high sugar foods among these women is not currently supported by the literature.

Studies that have shown the association between food insecurity and obesity and overweight are cross-sectional, with data collected at the same point in time, so it is difficult to claim cause and effect. Longitudinal data could assist and inform the direction of the causality. One recent longitudinal study in pregnant and (2 years) postpartum women (the childbearing years being when women are at greatest risk for becoming overweight or obese) indicated that food insecurity was more likely to cause obesity than vice-versa and that food insecurity was associated with major weight gain only in initially obese women. The researchers believe that this hints that obesity and food insecurity among adult women might be caused by a third common factor - - socioeconomic disadvantage in childhood.

In fact, several studies have found socioeconomic disadvantage in childhood to be positively associated with increased obesity in young adulthood. (Upward mobility does not change this association.) In other words, being exposed to the adversities of being poor in the critical period of childhood seems to increase the risk of being overweight, but it takes time for this adversity factor to be expressed visibly as body weight. Given the association of low income with hunger and food insecurity, it is probably safe to assume that economic problems in childhood also included the experience of food insecurity. In addition, research has shown that socioeconomic disadvantage in childhood is associated with increased risk of food insecurity in adulthood. However, the mechanisms for the relationships among socioeconomic status, food insecurity and obesity are still unclear.

Nevertheless, it is clear that food deprivation in childhood makes an enormous impression on people, especially in a country as affluent as the United States. Current research strongly indicates that the psychological, emotional, and behavioral responses to poverty and related food deprivation in childhood may be important components of the obesity epidemic and the economic and racial/ethnic disparities in obesity in the U.S.

In addition, the impact of the stress of poverty and its related effects may have physiological as well as psychological and behavioral impacts. Recent neurobiological research reported at the 2004 meeting of the North American Association for the Study of Obesity indicates strong effects of stress on the brain and the secretion of neurotransmitters. There is good evidence, according to the researchers, that this increases the secretion of glucocorticoids which leads to central patterning of fat deposition, and that central adiposity helps to relieve the effects of further stress. Thus, there may well be a neurobiological explanation for how food deprivation in childhood sets one up to be overweight later in life. Using food to relieve stress, and the creation of fat stores to relieve stress, may be part of the answer.

There are many important policy implications that arise from a review of the research on food insecurity, obesity and the linkages between them. Among them is the need for policymakers to take into account the high rates of family poverty and deprivation in the U.S., with a focus on their profound effects on the future health of children, when developing anti-obesity policies. Policymakers should focus on what parents are experiencing, because research shows, for example, that threats to employment lead to weight gain and obesity. This implies that the economic security of American workers ought to be addressed as part of any anti-obesity campaign. In addition, discrimination against obese women in education, employment and wages may be contributing to the obesity epidemic. This situation will only increase the chances that they and their families will experience food insecurity. Moreover, all health, nutrition and food assistance programs need to recognize that the majority of women they serve are overweight or obese, and also may be currently or were at some time food insecure. Aiming to reverse weight problems is needed, while recognizing at the same time their lack of household food resources. This dual role will be a great challenge to program operators. Finally, since maternal obesity is one of the strongest indicators of obesity in children, programming for mothers should not be sacrificed in favor of reaching children alone. Families should be viewed holistically. WIC, for example, has tremendous potential. Women are very receptive to nutrition and health information during pregnancy, and preventing their excessive weight gain can affect their child's birthweight and future health. In addition, the Food Stamp Nutrition Education Program and the Expanded Food and Nutrition Education Program (Extension Service) could play important roles.

Comments from Panelists and Attendees on the Links between Hunger and Obesity (This section includes points from the comments made by panelists Katherine Alaimo and Lucia Kaiser, as well as audience comments.)

Causes of Obesity Among Low-Income People

- According to several studies, there is an association between food insecurity and overweight among women, and maybe among older girls.
- There are three layers of factors that could influence the higher prevalence of overweight among low-income women - - the factors that are causing the increase in overweight in the entire population; the unique factors that are causing obesity among some low-income households; and the specific influence of food insecurity on overweight among low-income families.
- There is a great variety of ways that low-income families cope with food insecurity, but they fit into two main areas: managing the food supply (e.g., sharing food with friends, participating in food programs, etc.) and regulating eating patterns (e.g., eating less of some foods and more of

others, etc.). Different coping strategies will affect obesity rates in differing ways.

- Drewnowski hypothesizes that the connection between poverty and obesity is as a result of low-income households choosing energy-dense foods because they are cheaper. These foods contain more calories, which could result in a higher calorie diet. However, there are no current papers that examine calorie consumption by income level using NHANES data.
- Low-income individuals in the U.S. are also less likely to be physically active, which puts them at increased risk of obesity. They have less access to recreational facilities; rural roads are hard to walk on (i.e., no sidewalks); issues of safety in urban areas make walking less attractive; and lack of time to be physically active due to employment that requires many hours of work decreases opportunities for physical activity.

The Links Between Food Insecurity and Obesity Among Low-Income Women

- Increasingly, there is research showing that there are fluctuations in food consumption among some low-income households. Fluctuations have been shown to be monthly, following availability of food stamp benefits, and also seasonally, with low-income families reducing their food spending during the winter months in order to be able to pay for the increased cost of heating.
- Coping strategies for people who are periodically without food can include: eating as much as possible because of uncertainty about when the next meal will come; and encouraging one's children to "binge" on food when it is available.
- The consequences of not having food and then having it, whether the food deprivation was voluntary or involuntary, could lead to overeating when food is made available. There is evidence for this phenomenon in the literature on dieting; research by Keys on starvation; and the examination of war victims who went through periods of starvation.
- In fact, food deprivation has long-term effects. Low-income adults describe vividly in focus groups how deprivation played out in their childhoods.
- In the scientific literature, the consequences of food deprivation have been shown to be: a focus on food and eating, difficulty concentrating, increased distractibility, anxiety, depression, and heightened emotional response. There is also a change in taste - - not being able to reject sweets

even after eating a high calorie meal. The experience can completely disrupt normal signals for hunger. Thus, the normal self-regulation of food intake can be lost as a result of chronic food insecurity.

- Anxiety about the possibility of not having enough food, as experienced many times in the past, can lead women to feel the anxiety of food insecurity, and make food insecurity related dietary adjustments, before food insecurity is actually affecting their families. This kind of economic insecurity may place low-income mothers in a constant state of a “hyper-alert” - - reducing their personal food quality and quantity in order to protect their children from hunger.
- The past deprivation of Latino mothers may lead to parenting habits around food that lead to obesity among children. They are more likely to be controlling about food - - bribing and scolding children into eating and finishing all their food, and being more indulgent about the kinds and quantities of food they allow their children to eat.
- All supplies of food are lower among food insecure Latino families, but the quantity of fruits and vegetables is most negatively affected. These foods are seen as relatively expensive and “don’t fill you up.”

Public Policy Related to Poverty, Food Insecurity and Obesity

- The relationship between hunger and obesity is not a paradox. There are plausible mechanisms for why and how obesity and food insecurity could co-occur in the same individual and within the same household. The underlying cause of food insecurity – lack of family resources, (in terms of wages, health insurance, child care, transportation, housing and education), and in particular, lack of consistent food supplies – needs to be addressed, and would also address the causes of obesity that are due to low income. The public policy solutions are the same for both problems, and they are not counteractive to each other. It is becoming more and more clear in the public health literature that the key to increased health status of an entire country is to reduce income inequality.
- Public policies that help working families to make ends meet, and support Americans who cannot work -- the elderly, the emotionally and physically challenged, and children -- will address both food insecurity and some of the causes of obesity.
- Unfortunately, obesity has become a moral issue in the U.S. People are judged as “bad” or “good” people based on their weight. In the U.S., where we vilify the poor for so many reasons, this is one additional characteristic we often hold against them.

Implications of Linkages Between Poverty, Food Insecurity and Obesity for Federal Nutrition and Nutrition Education Programs

- Considering the impact of food deprivation on eating patterns, it seems more critical than ever to ensure regular and consistent access to nutritious food through the federal nutrition programs.
- U.S. Department of Agriculture programs need to address both primary and secondary prevention. Learner-centered education is most effective for adults - - asking first, what do you want to know? However, if the potential learner says that she or he wants to lose weight or know what to eat if she or he has diabetes, in some circumstances the Extension employee is prohibited from providing information on these topics because current policy requires nutrition education to focus on general nutrition issues related to prevention rather than “treatment.” Unfortunately, not enough public health programs are available for the many people who need this assistance. It would be very helpful for the Extension Service to be able to work in partnership with public health programs on these issues.
- There is a paradigm shift among food banks, from dependence on non-perishable donated foods, which may include a great deal of sweet drinks and snack foods, to seeking grants for coolers to store and provide more fresh fruits and vegetables.
- It may be unrealistic to expect the food assistance programs alone to make families economically secure. If food insecurity is associated with overweight, it’s because of economic insecurity. Solving economic insecurity will solve the part of overweight that is due to economic insecurity. Research has shown that the higher the income disparity in a society, the more health problems for all there will be in that society. Policies that increase economic security for all can protect health for all.

Food Insecurity Measurement

- The validity of the government’s food security measure in its ability to capture food deprivation as it is experienced in the U.S. is excellent. Higher income people who show up as food insecure have been sick or experienced unemployment, thus experiencing a gap in or loss of income. Food insecurity, as measured by the CPS module, is clearly associated with low food supplies.

Environmental Barriers to Nutritional Health in Low-Income Communities

(a summary of the written paper and oral presentation by Sarah Samuels, “Environmental Barriers and Solutions to Gaining Access to the Essentials of Nutritional Health in Low-Income Communities”)

Although rates of poor nutrition, physical inactivity and diabetes are increasing among all adults and children, some disparities in these rates are related to ethnic background and socio-economic status. No single factor is the primary cause of increasing rates of population overweight and obesity; rather it is a constellation of factors. Disparities of race, ethnicity and income are linked to the environmental conditions in which people live, and disparities in those conditions. These conditions shape people’s capacity to maintain a healthy diet and lifestyle that includes regular physical activity. Traditional medical models and individual behavior change are not the full answer to increasing population rates of overweight and obesity. Models that rely on environmental change have a greater potential to affect these rates by increasing access to affordable healthy foods and opportunities for physical activity.

For example, among the poorest and most remote populations in the U.S., there is little access to healthy food. Low-income neighborhoods lack full-service grocery stores and the available stores are less likely to offer healthful foods. Food choices are often limited to small neighborhood convenience stores, liquor stores or fast food outlets, where high-fat, high calorie foods are more common, and fruits, vegetables, non- and low-fat milk and low-fat snacks are not. The price of healthy foods is also a factor for many low-income households - - healthy foods are often significantly more expensive. In addition, foods marketed to children are predominantly high in calories, sugar, and fat.

While school breakfast and lunch programs must follow USDA nutritional standards, “competitive foods” sold in schools as individual items in cafeterias, snack bars, vending machines and student stores throughout the school day are generally unregulated or need not comply with any but the most basic nutritional standards. These foods tend to be high in fat, sugar and calories. In addition, many school districts are engaged in agreements with food and beverage companies that offer financial incentives for the placement of their vending machines and products in schools that are enticing to under-funded or low-wealth districts.

Low-income communities often lack safe spaces for physical activity. In some low income communities, open space at a minimum and recreational facilities are often inadequate. High rates of crime or fear of crime may limit the ability to play safely and be physically active outdoors in certain neighborhoods. Less pleasant “street scenery” in low-income neighborhoods also discourages recreational walking and cycling. Many school districts are facing budget deficits, causing them to reduce spending on physical education and sports

programs. This translates into less access to physical activity during the school day.

Many low-income people lack access to basic health care, or if health care is available, it is of lower quality - - e.g., culturally and linguistically insensitive, lacking respect for patients, or insufficient in the appointment time necessary to address needs and concerns. Low-income families may also face the additional fiscal and emotional pressures of low-wage work, inadequate and long-distance transportation, poor housing, and neighborhood violence.

Addressing environmental barriers to health requires policy change at state, community and institutional levels. Potential solutions at the state level include: policy mandating improvements in foods that are sold on school campuses; state physical education standards for schools (including for afterschool programs), that are enforced and adequately funded; and elimination of marketing and advertising to children while in school.

Community strategies could include: assessing community food and physical activity assets and areas of need; improving foods served and sold in schools; increasing the availability of full service grocery stores, community gardens and farmers' markets; improving the quality of food sold in small corner groceries and convenience stores; establishing zoning and community design ordinances that include a limit on liquor stores and fast food outlets and provide more sidewalks, green space, playing fields, and lighting; developing physical activity programs; addressing food and beverage marketing and advertising; and forming broad-based coalitions.

Federal nutrition programs, such as WIC, Food Stamps, the Child and Adult Care Food Program, the Summer Food Service Program, School Lunch and Breakfast and the afterschool snack program address hunger and undernutrition, but we also need to look more closely at the role they can play in obesity prevention. The school meals programs are a key place for strides to improve the choices children have, if we can get them into these regulated meal programs. Therefore, focusing on changing the school food environment is very important. Also, steps that have been taken to integrate obesity prevention into WIC have been quite promising and need to be expanded. We also need to focus on the quality of the foods in afterschool snack programs. Afterschool programs provide good opportunities to get healthy food choices to hungry children.

Even when people understand what a healthful diet is and how important physical activity is, and are motivated to purchase, prepare and consume healthy foods with their families and engage in regular physical activity, countervailing forces in low-income neighborhoods and schools often do not support, or even work against, these important changes. Many changes will have to occur to turn this situation around.

Comments from Attendees During Discussion Session on Environmental Issues and Strategies Related to Hunger and Obesity

- As to vending machines, many feel that children should be moved from soda consumption to water consumption rather than to juice consumption, because of the caloric content of juice, especially considering the large bottles in which juice is sold. However, others raised problems with each of the alternatives: the dangers of some urban water supplies; the need for variety for continued vending sales purposes; and the concern about lack of fluoride in bottled water and the cost of bottled water. Some pointed out that research shows that the concern about juice consumption is really not about the juice per se, but rather the tendency of some children to overconsume it. Also, some feel that drinking juice “trains your taste” for eating fruit, which is preferable to the taste preference to which soda drink consumption may lead.
- Some feel that the large 1981 cuts in per meal school lunch funding led to increased sales of food items in “a la carte” lines and vending machines to compensate for lost revenue, and that the school lunch reimbursement typically does not cover the full cost of providing meals. This cutback plus the loss of federal food service equipment repair and replacement funds, have made it more difficult to prepare meals in the school setting, and have led many schools to shift to pre-plated meals.
- These kinds of issues speak to the underfunding of school systems and the problematic moral and ethical trade-offs we are making. We should be able to feed our children healthy and attractive meals and snacks. School food service should not have to serve as a backbone for financially supporting underfunded schools, nor should we have to make trade-offs between teaching reading and providing physical education. We need to change this conversation and find a way to obtain resources for all these equally important things.
- When we conduct research on the impact of changes in nutrition or physical environment, on health or the reduction of health disparities, we must ensure that the changes are fully implemented before we begin to measure outcomes. These changes take a long time to happen, so measuring outcomes prematurely may lead to a false conclusion that there is no impact.
- There are some steps that can be taken now to improve school meals, if focused attention is brought to these “do-able” pieces. For example, it is important to look at food specifications that school systems have on the books for purchasing foods for school meals and snacks. These are seldom reviewed, can be improved relatively easily, and have the potential of making an enormous difference.

- It is important to be attuned to new opportunities for change in the nutrition environment in a community or school. For example, when the mayoralty in New York City changed, and a decision was made by the city to revamp its education system, advocates and others took advantage of this goal to urge the inclusion of school meals as part of the change to be made.
- In making change in school meals, it is important to bring a broad set of stakeholders to the table - - food service, school board, principals, parents, etc. - - to define what the issues really are so that you can define what it is that people want to change in the school district and how they can actually make that happen.
- In making changes and substitutions in vending, it is important to provide healthy choices that children like, so that they will not feel deprived.
- WIC can and should play an important role in obesity prevention. However, WIC (by law and reputation) has many important tasks to perform that are unrelated to nutrition - - smoking cessation, immunization, voter registration, literacy, and drug screening and referral - - that have been added over the years. Yet, obesity prevention is part of WIC's mission, and has become difficult to carry on because of increased responsibilities without increased resources.

Advocates Finding Solutions to Obesity Among the Poor and Food Insecure

The Food Trust, Philadelphia, PA (based on an oral presentation by Hannah Burton)

The mission of the Food Trust is to increase access to nutritious foods in low-income communities. The Food Trust is based in Philadelphia - - it runs 18 farmers markets in low-income areas; trains teachers to do nutrition education; works to incorporate nutrition into the standard Philadelphia school district curriculum; and has led the efforts to ban soda sales in the schools.

A major challenge for Philadelphia's low-income communities is a severe lack of supermarkets, with a proliferation of corner stores that sell mainly soda and snacks, and offer no fruits or vegetables. The Food Trust conducted research on the availability of supermarkets and found that low-income neighborhoods had many fewer supermarkets per capita than more affluent neighborhoods. It also mapped the location of supermarkets, the income levels of the neighborhoods, and the death rates from chronic disease, in order to show that low-income areas had far fewer stores and higher death rates.

The Food Trust then approached public health advocates and public policymakers with this information, arguing that the city needed to develop more supermarkets for low-income areas, both to protect the health of children and families and to create jobs and contribute to the revitalization of Philadelphia. After a great deal of Food Trust effort, the city asked it to develop a task force of 45 people - - 1/3 from the supermarket industry, 1/3 from city government, and 1/3 from community groups. The task force met to discuss what the city could do to bring in more supermarkets to low-income neighborhoods. The task force identified as one barrier the higher cost of developing supermarkets in cities - - taking into account issues like land assembly, taxes, and infrastructure, the costs of which the conventional financing industry doesn't do a good job in meeting.

As a result, when Governor Rendel included \$100 million in his economic stimulus legislation, the First Industries Program, to promote the Pennsylvania agricultural sector, he made supermarkets in underserved areas eligible for this funding. He followed this action with the creation of the Pennsylvania Fresh Food Financing Initiative, including seed funds amounting to \$10 million, called the Reinvestment Fund. It has partnered with the Food Trust and the Greater Philadelphia Urban Affairs Coalition to leverage that \$10 million to create a \$40 million fund, including private investment, to bring healthy food to low-income communities, both urban and rural, state-wide. This project was packaged as a jobs program and, in fact, the first new store that opened with these funds created 258 union jobs.

The Food Trust is also working to improve the variety and healthfulness of foods for sale in "corner stores." It has created a Healthy Community Stores National Network to work together nationally to achieve these goals.

Institute for Community Resource Development (ICRD), Chicago IL (based on an oral presentation by LaDonna Redmond)

ICRD has a public-private partnership with universities and other nonprofits, called the Chicago Food Systems Collaborative. One of its goals is to build grocery stores that serve urban communities of color by tapping into their unique neighborhood economic bases.

ICRD believes that each community has the intellect to heal itself, and that planning should be based on the assets already available in the community. It surveyed its own community (the Austin neighborhood) to find out the magnitude of the food buying power in the "low-income community," and found it to be substantial. ICRD also found out that major causes of death in its area are heart disease, cancer, strokes, accidents and diabetes. In addition, ICRD carried out a market basket study with community residents and college students to find out what foods are available and how much they cost; and mapped store locations, fast food locations, and how far these establishments are from people's homes.

ICRD now is working closely with corner stores to find out how the availability of fruits and vegetables can be increased at these stores.

School Food Plus Initiative, New York, NY (based on an oral presentation by Toni Liquori, Food Change)

The School Food Plus Initiative's primary goal is to improve the eating habits, health and academic performance of youth who are within reach of the New York City School meals program. The initiative is coalition-based because the magnitude of the New York City school meals reform effort requires the engagement of parents, health care providers, physical education teachers, community organizations, farmers, bodega owners, school lunch workers, and many others. The initiative grew out of a nutrition education effort in the schools by the Community Food Resource Center (CFRC), now called FoodChange - - the Cook Shop Program, cooking with children in the classroom with whole fruits, vegetables and grains. These foods were served in the cafeteria multiple times after the students became familiar with them through cooking and tasting them in the Cook Shop Program.

With the election of Mayor Bloomberg, the reorganization of the city schools' Office of School Food was begun and CFRC was asked to help that process because of its involvement with the school meals programs and the Cook Shop Program. This was the origin of the School Food Plus Initiative. There are several key partners in the institutional changes that are occurring - - the Office of School Food, FoodChange, the City Health Department, the State Department of Agriculture and Food, and Teachers College of Columbia University. The focus that pulls them all together are the recipes they have developed for school lunches - - which are based on nutrition standards for school lunches, the priority of procuring local foods, and the Cook Shop target foods.

School Food Plus programs are tiered so that different schools can choose different aspects of the programming. Components include the Cook Shop program in the classroom and in the cafeteria; turning the cafeterias into classrooms; Vegetable of the Month parent cooking clubs; S.P.A.R.K. (physical fitness-related); Food and Fitness Council (school-based assessment of food and fitness); and Choice, Control, Change (a curriculum about the food system and obesity for middle school nutrition education).

DC Action for Healthy Kids (chaired by D.C. Hunger Solutions), Washington DC (based on an oral presentation by Kim Perry)

This coalition is part of the national Action for Healthy Kids coalition, and is working to change the school environment in Washington, DC. DC Hunger Solutions' involvement in this coalition added a focus on the sometimes limited

choices of low-income children and the need to ensure that all children have access to the child nutrition programs and nutritious foods.

The team developed three goals: to develop age-appropriate and culturally sensitive health education policies; to improve the school nutrition environment, especially in the middle and high schools where vending machines sold soda and other unhealthy foods in competition with school meals; and to assure friendly policies toward the use of school facilities for afterschool programs that promote physical activity.

The healthy vending policy was based on California's S.B.19 standards. Initial conversations focused on piloting these changes in a few schools, but the full Board of Education eventually passed a rule that all schools would implement the policy by February 2005. The healthful vending items are well-marketed in the schools. The next steps will be to apply these standards to all foods sold or offered in the schools.

The group also is promoting Universal School Breakfast for all schools in the city - - breakfasts at no charge to all students - - as an anti-hunger tactic, a nutrition promotion measure, and an anti-obesity strategy.

The lessons learned by the group so far are: it is better to develop messages on healthy lifestyle rather than on healthy weight in this community, and because the community feels that it is used as a "guinea pig" too often, broader policy change is better received than pilot projects.

Contra Costa Child Care Council, Contra Costa California (based on oral an presentation by Paula James)

There is an enormous opportunity for obesity prevention during early childhood, working with parents and caregivers. Close to three out of every four children younger than five are regularly in child care. Many children are spending 40 or more hours per week in child care, most of their waking hours, and receiving most of their meals there. Moreover, with more parents working for longer hours, many children do not have the benefit of home-cooked family meals and all the learning opportunities that they offer. Many children coming into child care don't know the smells of foods being cooked and don't recognize fruits and vegetables. Many parents can't afford enough food, and many have very little time to purchase and prepare food.

Good health and nutrition serve as a foundation for development and learning. Caregivers and parents have a small window of opportunity to develop healthy food preferences by age 3 to 4 and to promote self-regulation of portion size. These influences will have a profound effect on healthy eating habits in later life.

Young children learn by watching and mimicking adults. In child care this means a caregiver eating with children, and children learning about foods, being able to eat in a family style setting, being comfortable to self-regulate their own eating (by not being required to “clean the plate,” but also knowing that they will have access to enough food), and being offered healthful food choices.

The Child and Adult Care Food Program (CACFP) is not as well-known as the school nutrition programs. It is available to family child care providers and child care centers, and provides reimbursement for young children’s meals and snacks meeting U.S. Department of Agriculture nutrition standards. This program gives centers and homes a basis for sound nutrition.

Many low-income children are taken care of in family child care homes. These homes receive visits from their CACFP sponsors, which provide opportunities to examine the foods that are being served to children and recommend ways to create a supportive food and nutrition environment for children. There are also a lot of opportunities for caregivers to interact with parents about food-related issues.

There are challenges facing CACFP that stand in the way of fully realizing its enormous potential:

- There are thousands of homes and centers that are not taking advantage of this nutrition program, in part because of lack of marketing of its nutrition and health benefits.
- Many child care settings do not have nutrition policies. (In California there is a project to develop these policies, to provide cooking classes for parents, and to help caregivers in child care settings to improve their own nutrition and health.)
- Family child care providers are strapped for funds to provide nutrition expertise, physical activity counseling, and special needs advice on nutrition issues. They need help from community collaborators to assist in these kinds of efforts and to get additional funding through community grants.

Finally, an important research issue for the larger group is how the increase in employment among mothers of preschoolers, especially those in low-income families, and the resulting decline of family meal service, have contributed to growing obesity rates among very young children.

Children’s Hunger Alliance (CHA), Columbus, Ohio (based on an oral presentation by Dianne Radigan)

The focus of CHA is ensuring that children in Ohio receive the food they need. In many ways, the greatest strength it brings as an anti-hunger organization is the ability to bring people together to accomplish this goal. CHA acts as a sponsor of the Child and Adult Care Food Program; its staff acts as “sales people” and “brokers” to increase children’s access to all of the federal nutrition programs; and it works on broader state hunger and nutrition policy issues. CHA also co-chairs Ohio’s Action for Healthy Kids, which has three goals: increasing access to the School Breakfast Program; improving the quality of foods offered and sold to children in school and afterschool; and increasing opportunities for physical activity.

In addition, CHA has worked to ensure that each nutrition program can be the best it can be, and to use each program to enhance everything else that is going on for children. For example, CACFP is used as an access point to get in and work with caregivers on nutrition and school readiness; in afterschool settings CHA is getting children involved in nutrition education and fitness programming; and in all of the programs it is focused on increasing the quality of food and physical activity in general.

A new project in Franklin County, Ohio, brings the community together on the issue of obesity prevention among children. The project began with the development of two leadership groups - - one for funding and guidance, and one including community stakeholders to find out about existing assets in the community. In addition, focus groups were held with mothers and children. Key issues that came out of these groups included: parental fear of violence against children if they went out to play; weight problems of mothers; and a general lack of accurate information. Based on all of this, a plan has been developed for the community, and the educational system, with an emphasis on what families can do and how they can be supported in their efforts.

Research Needs to Better Understand the Relationship Between Hunger and Obesity (a summary of the written paper and oral presentation by Sonya Jones on “Research Needs to Better Understand the Relationship Between Hunger and Obesity.”)

A number of studies have been published in peer-reviewed scientific journals in the past 10 years that describe a relationship between food insecurity and obesity. These studies show that household food insecurity is related to overweight in adult women and sometimes children and men. Specific conceptual frameworks, types of data and analytical strategies are needed to understand what the relationship between hunger and obesity is - - which direction it goes (i.e.,

from food insecurity to obesity, or obesity to food insecurity) and what the steps in the process are. This will help us understand better what policies to put into place. Ultimately, however, more basic research is probably not the answer to the problems we are seeing. Research is not enough. What we will need to solve these health problems are innovative partnerships, local solutions, and policy solution research.

Nevertheless, it is important at the national level to try to understand this phenomenon. Five hypothesized mechanisms (plausible pathways) for this relationship are currently in play:

1. Hunger and obesity are opposite extremes of food consumption. If obesity exists, it is illogical to presume that hunger or food insecurity could also exist in the same individual. Associations between obesity and food insecurity are evidence that the latter actually does not exist, according to this perspective. (To accept this hypothesis, we would have to ignore the literature that says that there is a 30 percent increase in overweight among women who are food insecure.)

Potential policy implications of this mechanism: Prevention of obesity as the primary federal policy, with a focus on personal responsibility.

2. Hunger is an experience of material hardship that leads to the purchase and consumption of low-cost, energy dense foods. The consumption of low-cost energy dense foods that is caused by resource constraints leads to excess weight gain and obesity. Associations between hunger and obesity are evidence of reliance of food-insecure households on low-cost, energy-dense foods.

Potential policy implications of this mechanism: Increase in the amount of resources available in the Food Stamp Program to allow people to purchase a healthful diet; promotion of physical activity among nutrition program participants; and agricultural policies that support production of food that is consistent with weight maintenance.

3. Hunger is cyclical because households are more likely to have resources to obtain food at certain times of the month. The hypothesized cyclical nature of hunger could lead to cyclical overeating and fasting, which in turn could lead to weight cycling.

Policy implications of this mechanism: Food assistance programs could deliver benefits over a shorter time frame; the benefit allotment in the Food Stamp Program could be increased; income transfer programs could increase their cost-of-living adjustments; benefits for working families could be increased; and budget counseling and financial services could be provided as part of nutrition and income transfer programs.

4. Both hunger and obesity are social problems that result from poverty but are not causally linked to each other. Food insecurity is best described as the social, economic and personal experience of food shortage. Obesity in this

perspective is not only a health problem, but also a social and economic problem with similar stigma to the problem of hunger.

5. Food insecurity is a stressor that results in a stress response. The experience of stress may induce a variety of responses, including disordered eating, reduced participation in physical activity, depression, and substance abuse, all of which may be related to weight gain.

Policy implications of mechanisms 4 and 5: Ending poverty or ensuring that the experience of poverty for communities, households, and individuals is not a negative one when it comes to the availability of a nutritionally adequate and healthful diet.

Obviously, people's conceptual frameworks when they think about the relationship between hunger and obesity will, to a large extent, determine the policy recommendations they favor. However, most policy solutions flowing from these frameworks would include the importance of continuing, better-funded, and high quality federal nutrition programs, and the alleviation of food insecurity.

There are several limitations in the study designs and analytical approaches of research on the relationship between hunger and obesity. The type of data used by most studies to date has been cross-sectional survey data, yet longitudinal data would be the most reliable data possible for establishing a causal relationship. In addition, selecting multiple measures of material hardship, or conceptualizing poverty as a social and economic experience, would help to determine the extent to which food-related material hardship is distinct from the other effects of poverty. Finally, one should consider the role of food assistance participation when carrying out studies on hunger and obesity. The propensity to participate in a program is a source of bias not accounted for in most studies. In addition, the mediating and modifying effects of participation often are not accounted for.

Comments on Research Needs Related to Hunger and Obesity from Panelist Barbara Laraia and Attendees

- Household food insecurity may be an umbrella term that covers multiple etiologies, depending on the characteristics of the household.
- Why does the relationship between food insecurity and obesity show up for women, but not for men or children? There are obviously differences in the experience of household food insecurity by age and gender. It may have to do with the lives of women. Research among women is showing that food insecurity is related to high psycho-social stress measures, including anxiety and depression.

- Qualitative as well as quantitative research can provide important information about the mechanisms of the relationship between food insecurity and obesity among women.

APPENDIX A

ROUNDTABLE ATTENDEES

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APPENDIX B BIOGRAPHICAL INFORMATION ON SPEAKERS

Lynn Parker, M.S. is the Director of Child Nutrition Programs and Nutrition Policy at the Food Research and Action Center (FRAC). Ms. Parker played a leadership role in the development of FRAC's Community Childhood Hunger Identification Project (CCHIP), a ground-breaking survey of childhood hunger in the United States. She also led the development of FRAC's Building Blocks Project, an effort to expand child nutrition programs as core funding for meeting the broader needs of children, and FRAC's initiative on understanding and responding to the paradox of hunger and obesity.

Ms. Parker was elected President of the Society for Nutrition Education, completing her term in 2000. She was appointed in 1999 to the Food and Nutrition Board of the Institute of Medicine, and is currently serving her second term on the Board. In 1992 Senate Majority Leader George Mitchell appointed her to a five-year term on the National Nutrition Monitoring Advisory Council. She also served as a member of the Technical Advisory Group to America's Second Harvest 2001 National Hunger Survey. Ms. Parker received the 2000 Mildred Kaufman Distinguished Lecturer Award from the Department of Nutrition, School of Public Health, at the University of North Carolina at Chapel Hill. She holds a B.A. in Anthropology from the University of Michigan and an M.S. in Nutrition with a minor in Rural Sociology from Cornell University.

Patricia Crawford, DrPH is Co-Director of the Center for Weight and Health in the College of Natural Resources, which provides leadership for the development of interdisciplinary, science-based solutions to body weight, health and hunger related problems. She is also Nutrition Specialist and Lecturer in the Department of Nutritional Sciences at the University of California, Berkeley. Nationally recognized as an authority on childhood obesity, Dr. Crawford has served as Principal Investigator on a number of significant studies, including the NHLBI Growth and Health Study, a 10-year longitudinal study of a cohort of 2379 black and white girls that investigated the development of heart disease risk factors. She also served as Principal Investigator on the 5-state FitWIC intervention study. She served on the scientific panel for the California Center for Public Health Advocacy's recent report on California children's fitness, and is currently Principal Investigator on a number of studies designed to explore how environmental, family, and clinical approaches can address the childhood obesity epidemic in California communities and the country.

Christine Olson, PHD is a Professor of Community Nutrition in the Division of Nutritional Sciences at Cornell University. From 1998 to 2003, she was the Hazel E. Reed Human Ecology Extension Professor of Family Policy. In 2002, she received the award for Excellence in Dietary Guidance from the Food and Nutrition Section of the American Public Health Association. The nutritional concerns of women, infants, and children are the focus of Professor Olson's scholarly work, with a focus on how recommendations for weight gain during pregnancy and selected health behaviors relate to the development of obesity in women, and hunger and food insecurity among low-

income rural families, and how they are affected by welfare reform and the economy. Both projects are motivated by a concern for improving the nutritional well-being of populations using well-designed interventions.

Sonya Jones, PhD is an assistant professor at the University of Tennessee in Knoxville. Her research interests include social determinants of health and healthy eating, the longitudinal effects of poverty on weight gain and overweight in adults and children, and conducting research in partnership with communities to address pressing nutrition issues, using methodologies including giving community residents cameras, collecting ethnographic data, and mapping to accomplish this type of research. Before she came to University of Tennessee, she was Project Director of the Durham Food Project/Proyecto Alimenticio.

Sarah Samuels, DrPH is President of Samuels & Associates, a public health evaluation, research and policy consulting firm. Samuels & Associates conducted a study of Fast Food Sales in Public High Schools in California for California Project LEAN that helped to inform and shape state policy setting standards for foods sold on school campuses. Current projects include studies of unhealthy food and beverage sales in California schools, evaluation of diabetes prevention and treatment programs, and evaluation of childhood obesity prevention strategies. For over 25 years, Dr. Samuels has worked on public health and health policy issues for government, university, and philanthropic institutions. She conceived and directed Project LEAN, a national nutrition social marketing campaign. As a program officer at the Kaiser Family Foundation, she was instrumental in developing major foundation initiatives in disease prevention, reproductive health and health care reform. Dr. Samuels is the co-chair of the California Project LEAN steering committee, a founding member of the California Nutrition Network and the Strategic Alliance to Promote Healthy Food and Physical Activity Environments, and is on the board of California Food Policy Advocates. She is also an evaluation advisor to the CDC Youth Media Campaign.

APPENDIX C ROUNDTABLE PAPERS

A Snapshot of Food Insecurity and Hunger in the U.S.: Conceptualizing, Defining, and Measuring U.S. Hunger and Food Insecurity **Lynn Parker, Food Research and Action Center**

For the purposes of understanding the paradox of hunger and obesity, it is important to understand the current concepts, definitions, and measurements behind discussions of hunger and food insecurity.

Hunger In America

Hunger was “discovered” in the United States in the late 1960’s, and part of that discovery was a result of the work of a group of physicians funded by the Field Foundation to visit the poorest areas of the U.S.—pockets of poverty in Appalachia, the Southeast and the Southwest—and examine the nutritional health of low-income children. The doctors reported seeing nutritional problems that they would have expected to find in developing nations, but not in the U.S. They described the hunger they found: “Wherever we went and wherever we looked we saw children in significant numbers who were hungry and sick, children for whom hunger is a daily fact of life, and sickness in many forms, an inevitability. The children we saw were more than just malnourished. They were hungry, weak, apathetic. Their lives are being shortened. They are visibly and predictably losing their health, their energy, their spirits. They are suffering from hunger and disease, and directly or indirectly, they are dying from them – which is exactly what ‘starvation’ means.” They reported finding “...large numbers of stunted, apathetic children with swollen stomachs and the dull eyes and poorly healing wounds characteristic of malnutrition...” (Kotz, N. 1979. *Hunger in America: The Federal Response*. The Field Foundation. New York, New York.) National nutrition survey data affirmed these findings—in biochemical measures (i.e., blood values for nutrients), anthropometric measurements (such as heights and weights) for certain groups of children, and in dietary survey results.

During the years that followed, the existing federal nutrition programs expanded significantly in scope, and new programs were added to reach different ages of children in various settings. As the physicians reported in 1977, there were “far fewer grossly malnourished people in this country....Malnutrition has become a subtler problem....many poor people now have food and look better off. This change does not appear to be due to an overall improvement in living standards or to a decrease in joblessness in those areas....But in the area of food there is a difference. The Food Stamp Program, the nutritional component of Head Start, school lunch and breakfast programs, and to a lesser extent the Women-Infant-Children (WIC) feeding programs have made the difference.” (Kotz, 1979)

Food insecurity and Hunger in America

Over the ensuing years, we have seen the evolution of a concept that is now called food insecurity, which has helped to better define and measure the degrees and kinds of food insufficiency most likely to be experienced in the United States. In part, the necessity for developing such a concept was due to the creation of a significantly expanded (but still imperfect) safety net for low-income families—including the Food Stamp Program, WIC, School Breakfast and Lunch, the Summer Food Service Children, the Child and Adult Care Food Program, the Emergency Food Assistance Program (TEFAP), and the national network of food banks, food pantries, soup kitchens and shelters. In general, the kind of “hunger” we typically see in the U.S. is no longer the poverty-related nutritional deficiency diseases of the past, but rather the (still poverty-related and of great concern) chronic or cyclical inadequacy in household food supplies. This kind of food insufficiency lends itself to direct questions to the household about the adequacy of their food supply and the coping strategies they use to make the most of the food they can afford.

This conceptualization of food insufficiency evolved fully in response to a need in the early 1980s to effectively and feasibly measure the kind of hunger that appeared to be increasing in the U.S., and to be able to document its growth at the community level. The relatively small numbers of food pantries and soup kitchens in existence at that time suddenly were seeing very large and unexpected increases in demand for emergency food, with increasing numbers of women and families with children showing up to obtain food. Community-based organizations and local government officials wanted to bring this growing need for food to the attention of public officials in some kind of a “scientific” manner so that they would believe that there was a real problem at the local level that required a serious and prompt response. As a result, academic researchers and advocates were working individually and together to define and measure the problem they were seeing. (Nestle, M. and Guttmacher, S. 1992. Hunger in the United States: Rationale, Methods, and Policy Implications of State Hunger Surveys. *Journal of Nutrition Education*. 24(1): 18S-22S.)

The problem became so visible on a national scale that the Reagan Administration commissioned a “President’s Task Force on Food Assistance.” Among other things, the Task Force reported: “While we found evidence of hunger in the sense that some people have difficulty obtaining adequate access to food, we have also found that it is at present impossible to estimate the extent of that hunger. We cannot report on any indicator that will tell us by how much hunger has gone up in recent years.” (Raisan, J., et al. 1984. Report of the President’s Task Force on Food Assistance. Washington, DC.)

Finally, there was also a desire on the part of many to develop a measure that could act as an early warning system—one that would highlight potential nutrition problems at the individual, household, or community levels before they became severe enough to be able to be documented by biochemical and anthropometric measurements.

Measuring Food Insecurity

Over the years, a number of measures have been developed to measure food sufficiency, or what is now called food security (Keenan, P., et al. 2003. Measures of Food Insecurity/Security. Journal of Nutrition Education. 33:S49-S58), separate from the traditional measures of dietary intake, blood chemistry and anthropometrics.

- Since 1977, the “USDA food sufficiency question” has been in every USDA food survey. It asks, “Which of the following statements best describes the food eaten in your household: 1. Enough of the kinds of food we want to eat, 2. Enough but not always the kinds of food we want to eat, 3. Sometimes not enough to eat, or 4. Often not enough to eat.”
- Starting in the 1990s, the Expanded Food and Nutrition Education Program reporting system included a question asking, “How often do you run out of food before the end of the month? 1. Do not run out of food, 2. Seldom, 3. Sometimes, 4. Most of the time, or 5. Almost always.”
- Since 1996, the Behavioral Risk Factor Surveillance System includes a question requiring a yes or no answer to: “In the past 30 days, have you been concerned about having enough food for you or your family?”
- Starting in the late 1980s, the Community Childhood Hunger Identification Project Hunger Identification Project hunger index (developed by the Connecticut Association for Human Services and the Food Research and Action Center), a scale of eight questions developed to measure hunger among families with young children, was developed and used in states and localities across the country. Five or more affirmative responses indicated that hunger affected everyone in the household, and “yes” answers to 1 to 4 questions indicated a family that was “at risk of hunger.” A unique aspect of this survey is that it stated explicitly in each question that the condition or situation being questioned was related to insufficient resources. The questions included:
 - Does your household ever run out of money to buy food to make a meal?
 - Do you or adult members of your household ever eat less than you feel you should because there is not enough money for food?
 - Do you or adult members of your household ever cut the size of meals or skip meals because there is not enough money for food?
 - Do your children ever eat less than you feel you should because there is not enough money for food?
 - Do you ever cut the size of your children’s meals or do they ever skip meals because there is not enough money for food?

--Do your children ever say they are hungry because there is not enough food in the house?

--Do you ever rely on a limited number of foods to feed your children because you are running out of money to buy food for a meal?

--Do any of your children ever go to bed hungry because there is not enough money to buy food?

- The Radimer Cornell measure of hunger was developed by Radimer and colleagues at Cornell University. It originally included these 12 questions, forming three subscales:

Household Hunger

--I worry whether my food will run out before I get money to buy more.

--The food that I bought just didn't last, and I didn't have money to get more.

--I ran out of the foods that I needed to put together a meal and didn't have money to get more food.

--I worry about where the next day's food is going to come from.

Women's Hunger

--I can't afford to eat the way I should.

--I can't afford to eat properly.

--I am often hungry, but I don't eat because I can't afford enough food.

--I eat less than I think I should because I don't have enough money for food.

Children's Hunger

--I cannot give my child(ren) a balanced meal because I can't afford that.

--I cannot afford to feed my child(ren) the way I think I should.

--My child(ren) is/are not eating enough because I just can't afford enough food.

--I know my child(ren) is/are hungry sometimes, but I just can't afford more food.

USDA/Census Measure of Food Insecurity

The next major step in conceptualizing and measuring what was eventually to be called “food insecurity” was the development of the food security module of the Bureau of Census Current Population Survey (CPS). This has become the “gold standard” of hunger/food insecurity measures, and is based on the lessons learned in the development of the surveys, indices and scales that came before.

The conceptualization behind this survey was based on definitions developed by the Life Sciences Research Office of the Federation of American Societies for Experimental Biology under the sponsorship of the American Institute of Nutrition. (Anderson, SA (ed.). 1990. Core Indicators of Nutritional State for Difficult-to- Sample Populations. Journal of Nutrition. 120(11s)1557-1600):

Food security - - Access by all people at all times to enough food for an active, healthy life and includes at a minimum: a) the ready availability of nutritionally adequate and safe foods, and b) the assured ability to acquire acceptable foods in socially acceptable ways (e.g., without resorting to emergency food supplies, scavenging, stealing, and other coping strategies).

Food insecurity - - The availability of nutritionally adequate and safe foods or the ability to acquire acceptable foods in socially acceptable ways is limited or uncertain.

Hunger - - The uneasy or painful sensation caused by a lack of food.

The food security measurement developed by the Bureau of Census in conjunction with the Departments of Agriculture and Health and Human Services, and used in the CPS for the first time in 1995 and every year since, originally classified each household into one of four categories:

Food secure households show no or minimal evidence of food insecurity.

Food insecure without hunger households express concerns about the availability of food and make adjustments to household management, including reduced quality of diets.

Food insecure with moderate hunger households are those in which food intake for adults in the household has been reduced to an extent that it implies that adults have repeatedly experienced the physical sensation of hunger.

Food insecure with severe hunger households are ones with children in which children's food intake has been reduced to the point they have likely experienced the physical sensation of hunger, and ones with or without children in which adults have repeatedly experienced more extensive reductions in food intake.

The last two terms have since been collapsed into one term: food insecure with hunger.

The questions in the CPS food security module that were used to develop the scale for determining the level of food security/insecurity are:

1. We worried whether our food would run out before we got money to buy more. Was that often, sometimes, or never true for you in the last 12 months?
2. The food that we bought just didn't last and we didn't have money to get more. Was that often, sometimes, or never true for you in the last twelve months?
3. We couldn't afford to eat balanced meals. Was that often, sometimes, or never true for you in the last 12 months?
4. In the last 12 months, did you or other adults in the household ever cut the size of your meals or skip meals because there wasn't enough money for food?
5. (If yes to Question 4) How often did this happen—almost every month, some months but not every month, or in only 1 or 2 months?
6. In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money for food?
7. In the last 12 months, were you ever hungry, but didn't eat, because you didn't have enough money for food?
8. In the last 12 months, did you lose weight because you didn't have enough money for food?
9. In the last 12 months did you or other adults in your household ever not eat for a whole day because there wasn't enough money for food?
10. (If yes to Question 9) How often did this happen—almost every month, some months but not every month, or in only 1 or 2 months?

(Questions 11-18 are asked only if the household includes children 0-18)

11. We relied on only a few kinds of low-cost food to feed our children because we were running out of money to buy food. Was that often, sometimes, or never true for you in the last 12 months?
12. We couldn't feed our children a balanced meal, because we just couldn't afford that. Was that often, sometimes or never true for you in the last 12 months?
13. The children were not eating enough because we just couldn't afford enough

food. Was that often, sometimes, or never true for you in the last twelve months?

14. In the last 12 months, did you ever cut the size of any of the children's meals because there wasn't enough money for food?
15. In the last 12 months, were the children ever hungry but you couldn't afford more food?
16. In the last 12 months, did any of the children ever skip a meal because there was enough money for food?
17. (If yes to Question 16) How often did this happen—almost every month, some months but not every month, or in only 1 or 2 months?
18. In the last 12 months did any of the children ever not eat for a whole day because there wasn't enough money for food?

Since the first national food security survey in 1995, the food security questions have been incorporated into numerous national, state and local surveys. These surveys are being carried out by the federal government; state governments; national, state and local nonprofit organizations; private research institutes; universities; local health agencies; and others. These surveys are diverse in nature and purpose—from those looking at children's early learning and school performance to others monitoring the outcomes of welfare reform. (A shorter six question version of this survey also was developed by USDA food security researchers, and this version has been incorporated into some surveys.)

In addition, a food security objective for the nation has been included in Healthy People 2010, the U.S. prevention agenda consisting of “national health objectives designed to identify the most significant preventable threats to health and establish national goals to reduce these threats”. The goal is: “Increase food security among U.S. households and in so doing reduce hunger.” The baseline is the 88 percent food security of all households in the 1995 national food security survey, and the objective is to hit 94 percent by the 2010 survey. (U.S. Department of Health and Human Services. 2000. Healthy People 2010, Volume II, pp. 19-44. Washington, DC.)

What We Know about Food Insecurity and Hunger in the U.S.

A “Managed” Process

It is important to note that the researchers who developed the scale that is used to determine the severity of food insecurity found that food insecurity was a process that was “managed” by the household. “In this process, households first note serious inadequacy in their food supply, feel anxiety about the sufficiency of their food to meet basic need, and make adjustments to their food budget and food served. As the situation becomes more severe, adults experience reduced food intake and hunger, but they spare

the children this experience. In the third state, children also suffer reduced food intake and hunger and adults' reductions in food intake are more dramatic." Quality is reduced first, then quantity. (U.S. Department of Agriculture, Food and Consumer Service, Office of Analysis and Evaluation. 1997. Household Food Security in the United States in 1995, Summary Report of the Food Security Measurement Project. Alexandria, Virginia.)

How Many Are Affected?

In the last food security survey for which we have published results (2002), USDA reports that 11.1 percent of households (a total of 12.1 million households) in the U.S. were food insecure, an increase from 10.7 percent (11.5 million households) in 2001, and 3.5 percent were food insecure with hunger, an increase from 3.3 percent in 2001. Food insecure households included 21.8 million adults and 13.1 million children, a total of almost 35 million individuals. Households with hunger, a segment of all food insecure households, included 3 million adults and 800,000 children. (Nord, M, et al. 2003. Household Food Security in the United States, 2002. U.S. Department of Agriculture, Economic Research Service. Washington, DC.)

Who Is Affected Most?

Those affected most by food insecurity are: households with incomes below the poverty line; households with children, headed by a single woman; and Black and Hispanic households. In 2002, 38.1 percent of households living below the poverty line were food insecure; 32 percent of the households with children headed by a single woman were food insecure; and 22 percent and 21.7 percent, respectively, of the Black and Hispanic households were food insecure. Other characteristics that put households at a greater risk of food insecurity are: having children (16.5 percent vs. 8.1 percent among households with no children); living in central cities or rural areas; and living in the South and West. On the other hand, households with the lowest food insecurity levels include: households with more than one adult and no children; households with elderly persons (but not with an elderly person living alone); and households with incomes at or above 185 percent of the poverty level. (Nord, M. et al. 2003)

Trends in Food Insecurity

In general, food insecurity and food insecurity with hunger show a gradual downward trend from 1995 to 1999, and then begin to move up again, although the numbers in the 2002 report are still somewhat short of the 1995 high. (Nord, M. et al. 2003)

Participation in Nutrition Programs by Food Insecure Households

A little more than half (54.2 percent) of food insecure households participated in at least one of the three largest federal nutrition programs during the month prior to the 2002 food security survey—36.4 percent in the National School Lunch Program, 28 percent in the Food Stamp Program, and 13.5 percent in the WIC program. About 19 percent

obtained emergency food from a food pantry, church or food bank during the 12 months prior to the 2002 survey. (Nord, M. et al. 2003)

Consequences of Food Insecurity

Researchers are just beginning to explore and understand the impact of food insecurity on other aspects of quality of life, including child and adult health, mental health, food habits, dietary intake, pregnancy, educational achievement and obesity. These researchers have used several of the “food security” measures described earlier to study the consequences of food insecurity.

For example, researchers have shown that when children live in food insecure households, their health status can be impaired, making them less likely to resist illness and more likely to become sick or hospitalized. Iron deficiency anemia among very young children also has been associated with household food insecurity. Children from food insecure households have problems with learning, resulting in lower grades and test scores. They are also more likely to be anxious and irritable in the classroom, and more likely to be tardy, or absent from school. Adolescents from food insecure households appear to be more likely to have psychological problems. (Center on Hunger and Poverty. 2002. *The Consequences of Hunger and Food Insecurity for Children: Evidence from Recent Scientific Studies*. Brandeis University.) In addition, recent research has shown associations between food insecurity and obesity among low-income women, and among some groups of children. (Olson, CM. 1999. *Nutrition and Health Outcomes Associated with Food Insecurity and Hunger*. *Journal of Nutrition*. Vol. 131: 521S-524S; Townsend, MS, et al. 2001. *Food Insecurity Is Positively Related to Overweight in Women*. *Journal of Nutrition*. 131: 2880-2884; Adams, EJ, et al. 2003. *Food Insecurity Is Associated with Increased Obesity in California Women*. *Journal of Nutrition*. 133:1070-1074; Center on Hunger and Poverty. 2002.)

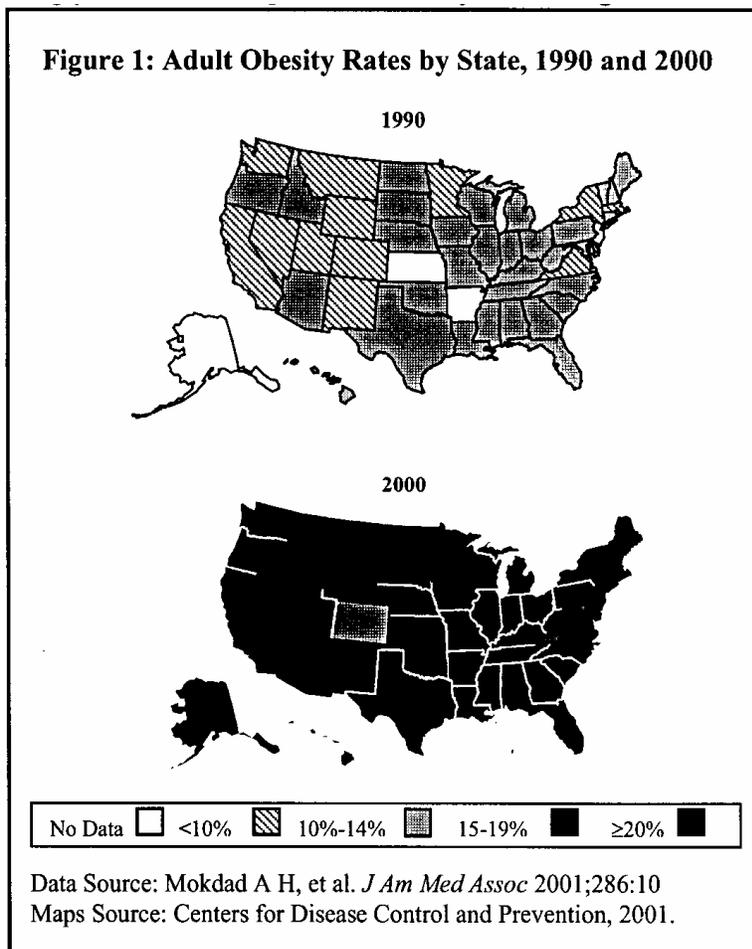
Fortunately, starvation seldom occurs in the U.S. However, when financial resources are persistently inadequate to meet basic needs, many households become food insecure, and many adults and children go hungry (and run the risk of suffering chronic mild under nutrition.) Research is beginning to show that the mental and physical changes that result from food insecurity have harmful effects on learning, development, productivity, physical and psychological health, and family life.

A Snapshot of the Obesity Problem in the U.S., with a Focus on Low-Income and Minority Populations

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Prevalence of obesity in the U.S.

Obesity has become an epidemic in America, and is poised to become the nation's leading health problem. As a result of this epidemic people in their early years are experiencing health problems commonly associated with middle age. Poor diet and lack of physical activity are estimated to contribute to 17% of the deaths in the US (Koplan 2002) As seen in Figure 1 obesity rates are climbing rapidly in every State. Individuals of both genders, varied ages, and all ethnic groups are affected, but unequally.



Measurement of Overweight and Obesity in Adults (age 20 and above): Body Mass Index (BMI) is a tool for expressing the relationship of weight to height. It is a measure of weight for height which is highly correlated with body fat. BMI is calculated in the following ways:

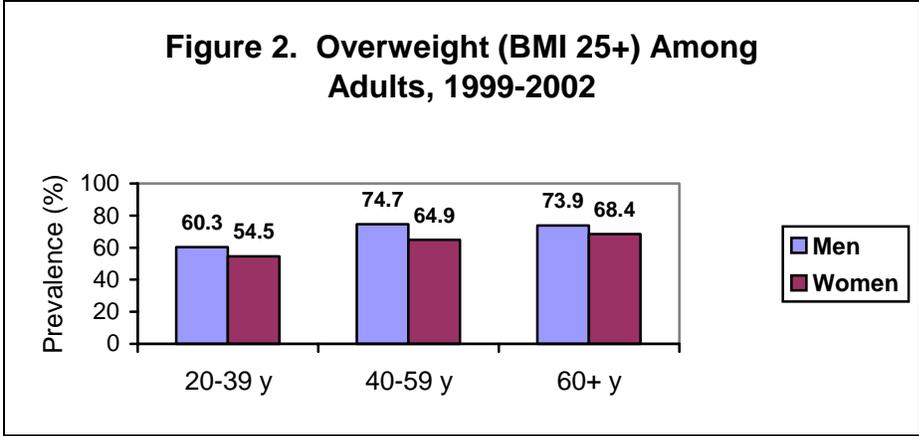
$$\text{BMI (American formula)} = \frac{\text{(Weight in pounds)}}{\text{(Height in inches)} \times \text{(Height in inches)}} \times 703$$

$$\text{BMI (Metric formula)} = \frac{\text{(Weight in kilograms)}}{\text{(Height in meters)} \times \text{(Height in meters)}}$$

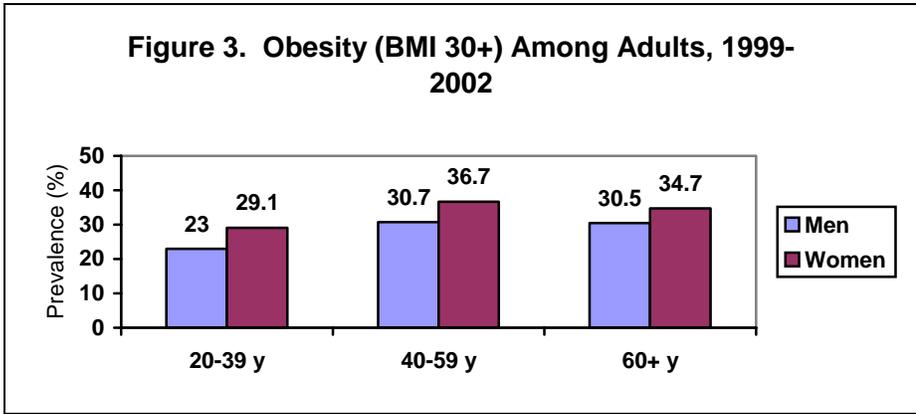
Adult BMI definitions are divided into 4 categories: underweight, normal, overweight, and obese. Individuals whether male or female with a BMI between 25 and 29.9 are considered overweight, while individuals with a BMI of 30 or more are considered obese. Cut-off values and their respective definitions are the same for males and females of all ages.

BMI values	Weight Status
Below 18.5	“Underweight”
18.5 - 24.9	“Normal”
25 – 29.9	“Overweight”
30.0 and Above	“Obese”

Since 1960 nationally representative data from the National Health and Nutrition Examination Survey (NHANES) have been used to monitor the national prevalence of overweight and obesity. The most current NHANES data, from 1999-2002, estimated that 65% of adults are either overweight or obese and 30% are obese (Hedley, 2004). Figures 2 and 3, which separate BMI by gender and age, illustrate that while men are overweight in larger numbers than women, women are more likely to be obese.



(Source: Hedley, 2004)



(Source: Hedley, 2004)

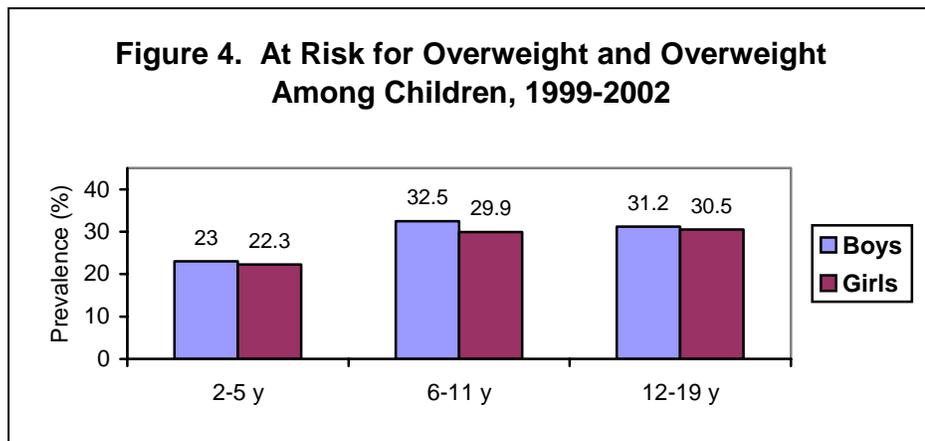
Measurement of Overweight in Children and Adolescents (ages 2-19 years): Overweight is defined differently for adult and pediatric populations. While body mass index (BMI) is calculated in the same way, the classification of overweight is different for youth, with definitions varying by age and gender. For children the cutoff criteria are based on the CDC BMI-for-age-growth charts for 2-19 years. Children's body fatness changes over the years as they grow, and therefore the reference points for BMI are different for each age group. Also, reference points differ by gender. BMI compares well to other measures of body fat, and can be used to track body size throughout life (CDC, 2004).

The following established percentile cutoff points are used to identify underweight, at risk for overweight, and overweight in children. The term “obese” is not used in childhood.

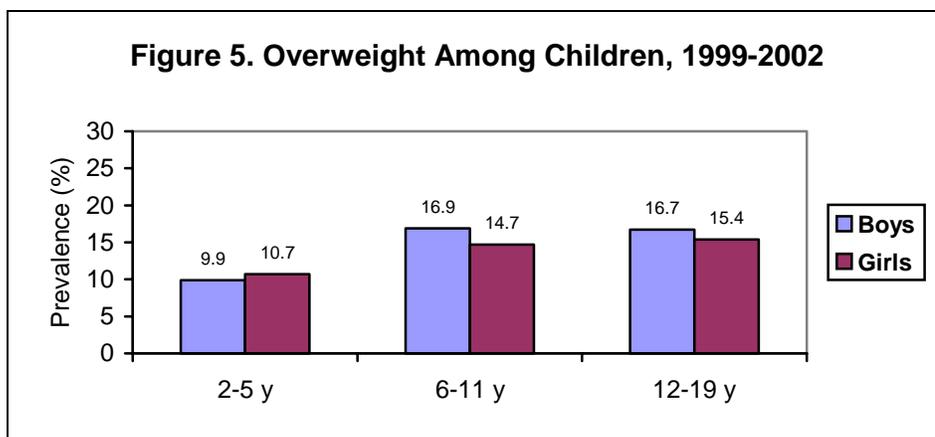
BMI	Weight Status
BMI-for-age < 5th percentile	“Underweight”
BMI-for-age 85th percentile	“At risk of overweight”

to < 95th percentile	
BMI-for-age \geq 95th percentile	“Overweight”

Results from the latest NHANES survey, collected from 1999-2002, indicate that among children aged 6 through 19 years, 31% were at risk for overweight (BMI \geq 85th percentile) (Hedley, 2004). Values for children 6-19 years are higher than those for children 2-5 years (Figure 4). Values for boys and girls are remarkably similar. Sixteen percent of children have BMIs above the 95th percentile and are thus classified as overweight. As compared to 6-19 year old children, fewer 2-5 year old children are classified as “overweight.”



(Source: Hedley, 2004)

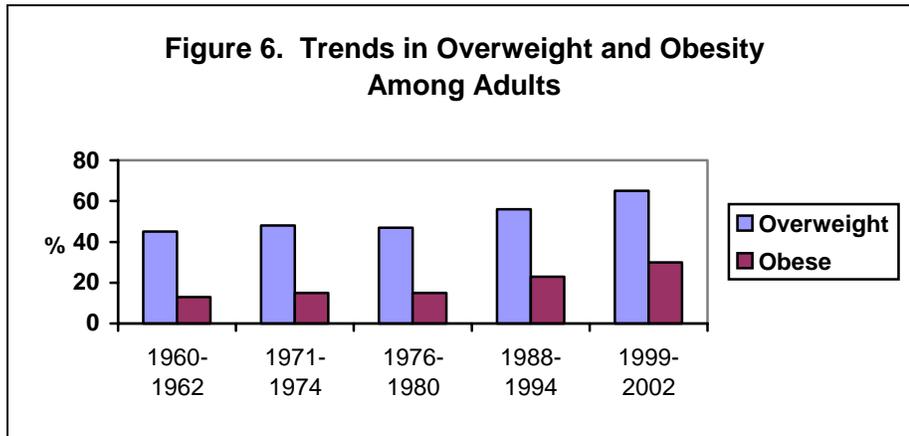


(Source: Hedley, 2004)

Changes in overweight and obesity over the last 4 decades

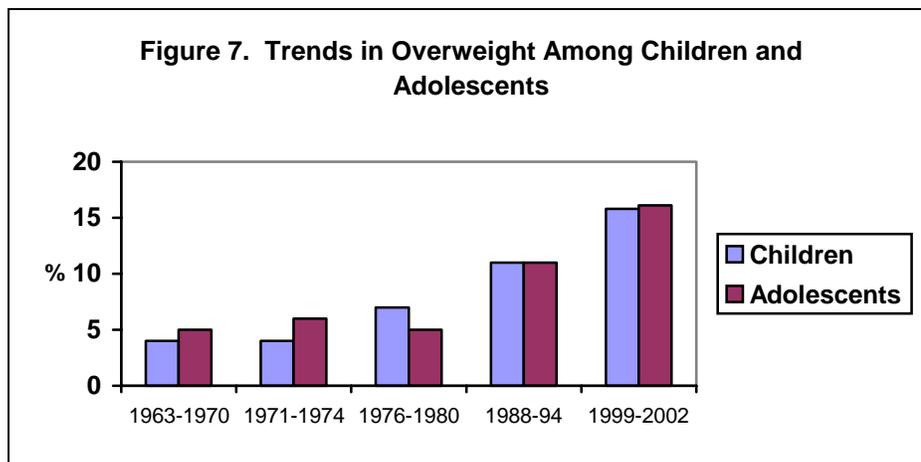
Trends in adult BMI over time: The period between 1960 and 1980 showed little change in the rates of overweight for adults (Figure 6). In contrast, rates doubled in the last 20 years, suggesting that changes in the environment promoting overconsumption of calories

and/or a reduction in energy expenditure occurred during this time period. To date, no leveling off of these rates has been observed.



(Source: CDC/NCHS, NHES I, NHANES I, NHANES II, NHANES III, Hedley, 2004)

Trends in children's BMI over time: The timing of the pattern of increase in children's rates of overweight mirrors the dates of increase seen in the adult data (Figure 7). However during the period of increase from 1980 to 2002, the rates for children tripled and thus increased significantly more for children than for adults, suggesting factors associated with these increases are equally (or more) potent for children.

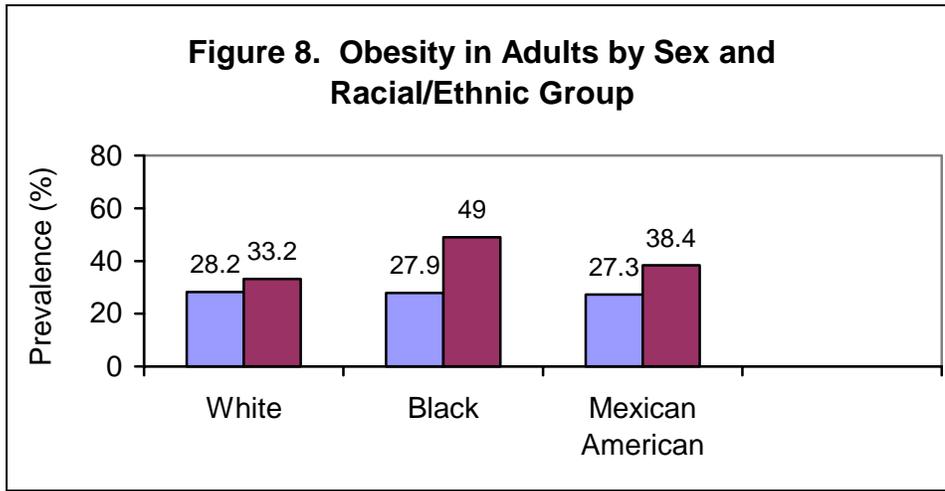


(NCHS 2002)

Racial/ethnic variations in overweight and obesity

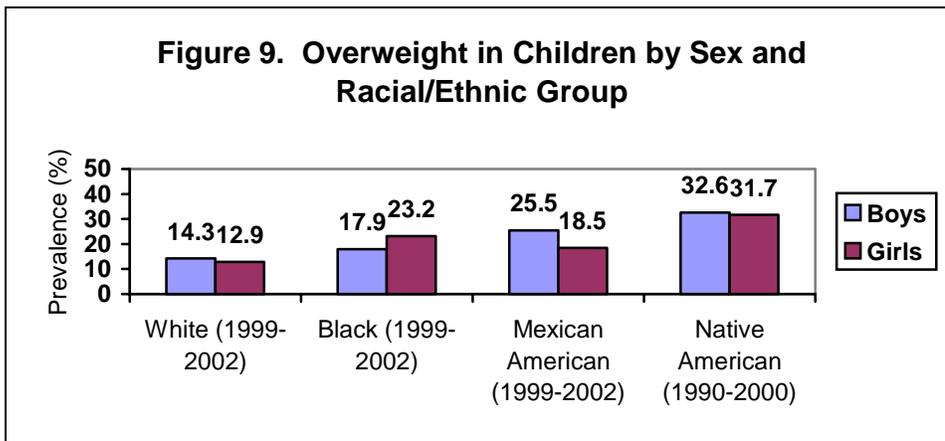
The prevalence of adult overweight and obesity is higher in Hispanics and African Americans (Figure 8). Women and members of minority populations are more affected by overweight and obesity, particularly African American women. For men, no obvious

pattern is observed. While no nationally representative data is available for Native Americans, smaller studies suggest that rates are highest for Native Americans.



(Source: 1999-2002 NHANES, Hedley, 2004)

As with adults, the prevalence of overweight is higher among African-American and Hispanic children compared with white children (Figure 9). While no nationally representative data exists for Native American children, reports from numerous smaller studies show rates of overweight often more than double the rates of white children (Crawford, 2001; Caballero, 2003). Native American children, African American girls and Mexican American boys have the highest rates.



(Source: 1999-2002 statistics from Hedley, 2004; 1990-2000 statistics from Crawford, 2001)

The increasingly high rate of overweight among Hispanic children has particular significance for the overall rates of overweight in the United States since this is the fastest growing ethnic group within the population. It is also noteworthy that time spent in the U.S. is associated with overweight with only 26% of first generation Hispanic adolescents overweight compared with 33% of second and third generation Hispanics (Popkin, 1998).

Changes in ethnic variations in overweight and obesity over time

Trends in adult BMI by race/ethnicity over time: The US has become more ethnically diverse during the past decade. In the 1990 census, roughly 76% of the population were non-Hispanic whites. In Census 2000 (US Bureau of Census 2003) only about 69% were non-Hispanic whites. During this period rates of overweight and obesity increased more for black and Mexican American adults.

Trends in children's BMI by race/ethnicity over time: For both children (6-11 years) and adolescents (12-19 years) increases in prevalence of overweight from 1988-94 to 1999-2000 varied by gender and race/ethnicity. Rates of increase were lowest for non-Hispanic/white children and greatest for Mexican American and non-Hispanic Black children regardless of gender or age (Figure 10).

Figure 10: Overweight prevalence by race/ethnicity for children 6-19

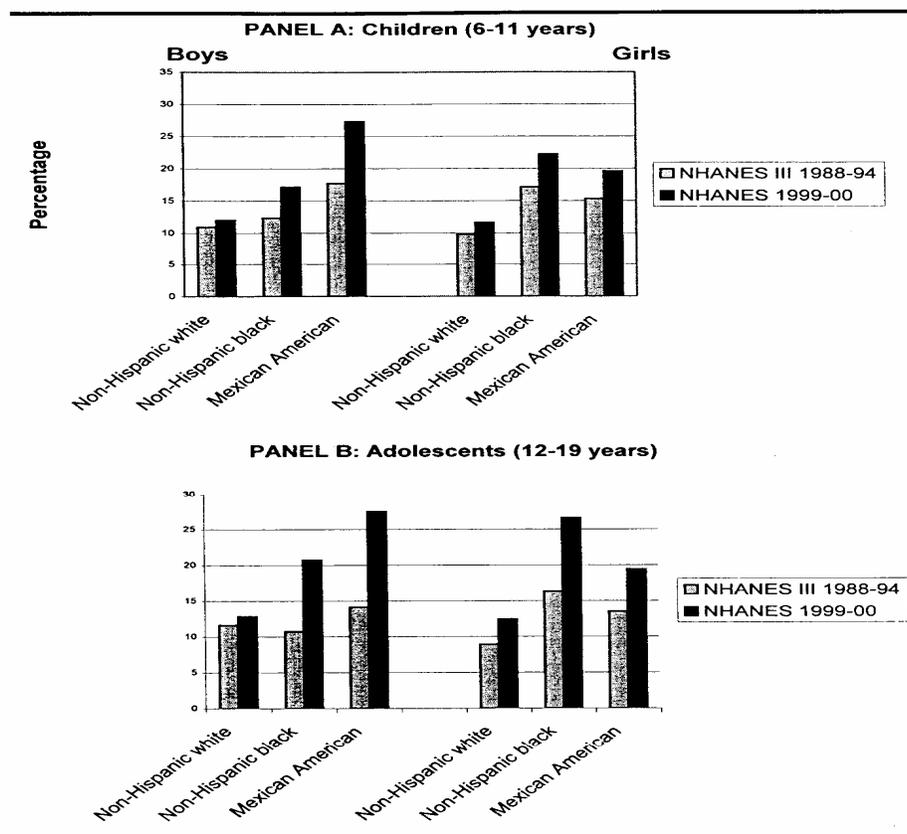


Fig 2. Overweight prevalence by race/ethnicity for children (6–11 years) and adolescents (12–19 years)

Source: Ogden CL, Flegal KM, Carroll MD, Johnson CL. Prevalence and Trends in Overweight Among US Children and Adolescents, 1999–2000. *JAMA*. Oct 9 2002; 288(14): 1728–32

years

Socioeconomic variations in overweight and obesity

Rates of overweight are highest for individuals of low SES. Socioeconomic status appears to play a role that is separate from the impact of ethnicity. In the early part of the 20th century higher rates of obesity were observed among high SES adults, particularly men and children. In the later part of the century, however, this trend reversed with higher rates associated with low SES adults and children (Sobal, 1989).

Obesity is more prevalent among those with less education and lower income; however patterns vary for women and men (Schoenborn et al, 2002). Men with incomes below the poverty line are slightly less likely than men in the highest income group to be overweight, although they are slightly more likely to be obese (21.7% versus 17.7%). Women in the “below poverty level” category are considerably more likely to be overweight than women earning the highest incomes, and are more than twice as likely to be obese (28.7% versus 13.7% for high income women).

In a study of young adults, ages 16-28 years, poverty and low parental education were associated with obesity in white and Hispanic women, but not in African American women or any men (Must, 1994).

Studies in children have also examined the relationship between SES and overweight with differences noted by racial and ethnic group. For White children rates of overweight are clearly highest among children in families at low socioeconomic levels as measured by household income and parental education (Gordon-Larsen, 2003). This pattern is not consistently seen for African-Americans nor for Hispanics (Crawford et al, 2001; Kimm et al, 2002; Patterson et al, 1997; Must 1994). The relationship between overweight and family income differs by ethnicity and differences are more pronounced for females (Gordon-Larsen 2003). Overweight prevalence decreases linearly with increased family income for white males; it is higher for Hispanic males at mid-to high incomes, while African-American males vary little by family income. Asian males have lower overweight prevalence at both low and high income extremes. There is greater variation for females with overweight prevalence declining with increased income in Whites, while for African-American girls, prevalence was lowest for mid-income families and highest among lowest and highest family income. Asian girls had lower overweight prevalence. Hispanic females had no decrease in overweight prevalence with increased SES girls.

Differences in response to socioeconomic factors by racial ethnic and gender specific groups suggest that increased SES levels do not confer the same benefits for each group.

Health and economic impacts of obesity

Obesity has become an increasingly important medical problem for children and adults alike.

Medical problems are associated with increases in the amount of body fat and secretions from the enlarged fat cells (Bray, 2004). Increases in body fat are associated with pulmonary complications, osteoarthritis and psychological consequences of obesity. Risks associated with fat cell secretions are risk of diabetes, cardiovascular disease, hypertension and some forms of cancer.

As body mass index increases, the likelihood of diseases and medical conditions increases particularly for adults:

- High blood pressure, hypertension
- High blood cholesterol, dyslipidemia
- Type 2 (non-insulin dependent) diabetes
- Insulin resistance, glucose intolerance
- Coronary heart disease
- Angina pectoris
- Congestive heart failure
- Stroke
- Gallstones
- Cholecystitis and cholelithiasis
- Gout
- Osteoarthritis
- Respiratory problems such as asthma and obstructive sleep apnea.
- Some types of cancer such as endometrial, breast, prostate, and colon
- Complications of pregnancy such as gestational diabetes, gestational hypertension and preeclampsia as well as complications in operative delivery (i.e., c-sections)
- Poor female reproductive health (such as menstrual irregularities, infertility, irregular ovulation)
- Bladder control problems such as stress incontinence
- Uric acid nephrolithiasis
- Psychological conditions such as depression, eating disorders, distorted body image, and low self-esteem

A number of these conditions are associated with pediatric overweight including type 2 diabetes mellitus, pulmonary complications (eg., asthma, sleep apnea), hypertension, dyslipidemia, early puberty, slipped capital femoral epiphysis (SCFE), and psychological problems such as depression.

Three of these conditions warrant particular concern:

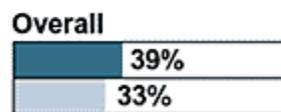
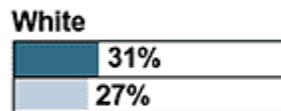
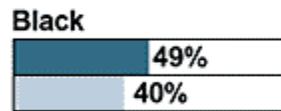
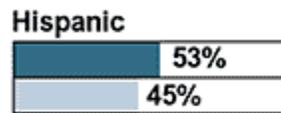
- *Hypertension:* The high prevalence of obesity is a contributing factor to the high prevalence of hypertension, especially for blacks who experience an earlier onset and more severe course of the condition. Once considered rare, hypertension in children has become increasingly common (Muntner, 2004). Overweight children as compared to non-overweight children are at three times the risk for hypertension (Sorof 2002).
- *Pulmonary complications:* Obesity is related to sleep disordered breathing as well as asthma. One study of urban minority youth found that regardless of gender or

age, obese youth were nearly three times more likely to be asthmatic as non-obese youth (Gennuso, 1998).

- *Diabetes:* Children and adolescents are now developing type 2 diabetes, known 20 years ago as an “adult disease.” Development of type 2 diabetes in childhood is associated with greater risks of adult diseases including heart disease, stroke, kidney disease, and blindness. It is predicted that 1 in 3 children born in the United States in the year 2000 (and one-half of the Hispanic children) will develop diabetes at some point in their lives. The risk of type 2 diabetes is particularly high for ethnic minorities, particularly Native American. Nearly half of the Pima people living within the United States are affected by type 2 diabetes. Members of the Pima tribe living in Mexico have lower rates of obesity and lower rates of diabetes.

Estimated lifetime risk of developing diabetes for children born in 2000

■ Girls ■ Boys



NOTE: Estimates were made using data from the annual National Health Interview Survey, which interviewed about 360,000 people between 1984 and 2000, the U.S. Census Bureau and a previous study on diabetes as cause of death.

SOURCE: Centers for Disease Control and Prevention **AP**

As a result of the obesity epidemic, much higher rates of serious disease in youth and adults is anticipated. This will be particularly true for ethnic minorities and low-income individuals, who have limited access to health care. The potential impact on the health care system, and on the national economy in general, will be devastating.

Economic consequences of the obesity epidemic

Overweight and obesity and their associated health problems have a significant economic impact on the U.S. health care system (USDHHS, 2001). Medical costs associated with overweight and obesity involve both direct and indirect costs. Direct medical costs may include preventive, diagnostic, and treatment services related to obesity, while indirect costs relate to morbidity and mortality costs (Wolf, 1998). Morbidity costs are defined as the value of income lost from decreased productivity, restricted activity, absenteeism, and bed days. Mortality costs are the value of future income lost by premature death (CDC, 2004).

National Cost of Obesity: According to a study of national costs attributed to both overweight and obesity, medical expenses accounted for 9.1 percent of total U.S. medical expenditures in 1998 and may have reached as high as \$78.5 billion (Finkelstein, 2003). Nearly half of these costs were paid by Medicaid (\$21.3 billion) and Medicare (\$17.7 billion). Persons with BMIs greater than 30 as compared to persons with BMI below 25 were reported to have increased costs for prescription drugs (105%), outpatient services (14%), inpatient services (38%) and overall medical care (36%) (Thompson, 2001).

Causes of the obesity epidemic

Although genetics play an important role in weight status, they alone do not explain the recent acceleration in the rise in obesity rates. Obesity is the result of the combined effects of genetics and the environment. To better understand the rising rates it is important to examine changes in the environment that may be associated changes in behaviors.

A changing food environment: Changes in our family life, daily activities, jobs and employment, and changes in our commutes all affect our patterns of eating. Increased portion sizes and energy density of our foods have contributed to the rising per capita calorie consumption documented over the last 20 years.

Convenience foods, high in fat, sugar, salt, and calories, are increasingly commonplace in our society. Annual increases in variety of food products are staggering; in 1995 alone, 16,900 new food and beverage products were introduced (Nestle, 2002). Larger proportions of supermarket shelves are devoted to prepackaged meals and convenience foods. Families spend less time cooking.

Frequent consumption of food from fast food restaurants has been associated with adiposity. Both adolescents and young adults are obtaining less of their energy intake at home and more at restaurants and fast food places (Nielsen, 2003). Children who eat at fast food establishments two or more times a week are more likely to increase their relative BMI than those who patronize fast food establishments once a week or less

(Thompson, 2004). Similarly, adults who more frequently eat restaurant food are more likely to have increased body fat (McCrary, 1999).

Increased consumption of snacks has occurred over the last 20 years (Zizza, 2001). Both children and adults are eating an extra half meal a day as a result of increased snacks (Jahns, 2001). Increased snacks are associated with higher calorie foods of lower nutritional value.

Increased sweetened beverage consumption is contributing to the rise in obesity levels (Mattes, 1996). Over the last 20 years, an increase of approximately 80 calories/per capita has resulted primarily from increased consumption of sweetened beverages. NHANES III data indicate that sweetened beverages have replaced milk as the primary beverage for many children, with African American and Hispanic teens consuming more than white teens. Positive associations with sweetened beverage consumption and overweight have been observed in ethnically diverse children (Nicklas, 2003). Further, declining calcium and dairy intake may put children at increased obesity risk (Zemel, 2000).

At the same time, *low consumption of fruits and vegetables* was found to be inversely associated with childhood overweight (Lin, 2002). Lower intakes of fruits and vegetable are consumed by persons of low SES (Wardle, 2003) and ethnic minorities (Brady 2000; Newark-Stainer, 1996). Both the cost of fruits and vegetables and the lack of availability in low income neighborhoods may contribute to lower intakes. Obesity promoting energy dense foods provide an inexpensive source of calories (Drewnowski, 2004). Conversely, health promoting fruits and vegetable are a costly way of obtaining calories. Thus persons of low income are more likely to select foods which provide the maximum calories for the least cost. These energy dense foods selected by necessity may be promoting obesity in our economically disadvantaged population.

A changing physical activity environment: Changes in how we live and work impact the number of calories we burn. Television, computers, the automobile, and labor saving devices of all kinds have all been implicated in our increasingly sedentary lifestyles. Additionally, reductions in physical education in schools as well as outdoor play, walking and biking have contributed to an inactive generation of children.

Physical activity is inversely associated with overweight regardless of gender and racial group (Gordon-Larsen 1999; Gordon-Larsen, 2002). In a study of ethnically diverse adolescents, insufficient vigorous physical activity was a significant risk factor for high BMI (Patrick, 2004). African American and Hispanic students are less likely to report exercise (YRBSS, 2001). Leisure time physical activity has been shown to decline in both black and white girls ages 9-19, but the decline for black girls is greater (Kimm, 2002). In recent years schools have reduced physical activity programs, often citing the need to cut non-academic programs due to budgetary constraints. Fitnessgram testing of students found fewer white children unfit (33.8%) as compared to Hispanic (44.5%) and Black children (46%) (CCPHA 2003).

Any of the above changes can result in small increases in caloric intake over time which can ultimately result in significant weight gain. An inadvertent increase of 50 kcal/day can result in a 5 pound gain in body weight per year.

Sedentary activity in the form of TV viewing, video games, and computers now dominates many children's leisure time. A direct association between TV viewing and increases in BMI may be a result of the combination of inactivity and low levels of physical activity (Berkey, 2000). Consistent associations between TV hours and overweight have been observed (Gordon-Larsen, 2002; Eisenmann, 2002). For each additional hour per day of TV/video watching a child's odds of being at risk for overweight increased. Children who had a TV in their bedroom were even more likely to be overweight (Dennison, 2002).

Ethnic differences are greater for sedentary than for moderate to vigorous physical activity. Data from ethnically diverse adolescents showed that, with the exception of Asian females, minority youth had consistently higher levels of sedentary activity (Gordon-Larsen, 1999). TV/video viewing times were higher among preschool aged Black and Hispanic versus white children and increased with the child's age.

The impact of television viewing may be more significant than videogame playing because it can reduce energy expenditure *and* increase energy intake. TV influences the type and amount of foods consumed by viewing children. A typical child watches about 40,000 commercials on TV each year, a number that has doubled during the years that have seen a large increase in the rate of pediatric overweight. Commercials increase children's desire and request for the highly advertised food products (Taras, 1989; Borzekowski, 2001). Fast foods, snack foods, and highly sugared foods are among the most heavily advertised items on children's television programs. Indeed, TV viewing in children has been related to a higher intake of fats, sweets, salty snacks, and fast food, and a lower intake of fruits and vegetables (McNutt, 1997; Boynton-Jarrett, 2003).

Solutions

A coordinated multi-level approach is needed to encourage changes in lifestyle that will prevent unhealthy weight gain, and slow the increase in the rate of obesity in the country.

Prevention: We must have a reorientation of the health care system in its approach to obesity. Prevention, rather than treatment, should be the focus. Weight loss is difficult and maintenance of weight loss is rare. Health care providers should take a proactive approach, tracking the BMI of their patients and explaining the risks of overweight. Providers and other community agencies who work with young women should encourage breastfeeding, which has been shown to be a protective measure against childhood overweight (Bergmann 2003).

Focus on early childhood: Prevention of overweight is a far more effective approach to the problem than is intervention and the most effective time for prevention is early in

childhood, preferably during the preschool years, before unhealthy habits have become established in the individual child. The WIC program is ideally suited to initiate obesity prevention efforts aimed at the young child. Child-care providers also have an important role to play in prevention of overweight.

Schools: Individual schools and school districts should be supported in their attempts to provide nutritious foods to their students and to discontinue sales of high fat, high sugar foods. School food programs can educate through example. Schools need adequate financial support so they are not dependent on corporate sponsorships that often encourage the consumption of sodas and other non-nutritious foods. Further, adequate funding must be made available for the incorporation of regular physical education within the students' class schedules.

Community and government agencies: Community, governmental, and social organizations, particularly those whose clientele includes low-income families and ethnic minorities, should play an active role in overweight prevention. Girls from food-insecure households who participated in the Food Stamp Program and the national school lunch and breakfast programs reduced their odds of being at risk for overweight by 68% when compared with food-insecure girls in nonparticipating households (Jones, 2003).

Governmental bodies that set broad policy goals and determine financial priorities can provide leadership in dealing with the issues of childhood obesity. The Surgeon General has recognized the seriousness of the problem; government at local, state, and national levels must play a role in funding solutions.

Research: More information is needed about effective prevention/intervention techniques and on how to help parents overcome environmental barriers to healthy lifestyles. More information is also needed on distinctive factors related to weight gain in different ethnic groups so that appropriate culturally sensitive approaches to the problem may be developed. To this end qualitative data from African American and Hispanic parents can provide ideas on how health professionals and others may better communicate healthy lifestyle advice (Crawford 2004).

Conclusion

Prevention of obesity is unlikely to succeed if we attempt to deal only with individuals without consideration of the environment in which they live. We must accept that the problem cannot be solved simply by an appeal to individual responsibility. We must work to change the economic and social environment to one that facilitates healthy life styles. Unfortunately, for the past twenty years or so we have been moving in the opposite direction toward an environment which does not promote healthy eating and physical activity choices. After all, we shall all pay the future social and economic costs of a sickly society.

Individuals of low SES have a greater risk of overweight than high SES. Different patterns of dietary intake have been demonstrated to result at least in part from cost factors and poor food access. The negative impact of an energy dense, nutrient poor diet appears, unfortunately, to be exacerbated by lower physical activity in the lives of many low SES individuals. Access to safe, convenient, well-lit places to exercise and to an open physical environment with all its resources is problematic for those who live in poor neighborhoods.

While race, ethnicity and SES explain some of the difference in lifestyle and behavioral choices, other broad environmental factors such as a medical system devoted to treatment of disease rather than prevention, school systems starved for adequate resources, and the enormous impact of advertising of energy dense foods all contribute to a society prone to obesity.

We are dealing with a serious epidemic and we are only just beginning to realize its implications for the future health of the U.S. population. We must immediately begin to undertake environmental changes that will stem the rise in overweight and obesity. For example, in the words of one expert, “Like any epidemic, we need to change the environment . . . If you have malaria, you drain the swamp. If you have death on the roads you impose seatbelts. Maybe we need to tax junk foods to get people to subsidize healthy foods.” (Ravussin, 2004).

A comprehensive, coordinated approach is needed that emphasizes prevention and the encouragement of healthy lifestyles for all. All children and the society at large will benefit from this approach. Prevention holds the greatest promise for reducing obesity and its inevitable complications.

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The Relationship Between Hunger and Obesity: What Do We Know and What Are the Implications For Public Policy
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Introduction

Overweight and obesity are prevalent and growing public health problems in the United States (US) today. In the 1999-2000 National Health and Nutrition Examination Survey (NHANES), the age-adjusted prevalence of obesity in adults was 30.5%, up from 22.9% in the 1988-1994 NHANES III (1). During this time period, the prevalence of overweight in adults increased from 55.9% to 64.5%. The 1999-2000 NHANES also determined the proportion of children who were overweight (defined as a body mass index [BMI] greater than the 95th percentile of the Centers for Disease Control and Prevention's growth standards.) The prevalence of overweight was 15.5% among 12-through 19-year-olds, 15.3% among 6- through 11-year-olds, and 10.4% among 2-through 5-year-olds (2). These prevalences can be compared to those from the NHANES III which were 10.5%, 11.3% and 7.2% respectively. In terms of the other topic included in the title of this paper, food insecurity, in 2002, 11.1% of US households were food insecure and 3.5% were food insecure with hunger (3). This is an increase of one full percentage point in the proportion of food insecure households since 1999.

The focus of this paper is the relationship between hunger/food insecurity and obesity. In addressing this topic, I have chosen to closely examine the research literature for women and children. I have done this, in part, because maternal and child nutrition is my area of expertise, but also because there is a research literature to review for these gender and age groups. I have also chosen to do this because of the clear and consistent differences in obesity rates by socioeconomic status in women as will be described in the following section.

Socioeconomic Status and Obesity in Women

In 1999 and 2000, 33.4% of adult women age 20 years and older were obese with a body mass index (BMI) of 30 or greater, according to the NHANES (1). Obesity varied dramatically by racial/ethnic group with non-Hispanic Whites showing a prevalence of 30.1%, non-Hispanic Blacks 49.7%, and Mexican Americans 39.7%. The prevalence of obesity among women ages 20 to 74 years increased from 25.9% in 1988-1994 to 34.0% in 1999-2000, representing a dramatic increase from 1976-1980 when the prevalence was 17.0%.

The racial/ethnic differences cited above very likely illustrate the well-known differences in obesity across socioeconomic strata. Sobal and Stunkard's (4) review of 144 published studies shows a strong inverse association of socioeconomic status (SES) and obesity in women and an inconsistent relationship in men and children. Using self-reported weights from the 2000 Behavioral Risk Factor Surveillance Survey (BRFSS), Mokad et al. (5) found nearly a two-fold difference in the prevalence of obesity by educational level. Twenty-six percent of adults with less than a high school education were obese compared to 15% of those with a college degree or higher education. These same data showed a three-fold difference in extreme

obesity between white women with less than a high school education and those with four or more years of college (6).

Educational level is the component of SES that has been used most frequently in the US in studying the SES and obesity relationship. Investigators such as Wardle, Waller and Jarvis (7) have pointed out that this is a shortcoming because different components of SES such as income or occupation may relate to obesity differently by gender.

Ettner and Grzywacz (8) outline the five major explanations for how SES leads to poor health status including obesity. These are selection effects, differences in life-style, differential exposure to life stresses, differences in psychosocial resources, and differences in access to and poorer quality health care resources. Using the 1998-2000 California Work and Health Survey, these investigators used indicator variables for each of the major explanations to determine the proportion of the educational gradient in obesity that could be explained. They state, “. . . virtually none of the educational gradient for obesity . . . could be explained by a variety of mediating factors representing the domains of social relationships, health behaviors, financial strain, and health care access.” While this recent finding is not unique (9), it is also true that investigators in Britain, Australia, and New Zealand to name a few countries where large, longitudinal data sets are available, have been able to explain a portion of the variance in differences in weight gain by SES (10). But in summary, relatively little is known about why low income women in the US are more likely to be obese. Food insecurity may be a possible explanation, since research demonstrates higher prevalences of overweight and obesity among food insecure compared to food secure women (11-16).

Relationship between Food Insecurity and Obesity in Women

In a 1993 random sample survey in a county in Upstate New York, Olson and colleagues (11, 14) showed body mass index (BMI) was significantly higher ($p < 0.05$) for women in food insecure households compared to women in food secure households (28.2 vs. 25.6). In addition, 37% of the women in the households with the least severe level of food insecurity had BMIs greater than 29 compared to 26% of women in food secure households. Controlling for the woman's height, income level, educational level, single parent status, and employment status, food insecurity was still positively related to BMI with a p-value of 0.06. Women in households where hunger was present did not differ on BMI or obesity from women in food secure households, indicating a curvilinear relationship between the severity of food insecurity and BMI.

Townsend et al. (12) replicated this finding in women, but not men, using nationally representative data from the 1994-1996 Continuing Survey of Food Intake of Individuals (CSFII). The prevalence of overweight (BMI > 27.3) increased as food insecurity became more severe, from 34% for those who were food secure, to 41% for those who were mildly food insecure, and 52% for those who were moderately food insecure. Food insecurity remained a significant predictor of overweight after adjusting for potentially confounding demographic and life-style factors.

Adams, Grummer-Strawn and Chavez (13) used data from the 1998 and 1999 California Women's Health Survey ($n = 8169$) to investigate the relationship between food insecurity and obesity in an adult, multi-ethnic sample of women. Multiple logistic

regression analysis was used to examine the relationship between food insecurity and obesity controlling for income, race/ethnicity, education, country of birth, general health status and walking. Food insecurity without hunger was associated with increased prevalence of obesity in non-Hispanic white women [odds ratio (OR) = 1.36] and others (OR = 1.47). Food insecurity with hunger was associated with increased risk of obesity for Asians, Blacks and Hispanics (OR = 2.81) but not for non-Hispanic white women (OR = 0.82).

Basiotis (15) selected women ages 19 to 55 who did not live alone from the NHANES III and compared the proportion of women who were overweight (BMI \geq 25) and obese (BMI \geq 30) between food sufficient and food insufficient households. He found the prevalence of overweight was significantly higher in women from food insufficient households than in food sufficient households (58% vs. 47%). There were no differences in the proportion of women who were obese or in the mean BMI between food sufficient and food insufficient households.

Two groups have used information from the Behavioral risk Factor Surveillance System (BRFSS) to study the association between food insecurity and obesity. This survey relies on self-reported height and weight to determine obesity and uses one question to assess concern about food security. This question is, "In the past 30 days have you been concerned about having enough food for you or your family?" Those who answer "yes" are considered concerned about food security. VanEenwyk (16) used data from 1995-1999 for Washington State. He found adults (not just women) who reported concern about food security were more likely to be obese (BMI \geq 30) than those who did not report such concerns (adjusted odds ratio = 1.29; 95% confidence interval = 1.04-1.83).

Laraia and colleagues (17) used 1999 BRFSS data for adults in the states of New York and Louisiana. In the unadjusted analyses they found an association between concern about enough food and morbid obesity (BMI \geq 35). The odds ratio was 2.20 (95% CI = 1.24, 3.90) for Louisiana and 2.23 (95% CI = 1.30, 3.84) for New York State. But the associations became non-significant after controlling for education, income, race/ethnicity, marital status, and general health.

A recent study of 561 low income, recent immigrant Latina mothers of preschool children in California also found an association between food insecurity with hunger and obesity (18). Nearly 51% of the food insecure with hunger mothers were obese with BMIs \geq 30 compared to 33.3% of mothers who were food secure ($p < 0.05$).

These studies found a significant association between food insecurity and increased risk of overweight or obesity. However, all are cross-sectional studies with data for the two major constructs collected at the same point in time. Thus all are constrained in specifying the direction of causality between the two constructs. Longitudinal data could inform the direction of the causality by facilitating analysis that considers the temporal sequence (occurrence in time) of the two constructs. (In order for A to be considered a potential cause of B, A must occur before B.)

Our recent study, “The Food Insecurity-Obesity Paradox in Women,” examined the temporal sequence of the relationship between food insecurity and obesity in a sample of 436 healthy, adult women from rural Upstate New York who were followed from early pregnancy until two years postpartum (19). This is a time in women’s lives when many experience major weight gain. Food insecurity at the beginning of pregnancy was positively associated with major weight retention at two years postpartum only in initially obese women ($p = 0.007$). Initial obesity was also associated with increased risk of becoming food insecure ($p < 0.05$). Cross-lagged panel analysis indicated the causal priority should be given to the latter pathway. In other words, it appeared from these analyses that food insecurity was more likely to cause obesity than vice-versa and that food insecurity was associated with major weight gain only in the obese women. These findings hint that both obesity and food insecurity might be caused by a third, or common, factor. Some ideas about what this third factor might be will be discussed later in the paper.

Potential Mechanisms for the Association between Food Insecurity and Obesity

In the 1993 study, Kendall, Olson and Frongillo (20) found a positive linear association between the severity of food insecurity and a binge-like pattern of eating. Radimer’s (21) early qualitative research on food insecurity in families documented that mothers go without food, particularly at times when food and money for food are limited, to insure that their children have something to eat. The eating pattern literature supports the idea that food deprivation could result in overeating when adequate food becomes available. Food restriction and deprivation, whether voluntary or involuntary, results in a variety of cognitive, emotional and behavioral changes such as preoccupation with food and eating that could lead to obesity (22).

At the 2002 Consumer Federation of America Food Policy Conference, Basiotis (23) presented an analysis dietary quality in food sufficient and food insufficient 20 to 39 year old women who did not live alone and were included in the CSFII, 1994-96 or NHANES III. He found no difference in the teaspoons of added sugar consumed between the two groups. He also found no differences in grams of discretionary fat or Healthy Eating Index total fat score. Likewise Townsend (12) found food insecurity was not associated with the percent of energy from fat or saturated fat. In both the CSFII and NHANES III, food insufficient women consistently consumed fewer servings of fruits, vegetables and milk. Kendall, Olson and Frongillo (20) have similar findings related to decreased fruit and vegetable consumption among the food insecure. These findings do not support the idea that food insecure women become overweight because they consume more empty-calorie, high fat and high sugar foods than food secure women. But the findings do support a role for fruit and vegetable consumption as a potential mediator of the relationship between food insecurity and obesity in women. Drewnowski and Specter (24) have pointed out that energy-dense foods composed of refined grains, added sugars and fats cost less per calorie than do fruits and vegetables. They posit this as an explanation for the association between poverty, including food insecurity, and obesity.

Socioeconomic Status and Overweight in Children

Generally speaking the pattern of differences across racial and ethnic groups described for women, is also seen in children with Mexican American and non-Hispanic Black children having higher rates of overweight than non-Hispanic White children (25, 26). Sobal and Stunkard (4) did not find a consistent relationship between socioeconomic status and obesity in children. More recent research by Alaimo, Olson and Frongillo (25) found no statistically significant differences in overweight by income group for any of the race-ethnic groups of children age 2 to 16 years in the NHANES III. Haas and colleagues (26) found no differences in overweight among 6 to 11-year olds by insurance status as the indicator of socioeconomic status (private insurance, public insurance, and uninsured). However, among adolescents aged 12 to 17 years, she found significant differences in the proportion who were overweight by insurance status: uninsured = 18.6%, public insurance = 15.0%, and private insurance = 9.2%.

Food Insecurity and Overweight in Children

A potential relationship of hunger and food insecurity to obesity in childhood was first highlighted by Dietz (27). He described an obese 7-year-old African American girl whose family fed her high fat foods at the end of the month when the money for food was running out. This original case study has been followed by several large studies that examined the relationship between a child's food security status and overweight. Casey and colleagues (28) found no differences in the proportion of children who were at risk of overweight (BMI > 86th percentile) by food insufficiency status among low income children 0 to 17 years participating in the 1994 to 1996 CSFII. Forty-seven percent in each group were at risk of overweight.

Kaiser et al. (29) studied 211 Mexican preschoolers age 3 to 6 years and although the percent overweight (48%, N = 19) and weight-for-height Z-score was slightly higher among the food insecure group, the differences were small and statistically insignificant. At least three additional studies with groups of Latino children in California and Connecticut have been conducted. They find no evidence to support an association between hunger/food insecurity and overweight in children (18, 30-31). Likewise a large study of children younger than five years in a large Midwestern city found not relationship between hunger and mean weight-for-height percentile (32).

Alaimo et al. (25), using NHANES III data, also found no increased risk of overweight among children from food insufficient households. The possible exception to the general finding was among non-Hispanic older girls where there was an indication in that food insecurity was positively associated with overweight ($p < 0.10$). In summary, food insecurity and hunger are not related to overweight in US children in the research that has been done to date to address the issue.

Life Course Perspective on Food Insecurity and Obesity

The findings in women suggest that there may be a third factor that contributes to both the risk of obesity and food insecurity in adulthood, particularly for women. This suspected factor is socioeconomic disadvantage in childhood. Two recent studies, one from New Zealand (33) and the other from Britain (34), have found socioeconomic disadvantage in early life (childhood) to be positively associated with increased risk of obesity in young adulthood. These studies support the earlier finding of Lissau and Sørensen (35) that 9-10 year old children in Copenhagen rated as dirty and neglected by school personnel were 9.8 times more likely to be obese 10 years later compared to children rated as average. Neglected children were not more likely to be obese in childhood, a finding consistent with the US research on children.

To understand the relationship between food insecurity and the development of obesity, we need studies that include some indicator of food insecurity in childhood and obesity in adulthood. A recent study of a nationally representative sample of adults aged 25 to 64 years from Finland provides some insights (36). Long-term economic problems in childhood, unemployment in the last 5 years, and current low household income were each independently and significantly associated with indicators of food insecurity and hunger in adults. Given the contemporary association of low income with hunger, it is probably safe to assume that economic problems in childhood also included the experience of food insecurity in childhood. Current obesity was associated with food insecurity, but current hunger was associated with thinness. These findings suggest that poverty-associated hunger and food insecurity in early life may be part of the explanation of the association between early SES disadvantage and adult obesity. The mechanisms for this relationship are a matter of speculation.

Implications for Policy and Programs

- The psychological, emotional and behavioral (including eating behaviors) responses to poverty and related food deprivation in early life are likely important components of the obesity epidemic and the economic and racial/ethnic disparities in obesity in the US.
- If some portion of the adult obesity problem is tied to deprivation in early childhood, adult obesity will remain a problem until the US deals with its high and increasing rates of childhood poverty.
- Discrimination against obese women may be contributing to the ever growing obesity epidemic. The research to date has examined the association between food insecurity and obesity. Given the evidence showing bias and discrimination against obese women in access to education, labor force participation, and in wages (37) and the suggestion from our recent work of obesity leading to food insecurity, measures must be taken to protect obese women from discrimination. Denying food assistance to obese persons is unethical and unacceptable social policy.
- Secondary prevention approaches to obesity are needed. All health, nutrition, and food assistance programs working with poor and minority adult women need to recognize that the majority of women in the target audience are overweight or obese and nearly half may be currently or were at some time food insecure. Thus these programs can no longer justify an exclusive primary prevention approach to weight issues. A secondary prevention approach, one that aims to reverse weight problems, is needed. Concurrently the interventions must recognize the lack of household food resources. This will not be easy and will take creativity.

- We can't give up on programming for mothers in favor of primary prevention programs with children. Maternal obesity is one of the strongest predictors of obesity in children. Intervention programs need to be designed to address mothers and families as well as children.

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Research Needs to Better Understand the Relationship Between Hunger and Obesity and to Develop Sensitive and Effective Policy Solutions.
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What do we know about the relationship between hunger and obesity today?

Box 1. Definitions of Key Terms

Hunger: The uneasy or painful sensation caused by lack of food. The recurrent and involuntary lack of access to food.

Food Insecurity: limited or uncertain availability of nutritionally adequate and safe foods or uncertain ability to acquire acceptable foods in socially acceptable ways

BMI: Body Mass Index, kg/m^2 , tool for determining the weight status of adults

Obesity: BMI of 30 or above

Overweight: BMI of 25 to 29.9 in adults or BMI for age, gender at or above the 95th percentile for children

At Risk of Overweight: BMI between the 85th and 94th percentile in children

A number of studies have been published in peer-reviewed scientific journals in the past 10 years that describe a relationship between hunger and obesity (see Table 1). From these studies a few themes are consistent. Hunger, or more precisely, household food insecurity (Box 1), is related to overweight in adult women and sometimes children and men. What has not emerged from these studies with any certainty is whether household food insecurity causes excess weight gain that would lead to obesity. We also do not know why household food security might be related to obesity from these studies. The purpose of this paper is to discuss the conceptual frameworks, types of data and analytical strategies needed to understand what the relationship between hunger and obesity is. Second, this paper will consider the current policy solutions for hunger and

obesity and how they might be more sensitive and effective were the relationship between poverty and hunger clearer.

Limitations of the conceptual frameworks used to study the relationship between hunger and obesity

The current studies of hunger and obesity have been done using surveys collected on individuals or households once (i.e, cross-sectional data). Cross-sectional data are useful for determining the frequency that a problem such as hunger occurs in a group of people or the sample. Cross-sectional data also can help uncover relationships such as the relationship between hunger and obesity when both are measured in the survey. However, results from studies using cross-sectional data need to be interpreted carefully. Because the data are only collected once, we cannot establish whether one measured item (e.g., hunger) led to another (e.g., obesity). If the relationship found between hunger and obesity were very strong (e.g. an odds ratio of higher than 2.5), if increasing severity of food insecurity increased the odds of obesity, and if the results could not be explained through an alternative approach (e.g., poverty) and there were a plausible

pathway for one to cause the other, then results might be interpreted as one led to the other. In the case of the studies of food insecurity and obesity in Table 1, the results are not strong enough to suggest that food insecurity led to obesity conclusively. However, the results for women do appear to be consistent across studies, with about a 30% increased risk of

Table 1.

Authors	Data	Population	Relationship between Hunger and Obesity
Adults			
Adams, Gummer-Strawn, Chavez	California Women's Health Survey	California women	1.36 increased odds of obesity among food insecure White women; 1.47 increased odds of obesity among food insecure minority women
Basiotis, Lino	NHANES III	US population	58% of food insecure people overweight v. 47% of food secure people overweight
Laraia, Siega-Riz, Evanson	BRFSS	New York and Louisiana	2.1 increased odds of concern about adequate food among the morbidly obese
Olson	Community survey	193 women in upstate New York	Moderately food insecure women had higher BMI than food secure or severely food insecure women
Townsend, Peterson, Achterberg, Murphy	CSFII	US women	1.3 increased odds of being overweight if food insecure controlling for income, program participation and other variables
VanEenwyk, Sabel	BRFSS	Washington state	1.3 increased odds of obesity among people in food insecure households
Children			
Alaimo, Olson, Frongillo	NHANES III	US population	Higher prevalence of at risk of and overweight among 8 to 16 year old White girls in food insufficient low income households
Bhattacharya, Currie		US population	Household food insecurity not associated with weight status in any age group
Casey, Szeto	CSFII	US population	Higher prevalence of at risk of and overweight among children from low-income, food insecure households

Jimenez-Cruz	Community sample	Mexican-Indian children in Tijuana	The prevalence of hunger was 5 to 6% higher among 10 to 12 year old children that were at risk of or overweight
Jones, Jahns, Laraia, Haughton	PSID	US population	The prevalence of at risk of and overweight was lower among food insecure low-income, school-aged children than food secure

overweight among women in food insecure households. A dose-response relationship does not appear in these studies. In other words, there was not increasing odds of obesity as severity of food insecurity increased. Two studies have provided some evidence that, if food is severe, the risk of obesity is actually lower. The available data do not allow for the analysis of other dose-response relationships, such as the number of episodes of food insecurity and obesity risk. Several authors and policy analysts have suggested that there is a plausible pathway. The plausible pathway forms the basis of a conceptual framework that guides the study design and analysis. Each of the hypothesized mechanisms that underlie existing analysis of the relationship between hunger and obesity are described and discussed below.

The first mechanism can be summed as follows: hunger and obesity are opposite extremes of food consumption. If obesity exists, it is illogical to presume that hunger could also exist in the same individual. Associations between obesity and hunger are evidence that hunger does not exist, according to this perspective. Existing cross-sectional associations between hunger and obesity have interpreted in this way by Besharov in his testimony to Congress. To adequately test the hypothesis implied by this perspective, that hunger and obesity cannot simultaneously exist, a more explicit definition of hunger is needed. Does hunger mean only famine or starvation? Can hunger be episodic? Can hungry people eat some foods and still be considered hungry?

A second conceptualization proposes that hunger is an experience of material hardship that leads to the purchase and consumption of low-cost, energy dense foods (Drewnowski 2004). The consumption of low-cost energy dense foods leads to excess weight gain and obesity. Associations between hunger and obesity are evidence of the reliance of food insecure households on low-cost, energy dense foods. There are some recent studies of diet that support this conceptualization of the relationship between hunger and obesity. Bowman and Harris (2003) have found that female-headed food-insecure households with children consume more calories, watch more TV and spend less money on groceries food secure households. Tarasuk (2001) has reported that women who are food insecure eat less meat, vegetables, and fruit. Moreover, the study shows a trend toward consuming fewer servings of grains and dairy products while there is an increase in consumption of high energy “other foods.” Additionally, NHANES III data on women living in Southern states indicate that food insecure women reported consuming 2.64% more kilocalories from carbohydrates and 2% fewer grams of dietary fiber than food secure women (Connell, Yadrick, et. al. 2000). While these studies lend some favor to this pathway from hunger to obesity, no studies to date have explicitly

measured and examined both the cost and energy density of foods that food secure and food insecure obese and normal weight people purchase and consume.

A third mechanism suggests that hunger is cyclical because households are more likely to have resources to obtain food at certain times of the month. For instance, households that receive food stamps may run out of food stamps before the end of the month leading to leaner food consumption patterns (hunger) for a week or two. When the food stamps arrive, there may be above average consumption for a short period of time. The hypothesized cyclical nature of hunger would lead to cyclical overeating and fasting which in turn could lead to weight cycling. There has been one study that examined the cyclical patterns of food insecurity over the month, and it supported the hypothesis that there is more food available in the first 3 weeks of the month than the last in food insecure households (MacIntyre, Glanville, et. al., 2003). To support this conceptual framework, studies are needed that establish that cyclical patterns of food insecurity are associated with food consumption patterns that lead to excess weight gain without compensatory weight loss.

A fourth hypothesized mechanism could be described as a third factor perspective. In this framework, both hunger and obesity are social problems that result from poverty. Food insecurity is best described as the social, economic and personal experience of food shortages. Hamelin and Habicht (1999) describe the changes in family dynamics and resource allocation in the face of food insecurity. Travers (1997) describes the many coping strategies that food insecure women develop to provide their families with food, such as memorizing the lowest prices for commonly purchased foods at a wide variety of stores, and only purchasing those items at the lowest price available. Obesity in this perspective is not only a health problem but also a social and economic problem with similar stigma to the problem of hunger. Most studies of the relationship between hunger and obesity control for socioeconomic status using a measure of household income or education, but this measure may not adequately capture the experience of social and economic stigmatization implied by this perspective.

Finally, a fifth mechanism would describe food insecurity as a stressor that results in a stress response. The experience of stress may induce a variety of responses, including disordered eating, reduced participation in physical activity, depression, substance abuse, all of which may related to weight gain. This mechanism would be supported by the literature that suggests that depression is associated with food insecurity (Ensel, Peek, et. al. 1996).

At a minimum, future research needs to articulate its underlying conceptual framework. If testing hypotheses based on one the conceptual frameworks described here then the conceptual framework should include a specific description of the measure of hunger. Is it a household or individual measure? Are there ways to capture the cyclical or episodic nature of hunger in the measure used? Is the experience of social and economic stigma related to hunger assessed? Further, a clear pathway between the experience hunger, changes in food purchase and consumption and weight gain need to be described. Finally, conceptual frameworks guiding research on the relationship between hunger and obesity need to be specific about what their position on the role of poverty is. Is

poverty material hardship that leads to inadequate food resources? Is it a social experience that creates problems that manifest themselves as hunger and obesity and other socially unacceptable phenomena?

Limitations of the study designs and analytical approaches of research on the relationship between hunger and obesity

Conceptual frameworks, when articulated prior to conducting a study, guide the research questions asked and the way data are collected and analyzed. To answer the question, “Does hunger cause obesity?” requires one type of study and analysis, and to answer the question, “Are hunger and obesity both caused by poverty?” requires another. Establishing causality is important because the policy solutions, to be most effective, should address the underlying issues rather than the symptoms. As discussed above, the type of data used by most studies to date have been cross-sectional survey data. The most reliable study design for determining whether hunger causes obesity would be an experiment in which otherwise normal, healthy people are randomly assigned to experience hunger and others are randomly assigned to not experience hunger. The people in both groups would be followed and the incidence of each new case of obesity would be tallied to determine which group has the highest risk of becoming obese. Obviously, this type of study cannot be conducted for ethical reasons.

The next most reliable source of data for establishing causality is longitudinal (Frongillo and Rowe 1999). Longitudinal data are data collected repeatedly on the same individuals over a period time. With longitudinal data, the timing of the relationship between hunger and obesity can be established. In other words, longitudinal data can answer the question, “Are people who are hungry at greater risk of becoming obese over time?” Longitudinal data would also allow for an evaluation of a dose-response relationship between the persistence of food insecurity over time and obesity risk. Longitudinal data, at a minimum needs to include repeated measures of hunger, such as the USDA Household Food Security Survey, repeated measurements of height and weight and any other data that would be needed to confirm the proposed pathway in the conceptual framework.

The analytical approaches needed to determine the nature of the relationship among hunger and obesity need to be consistent with the underlying conceptual framework. The most important analytical limitations of current studies involve the modeling of poverty and program participation. In the case of poverty, a few different approaches were used in the existing literature. First, only households in poverty were included in the analysis. The current measurement of poverty in the US is a comparison of the household’s total income to estimated household costs to purchase a Thrifty Food Plan plus a set amount for other essential costs, such as housing, adjusting for household size and the number of children. An income below the poverty line means that the household cannot afford, in theory, the basic foods at the lowest available costs to meet their nutritional needs. Most of the studies that have examined hunger and obesity use the poverty thresholds to either select a sample of only households in poverty or to control for poverty in multivariate models. Selecting multiple measures of material hardship or conceptualizing poverty as a social and economic experience would help to determine

the extent to which food-related material hardship is distinct from the other effects of poverty.

The second important analytical limitation of studies on hunger and obesity is the consideration of the role of food assistance participation. Food assistance programs are the safety net of programs designed to alleviate household food insecurity. There are a wide variety of reasons that people who are eligible for these programs choose to participate. The propensity to participate in the program is a source of bias not accounted in most studies of hunger and obesity that include program participation. If the propensity to participate is not associated with either hunger or obesity, then not including it would not be a limitation. However, it is reasonable to assume that the severity of food insecurity is one of the factors that strongly influence the decision to participate in a food assistance program. A second concern with the modeling of food assistance participation is the lack of testing for mediating and modifying effects in most studies. It is plausible that food assistance participation changes the effect of food insecurity on obesity. Conceptualizing food assistance programs as interventions that may reduce the negative consequences of hunger and modeling them as such would provide a framework for the consideration of other policies designed to prevent or hunger or obesity.

Research Needs to Develop Effective and Sensitive Policy Solutions to Hunger and Obesity

Due to the limited knowledge of the relationship between hunger and obesity, the development of effective and sensitive policy solutions will need to be guided by future research that clarifies the nature of this relationship. Each of the conceptual frameworks described above, if supported by future research would indicate a distinct policy direction. In this section, the hypothetical implications of research that supports each conceptual framework will be discussed.

Hypothesis 1. Hunger and obesity cannot coexist

If support for this understanding of the relationship between food insecurity and obesity were to emerge from future studies, then the policy solutions would need to focus on the prevention of obesity alone. Further, the distribution of food assistance would be seen as counter-productive, as it increased the calories available to people who are already over-consuming food.

Hypothesis 2. Hunger leads to the purchase and consumption of low-cost, energy dense foods that, in turn, cause weight gain

If support for this understanding of the relationship between hunger and obesity were to emerge, the policy solutions would be multifaceted. First, food assistance programs could require that foods purchased meet minimal nutritional standards in terms of calories, fat and fiber content. This solution would require an increase in funding needed to purchase foods of higher cost and improved nutritional quality. Another alternative

policy solution would be to include activity promotion in food assistance programs to counterbalance the effects of energy-dense food consumption.

Hypothesis 3 Hunger is cyclical and leads to weight gain because of the cyclical food consumption

Were there support for this policy approach, programs that delivery programs on a monthly basis could consider the distribution of benefits in smaller amounts over shorter periods of time. However, the more effective solution would be to provide more benefits to households in an effort to alleviate food insecurity for all the four weeks of the month. If the cyclical nature of hunger is due to monthly household expenses, such as a mortgage or utility bill, budget counseling, financial planning and increased benefits might all help to alleviate the cyclical hunger.

Hypothesis 4 Hunger and obesity are symptoms of the social and economic experience of poverty

Were there support in future research for this conceptual framework, the policy solutions to hunger and obesity would be to focus resources on the direct alleviation of poverty at the household and community level. For instance, income transfers could be increased to alleviate material hardship and community development programs could change the social experience of poverty by promoting mixed-income, mixed-zoned neighborhoods.

Hypothesis 5 Hunger is a stressor that leads to weight related stress responses

Were there support for this hypothesis, the policy interventions could focus on two areas, the alleviation of food insecurity (i.e., food assistance) and the alleviation of stress through publicly funded mental health services.

Summary

To better understand the relation between hunger and obesity, research that tests the accuracy of different conceptualization is needed. Such research could guide the direction of future policy. Policy solutions will vary depending on how we perceive the relationship between hunger and poverty.

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Environmental Barriers and Solutions to Gaining Access to the Essentials of Nutritional Health in Low-Income Communities

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Introduction

Over the past two decades the nutritional health of the US population has changed drastically. Marked changes in dietary practices accompanied by decreases in physical activity have played a major role in this shift,^{i ii} resulting in skyrocketing rates of overweight and obesity among both adults and children. Currently, nearly two out of three adults are now classified as obese or overweight, as are more than one in seven youths (ages 6 to 17).ⁱⁱⁱ

Obesity is linked to 300,000 premature deaths each year and is associated with increased health risks including type 2 diabetes, heart disease, osteoarthritis, asthma, cancer, high blood cholesterol, and increased surgical risk.^{iv} Low physical activity levels and poor eating patterns have resulted in children experiencing increasing rates of diseases that have traditionally been thought of as adult medical conditions, such as type 2 diabetes.

Although rates of poor nutrition, physical inactivity and diabetes are increasing among all adults and children, disparities in these rates are related to ethnic background and socio-economic status. Among women, higher obesity rates are associated with lower incomes.^{v vi} Minority groups (except for certain groups of Asians) have sharply higher obesity rates than U.S. whites.^{vii} African-American women are nearly twice as likely as white women to be obese, and one quarter of all Hispanic women are obese.^{viii} A number of environmental and social factors are responsible for these differences.

Traditional medical models and individual behavioral change strategies have demonstrated a limited impact on slowing these increasing population rates of overweight and obesity. Models that rely on environmental change may have greater potential to affect these rates – these models attempt to change the conditions or environments where individuals live and work by offering increased access to affordable healthy foods and opportunities for physical activity. In addition, and more importantly, environmental changes may have the potential to *prevent* individuals from becoming overweight or obese by providing them with healthy nutrition and physical environments at a young age.

Background:

The scientific literature suggests that the high prevalence of overweight and obesity in the United States is caused by numerous individual, social, and environmental factors. Studies have linked the epidemic to conditions including, but not limited to, a host of factors: increasingly high consumption of soft drinks and food high in fat and sugar; larger portion sizes in fast food chains and restaurants; availability of fast food, soda, and

junk food on school campuses;^{ix, x} limited access to healthy and affordable foods in low-income communities;^{xi} aggressive marketing of junk food to children and their families; limited compliance with physical education requirements in many schools; and inadequate physical activity infrastructures in schools and communities.^{xii}

While no single factor is the primary cause of changes in nutritional health and the resulting rates of population overweight and obesity, it is the constellation of these factors that have perpetuated the rise in rates of obesity and diabetes.

Environmental Factors Influencing Nutritional Health:

Significant disparities of race, ethnicity, and income are linked not just to nutrition and physical activity directly, but also to the environmental conditions in which people live. Environmental conditions affect an individual's health directly and also influence attitudes and behaviors.

These conditions largely shape people's capacity to maintain a healthy diet and a lifestyle that includes regular physical activity.

- Physical environment: Low-wealth neighborhoods and neighborhoods of color often have inadequate access to health-promoting goods, services, and infrastructure, including affordable and nutritious food, and parks and other safe places to play and exercise. Many low-income neighborhoods are home to an excessive number of outlets for unhealthy foods, such as fast food, while concurrently lacking access to supermarkets, produce markets and other retailers of healthy food options. These neighborhoods also lack safe spaces for physical activity. High rates of neighborhood crime and violence limit the ability to play safely and be physically active outdoors in many low-income communities.
- Social environment: Communities lack individual and community support for prevention and management behaviors. A number of studies have identified a positive association between enhanced social support and prevention/care measures, such as diet and physical activity.^{xiii}
- Access to health care: Many lower income whites, African-Americans, Latinos, Native Americans, Asian Americans and Pacific Islanders experience a lack of access to both health care providers and diabetes management programs. Inadequate access to appropriate health care is an issue that is often cited as a cause of poor health outcomes for diabetics as well as a cause of disparities in health among different diabetic populations.
- Quality of available health care: Culturally and linguistically appropriate care, respectful treatment of patients by health care providers, and sufficient appointment time to address needs and concerns improve health outcomes, but are often lacking in health care settings.

Socioeconomic status impacts a number of these factors resulting in the disproportionate effects of obesity and diabetes on low-income and ethnic specific populations. Low-income families may face the additional fiscal and emotional pressures of low-wage work, inadequate and long-distance transportation^{xiv}, poor housing and neighborhood violence, which increase their susceptibility to environmental influences that are associated with obesity: ubiquitous and cheap junk food, media bombardment, sedentary habits, and confusing nutrition messages.

Environment and Nutrition:

Local Stores and Supermarkets

Among the poorest and most remote populations in the US, there is very little access to healthy food and food choices are often limited to small neighborhood liquor stores or fast food outlets. Access to food increases as population density and community resources increase; however, healthy food options are disproportionately concentrated in medium and higher income areas.^{xv} The lack of full service supermarkets and grocery stores in low income neighborhoods has been well documented^{xvi} and in recent decades supermarket chains have been reluctant to locate in poor neighborhoods that are perceived to be less profitable.^{xvii} Grocery stores in low income African-American neighborhoods are less likely than those elsewhere to sell healthful items such as fruits, vegetables, non-and low-fat milk and low-fat snacks.^{xviii} Meanwhile, access to high-fat, high-calorie foods is easy at the large number of fast food restaurants, liquor stores, and convenience stores that are more common in lower-income neighborhoods.^{xix} In contrast, many rural areas offer virtually no stores or restaurants, and residents (for example, migrant workers) often lack transportation to shop in nearby towns.^{xx} The price of healthy foods is also a factor for many low income families – healthier foods are often significantly more expensive than a diet high in sugar, fat, and refined grains^{xxi} and despite access to healthy foods, many low income families cannot afford to purchase them.

Food and Beverage Marketing and Advertising

Marketing and advertising play a significant role in setting norms and encouraging behaviors, especially for children. Unfortunately, foods marketed to children—from highly sweetened cereals to cookies, candy, fast foods, and soda—are predominantly high in calories, sugar, and fat. Food marketers are interested in children and adolescents as consumers because children spend billions of their own dollars annually, influence how billions more are spent through household food purchases, and are future adult consumers among whom they hope to develop early brand loyalty.^{xxii xxiii}

Though currently no data link food and beverage marketing to obesity among low-income children of color, we do know that obesity affects Latino and African-American youth disproportionately to their white peers and that food marketers disproportionately target these population groups. For many low-income youth, there is little time or money for structured, healthy meals in the presence of an adult. Marketers have capitalized on this situation by using a number of marketing channels to reach children and adolescents. The content of the advertising as well as the growing amount of time children spend

physically inactive watching TV or playing computer or video games, appear to contribute to the rising rates of obesity and diabetes and their related health effects.

School Food

The school day may account for a large portion of a child's food intake, with some children obtaining up to two meals and one snack each day at school. While school breakfast and lunch programs must adhere to U.S. Department of Agriculture nutritional standards, foods served as individual items (a la carte) in snack bars, vending machines, and school stores are subject to very little regulation. Such foods tend to be high in fat, sugar, and calories. For example, a survey of California high schools found that pizza, chips, and cookies were the most common a la carte items.^{xxiv} Access to soda, chips, and candy throughout the school day increases consumption of high calorie, high fat foods.

Recent marketing trends add to the nutrition problem, such as school district agreements with large food and beverage companies that allow exclusive product placement within schools in exchange for corporate donations. These companies often offer financial incentives or commissions to schools for entering into agreements, which are especially enticing to underfunded or low-wealth school districts. The incentives might include funding of physical education or sports programs, or the provision of computers to the school.

Other Child Nutrition Programs

In addition to school meal programs, a number of federally sponsored nutrition programs exist which can offer nutritious foods to children at a variety of locations – afterschool programs, summer feeding sites, and childcare settings. Because these programs offer meals or snacks primarily to low income children, they have a profound influence on the nutrition status of this population. Two additional federally funded programs, WIC and the Food Stamp Program, offer food and nutrition coupons and nutrition education to low income individuals and families. Originally founded in order to address hunger and malnutrition in children, all of the federal food programs focused on the promotion of adequate calorie, protein and nutrient intake, with little concern for overweight or obesity status. For example, hunger, or stark food insecurity, continues to persist today among the poorest and most marginalized families in the WIC program, impacting an estimated 3% of the total population.^{xxv} Simultaneously, overweight is by far the most common public health nutrition problem facing WIC women and children. About 28% of all WIC participants (and 25% of WIC kids age 1-5) are overweight (weight-for-height greater than the 95th percentile), according to California state data; with highest obesity rates in Hispanic, African Americans, and Native Americans.^{xxvi} As rates of overweight and obesity have increased, these programs are in the position to play a role in improving nutritional health and preventing obesity, by changing the foods and beverages they offer to promote healthier eating among recipients.

Environment and Physical Activity

Trends in Physical Activity

Physical activity helps maintain a healthy body weight and reduces the risk of obesity, diabetes, coronary heart disease, stroke, colon cancer, and high blood pressure.^{xxvii} Despite these health benefits, government studies have found that less than one third of Americans get the recommended 30 minutes of moderate physical activity most days of the week; in fact 40 percent of adults get no leisure time exercise at all.^{xxviii} Latinos and African Americans are less likely to be physically active than whites, due in large part to the social, economic, and physical environments of their lower-income, largely urban neighborhoods. The opportunities for physical activity are limited by the minimal open space and inadequate recreational facilities in many low income neighborhoods.

The built and natural environments also have an influence on individuals' opportunities for physical activity. Higher street-connectivity, diversity of land uses,^{xxix} and the presence of viable parks influence the ability of community residents to be physically active.^{xxx} Building schools where students can no longer walk or bicycle ride to them—either because of distance or safety considerations—has reduced what was once a common form of exercise for children and youth.^{xxxi}

Parks, Recreation, and Physical Education

Low income communities are more dependent on public parks for physical activity than are high-income urban dwellers or suburban and rural residents.^{xxxii} However, lower-income communities have less space devoted to parks and less funding for recreation programs^{xxxiii} - safe, appealing places to play and be physically active are concentrated primarily in high income areas,^{xxxiv} which deter families from using public parks and recreation areas. Similar to the role of school nutrition, given the amount of time children spend at school, physical education and physical activity during the school day have the potential to influence student activity and physical fitness levels. However, many school districts are facing budget deficits and are required to place a larger amount of their resources toward improving academic performance, often at the expense of other programs, such as physical education and sports programs. In lower income schools, where many of these programs are already underfunded, students are at a clear disadvantage in gaining access to physical activity during the school day.^{xxxv}

Streets and Outdoor Environments

Local neighborhoods can be good venues for walking and biking for both leisure and transportation, however these activities may be discouraged in low income communities, due to concerns about crime and safety.^{xxxvi xxxvii} These concerns also prevent many families from allowing their children to walk or bike to school.^{xxxviii} Even the less enjoyable street scenery in lower income neighborhoods plays a role in discouraging recreational walking and cycling^{xxxix} - research has shown that residents are more likely to obtain physical activity in aesthetically pleasing neighborhoods, and that enjoyable scenery is more commonly found in higher income areas.

Addressing Environmental Barriers: What are the solutions?

A recent Field poll, commissioned by The California Endowment, found that two out of three Californians believe the best way to address the obesity crisis is through a community and policy approach, such as improvements in school health environments and fast food restaurant nutrition labeling, rather than leaving it solely to children and their families.^{x1} Addressing environmental barriers to nutritional health requires policy change in a number of different areas – in state, community and institutional level policies.

What are the state level policy strategies?

Improving the foods offered in schools: State level policy can provide the mandate required for school districts to change and improve the foods that are being sold on school campuses. Policies have been developed and implemented at the state level to restrict certain foods or beverages and to set nutrient standards for foods sold outside school meal programs or to provide guidance and direction for local school boards. The National Conference of State Legislatures has developed a tracking system for school obesity prevention policies and the comprehensive listing provides a brief description of bills being considered by state legislatures as well as the bill's sponsor and status. Examples include: the legislatures in 14 states have considered proposals that call for a modification or revision of the contents of vending machines.^{x11} Several specific examples of state level policy in this arena include the following:

Arkansas passed legislation passed in 2003 to create a statewide Child Health Advisory Committee to develop nutrition and physical activity standards and make recommendations on competitive foods for vending machines. The legislation bars vending machines in elementary schools and restricts access until after lunch in middle and high schools. It also sets parameters for soft drink companies on what can be sold in school vending machines.^{x12}

In *California*, the legislature considered strengthening the nutrition requirements for the regular school meal programs as well as the a la carte foods and beverages. Legislators also considered requiring all public schools in the state to offer a breakfast program. Legislation has already passed setting nutrition standards for all foods and beverages sold on school campuses and banning the sale of sodas in elementary and middle schools.^{x13}

Texas created a joint legislative and executive committee to study the nutritional content and quality of foods and beverages in public schools, including food service meals, a la carte foods, competitive foods, and vending machines. The first action is to review all school vending contracts in the state.^{x14} Further, the state agriculture department amended the state school nutrition policy to severely restrict Foods of Minimum Nutrition Value (FMNV) sold on school campuses.^{x15}

Providing adequate physical education and physical activity for students: Schools can also provide many opportunities for physical activity for students – through physical

education classes and chances for physical activity during and after school. For example, while California has a number of physical education standards that are comprehensive, many of these standards are not enforced.^{xlvi} States should ensure that schools have adequate physical education and resources – these resources include: trained PE teachers, adequate equipment and facilities, and opportunities for non-competitive physical activity outside of PE class. The Hawaii legislature recently introduced a proposal requiring 200 minutes of physical activity per 10 school days for grades 1-6 and 400 minutes per 10 school days for grades 7-12.^{xlvii} After school programs can also provide additional opportunities for physical activity, and any certified after school program should include a required physical activity enrichment component.^{xlviii}

Addressing marketing and advertising to children: While addressing regulations related to marketing and advertising is mainly the role of the federal government, states can adopt legislative resolutions to demonstrate statewide support for limiting advertising and marketing of unhealthy foods and beverages to children.^{xlix} In addition, states may have the ability to limit or eliminate all marketing and advertising to children while in school and should take advantage of this policy opportunity.

Taxing foods and beverages: States may also want to consider instituting taxes on junk foods, fast foods, and sodas and use the funds from these taxes to support nutrition and physical activity programs.¹

Federal food programs: Six sites of the California Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) participated in a staff wellness pilot intervention designed to improve staff self-efficacy in counseling WIC clients about childhood overweight. Intervention site staff were more likely to report that the workplace environment supported their efforts to make healthy food choices, be physically active, make positive changes in counseling parents about their children’s weight, and feel more comfortable in encouraging WIC clients to do physical activities with their children.^{li} This work was part of a small number of nationally funded pilot programs to look at ways in which the WIC program could impact rates of obesity within its clientele. Projects like these, where opportunities for nutrition education can also involve physical activity education, may provide additional ways to expand the role of the federal food programs in obesity prevention.

What are the community strategies?

Assessing community food and physical activity assets: To determine where the community strengths and areas of need are communities can map the availability of physical activity resources (such as parks, community centers, fitness centers, walking trails), informal transportation opportunities (including retail and employment destinations within walking and biking distance from residential areas), and assess the concentration of desirable (such as grocery stores, fruit and vegetable markets, farmers’ markets, community supported agriculture (CSA) sites, and community gardens), and undesirable food outlets (such as, liquor stores, convenience stores, and fast food retailers). With these tools in hand, communities can address food insecurity and deserts

using any number of strategies depending on the community assessment of resources available, or assets, and greatest areas of need.

Improving school food: Along with state level policy change, a number of communities and local school districts have mobilized around food sold in and around schools and developed school and school district policies that address a number of issues affecting good nutrition, including: improving the quality of school meals, setting nutritional standards for foods sold outside the school meal programs, mandating nutrition education, allowing adequate time for meal periods, and improving cafeteria surroundings and menu offerings to increase appeal to students. A few examples from school districts throughout the country that have passed local school district policies addressing these nutrition issues include the following: The El Paso (Texas) Independent School District,^{liii} The Fayette County (Kentucky) Public School District,^{liiii} The Portsmouth (New Hampshire) School Board,^{liv} and The Oakland (California) Unified School District.^{lv}

Improving community food options: City planners and local lawmakers should develop programs to assure access to healthy foods, including grocery stores, community gardens and farmers' markets in low-resource neighborhoods. Community groups can work with local city and county governments to enact zoning laws and redevelopment plans mandate the inclusion of healthy food retailers in future developments.

Supermarkets

Low-income communities have used many strategies to successfully recruit full-service supermarkets into their neighborhoods – these strategies have included strong community advocacy and involvement, in addition to components of strong local political leadership and public agency advocacy.^{lvi} In a low income neighborhood in Newark, New Jersey, the efforts of the New Community Corporation (NCC, a faith-based community development and social services corporation), led to the opening of the first supermarket built in 25 years in that area.^{lvii} In southeast San Diego, California, the comprehensive community initiative led by the Jacobs Center for Neighborhood Innovation has resulted in the opening of a highly profitable Food 4 Less store (a price-impact, warehouse-format supermarket) in a district that had had no supermarket for 20 years, with most of the employees in its unionized workforce now coming from the neighborhood.^{lviii}

Small Stores

Given the lack of supermarkets in many low income communities, families have turned to corner grocers and convenience stores to fill this gap. Although these stores succeed by catering to the tastes of the community, there are possibilities for improving the quality of food they offer. In Oakland, California Food Policy Advocates, a statewide public policy and advocacy organization, conducted a pilot project to improve access to fresh fruits and vegetables in one low-income African American neighborhood.^{lix} Aimed at turning the corner grocery store into a distribution network for fresh produce, the project provided technical assistance on purchasing and handling produce and helped the store with refrigeration and signage. Sales in the pilot store rose from zero to \$600–700 per week. The success of this pilot has led to an expansion of the project by the county

health department.^{lx} In a low-income, predominantly African American east-side neighborhood in Detroit, community organizations, University of Michigan researchers, and community members are collaborating on several projects to address the need for supermarkets and healthy food alternatives. Community health workers negotiate wholesale purchase of fresh fruits and vegetables and sell them directly to neighborhood residents at a community center. They also provide education to community members on healthy diet and cooking and working with small-store owners to increase the amount of shelf-space used for fruits and vegetables.^{lxi}

Farmers' Markets

Many communities and organizations have introduced farmers' markets to their communities as a way to bring fresh fruits and vegetables produce to low-income urban communities. The Food Trust in Philadelphia, which operates 14 farmers' markets in low-income neighborhoods, has used several methods to increase access and encourage usage of the farmers' markets by low income families – the Food Trust supplies the markets with signs and product displays, and supports nutrition education and cooking demonstrations during the markets. The Food Trust also successfully built collaboration among several organizations in Pennsylvania to improve healthy food access. As a result, the state government enacted an economic stimulus package that provides \$100 million of public funding to support the development of farmers' markets and supermarkets in low-income areas. New York State recently expanded its Farmers' Market Nutrition Program (FMNP) by increasing the number of participants in the Special Supplemental Program for Women, Infants, and Children (WIC) who can redeem their WIC food coupons for fresh produce. The results were an increased utilization of FMNP benefits by WIC participants and increased income to local farmers.^{lxii}

Establishing zoning and community design ordinances: Communities can establish guidelines for model zoning, transportation, community design policies and environmental assessments to increase community access to physical activity and healthy foods, and decrease availability of fast food outlets.^{lxiii} Land use and zoning policies can limit the prevalence of liquor stores and fast food outlets, or require a more acceptable ratio of healthy to unhealthy food outlets. Landscape design for new and revitalized neighborhoods alike should provide both sidewalks and bike paths, as well as green space and playing fields. Neighborhood design influences modes of transportation – designing neighborhoods that are more oriented toward public transportation than toward automobiles increases the number of people who walk and bike during their commute to work. Funding for community bike programs that include improving street safety features (crime, lighting, traffic) and connecting bikeways can increase the number of bikers, including those using bicycles for transportation.^{lxiv}

Developing physical activity programs and policies: Local officials should also develop policies and programs that assure access to safe and appealing physical activity opportunities for families in low-resource neighborhoods. These programs may include safe and expanded access to parks and walking trails or establishing after hours access to public recreational facilities. A health center in a low-income neighborhood of Oakland, California has had great success changing a low monthly fee for membership to a gym

that is associated with the health center (Zahn, 2004).^{lxv} Local government can also ensure protection of community open space for recreational use.

Forming broad-based collaborations: Collaborations can bring food policy and physical activity advocates together to influence local zoning, urban planning, land use, transportation and tax equity groups. Strengthening existing community coalitions working on obesity/diabetes prevention and assuring health department participation in these coalitions are additional strategies that should be pursued.

Addressing food and beverage marketing and advertising: There are a number of community strategies that can help communities begin to address these issues locally. Low income communities can assess neighborhood-level marketing and develop strategies to address food and beverage marketing targeted to their community.^{lxvi} These strategies could then be disseminated to community members, policy makers and advocates to help support local change.

Communities can also mobilize grassroots activity around neighborhood-level marketing and advertising to children by revealing marketers' intent to undermine parental authority.^{lxvii} Community groups could engage and train youth as advocates for changing food and beverage marketing practices, establish local best practices guidelines for marketing and advertising to children, and reward companies located in the community that comply with these guidelines.^{lxviii}

What are the institutional strategies?

Supporting model institutional environments: Government and health care institutions should be able to provide institutional environments that model prevention messages. Healthcare programs and many government programs emphasize healthy eating and physical activity as part of their service delivery, and the facilities that house these programs should support healthy behaviors. Reducing the price of healthier foods in schools and worksites leads to increased consumption of those foods over less healthy options. The more the price is reduced, the larger the increase in sales.^{lxix} Government and health care institutions should also develop and model specific standards related to food and physical activity (i.e., no fast food, improving the quality of food served, encouraging physical activity options).^{lxx}

Increasing health care emphasis on prevention: Health care institutions have traditionally focused on disease management and treatment, and have not been engaged in prevention of disease. Health care institutions should identify and model best practices guidelines for dissemination to health professionals and professional associations that include nutrition and physical activity messages.

Engaging the health care system in community environmental change: Health care institutions often have an influential status in the community and should work with advocacy groups to create a stronger link between health care and schools. These

institutions should also engage individual doctors as advocates who will present obesity prevention messages in schools, to school boards or in the legislative arena.^{lxxi}

CONCLUSION

Addressing environmental barriers to nutritional health for low-income communities and eliminating nutrition and physical activity related disparities requires a multilevel, multifactoral approach. Although consistent nutrition and physical activity education is a necessary component to help individuals make good choices, individuals make decisions about food and physical activity within the community and environments in which they work and live. Immense disparities exist between the environmental factors supporting nutrition and physical activity in communities of color and low-income populations and those of higher-income, predominantly white populations. Healthy food options and safe opportunities for physical activity are markedly absent from many low-income communities. When these opportunities are not available within the community, residents are much less likely to eat nutritious foods or be physically active. This disparity in available food and physical activity resources aids the increasing rates of nutrition and physical activity related diseases in the African American and Latino communities. Engaging community members in changing their environment is critical, but must also include public and private support from all sectors---industry, commerce, health care, transportation, policy, and media/advertising---to create a health-promoting community environment.

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