HUNGER AND OBESITY

Understanding a Food Insecurity Paradigm

WORKSHOP SUMMARY

Lisa M. Troy, Emily Ann Miller, and Steve Olson, *Rapporteurs*

Food and Nutrition Board

INSTITUTE OF MEDICINE
OF THE NATIONAL ACADEMIES

THE NATIONAL ACADEMIES PRESS
Washington, D.C.
www.nap.edu

THE NATIONAL ACADEMIES PRESS 500 Fifth Street, N.W. Washington, DC 20001

This study was supported by Contract No. AG-3198-C-10-0009 between the National Academy of Sciences and the U.S. Department of Agriculture. Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the view of the organizations or agencies that provided support for this project.

International Standard Book Number-13: 978-0-309-18742-8
International Standard Book Number-10: 0-309-18742-7

Additional copies of this report are available from the National Academies Press, 500 Fifth Street, N.W., Lockbox 285, Washington, DC 20055; (800) 624-6242 or (202) 334-3313 (in the Washington metropolitan area); Internet, http://www.nap.edu.

For more information about the Institute of Medicine, visit the IOM home page at: **www.iom.edu.**

Printed in the United States of America

The serpent has been a symbol of long life, healing, and knowledge among almost all cultures and religions since the beginning of recorded history. The serpent adopted as a logotype by the Institute of Medicine is a relief carving from ancient Greece, now held by the Staatliche Museen in Berlin.

Suggested citation: IOM (Institute of Medicine). 2011. *Hunger and Obesity: Understanding a Food Insecurity Paradigm: Workshop Summary.* Washington, DC: The National Academies Press.

"Knowing is not enough; we must apply.
Willing is not enough; we must do."
—Goethe

INSTITUTE OF MEDICINE
OF THE NATIONAL ACADEMIES

Advising the Nation. Improving Health.

THE NATIONAL ACADEMIES

Advisers to the Nation on Science, Engineering, and Medicine

The **National Academy of Sciences** is a private, nonprofit, self-perpetuating society of distinguished scholars engaged in scientific and engineering research, dedicated to the furtherance of science and technology and to their use for the general welfare. Upon the authority of the charter granted to it by the Congress in 1863, the Academy has a mandate that requires it to advise the federal government on scientific and technical matters. Dr. Ralph J. Cicerone is president of the National Academy of Sciences.

The **National Academy of Engineering** was established in 1964, under the charter of the National Academy of Sciences, as a parallel organization of outstanding engineers. It is autonomous in its administration and in the selection of its members, sharing with the National Academy of Sciences the responsibility for advising the federal government. The National Academy of Engineering also sponsors engineering programs aimed at meeting national needs, encourages education and research, and recognizes the superior achievements of engineers. Dr. Charles M. Vest is president of the National Academy of Engineering.

The **Institute of Medicine** was established in 1970 by the National Academy of Sciences to secure the services of eminent members of appropriate professions in the examination of policy matters pertaining to the health of the public. The Institute acts under the responsibility given to the National Academy of Sciences by its congressional charter to be an adviser to the federal government and, upon its own initiative, to identify issues of medical care, research, and education. Dr. Harvey V. Fineberg is president of the Institute of Medicine.

The **National Research Council** was organized by the National Academy of Sciences in 1916 to associate the broad community of science and technology with the Academy's purposes of furthering knowledge and advising the federal government. Functioning in accordance with general policies determined by the Academy, the Council has become the principal operating agency of both the National Academy of Sciences and the National Academy of Engineering in providing services to the government, the public, and the scientific and engineering communities. The Council is administered jointly by both Academies and the Institute of Medicine. Dr. Ralph J. Cicerone and Dr. Charles M. Vest are chair and vice chair, respectively, of the National Research Council.

www.national-academies.org

PLANNING COMMITTEE ON UNDERSTANDING THE RELATIONSHIP BETWEEN FOOD INSECURITY AND OBESITY: A WORKSHOP[1]

PATRICIA B. CRAWFORD (*Chair*), University of California, Berkeley
KATHERINE ALAIMO, Michigan State University, East Lansing
MARIANA CHILTON, Drexel University School of Public Health, Philadelphia, Pennsylvania
ADAM DREWNOWSKI, University of Washington, Seattle
EDWARD FRONGILLO, University of South Carolina, Columbia
CHRISTINE OLSON, Cornell University, Ithaca, New York
MARY STORY, University of Minnesota, Minneapolis
AMY YAROCH, The Center for Human Nutrition, Omaha, Nebraska

Study Staff

LISA M. TROY, Study Director
EMILY ANN MILLER, Research Associate
SAMANTHA ROBOTHAM, Senior Program Assistant
ANTON L. BANDY, Financial Officer
GERALDINE KENNEDO, Administrative Assistant
LINDA D. MEYERS, Director, Food and Nutrition Board

[1]Institute of Medicine planning committees are solely responsible for organizing the workshop, identifying topics, and choosing speakers. The responsibility for the published workshop summary rests with the workshop rapporteurs and the institution.

Reviewers

This report has been reviewed in draft form by individuals chosen for their diverse perspectives and technical expertise, in accordance with procedures approved by the National Research Council's Report Review Committee. The purpose of this independent review is to provide candid and critical comments that will assist the institution in making its published report as sound as possible and to ensure that the report meets institutional standards for objectivity, evidence, and responsiveness to the study charge. The review comments and draft manuscript remain confidential to protect the integrity of the process. We wish to thank the following individuals for their review of this report:

Ronette Briefel, Mathematica Policy Research, Inc.
Patricia B. Crawford, University of California, Berkeley
Lucia L. Kaiser, University of California, Davis
Nicolas Stettler, Children's Hospital of Philadelphia

Although the reviewers listed above have provided many constructive comments and suggestions, they were not asked to endorse the final draft of the report before its release. The review of this report was overseen by **Hugh H. Tilson**. Appointed by the Institute of Medicine, he was responsible for making certain that an independent examination of this report was carried out in accordance with institutional procedures and that all review comments were carefully considered. Responsibility for the final content of this report rests entirely with the rapporteurs and the institution.

Contents

OVERVIEW		1
1	Goals of the Workshop	5
2	Setting the Stage for the Coexistence of Food Insecurity and Obesity	7
3	Socioeconomic Disparities: Food Insecurity and Obesity	33
4	Sentinel Populations	51
5	Socioecological Perspectives: The Individual Level	71
6	Socioecological Perspectives: The Family and Household Level	85
7	Socioecological Perspectives: The Environmental Level	99
8	Socioecological Perspectives: The Institutional Level	115
9	Putting the Levels Together	125
10	Research Applications	135
11	Research Gaps from a Disciplinary Perspective	149
12	Research Methods and Measures	161
13	Key Elements, Priorities, and Next Steps	177

APPENDIXES

A Workshop Agenda 189
B Planning Committee Biographical Sketches 195
C Speaker Biographical Sketches 199
D Workshop Participants 215
E Acronyms 223
F Roundtable Discussions 225
G Public Comments 231
H Brief List of Recurring Workshop Discussions 235

Overview

The coexistence of obesity and food insecurity (which in its severe form is commonly referred to as hunger) in the same families and communities and even the same individuals is recognized by researchers and increasingly by the broader public. Though the coexistence of these two phenomena may appear inconsistent and thus policy makers may be tempted to question the rationale for nutrition assistance programs based on the fact that many recipients are obese, it is important to examine the complexity of the relationship before curtailing such programs based on this observation. Recent research findings raise questions about whether food insecurity significantly contributes to excess weight gain that leads to obesity, why food insecurity may be related to obesity, and the pathways through which food insecurity may affect weight status. The Workshop on Understanding the Relationship Between Food Insecurity and Obesity, held in Washington, DC, from November 16 to 18, 2010, was designed to provide an opportunity to explore and illuminate the relationship between food insecurity and obesity, the current state of research, and data and analyses needed to advance understanding of the relationship as a way of countering both hunger and obesity in the United States.

The workshop was organized by the Institute of Medicine (IOM) at the request of the U.S. Department of Agriculture's Food and Nutrition Service. To plan the workshop, the IOM appointed a Workshop Planning Committee chaired by Patricia B. Crawford of the University of California at Berkeley. Each member of the planning committee contributed substantively to organizing the agenda, and each moderated sessions during the

workshop. More than 40 experts in the field addressed important questions during formal presentations.

The workshop also offered an opportunity for presenters, participants, and the public to contribute to the discussion of the relationship between food insecurity and obesity. The workshop itself engendered many exchanges between presenters and other participants, which are summarized in the sections labeled "Group Discussion" in this report. Additionally, roundtable discussions were held at the end of the first day of the workshop with the goal of eliciting ideas from participants on how better to understand the relationship between food insecurity and obesity. Participants split into a number of small groups to discuss specific questions related to that goal, and the summary is in Appendix F of this report. Finally, after the workshop concluded, its participants and the general public had the opportunity to submit comments on the topic to a section of the IOM website.

The workshop created a dialogue among people who might not normally be talking with each other in depth: specialists focused on hunger and specialists focused on overweight/obesity, academics and activists, and qualitative and quantitative researchers. In so doing, the workshop underscored the importance of this kind of broad communication.

This workshop summary is organized according to the chronological order of the proceedings, except for notes from roundtable discussions, which are found in Appendix F. The goals of the workshop are presented in Chapter 1, followed by a stage-setting chapter that examines the evidence on the relationship between food insecurity and obesity in adults and in children. Chapter 3 examines the food insecurity and obesity relationship as it is influenced by socioeconomic disparities. Chapter 4 examines the relationship in sentinel populations, including young children, immigrants, Native Americans, and rural populations. Chapters 5 through 8 walk through four levels of a socioecological model—individual, family and household, environmental, and institutional, respectively, and Chapter 9 discusses a framework to integrate the perspectives of the four levels. Research applications that target both food insecurity and obesity are discussed in Chapter 10. Chapter 11 explores major research questions, from the perspective of four disciplines—nutrition, sociology, psychology/human development, and economics—that if addressed will likely help us to better understand the relationship between food insecurity and obesity and may help the research and policy communities integrate these disciplinary perspectives when designing programs and policies. Chapter 12 describes research methods and measures that may be useful in addressing the research gaps identified throughout the workshop, including strategies such as data modeling, qualitative research, and geographic information system mapping. Chapter 13 conveys the perspectives of government agencies and foundations on research priorities and considers how to address proposed priorities, as well

as foster potential partnerships, that would further the understanding of the relationship between food insecurity and obesity.

A number of appendixes provide details about the workshop agenda, participants, and proceedings. The workshop agenda is reproduced in Appendix A; the workshop planning committee and speaker biographical sketches appear in Appendixes B and C, respectively; and a list of workshop participants is compiled in Appendix D. For convenience, a guide to the acronyms used throughout this report is provided in Appendix E. As mentioned above, Appendix F contains notes from roundtable discussions. Appendix G contains comments submitted by the public regarding this workshop and its statement of work, and Appendix H provides a brief list of recurring themes that were discussed by participants during the course of the workshop.

1

Goals of the Workshop

Key Messages Noted by Participants

- The Workshop on Understanding the Relationship Between Food Insecurity and Obesity was held to explore the biological, economic, psychosocial, and other factors that may influence the relationship between food insecurity, overweight, and obesity in the United States.
- Experts in the field examined current concepts of and research findings on this relationship and discussed considerations for future research—study designs, data analysis, and selection of measures, among others—to advance the understanding from its current state.

In the first session of the workshop, Steven Carlson, director of the Office of Research and Analysis at U.S. Department of Agriculture's (USDA's) Food and Nutrition Service, which sponsored the workshop, laid out the objectives for the 2.5-day meeting. The Food and Nutrition Service (FNS) has a two-part mission, he said: (1) FNS seeks to ensure that people have the resources they need to acquire enough food and (2) FNS works to ensure that program benefits are aligned with the Dietary Guidelines for Americans and that the people served have the knowledge, skills, and motivation to make healthful choices. Both of these goals lie at the core of the relationship between food insecurity and obesity.

The day before the workshop, the Economic Research Service at USDA released its annual report on household food security in the United States (Nord

et al., 2010). The report observed that at some point during 2009, more than 17 million households in the United States had difficulty providing enough food for all their members because of a lack of resources. In more than one-third of these households, the food intake of some household members was reduced and normal eating patterns were disrupted because of limited resources.

The prevalence of food insecurity in 2009, although high compared with levels over the past decade, did not change dramatically between 2008 and 2009, despite significant growth in unemployment and poverty during that period. "That underscores the important role that federal nutrition assistance programs play in helping to prevent food insecurity," said Carlson. The largest of these programs respond rapidly and automatically to changing conditions, both in the lives of individual families and in the economies of communities. Currently, USDA programs serve roughly one in four people in the United States. In August 2010 the Supplemental Nutrition Assistance Program (SNAP, formerly known as the Food Stamp Program), reached more than 42 million people. In addition, more than 31 million children participated in the National School Lunch Program, with two-thirds of them receiving a free or reduced-price meal, and more than 9 million people participated in the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC).

Even as demands for food assistance have grown, governments at all levels and the private sector have grappled with an equally dramatic increase in the prevalence of overweight and obesity (defined in Box 2-2). The main objective of the workshop was to understand the relationship between food insecurity and obesity in the low-income populations that nutrition assistance programs are designed to serve in an effort to help identify a research agenda that would increase our understanding of their coexistence. The presenters and other workshop participants were asked to identify information gaps, consider alternative approaches to analyzing data, think about new data that need to be collected, and address the limitations of the available research. "We're not expecting a consensus to emerge from the discussions over the next two and a half days," said Carlson. "But I want to challenge each of you to help us avoid following the easy path. I want to challenge you to think hard about building a logic model of the relationship between food insecurity and obesity that can highlight the critical questions that we need to be asking, and [then] identify approaches that might be used to address those questions."

REFERENCE

Nord, M., A. Coleman-Jensen, M. Andrews, and S. Carlson. 2010. *Household food security in the United States, 2009*. Economic Research Report No. 108. Washington, DC: Economic Research Service.

2

Setting the Stage for the Coexistence of Food Insecurity and Obesity

Key Messages Noted by Participants

- Food insecurity is associated with many negative health outcomes, but most of the existing evidence does not show a relationship between food insecurity and childhood obesity. For adults, some groups show a modest association while others do not.
- Reducing poverty and stress in the United States would likely lead to reductions in childhood obesity, but reducing food insecurity alone would not necessarily have this effect.
- Research topics that may contribute to our understanding of the relationship between food insecurity and obesity include the role of stress, better measures of food insecurity and obesity, and the links between food insecurity and diet quality.
- Study designs that may contribute to our understanding include prospective and retrospective studies to examine the dynamics of food insecurity and obesity, and experimental designs to establish causative links.
- The harmful impacts of food insecurity are sufficiently severe to justify action, regardless of their effects on obesity.

During the first session of the workshop, three speakers provided an overview of the issues associated with food insecurity and obesity. They explored the relationship between food insecurity and obesity, in both chil-

dren and adults, and differences that exist by gender, age, and race/ethnicity. They provided an introduction to many of the issues discussed during the remainder of the workshop, including the relationship of food insecurity to stress, the relationship between food insecurity and health outcomes, and the role of the Supplemental Nutrition Assistance Program (SNAP) and other federal nutrition assistance programs. The speakers also suggested future research directions. Box 2-1 defines a number of terms related to food insecurity that were discussed during the workshop.

The literature on this relationship is "really mixed," said Mary Story, professor and associate dean at the University of Minnesota School of Public Health, who moderated the session. Some studies show that there is a positive association between food insecurity and obesity; others do not. What accounts for this discrepancy, Story asked, and what are the strengths and limitations of the current research?

PREVALENCE AND MEASUREMENT OF FOOD INSECURITY

Food security exists when "people at all times have physical, social, and economic access to sufficient, safe, and nutritious food which meets their dietary needs and food preferences for an active and healthy life" (FAO, 1996). The U.S. Department of Agriculture (USDA) monitors food security as an ongoing measure of the effectiveness of federal nutrition assistance programs, private food assistance programs, and other public-private initiatives in reducing the food insecurity of low-income households. "Food insufficiency" and "food insecurity" are related but distinct concepts. Food insufficiency is defined as an inadequate amount of food intake due to a lack of resources (Briefel and Woteki, 1992). Food insecurity is the ability to access sufficient, safe, and nutritious foods in socially acceptable ways (FAO, 1996). Food insecurity describes a "broader condition" that includes food insufficiency and additionally psychological and other qualitative aspects of the food supply and food intake (Casey et al., 2001).

Prevalence of Food Insecurity

Prior to 2008, food insecurity for all households in the United States hovered between 10 and 12 percent, with a higher prevalence among Latino and African-American households (Figure 2-1). The prevalence, however, increased sharply in 2008 to almost 15 percent, with the most recent measures showing a continuation of that high level (Nord et al., 2010). "The economic downturn has had an impact on food insecurity," said Barbara Laraia, associate professor in the Department of Medicine at the University of California at San Francisco.

BOX 2-1
Food Security Definitions

Food security Access to enough food for an active, healthy life; at minimum, includes (1) the ready availability of nutritionally adequate and safe foods and (2) an ensured ability to acquire acceptable foods in socially acceptable ways (NRC, 2006).

High food security Households that report no indicators of food insecurity on the U.S. Department of Agriculture (USDA) survey (Nord et al., 2010). Households had no problems, or anxiety about, consistently accessing adequate food.[a]

Marginal food security Households reporting one to two indicators of food insecurity on the USDA survey (Nord et al., 2010). Households had problems at times, or anxiety about, accessing adequate food, but the quality, variety, and quantity of their food intake were not substantially reduced.[a]

Low food security A range of food insecurity in which households report multiple indications of food access problems, but typically report few, if any, indications of reduced food intake on the USDA survey (Nord et al., 2010). Households reduced the quality, variety, and desirability of their diets, but the quantity of food intake and normal eating patterns were not substantially disrupted. Prior to 2006, USDA described households with low food security as "food insecure without hunger."[a]

Very low food security A severe range of food insecurity on the USDA survey in which the food intake of some household members was reduced and normal eating patterns were disrupted because of limited resources. At times during the year, eating patterns of one or more household members were disrupted and food intake reduced because the household lacked money and other resources for food. Prior to 2006, USDA described households with very low food security as "food insecure with hunger" (Nord et al, 2010).[a]

Food insecurity Limited or uncertain ability to acquire acceptable foods in socially acceptable ways (Anderson, 1990).

Food insufficiency An inadequate amount of food intake due to a lack of resources (Briefel and Woteki, 1992).

Hunger The uneasy or painful sensation caused by a lack of food; the recurrent and involuntary lack of food (NRC, 2006).

---

[a] See http://ers.usda.gov/Briefing/FoodInsecurity/labels.html.

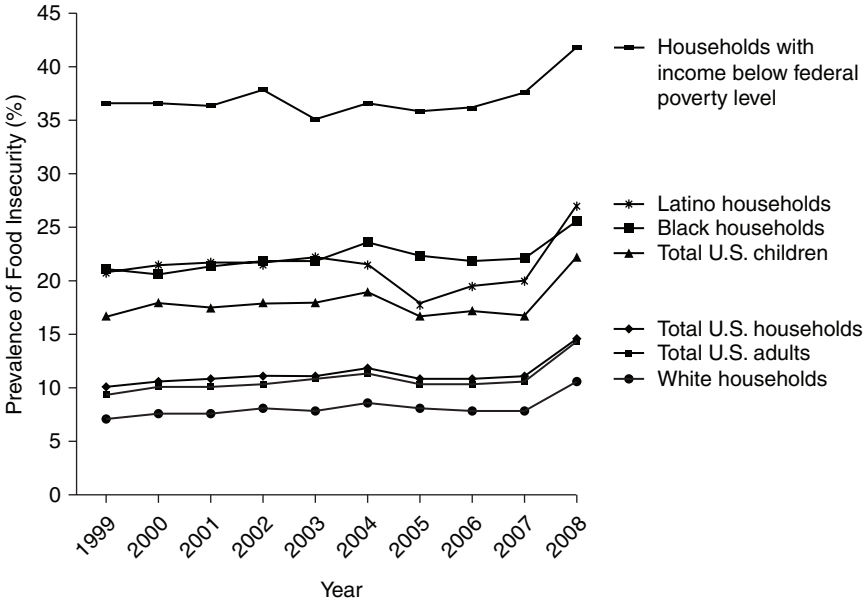

FIGURE 2-1 Prevalence of food insecurity in the United States, 1999-2008.
NOTE: Data are from the USDA food security reports, which are based on an annual survey conducted by the U.S. Census Bureau as a supplement to the monthly Current Population Survey.
SOURCE: Seligman and Schillinger, 2010. Hunger and socioeconomic disparities in chronic disease. *New England Journal of Medicine* 363(1):6-9. Copyright © 2010 Massachusetts Medical Society.

Measuring Food Insecurity

Craig Gundersen, associate professor in the Department of Agricultural and Consumer Economics at the University of Illinois at Urbana-Champaign, briefly described the tool used to determine food insecurity in the United States. A household's food insecurity status is calculated from responses to a series of questions in the Core Food Security Module (CFSM), which ask about conditions and behaviors known to characterize households having difficulty meeting basic food needs (Nord et al., 2010); these methods have been described by Hamilton and colleagues (1997) as well as others. The following are example questions from the CFSM:

- Did you worry whether your food would run out before you got money to buy more?
- Did you or the other adults in your household ever cut the size of your meals or skip meals because there wasn't enough money for food?

- Were you ever hungry but did not eat because you couldn't afford enough food?
- Did a child in the household ever not eat for a full day because you couldn't afford enough food?

The CFSM has a total of 18 questions. Ten items are asked of all households, and 8 additional questions are asked of only households with children. Responses to these questions are used to assign households to food security categories. Households are classified as *food insecure* (having low food security) if they have affirmative responses to three or more of the CFSM questions. Households are further classified into "very low food security" based on the presence or absence of children in the household. Households are classified as having "very low food security" if they have 6 or more affirmative responses in households without children or 10 or more affirmative responses in households with children.

THE RELATIONSHIP BETWEEN FOOD INSECURITY AND OBESITY

Gundersen emphasized the importance of using measures of obesity collected by trained personnel when examining the relationship between food insecurity and obesity. The definition of obesity and other terms used to classify weight status are in Box 2-2. For example, a paper by Lyons et al. (2007) found a connection between food insecurity and obesity when self-reports of weight status were used. However, when body mass index (BMI) was calculated using measured weight and height, there was no relationship. Because of such discrepancies, Gundersen limited his comments to papers that used trained personnel to measure obesity because measured values are more accurate than self-reported data. Gundersen also only included papers that used the CFSM as a measure of food insecurity and excluded from consideration papers focusing on children under the age of 2 years because of challenges associated with measuring obesity at such young ages.

Children

Gundersen et al. (2009a) did not find a relationship between food insecurity and childhood obesity in a cross-sectional study that used multiple measures of obesity and a sample of children from the 1999-2002 National Health and Nutrition Examination Survey (NHANES). The sample was confined to children below 200 percent of the poverty line, which, according to the authors, captures the majority of households experiencing food insecurity. In separate analyses of boys, girls, and racial/ethnic groups (non-Hispanic white, non-Hispanic black, and Hispanic), no relationship

BOX 2-2
Definitions of Terms Used to Classify Weight Status

Body Mass Index (BMI) An indirect measure of body fat, calculated as the ratio of a person's body weight (in kilograms) to the square of a person's height (in meters):

$$\text{BMI } (kg/m^2) = \text{weight (kilograms)} \div \text{height (meters}^2)$$
$$\text{BMI } (lb/in^2) = \text{weight (pounds)} \div \text{height (inches}^2) \times 703$$

Overweight For adults 20 years of age and older, a BMI between 25.0-29.9 is considered overweight. For children and youth ages 2-19, BMI is based on growth charts for age and gender and is referred to as BMI-for-age, which is used to assess underweight, overweight, and risk for overweight. According to the Centers for Disease Control and Prevention, a child with a BMI-for-age that is equal to or between the 85th and 95th percentiles is overweight.

Obese For adults 20 years of age and older, a BMI $\geq$ 30 is obese. For children and youth ages 2-19, a child with a BMI-for-age that is $\geq$ the 95th percentile, on the growth charts as explained above, is considered obese.

was found. This study used "state-of-the-art data, state-of-the-art methods of measuring obesity, and there's no relationship between food insecurity and obesity [in children]," Gundersen said.

Another study looked at how the effects of food insecurity differ over time (Bhargava et al., 2008). Using 1999-2003 data from the Early Childhood Longitudinal Study, BMI as a measure of obesity, and a dynamic random effects model that controls for unobserved factors, the study found no effect of food insecurity on BMI. It is "another paper showing no effect using state-of-the-art methods," said Gundersen.

In response to the question of whether children in food-insecure households are more likely to be obese, Gundersen's answer was "probably not" for children as a whole. Published studies such as Larson and Story (2010) provide support for this conclusion, but Gundersen said he would answer with an even more emphatic "no" if unpublished studies were taken into account. Gundersen underscored the importance of publication bias—explaining that the authors of studies that find no relationship are less likely to submit their work for publication. This bias against publishing statistically insignificant results leads to a lack of published confirmation of the absence of a relationship between food insecurity and obesity in children.

Counterfactuals

Gundersen examined the use of "counterfactuals" in obesity research, involving such questions as the effects on obesity of making all food-insecure households food secure. The problem with such exercises is that it is impossible to measure the potential effect of food insecurity on obesity for food-secure children or the potential effect of food security on obesity for food-insecure children. "We don't observe the counterfactual. You only observe a food-insecure child. . . . You don't observe a food-insecure child who's food secure, and vice versa." For this reason, it is not possible to measure accurately the effects on obesity of making everyone in society food secure or food insecure (Gundersen and Kreider, 2009).

Adults

Laraia summarized the documentation of the association between household food insecurity and weight status among adults, based on a large research literature (Olson, 1999; Townsend et al., 2001; Adams et al., 2003; VanEenwyk and Sabel, 2003; Vozoris and Tarasuk, 2003; Kaiser et al., 2004; Laraia et al., 2004; Jones and Frongillo, 2006, 2007; Wilde and Peterman, 2006; Hanson et al., 2007; Whitaker and Sarin, 2007). Among many groups there is no association, but there are positive or negative associations for other groups (Figure 2-2). There was a modest association

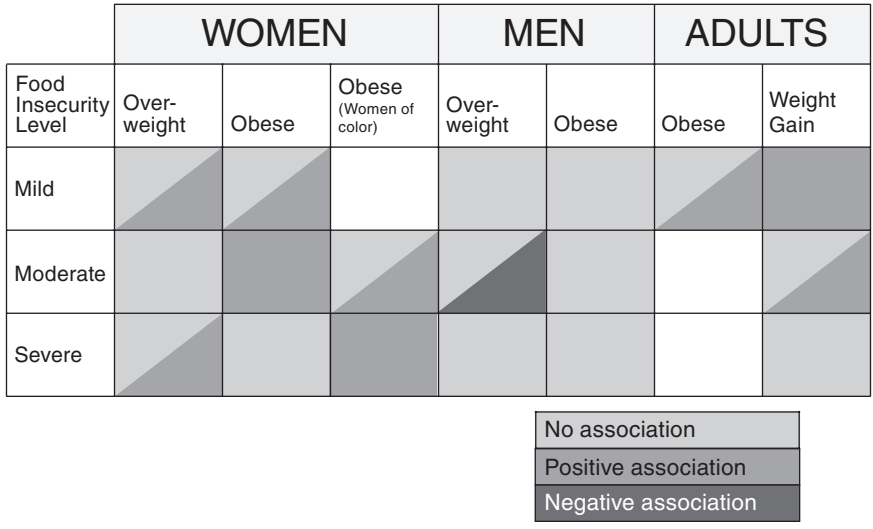

FIGURE 2-2 Summary of findings for food insecurity and weight status.
SOURCE: Laraia, 2010.

between food insecurity and obesity among women, especially women of color, that is, women who were food insecure were more likely to be obese than women who were food secure. Among men there was either a negative or a null association between food insecurity status and overweight and a null association with obesity. For men undergoing a mild or moderate amount of food insecurity there was a significant negative association, i.e., men who were food insecure were less likely to be overweight than men who were food secure.

Laraia also discussed studies of pregnancy in which one study found higher weight gain among women from food-insecure households and a greater risk of gestational diabetes (Laraia, 2010). Another prospective study found that obese rural childbearing women were more likely to become food insecure over time (Olson and Strawderman, 2008).

OTHER IMPLICATIONS OF FOOD INSECURITY

Poverty

The definition of food insecurity has an economic component through material deprivation, said Laraia. Thus, food insecurity is a sensitive measure of the stresses that families are under, she continued, although it is not necessarily specific.

Laraia explained that food insecurity is not the same as poverty. For households with incomes below the federal poverty level, the prevalence of food insecurity was between 35 and 40 percent for most of the past decade, with an increase since 2008. Some households below the poverty level are not food insecure, and some households well above the poverty line are food insecure. Factors such as a job loss, divorce, or other unexpected events that are not captured by an annual income measure could affect a household's food security status. Furthermore, some households experience food insecurity episodically, even though their annual incomes are well above the poverty line (Nord et al., 2010).

Diet Quality

The definition of food insecurity also has a nutritional component, reflecting a compromise between food quality and food quantity, Laraia said. Little research to date has found a clear association among diet variety, diet quality, meal patterns, or nutrient intake, added Laraia. She noted examples of research examining these issues:

- Drewnowski and Specter (2004) showed that energy-dense foods are much less expensive than nutrient-dense foods. Under stress, people are often drawn to energy-dense foods, Laraia noted.
- Individuals from households that are food insecure have slightly lower average scores on indices of healthful eating compared to individuals in food-secure households (Basiotis and Lino, 2002).
- Another study observed that there was no significant difference in total energy intake when comparing adults (ages 20-59) from food-insufficient to food-sufficient families, but there were lower intakes of calcium in that group of adults from food-insecure families. Older adults (> 60 years) from food-insufficient families had both lower intakes of calories and several micronutrients (i.e., vitamin B6, magnesium, iron, and zinc) compared to their food-sufficient counterparts (Dixon, 2001).

Negative Health Outcomes

Food insecurity is associated with numerous negative health outcomes, said Gundersen, citing a large number of studies showing a relationship between food insecurity and various health outcomes (Jyoti et al., 2005; Slack and Yoo, 2005; Cook et al., 2006; Skalicky et al., 2006; Whitaker et al., 2006; Chilton and Booth, 2007; Rose-Jacobs et al., 2008; Eicher-Miller et al., 2009; Gundersen and Kreider, 2009; Hernandez and Jacknowitz, 2009; Yoo et al., 2009; Zaslow et al., 2009; Kirkpatrick et al., 2010). "Food insecurity is one of the most important public health threats in the United States," he said. "It has serious negative health consequences." This observation alone argues for devoting resources to alleviating food insecurity in the United States.

Diet-Sensitive Chronic Disease

An association between food insecurity and diet-sensitive chronic disease has been observed. Seligman et al. (2010) found a modest association between food insecurity, hypertension, and hyperlipidemia and less of an association with diabetes. When the authors restricted their data to households with very low food security, they found more than a twofold increase in the risk of diabetes compared to those in food-secure households. Adults with diabetes in food-insecure households also exhibited higher hemoglobin A1c values than adults living in food-secure households, suggesting that food-insecure adults are not managing their disease well through their diets.

Stress

Numerous studies have shown an association between food insecurity and mental well-being, stress, and depression, Laraia said. The concept of household food insecurity is multidimensional, she said, and its definition captures the psychological effects that food insecurity might have in households.

Food insecurity is very stressful to families, Gundersen pointed out. Food insecurity may interact with stress to foster obesity. For example, Lohman et al. (2009) found that increased levels of individual stressors led to an increased probability of obesity and that food-insecure adolescents between 10 and 15 years of age whose mothers experience stress were more likely to be obese. In contrast, another study found that younger food-secure children (under the age of 10 years) in families below 200 percent of the poverty line were more likely to be obese (Gundersen et al., 2008). In this case, Gundersen said, children who experience stress may eat comfort foods to make themselves feel better, and they are more likely to have food readily available if they belong to food-secure families.

The emerging research on stress is provocative and important but also complicated, noted Laraia. Under stressful conditions where humans or animal subjects are threatened, they tend to lose weight. However, even with a loss of weight, fat is redistributed into the viscera, becoming abdominal fat, which is more likely to produce adverse health effects than other kinds of fat because of its increased metabolic activity and its proximity to visceral organs, she said (Adam and Epel, 2007).

Food insecurity is a form of threat to humans, said Laraia. It can stimulate the hypothalamus-pituitary-adrenal (HPA) axis, which is a stress feedback mechanism that ultimately influences metabolic outcomes. In this way, stress can trigger hunger and an increased drive for feeding. Eating in the presence of stress also can lead to insulin resistance and visceral fat accumulation, and it can create a desire for palatable foods, because the high fat content of these foods dampens the stress response (Adam and Epel, 2007). "It feels good psychologically, emotionally, [and] biologically."

In a study of pregnant women, stress, anxiety, depression, and other measures of distress were higher among women from marginally secure and food-insecure households, while measures of self-esteem and mastery decreased as food insecurity increased (Laraia et al., 2006). Furthermore, women who scored high in dietary restraint—measured by dieting, restrained eating to regulate weight, and a history of weight cycling—who were from food-insecure households gained the greatest amount of weight on average during the gestational period. These women also had a higher ratio of observed-to-recommended weight gain than did other women.

Animal models have been used to study stress. In most cases, animals under stress lose weight. However, in mice fed different kinds of foods and put under different amounts of stress, the mice under stress and fed a diet high in fat and sugar developed the most abdominal fat. Mice subjected to swimming in lukewarm water for an hour did not experience fat accumulation, while mice subjected to stress by swimming in ice-cold freezing water for an hour or placed in a cage with an aggressive male mouse for 10 minutes did experience fat accumulation (Kuo et al., 2007).

Regarding biochemical changes and stress, mice subjected to stress and fed a diet high in fat and sugar had increased levels of insulin and neuropeptide Y, two factors that regulate energy. Neuropeptide Y, in addition to serving as an energy regulator, causes a drive to eat, increases the likelihood of sedentary behavior, and shunts energy to be stored as abdominal fat. After 4 months of stress and the diet high in fat and sugar, the mice had full-blown metabolic syndrome. Yet when the researchers blocked neuropeptide Y, they saw no fat accumulation (Kuo et al., 2007). This "ties together the energy regulation path and the stress path," said Laraia.

Another line of animal research involves macaque monkeys and the variable foraging demand protocol. In this 16-week protocol, mother monkeys alternated 2-week periods in which food was relatively easy to obtain (low foraging demand) or more difficult to obtain (high foraging demand). The difficulty of the foraging demand was varied through the use of a foraging cart, a device in which food can be hidden in differing amounts of wood chip, with openings on the side of the cart through which the mother monkeys search. Coplan and colleagues (2006) found that when nursing mothers were exposed to variable foraging, there was no change in levels of maternal corticotropin-releasing factor, which is another factor in the HPA axis. However, when their infants were being weaned, variable foraging caused an increase in maternal corticotropin-releasing factor, indicating a higher stress response. In both cases, the corticotropin-releasing factor of the infant monkeys increased. "There was a stress response in the infant even though there was no calorie restriction, and it was the stress response of not knowing whether they were going to get their food during those intermittent periods of foraging."

Kaufman and colleagues (2007) extended the research on late variable foraging. If mothers were subjected to variable foraging while weaning their offspring, the adolescent monkeys had higher weight, increased BMI, and greater abdominal circumference. This research concluded that "early-life stress during a critical period of neurodevelopment can result in the peripubertal emergence of obesity and insulin resistance," said Laraia.

POLICY IMPLICATIONS

Would reductions in poverty lead to reductions in childhood obesity? Gundersen asked. Absolutely yes, he said, citing a variety of research results (Miech et al., 2006; Phipps et al., 2006; Shrewsbury and Wardle, 2008; Singh et al., 2008). "If we got rid of poverty, we'd definitely make a huge dent in the level of obesity in the country." More importantly, poverty is a very serious problem in the United States, and "eliminating it would be good in and of itself."

An increasing amount of work has convincingly demonstrated that reducing stress also would lead to reductions in childhood obesity (Sweeting et al., 2005; Crossman et al., 2006; Gibson et al., 2007; Zeller et al., 2007; Koch et al., 2008; Garasky et al., 2009; Van Jaarsveld et al., 2009; Stenhammar et al., 2010). Yet would reducing food insecurity lead to reductions in childhood obesity? No, replied Gundersen. There are many reasons for eliminating food insecurity, but reducing obesity is not one of those reasons. "We should eliminate food insecurity for other reasons."

SNAP has been extraordinarily effective in alleviating food insecurity and poverty (Gundersen and Oliveira, 2001; Van Hook and Balistreri, 2006; Gundersen and Kreider, 2008; DePolt et al., 2009; Gundersen et al., 2009b; Nord and Golla, 2009). To the extent that SNAP further reduces poverty, it will reduce childhood obesity, Gundersen remarked. However, if its only effect is to reduce food insecurity, according to the existing research, it will not have an effect on obesity. "Without a doubt, SNAP plays a huge role in our efforts in society to relieve obesity because it reduces poverty and because it reduces stress," said Gundersen. Yet the fact that SNAP leads to reductions in food insecurity will not have an impact on obesity, he concluded.

A RESEARCH AGENDA

Should scarce research dollars be spent on further study of the connection between food insecurity and childhood obesity? Gundersen said no, even though some of his research has been on that very topic. The connection already has been studied extensively, and it is not clear that more research in this area is needed. "It's not what the conference probably wanted to hear, so I apologize."

The U.S. government has set a goal to eliminate childhood hunger by 2015.[1] In that case, said Gundersen, much more needs to be learned about the determinants of childhood hunger. "We don't know much about what

[1]See http://obama.3cdn.net/c4b14802fd5e66ee67_xum6bn6nu.pdf (accessed January 26, 2011).

the determinants of childhood hunger are, outside of some broad sweeping generalizations about it . . . let's devote our resources to that."

The effect of stress among low-income households on childhood obesity warrants further research. Early work suggests that the effects of stress are substantial, but many questions surround the determinants and effects of stress. "Looking more at this is really important," Gundersen advised. If additional work did demonstrate a connection between food insecurity and obesity, the results of studies on stress would be relevant.

Another important research question, according to Laraia, is whether overweight or obese women perceive their household food situation differently than normal-weight women, which could create a spurious relationship between food insecurity and obesity. Perhaps they are stressed by many things and getting their next meal is first and foremost in their minds, she suggested.

Inconsistencies in measuring both exposures and outcomes also can affect research findings. Studies use different measures for food insecurity and for weight. Some analyses look at the full population, others look only at middle- and low-income households, and others are restricted to very low income households. "We're trying to tease out only the direct effect of food insecurity when we have this wonderful multidimensional construct that's capturing probably more than just the food security status in households," Laraia said.

The conceptual framework of research in this area needs to be better defined and thought through, said Laraia. Perhaps the focus should be on visceral fat instead of BMI or obesity. Categories of obesity and moderators of food insecurity such as dieting need to be considered more carefully. Dieting can be very stressful, as shown both psychologically and from animal and human studies, so dieting itself causes a stress response.

With regard to stress, research should focus on critical periods of growth and development, especially during adolescence and in girls, said Laraia. The aging population and diet-sensitive chronic disease are other important issues. Finally, she recommended that the interaction between food insecurity and the food environment be explored.

Types of Research Studies Needed

A very large proportion of the evidence for both children and adults comes from cross-sectional studies, observed Rafael Pérez-Escamilla, professor of epidemiology and public health at Yale School of Public Health. He agreed with Gundersen that little progress can be expected if more of the same studies are funded. However, prospective, retrospective, experimental, and other types of studies also have the potential to advance knowledge.

Longitudinal Studies

Longitudinal studies are needed to better characterize and understand what happens over the course of the month in low-income households enrolled in food assistance programs, said Pérez-Escamilla. Key questions to be addressed are: Do food purchasing and eating behaviors change during the month? Are these changes explained by the level of food assistance benefits? Do eating behaviors lead to weight cycling during the month?

Longitudinal studies also are needed to understand if maternal depression or infant feeding parenting styles modify the relationship between food insecurity and childhood obesity. As shown by the work of Bronte-Tinkew et al. (2007), complex statistical approaches based on sound theoretical frameworks such as structural equation modeling are needed to disentangle the direct and indirect pathways by which food insecurity may influence childhood obesity. In the research on food insecurity and obesity, it is crucial to model interactive effects to identify key effect modifiers. "Some of the most interesting findings that illustrate the complexity of the pathways that may make these relationships come from those studies that have bothered to look at effect modification," said Pérez-Escamilla. "This information can provide the evidence base for the design of effective interventions targeting different subgroups." Examples of key potential effect modifiers are participation in food assistance programs, caregiver stress or depression, social supports, family structure, and child age and gender.

As an example of effect modification, Pérez-Escamilla cited findings from Canada suggesting that birth weight may modify the relationship between food insufficiency and the likelihood of childhood obesity later in life (Dubois et al., 2006). Babies with low birth weight were several times more likely to develop childhood obesity if they lived in a food-insecure household, whereas there was no relationship if a baby was born with a normal birth weight. Babies born heavier than expected for their gestational age also had an increased risk for obesity, though not as high as babies with low birth weight.

Retrospective Studies

Retrospective studies can answer a different set of questions. How do food insecurity experiences early in life shape longer-term eating behaviors? Do such experiences transfer to the next generation? Are caregivers who were food insecure more likely to overfeed their children? Does acculturation modify the relationship between food insecurity and obesity? Does food insecurity modify the relationship between acculturation and obesity? Acculturation is a complex, dynamic, and time-dependent process,

Pérez-Escamilla observed. Methodological advances have yielded ways to measure acculturative changes based on retrospective life history questionnaires, whereas longitudinal studies would take decades to yield similar results.

Experimental Studies

Experimental studies can help answer at least some counterfactual questions, discussed earlier in this chapter. Will reductions of food insecurity lead to decreases in obesity? How can food-insecure households be made food secure? The design of these studies is ethical, Pérez-Escamilla pointed out, because it is not known whether programs such as SNAP have a mitigating, exacerbating, or no effect on the development of obesity among low-income individuals. On the other hand, it would be unethical to probe the other side of the counterfactual, because it would be unethical to make food-secure households food insecure to determine whether obesity increases.

A major question in experimental studies is how to make food-insecure households food secure. For example, is it better to give families food, money, or both? "I am not sure that we really know how to do that. And without this knowledge, it is not possible to test the hypothesis that food insecurity leads to obesity based on experimental designs," he noted.

Other Considerations for Designing Future Research

Choice of Variables

Most research in this area models obesity as a dependent variable and food insecurity as an independent variable. However, it is also possible that the opposite is true—that obesity leads to food insecurity, perhaps through pathways mediated by depression and chronic disease that limit work performance and the ability to generate a reasonable income. "To my knowledge, there are almost no studies that focus on answering questions related to this direction of the relationship," said Pérez-Escamilla. If this hypothesis is confirmed, it would indicate that improving access not only to chronic disease management care but also to much-needed mental healthcare services could lead to improvements in food security for entire households.

Measuring Food Insecurity

Practically all studies reviewed have measured household food insecurity using experience-based scales or subscales. These scales have adequate

psychometric, predictive, and concurrent validity in diverse socioeconomic and cultural settings. They also capture information that goes above and beyond traditional poverty measures. Measures of food insecurity and poverty "are not the same," emphasized Pérez-Escamilla. "If they were the same, we wouldn't need to be meeting here today, because the relationship between poverty and obesity is fairly well established."

There are several limitations to be considered with experience-based measures of household food insecurity. First, these measures provide a description of the situation of the household as a unit. They do not necessarily represent the food insecurity of the individuals living in a household. Thus, it is possible that the household food insecurity measure does not always capture accurately the food insecurity of individuals whose anthropometric or body composition data are modeled in regression analyses. Research is needed to better understand if and how food insecurity varies across individuals within a household, Pérez-Escamilla said. Also, he continued, measures of food insecurity need to be more standardized, with the use of similar scales and evidence-based cutoff points.

Some studies simply classify households as either food secure or food insecure, while others divide households into two or three different levels of food insecurity. "I suspect this is mostly [the result of] a post hoc decision after exploring the data [and identifying the 'best' food insecurity classification algorithm]," Pérez-Escamilla said.

THE NEED FOR ACTION

Regardless of whether food insecurity is causally linked with obesity, it has been consistently associated with lower dietary quality and especially with a lower consumption of fruits and vegetables. Food insecurity is likely to have many other negative consequences for human development, said Pérez-Escamilla (Dietary Guidelines Advisory Committee, 2010; Pérez-Escamilla, in press). Food insecurity is associated with negative psychoemotional outcomes for children and adults, poor academic performance, and maternal stress and depression (Pérez-Escamilla, in press). Maternal stress has been associated with childhood obesity and high-energy-density diets characterized by low fruit and vegetable consumption; such diets correlate with both childhood and adult obesity. Given these observations, said Pérez-Escamilla, having a definitive answer to the question at the heart of the workshop is not essential to take action.

Nevertheless, the question being addressed at the workshop remains important because understanding potential pathways by which food insecurity influences obesity may provide opportunities for interventions, said Pérez-Escamilla. This, in turn, can have major implications for the design or redesign of food assistance and nutrition education programs. For example,

if research shows that dietary behaviors leading to obesity result from an abundance of food during some parts of the month but not others, then programs such as SNAP could reconsider the best timing for benefit distribution, he noted. Similarly, if studies confirm that lack of access to fruits and vegetables mediates a relationship between food insecurity and obesity, then programs such as SNAP and the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) could continue to develop innovative ways of encouraging SNAP and WIC recipients to purchase more fruits and vegetables with their benefits. "This line of work can have an impact not only on the improvement of food assistance programs but also on the improvement of the vulnerable communities' food systems as a whole," Pérez-Escamilla said.

GLOBAL IMPLICATIONS OF THE RELATIONSHIP BETWEEN FOOD INSECURITY AND OBESITY

Pérez-Escamilla observed that the theme of the workshop has global implications. For example, the Mexican conditional cash transfer program known as Oportunidades provides a stipend and complementary food for young children as long as families keep their children in school and bring them to receive immunizations and other primary healthcare services. The Mexican government is investing close to $3 billion annually in the program with the hope of improving the health and nutritional status of the most poor and food insecure in Mexico. Rigorous evaluations have shown that risk of stunting declines among certain subgroups of children as a result of exposure to Oportunidades (Fernald et al., 2009). However, the risk of obesity increases among caregivers (Fernald et al., 2008), illustrating the need to understand how food insecurity and federal nutrition assistance program participation affect different members of the same household. "This principle can be extended to SNAP," said Pérez-Escamilla, and "to any type of food assistance program in the world."

GROUP DISCUSSION

Moderator: Mary Story

During the group discussion period, points raised by participants included the following:

Influence of the Life Course

Several questions revolved around associations between food insecurity and obesity for specific age groups. Story pointed out that very few studies

have examined the association among the elderly, where she said that much more research is needed. Gundersen said that in the studies to which he has contributed, no relationship was found in adolescents. Pérez-Escamilla pointed out that the growth rate during infancy is an important predictor of childhood obesity risk and that there are major differences in the way breastfed babies grow. This observation raises several largely unresolved questions about the feeding of infants including the influence of food insecurity on exclusive breastfeeding and the introduction of complementary foods before the recommended 6 months of age. There are very few studies that examine food insecurity and breastfeeding behaviors, noted Pérez-Escamilla. One study in Africa demonstrated that women who are food insecure are less likely to breastfeed exclusively, in part because they have doubts about their ability to produce enough milk. This is an area of research where existing scales of food insecurity "don't mean much," unless we examine household food insecurity in relation to infant feeding practices, said Pérez-Escamilla.

Edward Frongillo, Jr., raised the issue of whether food insecurity in children predisposes them to greater risk of obesity later in life. The work that has looked at this question either prospectively or retrospectively is "extremely limited." He also raised several additional issues regarding the standard measures of food insecurity and obesity. "Some of the basic assumptions that we have about what obesity even means in children are, I think, questionable." For example, recent research on the so-called adiposity rebound—in which BMI increases after a low point in childhood—suggests that this phenomenon involves lean tissue rather than fat. "So this very basic idea—that we're looking over patterns of changes in fatness as measured by BMI—is just wrong, most likely, in a developmental sense with children."

Interpretations of Measures

Another consideration is whether "worry" over food supplies, which is the least severe measure of food security—that is, in a psychometric sense—may be one of the most important indicators of stress. "We're going to have to be thoughtful about that," said Frongillo.

Retrospective Studies

Gundersen responded that retrospective studies may help with some of these questions. For example, work with recent immigrants can indicate what they may have experienced in their home countries and how their experiences even 20 years ago may influence the food insecurity status of their adult children today.

Cautions in Modeling Data

Mark Nord raised a caution about the use of controls in modeling research. Good evidence demonstrates that food insecurity is related to stress and that stress is related to overweight, yet evidence also suggests that food insecurity is not related to overweight, Nord pointed out. Studies have to control for stress, because stress can have origins other than food insecurity, but in controlling for stress some of the most important possible pathways to obesity may be overlooked. "An important question is: How much of the stress is related to food insecurity? . . . Is it the kind of stress that matters? I don't know that we have the answer to that at this point," Nord said. Pérez-Escamilla responded that structural modeling can help address such questions, even if statisticians disagree on the mathematics behind such modeling. "Conceptually it forces us to have a reasonable theoretical model in place before we start collecting the data."

Publication Bias

Valerie Tarasuk, citing her own research experiences, agreed that negative publication bias is an important factor. "The literature is only a small window on the findings, because some of us have walked away from negative effects," she said.

Dieting

In response to a question from Elizabeth Dowler about how issues surrounding dieting to lose weight might relate to food insecurity, Laraia responded that very little research-based evidence is available on the subject. However, she also observed that because obesity is more prevalent than food insecurity, episodes of food insecurity may have a relationship to dieting during those episodes or during other parts of a person's life. "Women might be confronted with that horrible cycle of not knowing where the next meal is, being stressed out, and also trying to possibly lose weight. It's all enmeshed, and I'm not sure how we would begin to tease it out. We would need to start with a group of young women who are of normal weight and follow them prospectively, but that would take years, and I don't know if that's necessarily the right question. It is very complicated."

Assessing the Impact of Various Stressors

Frongillo observed that one way to use experimentation in exploring the relationship between obesity and food insecurity is to take advantage

of perturbations in existing systems. For example, in work he has done in Bangladesh, a program was instituted to alleviate poverty among women in an extremely poor population. Researchers looked at four potential forms of stress on these women: food insecurity, domestic violence, workload, and a lack of social support. The research showed that food insecurity was by far the dominant mediator between the alleviation of poverty and improvement in women's well-being.

Laraia responded to this observation by pointing to the possibility that abuse early in life is connected to food insecurity and weight outcomes later in life. Various stressors are highly correlated with anxiety and depression, so it becomes hard to separate causative factors. The dieting issue is also important, she said, especially because dieting can cause a biological stress response.

Episodic Nature of Food Insecurity

John Cook asked about measures of food insecurity that look back over the previous month rather than the previous year. Conditions can change considerably over the course of a year, and food insecurity tends to occur in spells. The episodic nature of food insecurity could be a complicating or exacerbating factor with regard to nutrition and nutritional health. In general, he said, "obesity is an extremely complicated phenomenon, and if there are associations between food insecurity and obesity, they are way more complex than I ever dreamed they could be. I don't really dismiss the idea that there are important relationships . . . even when the predominance of research strongly suggests there aren't."

Diet Quality

In response to a question from Marlene Schwartz about diet quality and obesity, Laraia said that the literature does not point to much of an association, although this may be a consequence of how diet is measured. Diet quality usually is measured through food records or recall covering the past few days, but short-term records, even if accurate, can be misleading. "We probably need to be using the 30-day retrospective food security scale and the 3 days of food recall." Also, the food propensity questionnaire being used in NHANES can capture much more information about diet.

Pérez-Escamilla said that he had a different take on this issue. He has been involved with the adaptation and validation of the U.S. food security measure in different parts of the world, and especially in Latin America, and one of the validation criteria used in addition to poverty is how well the measure correlates with the intake of healthful, nutritious foods such as fruits and vegetables. Using simple and short food frequency question-

naires, he and his colleagues have found in extensive data from Brazil that the measure consistently correlates with fruit and vegetable intake—the more severe the level of household food insecurity, the greater is the reduction in the likelihood that the household consumes fruits and vegetables on a daily basis. Some data from the United States point in the same direction, along with research indicating that food-insecure households are less likely to have access to healthful diets.

Adam Drewnowski, who has conducted some of that research, said that the data on diet quality when stratified by socioeconomic status show two things. First, there is a social gradient for the consumption of certain nutrients and for some food groups. Lower cost grains, fats, and sweets are overconsumed by lower-income groups, and soft drinks are very much overconsumed by the lowest-income groups. By contrast, more fruits and vegetables are consumed by higher-income groups. Even within food categories there are social gradients, so that the consumption of whole fruit is associated with upper-income groups whereas juices are consumed by lower-income groups. This socioeconomic gradient in food consumption patterns is partly explained by the cost of different foods, but other factors, such as taste, convenience, and habit, may also exert an effect.

Christine Olson agreed that the food group least available in food-insecure households is fruits and vegetables. The 24-hour recall of food eaten by adults in food-insecure households includes less fruits and vegetables. Also the nutrients associated with fruits and vegetables are lower in circulating blood levels in adults who live in food-insecure households. The evidence linking insufficient fruits and vegetables and food insecurity is "really strong," said Olson.

Gundersen observed that questions about diet are critically important in health outcomes regardless of any effect on obesity. "I would like to see a workshop on understanding the relationship between food insecurity and nutrient intakes, because that, to me, is the core issue. If you improve people's nutrition, that has benefits, even if they still may be obese or not obese."

REFERENCES

Adam, T. C., and E. S. Epel. 2007. Stress, eating and the reward system. *Physiology and Behavior* 91(4):449-458.

Adams, E. J., L. Grummer-Strawn, and G. Chavez. 2003. Food insecurity is associated with increased risk of obesity in California women. *Journal of Nutrition* 133(4):1070-1074.

Anderson, S. A. 1990. Core indicators of nutritional state for difficult-to-sample populations. *Journal of Nutrition* 120(11S):1557-1600. Report by the Life Sciences Research Office, Federation of American Societies for Experimental Biology, for the American Institute of Nutrition.

Basiotis, P., and M. Lino. 2002. Food insufficiency and prevalence of overweight among adult women. *Family Economics and Nutrition Review* 15(2):55-57.

Bhargava, A., D. Jolliffe, and L. L. Howard. 2008. Socio-economic, behavioural and environmental factors predicted body weights and household food insecurity scores in the Early Childhood Longitudinal Study-Kindergarten. *British Journal of Nutrition* 100(2):438-444.

Briefel, R., and C. E. Woteki. 1992. Development of the food sufficiency questions for the third National Health and Nutrition Examination Survey. *Journal of Nutrition Education* 24:24S-28S.

Bronte-Tinkew, J., M. Zaslow, R. Capps, A. Horowitz, and M. McNamara. 2007. Food insecurity works through depression, parenting, and infant feeding to influence overweight and health in toddlers. *Journal of Nutrition* 137(9):2160-2165.

Casey, P. H., K. Szeto, S. Lensing, M. Bogle, and J. Weber. 2001. Children in food-insufficient, low-income families: Prevalence, health, and nutrition status. *Archives of Pediatrics and Adolescent Medicine* 155(4):508-514.

Chilton, M., and S. Booth. 2007. Hunger of the body and hunger of the mind: African American women's perceptions of food insecurity, health and violence. *Journal of Nutrition Education and Behavior* 39(3):116-125.

Cook, J. T., D. A. Frank, S. M. Levenson, N. B. Neault, T. C. Heeren, M. M. Black, C. Berkowitz, P. H. Casey, A. F. Meyers, D. B. Cutts, and M. Chilton. 2006. Child food insecurity increases risks posed by household food insecurity to young children's health. *Journal of Nutrition* 136(4):1073-1076.

Coplan, J. D., E. L. P. Smith, M. Altemus, S. J. Mathew, T. Perera, J. G. Kral, J. M. Gorman, M. J. Owens, C. B. Nemeroff, and L. A. Rosenblum. 2006. Maternal-infant response to variable foraging demand in nonhuman primates: Effects of timing of stressor on cerebrospinal fluid corticotropin-releasing factor and circulating glucocorticoid concentrations. *Annals of the New York Academy of Sciences* 1071:525-533.

Crossman, A., D. Anne Sullivan, and M. Benin. 2006. The family environment and American adolescents' risk of obesity as young adults. *Social Science and Medicine* 63(9):2255-2267.

DePolt, R. A., R. A. Moffitt, and D. C. Ribar. 2009. Food stamps, temporary assistance for needy families and food hardships in three American cities. *Pacific Economic Review* 14(4):445-473.

Dietary Guidelines Advisory Committee. 2010. *Report of the Dietary Guidelines Advisory Committee on the Dietary Guidelines for Americans, 2010, to the Secretary of Agriculture and the Secretary of Health and Human Services*. Washington, DC: U.S. Department of Agriculture, Agricultural Research Service.

Dixon, L. B., M. A. Winkleby, and K. L. Radimer. 2001. Dietary intakes and serum nutrients differ between adults from food-insufficient and food-sufficient families: Third National Health and Nutrition Examination Survey, 1988-1994. *Journal of Nutrition* 131(4):1232-1246.

Drewnowski, A., and S. E. Specter. 2004. Poverty and obesity: The role of energy density and energy costs. *American Journal of Clinical Nutrition* 79(1):6-16.

Dubois, L., A. Farmer, M. Girard, and M. Porcherie. 2006. Family food insufficiency is related to overweight among preschoolers. *Social Science and Medicine* 63(6):1503-1516.

Eicher-Miller, H. A., A. C. Mason, C. M. Weaver, G. P. McCabe, and C. J. Boushey. 2009. Food insecurity is associated with iron deficiency anemia in U.S. adolescents. *American Journal of Clinical Nutrition* 90(5):1358-1371.

FAO (Food and Agriculture Organization of the United Nations). 1996. Rome Declaration on World Food Security and World Food Summit Plan of Action.

Fernald, L. C. H., P. J. Gertler, and X. Hou. 2008. Cash component of conditional cash transfer program is associated with higher body mass index and blood pressure in adults. *Journal of Nutrition* 138(11):2250-2257.

Fernald, L. C., P. J. Gertler, and L. M. Neufeld. 2009. 10-year effect of Oportunidades, Mexico's conditional cash transfer programme, on child growth, cognition, language, and behaviour: A longitudinal follow-up study. *The Lancet* 374(9706):1997-2005.

Garasky, S., S. D. Stewart, C. Gundersen, B. J. Lohman, and J. C. Eisenmann. 2009. Family stressors and child obesity. *Social Science Research* 38(4):755-766.

Gibson, L. Y., S. M. Byrne, E. A. Davis, E. Blair, P. Jacoby, and S. R. Zubrick. 2007. The role of family and maternal factors in childhood obesity. *Medical Journal of Australia* 186(11):591-595.

Gundersen, C., and B. Kreider. 2009. Bounding the effects of food insecurity on children's health outcomes. *Journal of Health Economics* 28(5):971-983.

Gundersen, C., and V. Oliveira. 2001. The food stamp program and food insufficiency. *American Journal of Agricultural Economics* 83(4):875-887.

Gundersen, C., B. J. Lohman, S. Garasky, S. Stewart, and J. Eisenmann. 2008. Food security, maternal stressors, and overweight among low-income U.S. children: Results from the National Health and Nutrition Examination Survey (1999-2002). *Pediatrics* 122(3).

Gundersen, C., S. Garasky, and B. J. Lohman. 2009a. Food insecurity is not associated with childhood obesity as assessed using multiple measures of obesity. *Journal of Nutrition* 139(6):1173-1178.

Gundersen, C., D. Jolliffe, and L. Tiehen. 2009b. The challenge of program evaluation: When increasing program participation decreases the relative well-being of participants. *Food Policy* 34(4):367-376.

Hamilton, W., J. Cook, W. Thompson, L. Buron, E. Frongillo, C. Olson, and C. Wehler. 1997. *Household Food Security in the United States in 1995: Summary Report of the Food Security Measurement Project*. Alexandria, VA: Office of Analysis, Nutrition, and Evaluation, Food and Nutrition Service, U.S. Department of Agriculture.

Hanson, K. L., J. Sobal, and E. A. Frongillo. 2007. Gender and marital status clarify associations between food insecurity and body weight. *Journal of Nutrition* 137(6):1460-1465.

Hernandez, D. C., and A. Jacknowitz. 2009. Transient, but not persistent, adult food insecurity influences toddler development. *Journal of Nutrition* 139(8):1517-1524.

Jones, S. J., and E. A. Frongillo. 2006. The modifying effects of food stamp program participation on the relation between food insecurity and weight change in women. *Journal of Nutrition* 136(4):1091-1094.

Jones, S. J., and E. A. Frongillo. 2007. Food insecurity and subsequent weight gain in women. *Public Health Nutrition* 10(2):145-151.

Jyoti, D. F., E. A. Frongillo, and S. J. Jones. 2005. Food insecurity affects school children's academic performance, weight gain, and social skills. *Journal of Nutrition* 135(12): 2831-2839.

Kaiser, L. L., M. S. Townsend, H. R. Melgar-Quiñonez, M. L. Fujii, and P. B. Crawford. 2004. Choice of instrument influences relations between food insecurity and obesity in Latino women. *The American Journal of Clinical Nutrition* 80(5):1372-1378.

Kaufman, D., M. A. Banerji, I. Shorman, E. L. P. Smith, J. D. Coplan, L. A. Rosenblum, and J. G. Kral. 2007. Early-life stress and the development of obesity and insulin resistance in juvenile bonnet macaques. *Diabetes* 56(5):1382-1386.

Kirkpatrick, S. I., L. McIntyre, and M. L. Potestio. 2010. Child hunger and long-term adverse consequences for health. *Archives of Pediatrics and Adolescent Medicine* 164(8):754-762.

Koch, F. S., A. Sepa, and J. Ludvigsson. 2008. Psychological stress and obesity. *Journal of Pediatrics* 153(6).

Kuo, L. E., J. B. Kitlinska, J. U. Tilan, L. Li, S. B. Baker, M. D. Johnson, E. W. Lee, M. S. Burnett, S. T. Fricke, R. Kvetnansky, H. Herzog, and Z. Zukowska. 2007. Neuropeptide Y acts directly in the periphery on fat tissue and mediates stress-induced obesity and metabolic syndrome. *Nature Medicine* 13(7):803-811.

Laraia, B. A. 2010. Food insecurity and obesity among adults. Presented at the Institute of Medicine Workshop on Understanding the Relationship Between Food Insecurity and Obesity, November 16, Washington, DC.

Laraia, B. A., A. M. Siega-Riz, and K. R. Evenson. 2004. Self-reported overweight and obesity are not associated with concern about enough food among adults in New York and Louisiana. *Preventive Medicine* 38(2):175-181.

Laraia, B. A., A. M. Siega-Riz, C. Gundersen, and N. Dole. 2006. Psychosocial factors and socioeconomic indicators are associated with household food insecurity among pregnant women. *Journal of Nutrition* 136(1):177-182.

Larson, N., and M. Story. 2010. *Food insecurity and risk for obesity among children and families: Is there a relationship? A research synthesis*. Princeton, NJ, and Minneapolis, MN: Robert Wood Johnson Foundation Healthy Eating Research.

Lohman, B. J., S. Stewart, C. Gundersen, S. Garasky, and J. C. Eisenmann. 2009. Adolescent overweight and obesity: Links to food insecurity and individual, maternal, and family stressors. *Journal of Adolescent Health* 45(3):230-237.

Lyons, A. A., J. Park, and C. H. Nelson. 2007. Food insecurity and obesity: A comparison of self-reported and measured height and weight. *American Journal of Public Health* 98(4):751-757.

Miech, R. A., S. K. Kumanyika, N. Stettler, B. G. Link, J. C. Phelan, and V. W. Chang. 2006. Trends in the association of poverty with overweight among US adolescents, 1971-2004. *Journal of the American Medical Association* 295(20):2385-2393.

Nord, M., and A. M. Golla. 2009. *Does SNAP decrease food insecurity? Untangling the self-selection effect*. Economic Research Report No. 85. Washington, DC: Economic Research Service.

Nord, M., A. Coleman-Jensen, M. Andrews, and S. Carlson. 2010. *Household food security in the United States, 2009*. Economic Research Report No. 108. Washington, DC: Economic Research Service.

NRC (National Research Council). 2006. *Food insecurity and hunger in the United States: An assessment of the measure*. Edited by G. S. Wunderlich and J. L. Norwood. Washington, DC: The National Academies Press.

Olson, C. M. 1999. Nutrition and health outcomes associated with food insecurity and hunger. *Journal of Nutrition* 129(2 Suppl.).

Olson, C. M., and M. S. Strawderman. 2008. The relationship between food insecurity and obesity in rural childbearing women. *Journal of Rural Health* 24(1):60-66.

Pérez-Escamilla, R. In press. Food insecurity and hunger in children: Impact on physical and psycho-emotional development. In *Modern Nutrition in Health and Disease*. 11th ed, edited by C. A. Ross, B. Caballero, R. J. Cousins, K. L. Tucker, and T. R. Ziegler. Baltimore, MD: Lippincott Williams & Wilkins.

Phipps, S. A., P. S. Burton, L. S. Osberg, and L. N. Lethbridge. 2006. Poverty and the extent of child obesity in Canada, Norway and the United States. *Obesity Reviews* 7(1):5-12.

Rose-Jacobs, R., M. M. Black, P. H. Casey, J. T. Cook, D. B. Cutts, M. Chilton, T. Heeren, S. M. Levenson, A. F. Meyers, and D. A. Frank. 2008. Household food insecurity: Associations with at-risk infant and toddler development. *Pediatrics* 121(1):65-72.

Seligman, H. K., and D. Schillinger. 2010. Hunger and socioeconomic disparities in chronic disease. *New England Journal of Medicine* 363(1):6-9.

Seligman, H. K., B. A. Laraia, and M. B. Kushel. 2010. Food insecurity is associated with chronic disease among low-income NHANES participants. *Journal of Nutrition* 140(2): 304-310.

Shrewsbury, V., and J. Wardle. 2008. Socioeconomic status and adiposity in childhood: A systematic review of cross-sectional studies 1990-2005. *Obesity* 16(2):275-284.

Singh, G. K., M. D. Kogan, P. C. Van Dyck, and M. Siahpush. 2008. Racial/ethnic, socioeconomic, and behavioral determinants of childhood and adolescent obesity in the United States: Analyzing independent and joint associations. *Annals of Epidemiology* 18(9):682-695.

Skalicky, A., A. F. Meyers, W. G. Adams, Z. Yang, J. T. Cook, and D. A. Frank. 2006. Child food insecurity and iron-deficiency anemia in low-income infants and toddlers in the United States. *Maternal and Child Health Journal*:1-9.

Slack, K. S., and J. Yoo. 2005. Food hardship and child behavior problems among low-income children. *Social Service Review* 79(3):511-536.

Stenhammar, C., G. M. Olsson, S. Bahmanyar, A. L. Hulting, B. Wettergren, B. Edlund, and S. M. Montgomery. 2010. Family stress and BMI in young children. *Acta Paediatrica, International Journal of Paediatrics* 99(8):1205-1212.

Sweeting, H., C. Wright, and H. Minnis. 2005. Psychosocial correlates of adolescent obesity, "slimming down" and "becoming obese." *Journal of Adolescent Health* 37(5).

Townsend, M. S., J. Peerson, B. Love, C. Achterberg, and S. P. Murphy. 2001. Food insecurity is positively related to overweight in women. *Journal of Nutrition* 131(6):1738-1745.

Van Hook, J., and K. S. Balistreri. 2006. Ineligible parents, eligible children: Food Stamps receipt, allotments, and food insecurity among children of immigrants. *Social Science Research* 35(1):228-251.

Van Jaarsveld, C. H. M., J. A. Fidler, A. Steptoe, D. Boniface, and J. Wardle. 2009. Perceived stress and weight gain in adolescence: A longitudinal analysis. *Obesity* 17(12): 2155-2161.

VanEenwyk, J., and J. Sabel. 2003. Self-reported concern about food security associated with obesity—Washington, 1995-1999. *Morbidity and Mortality Weekly Report* 52(35): 840-842.

Vozoris, N. T., and V. S. Tarasuk. 2003. Household food insufficiency is associated with poorer health. *Journal of Nutrition* 133(1):120-126.

Whitaker, R. C., and A. Sarin. 2007. Change in food security status and change in weight are not associated in urban women with preschool children. *Journal of Nutrition* 137(9): 2134-2139.

Whitaker, R. C., S. M. Phillips, and S. M. Orzol. 2006. Food insecurity and the risks of depression and anxiety in mothers and behavior problems in their preschool-aged children. *Pediatrics* 118(3):e859-868.

Wilde, P. E., and J. N. Peterman. 2006. Individual weight change is associated with household food security status. *Journal of Nutrition* 136(5):1395-1400.

Yoo, J. P., K. S. Slack, and J. L. Holl. 2009. Material hardship and the physical health of school-aged children in low-income households. *American Journal of Public Health* 99(5):829-836.

Zaslow, M., J. Bronte-Tinkew, R. Capps, A. Horowitz, K. A. Moore, and D. Weinstein. 2009. Food security during infancy: Implications for attachment and mental proficiency in toddlerhood. *Maternal and Child Health Journal* 13(1):66-80.

Zeller, M. H., J. Reiter-Purtill, A. C. Modi, J. Gutzwiller, K. Vannatta, and W. H. Davies. 2007. Controlled study of critical parent and family factors in the obesigenic environment. *Obesity* 15(1):126-136.

3

Socioeconomic Disparities: Food Insecurity and Obesity

Key Messages Noted by Participants

- The prevalence of overweight and obesity among children and adults in the United States has increased dramatically over the past several decades.
- Obesity and poverty are associated, and food insecurity and poverty often coexist.
- It was noted that studies of food insecurity and obesity often fail to control adequately for differences in socioeconomic status (SES), leading to the mistaken conclusion that a characteristic linked to an unmeasured socioeconomic condition is due to a biological, cultural, or racial/ethnic factor.
- Socioeconomic status is a fundamentally multidimensional construct, and it is important that studies are designed to measure dimensions of SES that are most relevant to the subject population and the health outcome of interest, and that researchers are aware of the limitations of SES measures and the effect those limitations could have on conclusions.
- New ways of thinking about food and food systems could yield sustainable and healthful associations with food.

Studies of food insecurity often draw connections to measures of socioeconomic status (SES), noted Adam Drewnowski, professor of epidemiology and director of the Center for Public Health and Nutrition at the University

of Washington, who moderated the session on socioeconomic disparities, food security, and obesity. Measures of socioeconomic status have many shortcomings, for example, they typically are based on "snapshot" measures of current income or education. Such measures of income do not measure accumulated assets and wealth, and such measures of education can have little bearing on the current economic status of a person who is 50 and unemployed. A person's employment status may be measured at one point in time, but that job could be lost the next day, noted Drewnowski. Furthermore, SES measures typically do not reflect economic insecurity, which is a measure of desperate need.

New and different measures to better understand economic security are important in understanding the relationship between food insecurity and obesity, said Drewnowski. Should such factors as assets, wealth, property values, neighborhood in which a person lives, or whom a person knows be included? What currently unobserved factors are important?

One question is whether socioeconomic status should be measured along a continuous gradient. Some studies have made income-based dichotomous distinctions between the poor and non-poor. At $19,000 a year, a person is poor. At $21,000 a year, that person is almost middle class, said Drewnowski. Yet SES is a complex construct that may affect health outcomes through diverse mechanisms and at different points in the life course. New ways to measure social disparities may provide new insights on the distribution of food insecurity and obesity among children and adults.

SOCIOECONOMIC INEQUALITIES IN OBESITY

Gopal K. Singh, senior epidemiologist with the Maternal and Child Health Bureau, Health Resources and Services Administration, U.S. Department of Health and Human Services, described trends in obesity and overweight among children, adolescents, and adults and the extent to which socioeconomic disparities in obesity vary across the life course. He used data from three different nationally representative surveys: the National Health and Nutrition Examination Survey (NHANES), the National Health Interview Survey (NHIS), and the National Survey of Children's Health (NSCH). The NHANES has been conducted periodically in the United States since the mid-1970s and since 1999 has been a continuous annual health examination survey with a sample size of about 10,000 children and adults for every 2-year cycle. The NHIS has been conducted continuously since 1957 and has a sample size of about 100,000 children and adults. The NSCH is the largest child health survey in the United States and is conducted every 4 years, with the next survey scheduled for 2011. It has a sample size of about 100,000 children less than 18 years of age. Body mass index (BMI) in NHANES is based on measured height and weight data,

whereas BMI in the NHIS is based on self-reports and BMI in the NSCH is based on parental reports. Thus, each survey uses a different source of information to measure overweight and obesity. The terms used to classify weight status are defined in Box 2-2.

As calculated from these surveys, the obesity prevalence for male children quadrupled between 1976 and 2008 (Figure 3-1). The overall obesity prevalence among children ages 6 to 17 increased threefold during the same time.

For adults, the prevalence of obesity has increased threefold in the past 50 years (Figure 3-2). One in three adults and about 68 percent of the adult population is obese or overweight, respectively, according to most recent statistics. This represents a "dramatic increase in obesity prevalence among both children and adults in the past three decades," said Singh.

For children and adolescents, higher income is associated with lower prevalence of obesity in general (Figure 3-3). This relationship is not so clear for adults ages 18 to 44, 45 to 64, or older than 65. For children in poverty, the prevalence of obesity was 23 percent, as opposed to 8 percent among children whose family incomes exceeded 500 percent of the federal poverty level. If adjusted for gender or age differences, the gradient is more consistent for children and adolescents and not so consistent for adults and the elderly.

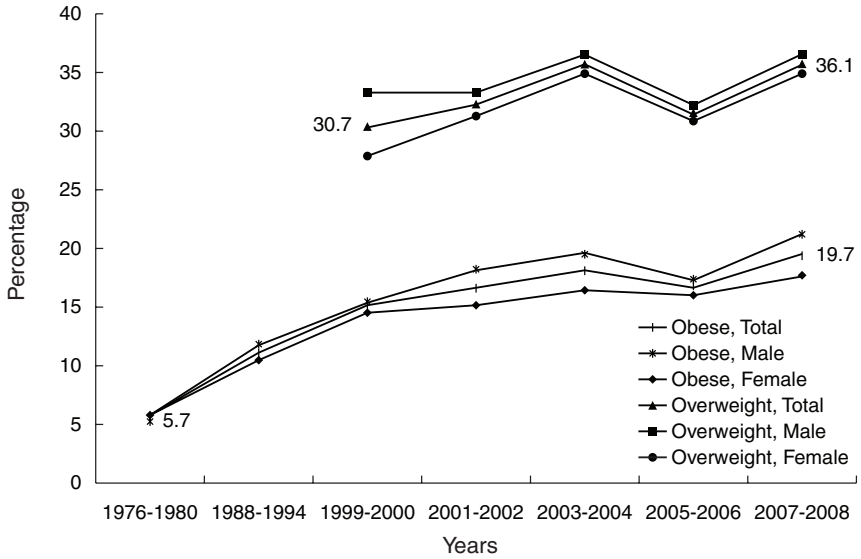

FIGURE 3-1 Trends in obesity prevalence among U.S. children ages 6-17 from 1976 to 2008.
NOTE: Combined male/female data were not adjusted for sex.
SOURCE: Singh and Kogan, 2010.

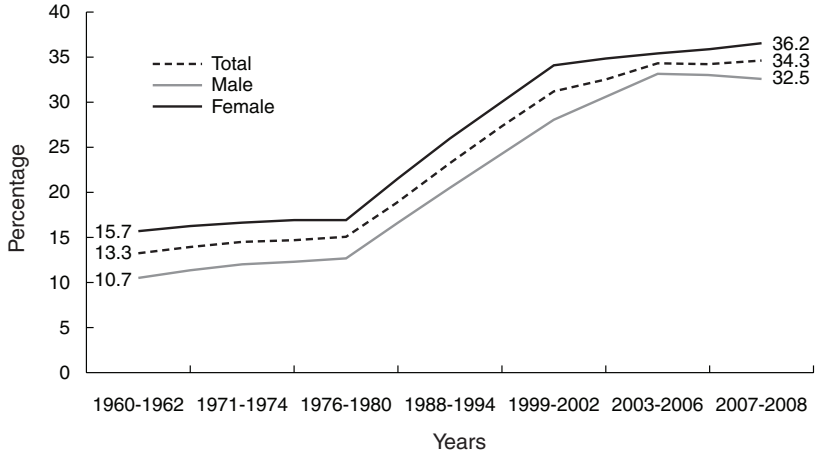

FIGURE 3-2 Percentage trends in age-adjusted obesity prevalence among U.S. adults ages 20-74 from 1960 to 2008.
NOTE: Combined male/female data were not adjusted for sex.
SOURCE: NCHS, 2010; 2007-2008 data from the National Health and Nutrition Examination Survey.

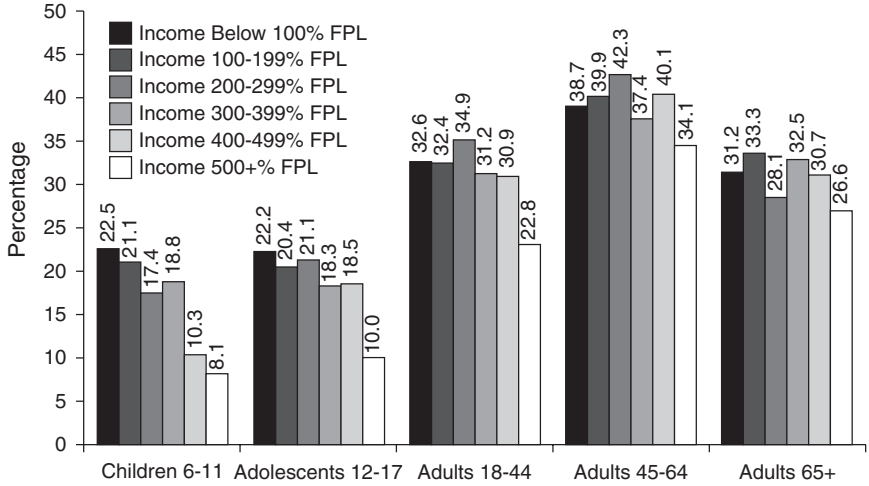

FIGURE 3-3 Socioeconomic disparities in obesity prevalence, in percentage, compared with federal poverty level, across the life course, data from the 2003-2008 National Health and Nutrition Examination Survey (NHANES).
NOTES: FPL = federal poverty level. NHANES provides heights and weights measured by a trained interviewer. Data were not adjusted for race/ethnicity.
SOURCE: Singh, 2010.

The prevalence of obesity and overweight among children ages 10 to 17 varies by household parental education (Figure 3-4). These statistics show that in almost every case, the prevalence of obesity and overweight increased from 2003 to 2007, and the increase was greatest for those with the least education. The same pattern is seen when looking at obesity and overweight prevalence by income or poverty status.

Neighborhood socioeconomic characteristics, measured by indicators such as safety, housing quality, and vandalism, are correlated with childhood obesity risk (Figure 3-5). For example, the prevalence of obesity was 20 percent for children who lived in neighborhoods with unfavorable social conditions as opposed to 15 percent for children who lived in the most desirable neighborhoods. The impact of neighborhood conditions was substantially greater for females and for children under 12 years of age. Singh explained, "As the neighborhood socioeconomic index score goes up, the obesity and overweight prevalence goes down."

For adults, somewhat different patterns have been observed. The increase in prevalence of obesity has been faster among those in the high-education groups, even though the overall prevalence is still lower among this group

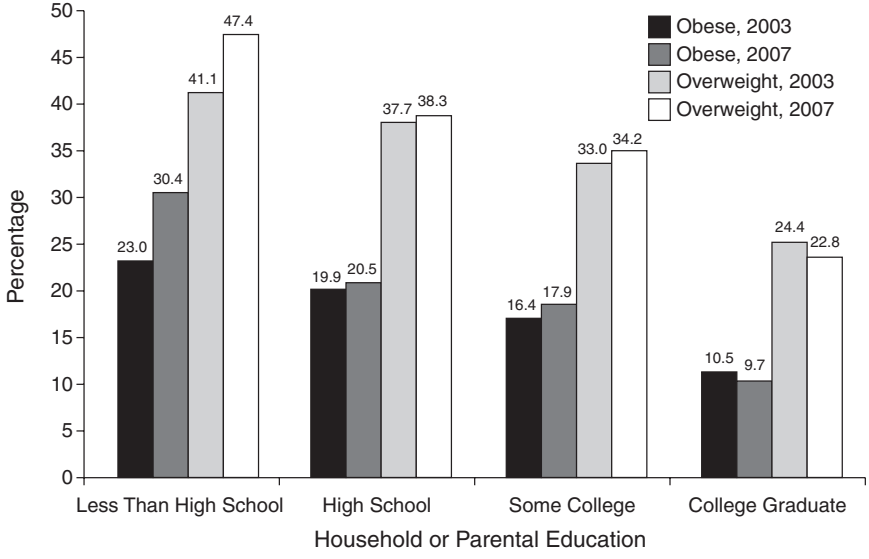

FIGURE 3-4 Percentage trends in obesity and overweight prevalence, among children ages 10-17 by household or parental education; data from the 2003-2007 National Survey of Children's Health.
NOTE: Data not adjusted for race/ethnicity.
SOURCE: Singh et al., 2010a.

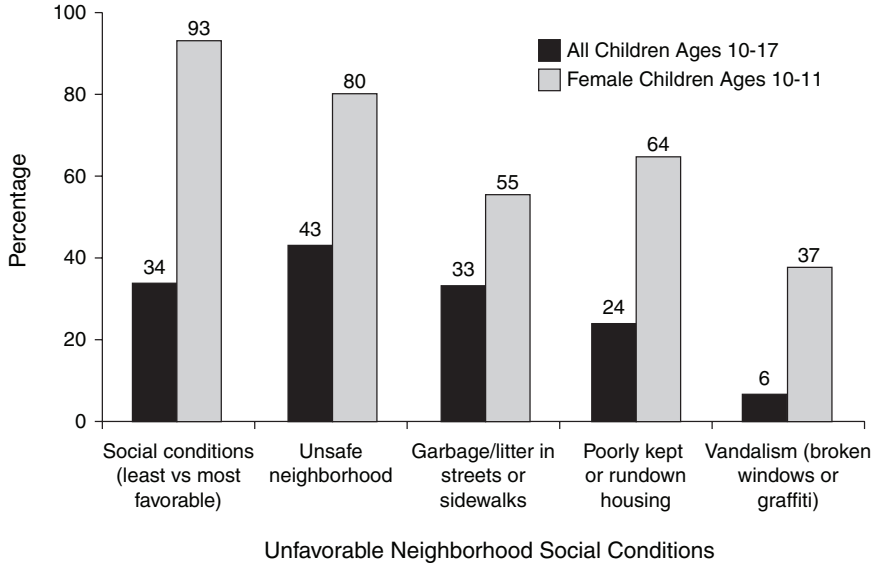

FIGURE 3-5 Excess obesity risk, in percentage of higher prevalence, among children ages 10-17 in unfavorable neighborhood social conditions, 2007.
SOURCE: Singh et al., 2010b.

than in the lower-education groups, and the same pattern applies to income. As a result, the socioeconomic disparity in obesity rates among groups has declined over time (Figure 3-6). The socioeconomic gradients in adult obesity have decreased over time, while the gradients in childhood obesity have increased because there have been faster increases in prevalence of obesity.

In looking for possible reasons for recent increases in childhood obesity, Singh cited an increase in the proportion of socially disadvantaged populations and possible dietary factors. The mean calorie and fat intake among youth has increased consistently over time. Among adults, declining physical activity levels and increasing total energy intake appear to be contributing factors. Also, differences in dietary quality among SES groups have narrowed over time, with higher-SES individuals losing their relative advantage.

THE NEED TO IMPROVE MEASURES OF SOCIOECONOMIC STATUS

Paula Braveman, professor of family and community medicine at the University of California at San Francisco, did not talk about either food insecurity or obesity. She spoke about measuring socioeconomic status be-

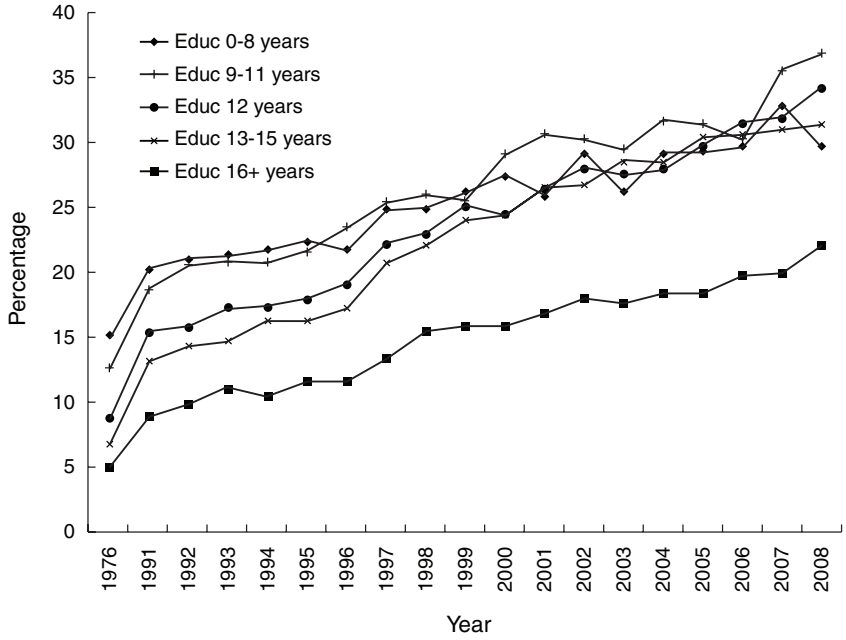

FIGURE 3-6 Percentage trends of educational inequalities in prevalence of obesity among adults older than 2, 1976-2008 National Health Interview Surveys.
NOTE: Educ = Education (years of school completed). NHANES provides heights and weights measured by a trained interviewer. In contrast, NHIS height and weight data are self-reported, which may be less accurate.
SOURCE: Singh et al., 2011.

cause it is so critical to the issues discussed at the workshop. Much of the information Braveman shared was previously presented in a 2005 journal article (Braveman et al., 2005).

Description of SES

SES is a widely used but rarely defined term, she said. Most commonly, it is measured by income, education, occupation, or wealth. Wealth refers to accumulated financial assets as opposed to income, which reflects the relatively recent (typically the prior month or year) financial situation, noted Braveman. More broadly, SES can be defined as ownership of, control over, or access to economic resources and the social standing or influence associated with those resources. "It defines where people are relative to each other in a pecking order determined by economic resources and the associated

social influence and social standing. It is fundamentally a multidimensional construct," explained Braveman.

SES and Health Outcomes

In the United States, health data traditionally have been reported by racial/ethnic group and much less frequently by any markers of SES. When SES is considered in such studies, said Braveman, one measure or occasionally two are generally used to describe SES, and the rationale for the measure selected—or acknowledgment of relevant measures that were not selected—is rarely given. Education is often used as a proxy for income, which is more sensitive to measure. Researchers typically say that they have controlled for SES through the use of income or education, but most studies fail to consider explicitly and fully the potential causal role that these or other closely linked socioeconomic factors may have played, either as a mediator or as a moderator[1] of effects on the outcomes of interest.

This failure to account for SES raises many concerns. For example, health studies often conclude that a racial/ethnic difference in outcome must be biological or cultural because it persists after the researchers have controlled for one or perhaps two SES measures. However without adequate measurement of SES, it is impossible to assess accurately its role in health, Braveman stated. Nor is it possible to assess accurately the relationship between any predictor variable of interest—particularly race/ethnicity—and any health-related outcome variable for which SES is relevant, which includes most health outcomes and health behaviors.

Dimensions and Specifications of SES

Using population-based data from four national sources and one state source—the California Maternal and Infant Health Assessment—Braveman presented examples to illustrate these points. She referred to different "dimensions" and "specifications" of SES. The dimensions are general constructs such as income, wealth, education, and occupation, while specifications are the specific ways of measuring an SES construct—for example, whether it is continuous or categorical, is measured at different points in the life course, or applies to the household or the neighborhood.

[1]A mediator is the mechanism by which one variable affects another variable. A moderator is a variable that changes the impact of one variable on another.

Education and Income Are Not Collinear

The first question to ask is whether education, which is often assumed to be collinear with income, really correlates so closely with income as to be considered collinear, both overall and across different racial/ethnic groups, said Braveman. Examination of multiple specifications of these two dimensions (income and education) showed that conclusions did not vary by specification. Therefore, Braveman presented only one specification of each. In data from the National Health Interview Survey, at the same educational level, income varies substantially by racial/ethnic group (Table 3-1). "At every level of education you see very large differences in income across racial/ethnic groups." Education is an important SES measure in its own right, and it may better capture some causal pathways than income does, "but it is not an acceptable proxy for income," Braveman concluded.

Similarly, poverty levels (income expressed in increments of the federal poverty level) and educational levels are only modestly or weakly correlated. Across all five of the datasets Braveman considered, the Spearman correlation coefficients ranged, with a few minor exceptions, between 0.42 and 0.50. To further assess the importance of selecting appropriate SES measures, Braveman showed data from analyses in which a model was constructed that looked at racial/ethnic disparities in health outcomes and asked whether the conclusions about disparities (the size, direction, and statistical significance of odds ratios) would vary according to the SES measure used. Table 3-2 shows the results of one such comparison. As measures of SES are added to statistical models, the odds of adverse health outcomes compared to whites range from 2.47 to 1.53 for African Americans and from 2.16 to 0.86 for Mexican Americans. A similar variation in odds ratios exists when considering racial/ethnic disparities in delayed or no prenatal care. In fact, "we found this for the vast majority of the indicators that we looked at—that it really could make a difference which SES marker you chose." The differences were not necessarily statistically significant, but

TABLE 3-1 Mean Family Income by Educational Level and Racial/Ethnic Group, National Health Interview Survey 1989-1994, Ages 18-64

Educational Level (years)	Black	Mexican American	White
< 9	$15,503	$19,104	$22,707
9-11	$17,743	$22,377	$28,573
12	$25,337	$30,945	$37,853
13-15	$33,026	$37,642	$43,197
16+	$46,815	$48,055	$55,277

SOURCE: Adapted from Braveman et al., 2005.

TABLE 3-2 Odds Ratio for Racial/Ethnic Disparities in Fair or Poor Health Among Adults Ages 18-64—National Health Interview Survey 1989-1994

	Odds Ratio (95% CI)[a]	
SES Measure in Model[b]	African American	Mexican American
No SES measure (baseline)	2.47 (2.30-2.64)	2.16 (2.01-2.32)
Poverty level[c]	1.65 (1.56-1.76)	1.30 (1.22-1.39)
Income, per $1,000[d]	1.67 (1.57-1.78)	1.44 (1.32-1.56)
Educational level[e]	1.96 (1.85-2.08)	1.06 (0.99-1.14)
Education, per 1 year	2.02 (1.91-2.14)	0.89 (0.82-0.97)
Poverty level and educational level	1.53 (1.45-1.61)	0.86 (0.81-0.93)

NOTE: CI = confidence interval; SES = socioeconomic status.
[a]White, non-Hispanic is the reference group.
[b]All models included race/ethnicity, age, and sex.
[c]Annual income estimated in categories defined by 100% increments of the federal poverty level according to family or household size (0-10%, 101-200%, 201-300%, 301-400%, >400%, unknown).
[d]Annual income in continuous dollars estimated as the midpoints of a given income range.
[e]Completed education in levels according to earned credentials (<9 years, some high school, high school graduate or general equivalency diploma, some college, college graduate or more).
SOURCE: Braveman et al., 2005. *Journal of the American Medical Association* 294(22): 2879-2888, December 14, 2005.

a researcher could reach very different conclusions about a racial/ethnic disparity based on the SES measure used.

The results of these analyses conducted by Braveman and colleagues also underscore the conclusion that SES is a fundamentally multidimensional construct. For most outcomes, model fit was improved when both education and income were included. "We do not think you can capture SES with a single measurement, yet that is the prevailing standard."

Wealth

Wealth is very rarely measured in U.S. health studies, but it can be very important for health, noted Braveman. Wealth could buffer the effects of temporarily low income, and it is more likely to reflect socioeconomic circumstances in childhood. Lack of information on wealth could present problems in assessing the effects of SES among racial/ethnic groups, across which wealth varies greatly, as shown in Table 3-3. In the poorest quintile of the U.S. population, for example, non-Hispanic whites have more than

TABLE 3-3 Median Net Worth by Income for Three Racial/Ethnic Groups, 2000

Income Quintile	White	Black	Hispanic Origin
Lowest (poorest)	$24,000	$57	$500
Second	$48,500	$5,275	$5,670
Third	$59,500	$11,500	$11,200
Fourth	$92,842	$32,600	$36,225
Highest (richest)	$208,023	$65,141	$73,032

NOTE: Median net worth is an indicator of wealth.
SOURCE: Adapted from Orzechowski and Sepielli, 2003.

400 times the wealth of African Americans. Without controlling for wealth, studies could potentially conclude erroneously that a health disparity is based on underlying biological or cultural differences, because they have not controlled adequately for SES.

Other Factors

Other factors that are rarely measured but may have important associations with health include quality of education, occupational ranking, socioeconomic features of a neighborhood such as the concentration of poverty in it and related physical and social features, subjective social status, or past socioeconomic experiences, said Braveman. The evidence regarding the magnitude of the health consequences of each of these SES factors is not definitive and is sometimes controversial. "But there is a large body of evidence—and certainly in each case you would find a number of respected experts who believe—that these factors are very, very important as determinants of health, either as mediators or moderators."

As an example, Braveman discussed the potential effects of past SES on health. Experiences in utero or early childhood could have crucial effects that are not entirely erased by more favorable later circumstances. The effects of chronic deprivation also could differ from those of short-term deprivation. In addition, these past experiences may not be reflected in current or short-term SES measures. For example, among women who recently delivered live infants in California and who are college graduates, the percentage of the college graduates who were raised by a college-educated parent (an indicator of their socioeconomic circumstances in childhood) ranges from 19 percent for U.S.-born Latinas to 35 percent for African-American women to 59 percent for white women.

Selecting and Interpreting SES Measures

The choice of SES measure—particularly the dimension selected and potentially the way it is specified—can matter in disparities research. Furthermore, the same SES measure may have different meanings in different social groups, as demonstrated by the different correlations between education and income and between income and wealth across racial/ethnic groups.

Measures of SES need to be selected by thinking carefully about plausible pathways and mechanisms, not through "one-size-fits-all" approaches, recommended Braveman. Specific questions to ask when selecting an SES measure include the following:

- Which dimensions of SES might be important for this health outcome?
- What role could neighborhood socioeconomic conditions play?
- What role could socioeconomic experiences in childhood have played?
- Do the relevant socioeconomic measures have different meanings across different social groups (e.g., by age, gender, race/ethnicity, geography, country of birth)?

These questions have implications not just for researchers, but also for public health practitioners and policy makers. "I would hope that [decision makers] would be critical when they read studies . . . and would ask what potentially relevant socioeconomic measures were not examined and how that could affect the conclusions," Braveman cautioned. In particular, it is important to critically examine a claim that researchers have "controlled for SES" in studies of racial/ethnic disparities.

Measuring all of the relevant dimensions of SES is probably impossible, Braveman concluded. Yet paralysis is not the inevitable consequence, as long as researchers consider and acknowledge the limitations of SES measures and what effect those limitations could have on conclusions. Better SES data are needed, but researchers also could make much better use of the data they have, she said, by thinking critically about the potential role of a range of socioeconomic factors in causal pathways leading to health or disease.

EVERYDAY REALITIES

Beyond the discussion of inequalities, food security, and obesity are many people struggling with everyday realities, said Elizabeth Dowler, professor of food and social policy in the Department of Sociology at the University of Warwick, United Kingdom. The economic crises of recent years have made the situation even worse, and food prices are beginning to rise again, after a period of relative containment following their spike

a few years ago. People are overwhelmed by how and what to eat so that they and their children are not hungry, how to get to work if they have a job, and how to fill their days productively if they do not. Researchers and policy makers need good indicators and frameworks for understanding causal mechanisms, but they also need "compassionate imagination" to interpret the findings of research.

As demonstrated by the previous two talks, SES is complex and multidimensional. Dowler suggested that one way to interpret this complexity is by examining poverty in terms of three sets of factors (Spicker, 2007):

1. Material deprivation—encompassing such factors as physical needs, ill health, and bad housing
2. Economic circumstances—relating inequality, occupational status, employment, and the structure of opportunities
3. Social relationships—referring to social exclusion, marginality, dependency, powerlessness, and inability to participate

These factors overlap, said Dowler, but also can be distinct.

This interpretation raises several conceptual and policy challenges, particularly in relation to food and health. Should attention focus on the absolute lowest-income families or on the lowest deciles? Should the policy aim be to reduce differentials or to improve the lives of those who are worst off? Should income or environmental factors be the focus of interventions? Should specific groups be targeted or the whole population? Is the problem material or economic poverty or a lack of cultural and social capital?

Reducing Inequalities

Researchers in the United Kingdom have established consensual minimum income standards for different household types that include sufficient food to meet requirements for health (Davis et al., 2010). This minimum income standard forms the basis of the campaigns for a "living wage"—which is above the national statutory minimum wage—a campaign that has met with some success.[2] The income standard meshes with the idea of household food security—that people should have access to sufficient, safe, affordable, and healthful food appropriate for their needs and culture. They also should be free from anxiety about whether they can eat properly. However, these objectives present other questions in trying to understand people's circumstances and needs. Do people have enough money to buy healthful food when other essential expenditures are met? Can they get to shops selling the range of food needed at reasonable prices? Is food more

[2]See http://www.citizensuk.org/campaigns/living-wage-campaign/ (accessed January 27, 2011).

expensive in the shops poorer people use? What is the quality of the food where poorer people live? What kind of food is available at institutions such as schools and workplaces? Do people have the skills, confidence, time, and equipment to cook? Are people able to eat socially or share food?

Reducing inequalities is not the same as improving nutritional health for those who are worst off. Recent policy documents in Europe, such as *Closing the Gap in a Generation: Health Equity Through Action on the Social Determinants of Health* (Commission on Social Determinants of Health, 2008) and *Fair Society, Healthy Lives: A Strategic Review of Health Inequalities in England* (Marmot et al., 2010), have urged the reduction of the gradient of inequalities. Yet actual policies have tended to focus on the most disadvantaged and to urge "lifestyle" change, rather than focus upstream on structural dimensions that shape immediate practice and long-term thinking. Thus, recent policies that only aim to encourage people to "eat the right food" or "give up smoking" are ignoring the immediate and wider reasons why unhealthful behaviors (as regarded by health professionals) are adopted. Interventions against obesity may need to be both upstream and targeted more broadly to have an effect. Of course, there may be particular problems for people living in particular circumstances and conditions, which Dowler said will require targeted interventions. For instance, it may be that in areas of multiple deprivation the majority of places where food can be obtained are the cheapest fast-food outlets, which are not conducive to healthful eating. However, Dowler asked whether it is more likely that the problems are much more generalized and that the drivers of rising obesity affect many within the population, except the very richest. These questions challenge both research and policy.

Social Capital

Social capital—the resources available to individuals through their social behaviors and membership in community networks—has been shown to have a positive link with food security and with a lower risk of hunger at a household level in the United States (Martin et al., 2004). European theorists have looked at social exclusion, "which is not quite the same thing, but it does recognize that multidimensional disadvantage for people and areas and its role in perpetuating deprivation," noted Dowler. European attention to social exclusion has informed approaches to reducing health and social inequalities—and to some extent those in food—in the United Kingdom, though arguably not in obesity.

Structure Agency Debate

Obesity is an excellent example of what sociologists call the "structure-agency debate," said Dowler. Structure refers to the environmental factors and social forces that shape people's thinking such as preferences, practices, the media, and advertising. Yet people are also self-conscious beings able to participate in and change the societies in which they live. Dowler said that we have the capacity and "the potential to exercise our own choice and influence on our daily lives."

There is current debate over the role of physical, economic, retail, and media environments in shaping what is normative versus people's understandings and capacity to effect their own decisions about eating behaviors. Research on lay knowledge and understanding about body size and obesity illuminates this tension. Several researchers have drawn upon Bourdieu's notion of "habitus"—how people view the world from within their own social position and experiences to make sense of possibilities, disposing them toward particular attitudes and expectations in their research studies. Coveney (2005) in Australia, and Backett-Milburn et al. (2006) in the United Kingdom, have revealed the social class distinctions in parental attitudes toward their children's body sizes and how these fit with their goals and expectations. The researchers found that middle-class families value taste and variety, restraint and control over eating and the body, and healthiness now and in the future. Working-class families, however, tend to eat in more traditional ways, with tastes molded by supermarkets and advertising; individual autonomy over food is important, even for young people, and their focus is more on "here and now"—that children are growing well or keeping active.

Obesity is not just about inappropriate consumer choice to be addressed by changes in labeling and exhortations to walk more. It is a marker, Dowler said, of a food system that is failing to deliver healthful food to all. "It is failing to provide true food security and a food system that is sustainable environmentally and socially, and this is despite huge technological innovations." New ways of thinking about food and food systems are being developed by public health advocates, policy makers, social scientists, food producers, and many others. "These different ways of growing, processing, retailing, sharing, preparing, and eating foods not only reconnect producers and consumers to one another and to the natural world, but [represent] a different relationship to food." Dowler said that she had not seen a reduction in BMI as a consistent measured outcome of studies of such innovations as growing your own food on a community plot or shopping at a local market. "But I do know a lot of anecdotal evidence that suggests that healthier living, including feeling better about yourself and your eating, is a consistent result [of those sorts of activities]."

GROUP DISCUSSION

Moderator: Adam Drewnowski

During the group discussion, points raised by participants included the following:

Gauging Economic Security

Adam Drewnowski asked what measures besides income could be used to gauge economic security. Braveman responded that she has worked on the possibility of more simplified wealth measures because "that is one of the big obstacles to the use of wealth in health research." Calculating net worth involves going through a person's assets and debts, "and that is not going to happen in any health survey," although some economic surveys take such an approach. At least six or seven questions would have to be asked to capture wealth, which would be difficult to do in a health survey. Some countries use home ownership as a measure of wealth, but this would be more difficult to do in the United States. Some surveys ask how hard it is to get by on the amount of income a person or household earns, and others ask about unpaid bills. Yet either of these measures can apply to people at all income levels. Another possibility for retrospective studies is asking individuals how often, as a child, a family was worried about having enough money to cover the basics, such as food or housing. Braveman said that she and her colleagues will continue to work on measures of economic security, and she would like to see others do the same.

Singh responded to the same question by saying that the health surveys he uses do not contain a range of measures that could capture wealth and assets. One possible way to make up for this lack is to use data from the decennial census or the American Community Survey to look at area-based income and wealth indicators. Data about housing values, housing tenure, and mortgage payments can be linked to national health surveys at the record level or at the area level.

Occupation as an Economic Measure

Drewnowski also asked Dowler about the use of occupation in the United Kingdom as an economic measure. She replied that the same problem occurs in the United Kingdom as in the United States, with complex issues of wealth being reduced to a few simple measures. She also stated that economic insecurity is as complex a condition as income and wealth. "What may be economically insecure for one person of course doesn't look so economically insecure for somebody else." Qualitative research can uncover indicators of economic insecurity, but they include such measures as

the presence of parents, having good neighbors, kinship networks, and loan availability. These indicators are not always obvious. For example, poorer neighborhoods can have a stronger sense of social capital, as suggested by the observation that poorer people give away a greater proportion of their incomes than do richer people.

Frongillo observed that simply having more data may not be sufficient, because multiple measures interact in complex ways. "One of the challenges will be to get better information and also figure out how to use it."

Education to Approximate Income

John Cook asked how to reconcile the idea that education cannot readily be associated with income given the premise of human capital development that the two are closely linked. Drewnowski pointed to the situation in Seattle, Washington, where 50 percent of the population has a college education but incomes do not necessarily correlate with that measure. "We have a very highly educated population and yet there is dissociation between education and incomes." However he also pointed to a stepwise effect of education where simply completing college was protective of obesity. Singh explained that education does not explain *all* the differences in income or occupation. The error made in some research is to control for one indicator of SES and then attribute the remaining effect to a social or demographic characteristic. Braveman agreed that education is very important in determining life chances, but "it is not sufficient on its own. There are other dimensions as well."

REFERENCES

Backett-Milburn, K. C., W. J. Wills, S. Gregory, and J. Lawton. 2006. Making sense of eating, weight and risk in the early teenage years: Views and concerns of parents in poorer socio-economic circumstances. *Social Science and Medicine* 63(3):624-635.

Braveman, P. A., C. Cubbin, S. Egerter, S. Chideya, K. S. Marchi, M. Metzler, and S. Posner. 2005. Socioeconomic status in health research: One size does not fit all. *Journal of the American Medical Association* 294(22):2879-2888.

Commission on Social Determinants of Health. 2008. *Closing the gap in a generation: Health equity through action on the social determinants of health. Final report.* Geneva: World Health Organization.

Coveney, J. 2005. A qualitative study exploring socio-economic differences in parental lay knowledge of food and health: Implications for public health nutrition. *Public Health Nutrition* 8(3):290-297.

Davis, A., D. Hirsch, and N. Smith. 2010. *A minimum income standard for the UK in 2010.* York, UK: Joseph Rowntree Foundation.

Marmot, M., J. Allen, P. Goldblatt, T. Boyce, D. McNeish, and M. Grady. 2010. *Fair society, healthy lives: A strategic review of health inequalities in England, post-2010.* London: The Marmot Review.

Martin, K. S., B. L. Rogers, J. T. Cook, and H. M. Joseph. 2004. Social capital is associated with decreased risk of hunger. *Social Science and Medicine* 58(12):2645-2654.

NCHS (National Center for Health Statistics). 2010. *Health, United States, 2009: With special feature on medical technology.* Hyattsville, MD: National Center for Health Statistics.

Orzechowski, S., and P. Sepielli. 2003. *Net worth and asset ownership of households: 1998 and 2000.* Current Population Reports, P70-88. Washington, DC: U.S. Census Bureau.

Singh, G. K. 2010. Trends in socioeconomic disparities in obesity across the life course, United States, 1976-2008. Unpublished analysis of 2003-2008 NHANES data. Presented at the Institute of Medicine Workshop on Understanding the Relationship Between Food Insecurity and Obesity, November 16, Washington, DC.

Singh, G. K., and M. D. Kogan. 2010. *Childhood obesity in the United States, 1976-2008: Trends and current racial/ethnic, socioeconomic, and geographic disparities*. A 75th Anniversary Publication. Health Resources and Services Administration. Maternal and Child Health Bureau. Rockville, MD: U.S. Department of Health and Human Services.

Singh, G. K., M. Siahpush, and M. D. Kogan. 2010a. Rising social inequalities in US childhood obesity, 2003-2007. *Annals of Epidemiology* 20(1):40-52.

Singh, G. K., M. Siahpush, and M. D. Kogan. 2010b. Neighborhood socioeconomic conditions, built environments, and childhood obesity. *Health Affairs* 29(3):503-512.

Singh, G. K., M. Siahpush, R. A. Hiatt, and L. R. Timsina. 2011. Dramatic increases in obesity and overweight prevalence and body mass index among ethnic-immigrant and social class groups in the United States, 1976-2008. *Journal of Community Health* 36(1):94-110.

Spicker, P. 2007. *The idea of poverty.* Bristol, UK: The Policy Press.

4

Sentinel Populations

Key Messages Noted by Participants

- Study of some specific groups within a population may provide insights into the relationship between food insecurity and obesity in broader populations.
- Economic and cultural variations between specific groups may be related to varying rates of obesity later in life, although obesity is high throughout the general population.
- Government food and antipoverty programs have varying impacts on specific population groups because of geographic, cultural, linguistic, and political differences.
- Young, low-income children may be an important sentinel population, if food insecurity influences nutritional programming during development and increases risk of obesity later in life.
- New immigrants have high rates of food insecurity and share characteristics that may mediate between food insecurity and obesity.
- Very high rates of obesity and food insecurity among Native Americans point to possible causal mechanisms linking the two.
- In rural populations, the relationship between food insecurity and obesity is likely bidirectional and may be affected by the persistent poverty, reservation of food for children, tendency to binge when food is available, and lack of quality mental health services and health promotion programs, all of which have been reported in these populations.

In the third session of the workshop, four speakers discussed "sentinel populations"—specific groups within a population that might help to elucidate possible links between food insecurity and obesity. As moderator Mariana Chilton, associate professor in health management policy at Drexel University, pointed out, such groups cannot easily and clearly be bounded. Children, immigrants, American Indians, and rural populations—the four groups discussed in the session—could all be represented in the same household. Nevertheless, focusing on distinct subgroups within an overall population offers a way to examine more closely the relationship between food insecurity and obesity.

YOUNG CHILDREN AS A SENTINEL POPULATION

John Cook, associate professor in the Department of Pediatrics at the Boston University School of Medicine, has been studying children under the age of 3 years in five states as a sentinel population to detect the effects of food insecurity on child health. He began his talk by pointing out, as described in Chapter 2, that the link between food insecurity and obesity is elusive. Although a few studies have found that children living in food-insecure households are more likely to be obese than children who are food secure, most studies have found no evidence of a direct relationship (Larson and Story, 2010). Still, the question remains whether sentinel surveillance of a population of young children could yield useful information about the prevalence or incidence of obesity among different groups, including the overall population of young children, subpopulations of young children, subpopulations distinguished by socioeconomic status (SES) or ethnicity, adolescents, all children, or adults.

Sentinel surveillance is a system in which a prearranged sample agrees to report all cases of one or more notifiable conditions. Such systems have been established for HIV infection, sexually transmitted diseases, influenza, and other diseases. Surveillance involves monitoring the rate of occurrence of specific conditions to assess the stability or change in health levels of a population. The study of disease rates in a specific cohort, geographic area, or population subgroup can point to trends in the larger population, revealing notable changes before they affect the general population, said Cook. A subpopulation may be especially vulnerable to a disease and experience higher disease rates before the general population. It also could be a subpopulation in which the occurrence of or exposure to a disease at one age or life-cycle phase reliably predicts occurrence of disease at a later age or life-cycle phase. "That is the sense in which it makes sense to think of young children as a sentinel population," Cook said.

The prevalence of obesity varies by age and race/ethnicity (Figure 4-1). The prevalence is not as high for younger children ages 2 through 5 years

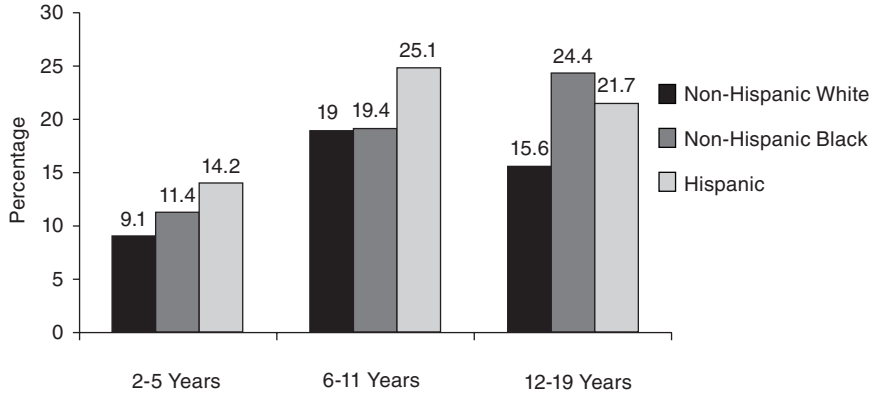

FIGURE 4-1 Obesity (gender- and age-specific BMI ≥ 95th percentile) prevalence by age and race/ethnicity, National Health and Nutrition Examination Survey 2007-2008. Obesity rates are higher for non-Hispanic black and Hispanic children than for non-Hispanic white children at different ages.
SOURCE: Adapted from Ogden et al., 2010.

as for older children. However, the prevalence of obesity for this group has risen over time, although it has leveled off in recent years (Figure 4-2).

Obesity Across the Life Span

Research that has examined the link between obesity in young children and later obesity has found strong links. According to Guo et al. (2002), children and adolescents with a high body mass index (BMI) percentile according to the Centers for Disease Control and Prevention's (CDC's) BMI-for-age growth charts have a high risk of being overweight or obese at age 35, and the risk increases as those individuals grow older. Stettler et al. (2003) proposed that early infancy is a critical period for the development of obesity, based on their findings that rapid weight gain during early infancy is associated with obesity in childhood as well as young adulthood. Whitaker et al. (1997) report that if parents are obese, it increases their children's risk of adult obesity more than twofold, regardless of their obesity status during childhood. They also report that obese children under age 3 years without obese parents are at a low risk for adult obesity, but obesity among older children is an important predictor of adult obesity, whether or not the parents are obese.

Additionally, food insecurity had significant effects on parental depression, which in turn affected physical health, according to Bronte-Tinkew et al. (2007). They also reported that food insecurity affected parenting

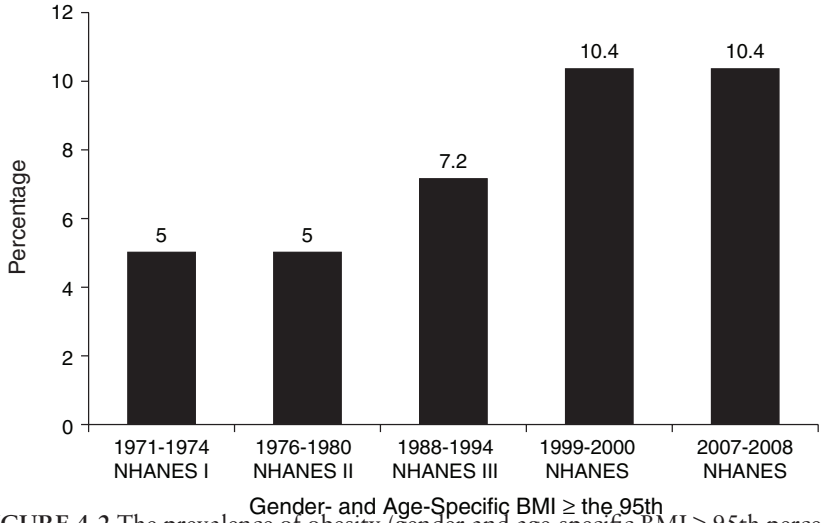

FIGURE 4-2 The prevalence of obesity (gender and age-specific BMI ≥ 95th percentile) among children ages 2-5 has increased over the past four decades.
SOURCE: Adapted from Ogden et al., 2002, 2010.

practices, which were significantly associated with infant feeding and subsequent toddler overweight.

Perinatal Risk Factors

Perinatal risk factors can affect birth outcomes and obesity. The Institute of Medicine (IOM/NRC, 2009a) has recommended weight gain between 16 and 40 pounds during pregnancy depending on the anthropometric characteristics of the mother. From 1990 to 2006, the proportion of mothers who gained less than 16 pounds increased nearly 50 percent, from 8.3 to 12.3 percent (Martin et al., 2009). Over the same period, the percentage gaining more than 40 pounds rose 30 percent, from 16 to 20.7 percent. Weight gain of fewer than 16 pounds during pregnancy is associated with increased risk of intrauterine growth retardation, shortened period of gestation, low birth weight, and spontaneous preterm birth. Weight gain of more than 40 pounds is linked with elevated risk for the mother of gestational diabetes, long-term maternal weight retention, and other adverse maternal outcomes. In addition, during the 1990s the diabetes rate during pregnancy increased by an average of 3 percent per year, and between 2000 and 2006 the pace of increase rose to 6 to 7 percent per year.

Young children at both ends of the birth weight spectrum seem to be at risk with regard to weight gain during pregnancy. Gilbert et al. (2010) con-

cluded that "increasing epidemiological evidence links low birth weight to a syndrome of metabolic changes. These adverse health conditions include increased risk of developing obesity when embryo/fetal undernutrition occurred during the first half of pregnancy." Other evidence indicates that larger babies are at greater risk for eventual obesity, measured by overall BMI (Oken and Gillman, 2003).

Nutritional Programming

The observations on perinatal risk factors relate to the idea of nutritional programming, which refers to the concept that an insult or stimulus applied at a critical or sensitive period may have long-term or lifetime effects on the structure or function of an organism (Lucas, 2005). A growing body of evidence shows that too little or too much maternal weight gain in pregnancy can influence nutritional programming and obesity in offspring. Low birth weight infants are at greater risk for central obesity, while high birth weight infants are at risk of high BMI and obesity.

Given these observations, young children may be a sentinel population for obesity, Cook said. Low-income young children may be an especially relevant sentinel population if food insecurity influences nutritional programming through the lack of availability of food to the mother during pregnancy. However, additional research is needed to clarify whether food insecurity influences nutritional programming and—if so—how, Cook said.

IMMIGRANTS

One way in which immigrants differ from other possible sentinel populations is that fewer data are available to draw conclusions, said Sara Quandt, professor of epidemiology and prevention at Wake Forest University School of Medicine. She therefore drew from small-scale studies and personal experiences to describe food insecurity and obesity among immigrants.

In 2008, about 12.5 percent of the U.S. population was foreign born, representing an increase from 11.1 percent since 2000. About two-thirds of the growth in the U.S. population over those 8 years is attributable to the native-born population, and about one-third is due to immigrants. Mexico is the leading region of origin for immigrants to the United States. South and East Asia represent the next-largest contributor, followed by the Caribbean and Central and South America. Combining Mexico and Central and South America, 45 percent of the foreign-born population in the United States comes from Latin American, stated Quandt.

Although immigrants come from many regions, they tend to move to particular regions in the United States. Table 4-1 lists the states with

the largest foreign-born populations. Border states and traditional entry points for immigration top the list, but some states that traditionally have not had large foreign-born populations now do. For example, Georgia had a 58 percent change in immigration between 2000 and 2008; Virginia, a 39 percent change; and North Carolina, almost 50 percent. Immigrants to these and other states were moving to regions that do not have long-standing and established immigrant communities. It's quite a different thing for these immigrants to arrive in Georgia, where there are few services equipped to help them, than to arrive in California or in Texas, said Quandt.

The age structure of new immigrants also tends to be different than for native populations of earlier immigrants. There are few foreign-born Hispanic children in the United States; most of the children in this population are native born, many living in families where their parents and perhaps older siblings are foreign born. Quandt focused specifically in her talk on the Latino population in the United States.

Among the most important considerations in the life of new immigrants is documentation status. "Those of you who work with immigrant populations and listen to what they say know that this runs everything. We have a lot of people here without legal documents, they're reluctant to access services, they're reluctant to drive, and in most states now they can't

TABLE 4-1 Change in the Foreign-Born Population, by State, 2000 and 2008

State	2008	2000	Change, 2000-2008	Percentage Change, 2000-2008
California	9,856,283	8,885,299	970,984	10.9
New York	4,224,175	3,864,227	359,948	9.3
Texas	3,874,847	2,900,232	974,615	33.6
Florida	3,404,395	2,666,010	738,385	27.7
Illinois	1,787,358	1,533,949	253,409	16.5
New Jersey	1,727,049	1,471,566	255,483	17.4
Arizona	938,300	662,174	276,126	41.7
Massachusetts	934,858	771,627	163,231	21.2
Georgia	911,770	578,636	333,134	57.6
Washington	806,131	616,840	189,291	30.7
Virginia	793,415	569,787	223,628	39.2
Maryland	707,450	516,935	190,515	36.9
Pennsylvania	664,202	507,847	156,355	30.8
North Carolina	642,409	432,083	210,326	48.7
Michigan	580,382	521,150	59,232	11.4

SOURCE: Pew Hispanic Center, 2010.

get drivers' licenses, and so they have to have a very good reason to drive somewhere. Going to a grocery store or to a WIC [Special Supplemental Nutrition Program for Women, Infants, and Children] program may not be a good enough reason to put themselves at risk." Even those who have legal documents fear that they will be assumed to be illegal, in which case they could be locked up and their children could come home from school and find no one there, noted Quandt.

Many immigrant families have mixed documentation status. A child born in the United States is a citizen while parents may not have the appropriate documents. "What happens is that the attitudes and activities of the family go to the lowest common denominator. If somebody in the family is not documented, then everybody acts like they're not documented."

Eligibility for government benefits is another important consideration. Welfare reform has created considerable confusion about public assistance. Many immigrants have lost eligibility for SNAP (Supplemental Nutrition Assistance Program) and other programs. Many people do not know about benefits even if they are eligible for them, or people may harbor misconceptions about programs—for example, that they will need to pay back any money they receive. Finally, many immigrants are ashamed to admit that they lack food. "Oftentimes, people come and they live in communities with others from back home, and they're very much afraid that word is going to get home that they can't take care of their children."

Immigrants have to change the ways they shop, produce, and consume food in a new country. Many were food producers, and now they are food purchasers. They are exposed to an abundance of low-priced, high-sugar, high-fat foods. They also have access to unfamiliar foods, and they may have substandard housing or an inability to cook or store food.

Many immigrants do not speak English, and those from Latin America may speak many different languages as a first language, with some of these languages being unwritten. New immigrants tend to be poor, with low-wage jobs, precarious employment, and seasonal pay cycles. They deal with racism and discrimination, which affects their willingness to use services and may restrict where they buy food. Sometimes women are working outside the home for the first time.

Many of these households are transnational, so parents have left even their young children in their home country with grandparents. They need to send money home, so getting them to talk about food security is difficult. They see their family here and there as part of the same network, which creates complex issues for measures of food insecurity.

Food Insecurity and Obesity Among Immigrants

Several small studies indicate that these families experience considerable food insecurity (Kasper et al., 2000). For example, one early-childhood longitudinal study has found that the children of foreign-born mothers have about twice as high rates of food insecurity as the children of native-born mothers (Kalil and Chen, 2008). However, the evidence for food security and obesity being connected in this population is "very mixed," said Quandt. Some studies say yes and some say no. The results appear to be closely related to issues of sampling and measurements, said Quandt (Quandt et al., 2006).

Despite the ambiguity of current evidence, mixed-method studies that combine quantitative and qualitative approaches point to factors that could potentiate the relationship between food insecurity and obesity, including monotony, emotional eating, feeding children preferentially, and cycles of food restriction. For example, fathers might leave the house so that children are able to eat, or mothers will not eat so children can eat. Families also might choose less expensive items that are assumed to be equivalents, such as fruit-flavored sweetened beverages instead of orange juice.

Acculturation appears to be related to obesity (Rosas et al., 2009). For example, boys have higher rates of obesity than do girls depending on whether the mother was born in the United States, moved to the country as a child, or moved as an adult (Van Hook et al., 2009). Language proficiency is also relevant. The lower the language proficiency of the mother, the more obesity is seen.

Quandt pointed to several high-priority research topics:

- Focusing on the heterogeneity of immigrants, including their country of origin, where they live, parental SES, and the gender of children
- Documenting variation in the food insecurity experiences among immigrants, including persistent food insecurity and cyclical food insecurity
- Untangling the processes by which food insecurity can affect body weight among immigrants

"I'm a big proponent of mixed methods simply because then we can start to understand what's going on," Quandt said, in particular, how food ways and physical activity patterns change in immigrants. Quandt suggested longitudinal and retrospective studies to trace food security and other experiences over time.

NATIVE POPULATIONS

Researchers need to avoid what Derek Sayer termed the "violence of abstraction," said Kathleen Pickering Sherman, professor and chair of the

Department of Anthropology at Colorado State University. These are real lives and real people. "There's a lot of joy and humor on the Indian reservations where I've had the privilege to work, and I hope to share some of that with you as well," she said.

As with the immigrant population, incredible diversity exists across the 564 federally recognized tribes. This diversity further increased when the U.S. census made it possible to report ethnicity as mixed and more people began self-reporting as having Native ancestry. One-third of Native people live on reservations and Designated Statistical Areas, which refers mostly to Oklahoma. Some live in cities, while others live in extremely isolated reservations. A handful of very wealthy tribes have been able to profit from casinos, but that is not the experience of most Native people in the United States. Approximately 26 percent of American Indians in the United States live below the poverty line, and in some reservations, such as the Pine Ridge Reservation in South Dakota where Pickering Sherman has worked, more than half of the people live in poverty. All Native populations have "the shared history of land alienation, dispossession of resources, and having to adapt to a government that was imposed on them."

American Indians and Alaskan Natives, even those who are full-time, year-round wage workers, earn much less than the median income for the U.S. population as a whole. Also, the returns on education for Native Americans in general are lower than for other groups, in part because of their dedication to returning to and giving back to their reservation communities.

Among American Indians, 67 percent are overweight, and 34 percent of American Indian and Alaskan Native men and women are obese. These "astronomical" rates of obesity have dire health consequences. One in six American Indians is diagnosed with diabetes, and 95 percent of those with diabetes are overweight. Tribes such as the Pima demonstrate amazingly high rates of diabetes—more than 50 percent—so much so that they have become a research gateway for looking at the effects of genetics on obesity for Native Americans. Policy clearly plays a role in these rates, because in some cases the same tribal ethnic communities reside on both sides of the Mexican or Canadian borders, yet there are different rates of obesity for the populations across the borders. "There's something more than just genetics going on," said Pickering Sherman.

Access to Food

For many people on reservations, access to food can be a great challenge. Many reservations have significant food deserts,[1] where people have

[1] A geographic area, particularly lower-income neighborhoods and communities, where access to affordable, quality, and nutritious foods is limited (IOM/NRC, 2009b).

to go a long way to get food. As one person interviewed on a reservation said, "We don't have big stores like in Rapid [City]. If you've gone into Sioux Nation [the local grocery store], and look, the first thing you see is pop, chips, donuts, and candy, and all of the fruits in the back. All of the [healthful food] is in the back of the store, everything that's bad for you is right there in the front. I went and, you know, our food ain't the best here. It's not very good fruit. For this program, if we want really good fruit we have to go to Rapid (120 miles one way) and buy it at Wal-Mart, and you go for quantities."

Some of the research Pickering Sherman has done at the Pine Ridge Reservation looks at the coping strategies people use to maintain food security on a daily basis. These are very dynamic households, she noted. "Every aspect of economic life of households on a reservation is constantly moving—household composition, whether you're in or out of wage work, what kinds of resources you're bringing to bear, how you're responding to short-term and long-term health conditions. You really miss the ball when you try to annualize any of these kinds of measures."

A survey developed in concert with community members asked whether there was a time in the past year when the person being surveyed did not have enough food. For the 300 participants on the Pine Ridge Reservation, half said yes. Most pointed to economic hardships as the reason they did not have enough food. Thirty-two percent mentioned the expectation of sharing, which also occurs with borrowed money. "For Lakota people it's considered culturally shameful to be a borrower, but it's considered a good thing to be generous, so people will report what they gave or what they loaned to other people, but will underreport what they received or whom they borrowed from."

Food Assistance Programs

Special food access programs occur on reservations. The Food Distribution Program on Indian Reservations (FDPIR), started in 1977 as one of the Food Stamp Act renewal programs, has a critical influence on nutrition availability and affordability. "The reach of this commodities program is tremendous."

Pickering Sherman's research has found a strong association between poverty and food insecurity. Many social and cultural circumstances surround the consumption and distribution of food. Yet programs such as FDPIR and SNAP focus on individuals or household units. "We need to think about community-based measures for understanding food access and food insecurity," Pickering Sherman said. When asked about food sharing, for example, 91 percent of the respondents said that they share food with people not living in their household, so a community-level orientation for

food research is necessary. As one person said, "Everyone shares food here. It's a Lakota trait. We share with whoever needs it. It's a tradition that when someone comes into the house, you're supposed to feed them." Another respondent said, "No one has ever starved to death, because of the kinship system. Everyone has somewhere to go. Even strangers are treated as kin."

The U.S. Department of Agriculture (USDA) has tremendous potential to improve food security and the relationship with health on reservations, according to Pickering Sherman. The FDPIR and SNAP programs together represent 45 percent of the sources of food for reservation residents in Pine Ridge. In contrast, only 3 percent of the total food consumed is wild food, although 65 percent of households still hunt, fish, and gather wild plants. The Lakota people often mention the idea of restoring access to wild plants instead of using land for other purposes, such as leasing it for cattle production.

Many households prefer to use SNAP rather than FDPIR, in part because it is more flexible. About 58 percent of households use SNAP, and 41 percent use FDPIR. Also, some people suspect that the food provided by FDPIR cause diabetes, though there is no research substantiating such an association.

The reduction of TANF (Temporary Assistance for Needy Families) benefit levels has caused confusion around SNAP. As people stay away from TANF, more pressure is being put on limited food dollars. The FDPIR program avoids some of these problems by providing foods that can be shared.

A Holistic Approach

Finally, Pickering Sherman said that people need places to engage in physical activity to help control weight. "I want to make a pitch for a holistic approach. When you link food security, health, physical activity, and economic (and cultural) revitalization, then you can start coming up with community-based solutions to food problems."

RURAL POPULATIONS

In the United States there are two primary definitions of rural, said Christine Olson, professor in the Division of Nutritional Sciences at Cornell University. Using the definitions adopted for the 2000 Census of "rural" as open country and settlements less than 2,500 people, about 21 percent of the U.S. population was classified as rural in 2000. Nonmetropolitan areas, in contrast, are counties outside the boundaries of metropolitan areas. Using that definition, about 17 percent of the U.S. population lived in nonmetropolitan counties. There are 2,052 nonmetropolitan counties in

the United States (Figure 4-3). Seventy-five percent of the land area in the United States today is nonmetropolitan.

The low population density in rural areas means there are fewer services, and the services might be of lower quality. This is particularly true in the area of health, including mental health. "You might not have an M.D. psychiatrist within 200 miles of where you live in a rural community. You might get your primary health care related to mental health from a family physician." Also, having a long distance to travel to services may influence the cost of those services or the adherence to treatment.

The population in rural areas has a different composition than the population in urban areas. The population is older, and a higher proportion of people have disabilities. In self-rated health measures that are done in many surveys, rural residents are more likely to rate their health as poor than are urban residents.

A smaller proportion of rural residents have gone to college. About 16 percent of the people in nonmetropolitan areas have 4-year college degrees, compared with about 27 percent in metropolitan counties.

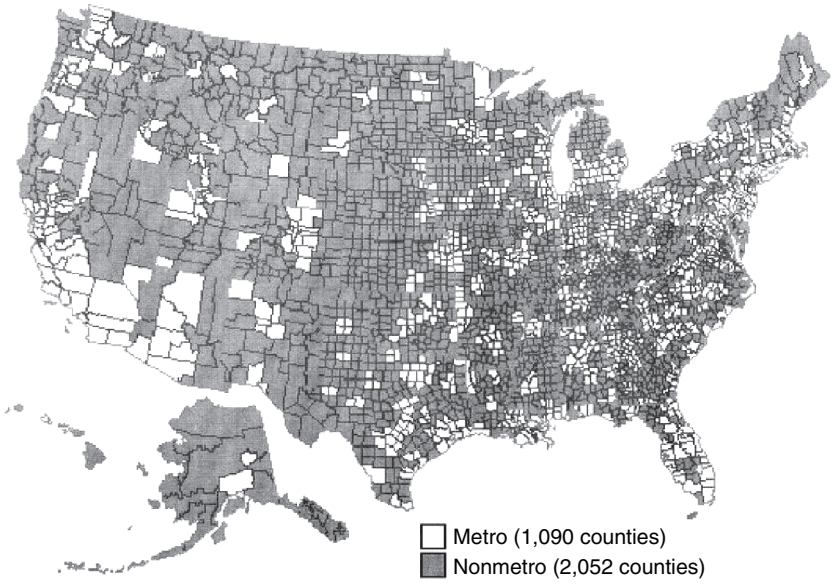

FIGURE 4-3 Nonmetropolitan counties constitute 75 percent of the land area of the United States and contain about 20 percent of the U.S. population.
SOURCE: ERS, 2007. See http://www.ers.usda.gov/briefing/rurality/whatisrural/ (accessed January 10, 2011).

Underemployment and unemployment are more common in rural areas. Farming is no longer the primary occupation among rural residents. For people who live in nonmetropolitan counties, nonfarm employment accounts for 61 percent of total income. At the same time, wages in nonmetropolitan areas are only about 60 percent of those in metropolitan areas for a similar job. The cost of living can be lower outside metropolitan areas, but the wage differential has been getting bigger rather than smaller. Poverty rates are higher in nonmetropolitan areas than metropolitan areas.

Using 2008 data, food insecurity among all households is slightly lower in nonmetropolitan areas (14.2 percent) than in metropolitan areas (14.7 percent) (Nord et al., 2009). Yet using the same data, nonmetropolitan households with children are more likely to be food insecure (22 percent) than households with children in metropolitan areas (20.8 percent). The prevalence of obesity (defined as a BMI ≥ 30) is higher among rural adults (23 percent) than urban adults (20.5 percent) (Jackson et al., 2005). When childhood overweight is defined as a BMI for age and sex above the 95th percentile, rural children (ages 10-17 years) are more likely to be overweight than urban children (Liu et al., 2008). Thus, using the data presented, both food insecurity and obesity are more common in nonmetropolitan than metropolitan areas among households with children.

Research Findings

Olson has done much of her work in the area surrounding Ithaca, in upstate New York. In a longitudinal study of 28 rural households below 200 percent of the federal poverty line and having at least one child less than the age of 13, one observation that comes out "loud and clear," said Olson, is that adults restrain their eating and divert food to their children (Bove and Olson, 2006). According to a quotation from Eliza, "I don't like to waste food, so sometimes I'll find myself eating what the kids left over on their plates. . . . When things are low you don't think about sitting down and having that complete meal." Or as Therica said, "I go hungry for like 2 days and then I'll eat. . . . 'Cause I normally don't eat, I let the kids eat, and then I go for 2 days without eating and then when I do eat, it's big meals that I eat." This is not healthful in terms of avoiding obesity in the long run, Olson said.

Adults in Olson's survey also consume large quantities of sugar-sweetened beverages to cope with eating few solid foods. "I can't tell you how many women told us, 'I buy a 2-liter bottle of sugared soda for 99 cents, and that's what I consume for the day when things really get tight.' Or they go to work—coffee is free at work—and drink coffee all day with two sugars and cream."

After a period of deprivation, when the check comes in or they have gone shopping, people can eat much more. One woman described such a period as being like Christmas because the household had cookies. Emotional eating as a response to stress, including the stress of food insecurity, was also common in the sample. Women described such eating as "binging." There also was an association between this emotional eating pattern and weight: 74 percent of overweight or obese women report binging, compared with only 44 percent of the normal-weight women. The only underweight woman in the sample reported that she had the opposite reaction to stress and did not eat.

A longitudinal study that followed women from early in their pregnancies to 2 years' postpartum provided a way to track food insecurity, body weight, and weight gain over time (Olson and Strawderman, 2008). Being obese early in pregnancy was associated with being food insecure 2 years after childbirth, but food insecurity in early pregnancy was not associated with obesity 2 years after childbirth. The interaction of initial obesity and food insecurity was strongly related to major weight gain over time. Based on this result, Olson and her colleagues looked for a common element that predicts both food insecurity and increased risk of weight gain. In a separate study of the consequences of growing up poor, there was an association between childhood socioeconomic status and being overweight or obese in adulthood (Olson et al., 2007). Olson and her colleagues looked at several mechanisms behind this observation, and an important one that emerged is overeating as a generalized response to negative emotions.

In poor families, persistence of food insecurity is common. Olson said that more than half of the families with low food security in her survey remained there 1 year later. Among the factors that constrain becoming food secure are chronic health conditions and having depressive symptoms. Factors that support becoming food secure are having more than a high school education and 2 years of employment prior to the time being sampled.

Numerous studies have found a positive relationship between food insecurity and obesity in adult women but not men, said Olson. Few studies have explored in depth any of the possible mediating mechanisms, but suspected mediators include overconsumption of energy-dense, low-nutrient foods; decreased consumption of fruits and vegetables and associated nutrients; and disrupted eating patterns and feelings of deprivation. In rural populations, a long-term history of poverty and food insecurity makes it challenging to achieve food security and healthful body weight in adulthood. The relationship between food insecurity and obesity is likely bidirectional. Obesity may increase the risk of becoming food insecure. Food insecurity may make it harder to lose weight. In addition, lack of quality mental health services and health promotion programs is a barrier to solving the problems of food insecurity and obesity in rural areas.

COMMON THEMES

In the final talk of the session on sentinel populations, Valerie Tarasuk, professor in the Department of Nutritional Sciences at the University of Toronto, highlighted several key issues. All of the talks on sentinel populations brought to life the hard statistics of poverty and obesity among these groups while also revealing the complexity of these conditions. The depth and persistence of poverty, the marginalization that comes with those conditions, the racism and discrimination these groups face, and their inability to access services are common threads across sentinel populations, even though each context is multifaceted and unique.

At the individual level, food access and food consumption patterns are rooted in issues of profound poverty, but they also reflect variations in stress and in physical activity. In particular, Tarasuk affirmed that obesity is a product of both energy intake and energy expenditures, and both have to be examined to understand the problem.

The complexity of these relationships is one reason why it is so difficult to delineate a relationship between food insecurity and obesity, said Tarasuk. This complexity also has implications for future research. First, it is important to focus on the life experiences of food insecurity starting in the womb. Stress and nutritional deprivation are obvious aspects of these experiences, but life history encompasses much more, including food insecurity within households in general. A second research topic is the persistence of food insecurity, which takes a different toll on health and well-being. The measure of food insecurity used today does not go beyond 12 months, but body weights are attained and change over decades.

Obesity is a much more widespread problem than food insecurity, Tarasuk observed. About two-thirds of American adults are overweight or obese, and one-third of American children are. Even if every food-insecure person in the country were to lose weight, many Americans would still be overweight or obese. As a consequence, all Americans have a baseline risk factor driven by sedentary lifestyles and suboptimal diets and food supplies. Finding measures of individual susceptibility within that baseline can be difficult. "That's a fundamental epidemiological problem," she said. "We don't have enough variants in the population, because everybody has a baseline risk factor."

The possibility of a link between food insecurity and obesity is still a useful question, but Tarausk said that broader issues also need to be examined. A meeting focused on obesity would treat food insecurity as just a minor factor because the former is so much more prevalent than the latter. At the same time, food insecurity is linked to publicly supported food assistance programs, which can make it a politically freighted issue.

GROUP DISCUSSION

Moderator: Mariana Chilton

During the group discussion period, points raised by participants included the following:

Obesity as a Contributing Factor to Food Insecurity

Christine Olson raised the issue of obesity being a contributing factor to food insecurity rather than the other way around. She noted that obesity can be a stigmatizing condition in rural communities. "The kinds of jobs that lower-income women can get are in the service sector, and how you look—if you have good teeth, if you have a pleasing body shape—is important to being effective as you're standing behind the desk at the local hotel, which might be the kind of service job you could get." In this case, the link between food insecurity and obesity is not through a nutritional pathway but through an economic pathway.

Tarasuk noted that the same argument can be made from the data showing that obesity declines with income and wealth, though she added that the widespread prevalence of obesity in society might be expected to reduce the stigma associated with being overweight or obese. However, Nicolas Stettler pointed to data showing that the stigma attached to obesity for children has gotten worse over time.

Craig Gundersen speculated about the negative consequences of tying food insecurity too closely to obesity. For example, some policy makers might be tempted to link food assistance programs to obesity and conclude that such programs should be curtailed to reduce obesity. Another participant echoed this concern, saying that she once heard a local official raise doubts about the existence of food insecurity and hunger based on the reasoning that if those phenomena actually existed, then people wouldn't be overweight and obese. Quandt agreed that members of the general population can use a link as "an avenue for discrimination and racism."

Native American Populations

In response to a question about whether Native Americans on reservations exhibit differences in food insecurity and obesity from Native Americans elsewhere, Pickering Sherman observed that Native Americans living in cities are very diverse both genetically and culturally. "The one thing that they have most in common genetically is white ancestry—what are you really able to glean from that?"

Obesity and Housing Values

Adam Drewnowski pointed to a study in Washington State that looked at the link between obesity and the value of the homes in which people live. This gives a much broader range of distinctions, since the housing values used in their study ranged from $100,000 to $4 million. Just within Seattle, this study found disparities of sixfold in obesity rates. "We had some [groups] with 5 percent obesity and others with 35 percent obesity." These distinctions are most obvious for women. "If you are a woman, the best thing to do is own your house and make sure it's worth more than a million dollars, and the obesity rates go way down."

Obesity and Diet Quality

Tarasuk raised the issue of the link between obesity and diet quality, observing that the differences in obesity between groups of people with higher- and lower-quality diets are less than would be expected (Tarasuk et al., 2007).

Role for Emergency Food Networks

Elizabeth Campbell with the University of California at Berkeley Atkins Center for Weight and Health pointed to the role of emergency food networks in combating food insecurity. In particular, public-private partnerships can be quite effective in fighting food insecurity. The relationship between the two may not be well documented now, but this solution should not be overlooked.

REFERENCES

Bove, C. F., and C. M. Olson. 2006. Obesity in low-income rural women: Qualitative insights about physical activity and eating patterns. *Women and Health* 44(1):57-78.

Bronte-Tinkew, J., M. Zaslow, R. Capps, A. Horowitz, and M. McNamara. 2007. Food insecurity works through depression, parenting, and infant feeding to influence overweight and health in toddlers. *Journal of Nutrition* 137(9):2160-2165.

ERS (Economic Research Service). 2007. *Measuring rurality: What is rural?* http://www.ers.usda.gov/briefing/rurality/whatisrural/ (accessed November 2010).

Gilbert, M. E., R. MacPhail, J. Baldwin, V. C. Moser, and N. Chernoff. 2010. Moderate developmental undernutrition: Impact on growth and cognitive function in youth and old age. *Neurotoxicology and Teratology* 32(3):362-372.

Guo, S. S., W. Wu, W. C. Chumlea, and A. F. Roche. 2002. Predicting overweight and obesity in adulthood from body mass index values in childhood and adolescence. *American Journal of Clinical Nutrition* 76(3):653-658.

IOM/NRC (Institute of Medicine and National Research Council). 2009a. *Weight gain during pregnancy: Reexamining the guidelines*. Washington, DC: The National Academies Press.

IOM/NRC. 2009b. *The public health effects of food deserts: Workshop summary.* Washington, DC: The National Academies Press.

Jackson, J. E., M. P. Doescher, A. F. Jerant, and L. G. Hart. 2005. A national study of obesity prevalence and trends by type of rural county. *Journal of Rural Health* 21(2):140-148.

Kalil, A., and J. H. Chen. 2008. Mothers' citizenship status and household food insecurity among low-income children of immigrants. *New directions for child and adolescent development* 2008(121):43-62.

Kasper, J., S. K. Gupta, P. Tran, J. T. Cook, and A. F. Meyers. 2000. Hunger in legal immigrants in California, Texas, and Illinois. *American Journal of Public Health* 90(10):1629-1633.

Larson, N., and M. Story. 2010. *Food insecurity and risk for obesity among children and families: Is there a relationship? A research synthesis.* Princeton, NJ, and Minneapolis, MN: Robert Wood Johnson Foundation Healthy Eating Research.

Liu, J., K. J. Bennett, N. Harun, and J. C. Probst. 2008. Urban-rural differences in overweight status and physical inactivity among US children aged 10-17 years. *Journal of Rural Health* 24(4):407-415.

Lucas, A. 2005. Long-term programming effects of early nutrition: Implications for the preterm infant. *Journal of Perinatology* 25(2 SUPPL.).

Martin, J. A., B. E. Hamilton, P. D. Sutton, S. J. Ventura, F. Menacker, S. Kirmeyer, and T. J. Mathews. 2009. Births: Final data for 2006. *National Vital Statistics Reports* 57(7).

Martin, K. S., B. L. Rogers, J. T. Cook, and H. M. Joseph. 2004. Social capital is associated with decreased risk of hunger. *Social Science and Medicine* 58(12):2645-2654.

Nord, M., M. Andrews, and S. Carlson. 2009. *Household food security in the United States, 2008.* Economic Research Report No. 83. Washington, DC: Economic Research Service.

Ogden, C. L., K. M. Flegal, M. D. Carroll, and C. L. Johnson. 2002. Prevalence and trends in overweight among US children and adolescents, 1999-2000. *Journal of the American Medical Association* 288(14):1728-1732.

Ogden, C. L., M. D. Carroll, L. R. Curtin, M. M. Lamb, and K. M. Flegal. 2010. Prevalence of high body mass index in U.S. children and adolescents, 2007-2008. *Journal of the American Medical Association* 303(3):242-249.

Oken, E., and M. W. Gillman. 2003. Fetal origins of obesity. *Obesity Research* 11(4): 496-506.

Olson, C. M., and M. S. Strawderman. 2008. The relationship between food insecurity and obesity in rural childbearing women. *Journal of Rural Health* 24(1):60-66.

Olson, C. M., C. F. Bove, and E. O. Miller. 2007. Growing up poor: Long-term implications for eating patterns and body weight. *Appetite* 49(1):198-207.

Pew Hispanic Center. 2010. *Statistical portrait of the foreign-born population in the United States, 2008. Table 12.* Washington, DC: Pew Hispanic Center.

Quandt, S. A., J. I. Shoaf, J. Tapia, M. Hernández-Pelletier, H. M. Clark, and T. A. Arcury. 2006. Experiences of Latino immigrant families in North Carolina help explain elevated levels of food insecurity and hunger. *Journal of Nutrition* 136(10):2638-2644.

Rosas, L. G., K. Harley, L. C. H. Fernald, S. Guendelman, F. Mejia, L. M. Neufeld, and B. Eskenazi. 2009. Dietary associations of household food insecurity among children of Mexican descent: Results of a binational study. *Journal of the American Dietetic Association* 109(12):2001-2009.

Stettler, N., S. K. Kumanyika, S. H. Katz, B. S. Zemel, and V. A. Stallings. 2003. Rapid weight gain during infancy and obesity in young adulthood in a cohort of African Americans. *American Journal of Clinical Nutrition* 77(6):1374-1378.

Tarasuk, V., L. McIntyre, and J. Li. 2007. Low-income women's dietary intakes are sensitive to the depletion of household resources in one month. *Journal of Nutrition* 137(8): 1980-1987.

Van Hook, J., K. S. Balistreri, and E. Baker. 2009. *Moving to the land of milk and cookies: Obesity among the children of immigrants*. Washington, DC: Migration Policy Institute.

Whitaker, R. C., J. A. Wright, M. S. Pepe, K. D. Seidel, and W. H. Dietz. 1997. Predicting obesity in young adulthood from childhood and parental obesity. *New England Journal of Medicine* 337(13):869-873.

5

Socioecological Perspectives: The Individual Level

Key Messages Noted by Participants

- Though individuals are embedded within households, environments, and institutions—which together constitute the socioecological context of a person's life—much can be learned about the relationship between food insecurity and obesity by examining processes that occur at the individual level.
- Research has shown that obesity is linked to health problems and that health problems are related to poor labor market outcomes, which could establish a link between obesity and food insecurity, but the direction of causation remains unclear.
- According to research presented by one speaker, the presence of mental health problems is especially indicative of poor labor market outcomes.
- Families that are persistently poor are more likely to become food insecure than other families, but children from the poorest households have lower rates of obesity than children from near-poor or moderate-income households.
- A framework extending across the life course can help explain the long-term links among socioeconomic position, food insecurity, and health.

The socioecological model is a framework allowing for integration of the multiple elements of a person's life. These elements occur at different levels, including the individual level, the family and household level, the environmental level, and the institutional level. On the morning of the second day of the workshop, speakers examined the link between food insecurity and obesity from each of these perspectives.

A challenge for the socioecological model is moving beyond association to causation, said Christine Olson, who moderated the session that focused on the individual. For example, there is little doubt among researchers that there is an association between food insecurity and obesity for adult women, but are the two causally related, and if so in which direction do the arrows of causation run? "Actually they probably run both ways," said Olson, "and sorting through the amount of a relationship accounted for by the arrows in each direction is an important thing to do." Similarly, it is important to understand what the mediators and moderators of a relationship are if a relationship does exist. Longitudinal studies are especially good for examining these types of questions.

SHORT-TERM DYNAMICS

Colleen Heflin, associate professor at the Truman School of Public Affairs at the University of Missouri, addressed two questions in her presentation:

1. How are obesity and weight change related to the risk of food insecurity in adulthood?
2. How is food insecurity related to the risk of obesity and weight gain in adults?

Of course, individuals are embedded within families, environments, and institutions, all of which interact. Nevertheless, it is possible to try to isolate the factors affecting the individual. In particular, what are the mechanisms that connect food insecurity and obesity, and how do these operate at the level of the individual?

Obesity and the Labor Market

The first possibility is that obesity may adversely affect labor market outcomes. This could occur because of the existence of weight-related health problems, or it could occur directly as a result of employers, coworkers, and clients discriminating against individuals with high weight. The reduction of labor market income then could increase the risk of poverty and food insecurity.

Considerable evidence from both the United States and Europe chronicles the relationship between obesity and health problems, including diabetes, hypertension, and osteoarthritis, said Heflin. For example, the Framingham Heart Study has shown that obesity in adulthood is associated with increased risk of disability throughout life and increased limitations of daily activity.

In addition, a large number of studies indicate that individuals with health problems have poorer labor market outcomes. Individuals with obesity-related health outcomes may not be able to perform certain job functions or may be limited in the amount of a function they can perform. They also may have a lower probability of being employed or may receive a lower wage.

Furthermore, studies have found that weight-related discrimination occurs at every stage of employment. When the weight of a job application is randomly assigned in a description, picture, or videotape but all other background information remains constant, the overweight applicant is consistently judged to be less qualified than an applicant with the same qualifications but a lower weight (Roehling, 1999). In a study of applicants for a sales job, participants rated the overweight applicants as lacking self-discipline, having lower supervisory potential, having poor personal hygiene, and lacking in professional appearance (Puhl and Brownell, 2001). Overweight applicants also are judged less desirable as supervisors and coworkers (Roehling, 1999).

Another set of evidence in this area comes from legal cases that have been brought alleging weight as a factor in a job dismissal or suspension of employment. In a Gallup poll (2003), 20 percent of respondents freely admitted that they would be less likely to hire an applicant if the applicant was overweight. "There is a substantial amount of evidence indicating that obesity and weight gain might be related to labor market outcomes," Heflin concluded.

Recent research supports the conclusion that obesity is associated with poorer labor market outcomes. A study by Lindeboom et al. (2010) that followed 17,000 individuals born in Great Britain in a single week in March 1958 found that obesity at age 33 was associated with lower employment probabilities for both men and women. Tunceli et al. (2006) found that obesity was marginally associated with reduced employment for both men and women after adjusting for baseline sociodemographic characteristics, smoking status, exercise, and self-reported health.

However, the evidence for lower incomes among overweight employees is considerably weaker. Lindeboom et al. (2009) found evidence of a wage penalty for women only, not for men, and the evidence of a wage penalty for women is sensitive to modeling assumptions and identification strategies.

Other support for a link between obesity and labor market outcomes derives from longitudinal studies of women on welfare. Research by Cawley and Danziger (2005) found that white women who were morbidly obese were less likely to work, spent more time on welfare, and earned less. In this study, the effect size was large, on the order of returning to finish high school versus dropping out permanently. However, the same effect sizes were not found for African-American women. Morbidly obese African-American women in the study were found to spend more time on welfare, but they had no difference in labor market outcomes compared to African-American women of lower weight. This finding of a racial difference supports the earlier work of Cawley in which he reported that weight resulted in lower wages among whites but not among African-American women.

Food Insufficiency and Disadvantage

Causality also could run in the opposite direction, Heflin noted. In work that she has done with Mary Corcoran and Kristine Siefert using a longitudinal study of women on welfare, food insufficiency, which is slightly different from food security, was found to be highly correlated with various disadvantages (Corcoran et al., 1999). Women with food insufficiency report lower income, fewer work hours, more use of welfare, lower levels of formal education and job skills, poorer physical and mental health, higher occurrence of domestic violence, and less access to a car and a driver's license. The data from this survey, which followed 750 women over a 7-year period, provide a unique opportunity to understand the short-term dynamics of food insufficiency. Roughly 20 percent of the sample reported food insufficiency during the five data collection waves, with considerable turnover in the population reporting food insufficiency. Although half of the sample never reported food insufficiency, half reported food insufficiency at least once over the 7 years, 21 percent reported food insufficiency only once, while 29 percent reported food insufficiency at multiple times.

Heflin et al. (2007) looked at possible explanations for changes in household food insufficiency. One possibility is that some households are better at managing scarce resources, which in a traditional framework might be related to a measure of human capital such as level of education. An alternative is that a mental health problem or domestic violence might interfere with the ability to budget resources rationally. A woman experiencing domestic violence may not be in control of financial resources or may be hoarding resources in order to escape. A household also could be responding to other demands, such as medical expenses or utilities, rather than food in the face of limited financial resources. Finally, food insufficiency may be related to changes in public assistance or the earned income tax credit, making it important to look at aggregate income.

Mental Health

Heflin's research showed that the presence of individual constraints was supported only for mental health problems. Women who were undergoing transitions involving mental health problems were more likely to experience bouts of food insufficiency. Household income also was related to food insufficiency. However there was less support for the competing demands hypothesis, and factors such as human capital, work skills, and even the number of job losses were not related to transitions in food insufficiency.

"It looks a little bit like a puzzle," Heflin concluded. "Obesity is related to lower labor force participation and wages potentially, but work transitions were not directly related to food insufficiency among low-income women. This suggests that perhaps there is a role for mental health." A longitudinal study (Heflin et al., 2005) found that food insufficiency was significantly related to increases in depression among low-income women after controlling for household composition, income, neighborhood hazards, stressful life events, domestic violence, discrimination, and individual fixed effects. Further examination of this observation by Heflin and Ziliak (2008) looked at the Supplemental Nutrition Assistance Program (SNAP) as a modifier of the relationship between food insufficiency and mental health. SNAP could improve the income available to a household, and the support of the household could lead to an improvement in mental health. Yet SNAP also has an associated stigma and brings the hassles of participating in the program. Heflin and Ziliak found that emotional distress associated with food insufficiency was higher among those who are SNAP recipients. There was some evidence for a dosage effect—food-insufficient individuals who received high amounts of food stamp benefits experienced greater emotional distress than food-insufficient individuals who received lower levels of benefits—and the effect was highest during the transition onto SNAP.

Research Considerations

Heflin pointed to two important research topics:

- **Mismatched Time Horizons:** Food insufficiency is often a very short term problem, said Heflin. Shortages may last only a few days, and they can usually be remedied at low cost. Weight gain, in contrast, is a long-term process. It is the result of cumulative disadvantages, and remedies are costly and difficult to implement. What long-term processes related to obesity do short-term spells of food insufficiency trigger in terms of mental health problems, metabolic processes, or access to food supplies?

- **Subgroup Differences:** There is some evidence that African-American women are protected from the negative effects of obesity and food insufficiency, at least in the labor market. It is unclear if this is also true for other groups. Understanding these subgroup differences and focusing on protective factors may be critical in planning effective interventions.

A LIFE COURSE PERSPECTIVE

As discussed earlier in the workshop, many studies have found that children growing up in poverty and in families of low socioeconomic status (SES) have a slew of negative outcomes overall, said Maria Melchior of the French National Institute of Health and Medical Research. Low socioeconomic position predicts higher rates of death in infancy and childhood, low birth weight, disability—even after accounting for birth characteristics and birth weight, acute illnesses, the recurrence and severity of chronic illnesses, and poor health behaviors such as poor diets (Spencer, 2008). Furthermore, these associations are not limited to the most disadvantaged but are distributed in a gradient across the whole population.

Research also shows that children growing up in disadvantaged conditions have poorer cognitive and behavioral outcomes on average than other children (Berger et al., 2009). As early as age 3, children who grow up in low-SES families tend to have lower language ability and cognitive scores and more behavioral problems.

Evidence regarding the association between childhood health problems and later socioeconomic attainment comes from the British birth cohort studies that followed samples of the general population born in 1946, 1958, and 1970 (Case and Paxson, 2006). Data from these studies suggest that there is a strong link between very early childhood health characteristics such as birth weight and later occupational and socioeconomic attainment in adulthood. Part of this association appears to be mediated by educational attainment because children with health problems tend to have worse academic achievement. Children with physical and behavioral difficulties have more problems concentrating in the classroom and also miss more school days on average, which contributes to their educational outcomes. Poor nutrition may also play a role for children, as in the case of iron deficiency anemia.

The association between childhood health and later academic and socioeconomic attainments is especially strong in children who come from low-SES families. Also children who have poor health are more likely to have health problems in adulthood, which can affect their success in the labor market.

Childhood SES and Health

Melchior has studied the association between childhood socioeconomic position and adult health in collaboration with a group headed by Terrie Moffitt and Avshalom Caspi, who are both at Duke University. They have used data from the Dunedin Multidisciplinary Health and Development Study, which is a birth cohort of 1,000 individuals born in New Zealand in 1972 and 1973 who have been followed regularly until, most recently, age 32. This long-term follow-up has made it possible to study the association between early life characteristics and later health in detail.

In a study of multiple health outcomes at age 32, Melchior et al. (2007) found no association between childhood SES and adult depression or anxiety disorders. However, they found that children growing up in low-SES families were 2.27 times more likely at age 32 to have tobacco dependence, 2.11 times more likely to have alcohol or drug dependence, and 2.50 times more likely to have cardiovascular risk factors, including obesity, high cholesterol, high blood pressure, and low cardiorespiratory fitness.

The longitudinal follow-up of the Dunedin cohort allowed the authors to test some of the mechanisms that might explain these associations. They found that the association between low childhood SES and cardiovascular risk factors decreased when they controlled for parental heart disease, childhood body mass index (BMI), childhood IQ, childhood maltreatment, and adult SES. In the full model, approximately 64 percent of the observed association was explained by these factors. These data suggest that the association between childhood socioeconomic position and adult cardiovascular health is multifactorial, Melchior said.

Food insecurity can be one aspect of low socioeconomic position. Using data from a cohort of 2,000 twins born in Britain in the early 1990s, the Environmental Risk (E-Risk) cohort study, Melchior and her colleagues found that food insecurity in childhood was associated with lower IQ, more behavioral problems, and more emotional problems among children (Belsky et al., 2010). These associations remained even after accounting for such factors as household income, health and personality, parenting characteristics, and childhood maltreatment.

Mental Health

One possibility, said Melchior, is that food insecurity in low-SES families may be related to the parents' psychological difficulties. Data from the E-Risk cohort suggest that the strongest factor predicting exposure to food insecurity among low-SES families was the presence of maternal mental health problems (Melchior et al., 2009). Among low-SES

families that did not experience food insecurity, approximately 40 percent of mothers had mental health problems such as depression, substance dependence, psychotic features, or exposure to domestic violence, compared with 60 percent among families that experienced transient food insecurities and 68 percent among families that experienced persistent food insecurity. In families that experienced persistent food insecurity, 30 percent of mothers had three or four mental health problems. The single factor that discriminated between low-SES families that did or did not experience food insecurity was maternal mental health problems. "Unfortunately, we did not have data on fathers' mental health, and to my knowledge there [are few] data on this, but it will be very interesting to include paternal characteristics in the study of determinants of food insecurities in the future."

Is food insecurity a cause of poor health? The association could be spurious if it is a reflection of a common cause, such as parental mental health problems. However the association is strong even when accounting for a number of covariates, including family socioeconomic characteristics, parenting characteristics, and exposure to other forms of difficulties such as neglect and mistreatment. This strengthens the claim that the association is causal, though causation remains difficult to demonstrate.

Effects Over the Life Course

In understanding the long-term links between socioeconomic position, food insecurity, and health, a life course framework is helpful, said Melchior. This framework searches for the biological, social, behavioral, and psychosocial risk factors for poor health over time. Three conceptual models have been suggested.

First, there may be critical or sensitive periods during which exposure to particular risk factors has long-term consequences for health and behavior. For example, Olson et al. (2007) found that food insecurity early in childhood had an important impact on the later relationship of women to food.

Exposure to cumulative disadvantage also could be critical. Some evidence suggests that individuals who experience worse socioeconomic circumstances throughout life have the highest risk of cardiovascular disease and also obesity (Galobardes et al., 2006).

Finally, the best way to think about the association may be through a chain of risks in which there are probabilistic associations between low family income, low education, and low adult SES (Figure 5-1).

Research Needs

Melchior listed a number of research needs:

- Longitudinal studies—in particular, birth cohort studies or cohort studies that start early in childhood—are especially informative.
- Information on life course circumstances collected in cross-sectional studies also can be quite informative on how health and socioeconomic position unfold over a person's life.
- Long-term evaluations of policies in this area are important, because current findings suggest that favorable living conditions in childhood can improve health and socioeconomic outcomes concomitantly and later in life.
- The many risk factors and mechanisms that can explain the association between poor SES and poor health need to be examined.

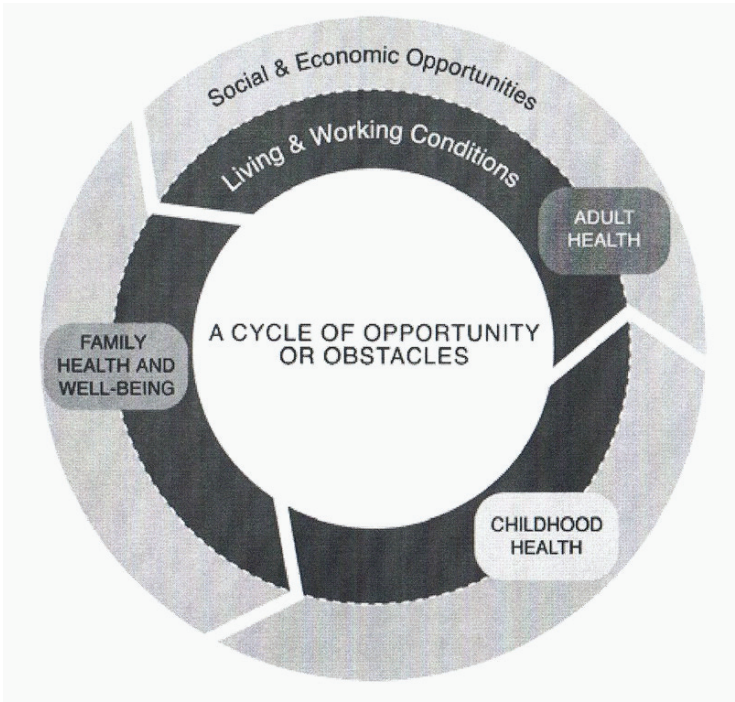

FIGURE 5-1 Health is shaped by social advantages and disadvantages across lifetimes and generations.
SOURCE: Braveman and Egerter, 2008.

- Because most health outcomes are distributed along socioeconomic gradients in the population, it may be possible to learn about the role of food insecurity in health by looking at large population samples and not just at the most disadvantaged populations.
- Mental health problems need to be a focus of research, given their strong association with food insecurity.
- To improve children's health and future prospects, the attitudes, parenting skills, and other characteristics of the adults with whom children live need to be studied, because these can have a strong influence on health in the next generation.

POVERTY AND FOOD INSECURITY

Another way to study the relationship between food insecurity and obesity is to look at changes in SES, food security, and obesity, observed Sandra Hofferth, professor in the Department of Family Science at the University of Maryland. She began by highlighting national prevalence data based on the nationally representative Panel Study of Income Dynamics. In 1997, 87 percent of families with children were food secure. In 1999, 85 percent were food secure—so over this period, the percentage of families with children that were food insecure rose from 13 to 15 percent. Fewer than 4 percent of families experience hunger, and children are usually protected. When children had to go hungry, "we had a lot of people who were in tears," said Hofferth. "That is a very stressful situation."

To study dynamics of food insecurity, Hofferth looked at a subset from the Panel Study of 2,258 families with children under age 13 in 1997 and again in 1999. She calculated "persistence" as the number that were food insecure in both years divided by the number that were insecure in 1997. She calculated "entry" as the number that became food insecure between 1997 and 1999 divided by the number that were secure in 1997.

About 90 percent were food secure in 1997, and of those about 7 percent were insecure by 1999. Families were more likely to become food insecure if they had low income in both years.

About 10 percent were food insecure in 1997, and of these about half were still insecure in 1999. If they became poor between 1997 and 1999, they were more likely to remain food insecure than those that were never poor.

Thus, there is a small amount of movement into food insecurity and a large amount of movement out. Changed economic conditions are the key to either exit or persist once you are food insecure, Hofferth said.

Low income is one of the main correlates of food insecurity in families. Families that are persistently poor are likely to become food insecure;

if they are food insecure and become poor they are more likely to remain food insecure. According to Rank and Hirschl (2009), about half of U.S. children are in a family that has ever received SNAP, but only one-fifth are in a family that has received SNAP for 5 or more years.

Low Income and Diet

Regarding the link between low income and childhood obesity, a possible causal mechanism is that low-income children eat a higher proportion of low-quality, high-fat food than children from higher-income families. Another possibility is that inadequate food may lead to binge eating when food is available. Using the Child Development Supplement to the Panel Study of Income Dynamics, Hofferth and Curtin (2005) looked at detailed information on food expenditures, food assistance programs, food insecurity, and overweight and obesity measured directly in children. They constructed a model in which food consumed is a function of spending on food at home, spending on food outside the home, food stamp supplements, participation in the National School Lunch Program (NSLP), family income, employment status, education, and other factors.

Children whose families are poor have the lowest expenditures on food—about $5,000 in 1997. Food expenditures jump dramatically for families at 100 to 130 percent of the poverty line, to about $6,000 annually, and they rise as income goes up.

Children who were poor had lower rates of obesity than children who were near poor, working class, or of moderate income, explained Hofferth. Children in high-income families had lower rates of obesity, but not as low as the poorest children. These data are relatively old and should be updated, said Hofferth, but they show that there is no simple linear relationship between income and child overweight. Low-income families do not have as much money to buy food. Children just above the poverty line have higher rates of overweight, possibly because they spend more money for lower-quality food. Higher-income families buy higher-quality food. "We need to understand more about the quality of lower- and higher-income family expenditures on food," she said.

Another important point is that it can be misleading to extrapolate from parents to children. Children often appear to be protected from food insecurity, although very poor low-income children clearly need assistance from food programs, Hofferth said.

It also is important to examine total expenditures on food, including the School Breakfast Program, the NSLP, and food stamps. Children get food from multiple sources, not just one.

Hofferth recommended that the dynamics of poverty and food insecurity be incorporated into research. Many families are poor at one time

but not over longer periods, which can be critical to their food security, she said.

Are there other critical periods besides the fetal period? Are there factors that are more or less important at different points in a child's life? These are important issues to examine, said Hofferth.

GROUP DISCUSSION

Moderator: Christine Olson

During the group discussion period, points raised by participants included the following:

African-American Women

Angela Odoms-Young offered a different interpretation of the observation that African-American women are protected from the negative consequences of obesity in the labor market. Perhaps the racial discrimination they face is so significant that weight-related discrimination does not produce an added effect. Heflin agreed that such an interpretation could be correct. She also observed that there may be an acceptance of body shape in African-American cultures that is protective. Research on the lack of an added effect would be interesting in documenting the degree of discrimination that African-American women experience. Wendy Johnson-Askew said that African-American women may be resilient in the face of historical trauma, especially given that they have had to enter the workforce in large numbers. In that case, "resilient" may be a better way of describing the effect than "protective."

Food Insecurity and Mental Health

In response to a question about the influence of food insecurity on mental health, Melchior said, "There is no question that experiencing life events and difficulties such as food insecurity can further hamper individual's mental health, especially if women are depressed." Her research has found an association not only with depression but also with alcohol and drug abuse and schizophrenia. These conditions are probably not caused by food insecurity, but they can be exacerbated by concern over food and other disadvantages. In response to the same question, Heflin said that her research produced evidence for causal influences extending in both directions. Food insufficiency is a risk factor for emotional distress and depression, and a change in mental health status is associated with a move into food insufficiency. Hofferth added that there is great interest

in precursors to mental health problems that may be triggered by adverse circumstances.

Mark Nord pointed to a possibly false measurement correlation between depression and food insecurity. "A person who is depressed probably sees a lot of things as worse than they might on a day when they weren't depressed." Because food insecurity is self-reported, someone who is depressed may be more likely to report subjective food insecurity than someone who is not depressed, whereas the two individuals may actually be experiencing the same level of objective food insecurity—this would lead to a measurement bias. A possible way to overcome this problem would be to use longitudinal studies to look at correlations between food security and measured outcomes as opposed to reported outcomes. Melchior agreed that the validity of an individual's self-report when that person is unwell is important and pointed to two other ways to deal with this issue. One is to use multiple informants who can gauge an individual's mental health. The second is to take personality characteristics such as negative affectivity into account.

Olson discussed an upcoming paper that looks at families in which one person is removed from the workforce, income plummets, and the family becomes food insecure. If the jobless person becomes depressed, the partner sometimes has to decrease work hours to care for that person, exacerbating the loss of income and creating another way in which food insecurity might be related to depression.

Measuring Stress and Depression

Edward Frongillo observed that the literature on stress often uses the same items to measure depressive symptoms and to conceptualize depression as a mental health entity. "That leaves us in a bind as to how to separate those things, because in a certain sense they can't mean the same thing." Melchior agreed that there are no biological tests for depression but returned to the idea of having multiple informants to strengthen a diagnosis rather than relying solely on a person's self-report.

REFERENCES

Belsky, D. W., T. E. Moffitt, L. Arseneault, M. Melchior, and A. Caspi. 2010. Context and sequelae of food insecurity in children's development. *American Journal of Epidemiology* 172(7):809-818.

Berger, L. M., C. Paxson, and J. Waldfogel. 2009. Income and child development. *Children and Youth Services Review* 31(9):978-989.

Braveman, P., and S. Egerter. 2008. *Overcoming obstacles to health: Report from the Robert Wood Johnson Foundation to the Commission to Build a Healthier America.* Washington, DC: Robert Wood Johnson Foundation Commission to Build a Healthier America.

Case, A., and C. Paxson. 2006. Children's health and social mobility. *Future of Children* 16(2):151-173.

Cawley, J., and S. Danziger. 2005. Morbid obesity and the transition from welfare to work. *Journal of Policy Analysis and Management* 24(4):727-743.

Corcoran, M. E., C. M. Heflin, and K. Siefert. 1999. Food insufficiency and material hardship in post-TANF welfare families. *Ohio State Law Review* 60:1395-1422.

Gallup Organization. 2003. Poll analyses: Smoking edges out obesity as employment liability. August 7.

Galobardes, B., G. D. Smith, and J. W. Lynch. 2006. Systematic review of the influence of childhood socioeconomic circumstances on risk for cardiovascular disease in adulthood. *Annals of Epidemiology* 16(2):91-104.

Heflin, C. M., and J. P. Ziliak. 2008. Food insufficiency, food stamp participation, and mental health. *Social Science Quarterly* 89(3):706-727.

Heflin, C. M., K. Siefert, and D. R. Williams. 2005. Food insufficiency and women's mental health: Findings from a 3-year panel of welfare recipients. *Social Science and Medicine* 61(9):1971-1982.

Heflin, C. M., M. E. Corcoran, and K. A. Siefert. 2007. Work trajectories, income changes, and food insufficiency in a Michigan welfare population. *Social Service Review* 81(1):3-25.

Hofferth, S. L., and S. Curtin. 2005. Poverty, food programs, and childhood obesity. *Journal of Policy Analysis and Management* 24(4):703-726.

Lindeboom, M., P. Lundborg, and B. Van Der Klaauw. 2010. Assessing the impact of obesity on labor market outcomes. *Economics and Human Biology* 8(3):309-319.

Melchior, M., T. E. Moffitt, B. J. Milne, R. Poulton, and A. Caspi. 2007. Why do children from socioeconomically disadvantaged families suffer from poor health when they reach adulthood? A life-course study. *American Journal of Epidemiology* 166(8):966-974.

Melchior, M., A. Caspi, L. M. Howard, A. P. Ambler, H. Bolton, N. Mountain, and T. E. Moffitt. 2009. Mental health context of food insecurity: A representative cohort of families with young children. *Pediatrics* 124(4).

Olson, C. M., C. F. Bove, and E. O. Miller. 2007. Growing up poor: Long-term implications for eating patterns and body weight. *Appetite* 49(1):198-207.

Puhl, R., and K. D. Brownell. 2001. Bias, discrimination, and obesity. *Obesity Research* 9(12):788-805.

Rank, M. R., and T. A. Hirschl. 2009. Estimating the risk of food stamp use and impoverishment during childhood. *Archives of Pediatrics and Adolescent Medicine* 163(11):994-999.

Roehling, M. V. 1999. Weight-based discrimination in employment: Psychological and legal aspects. *Personnel Psychology* 52(4):969-1014.

Spencer, N. 2008. *Health consequences of poverty for children*. London: End Child Poverty.

Tunceli, K., K. Li, and L. Keoki Williams. 2006. Long-term effects of obesity on employment and work limitations among U.S. adults, 1986 to 1999. *Obesity* 14(9):1637-1646.

6

Socioecological Perspectives: The Family and Household Level

Key Messages Noted by Participants

- Many children are much more aware of food insecurity and the efforts being made to counter food insecurity than their parents assume.
- Many children take responsibility for food insecurity through a variety of actions to conserve food and contribute resources to families.
- Families in low-income areas can be tremendously resilient in dealing with adversity and caring for children.
- Partnerships with qualitative researchers can enrich quantitative research.
- Families in poverty can be invaluable partners with researchers in learning about food insecurity and obesity and in designing interventions.

In the socioecological model, the next level beyond the individual is the family or household, two terms that are often but not always synonymous. Families can have both protective and deleterious effects on food insecurity and obesity—sometimes at almost the same time. The complex dynamics within families provide a rich area for research, said Amy Yaroch, executive director of the Center for Human Nutrition in Nebraska, who moderated the session on family and household perspectives at the workshop.

FOOD INSECURITY AND CHILDREN

Food insecurity is linked not only to maternal stress and depression but also to the psychosocial functioning of children, said Edward Frongillo, Jr., professor and chair of the Department of Health Promotion, Education, and Behavior at the Arnold School of Public Health at the University of South Carolina at Columbia. One important reason why these may be linked is through family processes, but much less is known than is needed about parent-child interactions, family eating patterns, and the social context of family life.

Much of what is known comes from the perspectives of mothers, which is reasonable because they are often the primary decision makers about food. Frongillo explained that his research has sought to extend knowledge about how family members experience and manage food insecurity. In particular, he has sought to understand children's experiences: why and when does food insecurity happen, what do children feel about it, what happens to them as a result of food insecurity, how are they facing it, and are they protected against it?

He discussed three studies: two in-depth qualitative studies that were done in South Carolina and one mixed-method study (Bernal et al., 2009) done in the state of Miranda in Venezuela. For the presentation, Frongillo combined the data from the South Carolina studies, yielding 38 families, split between urban and rural regions, that were interviewed. The sample included African Americans, whites, and Hispanics with children ages 9 to 17. Of these families, 17 had very low food security, 12 had low food security, and 9 were food secure. These families received the Supplemental Nutrition Assistance Program (SNAP) benefits, and nearly all of them were receiving free or reduced-price school lunches and/or breakfasts.

In the study in Venezuela, interviews with children using both focus groups and individual interviews were followed by cognitive testing, a field survey, and a survey of children-mother dyads, with an overall sample of 131.

Frongillo said that the results from the studies in South Carolina and Venezuela demonstrate that food insecurity affects children in terms of both awareness and responsibility. Awareness has cognitive, emotional, and physical dimensions. Responsibility involves participation, children's own initiatives, and the resources children generate themselves. He went through each of these elements in turn.

Children and Awareness

Frongillo said that *cognitive awareness* implies knowing about food scarcity and the family challenges that are created by it. Children are aware

of the inadequate quantity or quality of food, the struggles that adults are going through to meet food needs, and the limitations of resources for meeting those needs. Parents can share this information with children, or children can draw conclusions based on their own observations.

Emotional awareness constitutes feelings such as worry, sadness, and anger that are related to knowing about food scarcity and the challenges it creates, Frongillo continued. It includes being aware of worries about food and also worries about what parents and others who are supposed to be providing for the family are going through. Contributors to these worries are lack of confidence that adults will in fact work it out and the child's vigilance. As one African-American, female high school student said, "They don't really say anything, but you can read it in their face or if they're out of money, you just know. I just know. It's not really what they say, it's just how they act when they're out of money and you ask why you don't go to the store and they don't answer or something or they just try to find other ways, like they just forget. I can tell by people's expression. My older sister wouldn't be frowning, but like it wouldn't be a happy face. It wouldn't be a sad face. It wouldn't be any face at all. It would be just like an empty face."

Physical awareness consists of feelings such as hunger, pain, tiredness, and weakness that are related to food insecurity. Some contributors to these feelings are not having food at home or having poor-quality food, the poor quality of food served in schools, and also limitations in what parents are able to do.

Frongillo read a quote from an African-American, male high school student who was asked how he felt when he was hungry. The youth said, "Angry, mad, go to sleep basically. That's the only thing you can probably do and after you wake up, you feel like you've got a bunch of cramps in your stomach and you'll be light headed."

Children and Responsibility

Children are not only aware of what is going on, they take responsibility, said Frongillo. They go along with adult strategies for managing food resources. They eat less when asked, choose less-expensive foods or only foods that are judged to be healthful, or accompany parents and help them at the food pantry. Children also initiate strategies to stretch existing food resources by eating less without being asked, by encouraging others such as their siblings to eat less, and by asking for less food or less-expensive foods.

Children also take action to attain additional food or money for buying food such as having a part-time job, taking on informal work, giving money to the household, asking neighbors for food, or eating away from home so

that they will not draw on the food supply at home. They might also bring food home after a stay at a father's house if the parents are separated.

Frongillo relayed a quote from one child who said: "We'll get together and we'll find a way to get money up, not—we ain't got to sell no drugs, not like that, but we'll find a way to get money up. We might all get together and cut the grass or something. Sometimes they'll probably, like, people will be putting up money on fights and stuff and they might do dog fights every now and then to get money."

The study done in Venezuela produced quantitative information about this behavior. It indicated that children with food insecurity live adult roles, Frongillo concluded. They do more activities related to household chores such as ironing, washing, cooking, and taking care of siblings. They do more paid work. They engage in fewer activities related to school recreation and resting. They sacrifice time for activities that would increase their learning and quality of life.

Protection of Family Members

Based on the interviews conducted by Frongillo and his colleagues, parents try to provide for the quality and quantity of food. They also provide emotional support around eating.

Protection extends in multiple directions. Parents try to protect children and other parents. Children try to protect parents, especially mothers, and other children, especially younger children and poorer children.

However, Frongillo said, sometimes parents do not protect children, especially when there are mental health problems, unemployment, drug or alcohol problems, or deep poverty.

Consequences of Food Insecurity

These reactions to food insecurity produce compromised opportunities for children to study, play, rest, and live a happy childhood, Frongillo said. Furthermore, parents may be very much unaware of at least some of their children's experiences of food insecurity. This has two importance implications.

One is that researchers likely underestimate the prevalence of experiences of food insecurity among children given the measurement tools currently available. The second, Frongillo continued, is that the idea that children are protected from food insecurity by the parents is a myth. "It is a myth in the epidemiological sense of shared belief, and there is a need for the scientific community—frankly, this community—to stop perpetuating that myth."

Myths are tied to roles, said Frongillo. There is a shared belief that mothers' roles are to manage the household, manage the family, manage

resources, and protect the children. Their understanding of their experiences is shaped by the shared beliefs of the broader society.

Fathers also have a role. They talk about being the provider and protecting their wife and children. Frongillo stated that children also are active contributors. They are very aware that parents believe their role is to protect them. Children purposely do not tell their parents about some of the things that are going on because they want their parents to continue to believe that they are protecting their children.

"We have seen this play out even within one family," said Frongillo. "The father will be talking about how he is making sure his wife doesn't have to worry about having adequate food available and the things that he is doing to do that and protect her and the children. The wife is talking about how she tries to manage things so the father does not have to worry about all of these issues and to protect the children. Then, the children are telling us basically they know what is going on."

Balancing Capabilities and Demands

Frongillo showed a diagram from a National Research Council (NRC, 2006) report that he believes summarizes the balancing that occurs within families (Figure 6-1). The top of the diagram represents the balancing that occurs around food insecurity, making a livelihood, and other inputs. The bottom of the diagram represents the multiple pathways through which food insecurity affects well-being. The idea that children are not being affected because the pathways to them are being blocked by parents is not accurate, Frongillo maintained. "We know there are lots of effects on children that must be operating through those pathways."

Frongillo said that families balance capabilities and assets against demands and stressors. They also balance among the goals that they have for their children, including goals for security, certainty, safety, good nutrition and health, education, emotional and social development, family cohesion, belonging, acceptance, and feeling normal. Especially if parents are poor, they often have to make choices among these goals. Parents and children may say that they should not be eating fast food all the time, but that may be the only way for a parent to communicate to a child that a family is not deprived.

This balancing occurs within an environmental context, Frongillo explained. Beliefs about the roles in society, including parenting, are shaped by very powerful forces in society. The fast-food industry spends a huge amount of money to convince families that it is normative to go to fast-food restaurants. "I am not picking on them," Frongillo explained, "it is just exemplary. But what is happening is that these forces in society are shaping the way in which we think, the way we believe that we should be going about working together in our families."

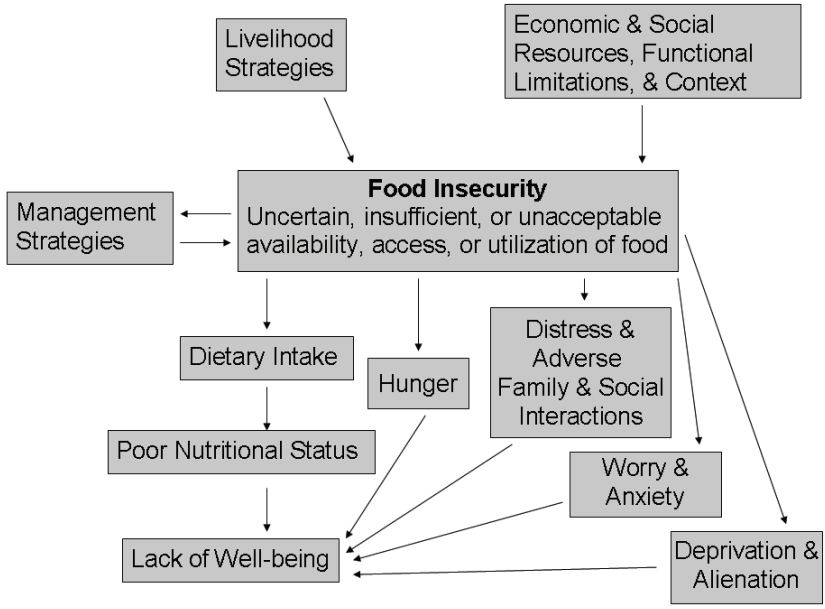

FIGURE 6-1 Families must balance many factors in efforts to remain food secure. SOURCE: NRC, 2006.

In late 2010, Sesame Workshop was scheduled to release a program developed to help food-insecure families cope in a way that does not promote obesity, Frongillo reported. "But this is like a drop in the bucket compared to the influences that are there in our larger society."

Frongillo ended by stating that food-insecure families have limited choices to achieve belonging, acceptance, and normality. They are susceptible to the food environment and to the larger environment. Balancing has to be done in a way that is integrated with influences from that environment. The environment has a larger impact on lower-income families because they cannot make the same choices more affluent families can.

These observations lead to four high-priority questions, said Frongillo:

- How do roles and myths of family members play out in responding to food insecurity?
- How do families balance among demands and goals for children under resource constraints?
- How does the balancing of resource-constrained families interact with the food environment, and how do these processes put children and adults at risk of obesity?

- What aspects of children's experience of food insecurity are most important, and how should these experiences be assessed?

CYCLES OF POVERTY AND FOOD INSECURITY

For the past 7 years, Mariana Chilton, associate professor in the Department of Health Management and Policy at the Drexel University School of Public Health, has been using qualitative methods to study vulnerabilities within households in Philadelphia.

Household Context Influences Well-Being

Household context affects dietary intake, nutritional status, hunger, distress, adverse family and social interactions, worry, anxiety, and well-being. Household context also contributes to six categories of vulnerability:

1. Economic insecurity
2. Overeating and deprivation
3. Stress and depression
4. Exposure to violence
5. Lack of care for self
6. Talk about the food environment

Examination of these vulnerabilities in turn makes it possible to talk about ways of protecting families from them. "I want us to broaden our thinking to talk not just about food assistance but about housing subsidies, energy assistance, and other types of income support programs that all can help contribute to well-being, to economic security, and to providing more opportunities to families," said Chilton.

Partnering with Families to Create Solutions

Researchers need not to target families but to partner with families "because they are the ones who actually have the answers," said Chilton. Families are not just passive recipients of aid and advice. They are purposeful agents that want to break the cycle of poverty and despair. They have a variety of needs, including good nutrition, good housing, good energy assistance, utilities, good health, job training and job opportunities, access to financial services, and access to information. One way to meet these needs is to focus on parents' attitudes toward their children. Another is to recognize the economic creativity that these parents bring to their lives.

The studies Chilton described treated the family as a dynamic unit. Families extend beyond the traditional parent-child dyad to include grand-

parents, aunts and uncles, nieces, nephews, and other children who may be coming in for the weekend or during the week. Also, many families in Philadelphia temporarily adopt unrelated young people to help them cope with economic insecurity and with safety issues. The local teenager or an elderly woman in the neighborhood may also constitute family or the household. Families also may hide the fact that some family members are part of a household to retain public assistance.

Research Findings

As examples of this research, Chilton described three qualitative studies done in Philadelphia. The first was the Women's Health, Hunger, and Human Rights study, in which she and her colleagues interviewed 34 women who used food cupboards or food pantries in Philadelphia and conducted four focus groups (Chilton et al., 2002; Chilton and Booth, 2007). As they were doing the interviews, they tested their hypotheses against what the women were saying in "a reciprocal process of [hypothesis] generation."

The second study she discussed is Children's HealthWatch (Chilton et al., 2011), a multisite study of 50 caregivers with children that looked at the impact of public policies on the health and well-being of young children. The interviews are finished and are being analyzed to make possible a multimethods analysis.

The third study was Witnesses to Hunger, a participatory research project begun in 2008 that is ongoing (Chilton et al., 2009a, 2009b, 2010). It has morphed into an ongoing ethnographic study in which 42 women with at least one child under the age of 3 use cameras and a photovoice methodology to take pictures of their experiences of what it is like to raise their children in poverty and to talk about their ideas for change. "The participant then becomes the person who is supposed to be framing the issue for the researcher." The researchers conducted one-on-one semistructured interviews with the women to ask why they took that picture, what they wanted people to see, and what they wanted people to do. The women also came together in focus groups to share their photographs and talk about their priorities.

Breaking Cycles of Violence

Chilton devoted most of her presentation to an analysis of the photographs taken through the Witnesses to Hunger project. These photographs, of which more than 10,000 have been taken, are both data and testimony. Chilton showed several at the workshop as a reminder of the stark conditions in which many families live. She also provided brief summaries of the difficult lives of the people who took the photographs. Most of the women

in the Witnesses to Hunger program have experienced rape, abuse, and neglect. Many have seen family members and friends murdered. Children who grow up under such conditions can contribute to a cycle of violence. "What happens is that the women and kids stop caring for themselves and start getting very angry, which then continues to perpetuate the situation."

The women in these studies want to break the cycle of violence. They "want the next generation to be better and better and better," said Chilton. "This is something we can really capitalize on." Many of these women have side businesses in which they use their creativity to survive. For example, a woman might braid hair to bring in money off the books. "They are entrepreneurs. They know what they are doing and they are super creative. There is no way that they would be actually able to survive and feed their families if they weren't having these little side businesses."

These people experience hunger and poverty firsthand, which makes them invaluable partners for researchers. Based on her experiences, Chilton made several recommendations:

- Seek to partner with study participants.
- Conduct intervention research aimed at improving economic well-being.
- Conduct intervention research aimed at improving the food environment.
- Conduct intervention research aimed at linking the prevention of violence with the prevention of food insecurity.

NUTRITIONAL CHALLENGES IN TEXAS *COLONIAS*

Joseph Sharkey, professor in the Department of Social and Behavioral Health and director of the Program for Research in Nutrition and Health Disparities, School of Rural Public Health at the Texas A&M Health Sciences Center, discussed the work he has done with Mexicano families in Texas *colonias*. *Colonias* run across the entire border of Texas from El Paso to Brownsville. These are rapidly growing areas with high and persistent poverty. There are more than 1,500 *colonias* along the Texas border, more than 70 percent of which are in Hidalgo County.

Many *colonias* lack basic services, have inadequate roads and drainage, and provide limited access to safe water and sewage. Housing includes single-pull trailers, double-lot trailers, and recycled materials. They tend to be low-density settlements, and many are outside cities, which means they are the responsibility of individual counties that may or may not provide needed services.

Residents in these areas have high rates of obesity, type 2 diabetes among children, food insecurity, and neighborhood deprivation. They also tend to be located at a great distance from supermarkets and health care, and they generally have no public transportation.

Influences of Food Choices

Sharkey and his colleagues have focused on the food choices that resource-limited families make. They use community surveys, participant observations, household food inventories, longitudinal studies of mother-child dyads, focus groups, and participant-driven photo elicitation. Indigenous health workers, or *promotoras*, who participate in the research "are our eyes and ears in the community," and serve as cultural brokers with community residents, explained Sharkey.

In a door-to-door survey of 610 households, overweight and obesity were determined through self-reported height and weight (Sharkey et al., 2010a, 2011). These households made heavy use of SNAP, WIC (the Special Supplemental Nutrition Program for Women, Infants, and Children), and the School Breakfast Program and National School Lunch Program. They had very high rates of very low food security as reported by the mothers and children. In addition to this survey, the *promotoras* spent extended periods in the home to get a sense of food choice, and photo elicitations produced additional information (Johnson, 2010; Sharkey et al., 2010b).

Overall, the results of this work show that this is a highly resilient population in the face of very few resources, according to Sharkey. They have very limited opportunities for physical activity, largely as a result of free-roaming dogs and other neighborhood structural limitations. Also, the houses are small, so there is not much room to play. One household put toys in a van parked outside in which the child would play.

Influences on Food Intake

The mothers consider themselves *reinas de la cocina*—queens of the kitchen, but insufficient financial resources exert great pressure on consumption by both children and friends of children. One mother had a 16-year-old son whom she wanted to keep out of gangs. He comes home immediately after school and stays there, but he wants his friends to come over, too. "She said yes. But what do 16-year-old boys do? They eat a lot. What is she struggling with? She is struggling with this competing demand of making sure there is enough food there for her family to eat but at the same time keep her son free from the gangs." Other factors that influence food availability in the home and subsequently food choice include wage earners' poor health, limited storage and cooking facilities, inadequate or costly transportation, and competing demands for resources.

Mothers seek to go beyond basic nourishment to communicate their love, their values, their expert use of resources, and their ability to provide delicious and available food. Many rely heavily on tortillas, because they are cheap to make, they are filling extenders, and they have multiple roles in

meals. Mothers get up early to prepare tamales and lunch so that children do not have hunger as an excuse for not learning. Households tend to lack fresh or processed fruits. The most frequent items found in households are whole milk, sugar-sweetened beverages, sugar cereal, corn tortillas, and lard, which must have an effect on dietary intake and obesity, according to Sharkey.

Sharkey listed a number of high-priority research gaps:

- Understanding the context in which people live,
- Establishing a frame of reference for measurements,
- Investigating the frequency and duration of food insecurity,
- Analyzing the role of physical activity,
- Thinking about how food security might differ between the family and the individual, and
- Facilitating improvements in food security.

GROUP DISCUSSION

Moderator: Amy Yaroch

During the group discussion period, points raised by participants included the following:

Measures of Food Insecurity

In response to a question from Amy Yaroch about whether 24-hour recalls of foods eaten pick up such things as sugar added to coffee, Sharkey expressed the opinion that such measures probably severely underestimate the extent of food insecurity, because the families in his survey believe that they can make a meal out of anything, even just a little hominy. He and his colleagues are currently analyzing the first wave of dietary intake data to answer this and other questions.

Incorporating Qualitative Methods into Quantitative Research

Craig Gundersen pointed to the emotional impact of qualitative research and asked how investigators who do quantitative research can incorporate the insights of qualitative research into their work. Chilton responded by recommending that quantitative researchers partner with an anthropologist, sociologist, and/or other social scientist. Together, these teams can develop protocols in which questions in national datasets are tested locally to provide a sense of context. Partnerships with communities also can help reveal the best questions to ask and the best ways to translate research findings into actions that are meaningful for the community. This

is extra work, Chilton said, "but there need to be more types of community forums in which researchers are able to talk to regular people who know those experiences firsthand."

Gundersen also asked how to incorporate the views of children into research along with those of adults. Frongillo pointed to three studies that have done surveys simultaneously of children and adults: one in Zimbabwe, one in Ethiopia, and the study he described in Venezuela. Such studies can derive survey questions for both children and adults from qualitative work, but the questions and responses still need to be validated with both adults and children. The three surveys he cited have had "astonishingly low" concordance between the responses of adults and children. "We need to understand whether that reflects measurement problems, or whether that is indicating that they really are experiencing and therefore reporting on very different experiences within the household."

Beyond Weight

Nicolas Stettler pointed out that it takes a lot of work to treat obesity. When families are wracked by violence, neglect, and poverty, they have greater problems than weight. Gundersen agreed that it is much more important for families not to be poor than not to be overweight, which re-emphasizes the importance of addressing issues of food insecurity independently from issues of obesity. Chilton pointed out that the primary concern of people who are food insecure and living in poverty is how to get through the day. Yet it is also the case that a profound effect of the Witnesses to Hunger program has been that some of the women who are overweight have gone on diets, have started to eat better, and are watching their weight. However to help them focus on weight as a priority, they need help with housing, energy, transportation, jobs, and economic opportunity.

Research Priorities

One workshop participant pointed out that priorities for researchers should not be seen as either-or propositions. Research on obesity can be linked to research on food insecurity, and obesity can have a very negative impact on adults and children. Factors such as stress, advertising, and the cyclicity of food insecurity all establish links between poverty and obesity, and these problems could be tackled simultaneously.

Frongillo replied that food insecurity is a valuable marker of families that are struggling and at risk for many problems, including obesity. Thus, conducting research on obesity is a way to bring attention and resources to families that need to move from where they are.

REFERENCES

Bernal, J., H. Herrera, S. Vargas, E. A. Frongillo, and J. Rivera. 2009. Food insecurity from the perspective of children and adolescents in Venezuelan communities. Presented at the Society for Latin American Nutrition, XV Latin American Congress of Nutrition, November, 2009, Santiago, Chile.

Chilton, M., and S. Booth. 2007. Hunger of the body and hunger of the mind: African American women's perceptions of food insecurity, health and violence. *Journal of Nutrition Education and Behavior* 39(3):116-125.

Chilton, M. M., E. Ford, M. O'Brien, and L. Matthews. 2002. Hunger and human rights in Philadelphia: Community perspectives. Presented at the American Public Health Association, Annual Meeting, November 9-13, Philadelphia, PA.

Chilton, M., J. Rabinowich, C. Council, and J. Breaux. 2009a. Witnesses to hunger: Participation through photovoice to ensure the right to food. *Health and Human Rights* 11(1):73-86.

Chilton, M. M., J. Kolker, and J. Rabinowich. 2009b. Witnesses to Hunger: Mothers taking action to improve health policy. Presented at the American Public Health Association, Annual Meeting, November 7-11, Philadelphia, PA.

Chilton, M. M., J. Rabinowich, C. Sears, and A. Sutton. 2010. The violence of hunger: How gender discrimination and trauma relate to food insecurity in the United States. Presented at the American Public Health Association, Annual Meeting, November 6-10, Denver, Co.

Chilton, M., J. Rabinowich, B. Izquierdo, and I. Sullivan. 2011. How the stress of hunger and the stress of advocacy can impact the lives of children. Presented at the Society for Research in Child Development Biennial Meeting, April 1-2, 2011, Montreal, Quebec.

Johnson, C. M. 2010. Using participant-driven photo-elicitation to understand what it takes for a Mexicana mother in the South Texas colonias to feed her family. Presented at the University of North Carolina at Chapel Hill Center for Health Promotion and Disease Prevention.

NRC (National Research Council). 2006. *Food insecurity and hunger in the United States: An assessment of the measure*. Edited by G. S. Wunderlich and J. L. Norwood. Washington, DC: The National Academies Press.

Sharkey, J. R., J. A. St. John, and W. R. Dean. 2010a. Community and household food availability: Insights from a community nutrition assessment conducted in two large areas of colonias along the Texas-Mexico border. Presented at the International Society for Behavioral Nutrition and Physical Activity, June 9-12, Minneapolis, MN.

Sharkey, J. R., A. Garibay, J. A. St. John, W. R. Dean, and C. M. Johnson. 2010b. Observation of food choice from the perspective of mothers in Texas Colonias. Presented at the International Society for Behavioral Nutrition and Physical Activity, June 9-12, 2010, Minneapolis, MN.

Sharkey, J. R., C. M. Johnson, and W. R. Dean. 2011. Association of country of birth with severe food insecurity among Mexican-American older adults in colonies along the South Texas border with Mexico. *Journal of Nutrition in Gerontology and Geriatrics* (30)2.

7

Socioecological Perspectives: The Environmental Level

Key Messages Noted by Participants

- The environment can affect food consumption and obesity through many mediating mechanisms, including supermarket access, marketing, and community stressors.
- The food students eat in schools—whether provided by schools or obtained from other sources—represents a substantial portion of the calories they consume, providing opportunities to influence their consumption patterns.
- A potentially useful way of analyzing the environment is to consider neighborhoods—as well as individuals and households—as food insecure.

One critical question from the socioecological perspective is whether the environment is a mediating factor between food insecurity and obesity, said Katherine Alaimo, associate professor in the Department of Food Science and Human Nutrition at Michigan State University, who moderated the session on the environmental level. "Regardless of whether or not there is a causal pathway between food insecurity and overweight we know that [they can] coexist," she said. "There is a possibility that one of the reasons why both of these things exist is because of [influences from] the environ-

ment." Three speakers addressed this topic at the workshop, focusing specifically on the availability, quality, and marketing of food.

THE FOOD ENVIRONMENT IN COMMUNITIES

Obesogenic environments are becoming more common, said Angela Odoms-Young, assistant professor in the Department of Kinesiology and Nutrition at the University of Illinois at Chicago. The least expensive food options are typically high in calories and low in nutrients. Households with limited resources tend to spend less on food overall and less on healthful foods such as fruits and vegetables (Alaimo et al., 2001; Drewnowski and Specter, 2004; Hartline-Grafton et al., 2009; Ludwig and Pollack, 2009; Larson and Story, 2010a).

Some evidence suggests that food-insecure families may be more susceptible to obesogenic environments for a variety of reasons including the ways in which food assistance is distributed, maternal stress, and disruptive family routines (Anderson and Whitaker, 2010; Gundersen et al., 2010). In addition, race/ethnicity, poverty, household structure, and location (such as living in a rural or urban area or in the Midwest or South) all interact with both food insecurity and obesity in complicated ways (Kendall et al., 1996; Blanchard and Lyson, 2002; Powell et al., 2007; Nord et al., 2008; Sharma et al., 2009; Chen and Escarce, 2010; Grow et al., 2010; Ogden et al., 2010).

Surprisingly, Odoms-Young said, relatively few studies have looked at the ways in which the environment, food insecurity, and obesity are interconnected. She discussed several possible mechanisms that could tie together these three phenomena as a guide to future research.

Energy-Dense Foods

The first mechanism is the high availability of energy-dense food options and the low cost of less healthful options. People living in low-income areas and communities of color tend to have less access to outlets that carry more healthful food options and greater access to stores with less healthful options (Cheadle et al., 1991; Morland et al., 2002a, 2002b; Laraia et al., 2004; Lewis et al., 2005; Zenk et al., 2005). Odoms-Young cited one study that looked at the relationship between food pantry clients and the food environment in Pomona, California, which demonstrated that these families had lower access to stores that carried more healthful food options and that only 9 percent lived within walking distance of the pantry (Algert et al., 2006). In this study, 83 percent of food pantry clients were within walking distance of stores with limited or no produce, generally small to midsized convenience marts, while 41 percent of the food pantry clients did not live within walking distance of a store carrying a variety of fresh produce.

Odoms-Young described studies she has conducted in Chicago and Detroit in neighborhoods with reduced access to healthful foods. As one person surveyed in Chicago said, "You go all the way out to the suburbs where the white people live at and you find everything. . . . It's even a better variety in [chain supermarkets] when you go to their stores. There's a difference." Another person interviewed in Detroit said, "You've got to go out in the suburbs now to get some decent food. And therefore, it's not available for us in this community. By the time you get to that store and get some fresh fruits and vegetables, you're going to pass about 30 fast-food joints and about 100 liquor stores." In these cases, added Odoms-Young, the stress of living in neighborhoods perceived to be substandard may further contribute to obesity.

Dietary energy density tends to be inversely associated with dietary quality and cost, so that people eating more calorie-dense foods are eating less healthful and cheaper foods, regardless of socioeconomic status (Monsivais and Drewnowski, 2009; Townsend et al., 2009). These dietary patterns are in turn associated with obesity. For example, Powell et al. (2010) found that a 10 percent increase in the price of fruits and vegetables was associated with a 0.7 percent increase in child body mass index (BMI). The impact of prices on BMI was stronger in both magnitude and significance for children of low compared to high socioeconomic status (SES).

Food Marketing

The marketing of foods is another mechanism that could create differences between higher-income and lower-income communities. Yancey et al. (2009) showed that living in an upper-income neighborhood, regardless of the residents' predominant ethnicity, is generally protective against exposure to most types of obesity-promoting outdoor advertising, including fast food, sugar-sweetened beverages, sedentary entertainment, and transportation advertisements. Food advertising coverage was greatest in low-income Latino neighborhoods, and fast-food advertisement coverage differed by neighborhood income but not ethnicity. The most advertisements for sugar-sweetened beverages were found in low-income African-American neighborhoods. Even though there was less advertising coverage in upper-income than in low-income African-American neighborhoods, it was similar to the coverage levels in low-income white and Latino neighborhoods.

Odoms-Young and her colleagues have done a study with low-income African-American families of how food marketing and environmental factors affect consumption (Odoms-Young et al., 2010). Low-income and food-insecure families can be very sensitive to discount-oriented marketing, she said. In her study, many families received information about food

products from store circulars and other types of community promotions. Many families reported that marketing efforts for unhealthful foods were most intensive at the time people received food benefits. As one person said, "So you'd about spent all your stamps on the junk food, cause you ain't even got to the meat and stuffs. You are still over here in this one aisle. But there is how it is. All the pop stacked up against the wall right there, you got your box of cookies, big box of cookies over here."

Violence

Community violence plays a role in food choices. In some locations where people access food, violence and other illegal activities are frequent. People may not go at night to certain stores to avoid robberies or other forms of crime.

Unfair Treatment

Zenk et al. (2010) have shown that greater everyday unfair treatment and an acute experience of unfair treatment in the past year were positively associated with greater consumption of comfort foods in the presence of a convenience store in the neighborhood. In contrast, for those with a large grocery store in the neighborhood, greater everyday unfair treatment and neighborhood physical environment stress were negatively related to comfort food intake.

Low-Resource Environments as a Source of Stress

Negotiating a low-resource environment can be a major source of stress. Odoms-Young reported that another interviewee in her study said, "That's the thing that kills us most because most of us don't watch what we eat you know. . . . Most of us in this area are stressed beyond belief. Because they are trying to make ends meet, they're trying to figure out how they're going to feed their families or how are they going get their kids to school next week off the $54 paycheck they just got. So you know high blood pressure is a big thing and diabetes is another big thing because of, again, we don't watch what we eat and we don't exercise properly."

Research Considerations

In conclusion, said Odoms-Young, the evidence suggests that the environment affects the relationship between food insecurity and obesity. She said that more research is needed on the following:

- The cost of food, marketing, and community stressors
- The varying impact of social, economic, and geographic factors
- The relationship of the food environment to obesity among families that are not food insecure, including high-income families

THE FOOD ENVIRONMENT IN SCHOOLS

The Food Trust, which was founded in 1992, is an organization of about 85 people based in Philadelphia that seeks to increase access to affordable, nutritious food. "Are children, especially those at risk of hunger, eating the right amount of the right kinds of foods to maintain a healthful diet?" This question speaks to the quantity, frequency, and quality of the food that children eat, said Allison Karpyn, director of research and evaluation for The Food Trust.

Eating Opportunities During the School Day

Students have a variety of opportunities to eat at school. Reimbursable school meals include breakfast, lunch, twilight meals (after-school meals provided by the Child and Adult Care Food Program), and snacks, and summer meals when school is not in session. Competitive foods—so called because they compete with the foods provided by schools—include vending machine items, foods from school stores, rewards from teachers, and foods made available at class parties and fundraisers. Foods brought into schools from outside include those prepared at home, bought from stores, and purchased at fast-food restaurants.

For the average child, on a school day 26 percent of daily energy is obtained and consumed at school, according to national survey data (Briefel et al., 2009a). If a child participates in the National School Lunch Program (NSLP), the proportion increases to 35 percent. If a child participates in both the NSLP and the School Breakfast Program (SBP), the figure is 47 percent.

Food Assistance Programs in Schools

Among the children who are certified for reimbursable school meals, more than 40 percent are from families that earn less than $10,000 a year. "This is a striking statistic for me," said Karpyn. "We are talking about a number of families that come from very low incomes."

Karpyn displayed a typical breakfast menu (Figure 7-1) and lunch menu (Figure 7-2) for Philadelphia's public schools. Children get an average of about 400 calories from breakfast and 560 calories from lunch. About 31 million children participated in the NSLP in 2009, which represents about

Monday	Tuesday	Wednesday	Thursday	Friday	
15 Rice Krispies Graham Crackers Grape Juice 1% Milk	16 Cinnamon Raisin Bagel Assorted Jelly Orange Juice 1% Milk	17 Blueberry Muffin Pineapple Juice 1% Milk	18 Cherry Yogurt Graham Crackers Apple Juice 1% Milk	19 Breakfast Round Blended Fruit Juice 1% Milk	**CALORIES: 406.9 PROTEIN: 14.4g CALCIUM: 358.2mg IRON: 2.3mg VITAMIN A: 163.5RE VITAMIN C: 47.5mg SATURATED FAT (% of calories): 7.4 TOTAL FAT (% of calories): 20.7**

FIGURE 7-1 A typical school breakfast menu for Philadelphia public schools. SOURCE: School District of Philadelphia, 2010. See http://www.phila.k12.pa.us/ (accessed January 26, 2011).

Monday	Tuesday	Wednesday	Thursday	Friday	
15 Cheese Ravioli w/Creamy Tomato Sauce Peach Cup Milk	16 Chicken Nuggets Potato Rounds BBQ Sauce Applesauce Cup Milk	17 Meatballs & Sauce or Beef Hot Dog w/Tri Tators Hot Dog Bun Mixed Fruit Cup Milk	18 Toasted Ham & Cheese on White Bread or Turkey on a Seeded Bun Pear Blended Fruit Juice Milk	19 5" Round Pizza or Beef Patty on a Bun Baby Carrots Ranch Dressing Blended Fruit Juice Milk	**CALORIES: 556.2 PROTEIN: 27.5g CALCIUM: 500.8mg IRON: 3.2mg VITAMIN A: 276.7RE VITAMIN C: 11.8mg SATURATED FAT (% of calories): 11.2 TOTAL FAT (% of calories): 27.3**

FIGURE 7-2 A typical school lunch menu for Philadelphia public schools. SOURCE: School District of Philadelphia, 2010. See http://www.phila.k12.pa.us/ (accessed January 26, 2011).

60 percent of school-aged children in America, at a cost of about $10 billion. About 11 million participated in the SBP, representing a cost of about $3 billion. Among children eligible for free and reduced-price meals, 79 percent of those who are eligible for a free meal on average each day actually take a lunch, while 71 percent of those eligible for a reduced-price lunch do so.

Participation in the NSLP went up 13 percent from 2000 to 2008 (School Nutrition Association, 2009), while the SBP saw an increase in participation of 40 percent over the same period. However, the effectiveness

in reaching low-income students with the SBP varies greatly among cities, from 98 percent in Portland, Oregon, to about 29 percent in New York City and Chicago (Levin et al., 2007).

Participation in the SBP is associated with lower BMI, although the effect size is small (Gleason et al., 2009). Other researchers, such as Millimet et al. (2010), have found null or modestly beneficial effects and cite evidence of nonrandom selection into the SBP as a problem with such studies. Overall, said Karpyn, although some changes in the program are desirable, "it looks like school breakfast is basically a good thing."

Participation in the NSLP, in contrast, appears to have a null or possibly detrimental connection to BMI, according to Millimet et al. (2010). However, some researchers have found positive influences on dietary intakes, such as reduced intake of sugar-sweetened beverages and increased intake of fruits and vegetables (Briefel et al., 2009b). Data from the National Health and Nutrition Examination Survey (NHANES) show that some children who are participating in the NSLP are eating more nutrient-dense lunches, including more milk, fruits, and vegetables (Cole and Fox, 2008).

Competitive Foods

According to a nationwide study of the food consumed at school, home, and other locations, about 17 percent of the calories public school children consumed consisted of foods brought into school from outside (Briefel et al., 2009a). About 50 percent of the children studied in a Philadelphia-based project shopped at least once a day in corner stores, about 40 percent shopped twice a day, and at each purchasing opportunity they bought about 350 calories and spent about a dollar on food (Borradaile et al., 2009).

Larson and Story (2010b) have found that limiting access to competitive foods improves diets. In Philadelphia, the top 10 purchased items include bottled water, Doritos, blow pops, gum, Cheetos, and—at number 1—Hugs, which are 8-ounce sugar-sweetened beverages (Borradaile et al., 2009). Vending machines, school stores, and snack bars remain very prevalent in schools and are largely exempt from federal standards. School wellness policies may regulate such food outlets, but these policies generally are not enforced. Schools have competing priorities, because food sales generate revenue.

Models for Improving School Eating

In Philadelphia, The Food Trust worked with the School District of Philadelphia and a number of collaborators on the School Nutrition Policy Initiative. A taskforce of 40 people representing different sectors has established school health and wellness councils. All schools completed a

School Health Index and a School Health Action Plan. Social marketing, food guidelines, and nutrition education were at the center of the initiative. Teachers received 10 hours of nutrition training, and family members and the community were involved. Over a 2-year period, 15 percent of students became overweight in the control schools versus 7.5 percent in the schools where the interventions were implemented (Foster et al., 2008). However, the initiative did not have an effect on the remission of obesity (i.e., moving individuals from overweight or obesity to a normal weight).

Another program that has led to changes in schools is the Healthy Corner Store Initiative. The Food Trust has worked with hundreds of corner stores to change their product mix and promote more healthful products. A school-based program also has been instituted to educate students about how to improve their purchasing patterns in corner stores.

Policy and Practice Considerations

Karpyn listed changes in policy and practice that could have an effect on child obesity:

- Enforce wellness policies
- Make breakfast part of the school day
- Include meal participation rates on school report cards
- Increase the reimbursement rate
- Provide universal free meals
- Reevaluate procurement practices to improve available foods
- Provide integrated nutrition education
- Establish school wellness councils
- Create standards and accountability for competitive foods
- Engage in farm-to-school programming
- Continue working with corner stores

Research Considerations

Karpyn also listed the following research considerations:

- What strategies are most effective in upgrading the food consumed from school lunch lines? Possibilities include increases in reimbursement rates, strategic procurement, educational interventions, farm-to-school programs, and taste testing.
- In what ways do food marketing, merchandizing, and product placement influence purchasing and consumption in schools and at stores?

- How does the availability of competitive food affect participation in food assistance programs in schools?
- What can cross-disciplinary studies reveal about diet, educational achievement, and behavioral outcomes?
- How can taxpayers be engaged in the support of research and the implementation of research-based policies?

Karpyn concluded by calling to task politicians who blame the hungry for their condition. "We have ignored for too long the pervasive attitude of pointing blame back at the individuals who are struggling. We haven't done enough to engage the taxpayers to talk about what is in it for them, why this is a societal issue, and why we need to be responsible as taxpayers."

FOOD-INSECURE NEIGHBORHOODS

In the final presentation of the session on environmental factors, Diego Rose, professor in the Department of Community Health Sciences at Tulane University, challenged the argument that environments impact the relationships between food insecurity and obesity, unless one considers a neighborhood or an environment itself as being food insecure. This viewpoint might alter our understanding of the coexistence of poverty, food insecurity, and obesity.

Store Access and Food Consumption

Rose reviewed studies linking neighborhood access to stores and consumption, beginning with the work done by Morland and colleagues (2002a) that linked the presence or absence of a supermarket in a census tract to fruit and vegetable consumption among African Americans. Similarly, Blanchard and Lyson (2003) demonstrated a relationship between residence in a food desert and decreased fruit and vegetable intake.

In the United Kingdom, Wrigley et al. (2002) showed that the opening of a new supermarket leads to increased fruit and vegetable intake. Laraia et al. (2004) and Rose and Richards (2004) also showed that improved access to a supermarket leads to improved diets and increased fruit intake, respectively, findings confirmed by Moore et al. (2008). "What those studies show is that there is a connection between [access to] stores and consumption."

Rose put these findings into the context of a consumer choice model (Figure 7-3). In traditional models, food purchases are determined by the prices of goods, household income, and tastes and preferences, which are often modeled with proxies such as age, ethnicity, or education. Rose focused instead on food cost, which includes the price for food and how much

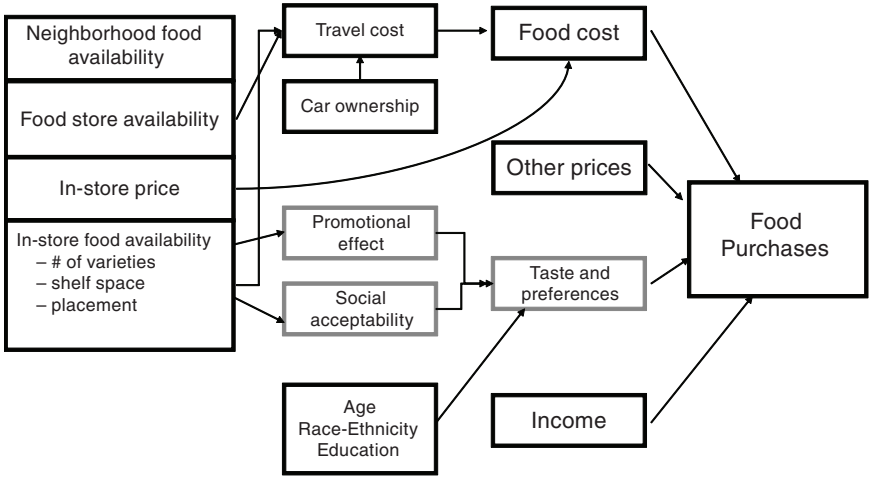

FIGURE 7-3 Food purchases depend on a number of factors in addition to food availability and price.
SOURCE: Rose et al., 2010. Adapted from *Journal of Nutrition* (2010; 140:1170-1174), © 2010 American Society for Nutrition.

it costs to travel to a store. This depends on such factors as the distance to a store, what is offered in a store, and whether a person owns a car. The variety of products, shelf location, and marketing also can affect preferences through promotional effects and social acceptability.

Food purchases are in turn related to consumption and obesity, which would require additional boxes to the right of his model, said Rose. For example, Morland et al. (2006) have linked the presence of supermarkets in a census tract to a decreased prevalence of obesity and the presence of convenience stores to increased obesity. Powell and colleagues (2007) have connected chain supermarket density to decreased BMI and convenience store density to increased BMI. Smaller-scale studies, such as Lopez (2007) and Rose et al. (2009), have produced similar results. In a national longitudinal study, Sturm and Datar (2005) found that the higher the price for fruits and vegetables in area stores, the higher was the BMI for first- through third-grade students.

Neighborhood Food Availability and Consumption

Focusing solely on store access, however, misses the point that not all stores offer the same products. A number of studies have used in-store surveys to study the foods available in a neighborhood and the connection

to consumption. For example, Cheadle et al. (1991) found an association between shelf space for low-fat milk, meats, and high-fiber breads and people's consumption of those products in 12 communities in California and Hawaii. Fisher and Strogatz (1999) and Edmonds and colleagues (2001) also looked at the links between the foods being offered in stores and restaurants and consumption. Franco et al. (2009) used the Nutrition Environment Measures Survey (NEMS) to develop a score of diet quality in the store and looked at consumption, finding a relationship between low diet quality and low availability of healthful foods.

Rose and his colleagues found associations in four census tracts in New Orleans between the shelf space allotted to vegetables and vegetable consumption (Bodor et al., 2008). In another study of 103 tracts in southeastern Louisiana, the shelf space allotted to energy-dense snacks was linked with greater BMI (Rose et al., 2009). "If you measure the chips, cookies, candies, and sodas and add it all up within a kilometer of where people live, there is an association with body mass index."

School Food Environments

Rose also discussed the consumption of food in schools. In a study of the NSLP, Gordon and Fox (2007) found that participants in the program had a higher consumption of calories than nonparticipants. However, their lunches tended to include more nutrients along with more calories, and participants in the program had lower consumption of competitive foods.

Several studies have looked at the availability of vending machines and consumption. Kubik et al. (2003) found a negative association between the availability of vending machine snacks and fruit and vegetable consumption in Minnesota middle schools. In Washington State middle schools, the availability of sugar-sweetened beverages in vending machines was positively associated with consumption (Johnson et al., 2009). Rovner and colleagues (2011), based on a national sample from 2006 and 2007, found that vending machines with fruits, vegetables, and candies each showed a positive association with consumption.

Research Considerations

In summary, said Rose, neighborhood studies show associations between food environments, dietary intake, and weight. However, most of these studies are cross-sectional. Future research needs to look at interventions or panel studies to determine causality, particularly regarding the effects of prices on consumption and obesity, he said.

GROUP DISCUSSION

Moderator: Katherine Alaimo

During the group discussion period, points raised by participants included the following:

Shopping Destinations

Adam Drewnowski observed that research also needs to look at where people actually shop, not just at the characteristics of the stores in a neighborhood. Many people do not shop in their immediate neighborhood. In Seattle, where people tend to shop by car, they may go to a supermarket considerably farther away than the one nearest their homes. "We need to have data on destinations, not just distance."

Karpyn noted that Amy Hillier at the University of Pennsylvania is doing qualitative and quantitative work on how people shop. When people are using their WIC (Special Supplemental Nutrition Program for Women, Infants, and Children) vouchers, they tend to go to the nearest corner store because they are not price sensitive, she said. With SNAP (Supplemental Nutrition Assistance Program) benefits, they may go to a supermarket. "I agree with you. It is very complicated."

Modes of Transportation to Shopping

Odoms-Young pointed out that many studies are not able to capture all of the places where people shop. Her studies have shown that some people are walkers and some are riders, and not all riders have cars. In the latter case, people may need to exchange something for rides, which involves social costs. For example, if someone is coming to another person's home to do informal work, that person may be able to get a ride to or from home or a store. People also have access to food from other people's homes and from food pantries, not just from stores.

Store Layout

Rose described a proposed study that would convert shelf space at corner stores from junk food to fruits and vegetables and determine the effects. To prepare for the study, he and his colleagues asked a random sample of 100 people from the neighborhoods selected for the study about everything consumed in the previous 24 hours and where it was purchased. They found that 75 percent of the people did not use the corner store. Of the 25 percent who did, the items targeted for intervention by the study

were a minor dietary factor (which led to changes in the study design). The major source of calories from corner stores was the lunch counter in the back preparing sandwiches and other foods.

Programs for Very Young Children

Alexandra Adams mentioned the importance of preschool and home day care environments. These programs tend to use different food reimbursement programs than do schools, which can affect consumption.

Food Use in Homes

Adams also mentioned that people may use WIC to feed their entire families, not just their children, which could have adverse consequences on some children. Finally, she emphasized not just whether food is available in the home but how it is used. For example, is anyone able to cook food? "A lot of the families that I work with of all ethnicities have really low cooking skills. Because of that, they value getting prepared foods that are more expensive, or they value being able to go out to fast foods." The role of cooking skills is an important target for research, she said, because simply increasing the availability of food will not necessarily lead to greater use of that food.

REFERENCES

Alaimo, K., C. M. Olson, and E. A Frongillo, Jr. 2001. Low family income and food insufficiency in relation to overweight in U.S. children: Is there a paradox? *Archives of Pediatrics and Adolescent Medicine* 155(10):1161-1167.

Algert, S. J., A. Agrawal, and D. S. Lewis. 2006. Disparities in access to fresh produce in low-income neighborhoods in Los Angeles. *American Journal of Preventive Medicine* 30(5):365-370.

Anderson, S. E., and R. C. Whitaker. 2010. Household routines and obesity in US preschool-aged children. *Pediatrics* 125(3):420-428.

Blanchard, T., and T. Lyson. 2002. *Access to low cost groceries in nonmetropolitan counties: Large retailers and the creation of food deserts*. Ithaca, NY: Cornell University.

Blanchard, T., and T. Lyson. 2003. *Retail concentration, food deserts, and food-disadvantaged communities in rural America*. Final Report for Food Assistance Grant Program, Southern Rural Development Center. Mississippi State University: Economic Research Service, U.S. Department of Agriculture.

Bodor, J. N., D. Rose, T. A. Farley, C. Swalm, and S. K. Scott. 2008. Neighbourhood fruit and vegetable availability and consumption: The role of small food stores in an urban environment. *Public Health Nutrition* 11(4):413-420.

Borradaile, K. E., S. Sherman, S. S. Vander Veur, T. McCoy, B. Sandoval, J. Nachmani, A. Karpyn, and G. D. Foster. 2009. Snacking in children: The role of urban corner stores. *Pediatrics* 124(5):1293-1298.

Briefel, R. R., A. Wilson, and P. M. Gleason. 2009a. Consumption of low-nutrient, energy-dense foods and beverages at school, home, and other locations among school lunch participants and nonparticipants. *Journal of the American Dietetic Association* 109(2).

Briefel, R. R., M. K. Crepinsek, C. Cabili, A. Wilson, and P. M. Gleason. 2009b. School food environments and practices affect dietary behaviors of US public school children. *Journal of the American Dietetic Association* 109(2).

Cheadle, A., B. M. Psaty, S. Curry, E. Wagner, P. Diehr, T. Koepsell, and A. Kristal. 1991. Community-level comparisons between the grocery store environment and individual dietary practices. *Preventive Medicine* 20(2):250-261.

Chen, A. Y., and J. J. Escarce. 2010. Family structure and childhood obesity, Early Childhood Longitudinal Study—Kindergarten Cohort. *Preventing chronic disease* 7(3).

Cole, N., and M. K. Fox. 2008. *Diet quality of American young children by WIC participation status: Data from the National Health and Nutrition Examination Survey, 1999-2004.* Document No. PR08-67. Washington, DC: Abt Associates, Inc. and Mathematica Policy Research.

Drewnowski, A., and S. E. Specter. 2004. Poverty and obesity: The role of energy density and energy costs. *American Journal of Clinical Nutrition* 79(1):6-16.

Edmonds, J., T. Baranowski, J. Baranowski, K. W. Cullen, and D. Myres. 2001. Ecological and socioeconomic correlates of fruit, juice, and vegetable consumption among African-American boys. *Preventive Medicine* 32(6):476-481.

Fisher, B. D., and D. S. Strogatz. 1999. Community measures of low-fat milk consumption: Comparing store shelves with households. *American Journal of Public Health* 89(2):235-237.

Foster, G. D., S. Sherman, K. E. Borradaile, K. M. Grundy, S. S. Vander Veur, J. Nachmani, A. Karpyn, S. Kumanyika, and J. Shults. 2008. A policy-based school intervention to prevent overweight and obesity. *Pediatrics* 121(4).

Franco, M., A. V. Diez-Roux, J. A. Nettleton, M. Lazo, F. Brancati, B. Caballero, T. Glass, and L. V. Moore. 2009. Availability of healthy foods and dietary patterns: The Multi-Ethnic Study of Atherosclerosis. *American Journal of Clinical Nutrition* 89(3):897-904.

Gleason, P. M., R. Briefel, A. Wilson, and A. H. Dodd. 2009. *School meal program participation and its association with dietary patterns and childhood obesity.* Contractor and cooperator report no. 55. Washington, DC: Mathematica Policy Research.

Gordon, A., and M. K. Fox. 2007. *School Nutrition Dietary Assessment Survey-III: Summary of findings.* Washington, DC: USDA Food and Nutrition Service.

Grow, H. M. G., A. J. Cook, D. E. Arterburn, B. E. Saelens, A. Drewnowski, and P. Lozano. 2010. Child obesity associated with social disadvantage of children's neighborhoods. *Social Science & Medicine* 71(3):584-591.

Gundersen, C., D. Mahatmya, S. Garasky, and B. Lohman. 2010. Linking psychosocial stressors and childhood obesity. *Obesity Reviews* DOI: 10.1111/j.1467-789X.2010.00813.x.

Hartline-Grafton, H. L., D. Rose, C. C. Johnson, J. C. Rice, and L. S. Webber. 2009. Energy density of foods, but not beverages, is positively associated with body mass index in adult women. *European Journal of Clinical Nutrition* 63(12):1411-1418.

Johnson, D. B., B. Bruemmer, A. E. Lund, C. C. Evens, and C. M. Mar. 2009. Impact of school district sugar-sweetened beverage policies on student beverage exposure and consumption in middle schools. *Journal of Adolescent Health* 45(3 SUPPL.).

Kendall, A., C. M. Olson, and E. A. Frongillo. 1996. Relationship of hunger and food insecurity to food availability and consumption. *Journal of the American Dietetic Association* 96(10):1019-1024.

Kubik, M. Y., L. A. Lytle, P. J. Hannan, C. L. Perry, and M. Story. 2003. The association of the school food environment with dietary behaviors of young adolescents. *American Journal of Public Health* 93(7):1168-1173.

Laraia, B. A., A. M. Siega-Riz, J. S. Kaufman, and S. J. Jones. 2004. Proximity of supermarkets is positively associated with diet quality index for pregnancy. *Preventive Medicine* 39(5):869-875.

Larson, N., and M. Story. 2010a. *Food insecurity and risk for obesity among children and families: Is there a relationship? A research synthesis.* Princeton, NJ, and Minneapolis, MN: Robert Wood Johnson Foundation Healthy Eating Research.

Larson, N., and M. Story. 2010b. Are "competitive foods" sold at school making our children fat? *Health Affairs* 29(3):430-435.

Levin, M., J. Adach, R. Cooper, L. Parker, and M. Saltzman. 2007. *School breakfast in America's big cities: Successes and shortfalls.* Washington, DC: Food Research and Action Center.

Lewis, L. B., D. C. Sloane, L. M. Nascimento, A. L. Diamant, J. J. Guinyard, A. K. Yancey, and G. Flynn. 2005. African Americans' access to healthy food options in South Los Angeles restaurants. *American Journal of Public Health* 95(4):668-673.

Lopez, R. P. 2007. Neighborhood risk factors for obesity. *Obesity* 15(8):2111-2119.

Ludwig, D. S., and H. A. Pollack. 2009. Obesity and the economy from crisis to opportunity. *Journal of the American Medical Association* 301(5):533-535.

Millimet, D. L., R. Tchernis, and M. Husain. 2010. School nutrition programs and the incidence of childhood obesity. *Journal of Human Resources* 45(3):640-654.

Monsivais, P., and A. Drewnowski. 2009. Lower-energy-density diets are associated with higher monetary costs per kilocalorie and are consumed by women of higher socioeconomic status. *Journal of the American Dietetic Association* 109(5):814-822.

Moore, L. V., A. V. Diez Roux, J. A. Nettleton, and D. R. Jacobs. 2008. Associations of the local food environment with diet quality—A comparison of assessments based on surveys and geographic information systems. *American Journal of Epidemiology* 167(8):917-924.

Morland, K., S. Wing, and A. D. Roux. 2002a. The contextual effect of the local food environment on residents' diets: The Atherosclerosis Risk in Communities Study. *American Journal of Public Health* 92(11):1761-1767.

Morland, K., S. Wing, A. Diez Roux, and C. Poole. 2002b. Neighborhood characteristics associated with the location of food stores and food service places. *American Journal of Preventive Medicine* 22(1):23-29.

Morland, K., A. V. Diez Roux, and S. Wing. 2006. Supermarkets, other food stores, and obesity: The Atherosclerosis Risk in Communities Study. *American Journal of Preventive Medicine* 30(4):333-339.

Nord, M., M. Andrews, and S. Carlson. 2008. *Household food security in the United States, 2007.* Economic Research Report No. 66. Washington, DC: Economic Research Service.

Odoms-Young, A., S. Zenk, L. Holland, A. Watkins, J. Wroten, N. Oji-Njideka, S. Ellis, I. Davis, C. Dallas, M. Fitzgibbon, R. Jarrett, M. Mason, A. Webb, and D. Sharp. 2010. *Family food access report: When we have better, we can do better.* Chicago, IL: University of Illinois at Chicago and Chicago Department of Public Health Englewood Neighborhood Health Center.

Ogden, C. L., M. D. Carroll, L. R. Curtin, M. M. Lamb, and K. M. Flegal. 2010. Prevalence of high body mass index in U.S. children and adolescents, 2007-2008. *Journal of the American Medical Association* 303(3):242-249.

Powell, L. M., F. J. Chaloupka, and Y. Bao. 2007. The availability of fast-food and full-service restaurants in the United States. Associations with neighborhood characteristics. *American Journal of Preventive Medicine* 33(4 SUPPL.).

Powell, L. M., E. Han, and F. J. Chaloupka. 2010. Economic contextual factors, food consumption, and obesity among U.S. adolescents. *Journal of Nutrition* 140(6):1175-1180.

Rose, D., and R. Richards. 2004. Food store access and household fruit and vegetable use among participants in the US Food Stamp Program. *Public Health Nutrition* 7(8):1081-1088.

Rose, D., P. L. Hutchinson, J. N. Bodor, C. M. Swalm, T. A. Farley, D. A. Cohen, and J. C. Rice. 2009. Neighborhood food environments and body mass index. The importance of in-store contents. *American Journal of Preventive Medicine* 37(3):214-219.

Rose, D., J. N. Bodor, P. L. Hutchinson, and C. M. Swalm. 2010. The importance of a multi-dimensional approach for studying the links between food access and consumption. *Journal of Nutrition* 140(6):1170-1174.

Rovner, A. J., T. R. Nansel, J. Wang, and R. J. Iannotti. 2011. Food sold in school vending machines is associated with overall student dietary intake. *Journal of Adolescent Health* 48(1):13-19.

School Nutrition Association. 2009. *The pressure cooker: School meals face rising costs and participation.* National Harbor, MD: School Nutrition Association.

Sharma, A. J., L. M. Grummer-Strawn, K. Dalenius, D. Galuska, M. Anandappa, E. Borland, H. Mackintosh, and R. Smith. 2009. Obesity prevalence among low-income, preschool-aged children: United States, 1998-2008. *Morbidity and Mortality Weekly Report* 58(28):769-773.

Sturm, R., and A. Datar. 2005. Body mass index in elementary school children, metropolitan area food prices and food outlet density. *Public Health* 119(12):1059-1068.

Townsend, M. S., G. J. Aaron, P. Monsivais, N. L. Keim, and A. Drewnowski. 2009. Less-energy-dense diets of low-income women in California are associated with higher energy-adjusted diet costs. *American Journal of Clinical Nutrition* 89(4):1220-1226.

Wrigley, N., C. Guy, and M. Lowe. 2002. Urban regeneration, social inclusion and large store development: The Seacroft development in context. *Urban Studies* 39(11):2101-2114.

Yancey, A. K., B. L. Cole, R. Brown, J. D. Williams, A. Hillier, R. S. Kline, M. Ashe, S. A. Grier, D. Backman, and W. J. McCarthy. 2009. A cross-sectional prevalence study of ethnically targeted and general audience outdoor obesity-related advertising. *Milbank Quarterly* 87(1):155-184.

Zenk, S. N., A. J. Schulz, B. A. Israel, S. A. James, S. Bao, and M. L. Wilson. 2005. Neighborhood racial composition, neighborhood poverty, and the spatial accessibility of supermarkets in metropolitan Detroit. *American Journal of Public Health* 95(4):660-667.

Zenk, S. N., A. J. Schulz, G. Mentz, B. A. Israel, and M. Lockett. 2010. Do obesogenic neighborhood food environments exacerbate effects of psychosocial stressors on 'comfort' food intake? Presented at the International Society of Behavioral Nutrition and Physical Activity Conference, Minneapolis, MN.

8

Socioecological Perspectives: The Institutional Level

Key Messages Noted by Participants

- The growth of the local and organic foods movement could serve as a model for making changes in food assistance programs.
- Emergency food systems such as food banks, pantries, soup kitchens, and shelters are facing the challenge of a changing food system.
- Changes in public- and private-sector food programs could have substantial nutritional benefits for the populations they serve.

The most encompassing level from a socioecological perspective is the institutional level, because institutions help to create the environments that shape household and individual behaviors. These institutions create the macroeconomic, taxation, and policy conditions that may contribute to the coexistence of food insecurity and obesity, noted Katherine Alaimo, who moderated the session on institutional factors at the workshop. In particular, food assistance programs and emergency feeding systems, which were the primary focus of the session, can have a profound effect on the lives of low-income and food-insecure people.

THE SUPPLEMENTAL NUTRITION ASSISTANCE PROGRAM (SNAP) AND THE AGRICULTURAL SYSTEM

Researchers often treat food-insecure households as optimizers, said Sonya Jones, assistant professor in the Department of Health Promotion, Education, and Behavior at the University of South Carolina. These households work hard to save their money, they do the best they can when they have shortfalls, and they are rational in their decisions.

A better way to think about these families may be through the lens provided by the recent book *Nudge: Improving Decisions About Health, Wealth, and Happiness* (Thaler and Sunstein, 2008). Subtle clues in society and the environment, such as putting more healthful foods in the front of a buffet or rearranging the items in supermarkets, can influence choices in important ways. "We need to challenge ourselves to be more expansive than a traditional, economic maximizing approach in thinking about food insecurity," said Jones.

In her work in South Carolina, Jones has been moving toward a model that incorporates family adaptation and adjustments. Families have demands and structures, the hassles of everyday life, and the chaos and unpredictability that tend to come with food insecurity. Families balance liabilities against their assets and capabilities. They understand the demands and stresses of their lives and adapt or adjust. They use family management strategies such as maintaining a family meal time or going out for fast food to feel like a normal family. When families are able to achieve this balance, they are resilient—they are able to maintain healthful diets, positive parenting, and healthful food routines. When imbalances arise, maladaptation can occur. Families can have obesogenic diets, disrupted food routines, and lack of parental monitoring or engagement. "The qualitative work we have done suggests that this might be a promising way to understand and intervene on food insecurity," said Jones.

Features of SNAP

An institution can be seen as an organization with rules and policies that affect a person's behavior. By that measure, the Supplemental Nutrition Assistance Program (SNAP) fits the definition of an institution, because it affects people's behavior when they participate. The Food Stamp Act of 1977 describes the program's original intent as

- To strengthen the agricultural economy;
- To help to achieve a fuller and more effective use of food abundances; and

- To provide for improved levels of nutrition among low-income households through a cooperative federal-state program of food assistance to be operated through normal channels of trade.

The program still supports the agricultural economy, injecting about $50 billion into the food economy in 2010, almost double the level of 5 years ago. It also supports low-income people, who can qualify for the program by meeting one of several financial or nonfinancial criteria. Participants are required to complete a significant amount of paperwork, which represents a demand on families, said Jones. They also can be subject to the stigma of participation, may find benefits to be inadequate, or can choose inappropriate foods that lead to obesity. "Families are trying to be resilient in the face of crisis, and they use programs that might be adding to their demands."

Balanced against these demands are the adaptive assets of having additional money to purchase food, receiving nutritional education from the Supplemental Nutrition Assistance Program for Education (SNAP Ed), and establishing healthful family routines. The challenge, said Jones, is to use research about these programs to channel support in the most effective ways.

SNAP and Obesity

With regards to obesity, research has shown that women who participate in SNAP have a small increase in the risk of obesity (Townsend et al., 2001; Gibson, 2003, 2006). Food-insecure women also may undergo changes in meal patterns (Zizza et al., 2008). Jones and Frongillo (2006) found a small increase in weight gain when participating in the food assistance programs—"maybe a 10 percent increase in risk."

As with any large institution, SNAP has multiple effects, some of which are positive and some negative. One way to view this problem is through what researchers call the "multiple streams theory." Multiple problems such as obesity, hunger, and increasing agricultural yield are attacked with very broad solutions, such as "taking care of poor people" or "reducing the size of government." As Jones said, "The solutions are driving the problems, or the politics are driving the problems, rather than the other way around."

In addition, said Jones, agriculture is a classic example of an "iron triangle" where policy makers, interest groups, and bureaucracies are tightly linked in making policy. This makes it very difficult to change the agricultural system, of which SNAP is a part. One promising change in the past 20 years, Jones added, has been the growth of the local and organic foods movement, which has used the growth of a market sector and local advo-

cacy to make policy changes. "This is a model that we need to think about learning from," she said.

Research Considerations

Jones suggested several future research directions:

- Use family systems theory to integrate program evaluation research.
- Use policy analysis to understand how new "solutions" change problems and politics. Examples include taxes on sugar-sweetened beverages, changes in food subsidies, and the development of local food economies.
- Conduct experiments that help families develop resilience, set food procurement standards for retailers participating in programs, and keep food assistance dollars local.

ADDRESSING OBESITY THROUGH THE EMERGENCY FOOD SYSTEM

Food banks, which originated in the 1960s, were originally intended to be used for emergencies and to help people in disasters, said Tom Slater, executive director of the Food Bank of Central New York, which is part of the Feeding America network of 200 food banks across the United States. Food banks glean, purchase, store, and distribute foods to their subsidiary emergency food programs (EFPs) such as food pantries, soup kitchens, and shelters. Food banks are the equivalent in the commercial food distribution system of wholesalers, while EFPs are equivalent to food retailers in that they receive food from a variety of sources, including but not limited to food banks, and distribute food directly to recipients.

The number of food banks increased significantly in the 1980s. Over the past few years they have continued to grow and have served many people who suffer from chronic food insecurity. Slater said that 82 percent of food pantries, 67 percent of soup kitchens, and 80 percent of shelters have seen an increase since 2006 in the number of recipients who come to their programs.

Food Banks and a Changing Food System

In recent years, many food banks have faced the challenge of a changing food system. They have lost significant food donations, which typically come from food manufacturers, grocers, farmers, and individuals. Information technology has increasingly made it possible for food manufacturers to make just enough food that they can sell. Also, the rise of dollar stores and

drug stores selling food has created lost opportunities for food banks, while donations to food banks of energy-dense foods with minimal nutritional value have increased, noted Slater.

The role of food banks as major food suppliers to food-insecure and nutritionally vulnerable people necessitates consideration of the nutritional impact of food donation and distribution policies and practices, said Slater. "If we are going to change behaviors, we not only have to educate but we have to change the environment in which people are getting food."

The Food Bank of Central New York distributed more than 11 million pounds of food in 2009, which is equal to more than 23,000 meals every day. With four registered dietitians on staff, it has been conducting an in-depth discussion within the organization of how to change the way it works. The Hunger Prevention Nutrition Assistance Program within the New York State Department of Health, which is a major funder of the food bank, is very supportive of this process. Food banks tend to accept every food donation that is offered, said Slater, because even if the donation is not healthful, food banks may be concerned that rejecting certain items might preclude people from making future donations. When a solicitor from Slater's food bank went to Pepsi to talk about the nutritional value of its donations, Pepsi responded that it would be glad to provide noncarbonated beverages. "That was a huge barrier to overcome that we could have a dialogue with our donors and perhaps come to a better understanding."

No-Soda/No-Candy Policy

In 2004 the Food Bank of Central New York implemented a no-soda and no-candy policy. The policy was very controversial in the emergency food network. "I went on a series of debates across the country with John Arnold, the food bank director from Michigan, to talk about whether we should have policies that would exclude foods," Slater said. "Those against exclusion policies argued that clients may want or need specific food items and food banks should not limit their choices. We responded that we are not saying that people shouldn't have soda or candy. We are saying that it is affordable and accessible in their neighborhoods." Food banks also spend considerable time and money picking up products that are not healthful; when the Food Bank of Central New York considerably reduced the amount of soda distributed, it prevented a potential 3,300 pounds of weight gain among its clients.

Perspectives of Bank Recipients

Since the policy was instituted, the Atkins Center on Weight and Health at the University of California at Berkeley has conducted an evaluation to

assess the policy's impact, the preferences of emergency food recipients, and the perceptions of food pantry directors. Recipients were asked to rank the importance of various considerations on a four-point scale. Ninety-eight percent indicated that having nutritious food available to choose at a food pantry was important or very important. Ninety-four percent reported that taste was also an important or very important consideration when choosing food for their households. Seventy percent did not place a priority on receiving snacks, reporting that it was somewhat or not important to them. Ninety-four percent placed a high priority on the availability of staple items.

Recipients also ranked items they would like to get at a food pantry. Meat, poultry, and fish; vegetables; and fruit received the three highest ranks. Snacks, soda, and candy were the three least preferred items. "These findings helped validate the Food Bank of Central New York's original no-soda/no-candy policy and can help shape future nutrition policies," said Slater.

More than 70 percent of food recipients said that they preferred fresh fruit rather than frozen or canned fruit, and 51 percent said they preferred to receive fresh vegetables rather than frozen or canned.

Perspectives of Food Pantry Directors

About 80 percent of directors said they "strongly agree/somewhat agree" and 20 percent said they "strongly disagree/somewhat disagree" with the statement "the role of the food pantry is to provide healthy items only." Only about twenty-seven percent said they "strongly agree/somewhat agree" with the statement "the role of the food pantry is to provide a variety of foods including soda and candy," with about 74 percent indicating that they "strongly disagree/somewhat disagree" with that statement. Most of the directors surveyed were familiar with the Food Bank of Central New York's policy of no soda and no candy and had come to agree with it.

Directors reported that inconsistent availability is the greatest barrier to providing fresh fruits and vegetables. The costs of meat, poultry, fish, refrigerated milk, and whole wheat bread also were identified as barriers to distribution, as was the inability to store milk and fresh fruit properly.

This study revealed several important points, Slater said. The biggest challenges to providing preferred foods are not attitudinal; instead, they relate to cost, inconsistent availability, and storage capacity. Recipients' preferences can be used to guide food donors, purchasers, program directors, and dietitians when determining the product mix to distribute as well as what types of foods may need promotion. "Findings from this study should be used to support internal discussions regarding improvement of the infrastructure of food pantries to help support the improvement of foods distributed at food pantries," Slater concluded.

Building the Infrastructure

Since 2004 the Food Bank of Central New York has put more than a million dollars into refrigerators, freezers, and shelving to handle different kinds of food. Its staple items are now meat, poultry, fish, fresh fruits and vegetables, and frozen vegetables. It has set up a million-dollar line of credit so that food pantries can draw on the bank throughout the year. The 276 emergency food programs it serves can choose on a monthly basis the type of foods they want to distribute. It has partnered with neighborhood stores so that people can redeem milk vouchers for 1 percent or skim milk and food banks do not have to store and distribute as much milk. Of the people surveyed in the territory served by the bank, 97 percent were happy with the quantity of food that they received, 98 percent were happy with the quality of the food they received, and 95 percent said that they were treated with respect.

The Food Bank of Central New York can be "a model for the nation," said Slater. The Feeding America network has begun to source and track nutritious food. Slater is working with the network to define a meal as containing three to five food groups, rather than simply 1.3 pounds of food, the definition used in the past. The provision of funding from the New York State Department of Health, rather than the Department of Social Services, means that the Food Bank of Central New York can focus on health. It also works with recipients to ensure that they get the government benefits to which they are entitled. A full-time staff member works with the emergency food programs to assess why individuals come into the network and to address their needs, whether paying a heating bill, feeding a new baby, or applying for SNAP. "It is critical that we partner with the government so that . . . we can have a comprehensive approach."

Research Considerations

Slater identified the following questions:

- To what extent can the emergency food system change nutrition and procurement policies to meet the demand of recipients?
- To what extent would the infrastructure of the emergency food system need to change to accommodate more healthful foods? Is this sustainable?
- Do recipients, directors, food bank staff, and nutrition experts define nutritious food similarly?
- How do inventory improvements in the emergency food system affect recipients' overall diet quality?

DISAGREEMENTS OVER THE RATIONALE FOR STUDYING FOOD INSECURITY AND OBESITY

In the final presentation of the session on institutional factors, Diego Rose, professor in the Department of Community Health Sciences at Tulane University, raised several provocative questions as a way of helping people think more deeply about the topic of the workshop.

Rose began by asking whether it made sense to focus on the relationship between food insecurity and obesity. Because both food insecurity and obesity are major social problems and because relatively little is known about how to improve either, Rose suggested that it would make more sense to focus energies on each problem separately.

The Obesity Problem

Obesity is strongly associated with poverty, even more so than with food security. For those working on the problem of obesity, it would make more sense to focus on the poor, rather than the narrower subset of the food insecure. Surveys show that 43 percent of the poor are food insecure, leaving 57 percent who are not food insecure. "Do we want to exclude them if we are concerned about obesity?" Rose asked.

Similarly, only about 10 percent of overweight children are food insecure, but about a quarter of overweight children are poor. "Maybe we would have more of an impact if we worked on poor people rather than food-insecure people."

If one is concerned about obesity, the other problem Rose mentioned is that focusing on the narrower food insecurity-obesity linkage removes physical activity from consideration. Of course, physical activity level is a key determinant of obesity. Yet being physically active in poor neighborhoods, for example, can be difficult because of crime, difficulty accessing playgrounds, and other issues. Leaving out physical activity gives an incomplete picture of the factors contributing to obesity, particularly among the poor.

The Food Security Problem

Just as with obesity, food insecurity is a major problem in its own right that requires solution. Thus, for those concerned with solving the problem of food insecurity, it can be misleading to focus only on those food-insecure people who are overweight or obese, because that would exclude one-third to two-thirds of the food-insecure population. "Why muddy it up with looking at just those who are overweight?"

Other Considerations

Rose said that focusing on the relationship between food insecurity and obesity may detract from our real concerns, which are to reduce food insecurity and to reduce obesity. Even in isolation, these objectives are very difficult, both for researchers and for policy makers. Intervention science can be more effective if one outcome at a time is studied. Focusing on whether institutions affect the relationship between food insecurity and obesity detracts from the more pressing concerns of how we influence institutions to reduce food insecurity or how we influence institutions to reduce obesity. Furthermore, policy makers understand the importance of reducing food insecurity or reducing obesity, but emphasizing the relationship between the two may obscure the importance of each goal. Rose asked whether we might be analyzing ourselves out of relevance by focusing too narrowly on this complex relationship. Rose also wondered whether some emphasized the relationship between food insecurity and obesity as a way of justifying food assistance programs to U.S. taxpayers. Rose argued that this wasn't necessary because "food" assistance programs had modernized to become "nutrition" assistance programs—offering nutrition education and better access to healthful foods.

GROUP DISCUSSION

Moderator: Katherine Alaimo

During the group discussion period, points raised by participants included the following:

The Rationale for Studying Food Insecurity and Obesity

Researchers need to understand the relationship between food insecurity and obesity because the public blames poor people for having obese children, said one participant. By delineating mechanisms that link food insecurity and obesity, researchers can help explain the association. Another pointed out that the public may come to the conclusion that food assistance programs promote obesity, which can reduce support for these programs. Research on the links between poverty, food insecurity, and obesity can reduce public confusion about this issue. Similarly, rates of obesity vary among regions and ethnic groups in the United States, and research can help delineate the reasons for this variation.

Rose agreed in part with these observations. He pointed out that many people blame the obese for their condition. Research can reveal the

socioecological contributors to obesity, which might shift blame more appropriately. A benefit of focusing on food insecurity and obesity is what this workshop provides: a way to bring creative, interdisciplinary researchers together to devise solutions that would not necessarily be considered from a single disciplinary perspective, he said.

Food Quality in the Emergency Food System

Several participants commented on the efforts of food banks around the country to improve the nutritional quality of the foods they distribute. As the result of a recent initiative in California, for example, 60 percent of the food going into the food bank system now consists of fruits and vegetables. Changes in advocacy and communication also have been made, and other states are adopting these changes, just as other state food banks have adopted changes pioneered in New York State.

In response to a question about how he has managed to have so many nutritionists on the staff of the Food Bank of Central New York, Slater responded that he has been able to hire four nutritionists by convincing government of the importance of their positions. "We need to hold [government] accountable to help fund this, and we need to show them that it is critical that we do it from a nutritional standpoint."

Redefining "Success" of Food Distribution

Michelle Berger from the Feeding America network remarked that her organization is working with member organizations on both food insecurity and nutritional insecurity. It also is considering such issues as how to define success beyond the distribution of particular quantities of food. "What does success look like in the emergency feeding system beyond just pounds?"

REFERENCES

Gibson, D. 2003. Food stamp program participation is positively related to obesity in low income women. *Journal of Nutrition* 133(7):2225-2231.

Gibson, D. 2006. Long-term food stamp program participation is positively related to simultaneous overweight in young daughters and obesity in mothers. *Journal of Nutrition* 136(4):1081-1085.

Jones, S. J., and E. A. Frongillo. 2006. The modifying effects of food stamp program participation on the relation between food insecurity and weight change in women. *Journal of Nutrition* 136(4):1091-1094.

Thaler, R., and C. Sunstein. 2008. *Nudge: Improving decisions about health, wealth, and happiness*. Ann Arbor, MI: Caravan Books.

Townsend, M. S., J. Peerson, B. Love, C. Achterberg, and S. P. Murphy. 2001. Food insecurity is positively related to overweight in women. *Journal of Nutrition* 131(6):1738-1745.

Zizza, C. A., P. A. Duffy, and S. A. Gerrior. 2008. Food insecurity is not associated with lower energy intakes. *Obesity* 16(8):1908-1913.

9

Putting the Levels Together

Key Messages Noted by Participants

- Gaps in the research on food insecurity and obesity, particularly in the areas of volatility, developmental stages, and causality, limit the ability to design and evaluate interventions.
- The influence of multiple factors on the relationship between food insecurity and obesity is not additive or interactive but integrative.
- Models that incorporate these factors, though inevitably limited, can inform interventions to reduce obesity.
- Conditional cash transfer programs could be used to address food insecurity and obesity, but only after careful consideration of issues associated with their design and implementation.

Following the sessions on the four levels of socioecological influence, Pamela Morris, professor of applied psychology at the New York University Steinhardt School of Culture, Education, and Human Development, sought to put the levels back together. Although much of Morris's research has been on antipoverty programs and their effects on families and children rather than on obesity per se, she was trained with Urie Bronfenbrenner at Cornell University to look at systems-level processes, giving her a broad perspective to integrate the interactions across levels.

RESEARCH GAPS

From an outsider's perspective, Morris said, the research on food insecurity and obesity has several prominent gaps that limit the ability to inform interventions. First, what are the relevant aspects of food insecurity that are central to the relationship? Is it the level of food insecurity, as measured by hunger or lack of food? Is it the quality of food that low-income individuals and families eat? Or is it the volatility of access to food that influences obesity?

Each of these factors points toward a different policy response. If the level of food insecurity matters, then families need more resources. If it is quality that matters, families need access to more nutritious food. If the critical factor is volatility, the question becomes how to smooth consumption over a monthly period so that families do not have times of great need and less need.

Gaps also exist in the research methods that can be applied to these topics, said Morris. In particular, better ways are needed to measure sources of influence across levels and causal processes.

Volatility and Food Access

Volatility may be the most understudied of these issues, Morris said. Volatility is also a topic that has not been much attended to in poverty research. In child development research, income is typically annualized so that short-term fluctuations are smoothed out (Duncan and Brooks-Gunn, 1997; Cancian and Danziger, 2009; Gennetian et al., 2010). Economics research has looked at earnings volatility; for example, earnings volatility has been linked with material hardship and food insecurity (Bania and Leete, 2007; Jolliffe and Ziliak, 2008; Mills and Amick, 2010). Yet poverty research generally has examined the volatility of residential stability or family structure (Wu and Martinson, 1993; Ackerman et al., 1999) and not income instability. Also, this research tends to look at a single event rather than a chronic pattern of events.

If a low-income family cannot predict its income levels, it may experience more distress than in adjusting to a routinely low income. Variations in how much parents can purchase for their children could have a variety of deleterious effects, from disruptions of predictable food cycles to reductions in academic achievement. Volatility could reduce parents' time and money investments in children's human development (Becker, 1981). Volatility also can lead to stress, raising the possibility that stress and not just deprivation leads to behavioral outcomes (McLoyd, 1990). In this regard, animal research has demonstrated enormous effects of unpredictable feeding and social relationships on parental and offspring behaviors.

Human Development

Another understudied subject, according to Morris, is the effect of developmental stage on the relationship between food insecurity and obesity. Food insecurity can have very different effects on an infant versus a preschooler versus a school-aged child versus an adolescent. A young child may be protected against hunger by the family or by food assistance programs, while an older child may have more autonomy in selecting foods to consume.

Children also may go through critical periods where food insecurity has especially dramatic effects. If so, interventions might be structured to protect children during these periods.

Causality

Finally, said Morris, causality is a critical factor. If a relationship is not causal, interventions will not necessarily make a difference to the desired outcome. Ways to determine causality include state-level variation, natural experiments, sibling and longitudinal fixed-effect studies that factor out unobserved influences, and the study of instrumental variables with randomized experiments, which essentially discards the naturally occurring variation in the predictor of interest and estimates causal relations.

In addition to theory, methods are important in research on food insecurity and obesity. Multiple factors need to be measured at multiple levels to understand the relationship from a biological, psychosocial, and environmental perspective. Only through these measurements can models and theories be tested in the context of individuals, households, neighborhoods, and policies.

AN INTEGRATIVE FRAMEWORK

Individuals are embedded within systems at various levels, from the microlevel to the eco-level to the macrolevel, said Morris, but the influences of factors at these various levels are not additive or even interactive but truly integrative. In addition, biological factors, including genetic influences, interact with environmental factors, producing outcomes for the developing person.

The standard Bronfenbrenner model can be represented by an individual in the middle of concentric circles symbolizing the increasing levels of the environment surrounding that individual. The mutually influencing effects of genes and the environment and their interactions produce outcomes for the developing person. An extension of this model developed by Sameroff (2010) includes macrolevel influences that constrain these levels

(Figure 9-1). It is a biopsychosocial model, because individuals have both a biology and a psychology that help create the person. Changes in the outer circles can have effects on lower-order systems, and these effects may be heterogeneous across individuals with different biological or psychological processes or starting states.

As an individual develops over time, the elements of the model expand through the integrated effects of genes and the environment (Figure 9-2). Over time, the individual interacts with and influences more of the environment, producing the self embedded within the large contextual framework. The advantage of this model, said Morris, is that a change in one aspect can "reverberate" throughout the system. "By being interactive and integrative, we could change one thing and see ramifications," which allows such models to inform interventions.

Key measurements that are needed to inform such models are physiological as well as behavioral health indicators, contextual features of households and neighborhoods, and policy variables.

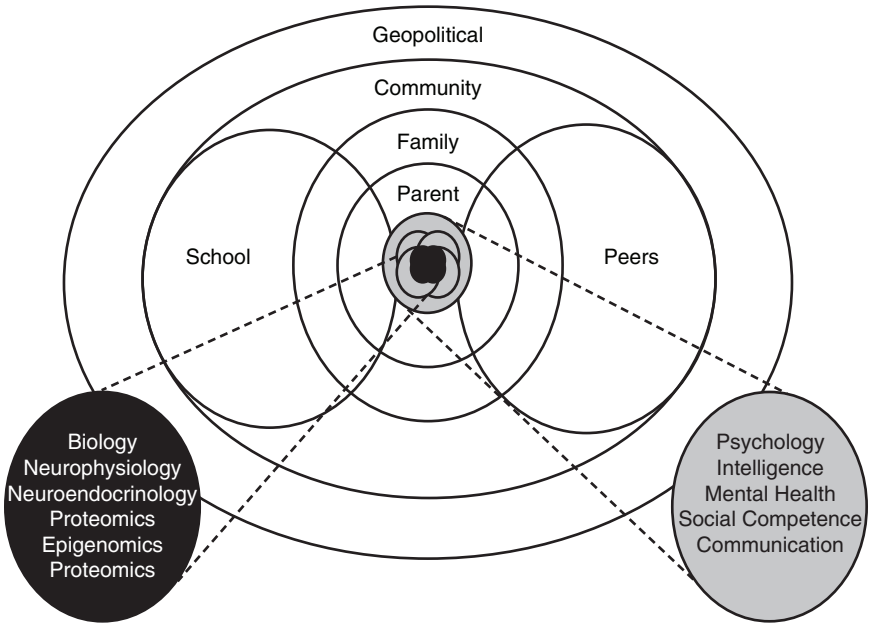

FIGURE 9-1 The biopsychosocial ecological model depicts the individual at the center of concentric circles of broader influences.
SOURCE: Sameroff, 2010.

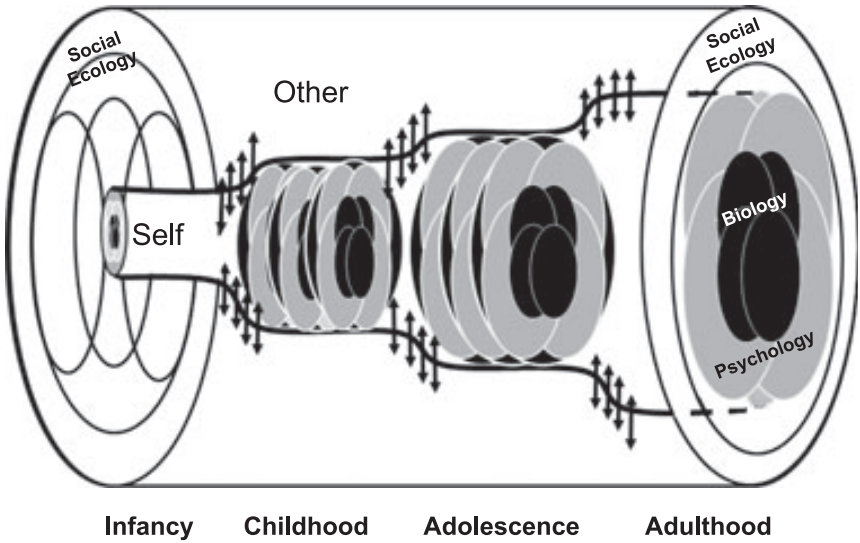

FIGURE 9-2 Over the life span, individuals gain greater control over their socio-ecological surroundings.
SOURCE: Sameroff, 2010.

Conditional Cash Transfer Programs

One intervention that Morris discussed extensively is the use of conditional cash transfers in antipoverty programs. These transfers have two major goals. First, they reduce current poverty by transferring cash to low-income families in return for behavioral changes. Second, they reduce long-term poverty by tying those transfers to parental investments in their children through actions such as adherence to well-baby visits, immunizations, nutritional regimens, and school attendance.

The idea has been pioneered in Mexico and is now operating in about 30 lower- and middle-income countries, and "there is some evidence of its effects in improving health," said Morris. These programs also have been controversial, and Morris encouraged workshop participants to discuss such strategies during the discussion period.

New York City is testing a version of a conditional cash transfer program called Opportunity New York City/Family Rewards. Developed by MDRC and sponsored by the New York City Center for Economic Opportunity, the intervention is layered on top of the existing social safety net. Low-income families in New York get access to all of the benefits that they would otherwise receive, along with additional benefits. Participating

families can receive $4,000 to $6,000 per year in the form of rewards for certain behavioral changes. They might receive $50 a month for their children going to school regularly, $25 for getting a library card, and several hundred dollars for a child receiving a high score on a standardized test. For older children, the rewards are split between the child and the family. The program offers rewards in three domains: children's education, family preventive health care, and parents' work and training.

Low-income families in six communities in New York City with a fourth, a seventh, or a ninth grader have been randomly assigned to experimental or control groups, and results from a 5-year evaluation thus far cover the first 2 years, including startup (Riccio et al., 2010). According to Morris, the program is having substantial effects on low-income families. Families in the program have seen an 11 percentage point reduction in being below the poverty level compared with control families (from 70.0 percent to 58.9 percent), and they have experienced a 13 percentage point reduction in being below half of the poverty level (from 30.0 percent to 16.7 percent).

In addition, the program has had "remarkable effects" on food insecurity, according to Morris. Control families reported a 22.1 percent rate of food insufficiency, while families in the program had a 14.8 percent rate. "Here you have a policy that is actually changing food insecurity for families."

As mentioned earlier by Sonya Jones, interventions can have a wide variety of effects. For example, conditional cash transfers can have the effect of reducing work efforts. However, that has not been the case with the New York program, Morris observed. The program has produced greater use of healthcare services, particularly dental care, and it has produced small benefits for the academic achievement of older children who are already among the most proficient students. A question Morris posed to the workshop is how such programs could be used to address health and obesity issues specifically.

Incentives may not be enough to change some behaviors, Morris acknowledged. Low-income families face many sources of stress. It can be very complicated for such families to figure out how to buy better foods for their children. However, Morris agreed with Jones that behaviors can be nudged. "Can we . . . change the defaults or reduce the psychic pressures for low-income families in a way to make a big difference for behavior?" For example, is it possible to redesign supermarkets or food assistance programs to change purchasing or consumption patterns? As another example, low-income families are more likely to apply for financial aid when a child is preparing to enter college if financial aid forms are filled out for them in advance. "Could we imagine doing the same thing with the food stamp program?"

Finally, if volatility is a major issue, interventions may have to be targeted specifically to volatility, said Morris. Many income support policies do not try to reduce volatility, and some of them might increase income volatility. Do families need savings accounts or rainy day funds to weather income instability? Can the timing of food assistance distribution protect families from food instability? Such policy innovations also could protect families from lenders who otherwise could contribute to their poverty.

The application of models needs to be strategic. Where are the points of intervention that have synergistic effects? How can additional resources most effectively reduce poverty? How can food resources be made available to low-income families in ways that address both food insecurity and obesity? Policies should support rather than undermine health-related outcomes for low-income families and children, Morris concluded.

GROUP DISCUSSION

Moderator: Edward Frongillo, Jr.

During the group discussion period, points raised by participants included the following:

Conditional Cash Transfer Programs

Frongillo noted that conditional cash transfer programs have met with resistance wherever they have been proposed and asked how people can be persuaded that the idea is viable and worthy of testing. Morris responded that a major challenge is framing. Such programs should not be described as paying people to do what you want them to do anyway. Rather, they should be described as compensating families to overcome the barriers in their lives. For example, when middle-income families need medical care, they make an appointment and lose just a few hours from work, but when low-income families go a clinic, they can lose half a day or more of work and possibly a job if their work absences are too frequent or protracted. "The idea is to compensate families to make up for those times of challenge."

Marion Standish of The California Endowment asked whether conditional cash transfer programs may add to the stress of families in environments where it may be very difficult or impossible to achieve certain goals. Morris acknowledged that this was a concern in establishing the Family Rewards program in New York City. In response, the program has sought to design the incentives to be large enough to be beneficial but not so large that they would create undue pressure on families. A related concern has been to ensure that the goals are worth achieving. For example, schools should not be dangerous for or unsupportive of students striving to attend them.

John Cook also observed that programs often seek to screen out people and asked how conditional cash transfers would differ from something like the Temporary Assistance for Needy Families (TANF) program. Morris pointed out that considerable stigma is associated with programs such as TANF. Such programs also have mixed goals. The predecessor to TANF was originally created for widowed women and then became a program to support people while they were not working and at the same time encouraging them to find work. Conditional cash transfer programs, in contrast, try to work outside the traditional welfare system.

In response to a question about how families receive the funds from conditional cash transfer programs, Morris said that the money goes into a bank account and can be spent without constraints by the recipient. It would be possible to designate the money for particular purposes, such as savings for college attendance or purchases of certain foods. Frongillo added that antipoverty programs need to be integrative, because changing a single aspect of the environment tends not to be effective.

Counterproductive Policies

Workshop participants also discussed the ways in which antipoverty and food assistance programs can contribute to income volatility and food insecurity. Programs can change eligibility requirement from year to year or even go in and out of existence. Programs also can have cutoffs where recipients suddenly lose benefits. For example, Barbara Lohse pointed out that schools can participate in the Supplemental Nutrition Assistance Program for Education (SNAP Ed) in Pennsylvania if more than 50 percent of their students receive free or reduced-price lunches, which means that some schools can participate some years and not other years. In this case, volatility occurs at the community level, not just at the individual or household level.

REFERENCES

Ackerman, B. P., J. Kogos, E. Youngstrom, K. Schoff, and C. Izard. 1999. Family instability and the problem behaviors of children from economically disadvantaged families. *Developmental Psychology* 35(1):258-268.

Bania, N., and L. Leete. 2007. *Income volatility and food insufficiency in U.S. low-income households, 1992-2003*. Discussion Paper #1325-07. Madison, WI: Institute for Research on Poverty.

Becker, G. S. 1981. *A treatise on the family.* Cambridge, MA: Harvard University Press.

Cancian, M., and S. Danziger. 2009. *Changing poverty and changing antipoverty policies.* Discussion Paper no. 1364-09, Focus 26(2). Madison, WI: Institute for Research on Poverty.

Duncan, G. J., and J. Brooks-Gunn. 1997. *The consequences of growing up poor.* New York: Russell Sage.

Gennetian, L. A., N. Castells, and P. A. Morris. 2010. Meeting the basic needs of children: Does income matter? *Children and Youth Services Review* 32(9):1138-1148.

Jolliffe, D., and J. P. Ziliak (Eds.). 2008. *Income volatility and food assistance in the United States*. Kalamazoo, MI: W.E. Upjohn Institute for Employment Research.

McLoyd, V. C. 1990. The impact of economic hardship on black families and children: Psychological distress, parenting, and socioemotional development. *Child Development* 61(2):311-346.

Mills, G., and J. Amick. 2010. *Income volatility, savings, and material hardship*. Ideas 42 Working Paper. Cambridge, MA: Institute for Quantitative Social Sciences, Harvard University.

Riccio, J., N. Dechausay, D. Greenberg, C. Miller, Z. Rucks, and N. Verma. 2010. *Toward reduced poverty across generations: Early findings from New York City's conditional cash transfer program*. New York: MDRC.

Sameroff, A. 2010. A unified theory of development: A dialectic integration of nature and nurture. *Child Development* 81(1):6-22.

Wu, L. L., and B. C. Martinson. 1993. Family structure and the risk of a premarital birth. *American Sociological Review* 58(2):210-232.

10

Research Applications

Key Messages Noted by Participants

- There already are many ways to change the food environment to discourage the consumption of unhealthful food and encourage healthful eating, and ongoing research on these options can further improve their effectiveness.
- Because outcomes of anti-obesity programs and food security programs can conflict, it is important to identify areas where programs can benefit both concerns.
- Government programs that have achieved demonstrated success in reducing both food insecurity and obesity, such as the School Breakfast Program (SBP) and the Child and Adult Care Food Program, offer lessons for much more widespread and effective programs.
- Research programs can grow directly from policy initiatives designed to achieve goals related to food insecurity and obesity.

The findings of research can have applications at the individual, family, environmental, and institutional levels to address the coexistence of obesity and food insecurity, said Mary Story, the moderator of the session on research applications. However the application of research can encounter obstacles at various levels of implementation. In the final session of

the workshop's second day, three speakers looked at the ways in which researchers can help overcome these obstacles.

RESEARCH DIRECTED AT IMPROVING DIETS

Treating obesity clinically is usually very difficult regardless of a person's income level, said Marlene Schwartz, deputy director of the Rudd Center for Food Policy and Obesity at Yale University. For food-insecure people, who already have many stressors in their lives, keeping food records and counting calories is for the most part "completely unrealistic." A better option is to change the environment in such a way that people find it easier to eat healthful food.

Schwartz examined several research avenues designed to improve diets for everyone, including those who are food insecure or obese. American diets tend to be high in sugar, salt, and fats and low in fruits and vegetables, fiber, and calcium. To some extent, people are biologically predisposed to prefer high sugar, high salt, and high fats, Schwartz said. Even infants prefer these substances in their food, noted Schwartz.

Some foods also may have addictive qualities. Although this idea has been very controversial, evidence is starting to accumulate that certain foods can trigger addictive processes, Schwartz said. For example, foods that combine sugar, salt, and fat can override satiety signals. In addition, foods can have emotional connotations that encourage overeating.

A variety of policy options aim to decrease consumption of unhealthful food and promote healthful eating. Schwartz went through these options one by one while pointing to the potential of further research to improve diets, prevent obesity, and reduce the stigma associated with weight.

School Foods

A variety of options exist for changing what students eat in educational institutions, including limiting competitive foods in schools, limiting unhealthful foods in child care, and otherwise altering what students eat when they are in schools. For example, Schwartz and her colleagues have done research in Connecticut on taking unhealthful competitive foods out of schools and found that children's consumption of these foods went down, with no evidence of their compensating by eating more of those foods outside of school (Schwartz et al., 2009).

Portion Sizes

Federal food assistance programs often talk about the minimum amount of food that recipients need, but they do not talk about a maximum. New

recommendations from the Institute of Medicine (IOM, 2010) and other organizations directed toward managing portion sizes could be implemented much more widely.

Marketing

As part of the Child Food and Beverage Advertising Initiative, the food industry has pledged to decrease marketing to children of unhealthful foods. Unfortunately, evaluations by the Rudd Center have determined that marketing of fast food, despite the pledges of industry, has increased. Instead of marketing the food, companies are marketing their brands. "They are marketing the experience of going to McDonald's and having a Happy Meal or being with your family," said Schwartz.

Zoning Restrictions

One option for communities is to use zoning laws or other neighborhood controls to control the foods available in those neighborhoods. More research needs to be done on both the potential and the limitations of such restrictions.

Satiety

Foods that are high in calories and low in nutrients tend not to be very satisfying. Research on how humans process food and how long they feel full after eating could clarify which foods achieve satiety while delivering sufficient nutrients.

Eating Disorders

Although anorexia nervosa is rare in the population, bulimia is more common. Schwartz believes that the relationship to the binge eating sometimes seen among food-insecure individuals should be further explored.

Food Reformulation

Some companies have been reformulating their products to be lower in sugar, salt, and fat, and labeling can encourage further movement in this direction. For example, when *trans* fats were included on nutrition labels, their use in many food products decreased, said Schwartz. Government and industry are currently working on new systems for labeling that "are going to make a big difference in terms of what food companies either do or don't do in terms of reformulating their foods," said Schwartz.

Food Costs

One policy option would be to make unhealthful food cost more. The action that has gotten the most attention is taxing sugar-sweetened beverages, but even this step has been politically controversial, and "the food industry is extraordinarily opposed to it." If a substantial tax were instituted in one jurisdiction, its effects could be studied. Another option is to reduce the costs of healthful foods by subsidizing their purchase.

Nutrient Levels

Several food assistance programs have been promoting the consumption of more healthful foods such as fruits and vegetables. Another option is to reformulate healthful foods to make them more palatable, such as adding chocolate to milk or nutrients to cereals, Schwartz noted. "It is a whole lot easier to get people to eat more than to get them to eat less. It is psychologically easier. It is politically easier." Unfortunately, the easy solution of turning to added sugar and flavorings to promote otherwise healthful foods that contain important nutrients (e.g., milk, yogurt, cereal) wins the battle but loses the war. We must stop teaching children that everything can taste like a treat, suggested Schwartz. Parents must resist the trap of only feeding children industry-labeled "kids foods."

Changing Consumption

To change the quality of diets, two things must happen, Schwartz said. People must increase their consumption of healthful foods and decrease their consumption of unhealthful foods. These twin goals can generate competing messages. Personal choice and freedom need to be protected. "Once you start talking about restricting and taking things away, suddenly you are the food police." Yet people also need to be protected from a toxic environment, which is how Schwartz said she would describe many of the food choices offered today.

Education must be a component of any such campaign, but Schwartz observed that it is difficult for education to compete with the environment and with the experience of being food insecure and hungry. When people are hungry, they are less likely to make a cost-benefit calculation about the nutrients in the foods they are considering. "That is why they tell you not to go shopping when you are hungry."

Nutrition education also can send mixed messages. It can simply urge moderation and not make judgments about whether a given food is good or bad. A clearer message, said Schwartz, is that there are nutritious foods and other foods that should be seen as treats and eaten sparingly. People

need to learn about discretionary calories and how limited they are, which points to the need for research on the messages and information that are most motivating to different populations, including those served by the Supplemental Nutrition Assistance Program (SNAP).

Weight Stigma

Schwartz raised the issue of weight stigma, which is an important part of the Rudd Center's work. Despite the increase in obesity in the United States, weight remains a substantial source of perceived discrimination. Among adult women, weight is the second-greatest source of discrimination after gender, and it is the third-greatest source of discrimination among adult men (Figure 10-1). Furthermore, weight discrimination has increased over the past 15 years. "The idea that discrimination has gone down because the prevalence of obesity has gone up does not seem to be the case," said Schwartz. "These data suggest that it is more common than discrimi-

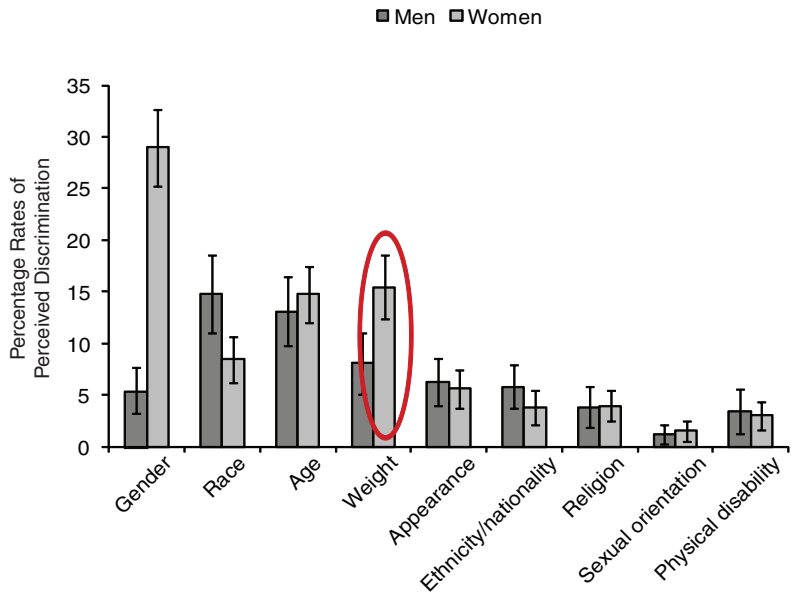

FIGURE 10-1 Rates of perceived discrimination among Americans ages 35-74 years, data for 2004-2006.
NOTE: Error bars indicate 95 percent confidence intervals.
SOURCE: Puhl et al., 2008.

nation due to ethnicity, religion, sexual orientation, and disability, and for women it is actually more common than racial discrimination." There are no federal laws that prohibit weight discrimination, and mass media messages reinforce weight bias. Also, the perception remains widespread that obesity results from a lack of personal control and willpower regardless of the environmental influences that foster obesity.

Nutritious Food Insecurity

Finally, Schwartz pointed out that the missions of the two communities that were combined at the workshop are slightly different. For example, the mission of a food bank is to alleviate hunger, while the mission of the Rudd Center is to improve diets. These different missions can lead to different measures of success. Food assistance programs may be more concerned with the amount of food distributed, money provided, or hunger alleviated, while obesity researchers may be more concerned with body weight, diet quality, and health improvements. In addition, these two concerns can have different relationships with the food industry. Perhaps a way to combine these concerns, said Schwartz, is through the idea of "nutritious" food insecurity, a concept that considers diet quality as part of the food insecurity equation.

FINDING THE SWEET SPOT IN GOVERNMENT FOOD PROGRAMS

There are substantial opportunities ahead to examine existing, and adopt new, public strategies and policies that have positive impact both on obesity and on food insecurity, and in some cases both, said James Weill, president of the Food Research and Action Center (FRAC) in Washington, DC. We know some of these strategies already, and we need much more research to find others.

However, although there is an understandable focus on finding the "sweet spot"—the place where there are positive effects from a single intervention on both obesity and food insecurity, and there are some opportunities to do that—real life often offers only limited numbers of intervention points that address all priorities simultaneously and efficaciously. Weill said that we need also to pursue strategies that focus on primarily (maybe even exclusively) one goal—either food insecurity or obesity—while hopefully advancing and certainly not doing damage to the other sphere.

Positive Effects of Food Assistance Programs

As one example of a sweet spot, there is considerable evidence that SBPs are reducing hunger among low-income school children as well as reducing

obesity. There also is some evidence that children are vulnerable to gains in body mass index (BMI) and greater food insecurity in the summer when most of them are not consuming school meals. More research will help to determine whether there is a relationship between increased participation in summer food programs and reduced obesity.

Another sweet spot appears to be in child care. Meals and snacks that children receive through the Child and Adult Care Food Program (CACFP) provide needed nutrition and may reduce the risk of overweight among children from low-income families. "If we are going to seriously confront obesity in the country, we have to pay more attention to preschoolers and not just start paying attention when they are in school," said Weill. "Early childhood is the critical time for growth and development in forming healthy patterns and habits."

Federal after-school supper programs also have positive effects. Children have higher daily intake of fruits, vegetables, milk, and key nutrients such as calcium, vitamin A, and folate on days when they eat suppers in after-school programs. More needs to be learned about whether these healthful meals lead to reduced food insecurity and reduced obesity. The research opportunities are especially great in this area because only 13 states currently have these programs, Weill observed, so the programs' effects can be measured across states. The passage of the child nutrition reauthorization bill would bring these programs to the remaining states, allowing comparisons between states and longitudinally.

Finally, food-insecure people over age 54 who participate in SNAP are less likely to be overweight than food-insecure nonparticipants. "These are a few [of the] places where the research to date suggests promising results and points to the need for further targeted research either to confirm the results or to tease out further the ultimate impact [of these programs] on food insecurity and obesity."

Policy Changes to Food Assistance Programs

These examples of successful attributes of programs suggest changes to federal policies and research approaches that can yield future progress. First, if improvements in the nutritional quality of meals and snacks recommended by the Institute of Medicine and under consideration by both the U.S. Department of Agriculture (USDA) and Congress are to reduce both food insecurity and obesity, those meals and snacks and the programs through which they are distributed need to be attractive to children and their parents. One key question is how to design and implement higher nutritional standards in school lunches and breakfasts to maximize participation. Simulation models developed by USDA of higher nutrition standards suggest that participation could decline modestly when such standards are

implemented. How can this decline be not only averted but also reversed so that participation grows?

States have had different experiences when implementing new school lunch standards in the past. One difference among states is that some address the issue of competitive foods in such a way that students have fewer alternatives to school breakfasts and lunches. Such differences should be studied, Weill said, along with the differential impacts of participation in school meal programs on obesity and food insecurity. There will be "great opportunities," he asserted, to study the impact of different strategies as schools or districts across the country implement new standards in different ways and at different paces.

These opportunities—and the challenges posed by the issue of participation—are magnified in the case of school breakfasts. The implementation of new nutritional standards will require a considerably larger reimbursement boost for breakfast than for lunch (IOM, 2010). However, funding is projected to increase for lunches but not for breakfasts in the Child Nutrition Act, Weill said. This creates a risk that schools will drop SBPs or, more likely, will slow down recent efforts to boost participation as the new standards are implemented. This would be counterproductive.

One strategy for increasing participation in the SBP is offering breakfast free to all students in low-income schools, and ultimately offering breakfast in the classroom. This strategy is gaining increasing acceptance among schools and districts, which will provide increased opportunities to look at the effects of school breakfasts on food insecurity and weight.

Competitive Foods

With regard to the National School Lunch Program and SBP, the presence of unhealthful competitive foods is especially harmful to children from low-income and food-insecure families, Weill said. It not only potentially decreases the nutritional quality of their diets but also incurs costs that families cannot afford. The presence of competitive foods also creates peer pressure and stigma for the federal food programs that drive students who can least afford it to purchase competitive foods instead of eating free or reduced-priced meals at school. Better regulation of competitive foods could be linked with research to examine the effects of this regulation on food insecurity as well as obesity. Research on stigma and ways to reduce stigma also will be very valuable.

Child Care Programs

Federal child nutrition programs as a whole—and their consideration by Congress—focus much more energy and funding on school-aged chil-

dren than on preschool children. The Supplemental Nutrition Program for Women, Infants, and Children (WIC) is an exception, but participation in WIC drops off rapidly after 1 year of age; 2- through 4-year-olds are "underrepresented in the federal nutrition universe," according to Weill.

The Child and Adult Care Food Program should be one central focus for Congress and USDA, he said. Congress is poised to mandate higher CACFP standards without any increase in reimbursement. For the child care program, such a step would raise the question of how to improve the nutritional value of meals and snacks while increasing the willingness of underfunded, community-based child care providers to offer the food program in family day care homes and centers. "If providers find that participating isn't worth the cost . . . then there is a great danger that they are going to walk away from the program, and the children in child care will lose the opportunity to have healthful meals and snacks. We have to pay attention to how the change can be implemented in a way that works for struggling providers. It is an opportunity to stabilize, at least, and ideally to increase participation by child care providers. What are the variables that lead to success in maintaining or increasing provider participation?"

A complication is that changes in CACFP reimbursement made by Congress in 1996 as part of welfare reform have made it more difficult for family child care providers to participate in CACFP. Over the past 15 years the participation of children in centers in CACFP has risen significantly, but the participation by children in family child care homes in CACFP has dropped. At the same time, cash-strapped states grappling with federal mandates to get Temporary Assistance for Needy Families (TANF) applicants and recipients into job search and training programs and employment often have eased the resulting crunch by putting children in the cheapest child care available, which is family child care. The children in family child care could be disproportionately food insecure. "It is going to be essential going forward to make sure that the higher nutritional standards, which at least for now are unsupported by reimbursement increases, don't adversely affect participation in the food program and thereby further increase food insecurity among some of the poorest and neediest [preschool children]," Weill remarked.

Food Insecurity and Obesity Among Adults

At the end of his presentation, Weill turned to the relationships among food insecurity, poverty, and obesity among adults. More needs to be learned about the relationship between SNAP, food security, and healthful eating, he said. A valuable research window has recently opened in which benefits are moderately higher because of the economic recovery act. Anecdotal reports from beneficiaries, stores, and social workers indicate that

benefits are lasting longer into the month and that those benefits are supporting the purchase of more healthful food. It is important to measure the potential impact that these better SNAP benefits may be having on both food insecurity and obesity.

It is possible that the nation will suffer through another decade without growth in incomes for the bottom portion of the population. In that circumstance, SNAP likely will remain the primary means to bolster the economic and food security of somewhere between 35 million and 50 million people, said Weill. "We need to know much more about what level of benefits can possibly impact obesity and food insecurity." It also will be important to look at the impact of food cost and access to healthful food on low-income communities, particularly for those relying on SNAP benefits.

Finally, research on food insecurity and obesity among low-income people, and especially women with children, needs to look at the extremely high stress levels with which many live. Food insecurity and obesity both result from and cause stress and psychological suffering. "There are incredibly complicated interactions going on here that we have only begun to understand, and we need to understand them much more deeply," Weill concluded.

POLICY-DRIVEN RESEARCH

California Food Policy Advocates is an organization that defines policy objectives and then identifies the kinds of research that will support those objectives, said the organization's Executive Director Kenneth Hecht. It works on the assumption that federal food programs can prevent hunger and food insecurity, even if the link with obesity and food insecurity is not clear. Hecht provided three examples of this approach: (1) the provision of drinking water in schools, (2) obesity prevention in child care, and (3) increasing participation in school food programs.

Drinking Water in Schools

Free water to drink in cafeterias is limited in many California schools. When California Food Policy Advocates began to ask school administrators why this was so, they heard that federal food programs or contracts with soda distributors prohibited the distribution of water, but both of these explanations turned out to be myths. They therefore worked to have legislation introduced at the state level guaranteeing drinking water to students, but the governor initially vetoed the legislation. A few months later, a survey by the Department of Public Health of public schools in California found that 40 percent responding to the survey said they had no free drink-

ing water in their cafeterias. Given this information, the governor became the sponsor of a bill that he signed into law in 2010.

The bill states that schools in California shall provide free fresh drinking water in places where children eat. But in California, in contrast to many other parts of the country, students can eat in many different places on school campuses, which could make implementing the bill expensive. California Food Policy Advocates has therefore promoted research on how schools can meet this challenge. "It is not as simple as we thought it was." The water should be tap water, since the drinking of tap water is a good strategy to prevent obesity and can be equitably implemented, said Hecht, but at least some schools in California do not have safe water. Fountains in hallways are "typically scuzzy or inoperative," said Hecht. What if children do not want to enter a bathroom to get water? Will water replace the intake of important nutrients and calories, especially for younger children? Research will have to look at how schools deal with these and related issues if the law is going to work, said Hecht.

At the national level, the Child Nutrition Reauthorization Act may require that free fresh water be available for all of the child nutrition programs. "To be able to observe what happens in California could be very important in terms of a national rollout."

Child Care

The second issue he discussed is child care. It is easier to focus on obesity prevention in schools that contain many children and are unified institutions. Yet child care is extremely fragmented, which makes obesity prevention initiatives difficult for preschool children.

One in four 5-year-olds entering kindergarten is already obese or overweight, and this condition is very difficult to reverse. At the same time, children at preschool ages are more amenable to changing behaviors, tastes, and preferences. "This seemed to us to be a wonderful place on which to focus obesity prevention policy and try to improve nutrition for kids before they go to school," said Hecht.

However, there turned out to be very little information on obesity prevention measures in child care. As a result, California Food Policy Advocates worked with the Atkins Center for Weight and Health on a state mail-in survey and a smaller observational study in Los Angeles that came to very similar results. These results became the core of a bill brought to the state legislature that goes into effect in 2012. The bill promotes water, eliminates sugar-sweetened beverages, restricts milk to 1 percent or nonfat, and limits juice to being 100 percent fruit juice and one serving per day.

The success of the bill has been a great surprise to the organization because it calls for major dietary changes, but research still needs to be

done to guide those changes and prepare for future steps. Hecht noted several areas for future investigation: what does and does not go well in the implementation should be studied, the displacement of other beverages both in child care and out of child care should be monitored, and the compatibility of the measures instituted by the bill should be compared with other proposals for change.

School Meals

The third topic Hecht discussed is how to make school meals more attractive to students. These meals need to meet nutritional standards and be affordable for schools, but they also need to be meals that students want to eat, he said. Should students be involved in planning the meals? Should schools have closed campuses rather than open campuses for food, as has occurred with some California districts? Will students have enough time and places to eat if food choices are more limited? Should schools be used as laboratories for good nutrition? The schools being built today in California typically do not have places to cook, eat, or drink water.

California Food Policy Advocates has been working on an idea called scratch cooking, which Hecht described as "a movement toward real food." How can schools be supported to have fresh food that is grown and prepared locally? Some school food service directors are doing "heroic work making this happen," and USDA commodity foods are often very good. Yet more than half of the food from USDA is diverted to a processor before reaching a school district. "What we are trying to do is find very positive ways to make this thing work and, in the process, to give support to people who have an amazingly difficult job of trying to provide good food to kids."

GROUP DISCUSSION

Moderator: Mary Story

During the group discussion period, points raised by participants included the following:

Sugar-Sweetened Beverages

All three speakers addressed a single question posed by Mary Story. The mayor of New York City has announced a plan to seek permission from USDA to prevent the city's SNAP recipients from purchasing sugar-sweetened beverages with their benefits. Anti-hunger advocates feel that

this restricts freedom to purchase the foods that people should be able to buy. Obesity prevention advocates feel this is an opportunity to limit empty calories. Are such restrictions a good idea?

Schwartz said that she supports the idea. "I support any idea that is going to decrease sugar-sweetened beverage consumption." People do not like the idea because it targets one population rather than applying to everyone, but such a policy emphasizes to the American public that these beverages are not a source of nutrition. Also, New York has asked to pursue the policy as an experiment that can be assessed after it has been implemented. "As a researcher, that sounds like a great idea to me."

Weill said that he opposes the idea. His opposition is not based primarily on the impingement on the freedoms of SNAP recipients. Rather, an experiment should not be conducted initially on millions of people. If sugar-sweetened sodas were banned for everyone, or in public settings such as hospitals or colleges, said Weill, he could support that.

The problem with the proposal, said Weill, is that it is "picking on the poor in a symbolic fight over bigger issues." It is premised on the view that society contains a permanent underclass rather than a population of people who move in and out of a program on a constant basis. Most stays in the Supplemental Nutrition Assistance Program are short, and most people buy food with their own money as well as with food stamp benefits. Thus, a restriction would not necessarily affect what people buy. Also, restrictions on foods would make the people using food stamps very visible at the checkout counter, which could drive people out of the program. The substitution of EBT (electronic benefit transfer) cards for food stamp coupons has made one's participation in the program much less visible, which has reduced the stigma associated with using the coupons and thus removed that barrier to people participating in the program.

Most important, said Weill, such restrictions are "one more way that the society will identify low-income people, poor people, as the other . . . and change their programs as a safety valve for a broader social problem and then not address the broader social problem."

Hecht was clear in his support of the use of incentives rather than restrictions. He stated, "I don't want to see people drinking sodas, and I don't want to see low-income people targeted as the guinea pigs. There isn't to my understanding any evidence to suggest that these folks make any different or worse decisions." A better option would be to include incentives in SNAP to encourage people participating in the program to select fresh fruits and vegetables. Refinements to SNAP to make it the most effective program it can be will result in its getting the greatest possible support, "and it is going to need that support in the next few years."

Older Adults and SNAP

A final comment in the discussion session involved older people, who participate in SNAP at much lower rates than younger people. This will become an increasingly important issue as the population ages and also because more grandparents are now raising children. Weill said that two-thirds of SNAP-eligible people get benefits, but among seniors the participation rate is only about 33 percent. He also said that this issue is a high priority for USDA, and AARP is conducting activities involving SNAP in many states.

REFERENCES

IOM (Institute of Medicine). 2010. *School meals: Building blocks for healthy children.* Washington, DC: The National Academies Press.

Puhl, R. M., T. Andreyeva, and K. D. Brownell. 2008. Perceptions of weight discrimination: Prevalence and comparison to race and gender discrimination in America. *International Journal of Obesity* 32(6):992-1000.

Schwartz, M. B., S. A. Novak, and S. S. Fiore. 2009. The impact of removing snacks of low nutritional value from middle schools. *Health Education and Behavior* 36(6):999-1011.

11

Research Gaps from a Disciplinary Perspective

Key Messages Noted by Participants

- The complexity of the relationship between food insecurity and obesity results in many questions to be answered through research, particularly that which incorporates multidisciplinary collaborations.
- Perspectives on food insecurity and obesity from four disciplines—nutrition, sociology, psychology/human development, and economics—may help fill research gaps.
- Even within individual disciplines, different conceptual frameworks offer different perspectives on food insecurity and obesity.

Discussions of needed research often use the words transdisciplinary, multidisciplinary, and interdisciplinary, said Christine Olson, moderator of the session on research gaps. She admitted to finding it challenging to plan and implement the research implied by these terms, largely because researchers almost inevitably have discipline-based perspectives that include potentially differing basic assumptions about how the world works. This session was planned to facilitate understanding some of the assumptions of common disciplinary perspectives. The four speakers at the session therefore were asked how their individual discipline would frame impor-

tant issues, questions, and concerns about the relationship between food insecurity and obesity.

A NUTRITIONIST'S PERSPECTIVE

Athens, Ohio, is a rural Appalachian community that is searching for solutions to food insecurity, said David Holben, professor in the School of Applied Health Sciences and Wellness at Ohio University and registered dietitian. More Supplemental Nutrition Assistance Program (SNAP) benefits have been used at its farmers' markets than in all the other farmers' markets in the state of Ohio combined. The U.S. Department of Agriculture (USDA) has funded an incubator kitchen that has spawned many new food-based businesses. Also, gleaning of produce grown in the Ohio River valley, including tomatoes, peppers, pumpkins, and potatoes, is an important part of coping with community food insecurity in the region.

Obesity is a multifactorial disease, Holben observed. A person may have a genetic susceptibility to becoming overweight or obese, but that person also has been exposed to an environment that encourages obesity through diet, chemical exposures, lack of physical activity, and so on. Furthermore, these gene-environment interactions take place in a natural environment, a policy environment, and a social environment. The complexity of these circumstances points toward many of the research gaps that exist in the extremely heterogeneous field of nutrition.

Food insecurity can lead to poor dietary intake, malnutrition, and negative health outcomes. Various risk factors can contribute to food insecurity, including limited resources, functional constraints, and poor management strategies. Again, the complexity of even this simplified framework points toward a variety of research gaps.

Measurement of Food Security and Obesity

One of the most basic gaps involves the measurement of food security and obesity. Does the current measure of food insecurity fully capture the experience among children? Is body mass index (BMI) enough to measure obesity, or should a measure such as waist circumference be added?

Causality and Directionality

The relationship between food insecurity and obesity is especially troublesome, as this workshop made clear. If there is a causal relationship, in which direction does causation extend, or does it extend in both directions?

Study Design

Controlled experiments have been lacking. Prospective and retrospective studies all need to be done, Holben said, with a special focus on critical and sensitive periods of development.

Mediating Factors

If there is a causal relationship between food insecurity and obesity, then what are the mediating factors? It will be important to test each of the hypotheses that have been proposed and incorporated into conceptual frameworks. Holben expressed the opinion that one of the most important factors is diet quality, in that some diets have adequate calories but lack the qualities needed to promote health. This hypothesis leads to questions such as: What is the diet of people on a low food budget? What kinds of foods do they eat and what are the components of those foods? Do their foods have high levels of dietary contaminants such as bisphenol A?

In this respect, a particularly exciting experiment is being conducted with SNAP in Massachusetts to look at a form of cash transfer that would encourage the consumption of healthful foods. As Holben said, perhaps SNAP should be reoriented to resemble the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) in which specifying healthful foods is acceptable.

Weight Cycling

Another interesting set of questions surrounds the concept of weight cycling. Does weight gain among individuals from food-insecure households result from consuming inexpensive foods with high energy density when money is less available? Or does inconsistent access to food lead to periods of underconsumption followed by compensatory overconsumption? The answers to these questions could have implications for food benefit distribution schedules.

Lifestyle

Lifestyle and daily schedules also can affect dietary patterns. Does working at night disrupt eating? How does smoking affect eating patterns and obesity? What role does a lack of physical activity play?

Answering many of these questions will require multidisciplinary collaborations, said Holben. Economists can look at questions of resource utilization. Psychologists can look at indicators of stress, dietary quality, and hormonal responses. Sociologists can examine socioeconomic deprivation

and early life stressors. Urban planners and geographers can contribute to analyses of physical activity. "It's vital that we understand the other disciplines and develop policies so we can be more effective in what we do," Holben concluded.

A SOCIOLOGIST'S PERSPECTIVE

Sociology was launched in many ways by Emile Durkheim's study of suicide, which is generally considered a very individual choice, noted Janet Poppendieck, professor of sociology at Hunter College in New York City. However, Durkheim was able to show that suicide rates varied tremendously depending on social factors. "That's very much the task that the research community has taken on with thinking about obesity," said Poppendieck. "Every time somebody raises the question of environmental as opposed to individual determinants, you are joining the sociologists."

Theoretical Perspectives

Sociology has three basic theoretical perspectives—the functionalist, the conflict-oriented, and the interactionist—each with a set of core questions. Most sociologists are associated with one or another of these perspectives, but it takes all three to get a complete picture of most social phenomena.

- *Functionalists* are concerned with order and stability in society, with social structure, and with the ways in which society's parts fit together. Looking at any social arrangement they ask: What functions (or dysfunctions) does it perform for society? They are particularly interested in finding "latent functions"—impacts that are not obvious. Almost everyone who engages in program evaluation research becomes a kind of functionalist, like it or not, Poppendieck said.
- *Conflict theorists* are especially concerned with the ways in which the benefits of human social arrangements are distributed. Who benefits and who does not benefit from any particular social arrangement? Conflict theorists see society as constantly changing, and they see conflict as the primary engine of change.
- *Social interactionists* focus more on the microsociological level—on interactions between individuals and among small groups, and they ask what meanings are conveyed by these interactions and how such meanings are conveyed. It is especially important to ensure that the interactionist perspective is included in evaluation studies, said Poppendieck. Programs need to be closely observed "on the ground." Policy intent is one thing, but program outcomes may

sometimes be very different. If students in a particular school characterize school lunch as "welfare food," no amount of dedicated menu planning may induce them to eat it. If a rumor spreads that a new entrée is "health food," students may avoid it without giving it a chance.

Sources of Information

One of the best sources of information about what is actually taking place on the ground is the staff—the workforce. Too many program evaluations focus solely on the clients, consumers, or customers, treating the people who actually fix and serve meals or lead exercise classes as mere conduits. "I believe that this is a mistake," said Poppendieck. "In my experience, workers are often keen observers and have the benefits of a sort of built-in longitudinal perspective. We should listen harder and more frequently."

Microsociological approaches take a somewhat different approach. For example, geographic information system (GIS) software has made it possible to identify food deserts without ever going there, but it is important to go there and to understand the dynamics taking place in these locations, said Poppendieck.

Community-Engaged Research

A focus on place can also permit wider use of "action research" or "community-engaged research" techniques. As an example, Poppendieck cited research on diabetes and other health matters conducted in Humboldt Park in Chicago with the assistance of local community leaders, who not only were consulted in the survey design but also were hired to conduct the interviews. One result was that when the data were compiled, the community was receptive to learning the results and acting on them. The intersection of obesity and food insecurity may be particularly well suited to community-based research interventions, Poppendieck said.

Cost-of-Living Differentials

Another line of research that Poppendieck said is urgently in need of attention involves the differential impact of programs in areas with widely differing costs of living. For example, with the National School Lunch Program and School Breakfast Program, school systems in relatively low cost-of-living areas benefit far more than those in high cost-of-living areas. In the former, more of the children in need are likely to be covered by the 185 percent of poverty income threshold for reduced-price meals. This raises

participation rates and, by embracing a larger spectrum of the community, changes the atmosphere and "reputation" of the program, Poppendieck explained. At the same time, lower labor costs in a low cost-of-living area mean that the federal reimbursement goes further; more of the $2.72 is available for food, and the meals are often better (which can further increase participation). According to Poppendieck, careful research should be conducted on the effects of cost-of-living differentials on food assistance programs, especially where food quality is important to the capacity of programs to address obesity and related health concerns.

Agricultural Subsidies

Speaking to the larger social context, Poppendieck suggested that rather than prohibiting SNAP recipients from purchasing soda with their benefits, the federal government should consider how its subsidization policies affect the nation's increase in weight. She suggested that subsidized corn, soy, and wheat are "artificially cheap" and are often processed into sweet and salty snack products, concluding that "the structure of our agricultural subsidies is obesogenic for us all." She pointed to potential research gaps in the realm of history and political science.

Framing

Poppendieck asserted that the way we frame an issue makes a difference in ways that we do not intend and probably do not anticipate. She explained her feeling that focusing on "obesity" may be a mistake. "The more we talk about obesity as a problem, the more we're apparently contributing to a movement in society to stigmatize a distinction between the fat and the fit—a divide." Poppendieck expressed a belief that a broader, more inclusive concept of diet-related health—healthful eating, healthful lifestyles, healthful weight, a food system that produces nutritious, palatable food—is the direction in which we need to move. She cautioned that the choice of how we frame our research questions affects the discourse that occurs.

A PSYCHOLOGIST'S PERSPECTIVE

Food insecurity has a variety of psychological effects, said Maureen Black, professor of pediatrics at the University of Maryland School of Medicine. It creates stress and anxiety about a lack of food or an inability to meet basic needs. Food insecurity also has been shown in several studies to be associated with maternal depression or depressive symptoms. For example, using childhood longitudinal data, Bronte-Tinkew et al. (2007) showed an association between food insecurity, maternal depression, and

insecure attachment among children. Zaslow et al. (2009) related food insecurity at 9 months to maternal depression, nonresponsive parenting, and insecure attachments and to low mental proficiency at 24 months. Also, the link between maternal depression and children's growth is particularly apparent in low- and middle-income countries (Black et al., 2009).

Depressive Disorder and Depressive Symptoms

Depressive disorder is a *Diagnostic and Statistical Manual of Mental Disorders*, Fourth Edition (DSM-IV) diagnosis made through a structured interview. The prevalence of depressive disorder is low compared with the presence of depressive symptoms. The latter is recognized through validated symptom checklists, readily available in the published literature. In a recent paper looking at variations in depressive symptoms among adolescent mothers with very young children, Black and her colleagues found three patterns of depression (Ramos-Marcuse et al., 2010). The first category consisted of women who have never been depressed (41 percent of the sample). The second consisted of women who have multiple depressive symptoms consistently over time (14 percent). The third consisted of women in the middle range who sometimes were above the cut point for depressive symptoms and sometimes were below (45 percent). This is the group Black focused on in her talk.

Depression and Weight

These women in the middle are particularly sensitive to environmental stresses such as food insecurity. However, the response to stress among mothers and children varies according to context. In low- and middle-income countries, the children of depressed mothers are at risk not for obesity but for stunting and for undernutrition (Black et al., 2009; Surkan et al., 2011). In high-income countries, there is some evidence for a link to obesity (McConley et al., 2011).

If caregivers are highly stressed, they may not be able to see the outcomes of their condition. Caretakers may rely on emotional coping strategies rather than problem-solving coping strategies. "If you find that your best friends are named 'Ben and Jerry,' you may feel great today, but you'll pay a price tomorrow—that's emotional coping." Caregivers who rely on emotional coping strategies may be unresponsive to their children during meals. They also may use food to control behavior. "Food is not [an effective] way to manage behavior, but if your child is crying, what is the quickest way to have [the child] stop? Have a cookie."

Do these behaviors lead to overweight? Not necessarily, said Black. In some contexts, they may lead to overweight. For most children, the snack is

given in addition to the regular meal, and as a result, children consume excess calories and gain weight. In some cases, however, the behaviors may lead to underweight or growth faltering when the snack food replaces the more healthful food or meals. For depressive symptoms, this context can be critical. For example, some evidence from Children's HealthWatch suggests that the alleviation of stress among mothers through WIC Food Package supplements can have positive effects on children's health outcomes (Black et al., 2011).

Adult and Child Affect

The impact of caregiver mood on children can best be understood from a transactional perspective, considering both the caregiver and the child (Sameroff, 2009). When a depressed caregiver is matched with a child who is sick or fussy, negative outcomes are much more likely than in other circumstances. When a caregiver is stressed or depressed and a child is happy, that child may be vulnerable to negative outcomes. When the caregiver has a positive affect but a child is fussy or unhappy, the outcome is variable, but a positive caregiving environment can often attenuate the negative effects of a fussy child. If both the caregiver and the child are happy, positive outcomes are most likely. "This paradigm, to my knowledge, has not been applied to food insecurity," noted Black.

The same sort of analysis can be applied to feeding interactions. A parent can be responsive or nonresponsive to a child. In the latter case, a parent may impose pressure to eat or not to eat, may use food to manage behavior, or may have very limited monitoring of a child's eating. Parental behavior is guided in part by parents' perceptions of the child's size and behavior. Although findings vary, there are suggestions that children of nonresponsive parents are more likely to exhibit poor growth (under- or overweight) than children of responsive parents.

Black recommended that future research include integrated longitudinal investigations of the effects of food insecurity on children's growth and development. Such studies could look at the psychological functioning of caregivers and children and the food-related interactions between them. She also acknowledged that psychologists do not spend much time thinking about nutrition. Black encouraged integrated research to work through relations linking food insecurity with caregiver mental health, caregiver-child feeding interactions, and children's growth and development.

AN ECONOMIST'S PERSPECTIVE

It is difficult to describe the perspective of economics on food insecurity and obesity because economists have so many different perspectives,

said Margaret Andrews, an economist in the Food Assistance Branch of USDA's Economic Research Service. In her presentation, she focused on two: a traditional neoclassical approach that she called the allocative efficiency approach and a more recent school of thought known as behavioral economics.

Allocative Economics

Allocative efficiency refers to a situation in which resources are allocated in a way that maximizes the net benefit attained through their use. In the context of food insecurity and obesity, this allocation of resources refers to households, which are endowed with such resources as human capital, financial capital, and physical capital. The household maximizes its welfare—based on its preferences—by allocating those resources to participation in the labor market, home production, or other income-generating activities such as participation in public assistance programs. Given the rewards of that resource allocation, the household distributes those gains to both consumption and savings.

The allocative efficiency approach recognizes that resources are not necessarily equitably distributed in society. As a result, the most disadvantaged may allocate their resources efficiently but still not be able to achieve economic security and food security. In that case, said Andrews, food insecurity and obesity are problems that may require interventions that transcend the household level.

Behavioral Economics

Behavioral economics recognizes that rationality is bounded, which is the main difference between it and allocative efficiency, said Andrews. The behavioral economics approach uses concepts from psychology and other social sciences to explain irrational decisions while acknowledging that there are limitations on humans' ability to optimize resources and behave in what would be considered a rational manner.

One insight from this approach that has been applied to food insecurity and obesity is that consumers tend to be biased toward the present. When they are making decisions, they tend to favor today's needs relative to the future. If asked about trade-offs in some future situation, they are likely to behave in an economically rational manner, but if the costs are up front, they are likely to have a pronounced present bias. For example, households facing deprivation have a very strong present-based focus. This can result in cyclical eating behavior, particularly in situations where resources are received on a cyclical basis, resulting in food shortages and possible obesity.

Research Gaps

From the allocative efficiency perspective, the most important research gap involves the direction of causality, as often mentioned at the workshop. Most researchers have looked at food insecurity as a risk factor for obesity, but to what extent is obesity a risk factor for food insecurity? It can be argued that obesity degrades household productivity. Not only does it result in labor market discrimination, but also it increases the need for nutrients to sustain activity—because heavier people require more calories to maintain a given expenditure of energy—which in turn can require reliance on cheaper calories.

Another research gap involves the incompatibility of variables in studying food insecurity and obesity. Food insecurity is a household condition, while obesity is an individual condition. Obesity is measured at single points in time, while food insecurity is measured across periods of time.

Another major question involves the extent to which food assistance programs should be reformed to improve efficiency. Should more thought be given to how to improve the efficiency of such programs so as to alleviate obesity? Can benefits be modified to increase the choice of individuals or households over how to alleviate resource constraints?

Finally, from the behavioral economics gap, is there sufficient physiological evidence to document the tendency for cyclical eating to cause obesity? Why do women seem to be more susceptible to this problem than men? Would more frequent issuance of SNAP or food stamp benefits alleviate the problem? What would be needed to implement a pilot project?

GROUP DISCUSSION

Moderator: Christine Olson

During the group discussion period, points raised by participants included the following:

Additional Disciplines

Elizabeth Dowler briefly mentioned some of the other disciplinary perspectives that can be brought to bear on food insecurity and obesity. For example, she mentioned a community horticultural project[1] in the United Kingdom that has led to some participants being able to reduce their medications for hypertension or depression. Learning to grow foods, teaching others how to grow foods, and becoming engaged in foods have turned

[1] See http://www.sandwellfoodnetwork.org/viewProject.php?id=1 (accessed February 22, 2011).

people's lives around. Such initiatives are hard to evaluate on a large scale, but evaluations are being done on smaller-scale projects.

Mapping

Dowler also mentioned a project to map the sources and prices of foods in selected neighborhoods. As part of this work, the researchers had long conversations with shopkeepers about the foods they stocked and their costs. These conversations in turn have helped some shopkeepers change their practices. Holben added that gardening projects provide an opportunity to examine physical activity as well as changes in the food environment.

Benefits Distribution

Diego Rose pointed out that people who live a long distance from a supermarket may gain efficiency by shopping just once a month because of transportation and time costs. For people who rely on food stamps, a transportation deduction or supplement, combined with semimonthly distribution of benefits, would give them more money with which to buy food. Andrews responded that an opt-in program giving households more flexibility in how to receive and use benefits could allow households to behave in ways in which they would like to behave.

REFERENCES

Black, M. M., A. H. Baqui, K. Zaman, S. E. Arifeen, and R. E. Black. 2009. Maternal depressive symptoms and infant growth in rural Bangladesh. *American Journal of Clinical Nutrition* 89(3).

Black, M. M., A. Quigg, P. Casey, D. Cutts, S. Coleman, T. Heeren, J. Cook, M. Chilton, R. Rose-Jacobs, A. Meyers, S. Ettinger de Cuba, E. March, and D. Frank. 2011. WIC attenuates the association between caregiver depression and negative child health indicators. Presented at the Pediatric Academic Societies and Asian Society for Pediatric Research, April 30-May 3, Denver, CO.

Bronte-Tinkew, J., M. Zaslow, R. Capps, A. Horowitz, and M. McNamara. 2007. Food insecurity works through depression, parenting, and infant feeding to influence overweight and health in toddlers. *Journal of Nutrition* 137(9):2160-2165.

McConley, R. L., S. Mrug, M. J. Gilliland, R. Lowry, M. N. Elliott, M. A. Schuster, L. M. Bogart, L. Franzini, S. L. Escobar-Chaves, and F. A. Franklin. 2011. Mediators of maternal depression and family structure on child BMI: Parenting quality and risk factors for child overweight. *Obesity* 19(2):345-352.

Ramos-Marcuse, F., S. E. Oberlander, M. A. Papas, S. W. McNary, K. M. Hurley, and M. M. Black. 2010. Stability of maternal depressive symptoms among urban, low-income, African American adolescent mothers. *Journal of Affective Disorders* 122(1-2):68-75.

Sameroff, A. J. (Ed.). 2009. *The transactional model of development: How children and contexts shape each other.* Washington, DC: American Psychological Association.

Surkan, P. J., C. E. Kennedy, K. M. Hurley, and M. M. Black. 2011. Maternal depression and early childhood growth in developing countries: a systematic review and meta-analysis. *Bulletin of the World Health Organization* 89.

Zaslow, M., J. Bronte-Tinkew, R. Capps, A. Horowitz, K. A. Moore, and D. Weinstein. 2009. Food security during infancy: Implications for attachment and mental proficiency in toddlerhood. *Maternal and Child Health Journal* 13(1):66-80.

12

Research Methods and Measures

Key Messages Noted by Participants

- Some national and state surveys produce data on food security and weight status.
- Qualitative methods such as focus groups, interviews, and photography projects can reveal the issues that are important within a particular cultural context.
- Spatial data and spatial methods can be particularly powerful ways of tracking behaviors and decisions.
- The kinds of questions asked and the way that research is conceptualized can be influenced by the methodologies used.
- Because food insecurity and obesity are complex and multidimensional, a combination of methodological approaches is appropriate.

Any discussion of research considerations, opportunities, and gaps would be incomplete without examination of the methods and measures used to conduct research. As moderator Amy Yaroch noted, these methods and measures encompass such topics as measurement development, qualitative approaches, and the use of technologies such as geographic information systems (GIS).

COLLECTING AND ANALYZING DATA ON FOOD INSECURITY

The causal connection between food security and weight status—to the extent that there is one—needs to operate through some mechanism, said Mark Nord, a sociologist at the Economic Research Service at the U.S. Department of Agriculture (USDA). This mechanism can be exceedingly complex. It can include, at a minimum, diet and health knowledge, nutrition motivation, cooking and food storage facilities, the physical ability to prepare food, physical activity, stress, genetics, and the inability to absorb and utilize nutrients because of some diseases (e.g., diarrheal disease) that interfere with nutrient incorporation into the body. Given these many factors, linking food security to weight status can be "almost a Herculean task," said Nord.

Nord suggested keeping these questions in mind when using food security measurements:

- Who is the measure describing—household, individual, which adult(s) or child?
- What levels of food insecurity exist—marginal, low, or very low food security?
- What time period does a measure cover—a year, a month, or persistent?
- What is the expected theoretical relationship between a measure and a specific outcome?

Who Is Being Measured?

As described in Chapter 2, many researchers measure food security through an 18-item questionnaire that is used to derive both an adult food security scale and a child food security scale (Hamilton et al., 1997). For almost all research purposes, including research on children's weight status, Nord recommended using the adult scale. The children's food security scale depends, to a considerable extent, on the oldest child in the household, and researchers typically do not know which child is the oldest. "Usually, the adult food security scale is what you want."

What Is Being Measured?

Food security can be divided into four categories: high food security, marginal food security, low food security, and very low food security. Most people include marginal food secure with low and very low food security. This may be appropriate because, on many outcomes, households with marginal food security are more like those with low food security than

those with high food security. It may be important to include the marginally food secure with the food insecure, because the marginal food security category is often as large as or larger than the low and very low food security categories combined. Very low food security is somewhat rare in the overall and low-income populations therefore sample sizes need to be large in order to observe an effect.

Nord also suggested not using food security as a continuous variable, because the measure is not linear. The difference between two adjacent raw scores or levels of food insecurity can be quite different than between two other adjacent levels.

What Time Period Is Being Measured?

The prevalence of food insecurity depends on the length of time over which it is measured (Figure 12-1). Researchers cannot change this variable when the data already have been collected, whether the data cover a year (which is most common) or a month. However, when designing research, data describing different time periods can be used. For example, body weight is the product of longer-term development, so longitudinal data are more valuable. For food intake in the very recent past, a 30-day or even shorter measure of food security is most useful. For biochemical markers

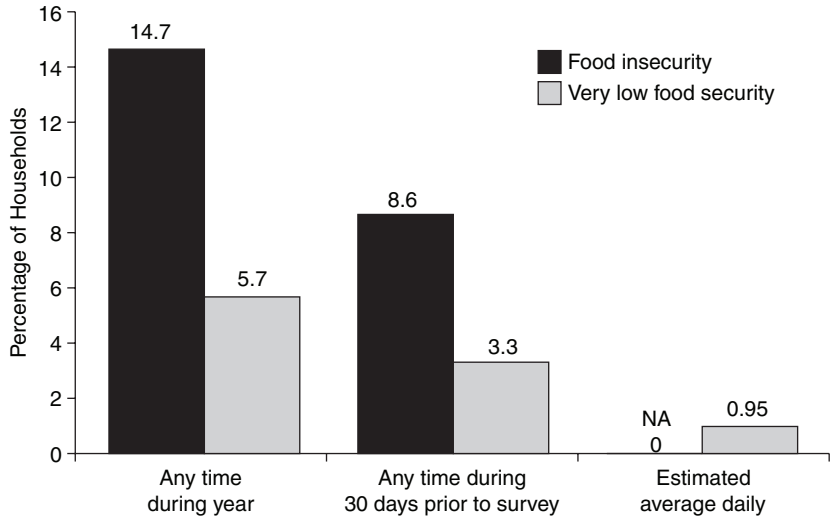

FIGURE 12-1 The prevalence of food insecurity can depend on the length of time over which it is measured.
SOURCE: Nord et al., 2010.

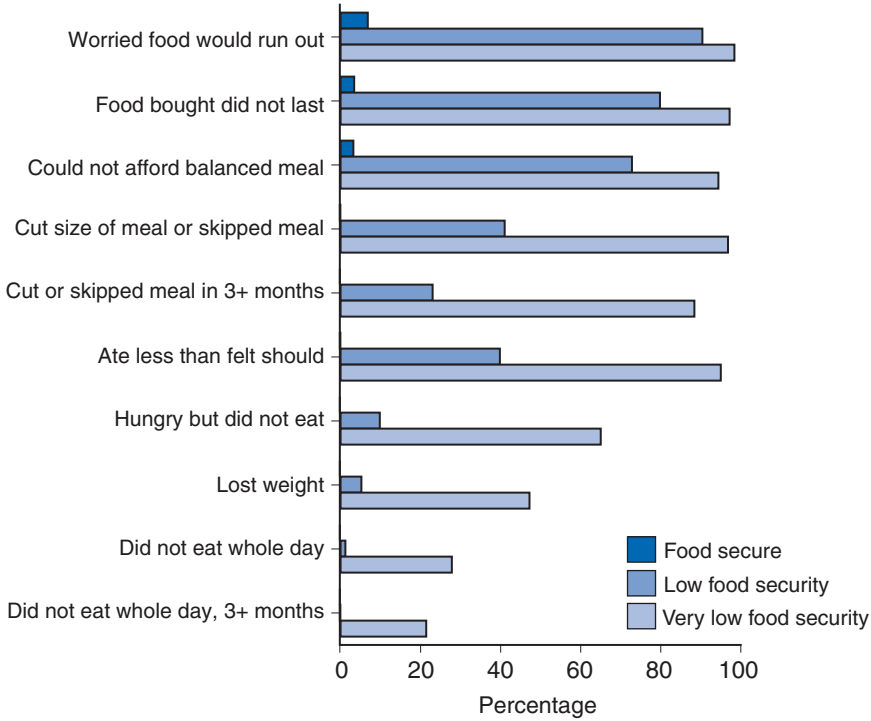

FIGURE 12-2 Households at different levels of food insecurity report conditions in different proportions.
SOURCE: Nord et al., 2010.

of nutritional status, how persistent the specific marker is will determine the time period for measuring food insecurity. "When you have the opportunity, if you are designing the research, think about what period you want to measure food security over," suggested Nord.

What Is the Relationship Between a Measure and an Outcome?

Responses to individual questions on the food insecurity scale tend to vary with the level of food insecurity and shed light on the specific types of behaviors characteristic of each range (Figure 12-2). Not until entering the severe range do reductions in intake occur that might be reflected in calorie restrictions. At this point, a connection between food insecurity and obesity can be offset by reductions in calories, said Nord. Nonetheless, variability of food security over time also can be a factor, because a household with

very low food security at one point during the year may not be at that level for long.

Available Sources of Survey Data

Nord provided a list of surveys that contain data on both food security and weight status[1]:

- Current Population Survey Food Security Supplement (CPS-FSS)
  - American Time-Use Survey (ATUS)
- National Health and Nutrition Examination Survey (NHANES)
- Early Childhood Longitudinal Study (ECLS)
  - Kindergarten Cohort (ECLS-K)
  - Birth Cohort (ECLS-B)
- California Health Interview Survey (CHIS)
- Behavioral Risk Factor Surveillance System (BRFSS, in selected states)
- Canadian Community Health Survey (CCHS)
- Children's HealthWatch (formerly the Children's Sentinel Nutrition Assessment Program)

Two other surveys are currently being developed:

1. The National Health Interview Survey (NHIS), which will include the 10 adult food security items in surveys conducted in 2011 and 2012.
2. The National Food Acquisition and Purchase Survey (FoodAPS), which will collect information on what households are actually buying and bringing home from the store along with information on food security and weight status.

COMMUNITY-BASED RESEARCH

Alexandra Adams, associate professor in the Department of Family Medicine and director of the Collaborative Center for Health Equity at the University of Wisconsin School of Medicine and Public Health, works with 11 tribes in Wisconsin, including the Menominee Nation, Bad River Nation, Lac du Flambeau tribe, and Oneida tribes, as well as the Great Lakes Inter-Tribal Council. Members of the tribes live in rural reservations, anywhere from 5 to 20 miles from the nearest town. Many experience

[1]As noted earlier, some surveys include interviewer-measured values of height and weight while others surveys provide self-reported height and weight.

significant issues with food access and food security, and understanding their views of child health is essential to addressing these issues, explained Adams.

Perceptions of Health

Adams discussed findings from seven focus groups with 42 participants, primarily women with children, done as part of an epidemiology study looking at cardiac risk factors on the reservations (Adams et al., 2008). Among the questions the researchers were trying to answer are: How do you define health? What does it mean to have a healthy child? What are some of the things that help you have a healthy child? What are some of the things that make it hard to have a healthy child? Finally, would that information help inform interventions?

Only one of the mothers ever mentioned anything to do with physical health—in that case an ear infection. Otherwise, the conversations revolved around children being happy, being inquisitive, being well-cared for, having the family involved, not having alcohol and drugs in the home, and not experiencing violence. These responses point toward a very different definition of health than in many other families, Adams said.

Basic needs came first in the focus groups. People were very focused on the present. If they had someone else in the home who could be supportive, such as a father or a grandmother, it was easier to provide a good meal. Many things outside the home were not under their control, so they used the inside of the home as a way to control their lives.

Barriers to Healthful Lifestyles

The focus group members mentioned many barriers:

- Lack of resources
- Lack of places for children to play
- Lack of ways to obtain fruits and vegetables
- Safety issues, including loose dogs and trouble caused by teenagers
- Shift work, which can be disruptive to schedules
- An open household structure, so that the number of people who need to be fed varies

When parents were worried about safety, they might keep their children indoors but give them free rein inside the house. In that case, children might be able to eat as much food or watch as much television as they wanted. It was important for these mothers to give their children this kind of free

choice, Adams said. Indeed, interventions that removed this choice would be difficult to implement.

An Intervention Trial

Using the results of the focus groups, Adams and her colleagues designed a 2-year randomized control trial called Healthy Children, Strong Families that examined a lifestyle intervention for children ages 2 through 5 and their primary caregivers. It compared families receiving home visits with those that did not receive home visits, randomized by family in four tribal communities in Wisconsin.

Designing this study presented some difficult data collection issues. For example, the study included three dietary recalls for the women and for their children, using the women or another parental figure as the person who provided the information. Researchers also did observations at school or Head Start for two meals and snacks. Finally, the study included menu analysis of school and Head Start meals and snacks, which was complicated because the menu is constantly changing.

The researchers found that it was difficult to get accurate answers in food and dietary surveys. First, mothers often over-reported their children's caloric intakes. Some 3-year-olds were consuming 1,800 to 2,000 calories a day according to the surveys. But the parents did not understand children's portion sizes, making it difficult to get accurate responses.

Meanwhile, the mean of the parents' reported intakes was about 1,500 calories. Given that 80 percent of these mothers are obese or overweight, with a body mass index (BMI) of 25 or more, this amount of calories also did not seem accurate. Similarly, when parents were asked about their child's food intake, the answers suggested that the parents were trying to support and protect their children.

When people were asked whether they were worried that food would run out, their answers had some correlation with BMI: people who were more worried about their food supplies tended to be heavier. The researchers concluded that food quality was often being sacrificed over the long term. "People get used to buying lower-quality foods at grocery stores that really don't provide higher-quality foods, so they don't feel that they're food insecure."

Photovoice as a Data Collection Method

The final study Adams described is the Youth Defining Health Study, which was done in conjunction with an American Indian graduate student who is also a professional photographer. He taught 22 students in a summer

school program, most of them middle schoolers, how to take pictures using digital cameras. They were then asked to take pictures of what health means to them on the reservation. After a week of taking pictures, they edited the photographs and divided them into categories with the investigator.

Many were pictures of water, pets, and traditions. A photograph of a basketball court might have been seen as a healthful image, but because the court was the scene of drug activity, the students viewed it as unhealthful.

No photographs of healthful food were taken by the students, just unhealthful foods. Many of the students had secret stashes of food in their rooms. Television and alcohol were also the subject of many photographs.

In some cases dogs were viewed as pets and in other cases as threats, with about half the children having received serious bites. Fish from the river were considered healthful by some students but unhealthful by others because of pollution. Similarly, some of the photographers thought a park was safe and others did not.

The researchers reviewed the transcripts of discussions recorded while they were viewing photographs with the students, and some of this information was shared with tribal elders. The elders were concerned about the loss of culture shown in the photographs, particularly the loss of food culture, said Adams. "The food stashes were completely new to them. They had not seen that or understood that or realized that kids were doing that." Understanding how communities respond to such findings is an important part of understanding food insecurity, said Adams, whether in urban or rural areas.

This was a very labor-intensive project, said Adams, but having the cameras home on weekends allowed the taking of photographs that could not be taken any other ways, such as the contents of freezers. Transcription and data analysis raised many issues. An effort to time-stamp the photographs did not work because the students exchanged cameras and altered their settings. The processes of transcribing conversations, conducting thematic analysis, and validating results were time-consuming and difficult, and better ways of conducting these processes need to be developed.

Clinical Observations

Adams has treated many children with obesity in an obesity treatment clinic, and she has seen various food behaviors. When parents are low income, family members struggle with food. Children hide and hoard food, primarily junk foods, in their rooms. They binge and overeat when they can. They also time their meals differently. They often eat very late at night if possible. They raid refrigerators in the middle of the night because they know that their mothers do not want them to eat. They also eat in response

to distress from family circumstances. Adams concluded by listing some of the questions that arise in doing community research:

- What does a community want and need?
- How does the community feel about research surveys?
- How can the survey questions be improved?
- How do the attitudes and coping responses of adults and children vary?

THE USE OF INTERVIEWS AND FOCUS GROUPS

It is important for researchers using qualitative methodologies to decide how best to utilize interviews and focus groups, said Chery Smith, associate professor in the Department of Food Science and Nutrition at the University of Minnesota. She also noted the importance of nonverbal qualitative methodologies such as photography, which had been discussed in the previous session. Smith devoted her presentation to interviews and focus groups.

Smith has conducted both interviews and focus groups on food insecurity and obesity with children and adults. For sensitive information, Smith prefers interviewing. It works well with children and adults and people from various ethnic backgrounds, she said. She trains students in both interviewing and focus group methods. She works closely with students before they are allowed to conduct interviews. She co-moderates focus groups with her research students. That "takes some of the bias out of what they are hearing," she said. Smith uses dual coding of focus group transcripts. When both she and her students are done coding, they compare their work and reconcile differences. She stressed the importance of dual coding when analyzing focus group data.

Qualitative methodologies fill gaps in the literature that are not caught using quantitative measures, she said. To better understand the experience of hunger, she asked children to tell her what happened when they reported being hungry at night.

As one child in the study said, "I go to sleep and I dream about food that I'm eating. . . . I dream about ooh, ahhh, I dreamed about hamburgers and carrots and strawberries and everything else . . . and then it makes me full when I get up . . . it makes me, I get, like, and why do I have a tummy ache?" (Richards and Smith, 2007).

Qualitative methodologies also provide formative data for survey development, marketing strategies, and the design of intervention projects.

"Think Aloud"

Another qualitative methodology Smith mentioned is what she called a "think aloud." Interviewees carry tape recorders while they shop and talk about the choices they make, providing insights into what people are thinking about when they buy food.

Cultural Perceptions of Obesity

Based on her research, Smith has concluded that it can be a mistake to assume that all overweight or obese people want to lose weight. Some do not. "Many of the African-American men [we have interviewed] are very happy to be big. You might perceive obesity as a huge problem, but one of the things that I've learned is that some of the populations don't perceive it in the same way that we do."

Researchers have a tendency to impose their own cultural perceptions on other populations. In interviews, she asks people what they think about weight and why they think some people are big and some people are small. Responses often have a genetic cast: "it runs in my family." Even with diseases such as diabetes, a respondent may point to a family predisposition. "One of the things that we have tried to do is not focus on the obesity [but] on other problems like finding interest in changing your blood pressure."

Interventions need to be tailored to specific cultures. When encountering different cultural perceptions regarding weight loss, the challenge, she said, is "walking that fine line in a culturally appropriate manner."

SPATIAL DATA AND SPATIAL METHODS

GIS and global positioning system (GPS) technologies are tools, and like any tools they could be replaced in 5 years by new technologies, said Amy Hillier, assistant professor of city and regional planning at the University of Pennsylvania, School of Design. Yet regardless of the tool, rich geographic data make it possible to do research that cannot be done any other way.

Much of the research using GIS in the past has been neighborhood effects research, in which individuals' home addresses are associated with data about their neighborhoods. This research has been an improvement over thinking that individuals make decisions regardless of their environments, but in some ways it has been unsatisfying. "It doesn't help us understand causal mechanisms," said Hillier. "It doesn't understand that people interact with their environments differently."

Combining GIS with Other Forms of Data

Vast amounts of administrative data about food stores and food resources can be put into GIS, but it is also important to send people into the community to "ground-truth" the administrative data against the reality. These field checks may reveal that some stores have closed, others have opened, and many have changed their names. It also makes it possible to take photographs of the outside of stores, which may reveal substantial qualitative data. Furthermore, when Hillier and her colleagues have spent time "on the ground" in the communities they study, they have been able to have conversations with food vendors and service providers and to see how they interact with customers, information that they could not have obtained in other ways.

In another study, a colleague of Hillier's developed a Nutrition Environment Measures Survey for stores, which is a systematic checklist of foods and healthful food options in stores (Glanz et al., 2007). "We have to get into the stores, food banks, and food cupboards if we really want to know what access to healthy food means," Hillier said.

These methods also make it possible to capture and map data about food environments. One study, for example, looked at outdoor advertising (Hillier et al., 2009). Students scoured neighborhoods with cameras and GPS systems to capture the location and content of outdoor advertising. "You wouldn't believe just how many of these cigarette ads are out in the poor communities in Philadelphia."

Human-Environment Interactions

Another sophisticated example of the use of spatial data involves capturing how people interact with their environments. Maps of how people move within their communities made with GPS technologies can reveal some of the decisions they make related to food insecurity and obesity. Mapping can reveal the following:

- Modes of transportation
- How long they took to reach a location
- How long a subject stayed at a specific location
- Levels of physical activity, if accelerometers are linked to mapping

Hillier's team has had success uncovering where people shop by going door to door and interviewing them. "That was a much richer way of experiencing communities and people." In addition, administrative data are available from, for example, websites that allow students to order food from area restaurants that is delivered to their dorm rooms.

Self-reports can be enriched considerably using spatial technologies. Students could use travel diaries that depict their routes to school. Heart monitors could reveal when people are under stress. Video cameras mounted on shoppers could show what food people buy.

Spatial data can help make services more efficient. This can be as simple as where to find day care or subsidized public transportation. Yet it also can be a rich source of information about accessing services and products in the community, whether WIC supplements, food banks, or healthcare services. For example, the MANNA Food Bank in Philadelphia distributes thousands of meals to people throughout the Delaware Valley. The organization hired a GIS software developer to increase the efficiency of food delivery. "There is no reason that nonprofits can't do this," said Hillier.

Spatial Distance as a Measure of Social Distance

Measures of spatial distance also can be converted into measures of social distance. For example:

- To what extent do people cross boundaries of race or class in cities?
- Do heart rates change when someone goes between ethnic neighborhoods?
- Where do people actually get their groceries and eat their food?

Qualitative Research

GIS technologies also can be used for qualitative research, as in the many projects using participants to take photographs. Measures of location can be combined with photo elicitation to encourage people to talk about the experience of going to a store. One researcher calls the integration of GIS software and qualitative data analysis "geoethnography."

Hillier ended with a plea. "Whether you find this compelling or not, collect spatial data even if you are not going to use it. Collect the address of where people live. Collect the address of where people shop if you can. A lot of times, it's just a matter of asking." By collecting these data, the door remains open for spatial analysis, regardless of whether that analysis is done in the original research. By the same token, national surveys should collect much richer spatial data in ways that protect confidentiality and privacy. "There are definitely ways that we can do that," Hillier said.

THE PROMISE OF TECHNOLOGY

Food insecurity exists within a broad social, environmental, and political context that is usually characterized by poverty, as shown in a concep-

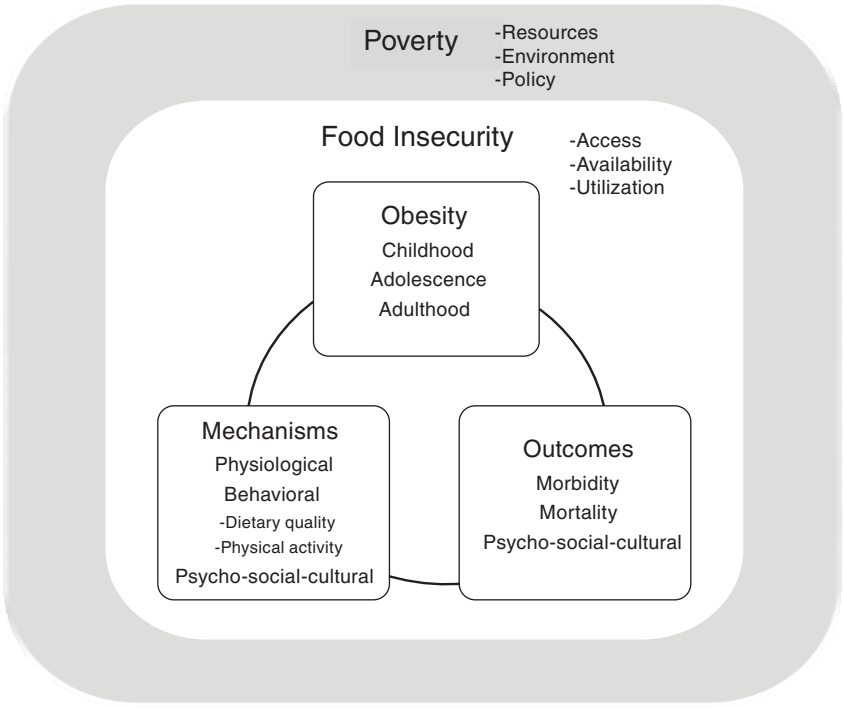

FIGURE 12-3 Food insecurity exists within the context of poverty in a multidimensional, multidetermined, dynamic, embedded, and multilevel system.
SOURCE: Finney Rutten et al., 2010. Reprinted by permission of Taylor and Francis Group.

tual model recently published in the *Journal of Health and Environmental Nutrition* developed by Lila Rutten, a behavioral scientist with SAIC, Inc., National Cancer Institute-Frederick, and her colleagues (Figure 12-3). In turn, food insecurity, nested within the larger context of poverty, provides a context that translates the influences of poverty into a mutually reinforcing cycle of excess weight gain and poor health outcomes through physiological, behavioral, and psycho-social-cultural mechanisms. The entire system is multidimensional, multidetermined, dynamic, embedded, and multilevel. "We're all aware of . . . the difficulty of addressing each of these [factors] individually," said Rutten.

Rutten expressed great optimism that recent changes in technology have "transformed the data landscape." Several of the speakers in the session on research methods, she noted, made the point that opportunities for the richness and variety of data capture, standardization, harmonization, analysis, visualization, and dissemination have never been greater.

Examples of Promising Technologies

Rutten briefly shared with workshop participants an example of data standardization, harmonization, and visualization from GapMinder,[2] a nonprofit organization that creates tools for visualizing and integrating datasets involving global health and economics. Through the "Wealth and Health of Nations" example from GapMinder World, she demonstrated the GapMinder software application called Trendalyzer that uses time-series analysis to compare life expectancy with per capita gross domestic product by nation. Rutten suggested that many of the data discussed throughout the workshop could be "popped into an application such as GapMinder to start to tease out and look at some of the intricacies and complexities of the relationships that we've seen here and to mirror methodologically some of the multilevel, multidimensional, and dynamic nature of these concepts."

In reference to the "Wealth and Health of Nations" example, Rutten said, "If you think about the spreadsheets that underlie this application, there's an enormous amount of data here. But we're able to sort of take it all in at once because of the way it's presented."

Appreciating the whole—or the gestalt—from disparate measurements can be very difficult, Rutten concluded, but "changes in technology can be leveraged to do a better job of pulling together and displaying our data. With the collective intelligence and efforts of the people in this room, there are reasons to be hopeful for gestalt."

GROUP DISCUSSION

Moderator: Amy Yaroch

During the group discussion period, points raised by participants included the following:

Funding

The kinds of research being discussed at the workshop will cost money, said the Food Research and Action Center's Geri Henchy in the discussion session. Will USDA be able to support that research? The moderator of the session, Amy Yaroch, said that she believed USDA would. She also said that the National Institutes of Health (NIH) is considering funding research in this area, although NIH traditionally has funded obesity prevention research rather than food insecurity research. Adams added that many researchers could be doing research on food insecurity and obesity as part of their current projects by adding additional data or analysis to

[2]See http://www.GapMinder.org (accessed November 18, 2010).

their results. "We can maximize what people are doing without having to add a ton of money."

Sharing Results for Decision Making

Chilton noted that an important component of the photovoice methodology is to be able to talk about the photographs with policy makers and the public to create change. Adams reported that sharing the photographs with the tribal elders in her study achieved that end by revealing how children viewed food and what they wanted to do in the community. "It was done for the community, within the community, to help understand those issues."

In response to a question about whether taking photographs can be used in intervention programs, Adams noted that her study was designed to get a broad sense of the foods people have in their homes. The point of her study was then to take this information to the community so it could decide what to do in response. She has not tried to use photography in her clinical practice to change the eating patterns of households or individuals. Some researchers are working on the use of photographs to calculate how much people eat, and she noted that self-monitoring can be very helpful for people trying to lose weight. "As more kids have cell phones, and they all have cameras with them, that kind of self-monitoring could be very useful clinically."

REFERENCES

Adams, A. K., H. Harvey, and D. Brown. 2008. Constructs of health and environment inform child obesity prevention in American Indian communities. *Obesity* 16(2):311-317.

Finney Rutten, L. J., A. L. Yaroch, U. Colon-Ramos, W. Johnson-Askew, and M. Story. 2010. Poverty, food insecurity, and obesity: A conceptual framework for research, practice, and policy. *Journal of Hunger and Environmental Nutrition* 5:403-415.

Glanz, K., J. F. Sallis, B. E. Saelens, and L. D. Frank. 2007. Nutrition Environment Measures Survey in Stores (NEMS-S). Development and evaluation. *American Journal of Preventive Medicine* 32(4):282-289.

Hamilton, W. L., J. T. Cook, W. W. Thompson, L. F. Buron, E. A. Frongillo, C. M. Olson, and C. A. Wehler. 1997. *Household food security in the United States in 1995: Technical report.* Washington, DC: Prepared for USDA Food and Consumer Service.

Hillier, A., B. L. Cole, T. E. Smith, A. K. Yancey, J. D. Williams, S. A. Grier, and W. J. McCarthy. 2009. Clustering of unhealthy outdoor advertisements around child-serving institutions: A comparison of three cities. *Health and Place* 15(4):935-945.

Nord, M., A. Coleman-Jensen, M. Andrews, and S. Carlson. 2010. *Household food security in the United States, 2009*. Economic Research Report No. 108. Washington, DC: Economic Research Service.

Richards, R., and C. Smith. 2007. Environmental, parental, and personal influences on food choice, access, and overweight status among homeless children. *Social Science and Medicine* 65(8):1572-1583.

13

Key Elements, Priorities, and Next Steps

Key Messages Noted by Participants

- Participants agreed that continued research on food insecurity and obesity is needed to answer the questions policy makers and the public have about how and why the two coexist, and that longer funding cycles will enable important questions to be answered.
- Such research is important because it will help to guide modifications of food assistance programs and to maintain public support for these programs.
- Comprehensive analyses of food purchases, acquisitions, and consumption can be achieved by linking data from different sources.
- Multiple federal agencies are interested in the possible links between food insecurity and obesity.
- Several participants affirmed that communications research is needed to uncover better ways of framing and disseminating the results of research on food insecurity and obesity.
- Research on the framing of obesity and food security from an individual perspective needs to be enhanced by more research on community level research in these areas.

In the final session of the workshop, several speakers representing government agencies and one official from a private foundation summarized the key messages and suggested actions from the previous 2.5 days. The moderator, Patricia B. Crawford, director of the Atkins Center for Weight and Health at the University of California at Berkley, encouraged panelists to reflect on the workshop content and discuss next steps to help increase our understanding of the relationship between food insecurity and obesity. Although much progress has been made in recent years, much more remains to be done, the panelists said. The potential for research and practice to improve the lives of people who struggle with food insecurity and obesity demands redoubled efforts.

A PERSPECTIVE FROM THE FOOD AND NUTRITION SERVICE

Is there value in continuing to examine the relationship between food insecurity and obesity? "I'm going to say a resounding yes and give you two reasons why that's the case," said Carol Olander, director of Family Programs Staff in the Office of Research and Analysis at USDA's Food and Nutrition Service (FNS), which sponsored the workshop.

Rationale for Conducting Research

First, a vocal contingent of policy makers and a significant segment of the public cannot fathom how it is possible for people to be both poor and obese. This group asks, if the poor or food insecure are overweight or obese, why do they need additional food or nutrition assistance? "That's the world I live in," said Olander.

To provide a persuasive and compelling answer to this question, a large body of complicated information needs to be distilled into a succinct message. "I originally thought about having this workshop with the idea that perhaps we would be able to walk out of the room, not necessarily with sound bites, but at least with the armament to move in that direction. That's not quite the case." Yet the lack of a succinct message at present demonstrates not only why additional research is needed, said Olander, but also some of the directions in which that research must go.

The second reason she cited for looking at the relationship between food insecurity and obesity is that the government has an obligation to demonstrate that it is a good steward of tax dollars. This calls for either a succinct message about the relationship or research aimed at providing that message.

Finally, the mission of FNS has evolved from a focus just on hunger to the broader issues of healthful diets and making good food choices. For

example, the change in name of the Food Stamp Program to the Supplemental Nutrition Assistance Program reflects that shift in emphasis. "We've moved from being about food assistance programs to being about nutrition assistance programs."

To fulfill this mission, FNS needs to support efforts that respond to both food insecurity and obesity. Olander cited Marlene Schwartz's concept of "nutritious food insecurity" as an important contribution of the workshop to meeting this objective.

Consideration of both food insecurity and obesity inevitably generates tension. With food insecurity, the emphasis is on more—more resources, more access, more calories. With obesity, the emphasis is on being more selective if not more restrained. Exploring and understanding this fundamental contrast "is essential to being able to go forward and get the sort of support that is necessary to continue programs that are intended to serve an increasingly large population in this country," said Olander.

Takeaway Messages

She cited several takeaway messages that emerged from the workshop:

- Further cross-sectional comparisons of overweight and obesity among different populations are not needed. "The additional return for the effort is probably not as worthy as it might be in pursuing some other paths in the research arena."
- Many other factors besides food security mediate the relationship between access to food and obesity. These factors could jointly cause obesity and food insecurity, or they could exert causal influences in either direction.
- Many research directions could provide useful information. Examples include ethnographic studies that look at the coping strategies that households use; longitudinal and retrospective studies that examine changes in or the persistence of food security and the likelihood that these have cross-generational influences; examination of the source, type, and quality of the foods that a household purchases and consumes; longitudinal research on the relationship of stress and depression to food insecurity and obesity; and case studies that look at how food potentiates the link between food insecurity and obesity, as when the members of a household share food or experience disrupted eating patterns.
- Measurement issues remain important, with respect to both socioeconomic status and obesity itself, which would seem to be a simple concept but in fact is not straightforward.

FNS is announcing a competitive grants program focused on childhood hunger, said Olander. It also is conducting studies on where people in a household get food, participation in farmers' markets, and where recipients of Supplemental Nutrition Assistance Program (SNAP) funds spend their resources. For example, a recent study analyzed national data to determine how many different types of stores SNAP recipients go to, how often they shop, and what they spend. The average number of transactions for a household is more than seven per month. Most of the dollars are spent in the first half of the month, with relatively few resources left for the end of the month, and most of the dollars are spent in supermarkets and superstores. Less than 5 percent of these households never shop in a supermarket or a superstore in the course of a given month.

The workshop produced many ideas about how changes to programs could be tested. Examples include alternative SNAP delivery schedules and a focus on family and community wellness. Olander pointed out that legislation can constrain such experiments. Appropriations generally come through very specific line items tied to particular programs, but as legislation at the federal and state levels is reauthorized and otherwise changed, these constraints can be lifted.

A PERSPECTIVE FROM THE ECONOMIC RESEARCH SERVICE

The interaction between food insecurity and obesity is one element in the larger issue of how to alleviate both. As a result, said Laurian Unnevehr, director of the Food Economics Division of USDA's Economic Research Service (ERS), understanding this interaction enriches and enlarges work on effective interventions.

Linking Different Kinds of Data

Unnevehr briefly described the investments USDA has made in linking data of different kinds, which is a way of capturing many characteristics of interest to researchers. For example, efforts are under way to link National Health and Nutrition Examination Survey (NHANES) data with administrative data to have a clearer picture of food assistance program participation and benefits. These data also are being linked with price data to have a better measure of the economic environment and how it may influence health outcomes. In addition, spatial data on the food environment from the American Community Survey are being linked with other kinds of data.

These various projects are laying the groundwork for a comprehensive survey of food purchases and acquisitions both at home and away from home. The data will cover where the household shops and will be linked to program participation data, providing an opportunity to look at how

acquisition might be shaped, for example, by participation in multiple programs. More information on the project is available in the Diet Quality and Food Consumption Briefing Room on the ERS website. Data delivery is expected in 2013 and will be shared with the research community in subsequent years.

Food Environment Atlas

Unnevehr also briefly mentioned a project on food deserts and the food environment. A Food Environment Atlas provides data at the county level on food deserts as well as what have been called "food swamps"—areas in which large relative amounts of energy-dense snack foods inundate healthful food options (Rose et al., 2009)—and the variety of food choices that may be available in a neighborhood. This project provides a national context for microspatial studies.

Intramural Research on Food Insecurity

USDA has been supporting intramural research on persistent food insecurity and the potential limitations of programs to address food insecurity. It also is looking at the relationship between food expenditures and food security, which is particularly important in an era of volatile food prices and economic recession. Another area of long-standing interest is food assistance and health outcomes. Understudied questions include the impact of the Supplemental Nutrition Assistance Program for Women, Infants, and Children (WIC), critical stages in development, and impact of participation in multiple programs on shaping food choices. The result of such research could be "a fuller picture of how policies can play a role in addressing either food insecurity or obesity or both."

Extramural Research on Food Insecurity

On the extramural side, USDA was preparing a request for proposals on the impacts of the recession and the role of food assistance in the broader safety net of social programs.

Federal Partnerships for Research on Food Insecurity

ERS and FNS are partnering in part to use new tools made available through behavioral economics, which is just one example of potential federal partnerships.

A PERSPECTIVE FROM THE NATIONAL INSTITUTES OF HEALTH

Food insecurity is a "hidden phenomenon," said Wendy Johnson-Askew, public health nutrition and health policy adviser for the Division of Nutrition Research Coordination within the National Institutes of Health (NIH). "Nobody comes out and tells you they don't have enough money for food." Surveys may or may not be able to determine what people are experiencing, although obesity can be an objective measurement. The co-existence of food insecurity and obesity can generate confusion for policy makers and members of the public. Even researchers can be hesitant to talk about this relationship if discussions seem to threaten necessary programs.

However, exploring the connection is critical, said Johnson-Askew. "We have to be bold, we have to be the advocates, we have to be able to explain to people and steer this conversation so that people get a better understanding of how these two things exist."

Core Measures and Procedures

NIH is interested in funding the best research it can fund, she said. Greater than 70 percent of NIH-funded research is investigator-initiated. In light of the mixed results of food insecurity and obesity studies she recommended agreeing on a set of core measures and procedures that can be incorporated in studies to measure the same things in the same way. Some areas of consideration for inclusion in core measures are: Should marginal food security be combined with low and very low food security? Should the population of interest be below 185 percent, 200 percent, or 250 percent of the federal poverty line? Which measures of socioeconomic status should be used in models?

Johnson-Askew suggested the following as areas in which more research is needed:

- **Communications research.** Researchers are not necessarily skilled at getting their points across to the public and reacting to the public's questions, said Johnson-Askew.
- **Food choices.** Many factors go into these decisions, not just money. Behavioral economics could make important contributions to how people make these decisions.
- **Food acquisition.** We need more information on where people are getting their food. "Food pantries, though they fill a great niche, are not acceptable ways for families to have to come once a month and get 3 days' worth of food," said Johnson-Askew.
- **Social networking.** This is a hot topic at NIH, and social networks undoubtedly influence nutrition behavior.

- **A variety of lenses.** Historical trauma, life course perspectives, and child health are all additional lenses through which to view obesity prevention.

NIH has substantial resources that it devotes to nutrition and obesity: 4 percent of the NIH budget goes to nutrition research, representing expenditures of $620 million annually, and 8 percent of that is targeted toward obesity. Much of the research funded in the past has been on interventions research. What happens if this one thing is changed? Food insecurity and obesity are very dynamic states. Currently there is a groundswell of interest in systems research, which fits well with the multifactorial nature of obesity and holds promise for helping to understand the relationship between food insecurity and obesity.

A PERSPECTIVE FROM THE CENTERS FOR DISEASE CONTROL AND PREVENTION

Most of the work done by the Centers for Disease Control and Prevention (CDC) occurs at the community and state levels, said Commander Heidi Blanck, chief of the CDC's Obesity Prevention and Control Branch. The CDC division that contains her branch funds adolescent and school health and adult and community health, with an increasing emphasis over time on the environment, policy, and systems approaches. Blanck said that CDC's portfolio is helping communities make the more healthful choice the easy choice.

The goals of CDC include increasing diet quality, increasing physical activity, and reducing obesity. These goals can be met by helping Americans to eat healthfully and live actively. Reducing obesity is a goal, but healthful relationships with the food environment and physical activity are routes to that goal.

Unintended Consequences of Policies

One thing CDC has examined is possible unintended consequences of policies. For example, will enhanced menu labeling worsen disparities among groups, some of which may not have the education, income, or health literacy to react to healthful incentives? Will emphasis on retail venues, farmers' markets, or farm-to-school programs enable equitable food choices?

It is one thing for government to emphasize the importance of fruits and vegetables and quite another to ensure access to those foods. The administration has been emphasizing programs such as the Fresh Food Financing Initiative to fill the "grocery gap," but it also has been working

on options that restrict consumption, such as limiting the consumption of sugar-sweetened beverages. Viewing such issues from the perspective of food insecurity has been helpful, said Blanck, because it is a valuable addition to the diet quality perspective.

Food Policy Councils and Community Food Security Coalitions

Blanck included the importance of food policy councils and community food security coalitions, which are groups of advocates and stakeholders that have the potential to do the following:

- Engage in discourse about meeting the needs of multiple groups including agriculture, public health workers, and lower-income individuals;
- Provide technical assistance for state and local communities to think about food access and anti-hunger; and
- Invest in interventions demonstrated to be effective.

The Farm Bill

The Centers for Disease Control and Prevention is convening stakeholders to consider public health in the reauthorization of the farm bill. Research on food insecurity and obesity can be a way to bring together people from different areas to work on these broader issues.

The National Collaborative on Childhood Obesity Research

CDC is part of the National Collaborative on Childhood Obesity Research (NCCOR), which has brought together several large public- and private-sector organizations interested in childhood obesity and food security.

A PERSPECTIVE FROM PRIVATE FOUNDATIONS

For the past 6 years, The California Endowment, which is a private foundation dedicated to improving the health of Californians, has been focused on a community-based, comprehensive obesity prevention initiative, said Marion Standish, director of The California Endowment's Community Health Program. This initiative has sought to frame the program around the community, not around individuals, which has implications for both research and practice. "We want to move from this narrow frame around outcomes of obesity to these larger frames of community priorities to improve health," she said.

One objective is to look carefully at the places where people live. The relationship between food security and place is "profound," said Standish.

Geographic information system (GIS) mapping of poverty, food security, school meal participation, and other measures related to socioeconomic status and food access find enormous geographic concentration. "A good solution solves many problems, and I think in this instance, a focus on place offers us the opportunity to address both food security and obesity simultaneously."

Focus on Prevention

Standish expressed the opinion that prevention had not been emphasized enough in the workshop. Once obesity has taken root, it is hard to undo. How can the problem be shifted upstream to the community factors that contribute to obesity? Communities recognize the importance of the same things researchers do in obesity prevention, including access to healthful food, safe places to play, and walkable neighborhoods.

Policy and systems change requires working with community members and parts of systems. It also requires research to evaluate multisectoral approaches.

- Which influences in the community environment offer the most promise for interventions?
- To what extent do those influences need to be changed?
- How many playgrounds, food stores, or food benefits are necessary to make communities food secure and eliminate obesogenic environments?
- How can longitudinal research be sustained to assess the long-run impact of policy on behavior?

The involvement of the National Institutes of Health in this research would be extremely welcome, said Standish. Currently, the resources to evaluate community change are very limited.

GROUP DISCUSSION

Moderator: Patricia B. Crawford

During the group discussion period, points raised by participants included the following:

Funding Cycles

The panelists discussed how the typical funding cycle for research at NIH can be harmonized with the study of long-term interventions. One option is to change the funding cycle, although in an institution as large

as NIH that it not easy, said Johnson-Askew. Another option is for NIH to provide support for organizations that can conduct long-term research, such as NCCOR. Foundations also may be able to fill some of the gaps that NIH cannot fill, she said.

Improving Program Evaluation

Standish pointed to a healthful food initiative that will represent a shared investment between the U.S. Department of the Treasury, USDA, and the Department of Health and Human Services. "There needs to be an evaluation of that initiative that goes beyond did we actually invest in stores or operators to—Did we really deliver healthful food? Did people choose healthful food? Who was choosing healthful food? Where were they coming from to get to those places? . . . I know funders are interested in this as well—a robust, multiagency, coordinated evaluation to address this one very important issue of access to healthful food."

Measuring Community Food Security

In response to a question about whether the federal government intends to invest in methods to measure community food security, Blanck said that CDC is sponsoring a survey that will look at how health planners are assessing access to food and water to glean environmental measures that could augment geographical data. CDC also has tools that communities can use for planning and evaluation. Lila Rutten mentioned a new resource developed by the National Cancer Institute called the Grid-Enabled Measures Database, or GEM, which is an online data repository that is based on wiki technologies so that contributors can add what they think are the best measures of nutritional intake, physical activity, and so on. "It's an opportunity for the scientific community to vet, comment on, and modify those measures."

Communications Research

Valerie Tarasuk emphasized the need for communications research. "A lot of the arguments that have been made over the last 3 days around the need for more research on the relationship between food insecurity and obesity have been rooted in concerns about the way in which perceptions about fatness are being used to raise questions about the legitimacy of poor people's needs for benefits. I would suggest to you that this is not a matter of science, or at least not solely a matter of science. Pouring more money into scientific endeavors to try to elucidate whether or not there is a relationship and what the biological pathways are will probably not be

enough to silence those who would raise questions about the legitimacy of benefits for people who are living in poverty."

Standish emphasized that the framework for health issues in the United States is oriented toward self-reliance and individual choice. "To the extent that we are trying to identify [other] factors, it's an uphill climb unless we have research to help us reframe the discussion." Standish highlighted the importance of better understanding community food security and factors that influence communities.

Edward Frongillo agreed that it is important not only to set a research agenda but to develop a communications strategy based on the findings of research. "If there isn't a counter narrative, we're in a position of replacing a narrative that's out there with nothing. We need to make a story that's more realistic and more useful to help improve people's lives."

REFERENCE

Rose, D., N. Bodor, C. M. Swalm, J. C. Rice, T. A. Farley, and P. L. Hutchinson. 2009. *Deserts in New Orleans? Illustrations of urban food access and implications for policy*. Paper presented at Understanding the Economic Concepts and Characteristics of Food Access, Washington, DC, January 23, 2009.

A

Workshop Agenda

Workshop on Understanding the Relationship Between Food Insecurity and Obesity

November 16-18, 2010

20F Conference Center
20 F Street, N.W., Washington, DC 20001

PURPOSE: To explore the relationship between food insecurity and obesity, the current state of research, and new data and analyses needed to further understand this relationship

NOVEMBER 16, 2010

8:30 a.m. **Registration**

9:00 **Welcome and Opening Remarks**
Patricia B. Crawford, University of California at Berkeley, Committee Chair
Steven Carlson, Food and Nutrition Service, U.S. Department of Agriculture (USDA)

SESSION 1: SETTING THE STAGE FOR THE COEXISTENCE OF FOOD INSECURITY AND OBESITY

Moderator: *Mary Story, University of Minnesota*

9:15 **Speakers:**
Craig Gundersen, University of Illinois at Urbana-Champaign
Barbara Laraia, University of California at San Francisco

Discussant: *Rafael Pérez-Escamilla, Yale University*

10:45 **Break**

SESSION 2: SOCIOECONOMIC DISPARITIES AND FOOD INSECURITY AND OBESITY

Moderator: *Adam Drewnowski, University of Washington*

11:00 **Speakers:**
Paula Braveman, University of California at San Francisco
Gopal Singh, Health Resources and Services Administration, U.S. Department of Health and Human Services (HHS)

Discussant: *Elizabeth Dowler, University of Warwick, United Kingdom*

12:15 p.m. **Lunch**

SESSION 3: SENTINEL POPULATIONS

Moderator: *Mariana Chilton, Drexel University*

1:30 **Speakers:**
John Cook, Boston University
Sara Quandt, Wake Forest University
Kathleen Pickering Sherman, Colorado State University
Christine Olson, Cornell University

Discussant: *Valerie Tarasuk, University of Toronto*

SESSION 4: IDENTIFYING KEY FACTORS IN RELATING FOOD INSECURITY AND OBESITY

3:00 ROUNDTABLE DISCUSSIONS

4:30 Networking Event

NOVEMBER 17, 2010

8:30 a.m. Welcome and Recap of Day 1
Patricia B. Crawford, University of California at Berkeley

SESSION 5: SOCIOECOLOGICAL ASPECTS

8:45 Part 1: The Individual Level
Moderator: *Christine Olson, Cornell University*

Speakers:
Colleen Heflin, University of Missouri
Maria Melchior, INSERM, Paris, France

Discussant: *Sandra L. Hofferth, University of Maryland*

9:45 Part 2: The Family and Household Level
Moderator: *Amy Yaroch, The Center for Human Nutrition, Omaha, Nebraska*

Speakers:
Edward Frongillo, Jr., University of South Carolina
Mariana Chilton, Drexel University

Discussant: *Joseph R. Sharkey, Texas A&M*

10:45 Break

11:00 Part 3: The Environmental Level
Moderator: *Katherine Alaimo, Michigan State University*

Speakers:
Angela Odoms-Young, University of Illinois at Chicago
Allison Karpyn, The Food Trust, Philadelphia

Discussant: *Diego Rose, Tulane University*

12:00 p.m. **Part 4: The Institutional Level**
Moderator: *Katherine Alaimo, Michigan State University*

Speakers:
Sonya Jones, University of South Carolina
Thomas Slater, Food Bank of Central New York

Discussant: *Diego Rose, Tulane University*

1:15 **Lunch**

SESSION 6: SYSTEMS OF INFLUENCE

Moderator: *Edward Frongillo, Jr., University of South Carolina*

2:30 **Speaker, "Meta-discussant":** *Pamela Morris, New York University*

3:30 **Break**

SESSION 7: PANEL ON RESEARCH APPLICATIONS

Moderator: *Mary Story, University of Minnesota*

3:45 **Panelists:**
Marlene Schwartz, Yale University
James Weill, Food Research and Action Center, Washington, DC
Kenneth Hecht, California Food Policy Advocates

5:00 **Adjourn**

NOVEMBER 18, 2010

8:30 a.m. **Welcome and Recap of Day 2**
Patricia B. Crawford, University of California at Berkeley

SESSION 8: PANEL ON RESEARCH GAPS

Moderator: *Christine Olson, Cornell University*

8:45 **Panelists:**
Maureen Black, University of Maryland

David Holben, Ohio University
Janet Poppendieck, Hunter College, City University of New York
Margaret Andrews, Economic Research Service, USDA

SESSION 9: RESEARCH METHODS AND MEASURES

Moderator: *Amy Yaroch, The Center for Human Nutrition, Omaha, Nebraska*

9:45 **Speakers:**
Mark Nord, Economic Research Service, USDA
Alexandra Adams, University of Wisconsin at Madison
Chery Smith, University of Minnesota
Amy Hillier, University of Pennsylvania

Discussant: *Lila Rutten, National Cancer Institute, National Institutes of Health (NIH)*

11:15 **Break**

SESSION 10: PANEL ON KEY ELEMENTS OF THE WORKSHOP, RESEARCH PRIORITIES, AND NEXT STEPS

Moderator: *Patricia B. Crawford, University of California at Berkeley*

11:30 **Panelists:**
Marion Standish, The California Endowment
Laurian Unnevehr, Economic Research Service, USDA
Carol Olander, Food and Nutrition Service, USDA
Wendy Johnson-Askew, NIH
Heidi Blanck, Centers for Disease Control and Prevention

12:30 p.m. **Concluding Remarks**
Carol Olander, Food and Nutrition Service, USDA
Patricia B. Crawford, University of California at Berkeley

12:45 **Adjourn**

B

Planning Committee Biographical Sketches

Patricia B. Crawford, Dr.P.H., R.D. (*Chair*), is director of the Atkins Center for Weight and Health, Cooperative Extension Nutrition Specialist in the Department of Nutritional Sciences, and adjunct professor in the School of Public Health at the University of California, Berkeley. Dr. Crawford directed the 10-year longitudinal National Heart, Lung, and Blood Institute (NHLBI) Growth & Health Study, a study of the development of cardiovascular risk factors in African-American and white girls, as well as the Five-State Fit WIC Initiative to Prevent Pediatric Overweight. Her current studies include evaluations of large community-based obesity initiatives and school-based policy interventions. Dr. Crawford chaired the Institute of Medicine (IOM) planning committee for a series of workshops on community perspectives to prevent childhood obesity; she is a member of the IOM Standing Committee on Childhood Obesity Prevention and the IOM Committee on Accelerating Progress in Obesity Prevention. She earned a B.S. from the University of Washington and a doctorate in public health and an R.D. from the University of California at Berkeley.

Katherine Alaimo, Ph.D., M.S., is associate professor in the Department of Food Science and Human Nutrition at Michigan State University. She has also worked on nutrition and food insecurity issues in the Division of Health Examination Statistics at the Centers for Disease Control and Prevention (CDC). Her primary research interests are hunger and its consequences for children; community food security; urban agriculture, community gardens, and school gardens; promoting healthful eating and physical activity through policies, programs, and community design; and

community-based participatory research. She received her Ph.D. and M.S. from Cornell University.

Mariana Chilton, Ph.D., M.P.H., is associate professor in the Department of Health Management and Policy at the Drexel University School of Public Health. She is the principal investigator (PI) for the Philadelphia GROW Project, a nutrition and growth initiative for children and their families, and co-PI of Children's HealthWatch. She most recently launched *Witness to Hunger* to increase women's participation in the national dialogue on hunger and poverty. Her work spans a variety of issues that affect low-income families to address nutritional well-being, public assistance participation, housing instability, and employment. She has held positions at the Hahnemann School of Public Health and the University of Oklahoma Health Sciences Center. Her awards include the Young Professional Award in Maternal and Child Health from the American Public Health Association, the Philadelphia Business Journal "40 Under 40" Young Professional Award, and the National Lindback Award for Teaching Excellence. Dr. Chilton received her Ph.D. from the University of Pennsylvania and an M.P.H. in epidemiology from the University of Oklahoma.

Adam Drewnowski, Ph.D., M.A., is director of the Nutritional Sciences Program, professor of epidemiology, and adjunct professor of medicine at the University of Washington (UW) in Seattle. He also serves as director of the Center for Public Health Nutrition and the UW Center for Obesity Research and is a joint member of the Fred Hutchinson Cancer Research Center. Following a postdoctoral fellowship at the University of Toronto, he served on the faculty of the Rockefeller University and the University of Michigan, where he became professor of public health, psychology, and psychiatry and director of the Program in Human Nutrition at the School of Public Health. His current research focuses on the relationship between poverty and obesity, the links between obesity and diabetes rates in vulnerable populations, and access to healthful foods. He is a member of the IOM Standing Committee on Childhood Obesity Prevention and served on the IOM Planning Committee for a Workshop on Perspectives from United Kingdom and United States Policy Makers on Obesity Prevention. Dr. Drewnowski received his Ph.D. in psychology from the Rockefeller University in New York and his M.A. in biochemistry from Oxford University in the United Kingdom.

Edward A. Frongillo, Jr., Ph.D., M.S., is professor and chair of the Department of Health Promotion, Education, and Behavior in the Arnold School of Public Health at the University of South Carolina in Columbia. Dr. Frongillo studies how to solve under- and overnutrition of populations

globally, especially children and families living in poverty, using qualitative and quantitative methods. His particular research interests are growth, development, and feeding of infants and young children and the role of family stress and parenting in these areas; measurement and consequences of household food insecurity and hunger; policies and programs for improving nutrition and development; advancement of consensus, commitment, and capacity for nutrition and health in poor locations; and design and analysis of longitudinal studies. Dr. Frongillo received his Ph.D. and M.S. from Cornell University.

Christine M. Olson, Ph.D., is professor in the Division of Nutritional Sciences at Cornell University. Prior to her current position, she was division extension leader in the Division of Nutritional Sciences, director of nutrition graduate studies, and assistant dean for research and graduate studies in the College of Human Ecology at Cornell and visiting faculty at the Institute for Research on Poverty at the University of Wisconsin at Madison. Dr. Olson has a long history of research on maternal and early-childhood nutrition, including food insecurity. She is currently completing a long-term, longitudinal research project on food insecurity in rural low-income families; the focus this year is on factors that facilitate and inhibit families from moving out of food insecurity across time. She has served on the IOM Committee on Nutritional Status During Pregnancy and Lactation and its Subcommittee on Clinical Application Guide. Dr. Olson received her Ph.D. and M.S., both in nutrition sciences, from the University of Wisconsin at Madison.

Mary Story, Ph.D., R.D., is professor in the Division of Epidemiology and Community Health, associate dean for student life and leadership in the School of Public Health, and an adjunct professor in the Department of Pediatrics School of Medicine at the University of Minnesota. She is director of the National Program Office for the Robert Wood Johnson Foundation Healthy Eating Research program, which supports research on environmental and policy strategies to promote healthful eating among children to prevent childhood obesity. Dr. Story's interests are in the area of child and adolescent nutrition and childhood obesity prevention. She has conducted numerous school- and community-based obesity prevention studies and has been PI on several National Institutes of Health (NIH) grants. She has numerous scientific publications on child nutrition and obesity prevention. Dr. Story was a member of the IOM Committee on Food Marketing and the Diets of Children and Youth, Committee on Nutrition Standards for Foods in Schools, and Committee on Childhood Obesity Prevention Actions for Local Governments; she is currently on the IOM Standing Committee for Childhood Obesity Prevention and the Committee on Examination of

Front-of-Package Nutrition Rating Systems and Symbols. She has received numerous awards for her research and work in the field of child and adolescent nutrition. She was elected to the Institute of Medicine in 2010. She received her Ph.D. in nutrition science from Florida State University.

Amy Yaroch, Ph.D., is executive director of the Center for Human Nutrition in Omaha, Nebraska. Dr. Yaroch also holds an appointment as professor in the Department of Health Promotion, Social and Behavioral Health, College of Public Health, University of Nebraska Medical Center. Her research areas include obesity prevention in youth, local food systems and health, survey development and evaluation, and health disparities. She has served as a behavioral scientist, program director, and program officer at the National Cancer Institute and as an assistant scientist at the AMC Cancer Research Center in Denver, Colorado. She is on the board of directors of the Nebraska Food Cooperative and is vice chair of the board of directors of Slow Food-Omaha. She has received a number of awards for her work at the National Institutes of Health. Professional activities include membership in the American Academy of Health Behavior, American Dietetic Association, Society of Behavior Medicine, American Public Health Association, and Greater Omaha Chamber of Commerce. She received her Ph.D. in nutrition and health sciences from Emory University.

C

Speaker Biographical Sketches

Alexandra Adams, Ph.D., M.D., is associate professor in the Department of Family Medicine and director of the University of Wisconsin (UW) Collaborative Center for Health Equity School of Medicine and Public Health at the University of Wisconsin at Madison. She is currently practicing at the UW Health Pediatric Fitness Clinic. Her special interests include pediatric nutritional problems, obesity, metabolic syndrome, and indigenous diets and health. Dr. Adams places a special emphasis on working in partnership with families and children to help them make more healthful lifestyle choices. Dr. Adams' research focuses on family- and community-based interventions for obesity prevention in underserved communities. She currently leads a family-based intervention project—Healthy Children, Strong Families—to reduce obesity and cardiac risk factors in American Indian children and their primary caregivers. This participatory research project, a partnership between four Wisconsin tribes, the Great Lakes Inter-Tribal Council, and UW researchers, is a randomized controlled trial funded by the National Institutes of Health (NIH) that examines the effect of a home visiting intervention on reducing metabolic risk and improving lifestyles for the children and their primary caregivers. Dr. Adams received her Ph.D. and M.D. from the University of Illinois at Urbana-Champaign. She completed her residency in family medicine at the University of Wisconsin Hospital and Clinics.

Margaret Andrews, Ph.D., is an economist in the Food Assistance Branch of the Economic Research Service's (ERS's) Food Economics Division. Her research interests are in the areas of food security, food access, and par-

ticipation and impacts of the Supplemental Nutrition Assistance Program (SNAP). Prior to joining ERS, Dr. Andrews was at the Office of Analysis and Evaluation at the U.S. Department of Agriculture's (USDA's) Food and Nutrition Service (FNS) where she designed and managed several large-scale evaluation projects, including the National Food Stamp Program Survey. Prior to going to USDA, she was a faculty member in the Department of Economics and Marketing at Rutgers University and a resident fellow at the National Center for Food and Agricultural Policy at Resources for the Future. Dr. Andrews received a Ph.D. in agricultural economics from the University of California at Berkeley.

Maureen Black, Ph.D., M.A., is the John A. Scholl M.D. and Mary Louise Scholl M.D. Professor of Pediatrics at the University of Maryland School of Medicine and director of the Growth and Nutrition Clinic, a multidisciplinary clinic for children with poor growth and feeding problems. She is an adjunct professor in the Center for Human Nutrition at the Johns Hopkins Bloomberg School of Public Health and in the Department of Psychology at the University of Maryland, Baltimore County. Dr. Black is a pediatric psychologist; she has been the president of the Society of Pediatric Psychology and the Division of Children, Youth, and Family Services of the American Psychological Association. She specializes in intervention research related to children's nutrition, health, and development. She is a site principal investigator (PI) for Children's HealthWatch and is conducting three NIH-funded intervention trials. She is chair of the Child Health Foundation, chair of the Maryland WIC (Special Supplemental Nutrition Program for Women, Infants, and Children) Advisory Committee, and has served on committees for UNICEF, the World Health Organization, and the Institute of Medicine. She has studied food insecurity among families of children from infancy through adolescence. Dr. Black received her Ph.D. from Emory University.

Commander Heidi Michels Blanck, Ph.D., M.S., U.S. Public Health Service, is chief of the Obesity Prevention and Control Branch at the Centers for Disease Control and Prevention (CDC) in the Division of Nutrition, Physical Activity, and Obesity. Dr. Blanck has more than 11 years of CDC experience as a public health epidemiologist and has authored more than 50 papers and reports in the areas of weight management, nutrition, physical activity, and environmental exposures. She currently oversees CDC's monitoring of state obesity prevalence and key behavioral, environmental, and policy supports for obesity prevention and control. Staff within the branch focus on national, state, and local surveillance, applied research, and guidelines development related to the topics of body mass index (BMI) screening and counseling, sugar drinks, calorie-dense foods and snacks, television

viewing and screen time, water access, and food and beverage labeling across multiple settings (such as child care, schools, hospitals, worksites, and communities). Additional branch initiatives include a State Childcare Action Guide and a Healthy Hospital Pilot. She is senior adviser to CDC's Nutrition and Obesity Policy Research & Evaluation Network and a member of the National Collaborative on Childhood Obesity Research. She received her Ph.D. in nutrition and health sciences from Emory University.

Paula Braveman, M.D., M.P.H., is professor of family and community medicine and director of the Center on Social Disparities in Health at the University of California at San Francisco (UCSF). For more than two decades, Dr. Braveman has studied and published extensively on social disparities in health and health care, and she is actively engaged in bringing attention to this field in the United States and internationally. Her research has focused on measuring, documenting, and understanding socioeconomic and racial or ethnic disparities, particularly in maternal and infant health and health care. During the 1990s she worked with World Health Organization staff in Geneva to develop and implement a global initiative on equity in health and health care. She recently served as research director for a national commission on the social determinants of health, supported by the Robert Wood Johnson Foundation. Throughout her career, she has collaborated with local, state, federal, and international health agencies to see rigorous research translated into practice with the goal of achieving greater equity in health. She has been a member of the Institute of Medicine of the National Academy of Sciences since her election in 2002. She received her M.D. and completed a residency in family medicine at UCSF, and she received an M.P.H. from the University of California at Berkeley.

Steven Carlson is director of the Office of Research and Analysis at USDA's Food and Nutrition Service. He leads a multidisciplinary staff responsible for the development, design, and execution of policy research and analysis for the nation's food assistance programs and for the preparation of legislative, regulatory, and cost analyses. He manages a portfolio of research contracts and grants worth more than $100 million that since 1989 has produced 300 analytical and technical reports to meet information needs of policy officials and program managers. He also led a 5-year partnership to create the first rigorous and comprehensive estimate of the extent of food insecurity in America, providing a critical benchmark to assess the performance of the nation's investment in food assistance.

John Cook, Ph.D., M.A.Ed., is associate professor in the Department of Pediatrics, Boston University School of Medicine. Dr. Cook is one of the PIs for Children's HealthWatch, a multisite, multistate pediatric research center

that monitors the impacts of economic conditions and social policies on the health of vulnerable young children. His research interests include examining the effects of hunger, food security, and energy security on children's health and well-being, and ways to increase access to affordable, healthful food. His current research is related to the effects of food insecurity at its lowest levels of severity, including "marginal food security"; the impacts of poverty-related stresses on cognitive development and brain growth in very young children; and global climate disruption and diminishing fossil-fuel supplies and their implications for low-income families' economic viability, for food availability and affordability, and for public health. Dr. Cook received his Ph.D. from the University of North Carolina at Chapel Hill and M.A.Ed. from Arizona State University.

Elizabeth Dowler, Ph.D., M.Sc., is professor of food and social policy in the Department of Sociology at the University of Warwick (UK) and is a registered public health nutritionist. She works on the social and policy aspects of food and nutrition and on poverty, nationally and internationally, drawing on science and social science in background, thinking, and practice. Her focus is on food, poverty, and inequalities, including local initiatives and policy evaluation; food security, rights, and justice; and "reconnection" to sustainable food systems, especially from consumers' perspectives. She is a member and trustee of the Food Ethics Council, an independent research and advocacy group working to make the food system fairer and more healthful; she was involved in its recent *Food and Fairness Inquiry*. From 2008 to 2010 she was a member of the UK Defra's Council of Food Policy Advisers. In 2008 she worked as a senior Marie Curie research fellow, in University College Dublin, on implementing a rights-based approach to poverty and food insecurity. Before going to Warwick, Dr. Dowler was based at the London School of Hygiene & Tropical Medicine, working in many parts of the world with health, agricultural, social, and planning sectors or for international agencies. Her work remains multi- and interdisciplinary. Dr. Dowler received her Ph.D. and M.Sc. from the University of London.

Craig Gundersen, Ph.D., is associate professor in the Department of Agricultural and Consumer Economics at the University of Illinois at Urbana-Champaign. He is a member of the Division of Nutritional Sciences and a faculty affiliate of the Institute for Government and Public Affairs. Previously, he was at USDA's Economic Research Service and at Iowa State University. Dr. Gundersen's research is concentrated in four main areas: examinations of the efficacy of food assistance programs; analyses of the determinants of food insecurity and food assistance participation; examination of measurement issues pertaining to food insecurity and food as-

sistance participation; and analyses of the effects of food insecurity and stress on childhood obesity. Among others, he has published in the *Journal of Human Resources*, *Journal of Health Economics*, *American Journal of Agricultural Economics*, *Journal of Nutrition*, *Pediatrics*, *American Journal of Public Health*, *Demography*, *Journal of Population Economics*, *Food Policy*, *Obesity Reviews*, and *Journal of the American Dietetic Association*. External funding for his work has come from, among other sources, USDA's Food and Nutrition Service, USDA's National Institute of Food and Agriculture, ERS, Merck Foundation, the U.S. Agency for International Development, and the U.S. Census Bureau. Dr. Gundersen received his Ph.D. from the University of California at Riverside.

Kenneth Hecht, J.D., is executive director of California Food Policy Advocates (CFPA), which he co-founded in 1992. CFPA is a statewide nutrition policy and advocacy organization that works to improve the health and well-being of low-income Californians by increasing their access to nutritious, affordable food. CFPA focuses on state and federal policy advocacy to expand and strengthen the federal food programs to increase their capacity to prevent both food insecurity and obesity. Prior to co-founding CPFA, Mr. Hecht practiced law, mainly in legal services programs focusing on children's rights and employment rights. After 3 years at a community foundation, he undertook consulting work dealing with hunger and food insecurity and private, nonprofit efforts to address those conditions. Mr. Hecht graduated from Dartmouth College and Yale Law School.

Colleen Heflin, Ph.D., M.P.P., is associate professor at the Truman School of Public Affairs, University of Missouri. She is affiliated with the Institute of Public Policy at the University of Missouri and the National Policy Center at the University of Michigan. Dr. Heflin's work is informed by the study of processes that create systems and patterns of social stratification. However, because she is interested in how social policies affect the well-being of vulnerable populations, her work falls at the boundaries of sociology, economics, public health, public administration, and women's studies. Her interdisciplinary research program focuses on understanding the survival strategies employed by low-income households to make ends meet, the implications of using these strategies for individual and household well-being, and how public policies influence well-being. A central focus of her work has been about understanding the causes and consequences of material hardship. Current projects examine how the populations using food stamps and unemployment insurance have changed with the recent recession; how economic shocks may impact the wealth of extended kin networks; and the quality, quantity, and composition of food provided by food pantries. Dr. Heflin received her Ph.D. and M.P.P. from the University of Michigan.

Amy Hillier, Ph.D., M.S.W., is assistant professor of city and regional planning at the University of Pennsylvania School of Design. She currently teaches courses on the application of geographic information systems (GIS) and on geography and public health at the University of Pennsylvania in the city planning, urban studies, social work, and public health programs. Her research focuses on the spatial analysis of public health disparities, including access to healthful foods, physical activity, and exposure to outdoor advertising. She has also used historical GIS methods to research mortgage redlining and W.E.B. Du Bois' classic book, *The Philadelphia Negro*. She learned GIS and spatial statistical analysis skills through a stroke of good luck while receiving her Ph.D. and M.S.W. degrees in social welfare at the University of Pennsylvania School of Social Work.

Sandra L. Hofferth, Ph.D., is professor in the Department of Family Science and director of the Maryland Population Research Center at the University of Maryland, College Park. She is the former co-director of the Michigan Panel Study of Income Dynamics and founding director of its Child Development Supplement. Her research focuses on American children's use of time; poverty, food insecurity, public assistance, and child health and development; and fathers and fathering. Dr. Hofferth is the author of more than 100 articles and 5 books, including the *Handbook of Measurement Issues in Family Research* (with Lynne Casper). She is vice president of the Population Association of America. Dr. Hofferth was awarded the Jensen Lectureship, jointly sponsored by the American Sociological Association and Duke University, for research contributing to social action, and the Research and Development Award from the School of Public Health, University of Maryland. Dr. Hofferth received her Ph.D. and M.A. from the University of North Carolina at Chapel Hill.

David H. Holben, Ph.D., R.D., L.D., is professor and associate director of nutrition in the School of Applied Health Sciences and Wellness and acting associate dean in the College of Health Sciences and Professions at Ohio University in Athens, Ohio. His research focuses on food access and health outcomes in North America, especially as this relates to women and households in the Appalachian region of the United States. Dr. Holben received his Ph.D. in human nutrition from the Ohio State University.

Wendy Johnson-Askew, Ph.D., M.P.H., is public health nutrition and health policy adviser for the NIH Division of Nutrition Research Coordination. Prior to going to NIH, Dr. Johnson-Askew held a number of clinical nutrition management positions and nutrition faculty positions. Her areas of research interest include community nutrition intervention strategies, community efforts to reduce or eliminate health disparities, effective nutri-

tion communication strategies, and community-based anti-hunger efforts. Dr. Johnson-Askew has been actively involved in follow-up actions to the Surgeon General's *Call to Action to Prevent and Decrease Overweight and Obesity*, and she speaks to a wide variety of audiences on the topic. Dr. Johnson-Askew received her Ph.D. and M.P.H. from the School of Public Health at the University of North Carolina at Chapel Hill.

Sonya Jones, Ph.D., is deputy director of the Center for Research in Nutrition and Health Disparities and assistant professor in the Department of Health Promotion, Education, and Behavior at the University of South Carolina. Dr. Jones has research interests in the consequences of nutrition policies and programs for women and children. She has evaluated the effects of food assistance programs on women's and children's health and well-being. She has also conducted local policy experiments by partnering with youth to identify and develop school-level nutrition policies. Other research interests include alternative policy designs and their association with school and child changes. More recently, her work has focused on the family as the key policy and intervention target in nutrition, including partnering with a local rural community to evaluate parent advocacy in schools, using secondary data about family function to understand children's weight status, and developing a weight loss intervention for women that are eligible for food assistance programs. Dr. Jones received her Ph.D. from the University of North Carolina at Chapel Hill.

Allison Karpyn, Ph.D., is director of research and evaluation for The Food Trust in Philadelphia. Her research encompasses a range of environmental and policy strategies to improve dietary intake in underserved communities, such as approaches to operate farmers markets in low-income communities, and the study of in-store marketing approaches in supermarkets to promote consumer shifts from high-calorie, nutrient-poor foods to lower-calorie, improved nutrient-density foods. In addition to her position at The Food Trust, Dr. Karpyn teaches program planning and evaluation as well as community assessment courses in the M.P.H. and Dr.P.H. programs at Drexel University. She received her Ph.D. in policy research, evaluation and measurement from the University of Pennsylvania.

Barbara Laraia, Ph.D., M.P.H., R.D., is associate professor in the Department of Medicine and co-director of the Center for Obesity Assessment, Study, and Treatment (COAST) at the University of California at San Francisco. Dr. Laraia is a public health nutrition investigator with a special interest in the relationships between food policy, the food environment, and health. She has expertise in qualitative methods, program evaluation, community-based research, and nutritional epidemiology. Her research

focuses on household food security status and neighborhood effects on diet, weight, perinatal outcomes, and other maternal and child health issues, especially among vulnerable populations. Her current projects include measurement issues of the food and physical activity environments; influences of the food environment on diet and weight among postpartum women; and understanding the role that *tiendas* (Latino grocery stores) play in diet quality among Latinos. She received her Ph.D. in nutrition from the University of North Carolina at Chapel Hill.

Maria Melchior, Sc.D., is research fellow at the National Institute for Health and Medical Research (INSERM) in Villejuif, France. Her research focuses on lifelong social determinants of health, with a particular emphasis on common mental disorders such as depression, anxiety, and substance-related problems. Specifically, Dr. Melchior studies the role of social and economic factors at different stages of life in the risk of onset and persistence of mental disorders. Her work also examines the impact of mental disorders on individuals' social, professional, and personal lives. Dr. Melchior is currently the principal investigator of the TEMPO study based in France, an epidemiological study investigating the roots of mental disorders among young adults. Prior to joining INSERM, Dr. Melchior received doctoral training in social epidemiology and public health from Harvard University and advanced postdoctoral training in psychiatric epidemiology at the Institute of Psychiatry at King's College in London.

Pamela Morris, Ph.D., is professor of applied psychology in New York University's Steinhardt School of Culture, Education, and Human Development. Dr. Morris's research lies at the intersection of social policy and developmental psychology. Her program of research focuses on several areas of inquiry. First, she has led research on the effects of welfare and employment policies—and their subsequent effects on parents' employment and income—on children. This research has had an impact on policy discussions at both state and federal levels, while contributing to developmental science as the first experimental evidence of the effects of increases in parents' income on children's development. To extend this line of research, she is currently conducting a study to understand how youth and their families are affected by conditional cash transfers as part of the MDRC's Opportunity NYC Study, an initiative of Mayor Bloomberg's Center for Economic Opportunity. Second, she is conducting a study to understand how low-income children are affected by parents' depression, understanding the effects of material depression on children's psychosocial, clinical, and physiological outcomes. Finally, she is the project director and co-PI of the Department of Health and Human Services Head Start CARES project. CARES is one of two large-scale cluster randomized trials that Dr. Morris is conducting

with researchers at MDRC assessing the effects of preschool intervention strategies aimed at improving children's social-emotional development. Dr. Morris received her Ph.D. in developmental psychology from Cornell University.

Mark Nord, Ph.D., M.S., is a sociologist at USDA's Economic Research Service. For the past 10 years he has led the agency's work on measuring and monitoring household food security and has conducted research on determinants of food security and on measurement of food security in the United States and in other countries. Previous work includes research on natural resources, rural poverty, and migration at ERS and at the Pennsylvania State University, and management of relief and development programs of a nongovernmental organization in Bangladesh. He received both a Ph.D. and an M.S. in rural sociology from the Pennsylvania State University.

Angela M. Odoms-Young, Ph.D., is assistant professor in the Department of Kinesiology and Nutrition at the University of Illinois at Chicago. Prior to her current position, Dr. Odoms-Young was assistant professor of public and community health in the School of Allied Health Professions of the College of Health and Human Sciences at Northern Illinois University in Dekalb, Illinois. She completed a Family Research Consortium postdoctoral fellowship focused on understanding family processes in diverse populations at the Pennsylvania State University and the University of Illinois at Urbana-Champaign and a Community Health Scholars fellowship in community-based research at the University of Michigan School of Public Health. Her current research is focused on social, cultural, and environmental factors that influence dietary practices and related health outcomes (obesity, cardiovascular disease, and diabetes, for example) in African-American and low-income women. Other research areas of interest include qualitative research paradigms, examining relationships between religion and health, and community-based participatory research. Dr. Odoms-Young received a Ph.D. in community nutrition and an M.S. in human nutrition from Cornell University.

Carol Olander, Ph.D., is director of Family Programs Staff in the Office of Research and Analysis at the USDA's Food and Nutrition Service. She and her staff are responsible for Supplemental Nutrition Assistance Programs (SNAP)-related research, as well as budget and legislative analyses. This year's activities incorporate a substantial research program targeted on key USDA goals: eliminating childhood hunger, reducing obesity, and expanding the farm-food connection in FNS programs. Before going to the Food and Nutrition Service in 1980, she conducted research and taught in university and community service settings. She received a Ph.D. in psychology from Northwestern University.

Rafael Pérez-Escamilla, Ph.D., is professor of epidemiology and public health and director, Office of Community Health, at the Yale School of Public Health. He is also director and principal investigator of the Connecticut National Institutes of Health EXPORT Center of Excellence for Eliminating Health Disparities Among Latinos (CEHDL). His public health nutrition and food security research has led to improvements in breastfeeding promotion, iron deficiency anemia among infants (by delaying the clamping of the umbilical cord after birth), household food security measurement and outcomes, and community nutrition education programs worldwide. His health disparities research involves assessing the impact of community health workers in improving behavioral and metabolic outcomes among Latinos with type 2 diabetes. He has published more than 100 research articles and 300 conference abstracts, book chapters, and technical reports. He is currently chair-elect of the American Society for Nutrition International Nutrition Council and has served on the editorial boards of the *Journal of Nutrition*, the *Journal of Human Lactation*, and the *Journal of Hunger and Environmental Nutrition*. He served as a member of the 2009 Institute of Medicine (IOM) Committee on Gestational Weight Gain Guidelines and of the 2010 Dietary Guidelines Scientific Advisory Committee. Dr. Pérez-Escamilla received a Ph.D. in nutrition and an M.S. in food science from the University of California at Davis.

Janet Poppendieck, Ph.D., is professor of sociology at Hunter College, City University of New York. Her primary concerns, both as a scholar and as an activist, have been poverty, hunger, and food assistance in the United States. She serves on the Board of Directors of the Association for the Study of Food and Society and the Advisory Committees of City-as-School and the Welfare Rights Initiative. She is the author of *Breadlines Knee Deep in Wheat: Food Assistance in the Great Depression* (Rutgers, 1986), *Sweet Charity?: Emergency Food and the End of Entitlement* (Viking, 1998; Penguin paperback, 1999), and articles on hunger, food assistance, and public policy. Her new book, *Free for All: Fixing School Food in America,* was released by the University of California Press in 2010. She received her Ph.D. from the Florence Heller Graduate School for Advanced Studies in Social Welfare at Brandeis University.

Sara A. Quandt, Ph.D., is professor of epidemiology and prevention, Division of Public Health Sciences, Wake Forest University School of Medicine. Her research focuses on rural and minority populations, with particular emphasis on the health of immigrant workers and their families. This has included community-based participatory research approaches to understanding food behaviors and food insecurity in these vulnerable populations. She received the 2006 National Occupational Research Agenda

(NORA) Innovative Research Award for Worker Health and Safety and the 2007 Outstanding Rural Health Researcher Award of the National Rural Health Association. Dr. Quandt received her Ph.D. in anthropology, with a minor in nutrition, from Michigan State University.

Donald Diego Rose, Ph.D., M.P.H., is professor in the Department of Community Health Sciences at the School of Public Health and Tropical Medicine, and director of the Prevention Research Center, Tulane University. Dr. Rose began his career as a project director/nutritionist for the Special Supplemental Nutrition Program for WIC Nutrition Program in a farm worker clinic in rural California. He worked for the Economic Research Service at USDA as a research team leader on the determinants and consequences of household food insecurity in America, the nutrition and health impacts of food assistance programs, and the evaluation of low-income nutrition education projects. He also worked internationally on food consumption and food security projects in Mozambique and South Africa. Dr. Rose's research at Tulane focuses on the social and economic side of nutrition problems, including disparities in access to food, the links between food access and consumption, domestic and international food security, and the importance of the time dimension for U.S. nutrition policy. He has research projects funded by USDA and the National Cancer Institute on neighborhood access to healthful foods and its influence on consumption in New Orleans and southeast Louisiana. Dr. Rose served on the National Research Council Panel to Review USDA's Food Security Measurement and the IOM Committee on Childhood Obesity Prevention Actions for Local Governments. Dr. Rose received his Ph.D. in agricultural economics and M.P.H. in public health nutrition from the University of California at Berkeley.

Lila Rutten, Ph.D., M.P.H., is a behavioral scientist with SAIC, Inc. National Cancer Institute (NCI) Frederick, Maryland, in support of NCI's Health Communication and Informatics Research Branch. Her current responsibilities include managing and coordinating the Health Information National Trends Survey (HINTS), involvement in the dissemination efforts of the Centers for Excellence in Cancer Communication Research (CECCR), and supporting branch and program activities related to the role of health communication in shaping cancer-relevant behavior. Dr. Rutten has served as an active member of NCI's team of scientists since 2001, when she joined NCI as a cancer prevention fellow. In addition to her work with NCI, Dr. Rutten currently serves as a methodological consultant to the Center for Human Nutrition and has served as an adjunct faculty member in the Department of Psychology at Augsburg College and in the Department of Behavioral Science at the College of Mount Saint Joseph. Dr. Rutten

received her Ph.D. in psychology from Miami University and her M.P.H. from Harvard University.

Marlene B. Schwartz, Ph.D., is deputy director of the Rudd Center for Food Policy and Obesity at Yale University. Prior to joining the Rudd Center, she served as co-director of the Yale Center for Eating and Weight Disorders from 1996 to 2006. Dr. Schwartz's research is focused on how home environments, communities, and school landscapes shape the eating attitudes and behaviors of children. She frequently collaborates on state projects with the Connecticut State Department of Education, including a large research study of Connecticut's K-12 School Wellness Policies and a statewide assessment of preschool nutrition and physical activity policies. Dr. Schwartz was the recipient of a transition grant from the Robert Wood Johnson Foundation in 2008 to create a website based on the school wellness policy coding system that she developed with national colleagues. Her other areas of research include studies on the effect of food marketing directed at children and how the WIC program changes the accessibility and affordability of healthful foods in low-income neighborhoods. Dr. Schwartz received her Ph.D. and M.S. in psychology from Yale University. She completed her clinical internship at the Yale Medical School and postdoctoral training in the Yale Department of Psychology.

Joseph R. Sharkey, Ph.D., M.P.H., R.D., is professor in the Department of Social and Behavioral Health and director of the Program for Research in Nutrition and Health Disparities, School of Rural Public Health (SRPH) at the Texas A&M Health Sciences Center in College Station, Texas. He is also director of the CDC-funded Texas Healthy Aging Research Network (TxHAN) Collaborating Center, director of the CDC-funded Texas Nutrition and Obesity Policy Research and Evaluation Network Collaborating Center, and director of the Program for Research in Nutrition and Health Disparities at SRPH. Dr. Sharkey is currently principal investigator on three interdisciplinary research programs examining complex, place-based factors that may either enable or constrain rural and underserved families from achieving and maintaining good nutritional health: (1) *Behavioral and Environmental Influence on Obesity: Rural Context & Race/Ethnicity*, which is a 5-year project funded as part of a new NIH National Center on Minority Health and Health Disparities-funded Program for Rural and Minority Health Disparities Research at SRPH; (2) Core Research Program, *Working with Rural and Underserved Communities to Promote a Healthy Food Environment*, within the SRPH Center for Community Health Development, a Prevention Research Center; and (3) *Influence of Mobile Food Vendors on Food and Beverage Choices of Low-Income Mexican American Children in Texas Colonias*, funded by the Robert Wood Johnson Healthy

Eating Research Program. He also serves as chair of the Senate Bill 343 Healthy Food Advisory Committee, Texas Health and Human Services Commission, and Texas Department of Agriculture. Dr. Sharkey's main areas of interest include food access and food choice in rural and underserved areas, measurement of household and neighborhood food environments, and nutritional and functional assessment. Dr. Sharkey received his Ph.D. and M.P.H. from the Department of Nutrition at the University of North Carolina at Chapel Hill.

Kathleen Pickering Sherman, Ph.D., J.D., is professor and chair of the Department of Anthropology at Colorado State University, where she has been on the faculty since 1997. Before starting graduate school, she worked as a legal services attorney on the Pine Ridge Indian Reservation in South Dakota, and she continues to conduct research there on household subsistence and community-based economic development. Her research interests include economic anthropology, traditional ecological knowledge, tribal community and economic development, collaborative ecosystem conservation and natural resource management, and the impacts of globalization on indigenous communities. Her current research focuses on integrative, culturally appropriate community-based development on three Lakota reservations in South Dakota. She is part of a 10-year poverty alleviation initiative funded by the Northwest Area Foundation through Cheyenne River Tribal Ventures. She works with a collaborative of reservation development practitioners to design a model for Native Entrepreneurship Development Systems, initially funded by the Kellogg Foundation. Her 7-year longitudinal study of household economic dynamics on the Pine Ridge Reservation, funded by the National Science Foundation, is providing baseline data for a wide variety of reservation development programs, including workforce development, small-business expansion, reservation regional planning, Lakota-based education models, and natural resource management. She has published a book entitled *Lakota Culture, World Economy* (University of Nebraska Press, 2000) and coauthored two books: *Welfare Reform in Persistent Rural Poverty* (Pennsylvania State University Press, 2006) and *Indigenous Peoples and the Collaborative Stewardship of Nature: Knowledge Binds and Institutional Conflicts* (Left Coast Press, Inc., 2010). Dr. Sherman received her Ph.D. from the University of Wisconsin at Madison, and her J.D. from New York University School of Law.

Gopal K. Singh, Ph.D., M.S., M.Sc., is senior epidemiologist with the Maternal and Child Health Bureau, Health Resources and Services Administration, U.S. Department of Health and Human Services in Rockville, Maryland. His research interests include social inequalities in health and mortality, child health disparities by ethnicity and socioeconomic depriva-

tion, obesity and physical activity, immigrant health, and spatial and time trends in cancer incidence and mortality. He has held research appointments at the National Cancer Institute, Kansas Health Institute, and National Center for Health Statistics. He has taught at the University of Kansas Medical Center and the Ohio State University and has served as a statistical consultant to the U.S. Agency for International Development and the Government of Egypt. He has published extensively in the field of health inequalities, immigrant health, obesity and physical activity, minority health, cancer epidemiology, and maternal and child health. He is the recipient of the 2010 National Maternal and Child Health Epidemiology Award for Advancing Knowledge. Dr. Singh holds a Ph.D. in sociology/demography from the Ohio State University; an M.S. in population planning from the University of Michigan; a post-master's diploma in population studies from the International Institute for Population Sciences, Bombay; and an M.Sc. degree in statistics from India.

Thomas F. Slater is executive director of the Food Bank of Central New York and has held that position since 1995. The Food Bank of Central New York is recognized by Feeding America for its focus on nutrition and its outstanding food stamp outreach program. Mr. Slater is a founder and currently serves on the Board of Directors for the Food Bank Association of New York State. He also serves on the National Council for Feeding America as the elected representative of the Eastern Region food banks.

Chery F. Smith, Ph.D., M.P.H., R.D., is associate professor in the Department of Food Science and Nutrition at the University of Minnesota. Her research focuses on how environment, age, socioeconomic status, culture, and food insecurity influence the nutritional status, dietary behavior, and health of selected populations (Native Americans, Hmong, African Americans, homeless individuals, veterans, and Sherpas). She is also particularly interested in the hunger-obesity relationship in the United States, food access by Minnesotans living in food deserts (places with limited food resources), and the anthropology of foods. She received her Ph.D. in anthropology from the Indiana University and her M.P.H. in nutrition from the University of Michigan.

Marion Standish, J.D., M.A., is director of The California Endowment's Community Health Program. As director, she leads the foundation's efforts to develop program and policy initiatives to improve community health and reduce health disparities. She has served as lead officer on many of The Endowment's major funding initiatives, some of which have supported community coalitions to develop and implement policies and programs to reduce obesity. Ms. Standish serves as the convener for the National Con-

vergence Partnership, which brings funders together to pursue multisectoral policy and program efforts that support healthy people in healthy places. Previously, Ms. Standish served as senior program officer for The California Endowment. Prior to joining The Endowment, she was co-founder and director of California Food Policy Advocates, a statewide nutrition and health research and advocacy organization focusing on access to nutritious food for low-income families. Before launching CFPA, Ms. Standish served as director of the California Rural Legal Assistance Foundation, a statewide advocacy organization focusing on health, education, and labor issues facing farm workers and the rural poor. Ms. Standish received a J.D. from the University of San Francisco School of Law and an M.A. from New York University.

Valerie Tarasuk, Ph.D., is professor in the Department of Nutritional Sciences at the University of Toronto. Much of her research focuses on problems of domestic food insecurity, considering their origins and nutritional implications and examining current policy and program responses. Paralleling this focus on food security is an ongoing interest in Canadian food policy and population-level nutritional assessment. Her research activities have included a study of nutritional vulnerability among homeless youth in Toronto; an examination of local responses to the food and nutrition needs of homeless groups; a study of the relationship between housing, neighborhood characteristics, and food access among a sample of 500 low-income families in Toronto; and an analysis of national survey data to examine nutrition disparities in Canada. Currently she is engaged in a pan-Canadian study of food charity and an examination of nutrition-related food marketing in Canadian supermarkets. Dr. Tarasuk served on the IOM Subcommittee on Interpretation and Use of Dietary Reference Intakes and its Committee on Use of Dietary Reference Intakes in Nutrition Labeling. She was also a member of the External Advisory Panel for the Food Directorate Review of Policies on the Addition of Vitamins and Minerals to Foods in Canada and Health Canada's Expert Advisory Committee on Dietary Reference Intakes. Dr. Tarasuk earned her Ph.D. in nutritional sciences from the University of Toronto.

Laurian J. Unnevehr, Ph.D., M.A., is director of the Food Economics Division in the Economic Research Service of USDA. She manages a division of more than 50 professional economists who conduct research on food demand, food assistance, diet and health, food safety, and food markets; and she administers ERS investments in consumer data and in extramural research on food assistance programs. Prior to joining ERS in 2008, Dr. Unnevehr was on the faculty of the Department of Agricultural and Consumer Economics at the University of Illinois at Urbana-Champaign from

1985 to 2008. Dr. Unnevehr is recognized for original contributions in food demand and food policy evaluation. In 2009, she was made a fellow of the Agricultural and Applied Economics Association. Dr. Unnevehr received a Ph.D. and M.A. from the Food Research Institute, Stanford University.

James Weill, J.D., has been president of the Food Research and Action Center (FRAC) since February 1998. FRAC is a leading anti-hunger public policy group in America, using research, policy advocacy, coalition building, and public education to combat hunger and improve nutrition for low-income people. He has devoted his entire professional career to reducing hunger and poverty, protecting the legal rights of children and poor people, and expanding economic security, income, and nutrition support programs and health insurance coverage. Prior to joining FRAC, he was at the Children's Defense Fund (CDF) as program director and general counsel, leading CDF's efforts to expand the Earned Income Tax Credit, Medicaid, and other programs. Mr. Weill is a member of the boards of Office of Management and Budget (OMB) Watch and the National Center for Youth Law. He serves on advisory councils to the National League of Cities Institute for Youth, Education, and Families and to Wider Opportunities for Women. He has served as a member of the U.S. delegation to the UNICEF Executive Board. He received his J.D. from New York University.

D

Workshop Participants

Jan Adams
U.S. Department of Agriculture (USDA)
Alexandria, VA

Katherine Alaimo
Michigan State University
East Lansing, MI

Elle Alexander
PepsiCo
Purchase, NY

Rajen Anand
USDA Center for Nutrition Policy and Promotion (CNPP)
Alexandria, VA

Margaret Andrews
USDA/Economic Research Service (ERS)
Washington, DC

Michelle Berger Marshall
Feeding America
Chicago, IL

Maureen Black
University of Maryland
Baltimore, MD

Heidi Michels Blanck
Centers for Disease Control and Prevention (CDC)
Atlanta, GA

Susan Blumenthal
Center for the Study of the Presidency and Congress (CSPC)
Washington, DC

Ed Bolen
Center on Budget and Policy Priorities
Washington, DC

Susan Borra
Edelman
Washington, DC

Paula Braveman
University of California at San Francisco
San Francisco, CA

Elizabeth Campbell
Washington, DC

Steven Carlson
USDA Food and Nutrition Service (FNS)
Alexandria, VA

Mariana Chilton
Drexel University School of Public Health
Philadelphia, PA

Helen Chipman
National Institute of Food and Agriculture (NIFA)
Washington, DC

Alisha Coleman-Jensen
USDA/ERS
Washington, DC

Irene Coletsos
Tufts School of Medicine/St. Elizabeth's Medical Center
Boston, MA

Uriyoan Colon-Ramos
George Washington University
Washington, DC

John Cook
Boston University School of Medicine
Boston, MA

Edward Cooney
Congressional Hunger Center
Washington, DC

Patricia B. Crawford
University of California at Berkeley
Berkeley, CA

Laura Dean
CSPC
Washington, DC

Elizabeth Dowler
University of Warwick
Oxford, UK

Maria Drago-Ferguson
University California at Berkeley
Berkeley, CA

Adam Drewnowski
University of Washington
Seattle, WA

Christa Essig
CDC
Atlanta, GA

Nan Feyler
Philadelphia Department of Public Health
Philadelphia, PA

Jeff Finn
Chandler Chicco Companies
Washington, DC

Rachel Fisher
National Institutes of Health (NIH) Division of Nutrition Research Coordination (DNRC)
Bethesda, MD

Chris Fox
Campaign to End Obesity
Washington, DC

Elizabeth Frazao
USDA/ERS
Washington, DC

Edward Frongillo
University of South Carolina
Columbia, SC

Larry Goolsby
American Public Human Services Association
Washington, DC

Mary Gorski
Pew Charitable Trusts
Washington, DC

Craig Gundersen
University of Illinois
Champaign, IL

Karla Hanson
Cornell University
Ithaca, NY

Kenneth Hecht
California Food Policy Advocates
Berkeley, CA

Colleen Heflin
University of Missouri
Columbia, SC

Amy Hillier
University of Pennsylvania
Philadelphia, PA

Geraldine Henchy
Food Research and Action Center
Washington, DC

Beth Higa
Office of Management and Budget (OMB)
Washington, DC

Jay Hirschman
USDA/FNS/Office of Research and Analysis (ORA)
Alexandria, VA

Sandra Hofferth
University of Maryland
College Park, MD

David Holben
Ohio University
Athens, OH

Cindy Hormel
USDA/FNS
Alexandria, VA

Deirdre Horvath
CSPC
Washington, DC

Brigitte Hurtubise
CSPC
Washington, DC

Kristen Hyatt
OMB
Washington, DC

Margaret Ingraham
Meals on Wheels Association of America
Alexandria, VA

Wendy Johnson-Askew
NIH/DNRC
Bethesda, MD

Sonya Jones
University of South Carolina
Columbia, SC

Chin Jou
NIH
Bethesda, MD

Usha Kalro
USDA/FNS
Alexandria, VA

Allison Karpyn
The Food Trust
Philadelphia, PA

Brendan Kelly
Administration for Children and Families
Washington, DC

Kelly Kinnison
USDA/FNS
Alexandria, VA

Sharon Kirkpatrick
National Cancer Institute (NCI)
Bethesda, MD

John A. Kirlin
USDA/ERS
Washington, DC

Bhagya Kolli
East Side Health District
East St. Louis, IL

Barbara Laraia
University of California at San Francisco
San Francisco, CA

Cindy Leung
Harvard School of Public Health
Boston, MA

Barbara Lohse
Pennsylvania State University
State College, PA

Elizabeth March
Children's HealthWatch
Boston, MA

Joshua Marcin
Administration for Children and Families
Washington, DC

Maria Melchior
National Institute for Health and Medical Research
Villejuif, France

Aleta Meyer
Administration for Children and Families
Washington, DC

Ruth Morgan
Altarum Institute
Washington, DC

Pamela Morris
New York University
New York, NY

Jennifer Noll Folliard
The MayaTech Corporation
Silver Spring, MD

Mark Nord
USDA/ERS
Washington, DC

Julie Obbagy
USDA/CNPP
Alexandria, VA

Angela Odoms-Young
University of Illinois at Chicago
Chicago, IL

April Oh
NIH/NCI
Rockville, MD

Carol Olander
USDA/FNS
Alexandria, VA

Christine Olson
Cornell University
Ithaca, NY

Sara Olson
USDA/FNS
Alexandria, VA

Lynne Oudekerk
New York State Department of Health
Albany, NY

Rafael Pérez-Escamilla
Yale School of Public Health
New Haven, CT

Janet Poppendieck
Hunter College
New York, NY

Donna Porter
Library of Congress
Washington, DC

Katie Porter
The University of Georgia
Athens, GA

Sarah Price-Fetchet
PepsiCo Foundation
New York, NY

Sara Quandt
Wake Forest University
Winston-Salem, NC

Kori Reed
ConAgra Foods
Omaha, NE

Jill Reedy
NCI
Rockville, MD

Rose Ann M. Renteria
AED Center for Health Communication
Washington, DC

Adele Robinson
National Association for the Education of Young Children
Washington, DC

Donald Diego Rose
Tulane University
New Orleans, LA

Lila Rutten
NIH/NCI
Frederick, MD

Sarah Samuels
Samuels & Associates
Oakland, CA

Marlene Schwartz
Yale University
New Haven, CT

Laura Seman
Share Our Strength
Washington, DC

Ryan Shadrick Wilson
Hogan Lovells
Washington, DC

Joseph Sharkey
Texas A&M University
College Station, TX

Kathleen Pickering Sherman
Colorado State University
Fort Collins, CO

Sameer Siddiqi
NIH
Bethesda, MD

Anita Singh
USDA/FNS
Alexandria, VA

Gopal Singh
Department of Health and Human Services (HHS)
Rockville, MD

Thomas Slater
Food Bank of Central New York
Syracuse, NY

David Smallwood
USDA/ERS
Washington, DC

Chery Smith
University of Minnesota
St. Paul, MN

Maggie Sommers
Edelman
Washington, DC

Marion Standish
The California Endowment
Oakland, CA

Nicolas Stettler
Children's Hospital of Philadelphia
Philadelphia, PA

Mary Story
University of Minnesota School of Public Health
Minneapolis, MN

Valerie Tarasuk
University of Toronto
Toronto, ON

Debra Thingstad Boe
Dakota County Public Health
Apple Valley, MN

Olivia Thompson
GA

Celeste Torio
Robert Wood Johnson Foundation
Princeton, NJ

Sophia Turrell
CSPC
Washington, DC

Laurian Unnevehr
USDA/ERS
Washington, DC

Shelly Ver Ploeg
USDA/ERS
Washington, DC

Richetta Webb
District of Columbia Department of Health
Washington, DC

Jennifer Weber
Nemours
Washington, DC

James Weill
Food Research and Action Center
Washington, DC

Donna West
Marin Health and Human Services
San Rafael, CA

Judy Wilson
USDA/FNS
Alexandria, VA

Jackie Windfeldt
USDA/FNS
Alexandria, VA

Hong Xue
Johns Hopkins University
Baltimore, MD

Sarah Zapolsky
USDA/FNS
Alexandria, VA

E

Acronyms

ATUS	American Time-Use Survey
BMI	body mass index
BRFSS	Behavioral Risk Factor Surveillance System
CACFP	Child and Adult Care Food Program
CCHS	Canadian Community Health Survey
CDC	Centers for Disease Control and Prevention
CFSM	Core Food Security Module
CHIS	California Health Interview Survey
CPS-FSS	Current Population Survey Food Security Supplement
DSM-IV	Diagnostic and Statistical Manual Disorders, Fourth Edition
DXA	Dual x-ray absorptiometry
ECLS	Early Childhood Longitudinal Study Kindergarten Cohort (ECLS-K) Birth Cohort (ECLS-B)
EFP	Emergency Food Program
E-Risk	Environmental Risk
ERS	Economic Research Service (USDA)
FDPIR	Food Distribution Program on Indian Reservations
FNS	Food and Nutrition Service (USDA)

FoodAPS	National Food Acquisition and Purchase Survey
FRAC	Food Research and Action Center
FSS	Food Security Supplement (CPS)
GEM	Grid-Enabled Measures Database
GIS	geographic information system
GPS	global positioning system
HPA	hypothalamus-pituitary-adrenal
IOM	Institute of Medicine
NCCOR	National Collaborative on Childhood Obesity Research
NCHS	National Center for Health Statistics
NEMS	Nutritional Environment Measures Survey
NHANES	National Health and Nutrition Examination Survey
NHIS	National Health Interview Survey
NIH	National Institutes of Health
NRC	National Research Council
NSCH	National Survey of Child Health
NSLP	National School Lunch Program
SBP	School Breakfast Program
SES	socioeconomic status
SNAP	Supplemental Nutrition Assistance Program
SNAP Ed	Supplemental Nutrition Assistance Program for Education
TANF	Temporary Assistance for Needy Families
USDA	U.S. Department of Agriculture
WIC	Special Supplemental Nutrition Program for Women, Infants, and Children

F

Roundtable Discussions

On the afternoon of the workshop's first day, the participants divided into groups to discuss six key questions.

1. What intervention strategies seem most promising to reduce food insecurity and obesity? What are the key target populations and why?
2. How can we better elucidate the mechanisms underpinning the relationship between food insecurity and obesity?
3. What are current knowledge research- and policy-related gaps in obesity and food security research, and why?
4. What are key questions for setting research priorities that would further the understanding of the relationship between food insecurity and obesity and help identify approaches that would reduce both food insecurity and obesity?
5. What are the methodological limitations associated with current research focused on the relationship between obesity and food insecurity?
6. How can these limitations be overcome with new data, new designs, alternative analyses, or different research approaches?

The following answers to these questions have been compiled from notes generated by the breakout groups and their reports at a subsequent plenary session.

1. **What intervention strategies seem most promising to reduce food insecurity and obesity? What are the key target populations and why?**

    - In the reauthorization of the Farm Bill, deemphasize corn, soy, and wheat and emphasize fruits and vegetables.
    - Reform nutrition education to have a more hands-on approach, as in home economics classes.
    - Reconsider inconsistent U.S. Department of Agriculture (USDA) policy (for example, USDA recommends limiting fats but also helped Dominos to reformulate pizza with twice as much cheese).
    - Create a more healthful school foods environment (for example, by removing vending machines and providing more healthful foods at parties).
    - Monitor the proximity of food vendors and the quality of food available near schools.
    - Promote and support farmers' markets.
    - Reduce marketing to children.
    - Focus interventions on specific subpopulations, including minority women, groups with the lowest incomes, rural populations, and areas of concentrated urban poverty.
    - Tailor approaches to the specific geographic, cultural, and economic context.
    - Provide point-of-contact interventions—a "one stop shop" for all programs.
    - Conduct more public education on assistance programs and benefits, and address stigma and fears.
    - Partner with rather than "target" populations.
    - Identify and address food deserts and/or unhealthful food swamps, and increase access to healthful foods.
    - Include the food industry in interventions.
    - Reduce poverty through income transfers (such as the Supplemental Nutrition Assistance Program [SNAP]), community-based prevention funds, and other measures.
    - Take a comprehensive community-based approach that includes more than food in the solution.

2. **How can we better elucidate the mechanisms underpinning the relationship between food insecurity and obesity?**

    - Study the mechanisms that influence food choice, such as taste, cost, convenience, how filling a food is, and how people socialize over certain foods.
    - Ascertain why people make obesogenic food choices.

- Develop understanding of what makes poor people susceptible to food insecurity and obesity.
- Conduct research on the episodic nature of food insecurity to identify the long-term link to obesity and health.
- Investigate the role of temporality in nutrition and obesity.
- Broaden the research lens through such methods as longitudinal studies, the use of mixed methods, and interdisciplinary research.
- Examine social capital to determine if food-related variables are being overlooked.
- Examine the influence of family roles and kinship networks on eating, food security, physical activity, and obesity.
- Study cultural factors (for example, food sharing).
- Broaden the study of obesity to all of society.

3. What are current knowledge-, research-, and policy-related gaps in obesity and food security research, and why?

- How can food assistance programs help provide a healthful diet? (For example, is there a link between obesity and intake of micronutrients?)
- What is the impact of food insecurity on dietary quality, and is this impact changing over time and within specific populations?
- Where do food-insecure populations access food, and what are the implications of this access for dietary quality and health?
- How do stress and other psychosocial factors affect food insecurity and obesity?
- What are the biological effects of such factors as feast versus famine and variations in the food supply?
- What are the pathways through which poverty and deprivation lead to food insecurity, obesity, and poor health outcomes from a chronic disease and life course perspective?
- What are the implications of interventions to address food insecurity in such areas as household perceptions of food insecurity and the use of additional resources?
- What coping strategies do individuals and households use in response to food insecurity?
- What are the implications for women who protect their children from food insecurity?
- What role should emergency food assistance play—for example, what types of food should be distributed?
- What are the characteristics and effects of food purchased with SNAP dollars?
- How can measures of both obesity and food insecurity be standardized?

- How can populations of need be identified to enable access to benefits?
- What role does stigma play in food-insecure and obese populations?

4. **What are key questions for setting research priorities that would further the understanding of the relationship between food insecurity and obesity and help identify approaches that would reduce both food insecurity and obesity?**

   - What should the role of private organizations be, and what types of foods should they provide?
   - What is the quality of people's diets, and where do these foods come from?
   - Where and how do people access food?
   - How can causal relations between food insecurity and obesity be identified and studied?
   - How do poverty and deprivation lead to chronic disease?
   - How can policies, such as restrictions on SNAP benefits or menu labeling, be studied and then implemented if shown to be effective?
   - How can the existing infrastructure and resources be leveraged to reduce food insecurity? (Examples include increasing SNAP benefits, conducting SNAP outreach, and increasing participation in an evidence-based context that recognizes such factors as dietary quality.)

5. **What are the methodological limitations associated with current research focused on the relationship between obesity and food insecurity?**

   - Most data do not include retrospective information, but experiences with food insecurity and obesity typically go back to early childhood.
   - Research needs to be conducted to validate retrospective measures.
   - New questions and data need to be inserted into existing surveys and datasets, such as the Early Childhood Longitudinal Study (ECLS), Head Start, and PACE.
   - All relevant factors need to be considered, including nontraditional items such as perceptions of the food environment.
   - New techniques such as area measures and maps should be used.
   - Food insecurity should be reframed from a life course perspective. Does it affect the poorest of the poor? What is the role of the food environment? Is understanding sentinel groups more important than understanding obesity?

- Can children be used as a sentinel population, and if so how?
- Are the right groups being studied? Do possible groups to study include people in transition, the homeless, or illegal immigrants?
- Use mixed methods.
- Conduct more targeted sampling for surveillance.
- Study how people who are food insecure, but not overweight, have managed to avoid gaining weight.
- Add measures of food insecurity, stress, depression, and how people use their time to studies that measure body composition using dual x-ray absorptiometry (DXA). These studies should be comprehensive but not overly burdensome with respect to collecting data.
- Examine the very early origins of the relationship between food insecurity and obesity.
- Improved measures are needed of overweight, food insecurity, dietary quality, and physical activity.
- Publication bias against negative results needs to be overcome.
- How can lifelong relationships with food insecurity and obesity be studied using cross-sectional studies?
- Data on contextual factors for subpopulations or sentinel populations are needed yet are not currently collected by national surveys.
- Food insecurity may change in a short time, but body mass index (BMI) may take time to change, even with a change in food security.
- The persistence of food insecurity for some households and individuals and the cyclicity of food insecurity for others need to be studied.
- What is a typical episode of food insecurity?
- What other common factors or pathways besides poverty exist between food insecurity and obesity?

6. How can these limitations be overcome with new data, new designs, alternative analyses, or different research approaches?

- Add new or existing questions to more surveys.
- Overlap time sets for risk measures, physical activity, and sedentary activity.
- Use better measurements of obesity (e.g., DXA), stress (e.g., cortisol in hair), and depression.
- Study short-term and long-term persistence of food insecurity.
- Expand sampling to underrepresented groups such as the homeless and illegal immigrants.

- Study how acute or chronic food insecurity relates to obesity.
- Conduct longitudinal studies that explore the relationship between food insecurity and obesity among children and adults.
- Use mixed methods to identify, for example, the contextual factors beyond those provided in quantitative studies.
- Study how the experience and interpretation of food insecurity and obesity differ among groups, households, and individuals.
- Study how parents or caregivers perceive food insecurity and obesity among their children.
- Study aspects of physical activity such as variations by social class, the presence of physical activity deserts, the influence of the built environment, and correlations with poverty.
- Consider factors such as stress, depression, and mental health as mediating factors or pathways to both food insecurity and obesity.
- Examine how nutrition assistance programs (such as SNAP) could provide incentives for families and households to purchase healthful foods.

G

Public Comments

The Institute of Medicine (IOM) invited public comments between October 14, 2010, and December 31, 2010, on Understanding the Relationship Between Food Insecurity and Obesity. Comments were submitted via the IOM website. The URL was shown during the workshop and sent via e-mail to workshop participants including speakers and to a list of experts working on food insecurity and/or obesity identified by the Planning Committee and the U.S. Department of Agriculture (USDA) Food and Nutrition Service. Three comments were received. The comments have been copy edited. The complete set of unedited comments was forwarded to the USDA Food and Nutrition Service for its consideration.

COMMENTER A

Maria Melchior
Inserm, Villejuif, Paris
Suggestions for future research:

- There is need for evidence on long-term effects of food insecurity, ideally from birth cohort studies that follow individuals from childhood to adulthood.
- Research should be conducted not only in low-income samples, but also in the general population, to gain a better understanding of factors that shape the risk of becoming food insecure.
- Observational studies on the relationship between food insecurity and obesity should account for important factors that could play a

confounding role (income, socioeconomic position, race, psychological characteristics).
- Greater use should be made of non-observational designs, which could help assess the causal nature of the association between food insecurity and obesity (quasi-experimental designs, natural experiments, reanalysis of randomized controlled trials that assess the effects of food supplementation).
- Additional longitudinal research should examine the mechanisms through which food insecurity is associated with poor health—critical periods (which are the key developmental periods?), cumulative disadvantage, chains of risk.
- Interventions and policies that aim to decrease hunger and food insecurity should be evaluated over the long-term, to test whether they contribute to improvements in health and decreases in health inequalities.

COMMENTER B

Elle Alexander
Johns Hopkins Bloomberg School of Public Health and
Global Health Policy Intern, PepsiCo

As a Johns Hopkins Bloomberg School of Public Health student and PepsiCo Global Health Policy intern in attendance at the Institute of Medicine Workshop on Food Insecurity and Obesity, I appreciated the presentations describing the current state of the research and the suggested solutions for food insecurity and obesity, but noticed the lack of discussion of several important factors. While several discussions focused on the negative contributions of food and beverage companies to overweight and obesity in low-income populations, conversation excluded the role of food companies as part of the solution. PepsiCo is taking important steps that should be noted:

- Removing full-sugar sodas from primary and secondary schools by 2012 and encouraging schools to supply only products that meet nutrition guidelines set by the Alliance for a Healthier Generation;
- Lowering sugar, salt, and fat in PepsiCo portfolio of products: sodium will be reduced 25 percent by 2015 in key global food brands; saturated fat will be reduced 15 percent by 2020 in key global food brands; and sugar will be reduced 25 percent by 2020 in key global beverage brands; and
- Expanding the nutrition portfolio—including Quaker Oats, Tropicana, and Gatorade—from $10 billion to $30 billion in 2020, supported by the new Global Nutrition Group.

Further, an important issue overlooked by the panelists is the influence of federal farm subsidies on the price of foods. The low price of corn contributes to its common use as an ingredient in foods and beverages, while items that receive fewer federal subsidies, such as fruit and vegetables, are more expensive for both consumers and food companies, and therefore less commonly used in products. All actors, including food companies, must be involved as part of the solution to food insecurity and obesity, and better dialogue is needed between food companies, academia, and the public health community. PepsiCo is interested in partnering with these communities to improve the health of the population together.

COMMENTER C

Elizabeth Metallinos-Katsaras
Simmons College, Boston, Massachusetts
Comments on the association between food insecurity and obesity

The association between food insecurity and childhood overweight and obesity is a complex one that, as noted by the conference participants, requires more studies using a longitudinal design. On day 1 of this meeting, Craig Gundersen reviewed the evidence linking food insecurity and obesity in children, and he declared that there was no association. However, it should be noted that the evidence thus far is not conclusive one way or the other because the research is flawed; this was noted by many of the conference presenters. Specifically, most of the research on children, even in the reference cited by Gundersen in his conclusion, was based on studies that were cross-sectional in nature and did not specifically study low-income populations (Larson and Story, 2010). In fact, only four studies cited in this review were longitudinal in design (Jyoti et al., 2005; Rose and Bodor, 2006; Bhargava et al., 2007; Bronte-Tinkew et al., 2007). Two out of the four of these better-designed studies found either a direct or an indirect association between food insecurity and child weight gain or status (Jyoti et al., 2005; Bronte-Tinkew et al., 2007). Moreover, one study that was omitted from this review (Dubois et al., 2006), likely because of the fact that it examined food insufficiency instead of food insecurity, also had positive findings; that study (Dubois et al., 2006) also found that food insufficiency was associated with high weight status in children. This means that out of the five longitudinal studies in children, three found a direct (Jyoti et al., 2005; Dubois et al., 2006) or indirect association between (Bronte-Tinkew et al., 2007) food insecurity or insufficiency and either high weight gain or overweight and obesity in children.

A major limitation of even the large longitudinal studies is that samples were drawn from the general population rather than the low-income populations (where in fact food insecurity is a relevant and prevalent issue),

thus reducing the ability to detect associations between food insecurity and health outcomes given the low incidence of food insecurity among populations at higher income levels. In addition, most of these samples were not diverse enough to examine these associations within the racial/ethnic groups that experience food insecurity most acutely and chronically. The important point that I would like to make is that until we conduct well-designed studies (i.e., longitudinal studies with large samples of low-income children), we cannot derive any conclusions about the association between food insecurity and obesity in children. We need better-designed studies that examine longitudinally how food security status and changes affect birth outcome and early growth as well as the later risk of obesity; currently there is a paucity of such studies.

REFERENCES

Bhargava, A., D. Jolliffe, and L. L. Howard. 2008. Socio-economic, behavioural and environmental factors predicted body weights and household food insecurity scores in the Early Childhood Longitudinal Study-Kindergarten. *British Journal of Nutrition* 100(2):438-444.

Bronte-Tinkew, J., M. Zaslow, R. Capps, and A. Horowitz. 2007 *Food insecurity and overweight among infants and toddlers: New insights into a troubling linkage.* Child Trends Research Brief. Washington, DC: Child Trends.

Dubois, L., A. Farmer, M. Girard, and M. Porcherie. 2006. Family food insufficiency is related to overweight among preschoolers. *Social Science and Medicine* 63(6):1503-1516.

Jyoti, D. F., E. A. Frongillo, and S. J. Jones. 2005. Food insecurity affects school children's academic performance, weight gain, and social skills. *Journal of Nutrition* 135(12): 2831-2839.

Larson, N., and M. Story. 2010. *Food insecurity and risk for obesity among children and families: Is there a relationship? A research synthesis.* Princeton, NJ, and Minneapolis, MN: Robert Wood Johnson Foundation Healthy Eating Research.

Rose, D., and J. N. Bodor. 2006. Household food insecurity and overweight status in young school children: Results from the Early Childhood Longitudinal Study. *Pediatrics* 117(2): 464-473.

H

Brief List of Recurring Workshop Discussions[1]

The presenters at the workshop put forth a wide variety of research considerations to help further our understanding of the relationship between food insecurity and obesity. Participants also had the opportunity to comment on the research considerations and present new ideas. Recurring themes are compiled and condensed below as a guide to the wide range of issues discussed at the workshop. The themes are organized by topics that arose during the workshop, which differ from the session titles. The overview provides general themes and is followed by recurring research topics, measures, and methods to improve our understanding of the relationship between food insecurity and obesity. The following list does not reflect priorities or group consensus.

OVERVIEW

Food insecurity negatively impacts health and well-being in adults and children—beyond any potential association with obesity. The importance of continuing to facilitate improvements in food insecurity status among individuals, households, and communities was underscored by participants throughout the workshop.

[1] The list, prepared by the rapporteurs and based on the workshop discussions, reflects suggestions made by presenters, discussants, panelists and other workshop participants in relation to the workshop's focus. It was prepared for the convenience of the reader. It should not be construed as representing recommendations or consensus statements, nor is it reflective of all topics or the entire breadth of the discussions.

Understanding the potential pathways by which food insecurity and obesity may be associated can help inform intervention strategies. Researchers may consider analysis, framework, and understanding of the relationship between food insecurity and obesity given that a high percentage of the population is overweight or obese.

Bringing together varied academic disciplines such as public health, nutrition, psychology, sociology, and economics, and encouraging research collaborations across organizations can make valuable contributions including expanding methodologies and frameworks used to examine the relationship.

RESEARCH TOPICS

A Life Course Perspective

- Impacts of food insecurity during critical periods of development such as fetal development and child growth and development, including examining the association and mechanisms of deprivation in childhood and obesity later in life.
- Whether specific factors are more or less influential on the relationship during different points in infancy and childhood.
- Other critical periods of development.
- The relationship in aging/older adults.

Environmental Factors

- Access to healthful foods including the impact of supermarket access, transportation access, and various sources of foods.
- Food marketing, including the impact on diet quality.
- Foods served and consumed in schools and childcare programs, including strategies to design and implement higher nutritional standards and other strategies to improve the quality of foods.
- Competitive foods, including the impact on healthful choices and participation in free or reduced-price school meals.

Institutional Factors

- Taxation of less healthful foods.
- Broader social policies such as agricultural subsidies.
- Food assistance programs, including the impact of Supplemental Nutrition Assistance Program benefit distribution on behaviors and benefit modifications to improve choices, free or reduced-priced school meals, and summer meals programs.

Mediators, Moderators, and Effect Modifiers

- A multitude of factors potentially influence the relationship between food insecurity and obesity. The importance of identifying additional factors beyond the ones listed below was also noted.
- Stress was mentioned in nearly every session—including both physiological and psychological stress; being food insecure and/or living in a low-resource environment may be stressful and conversely, stress may impact food insecurity status.
- Other potential factors recurring throughout the workshop included poverty, diet quality, maternal/caregiver mental health, infant feeding and parenting behaviors, gender, age, violence, social support, and physical activity.

RESEARCH MEASURES

Food Insecurity

- Variance of food insecurity measures across individuals within a household.
- Does the current food insecurity measure capture the experience of children?
- Impact of depression on the assessment of food insecurity.
- The concept of food-insecure neighborhoods or environments.
- The episodic nature of food insecurity, including the frequency and duration of food insecurity, the determinants of food insecurity episodes, and how periodic food insecurity influences behaviors.
- Differences between those with persistent and those with periodic food insecurity.
- Examination of food security at the individual, household, and community level.

Obesity

- Challenges of measuring obesity in children less than 2 years of age.
- Incorporation of alternative measures of assessing body fat, such as DXA, into studies, noting that it may not be practical in some studies.
- The relationship of the multiple factors related to obesity among food secure individuals.

Socioeconomic Disparities

- Improved measures of socioeconomic status.
- The impact of race and ethnicity on health outcomes.
- Variance of social, economic, and geographic factors on food insecurity and obesity.

RESEARCH METHODS

Data Collection

- Expand and combine data collection methods.
- Consider geographic information system and other electronic mapping techniques to track food insecurity, obesity, and other potentially related factors such as poverty and food access.
- Pair electronic mapping with on-the-ground research.
- Consider qualitative methods such as ethnographic studies and photovoice.
- Incorporate qualitative methods into ongoing quantitative research.
- Engage community members in data collection and interpretation.

Research Types

- Communications research including identifying improved ways of framing and disseminating results of food insecurity and obesity research; creating and disseminating messages to motivate different populations, including (but not limited to) those served by SNAP, to make healthful food choices.
- Evaluation research including evaluating approaches to encourage behavior change in purchasing and consuming healthful foods.

Research Designs

- Prospective and retrospective studies to better understand topics such as how food insecurity early in life shapes longer-term eating behaviors, intergenerational impacts, and acculturation, and to identify mediators and moderators and examine changes in or the persistence of food insecurity.
- Intervention studies or experimental studies to examine causality and to better understand program effectiveness.

Data Analysis

- Link data from different sources to enable analysis of key variables together.
- Assess interactions to identify effect modifiers.
- Use advanced statistical analysis such as structural equation modeling.