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Abstract

The Second Food Security Measurement and Research Conference (February 23-24, 1999) was co-sponsored by the U.S. Department of Agriculture's Food and Nutrition Service and Economic Research Service and the U.S. Department of Health and Human Services' National Center for Health Statistics. The conference was the second in a series and was attended by researchers from government, academia, and the private sector. The conference was part of an ongoing program of Federal food security research, the goal of which has been to establish a stable measurement strategy to assess annually the food security status of the U.S. population. This report is volume I of a two-volume set and contains abbreviated proceedings of all presentations and remarks by discussants at all sessions from the conference. The companion publication, *Second Food Security Measurement and Research Conference, Volume II: Papers* (February 2001, Stock # ERS-FANRR-11-2) contains a set of research papers that conference participants prepared to provide further detail on the content and findings of some research presented at the conference.

Keywords: Food security, hunger, food assistance, nutrition monitoring.

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Overview

The Second Food Security Measurement and Research Conference was held February 23-24, 1999, in Alexandria, VA. The conference was co-sponsored by three Federal agencies that were key players in the development of a national food security measure for monitoring the prevalence of hunger and food insecurity in the United States. These agencies are the U.S. Department of Agriculture's (USDA) Food and Nutrition Service (FNS) and Economic Research Service (ERS), and the U.S. Department of Health and Human Services's (HHS) National Center for Health Statistics (NCHS).

The conference was the second in a series and part of an ongoing program of Federal food security research. The goal of this research conducted in collaboration with academic and private-sector researchers was to establish a stable measurement strategy to annually assess the food security status on the U.S. population. Since 1995, USDA has sponsored an annual Food Security Supplement to the U.S. Bureau of the Census' Current Population Survey (CPS). These data have been used to produce annual estimates of U.S. food security and hunger for 1995-99 and State-level estimates for 1996-98.

The first Food Security Measurement and Research Conference, held in January 1994, brought together experts from government, universities, research institutes, and nonprofit groups interested in food security measurement. The aims of that conference were to synthesize the direction of earlier research, to develop consensus on the contents of a survey instrument for the CPS Food Security Supplement, and set up a structure for continuing research collaboration.

A similar format was adopted for the Second Food Security Measurement and Research Conference. However, given the earlier successes in collecting national population data and developing a standardized measure, this second conference more tightly focused on developing priorities for a future research agenda. Efforts were made to ensure a wide range of perspectives and to solicit critical review of the standard measure and prior research. Planning for the conference and follow-up activities were coordinated by the Federal Interagency Working Group on Food Security Measurement made up of staff from the three sponsoring agencies as well as representatives from the Center for Nutrition Policy and Promotion and USDA's Agricultural Research Service.[1]

The agenda of the conference was structured to provide a mix of panel presentations and more formal research papers. The conference was opened with a set of welcoming remarks from USDA's Eileen Kennedy, Deputy Under Secretary for Research, Education, and Economics, and Julie Paradis, Deputy Under Secretary for Food, Nutrition, and Consumer Services; and HHS's Linda Meyers, Director, Office of Disease Prevention and Health Promotion.

In session I of the conference, three panelists provided background on various aspects of Federal food security research and monitoring activities. Steven Carlson outlined the concept of food security and process by which a food security instrument was developed and incorporated into a supplement to the Current Population Survey (CPS). He also reported initial major findings: "For the 12 months ending in April 1995, 12 million households, 12 percent of the U.S. population, experienced some degree of food insecurity. A million of those households, roughly 4 percent of the population, experienced either moderate or severe hunger, and 800,000 households, less than 1 percent, experienced severe hunger." Chris Hamilton covered the basics of the Rasch model, which underlies the measurement of food insecurity,

[1]Members of this working group consisted of USDA's ERS's Margaret Andrews, David Smallwood, and Mark Nord, FNS's Gary Bickel, Steven Carlson, and Ted Macaluso, Agriculture Research Service's Mary Hama; and the Center for Nutrition Policy and Promotion's Peter Basiotis; as well as the HHS's NCHS's Karol Bialostosky and Ronette R. Briefel.

and provided details on the 18 items from the CPS survey questionnaire that make up the food security scale. He also explained how the Rasch model combines the household's item responses into a number that measures the degree of a household's food insecurity, and how the household is classified into various categories of severity along a food security and insecurity scale. Ronette Briefel reported how other national surveys and demonstration projects are using, or plan to incorporate, the food security instrument.

In session II, James Ohls described work conducted on whether the scale estimated from the 1995 CPS data using a Rasch model is applicable to data collected in the 1996 and 1997 CPS Food Security Supplements. The work affirmed the robustness of the Rasch model and showed the food security scale to be effectively steady over time. The model's assumption of stability across certain demographic subgroups also seemed acceptable. The research explained by Stephen Blumberg used a streamlined six-item scale to classify households into three categories of food insecurity and hunger (one less category than used by the 18-item scale). The research found that the resulting classification was similar to the results of the full 18-item scale, and Blumberg recommended the use of the six-item scale "if resources do not permit 18 items and your research goals do permit the combining of the moderate and severe hunger categories." The session was concluded by Mark Nord, who presented work that addressed whether the (18-item) food insecurity scale—which was developed as a general measure of food insecurity—is well-suited specifically for measuring the national prevalence of households with hungry children. Using the CPS data, Nord reported various possible figures for the number of such households and recommended that the government consider whether development of a second scale is warranted for estimating children's hunger.

In the conference's Luncheon Address, Susan Mayer contrasted the official measure of poverty with the food security measure, and three ways in which the latter is "relative" using historical examples of diet and nutrition from post-World War I and the Great Depression. Mayer went on to stress that people lack a clear intuition for the concept of food security, they view hunger as an attribute of individuals and not households, and the current food security measure results in figures that can be difficult for the public or Congress to interpret.

Session III contained three papers that examined applications of food security measurement. The first paper by Lori Reid focused on food insecurity among children, and presented preliminary results that found a very strong relationship between poverty status and household food insecurity. Other variables such as family structure, homeownership, and mother's education had distinct influences on a child's level of food insecurity. Joda Derrickson reported on work that found the food security measure to be a valid and stable instrument for most groups of Asian and Pacific Islanders in Hawaii, although the concept of "balanced" meal was not well understood. Valerie Tarasuk used a sample of Canadian women who used food banks to examine events that precipitated food insecurity for these women and to estimate the relationships between their food insecurity and their nutrient intake for a number of nutrients.

In session IV, the conference's first day concluded with a series of three speakers who addressed the establishment of a framework for a research agenda. Christopher Jencks observed, "The intricacies of Rasch modeling are not easy to convey" and advised that more transparent ways be considered for providing information about hunger. He identified potential advantages of the current measure, discussed the impact of different time-frames on the measured prevalence of hunger and its interpretation, and examined what is known and how much more needs to be learned about the causes of food insecurity and hunger. Angus Deaton stated that hunger and poverty are closely related concepts to most people (apart from economists, who usually view poverty as low income and not as low consumption of any one item). He questioned the validity of that connection, comparing U.S. food insecurity data with household responses to food consumption questions in India. Deaton considered problems of self-

reported measures, including the food security measure, and urged further research on external validation and on development of a measure of food insecurity at the individual level (in contrast to the current household level). Johanna Dwyer explained how nutritional status, like disease, is a multifactorial concept. Dwyer considered how the food security measure can be applied to target groups at special risks, such as children, the elderly, the mentally retarded and others, and she noted that it would be of great interest to know the food security histories of people with various chronic illnesses. Dwyer stressed that food security data need to be synthesized with biological data in addition to economic data.

In session V, the conference's second day continued the exploration of applications of food security measurement. Craig Gundersen reported on work that used the data from the Survey of Income and Program Participation, which included a food insufficiency question for a household. The study examined how negative shocks—such as lower earnings or lost food stamps—can precede a household's food insufficiency, and how factors such as liquid savings can help a household weather negative shocks. The work described by Katherine Alaimo used NHANES III data to relate a child's (proxy-reported) health status to the household's response to the food insufficiency question. The study also included a wide variety of other economic, educational, and health factors to isolate the role of food insufficiency. Karin Nelson explained research that used an eight-item measure for assessing the prevalence of hunger and food insecurity among patients at a county medical center. The study also gave special attention to diabetics and their experiences.

Session VI provided conference participants an opportunity to discuss in break-out groups a variety of issues related to food security measurement and research. Upon reconvening all conference participants, the essence of each group's discussion was reported.

In session VII, the conference concluded with a panel discussion on the next steps for a research agenda. Christine Olson reported some additional research results on the body mass index and urged that food insecurity be related to poor health consequences. Lynn Parker reviewed some history of hunger measurement, encouraged communities to use food security measures at the State and local level, and stressed the importance of annually measuring hunger and bringing the results to public attention. Richard Bavier raised several issues critical of how food insecurity is measured, especially the use of the item response theory, and recommended achieving greater discrimination between the frequency, intensity, and duration of disrupted food intake and hunger. Gary Bickel added that Rasch modeling has useful applications outside of educational testing, the area in which it was developed. He provided examples and noted the distinction between hunger as a personal experience and the public perception of hunger as a social problem. Helen Jensen concluded the panel session by surveying the uses of the food security measure, and noting ways through which the measure might be improved, for example, asking questions with shorter periods of recall or developing a high-frequency longitudinal survey.

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In followup to the conference, the Federal Interagency Working Group on Food Security Measurement met in April 1999 to review and discuss the conference proceedings. The group identified a set of research priorities as outcomes of the conference and posted them to the ERS website. The major themes of highest priority are grouped into two categories and listed as follows:

Research Priorities: Measurement

- Development and testing of individual (as opposed to household) scales for measurement of prevalence and severity of food insecurity among adults and children;
- Improvements in the measurement and understanding of the dynamics of food insecurity, such as frequency and duration of episodes;
- Developing better questions and strategies for asking about nutritional quality (alternative to balanced meal questions);
- Assessment of the effects of the questionnaire structure, item sequencing, and survey context on response patterns and measured food security levels; and
- Determination of research situations appropriate for implementation of abbreviated household food security scales and/or scales with different time frames such as monthly versus annual.

Research Priorities: Applications and Policy

- Focus of sampling and research on food insecurity and its consequences among high-risk groups with chronic health conditions, mental illness, and other biological vulnerability (especially among the homeless, elderly, and young children);
- Development of a research basis for linking community food insecurity and household food insecurity;
- Better understanding of the context and determinants of food insecurity and hunger and their relationship to poverty, household resources, and time management; and
- Applications that assess and investigate the linkages between food insecurity measures, welfare reform, and measures of program performance.

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	Core Food Security Module Questions and Answer Categories	true in last 12 months?
1	(I/We) worried whether (my/our) food would run out before (I/we) got money to buy more.	Often true Sometimes true Never true
2	The food that (I/we) bought just didn't last, and (I/we) didn't have money to get more.	Often true Sometimes true Never true
3	(I/we) couldn't afford to eat balanced meals.	Often true Sometimes true Never true
4	(I/we) relied on only a few kinds of low-cost food to feed (my/our child/the children) because (I was/we were) running out of money to buy food.	Often true Sometimes true Never true
5	Did (you/you or other adults in your household) ever cut the size of your meals or skip meals because there wasn't enough money for food?	Yes No
6	(I/we) couldn't feed (my/our child/the children) a balanced meal, because (I/we) couldn't afford that.	Often true Sometimes true Never true
7	Did you ever eat less than you felt you should because there wasn't enough money for food?	Yes No
8	How often did (you/you or other adults in your household) cut the size of your meals or skip meals because there wasn't enough money for food?	Only 1-2 months Some but not every Almost every
9	(My/Our child was/The children were) not eating enough because (I/we) just couldn't afford enough food.	Often true Sometimes true Never true
10	Were you ever hungry but didn't eat because you couldn't afford enough food?	Yes No
11	Did you lose weight because you didn't have enough money for food?	Yes No
12	Did you ever cut the size of (your child's/any of the children's) meals because there wasn't enough money for food?	Yes No
13	Did (you/you or other adults in your household) ever not eat for a whole day because there wasn't enough money for food?	Yes No
14	(Was your child/Were the children) ever hungry but you just couldn’t afford more food?	Yes No
15	How often did (you/you or other adults in your household) not eat for a whole day because there wasn't enough money for food?	Only 1-2 months Some but not every Almost every
16	Did (your child/any of the children) ever skip a meal because there wasn't enough money for food?	Yes No
17	How often did (your child/any of the children) skip a meal because there wasn't enough money for food?	Only 1-2 months Some but not every Almost every
18	Did (your child/any of the children) ever not eat for a whole day because there wasn't enough money for food?	Yes No

Note: Answer categories counted as affirmatives are shaded in gray. Items are ordered in terms of severity levels. For further information on scale scoring and categorization see: Bickel, Gary et al., *Guide to Measuring Household Food Security, Revised 2000*, USDA, Food and Nutrition Service, August 2000 or access on-line at http://www.ers.usda.gov:80/briefing/foodsecurity/surveytools/index.htm

Biographies: Speakers and Discussants

Katherine Alaimo

Dr. Alaimo is a postdoctoral fellow with the Community Health Scholars Program at the University of Michigan School of Public Health. She completed her Ph.D. in Community Nutrition from Cornell University in 2000. Before beginning her graduate program at Cornell, she worked as a Nutritionist for the National Center for Health Statistics, Centers of Disease Control in the Division of Health Examination Statistics and with the National Nutrition Monitoring and Related Research Program.

Richard Bavier

Mr. Bavier is a policy analyst at the Office of Management and Budget (OMB). His work includes analysis of income and poverty trends and the effectiveness of transfer and tax programs. At OMB, he has been involved in oversight and review discussions related to food security measurement.

Gary Bickel

Dr. Bickel, an economist at FNS, has studied the phenomenon of poverty in the United States from several different settings, including poverty-program fieldwork in southern Appalachia. From the start of the U.S. Government's Food Security Measurement Project in 1992, he has been involved in the development of the new measurement instrument as Project Officer for FNS's research contracts on the measure and as FNS's technical representative in the Federal Interagency Working Group on Food Security Measurement. Previously, Dr. Bickel was associate professor of economics at Cornell University and the University of Colorado; was staff member to Senator Gaylord Nelson on the Senate Subcommittee on Employment, Poverty and Migratory Labor; and was an associate in the Bureau of Social Science Research, providing research support on poverty issues to the original Legal Services Program.

Stephen J. Blumberg

Dr. Blumberg is a survey statistician within the Division of Health Interview Statistics at the National Center for Health Statistics (NCHS). Dr. Blumberg received his Ph.D. in social psychology and quantitative methods from the University of Texas (UT) at Austin, where he was also on the faculty as an instructor for research methods and statistics. While at UT, his experimental research focused on the failure of health education messages. Since arriving at NCHS in 1997, Dr. Blumberg has been working on telephone surveys of child health and welfare issues.

Ronette R. Briefel

Dr. Ronette Briefel is a senior fellow at Mathematica Policy Research, Inc. Formerly, she was the Nutrition Policy Advisor and Senior Research Epidemiologist at NCHS, Centers for Disease Control and Prevention, Department of Health and Human Services. During her 16 years at NCHS, she was responsible for coordinating nutrition monitoring and related research activities, advising the NCHS Director on nutrition policy, and planning the nutrition component of the National Health and Nutrition Examination Survey (NHANES). Her research includes food security, dietary assessment, cardiovascular nutrition, and national nutrition monitoring. She has published extensively on these topics.

Steven Carlson

As director of the Family Programs staff in Office of Analysis, Nutrition and Evaluation at the Food and Nutrition Service, Mr. Carlson has devoted his career to policy research and the analysis and evaluation of domestic food assistance programs, primarily the Food Stamp Program. He was named in 1992 as the USDA task-leader, along with Ronette Briefel of the National Center for Health Statistics, and was charged with developing a valid and reliable measure of food insufficiency and food insecurity for the National Nutrition Monitoring and Related Research Program. The Interagency Working Group on Food Security Measurement co-chaired by Carlson and Briefel has carried out

this assignment. At FNS, Mr. Carlson leads a multidisciplinary staff with research in welfare reform and coordination, electronic benefits transfer systems, program operations, and nutrition education and monitoring.

John Cook

Dr. Cook is an assistant professor in Boston University School of Medicine's Department of Pediatrics at the Boston Medical Center, and an adjunct professor in the School of Nutrition Science and Policy at Tufts University. Dr. Cook was principal investigator for the USDA Food Security Measurement Study, which developed measures of household-level food security and hunger for the United States. His research includes the relationships among individual, household, and community food security, the determinants of overweight and obesity in low-income children, and the influence of social welfare policy on poverty, food security, nutrition, and health.

Beth Osborne Daponte

Dr. Osborne Daponte is a faculty member at the John Heinz School of Public Policy at Carnegie Mellon University. Since 1992, she has been working on food-related issues and served as survey-director of a large-scale survey in Pittsburgh for a study of community food security and emergency food providers. She received her Ph.D. in sociology with a specialization in demography from the University of Chicago.

Angus S. Deaton

Dr. Deaton is professor of economics and international affairs at the Woodrow Wilson School of Public and International Affairs at Princeton University. His main areas of research are microeconomic analysis and applied econometrics, with particular reference to household behavior. He served as a member of the National Academy of Sciences Panel on Poverty and Family Assistance that recommended the reconstruction of the official poverty line in the United States. As a consultant to the World Bank, Dr. Deaton worked with the Living Standards Measurement Project and is the author of *The Analysis of Household Surveys: A Microeconometric Approach to Development Policy,* recently published for the World Bank by the Johns Hopkins University Press. His earlier books include *Economics and Consumer Behavior* (co-authored with John Muellbauer) and *Understanding Consumption (Clarendon Lectures in Economics).*

Joda P. Derrickson

Joda Derrickson, Ph.D., registered dietician, is a nutrition consultant in Hawaii, focusing on enhancing fitness as well as food and nutrition security. During her doctoral studies at Colorado State University, she was employed by the University of Hawaii at Manoa as a nutrition specialist and the Expanded Food and Nutrition Education Program State coordinator. Her research involved qualitative and quantitative assessment of food insecurity and hunger in Hawaii, where she tested the national food security module with particular attention to its validity among diverse Asian and Pacific Islander ethnic communities. Her subsequent work focuses on developing a face-valid food security-monitoring tool.

Johanna T. Dwyer

Dr. Dwyer is the director of the Frances Stern Nutrition Center at New England Medical Center, professor of medicine and community health at the Tufts University School of Medicine, and professor of nutrition at the Tufts University School of Nutrition Science and Policy. She is also a senior scientist at the Jean Mayer and USDA Human Nutrition Research Center on Aging at Tufts. Dr. Dwyer is the author/co-author of more than 85 research articles and 185 review articles published in scientific journals, primarily focusing on life cycle-related concerns such as preventing diet-related diseases in children and adolescents and maximizing quality of life and health in the elderly. Dr. Dwyer served as past-president of the American Institute of Nutrition, past-secretary of the American Society for Clinical Nutrition, and past-president and current fellow of the Society for Nutrition Education

and has received numerous awards for her work in the field of nutrition.

Edward A. Frongillo, Jr.

Dr. Frongillo is an associate professor in the Division of Nutritional Sciences, co-director of the International Nutrition Program, and director of the Office of Statistical Consulting at Cornell University. His research concerns the nutritional well-being of populations in the United States and developing countries, focusing on the measurement, causes, and consequences of food insecurity, understanding patterns of child growth, evaluating nutritional programs, and developing and validating methods for nutritional assessment.

Thesia Garner

Dr. Garner is a research economist in the Division of Price and Index Number Research, Bureau of Labor Statistics, U.S. Department of Labor. She conducts research primarily on topics related to the economic well-being of individuals, families, and households. Her work includes assessing subjective economic well-being, using household survey data, and evaluating the meaning of subjective questions, using cognitive methods. She has presented at conferences and has published on these topics, with various co-authors. Dr. Garner is an expert on the U.S. Consumer Expenditure Survey.

Craig Gundersen

Dr. Gundersen is an economist with the Economic Research Service of the USDA. He is working in a number of areas related to food insecurity, including analyses of the influence of the Food Stamp Program on food insufficiency and the connection between food insecurity and other dimensions of well-being. Other areas of research include analyzing the relative effects of stigma and transactions costs on food stamp participation, determining the effects of the macroeconomy on food stamp participation rates, and detailing the responses of States to changes in the Food Stamp Employment and Training Program. He is also leading a project that compares Mexican and U.S. food assistance programs.

William L. (Chris) Hamilton

Dr. Hamilton is a senior manager at Abt Associates, Inc.; a vice-president since 1971; and an Abt Fellow. He has directed policy research projects for three decades in a variety of substantive areas. Dr. Hamilton served as project director for the Food Security Measurement Study that developed the first national prevalence estimates of hunger and food insecurity in the United States, based on data from the April 1995 Food Security Supplement to the Current Populations Survey.

Gail Harrison

Dr. Harrison is a professor and chair of the Department of Community Health Sciences at the University of California, Los Angeles (UCLA), School of Public Health. She also serves as associate director for Public Health and International Programs of the UCLA Center for Human Nutrition. Dr. Harrison combined training in nutritional sciences at Cornell University and anthropology at the University of Arizona. From 1976 to 1992, she was on the faculty of the College of Medicine at the University of Arizona. She participated in the National Academy of Sciences panel that evaluated the nutritional risk criteria used in the Special Supplemental Nutrition Program for Woman, Infants, and Children (WIC) program and recommended consideration of food security indicators. Her research on food behaviors and nutrition has taken her to many countries, and she is advising doctoral candidates who use the new food security/hunger measure in their research.

Christopher S. Jencks

Dr. Jencks is a professor of social policy at the John F. Kennedy School of Government at Harvard University. He has also taught at Northwestern, the University of Chicago, and the University of California, Santa Barbara and, in an earlier life, was a fellow of the Institute for

Policy Studies in Washington (1963-67) and editor of *The New Republic* (1961-63). He is a member of the editorial board of *The American Prospect.* His recent research dealt with changes in the material standard of living over the past generation, homelessness, effects on children of growing up in poor neighborhoods, welfare reform, and poverty measurement. He is writing a book with Susan Mayer tentatively titled, *Did We Really Lose the War on Poverty?* His earlier books include *The Academic Revolution* (with David Riesman), *Inequality, Who Gets Ahead?, The Urban Underclass* (with Paul Peterson), *Rethinking Social Policy,* and most recently, *The Homeless.*

Helen H. Jensen

Dr. Jensen is a professor of economics and head of the Food and Nutrition Policy Research section of the Center for Agricultural and Rural Development at Iowa State University. Her research focuses on food consumption, food and nutrition policy analysis, issues of food program design, and methods of dietary assessment based on survey data. She directs several studies related to food and nutrition policy and welfare reform.

Susan E. Mayer

Dr. Mayer is an associate professor in the Irving B. Harris Graduate School of Public Policy Studies. She is also the director of the Northwestern University, University of Chicago Joint Center for Poverty Research and a research associate at the Population Research Center. Mayer's research focuses on poverty, inequality, and comparative social welfare policy. She wrote about how to measure poverty and inequality and how the social composition of schools and neighborhoods affects life chances of children. She recently completed *What Money Can't Buy: Family Income and Children's Life Chances* (Harvard University Press, 1997). She is editing a collection of papers on the causes and consequences of variations in cognitive skills (with Paul Peterson); finishing a book, *Did We Lose the War on Poverty?*, with Christopher Jencks; and writing on the role of early schooling on children's life chances. Before joining the faculty of the University of Chicago in 1989, she was a research associate at Northwestern's Center for Urban Affairs and Policy Research. Prior to that, she worked at the Department of Health and Human Services Office for Civil Rights.

Karin Nelson

Karin Nelson is a general internist who is a primary care research fellow in the Division of General Medicine at UCLA. As a resident at Hennepin County Medical Center in Minneapolis, she completed a study on food insecurity and hunger in an adult patient population, published in JAMA in 1998.

Mark Nord

Dr. Nord is a social science analyst at USDA's Economic Research Service. His research areas include rural poverty, with special attention to the spatial distribution and concentration of poverty, rural migration, rural welfare program use, and food security and hunger. Previous work includes research on natural resources and rural poverty at the Pennsylvania State University and management of relief and development programs of a non-government organization in Bangladesh. He received his master of science and Ph.D. in rural sociology from the Pennsylvania State University.

James C. Ohls

Dr. Ohls is a senior fellow at Mathematica Policy Research, Inc. He has directed several major studies of food and nutrition policy, including evaluating the San Diego Food Stamp Cashout Demonstration and the National Food Stamp Program Survey. He is project director on a study analyzing data from the 1996 and 1997 Food Security Supplements to the Current Population Survey. Dr. Ohls is the co-author, with Dr. Harold Beebout, of *The Food Stamp Program: Design, Tradeoffs, Policy and Impacts,* published in 1993.

Christine Olson

Dr. Olson is the Hazel E. Reed Human Ecology extension professor in the Division of Nutritional Sciences at Cornell University. She is researching the causes, measurement, and consequences of food insecurity for the last 12 years. Along with Donald Rose and Edward Frongillo, Jr., she recently organized a major symposium, "Advances in Measuring Food Insecurity and Hunger in the U.S." as part of Experimental Biology '98 Annual Meeting in San Francisco. Her recent work focused on the health and functional consequences of food insecurity in nutritionally vulnerable groups in the United States.

Lynn Parker

Ms. Parker is the director of Child Nutrition and Nutrition Policy at the Food Research and Action Center. She is also the president of the Society for Nutrition Education. Ms. Parker played a leadership role in the development and implementation of the Community Childhood Hunger Identification Project and served a 5-year term on the National Nutrition Monitoring Advisory Council.

Prasanta Pattanaik

Dr. Pattanaik is a professor of economics in the University of California at Riverside. His main areas of research are welfare economics and the theory of social choice; decision theory, including the theory of choice under non-probabilistic uncertainty and the theory of fuzzy preferences; and the measurement of poverty and the standard of living. Besides writing papers in professional journals, he wrote two books and co-edited three books including a festschrift for Amartya Sen.

Kathy Radimer

Dr. Radimer received a Ph.D. in nutritional sciences from Cornell University in 1990. Her research there involved use of qualitative data to develop a conceptual framework and definition of hunger, serving as a basis for the development of survey items to assess food insecurity. She also worked in Australia, Papua New Guinea, Cameroon, and Burkina Faso and is with the National Center for Health Statistics.

Lori Reid

Dr. Reid is assistant professor of sociology at Florida State University. Her research broadly focuses on issues of inequality. Her dissertation examined racial inequality in the labor market. While a research fellow at the University of Michigan, she focused her research efforts on the relationship between food insecurity and child well-being. She received her Ph.D. in sociology from the University of Arizona in 1997.

Donald Rose

Dr. Rose is a free-lance consultant in Maputo, Mozambique, where he has been working with the Michigan State University Mozambique Food Security Project, a collaborative effort with that country's Ministry of Agriculture to build human capacity in policy analysis and research. Prior to that assignment, he worked at USDA's Economic Research Service as a team leader on the determinants of food insecurity in the United States, the nutritional effects of food assistance programs, and the evaluation of low-income nutrition education projects. Dr. Rose has graduate degrees in public health nutrition and agricultural economics.

Valerie Tarasuk

Dr. Tarasuk is an assistant professor in the Department of Nutritional Sciences, Faculty of Medicine, University of Toronto. Her background training includes a Ph.D. in nutritional sciences from the University of Toronto and postdoctoral work in social epidemiology. Her primary research focus is the study of problems of domestic food insecurity, considering their origins and nutrition implications and examining current policy and program responses. Paralleling this focus is her ongoing work in methodological issues related to the interpretation of dietary intake data and the conduct of nutrition research with vulnerable groups.

Cheryl Wehler

Ms. Wehler served as project director for the Community Childhood Hunger Identification Project (CCHIP). There she directed the development and initial validity testing of the CCHIP hunger measure. From 1987 to 1995, 21 CCHIP surveys were completed under her direction. She is collaborating on a study of the psychosocial, developmental, and health outcomes of children from hungry families. Ms. Wehler completed her master of science in nutritional biochemistry at the Massachusetts Institute of Technology and is continuing her studies at Harvard University.

Welcome

Eileen Kennedy

Good morning. I am delighted to be here.

I first became involved with the issue of hunger back in the Johnson days of the Great Society. It was a time of renewed focus to hunger and nutrition problems in the United States. We had charismatic personalities, like Bobby Kennedy traveling around the country and giving visibility to problems that had been hidden. About 15 years ago, a report by the President's Task Force on Food Assistance stated, "It has been long an article of faith among the American people that no one in a land so blessed with plenty should go hungry. Hunger is simply not acceptable in our society."[2]

It was a wonderful period not only for defining the problems of hunger and malnutrition in the United States, but also for recognizing what we should do about them. Events in the late 1960's and early 1970's, including the 1969 White House Conference on Food, Nutrition and Health, catalyzed not just a definition of the problem but even a plan of action. Fairly soon after the 1969 conference, the country had the nationwide expansion of the Food Stamp Program, nationwide expansion of the National School Lunch Program, creation of the School Breakfast Program, and the creation of WIC and EFNEP. Shortly thereafter, the Senate Select Committee on Nutrition and Human Needs emerged, which is the predecessor of *Dietary Guidelines*.[3] A lot of positive events were launched that gave serious Federal attention to food and nutrition problems. The issue of hunger has also come to be called, more appropriately, "food insecurity." Our nutrition safety net has matured over the years. We can be proud when we look at the body of evidence on its effects.

The job never seems to be done, though. Dramatic changes have taken place—most recently welfare reform. There is a continued need to think about the tools we use to assess welfare reform's impact and the impacts of other changes on food security and the nutritional well-being of the poor. We need to acknowledge that families continue to slip through the cracks. Even more importantly, we need to identify why those families are missed and then to develop an action-oriented agenda. Research activities and forums such as this will help shape how we move forward with our nutrition safety net.

The Office of Analysis and Evaluation kindly invited me to the 1994 conference. I talked about some of my own research, which was monitoring activities done mainly in Sub-Saharan Africa. The audience was primarily domestically oriented. Several people asked, "With the magnitude of the food insecurity problem in developing countries, don't you find it a bit odd giving serious attention to the domestic issues?" My response then was similar to what it is now: I think we have to be honest that the magnitude of food insecurity in America is not directly comparable to what we see in developing countries, particularly in Sub-Saharan Africa. I do think of food security as a continuum, though, going from very poor to better-off countries. Food security is a matter of degree. It is a relative issue that depends on the development of a particular country. Even though the United States has immense wealth, we still need to think about the meaning and context of food security in our own country.

One measure of a country's wealth and development is the percentage of income spent on food. ERS provided the most recent statistics for me. By this measure, the United States is doing extremely well. On average, we spend only 6.5 percent of our income on food at home. This compares with 18 percent in Japan, 50 percent in India, and unfortunately 40 percent and rising in Russia. Food security has come to be defined in a global context as access, and by "access" I mean physical access, economic access, access by all people at all times to enough food for an active and healthy life.

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[2]U.S. President's Task Force on Food Assistance. *Report of the President's Task Force on Food Assistance.* 1984.

[3]U.S. Department of Agriculture and U.S. Department of Health and Human Services. *Nutrition and Your Health: Dietary Guidelines for Americans*. Home and Garden Bulletin No. 232. 1980; successive editions published every 5 years.

Despite the low percentage of income spent on food at home in the average U.S. household, food insecurity continues to exist in the United States. The problem is disturbing, in part because research increasingly finds that food insecurity is linked to a number of adverse health and social outcomes. We are going to hear about these connections from a number of speakers. One example is that food insecurity has been linked to increased risk of infection. We also know there are dietary inadequacies, including, from our own survey data, a number of nutrient deficiencies. Major medical complications and costs result from diagnosis and treatment of problems related to nutrition-based conditions. Preliminary evidence suggests an association between food insecurity and hypoglycemia. A recent concern, which is receiving a great deal of attention in the U.N. system, is the "fetal origins of disease": the sequelae of being born small—not simply low birth weight but being born small—may have enormous second- and third-round effects that only show up 20, 30, or 40 years later. A global agenda is emerging for studying the fetal origins of disease, and we are thinking about how to look at it in the context of the United States.

The available evidence also tells us that food insecurity in this country should not be addressed by simply focusing on diets that provide the bare essentials. We need to think about the whole issue of the overall appropriate diet that sustains a healthy and nutritious life and allows one to perform at an optimal level. That is why we are here today.

As a result of the conference's discussion, we will have a better understanding of the problem, how widespread it is, and how we can develop instruments to measure our progress; who the people are; and where they live. And, as I said, let's not forget the last part, what we will do about it. The discussion and the research that will follow will help us study not only the magnitude and causes but also some solutions for food insecurity and inappropriate nutrition.

I am delighted to take a closing moment to talk about a new initiative out of the Department of Agriculture. Secretary Glickman recently announced the creation of the Community Food Security Initiative. It's a result of conferences like this one and the compelling information we have been getting as policymakers travel around the country listening to people. Many people say that our Federal nutrition safety net is a key for dealing with food insecurity and the nutrition problem, but that it is not the total answer. We can measure success in a community by its ability to deal with the problem of food insecurity in local communities and local areas. Our emphasis in the Community Food Security Initiative is not taking over community work, but encouraging and facilitating grassroots activities that complement the Federal safety net. We need to think about new ways to measure food insecurity, and about the mix of activities that could be used appropriately at the community level. We want to make sure our policy and programs are brought together in the most aggressive and efficient way to combat food insecurity. Whatever we do has to be broad-based, evolving, and innovative, and involve more than just one level. Clearly the Federal Government will be involved, and we will continue to work with local and State governments. Over the next couple of years, we want to examine how we work with communities, including non-governmental organizations and the private sector.

This conference is an enormous opportunity to bring together different groups, to discuss the contribution of research, and to think about linking research more effectively to policy and programs. Other outcomes will be to think about scientifically based and better validated tools related to food security and nutrition, about the forward-looking research agenda, about the Federal agenda, and about partnering with our larger cadre of research institutions. I am looking forward to today's discussion and the guidance that will come from this meeting.

Julie Paradis

Good morning. It is a real delight to be here this morning with Eileen and Linda, who are absolutely committed to fighting hunger. I would like to associate myself with Eileen's remarks. It has been a pleasure to work with her ever since I was new on the Hill at the end of the 1980's. No one can doubt her understanding of nutrition and hunger issues, or her commitment to eliminating hunger and working with those involved in the hunger programs. Linda Meyers and I have known each other for a year or so since I joined the administration. Under Secretary Shirley Watkins and I have been delighted working with Linda and her boss, Surgeon General David Satcher. They are as committed as we are to eliminating hunger in this country, which we believe is a very real possibility.

Secretary Glickman, Under Secretary Watkins, and I have been working with many others to strengthen partnerships among the Department of Agriculture's mission areas, as well as partnerships with several Federal departments including HHS, Education, Transportation, Justice, and Labor. The Secretary is committed to be the country's leader to eliminate hunger, and as we traveled around the country, we learned that community groups too have partnered among themselves to comprehensively meet the needs of low-income families. For example, many hunger projects and programs expanded their scope. They saw the same families each month, and they thought about how to help these families achieve true self-sufficiency. Hundreds of these groups have added new components to their hunger fight. They are now providing job training and life skills. They have gotten involved in economic development and community development. The ultimate solution to hunger is to eliminate poverty. All those concerned about hunger need to think comprehensively about this complex problem, as communities around the country have already begun to do.

One vital need that we must address as we identify strategies that effectively address hunger is to also identify outcome measures that show the impacts of the work being done, so that we might garner additional support. I think that is the real value of this conference. We need food security measurement on a regular basis to see the outcomes, and then to tie our programs and community-based initiatives to those outcomes.

In the 5 years since the first conference in 1994, the problem of hunger in America—while not yet approaching the size and severity experienced in other countries—has in many respects grown more acute, in spite of a robust economy. It is an ongoing problem for the American conscience. While we believe it is solvable, it continues to go unsolved. We need to work together to determine why that is so.

The first conference laid out the guidelines for measuring and defining the scope and severity of the problem of food insecurity. That was a truly important task, for not everyone yet believes that there is hunger in America. In the early 1980's, policymakers suggested that hunger was not a problem because the economy was doing better. Those of us who worked with the nutrition programs knew that to be absolutely false. If you tell people that there are 300 billion stars in the galaxy, they believe you without question, but if you tell them that the porch railing has wet paint on it, they have to touch it to make sure. Well, people believe that times are good, but they have to touch the porch railing to believe that hunger exists. Your work can help us show in concrete and measurable terms the depth and the magnitude of the problem of hunger.

The 1994 conference also helped to establish the pattern of interagency partnership and the cooperation that has been a hallmark of the Food Security Measurement Project. Hunger cannot be addressed successfully by just one agency or one initiative. Food insecurity is connected to the larger problem of poverty, and we need to find creative and interrelated solutions.

We at the Food and Nutrition Service have adopted a mission statement that states our role in this effort: "FNS reduces hunger and food insecurity in partnership with cooperating organizations by providing children and needy families access to food, a healthy diet, and nutrition education in a

manner that supports American agriculture and inspires public confidence." It is crucial to our mission to have a sound and reliable measurement tool to gauge the severity of the problems of food insecurity and hunger. Our safety net of nutrition programs has been a lifeline for millions of families and children, but we know that there are millions more who still struggle to meet their most basic needs.

In 1990, Congress recognized that the methods and resources devoted to monitoring the nutritional status of Americans needed to be improved. The result was the creation of the National Nutrition Monitoring and Related Research Act. USDA and DHHS put together a 10-year plan to carry out this congressional mandate. One of the plan's challenging tasks was the development of a scientifically sound and reliable measure to monitor the severity and prevalence of food insecurity in the United States as a whole as well as at the State and local level. The task was assigned jointly to FNS and the National Center for Health Statistics at HHS. We are proud of the way it has been carried out through a multiagency public-private partnership. The food security measure has gained widespread acceptance in government and from the scientific community. We are incorporating the measure into our evaluations of program effectiveness and in our plans for improving and enhancing program services. The measure has also been proposed as a target for nutritional adequacy in the government's major public health initiative, Healthy People 2010. The Federal Interagency Forum on Child and Family Statistics uses it as one of the key indicators of well-being for America's children. It will be used in several major surveys to help understand the causes and consequences of hunger. Even more importantly, it will help us to make Federal nutrition assistance programs more effective. Increasing our abilities to accurately and reliably measure hunger and food insecurity in America are issues of the highest priority, not just at the Food and Nutrition Service but to all of USDA.

I thank you all so much for your hard work in developing and implementing this measure as we seek to better understand the scope and magnitude of a problem that should not even exist in a country like the United States. Armed with the tools that you all have provided, we stand a real chance of success.

Linda Meyers

I am honored to be here among such a dedicated group of individuals. I welcome you all, along with my USDA colleagues, on behalf of the Department of Health and Human Services and my boss, Assistant Secretary for Health and Surgeon General, David Satcher, who mentioned the other day that he was part of the Physicians Task Force on Hunger a number of years ago.

I have used the term "success story" when asked about hunger measurement and whether we know how many people are hungry or food insecure. The measures that were developed are products of collaboration among government, academia, nonprofit organizations, and the private sector. There have been great strides in operationally defining and measuring this concept called "food security." Ten years ago, there was barely consensus on even a general definition. Such a limited agreement was the reason there was no hunger or food security measure in Healthy People 2000, coordinated out of the office that I represent. Now there is a definition and a series of measures. I think it is safe to say that Healthy People 2010 will have at least one measure of food security.

We now have a substantial high-level commitment to increasing food security, including the *U.S. Action Plan on Food Security*.[4] I think it is the first of its kind for the United States, but it will not be a real success story as long as children go to bed hungry, as long as adults have to choose between the asthma medication and food, and as long as there is any food insecurity in the United States.

To achieve success, we are challenged a number of ways. We are challenged to refine research tools to obtain measures of community food

[4]U.S. Department of Agriculture, Foreign Agricultural Service. *U.S. Action Plan on Food Security: Solutions to Hunger*. 1999.

security; standard indicators that can be widely used at Federal, State, and local levels; and instruments that capture information on older persons, the homeless and institutionalized populations. In a welfare-to-work environment, we are challenged to monitor changes in nutritional status and food security and to better understand determinants and consequences. We are challenged to continue to improve coordination. We are challenged to continue to improve the translation of data into information that will drive action at Federal, State, and community levels.

Surgeon General Satcher speaks often of three evolving priorities for the health of Americans. One relates to increasing awareness and understanding of global issues such as infectious diseases, food security, and hunger. He also speaks of eliminating racial and ethnic disparities in health, pointing out that it is not a zero-sum game and that closing the gap among the most vulnerable will improve the health of all Americans. The third priority is achievement of balanced community health systems—a priority that emphasizes disease prevention, health promotion, access to health care for all, and a healthy start for every child. Achieving any of these priorities will require reducing food insecurity of communities, households, and individuals. Your work is critical to meeting these challenges.

Session I: Overview of Federal Activities and Monitoring

Evolution of the USDA/DHHS Food Security Measurement Project

Steven Carlson

The Food Security Measurement Project is a multi-year collaborative partnership of the public and private research community to provide rigorous and comprehensive estimates of the extent of hunger in America. I will describe its conceptual basis, certain aspects of data collection and analysis, some of its learned results, and possible future directions.

Drawing from the American Institute of Nutrition's definitions of 1990, "food security" is the assured access at all times to enough food for an active healthy life. The definition means a household has access to enough food that is safe, nutritious, and acquired in socially acceptable ways. While each of these dimensions is important, the measurement project focuses on the basic dimension of quantity. Food insecurity occurs whenever access is limited or uncertain. Hunger is the manifestation of severe food insecurity.

We approached hunger as a social rather than a medical problem, a distinction made by the President's Task Force on Food Assistance in 1984.[5] Hunger is the inability, even if occasional, to obtain enough food. It can be present without visible clinical symptoms of deprivation. Malnutrition is a potential but not a necessary consequence of chronic food insecurity and hunger.

We measure food security because hunger is an important dimension of basic individual and family well-being. Food insecurity is undesirable in its own right and a possible precursor of more serious health and developmental problems. As the welcomers noted this morning, nearly 15 years ago, the President's Task Force on Food Assistance pointed to the widespread reports of increasing hunger but concluded to their regret that hard data were simply unavailable to directly estimate the extent of hunger. In the absence of that information, they predicted, solutions would be elusive.

In 1990, Congress enacted the National Nutrition Monitoring Act to bolster the scientific and data resources devoted to assessing nutritional well-being. The act mandated development of a comprehensive plan and assigned the Food and Nutrition Service and National Center for Health Statistics the joint task of developing a standardized mechanism to obtain data on the prevalence of food insecurity that could be used at national, State, and local levels.

Finally, the issue of hunger measurement is entirely consistent with a focus on performance-based outcome measures embodied in the Government Performance and Results Act. As a result, the measure of food security has become a core part of the Food and Nutrition Service's strategic plan in dealing with food security and hunger.

The process for this project has always been inclusive. We started with a research conference at which experts concluded that a rigorous measure of food insecurity and hunger was feasible. A working group produced a draft survey instrument, building on pioneering research at the Community Childhood Hunger Identification Project and at Cornell's Division of Nutritional Science. We relied heavily on the expertise of staff at the Center for Survey Methods Research at the Bureau of the Census. The instrument was pretested in the summer of 1994 and then asked of a random sample of about 45,000 households in the April 1995 Current Population Survey, a nationally representative sample of American households that forms the basis for the monthly estimates of unemployment and labor force participation. At the moment, four rounds of data collection have been obtained as a supplement to the CPS: April 1995, September 1996, April 1997, and August 1998. There are plans for another round in April 1999. Our hope is that the rounds

[5] U.S. President's Task Force on Food Assistance. *Report of the President's Task Force on Food Assistance.* 1984.

continue in the spring and fall of alternating years.

The supplement itself consists of over four dozen questions, asking not only about food insecurity but also about food expenditures and sources of supplemental food such as food assistance programs, emergency feeding systems, or family and friends.

The food security items fall into four basic groups. Anxiety that the food budget may be insufficient is addressed when we ask, for example, whether the family worried that their food would run out before they got money to buy more. A group of questions concerns perceptions that the food was inadequate in quality or quantity, captured by statements like: "We could not afford to eat balanced meals." There is a group of questions about reduced food intake or its consequences for adults: "Did you or other adults in your household ever cut the size of your meals or skip meals because there was not enough money for food?" The final group of questions examines reduced food intake or its consequences for children: "Did any of the children ever not eat for a whole day because there was not enough money for food?" All questions in this set are conditioned on the family's lack of resources; we are not trying to measure hunger that results from being too busy to eat, from dieting, from illness, for any other cause except lack of sufficient resources.

Under the leadership of Chris Hamilton at Abt and with the cooperation of the working group from some Federal agencies, we began analyzing the data as part of the April 1995 supplement, with a series of linear and nonlinear factor analyses, to determine the underlying structure of the pattern of results that emerged. Based on those factor analyses, we concluded that it was possible to characterize this phenomenon as a single underlying factor, a unidimensional scale. The questions fell out in an order that was plausibly ordered by severity. The ordering is consistent with the Cornell group's notion that hunger is a managed process. At some initial level of financial stress, a household may have anxiety or concern about the food supply. If food intake is reduced, it appears first among the adults as they shield the children. However, as limitations tighten, children too begin to experience reduced intakes. A series of tests ensured that the results were robust.

On the basis of this scaling exercise, we assigned a numerical food security score to each household. Neither the household scores nor their average have a natural interpretation for the public, and so we used a household's score to assign it to one of four categories that we developed to characterize the variety and severity of experiences based on the range of scores. The four categories are: food secure—those who show no signs or evidence of problems with food sufficiency or quality; insecure with no hunger—those in which food insecurity is evident in household concerns or adjustments to the quality of their diet but short of actual reductions in intake; insecure with moderate hunger—those with reported reductions in the intake of adults; and insecure with severe hunger—those with reported reductions in the intake of children or, in the case of households where children are not present, extensive reductions among the adults. These categories do seem meaningful, and the frequency of positive responses to the most severe questions rises quite rapidly as you move from the food secure category to the severe hunger category.

Results were announced at the First National Summit on Food Recovery and Gleaning in September 1997. For the 12 months ending in April 1995, 12 million households, 12 percent of the U.S. population, experienced some degree of food insecurity. A million of those households, roughly 4 percent of the population, experienced either moderate or severe hunger, and 800,000 households, less than 1 percent, experienced severe hunger.

We examined the validity and reliability of the estimates. Measures of statistical fit and reliability fell well within conventional standards. To test the consistency of household responses, the Census Bureau reinterviewed a sample of the April 1995 respondents to ask the same questions again of the same set of households. The food

security questions have fairly moderate reliability, consistent with the reliability of most of the CPS questions.

Scores are related to other factors in expected ways. Food security rises as income goes up. Food security rises as food expenditures go up.

The relationship between insecurity and dietary intake or nutrient availability is still not fully answered. A direct answer obviously requires that food security questions be in the same survey that is collecting information on food consumption and nutrient intake. Such a survey will be done shortly. Meanwhile, there is a clue about the likely relationship. It comes from research that the Economic Research Service published, using data from the 1989 and 1991 Continuing Survey of Food Intake by Individuals. The research compared the intakes of those who said they sometimes or often did not have enough to eat with the intake of all other households, and found that the food-insufficient households had significantly lower intakes of both calories and 13 out of the 14 nutrients that they examined. Those results are encouraging.

This work can monitor changes in the food security of the American population. The lasting value of this project is as a tool to measure this important aspect of individual and family well-being. As part of our GPRA strategic plan and annual performance plans, we are incorporating the new measure into our thinking about the effectiveness of nutrition assistance programs in enhancing the well-being of the people these programs serve. It has been proposed to include the measure in Healthy People 2010. Food security has become one of the key national indicators of well-being for America's children, part of the Federal interagency group focusing on child and family statistics. The measure can serve as a benchmark for State and local comparisons. It is already being used in a number of State and local monitoring efforts around the country, and by other private sector researchers in the United States and Canada. We are also optimistic that it will contribute to future research into the causes and consequences of hunger.

In the recent book *Toward an End to Hunger in America*,[6] Peter Eisinger refers to the September 1997 release of the April 1995 results when he writes: "The release of the report on Household Food Security marks a cognitive watershed in the effort to deal with American hunger. It is no longer possible to argue that the United States has failed to solve its hunger problem because Americans do not know its nature or its scope."

[6]Eisinger, Peter K. *Toward an End to Hunger in America.* Washington, DC: Brookings Institution. 1998.

Developing National Prevalence Estimates From the 1995 Food Security Supplement to the Current Population Survey

William L. (Chris) Hamilton

This work was carried out by Abt Associates, Inc. under contract with FNS, with many people collaborating, including John Cook, the principal investigator, and Chris Olson, Ed Frongillo, Jr., and Cheryl Wehler.

As previously mentioned, about 12 percent of the households in the United States in 1995 experienced some measurable level of food insecurity, about 4 percent experienced hunger, and about 1 percent experienced something that we categorized as severe hunger. My goal today will be to explain the origins and meaning of these numbers, and the process by which the food security scale was obtained from the four dozen items in the Food Security Supplement to the CPS. In doing this, I will also describe the properties and interpretation of this scale and the origin of its four categories.

The underlying food security scale is essentially a zero-to-10 measure. Zero represents food security and 10 is the most severe level of food insecurity that we measured. The scale excludes more severe types of food insecurity that may be more relevant for other countries than for the United States.

The food security scale is a household scale rather than an individual scale: questions pertain to everybody, the adults as a group, or the children as a group. The scale I will talk about is the 12-month version of the scale: questions typically ask, "At any time in the past 12 months has your household experienced the following." We do not know whether its experience was continuous or for a limited period within the 12 months. The 30-day version of the scale exists, but it seems less useful.

Questions ask whether a household has enough food. Nutritional quality is not emphasized. The scale does not consider coping mechanisms that people take to deal with food insecurity, such as the use of soup kitchens, food pantries, or other food assistance programs. As Steven mentioned, there were some questions in the survey on those topics, but they were not included within the core scales.

The specific scaling procedure that was used is a Rasch model, which is a form of nonlinear factor analysis that fits within the general family of item response theory models. The model is widespread in educational testing where the underlying premise is that the probability that a student responds correctly increases with the student's ability and falls with the question's difficulty. The assumption of the food security scale is that the probability of affirming a question increases with the household's underlying level of food insecurity and falls as the severity of the condition measured by the particular item goes up.

In the simple case in which everybody answers the same set of questions, a household's score begins with the number of questions it answers affirmatively. The score is converted to a range from zero to 10. The converted scale value does not depend only on the number of affirmative answers. In particular, of the 18 items in the scale, only 10 apply to everybody, while 8 are applicable only to households with children. The Rasch approach derives comparable values on a single scale for households with and without children. It can handle missing responses on particular items, and it permits substituting questions in the future without losing comparability over time.

The technique derives a value called an "item calibration" that captures the severity of the conditions represented by a given item, and permits comparisons across items. Item calibrations help to break the scale into ranges, by which we develop the four categories of food security status.

The item calibrations are consistent with research showing that hunger is a managed process. Those items with less severe rankings, by and large, reflect household concerns and adjustments in food management. In the middle grouping, the items indicate reduced food intake for adults, and at the severe end, the items indicate reduced

intake for children. The severity of the individual items coincides with the results of previous literature.

We estimated the model separately for each of three groups: households with no children or elderly members, those with children, and those with elderly members but no children. Except for just one small order reversal, we found the same rankings of the items across all three groups, and the item calibration scores are quite comparable. Therefore, there is a very high level of consistency across groups, which enables us to develop a common scale for all groups.

We did many internal reliability tests, including Cronbach's Alpha and other traditional tests as well as tests done with the Rasch model itself. Reliability statistics were around 0.7, which suggests that the model is a solid descriptor of a population condition even though a higher score would be wanted before using it for clinical screening of individuals or households.

External validity tests show reasonably high correlations between food security and variables you would expect to be correlated, such as income and food expenditures.

A household that answers negatively to all 18 items is categorized as food secure. So too is a household that affirms one or two of the least severe items, which held for a plurality of cases. The category "food insecure without hunger" contains people who affirmed the first two items plus one or more of the next five items in the scale. These range from adults not eating balanced meals through indications of reduced food intake. In the last two categories are items showing conditions of hunger for one or more persons in the household, first for adults, then children.

When compared with other data, we see the prevalence of food insecurity is reduced as income increases. Interestingly, among households below 50 percent of the poverty line, 60 percent are classified as food secure. Perhaps these households remain food secure, despite very low income by experiencing significant deprivation on other dimensions of well-being. Alternatively, the measurement instrument's sensitivity may be limited in such a way that some food-insecure people are not being correctly identified. This area merits future research.

Households with children under 6 years of age have a fairly high prevalence of food insecurity. The fairly low prevalence of food insecurity among households with elderly members is surprising. Some anecdotal evidence suggests food insecurity is under-reported by elderly people. In contrast, ethnic groups' patterns match expectations.

One somewhat puzzling result is that people who are food insecure are much more likely to be participating in food assistance programs than the people who are food secure. There are reasons to expect this relationship to go in either direction. On the one hand, food insecurity should lead the households to seek out the programs. On the other hand, food insecurity should be ameliorated by participation.

I think the importance of this work lies not in the specific numbers for 1995 but in the development of a scale that enables one to observe changes over time. We can also use these numbers as a benchmark for understanding the prevalence of hunger and food insecurity within particular populations and regions.

Future Federal Plans For Monitoring Food Security

Ronette R. Briefel

In 1984, I joined the NHANES study and attended a hunger workshop in Berkeley. Ever since, the subject has been of research interest to me. My remarks today are based on input from Karil Bialostosky from NCHS, Ted Macaluso from the Food and Nutrition Service, and Bettylou Sherry with the National Center for Chronic Disease Prevention and Health Promotion at CDC.

Monitoring food insecurity relates to nutrition research and nutrition policymaking. The policy issues ultimately drive the research questions that we want to answer by collecting national survey data.

Many issues that we were struggling with 5 years ago at the first food security conference are still with us today. However, we did not then have a common definition for food security nor a standardized measurement tool for food security. We focused on research and development and produced a food security methodology for use in national nutritional monitoring. We now have a household-based tool conditioned on an economic resource constraint. We were interested in population subgroups at risk, and in incorporating the tool into national surveys to study different aspects of the problem, such as dietary intake, nutrition, and health status outcomes.

The tool's questions, the research and monitoring needs, and the policy questions are in a fluid environment. We will need to continually evaluate whether we are asking the right survey questions, the measurement tools are appropriate, and the information we are capturing is effectively answering the policy questions of the day.

During the development of the 18-item scale, national surveys were collecting information in the area of food security. The USDA food consumption survey, the Continuing Survey of Food Intakes by Individuals (CSFII), was using a single-item question that had been used over the past 20 years. The NHANES III included a battery of questions based on information derived from the CCHIP studies and the USDA question. These data will be useful to compare pre- and post-welfare reform situations with data based on the new 18-item questionnaire. The food security data will also be used to look at the prevalence of food insecurity across low-income groups, race and ethnic groups, and regions of the country and to provide a benchmark for State and local comparisons.

Several current and future national surveys will be using the 18-item scale, including the Current Population Survey with an annual estimate; the Survey of Program Dynamics; and the National Health and Nutrition Examination Survey (NHANES), which will start next month in March 1999. The NHANES and CSFII will begin to be integrated to form one National Food and Nutrition Survey beginning in 2000. This merger provides an opportunity to expand the annual sample size to between 8,000 and 10,000 individuals through low-income and race and ethnic oversampling. Full integration is expected in 2002 to 2003.

In addition, a Department of Education Early Childhood Longitudinal Study incorporated the 18-item scale along with a battery of behavioral, health, and education variables. Current national data will be used for continued research on the relationship between food program participation, food nutrient intake, and nutritional status and health, as well as the causes and consequences of hunger and food insecurity.

From the work of Katherine Alaimo and colleagues at Cornell, who used the NHANES III data for 1988-94, we find that Mexican-Americans are two times as likely as the total population to report food insufficiency. Those who did not graduate from high school are one-and-a-half times as likely, low-income persons are 1.6 times as likely and a single-parent household is twice as likely to report food insufficiency. One of the most interesting and important findings was that a single female-headed household with children is five-and-a-half times as likely to report food insufficiency, compared with other household types. More research could

focus on this particular subgroup. Those participating in the Food Stamp Program were two times as likely to report food insufficiency, and those with no health insurance were almost two times as likely, compared with those not participating in the Food Stamp Program, and those with health insurance, respectively.

About 2 years ago, a new working group on welfare reform and nutrition data needs was formed, and, to an extent, replaced the working group that developed the National Nutrition Monitoring and Related Research Program's Ten-Year Plan food security objective. The goals of the working group are to identify data gaps in national surveys, to examine the suitability of national surveys for addressing welfare-reform issues, to be a repository for current practices in food security and nutrition, and to foster interactive and interagency research. Karil Bialostosky serves as the group's executive secretary. It is co-chaired by the National Center for Health Statistics and the Food and Nutrition Service at USDA. A number of Federal agencies participate including the Health and Human Services, USDA, Census, Department of Labor, Congressional Research Service, NOAA, and Office of Management and Budget. We have State representation from the Association of State and Territorial Public Health Nutrition Directors. Individuals working on food security measurement and policy in their States came and shared their views with us. We have representatives from advocacy and private nonprofit organizations.

The group has served as a communication forum for keeping up to date with legislative changes in welfare. It has provided a context for discussion on how to improve the way we monitor food security in the U.S. population and on which measurement tools should be used in national surveys. We have followed changes in welfare reform and how these changes may affect the questions we are asking in national surveys. We have encouraged the use and distribution of the 18-item food security tool and succeeded in broadening the potential surveys and applications where food security might be used in the future.

In addition, the group has worked on developing a related six-item short scale. The short scale arose from the need of some surveys that lacked space and time to ask the 18 items. Stephen Blumberg will report on this short scale later this morning.

CDC has cooperative agreements with four States (Arizona, Massachusetts, Minnesota, and Missouri) and the District of Columbia that are demonstration projects in either the Pediatric or the Pregnancy Nutrition Surveillance System. The test clinic sites are primarily WIC clinics where the single USDA food-sufficiency question and four other questions derived from the 18-item set are being tested. The 3-year long demonstration project will be completed in September 1999. It will provide information about selected food security questions in a low-income population attending WIC clinics. A review of these test data will influence decisions about the exact questions that will be fielded in a broader way in the Pediatric and Pregnancy Nutrition Surveillance System. These projects are an important step forward for testing food security and working with the States to collect data and to look at these issues. Bettylou Sherry has more information if you are interested.

The Current Population Survey uses a household framework to assess household-based food insecurity and security. We are ready to go to the next research level and to develop an individual-based measure of food insecurity. We need to retain the household measurement because the household is the economic environment in which people live, but we know that individuals within a family are often very differently affected by hunger. Surveys such as NHANES or CSFII collect information on individuals living in households. We need to study how household food insecurity affects individuals in the household. Our next research task is to develop individual-level questions that can be added to individual-based surveys. Certainly we welcome your input and discussion on this research topic.

Two other food security areas were mentioned by Linda Meyers. The welfare reform working

group provided input for the U.S. Plan of Action for Food Insecurity, a follow-up to the World Food Summit of 1996, which has as its goal to reduce food insecurity by half worldwide by the year 2015. The working group has also developed the Healthy People 2010 objective, for which the 1995 CPS data serve as a baseline. The draft Healthy People 2010 objective is to increase the prevalence of food security among U.S. households to at least 94 percent of all households. The 1995 baseline was 88 percent.

We have a comprehensive research agenda planned that includes methodological development, applied research, and policy research. We want to continue research in assessment, validation and interpretation of methods, and scaling for individual-level measures that can be used to supplement the household-based food security measure. More emphasis will be given to asking survey questions on food access and expenditures, and to analyzing data sets that include economic data. Methods development to assess food insecurity among the elderly needs more attention, including possibly tailoring existing methods for use with elderly populations. Christine Olson mentions that the elderly may underreport food insecurity, and we observed that in analyzing the NHANES III data. Finally, temporal trends of food insecurity and other cultural and behavioral aspects will continue to be examined using data sets in hand. A number of annual national surveys will continue to include the 18-item scale for trends analysis, and will be used for tracking broad population statistics over the next decade, and for tracking progress in meeting the Healthy People 2010 food security objective.

Cross-sectional studies cannot fully investigate food insecurity and hunger. We also need longitudinal studies that include the food insecurity measure to examine what happens to an individual's nutrition and health status when there are changes in a household's income, welfare benefits, or food program participation.

The working group identified low-income persons, minorities, infants and children, and pregnant and lactating females as population groups that should be targeted for food insecurity monitoring. In the aftermath of welfare reform, the 18- to 50-year-old able-bodied adults without children is a new group to monitor. Even this extensive list, which covers a large portion of the population, does not include the homeless or the institutionalized.

With the NHANES program initiated, there has been the development of a mobile examination unit that could, upon request, go out into communities with a mini-NHANES. Perhaps we could collect dietary and food security information in a short survey interview coupled with a health examination.

We need to continue to disseminate the results of survey methods research and the results of data analysis so that others can benefit from the research findings. We also need to continue to encourage comparable use of food security methodologies across national, State, and local surveys, and data systems, as appropriate. To have purposeful data collection (national monitoring), assessment tools must be continually re-evaluated to revisit the link between monitoring, to meet data needs for research and policy, and to meet the goal of improving the health and nutritional status of the population.

Session II: Methodological Issues in Food Security Measurement

Testing the Robustness of the Food Security Scale With More Recent CPS Data

James C. Ohls

Abhijay Prakash, Larry Radbill, and Allen Schirm, my colleagues at Mathematica Policy Research, Inc., contributed to this work. Earlier Chris Hamilton described the Rasch model that provides the framework for the food security research that Abt Associates, Inc., did for FNS. A fundamental tenet of the model is that the underlying food security scale stays constant over time and that individual items stay more or less in the same place on the scale over time. It is important to test this underlying hypothesis to make sure it holds true in the current application. Under contract with FNS, we looked at whether the metric appears to be the same over time. Chris's early research was based on the 1995 data. Since multiple years of data are now available, our mandate was also to use the 1996 and 1997 data to expand the previous analysis of levels of food security to include a longer time period.

One technical issue raised by these research questions concerns screening. The Current Population Survey uses screening questions to track households into the detailed food security module; only something like 20 to 25 percent of households get tracked into the module each year. The screening questions were different each of the last 4 years, in part to experiment with different alternatives and in part to satisfy different constituencies. This raises the possibility that changes in results over time may be due not to some underlying phenomenon, but instead to what particular set of households enter the detailed analysis in any given year. To compare the 3 years, we identified what we call the "least restrictive common screen." This is defined as the least restrictive set of screening characteristics—that is, the set of characteristics allowing the most households to pass the screen—such that a given household will have the same screening outcome (pass and not pass) each year, if its values for the screening characteristics do not change. That is, a household with given characteristics that passes the original screen plus our screens in 1995 will also pass it in 1996 and 1997. The various screening criteria were nested in such a way that it was possible to develop this least common screen, to ensure that we dealt with completely comparable households in the analysis for all 3 years. The food security estimates we present here for 1995 are not quite the same as Chris's because we are using the least common screen and, therefore, a more limited set of households.

Another technical issue is normalization. Any linear transformation of a given Rasch scale has the same information content and yields the same results as the initial scale. A household's numerical score has meaning only relative to other numerical scores: such scoring attributes as the mean or the low-to-high range of the scores can be chosen by the investigator. Accordingly, to compare scores from different years, a single normalization must be chosen to ensure the same metric across years. The results we are showing today are based on setting the scale so that the mean of the item severity levels is zero. A second normalization used for much of the work follows the educational literature in setting the slope of what is known in the Rasch model literature as the "item characteristic curve" equal to one at its inflection point. That treatment comes close, at least in our data, to being equivalent to making the standard deviations of the item scores a constant. We are not using the zero-to-10 numerical range that Chris used for the scale.

To assess the effects of our screening on the model estimates, we compared our 1995 estimates made by using the least common screen with the Abt 1995 estimates. Our estimated ordering of items by severity is virtually the same ordering that Chris Hamilton and the Abt team obtained. We replicated their ordering with one exception: the ranking of two of the items was inverted. The use of different screening conven-

tions is one of several technical differences between this work and the work of the Abt team, but it is almost certainly the one that inverted the items. It is reassuring that in the Abt analysis those two items were clustered at almost exactly the same place on the scale, differing only at the second decimal place and by an amount that is not statistically significant.

We compared the 1996 and 1997 scores with the 1995 model to see whether the estimated ordering of the severity of each item stays the same over time. The basic result is that the ordering remains essentially constant. We continue to see the same inversion of two items as in the 1995 data, and then there is one other inversion that emerges for 1996 and 1997. The two items involved in this second inversion were so close in the original Abt analysis that their placement was almost indistinguishable; they just happen to be very close in the opposite direction in the later years.

In summary, the item order is essentially preserved across years. Differences are not statistically significant. Furthermore, the lesson of the results is that differences across years for any individual item are by and large not statistically significant. There are only two items where the differences over time are at all statistically significant. Our reading of the results is that the model is effectively the same in each of the 3 years.

In addition to the assumption of temporal stability, the Rasch model has an underlying assumption of stability across population subgroups. When the model is estimated on the population as a whole, the implicit assumption is that subgroups are behaving or reacting to these questions roughly the same. It is important to know if that fundamental tenet is true. We investigated the issue with several different groupings. The one I'll discuss is the ethnic grouping, because it is perhaps the one with the most intrinsic interest and it turned out to be the grouping with the most differences.

Among whites, there are three inversions of items, two of which are those noted earlier for the population as a whole. For African-Americans, there is a triplet cluster of inversions, that is, three consecutive items are rearranged, in addition to three pair-wise inversions. Hispanics have four pair-wise inversions. In general, inversions for the subgroups involve clusters of items similar to the inverted items in the national model. Overall, then, the results for the subgroups are a bit more complicated, but they are not dramatically different from the original Abt model. The model for any subgroup is recognizable as the same basic model: items are not shooting up and down in different ways.

In assessing these results, there is a question of magnitudes. What amount of item inversion alters the integrity of the model as a useful measurement tool for various applications? Is research that involves the food security scale jeopardized by the magnitude of the changes reported earlier? These questions are not susceptible to statistical tests but instead require research judgment. We solicited the judgments of Professor Benjamin Wright, an extensively published expert on Rasch models at the University of Chicago, and of Robert Mislevy, a senior scientist at Educational Testing Service (ETS). ETS is a national center of item response theory models, and it has the contract for the National Assessment of Educational Progress, which relies heavily on these models and for which Mislevy has done extensive work. Both experts indicated that, in their judgment, the above results showed more consistency than is usually present in Rasch model applications. In Bob's words, "this is about as good as it gets."

Finally, we calculated changes in food insecurity and hunger prevalences between 1995 and 1997. The essence of the results, which are preliminary, is that there was an increase in food security over the 1995 to 1997 period. The pattern is a little puzzling. There is hardly any increase from 1995 to 1996, and then food security rates increased

substantially in 1997. Mark Nord has just recently obtained 1998 data, and it is not yet clear whether the trend continued. For the time period under study, the most obvious candidate for improved food security is the booming economy, although perhaps policy changes could have also improved food security. Food insecurity has not ended, but in these data, it has been reduced somewhat.

Discussion

Edward A. Frongillo, Jr.

Jim Ohls and his team provided very well-written manuscripts.

Let us imagine that we have developed 18 items, and we simply count how many items a household answers affirmatively and then rank households by that count. Suppose the items are exchangeable, so that an affirmative on one is exchangeable with another. We could classify households based on whether less than three items are affirmed, three to seven items are affirmed, *et cetera.* The problem with this procedure is that those cut points for the classifications would be arbitrary, which is not very satisfying if we have a set of exchangeable items. We would feel better using a second procedure in which the items are not exchangeable but instead are ordered by "severity," and we base cut points on our understanding of severity. Then severity would be measured not by just the number of affirmative responses but by knowing which items are affirmed and that some of them are indicative of greater severity.

The Abt team used such a method on the 1995 data, and Mathematica Policy Research has done additional work here. To check how well the method was working, we could tabulate the numbers of affirmative responses and see if the ordering we expected is actually shown in the data. Jim Ohls did not show this in his presentation, but in his paper, they had some clever ways to see whether the ordering was preserved. The manuscript discussed that the safest way to normalize across the surveys may be to recognize that the same 18 items are used, and we expect them to perform the same.

Now notice to this point I have not used the term "Rasch model." A Rasch model relates to some observed variables, in this case dichotomous variables, with some unobserved food security status of households and some unobserved severity of the item. So we have things we observed, which are the items, and then we have the notion that in the background households are more or less food insecure. We want to know about food insecurity, but we cannot measure it directly—at least not routinely. (We can measure it directly if we want to. Anne-Marie Hamelin has done this in her study in Quebec, but the method is intensive.)

According to the model, we assume the items differ in their severity but that item severity is unobserved; we cannot know just by looking at the item what its severity is. In fact, given our knowledge about food security, a good idea about severity can be obtained by looking at the food security items. We use a questionnaire to infer the household food security status, which we cannot see directly in a questionnaire, by observing these variables that actually get measured.

The model assumes that food security status is a characteristic of the household, and which exact items we use should not matter in our determination of that. An assumption that is symmetric is that measurement of item severity should not depend upon what households happen to be in our sample. We also assume that all items discriminate in the same way among the households. Once we account for item severity, then the items are in a sense exchangeable. If one accounts for food security status of household, then the households are exchangeable.

What is the value of the statistical model? First of all, it allows comparisons of the results from different sets of items. We do not, in fact, have the same items for all households; we have 18 items for households with children and only 10 items for households without children. A few people—remarkably, only about 3 percent—do not answer all the items. Furthermore, there

could be variations in wording from year to year. In the future, we might actually change the items. The Rasch model is very useful by allowing us to make comparisons, despite such problems and changes.

A second advantage of the model is that it can compare different groups of people based, for example, on location or race and ethnicity or household composition. I do have concerns, however, about subgroup comparisons.

The Rasch model is very good at comparing across different sets of items when all those items are supposed to be measuring the same thing. The extra items for households with children, however, have a degree of severity that does not exist in our measurement tool for other households. For example, in the 10-unit scale that was in the Abt report, there is a 2-unit difference between the most severe adult item and the most severe child item, which means we do not have any items at the most severe end for households without children. These items are not missing at random; rather, the range of severity is truncated if there are no children.

The second concern is whether, theoretically, the Rasch model is a good tool for comparing across subgroups of people, that is, whether the model can tell us if the measurement tool is operating in the same way across different subgroups of people. In particular, the prevalence of food insecurity among the elderly may be underestimated. There is a need for fundamental research on groups other than households with children to provide an in-depth understanding of food security and a foundation for measurement. We do not know how to ask about the most severe food insecurity for households without children. We do not fully understand the importance of a food-use component of food security for the elderly, in addition to the components of food availability and access understood to comprise food security across all age groups.

Assessing the Sensitivity and Specificity of an Abbreviated Food Security Scale

Stephen J. Blumberg

This work was jointly authored with Karil Bialostosky, William Hamilton, and Ronette Briefel.

Surveys that operate under time constraints or financial limitations are likely to cut back on the 18-item scale. For example, the Urban Institute's National Survey of America's Families limited itself to four items. My understanding is that the Census Bureau's Survey of Income and Program Participation tried to limit the number to seven. Choosing which items to retain, however, has been somewhat haphazard. We worked with the Welfare Reform, Nutrition and Data Needs Working Group to take a more systematic approach toward the design of an abbreviated scale that was sufficiently valid for general population surveys of food security. This scale was then validated by statistical comparison to the larger 18-item scale.

A few principles guided our selection of the items. First, we knew that less than 1 percent of the general population is insecure with severe hunger. For a reasonably accurate measure of that prevalence (say, less than 20 percent relative standard error), the sample size would need to be about 3,000 or so. Given that a survey with financial or time constraints is also likely to have a sample size constraint, we combined the moderate and severe hunger categories into one overall category. In our work, the two categories of food insecurity are insecure without hunger and insecure with hunger. Because we do not distinguish between the two most severe levels of food insecurity, the most severe items add little information; the six most severe items were dropped.

Second, any short form should be able to classify households with and without children. A scale with questions specifically about children is necessarily weaker when used to classify households without children. We, therefore, excluded the four remaining child-focused items, leaving eight items.

Third, we excluded the first item in the scale because 80 percent of respondents who affirmed any questions affirmed this item. Finally, we retained the least severe item that clearly identified each food insecurity category. Given the remaining items and our feeling that six items were probably the minimum permissible length for this abbreviated measure, we were left with four possible six-item scales.

We compared classifications from the four possible short-form scales to the classifications determined by the 12-month, 18-item scale. Data for evaluating the six-item scales were collected as part of the April 1995 CPS. There were not many differences among the four scales. On average, they correctly identified the overall food insecurity category for 97.1 percent of the households. Population estimates of overall food insecurity were off by no more than 2 percentage points with all four scales. The particular six-item scale best at classifying households also had the least bias, and we concluded that it was the best set of items to use for an abbreviated scale.

Using categorizations from the 18-item scale as the standard, 97.7 percent of all households were put in the same category by the short form, given that we combined the two most severe categories into one.

When the prevalence of a condition is low, a scale with high specificity will usually correctly classify most people. Indeed, of the households who were food secure according to the full 18-item scale, 99.4 percent were still classified as secure by the short form.

The sensitivity of the short form was also quite good. Of those households classified by the 18-item scale as food insecure, either with or without hunger, 92 percent were classified as insecure by the short form. Of those households classified as insecure with hunger, 84.7 percent were correctly classified by the short form.

The short form correctly classifies a large proportion of households, in part because a large proportion of the households responded negatively to all of the items. But, when we examined just the subgroup households that affirmed at least one item, the sensitivity and specificity of the short form still continued to be strong.

We had excluded child-focused questions. As expected, the short form's sensitivity and specificity were, therefore, lower for households with children than households without children—in both the full sample and in the subgroup—but they were still quite acceptable. We tried other six-item subscales that included items that were child focused, and none provided a significantly better overall classification ability than the short form that I have been showing you.

The prevalences of overall food insecurity and food insecurity with hunger were under-estimated with this short form by just 0.3 percentage points. The overall bias of the short form was greater for households with children than for households without children.

The full 18-item scale is the gold standard that should be used if resources permit. But if resources do not permit 18 items and your research goals do permit the combining of the moderate and severe hunger categories, then we would recommend that the six-item short form be adopted as the standard. This will enable us to have a universal surveillance instrument and to make meaningful comparisons across surveys.

Discussion

Prasanta Pattanaik

The short form for assessing food insecurity and hunger in a household is a very useful tool that correctly classifies an overwhelming proportion of the households. It will be a helpful instrument when limited resources do not allow 18 items.

One conceptual point can be raised for the 18- and 6-point scales. After each household has been given a score on a particular scale, what do we do with these scores? One possible use is to classify the household into some broad categories. This has been done. An alternative use can be to construct an index of food insecurity for the entire group of households. Such an index will be analogous to indices of income poverty in the literature that has developed following the 1976 paper of Amartya Sen, this year's Nobel Laureate in Economics.

In the literature on income poverty, economists use a benchmark level of income below that which a person is considered poor. Then economists consider to what extent a person falls short of this benchmark (a person who is at or above the benchmark is considered to have zero shortfall). The shortfalls of the different individuals are then aggregated in some way to arrive at an index of poverty for the entire group of individuals under consideration. Using this general method, the literature on the measurement of income poverty has come up with alternative measures of income poverty, usually on the basis of alternative sets of axioms that postulate properties that a poverty measure should satisfy.

In the context of food insecurity, we have a scale on the basis of which we can measure the extent to which a household falls short of the ideal of complete food security. I was wondering whether one could measure, for each household, the shortfall from this ideal of food security, and then aggregate the shortfalls of the different households to arrive at a single index of food insecurity for the entire group of households. The underlying intuitive approach has been developed rigorously in the mathematical literature on the measurement of poverty and has been widely used in practice by economists. I was wondering whether this approach could be used to construct an index of food insecurity as an alternative to using the household scores for classifying the households into broad categories. Of course, categorization is important. It captures one of the dimensions of the phenomenon of food insecurity. However, we can also capture other dimensions by following the approach that I outlined. If we want to follow the route I described, then we can probably use even the short form of six items.

Note that in the short form of six items, there are specific questions that, by themselves, allow us to discriminate between households. Some of the questions ask households how often a particular problem occurred: very often or occasionally. "Very often" indicates greater severity of the problem than "occasionally." Therefore, even for specific questions, we have some scope for finer measurement that we can use in applying, in this context, the overall methodology used by economists for the measurement of poverty and deprivation.

Problems With Estimating the Prevalence of Child Hunger

Mark Nord

This work was performed jointly with Gary Bickel.

Concerns about children are salient in this interagency Food Security Measurement Project for legislative, programmatic, and public-perception reasons. Our paper proposes an improved method for estimating the prevalence of children's hunger and identifying households with hungry children.

Much has been said about the 18 questions as they relate to the four categories of food security. Some of the items are referenced at the household level, while others are referenced at the adult level. Eight items specifically ask about children in the household. These 18 items form a single scale.

The scale's severe hunger category is widely used as a proxy for households in which children are hungry, if there are children in the household. Much research concludes that households protect children from hunger until hunger reaches a severe level among adults, and only then the children start sharing in it.

Using the severe hunger category as a proxy for when children are hungry is effective if the items capture a unidimensional phenomenon. However, a second dimension could make that use problematic. Abt concluded correctly, I think, that the items are generally unidimensional but not perfectly so. The first dimension is severity. Once removed, the next factor in the raw data is, essentially, the extent to which households trade off adult hunger against children's hunger. The second factor creates concern that the overall 18-item measure may not optimally identify households in which there are hungry children. Even if only a small percentage of moderate-hunger households have children's hunger, the national prevalence of children's hunger could exceed the amount proxied by the severe hunger category by a large proportion because there are so many moderate-hunger households.

We pulled out the eight child-referenced items, scaled them by themselves, and set a threshold. The location of the threshold with reference to the children's items was analogous to the threshold's location in the 18-item scale. We estimated the prevalence of children's hunger using the 8-item scale and compared the results with the estimated prevalence based on the 18-item scale. Cross-tabulation showed that we were not looking at quite the same households in the two estimates, and we examined household characteristics to understand the differences.

First let's look at the dimensionality issue. We submitted item residuals to principal components analysis. Because the correlation matrix pertains to residuals, the first principal component should be considered the second factor in the raw data; the first factor is severity as extracted by the nonlinear Rasch method. We plotted the factor loadings of the items with severity of the item on the left scale. It is clear what the character of this factor is. It is the extent to which children in the household are protected from hunger at the expense of more severe adult hunger.

There are eight child items. The proportion of households with children that affirmed an item ranged from a high of 13.6 percent for "We relied on only a few kinds of low-cost foods to feed the children because we were running out of money to buy food" down to two-tenths of 1 percent for the most severe item: "Children did not eat for a whole day." The Rasch methodology scaled very consistently using these items alone or using the same items in the same households but adding the adult- and household-referenced items. That result is not surprising but it is always reassuring when procedures yield expected outcomes.

To get a prevalence estimate we had to establish an appropriate threshold. We examined item calibration and the household scores. We set the threshold between four and five affirmed items. Households classified as not quite having children's hunger would typically have affirmed these three items and that they cut the size of

children's meals, but would have denied the children were hungry. Those affirming five would also have affirmed: "children were hungry because we did not have enough money to buy food." The two items are very close so that, in fact, of those that affirmed four items, probably half also affirmed that children were hungry and denied that they cut the size of children's meals.

The threshold is exactly the same place as the severe-hunger threshold for adults on the household scale. Conceptually too it is the same place as the moderate hunger threshold relative to analogous adult items. To be classified in the moderate hunger category, the respondent must affirm three adult reduction-of-intake items. To be classified as having children's hunger, the respondent must affirm three items indicating reduction of quantity among children.

Our estimates of prevalences are based on 1995 data, the only ones in the public domain as of February 1999. We did replicate this entire analysis with the '98 data at the time when it was still unedited and basically everything in the '98 analysis was completely consistent with what I am reporting from the '95 data.

Among households with children, the current measure tells us that about 0.9 percent are in the severe hunger category at the household level. Therefore, we expect them to have children's hunger. Using only the child items, we find that about 1.1 percent of those households have children's hunger. Comparing the 0.9 and 1.1 percent figures might suggest that the difference between the two approaches is small. However, these percentage figures represent 332,000 households by the current measure and 425,000 households by our new estimates. If we want to focus on households with children's hunger, you could argue that the difference is enough to care about. The new estimates of 425,000 households represent a 29-percent increase over the current measure of only 332,000, and so the difference is proportionately large.

The survey contains the question: "In the last 12 months, were the children ever hungry but you just couldn't afford more food?" If that single item is used individually to measure the presence of children's hunger, then 671,000 households would be registered—about double the level of the severe hunger category. We do not advocate using a single-item instead of a multiple-item scale. Nevertheless, the number that results from the single-item scale provides a face-validity check on where we put the threshold; certainly it would be hard to argue that we overcounted households with children's hunger.

We cross-tabulated households using the two approaches to investigate whether the 8-item measure is simply more sensitive, that is, it picks up the same households as the 18-item measure plus some additional households. It turns out that the groups are not concentric but overlapping. Of the households in the severe hunger category, 24 percent or 80,000 households are not classified as having children's hunger by the child hunger measure.

Finally, we compared the two subgroups. In some ways, I think, the comparison is the most interesting part of the paper because it identifies a plausible reason for the second dimension. The results of the two measures are not just random, that is, that some households just show up as having severe hunger and others with children's hunger. There is some logic to this second dimension.

We studied the difference between the two prevalence rates, subtracting the 18-item scale from the 8-item prevalence, for various demographic and economic categories. Here I report mainly the bivariate analysis, but multivariate analysis was done as well. Single-parent households had a positive difference. One might argue that single-parent households are less able to protect children against hunger at the expense of adult hunger because the household has only one adult. Households with more children are also less able to protect the children, resulting in a higher level of child hunger than is detected by the 18-item measure. The strongest single factor is the age of the oldest child. If the oldest child in the household is 15 to 17 years old, it is more likely that children are also sharing in that adult hunger. That is not surprising. Interestingly, for the

group in which the oldest child is 6 years old or younger, the prevalence of child hunger in those households is lower than you would expect, given the level of adult hunger.

No systematic differences appeared when comparing boys and girls, in contrast to what might occur in some other countries.

Income is a major factor that affects relative prevalence on the two scales. Even if a high-income household registers food insecurity or hunger, its experience is likely to be episodic and short term, and children will not be sharing in the hunger. But for low-income households, hunger is a long-term phenomenon during which it is more difficult to protect the children.

In the bivariate results, black households have a higher incidence of children's hunger than non-Hispanic white households, but the difference disappears in the multivariate framework in which the difference is accounted for by the income difference. A higher prevalence for Hispanic households is found in bivariate and multivariate results, a result that calls for future research.

I made a metro and nonmetro comparison because I am a rural sociologist. Rural children are better protected in households with the same level of adult hunger, and that result persists even in a multivariate framework for reasons I do not know.

In conclusion, USDA, NCHS, and other agencies in this interagency group need to consider the wisdom of supporting a second scale to estimate children's hunger, using the same survey instrument. Although an extra scale creates extra explanations and work, intuitively, I think, the extra scale is easier to explain. Perhaps we could then drop the severe hunger category from our household-level measure, which is hard to explain. Ultimately, the extra scale might be better at estimating the prevalence of children's hunger, for research purposes and for identifying which households have children's hunger.

Discussion

John Cook

When we were first working on the 1995 CPS data, we wanted to address many questions but did not have time. The question of how to measure the prevalence of children's hunger was certainly one of them. Mark and Gary provide considerable improvement in the severe end of the food security scale.

I fully support the creation and use of a separate child hunger scale for several reasons.

We know that children, especially young children, are in critical periods of growth and development. For them, nutrition and food security are even more important than for adults. In the post-industrial era, we sell our thoughtware, our brain power. Food insecurity and hunger may reduce children's human capital accumulation, and they will be severely impaired as adults. Future research should clarify the roles of under-nutrition, food insecurity, and hunger on academic achievement, and on other measures of human capital. In addition, children are probably a sentinel group with regard to food insecurity and hunger; they can serve as an indicator of problems likely to emerge in the rest of the population.

The technical portion of the 1995 reports contains a review of literature on physiological indicators for hunger. The physical sensation of hunger, the painful or uneasy sensation caused by a lack of food, manifests heterogeneously across persons, but it can be subjectively, reliably reported. There are physiological correlates, involving emptying of food and nutrients from the stomach and upper intestine, established in the physiological and clinical nutrition literature. Therefore, a key to measuring hunger is to identify conditions that result in below-normal food intake. Children and adults differ physiologically. For example, the liver—where energy is stored largely for immediate use—has a different size relative to overall body size so that children have to eat more often or become hungry more quickly.

For all these reasons, accurately measuring child hunger is very important.

Quality of diet is extremely important because everyone, at all income levels, should eat five servings of fruits and vegetables a day. Mark and Gary are developing a scale that we can use to address quality of diet.

Finally, child obesity is a major problem in the U.S. population. Bill Dietz has raised two principles or hypotheses that might be addressed in future research using the scale. First, to prevent children from feeling hunger, a family might rely on a few low-cost foods that are also high-fat foods. Fat is a way to make the foods palatable, and low-cost foods besides beans and rice tend to be prepared with high-fat content. The second hypothesis involves weight cycling. Food insecurity may be periodic, occurring, say, in the last week of the month when food security is low. After a family gets its food stamps, or its pay, it eats fairly well for a while. Over time this eating cycle contributes to weight cycling, and Dietz observed that during the feast part of the cycle, children can gain more weight that becomes ever harder to lose. The difficulties of physical activity among low-income families, especially in metro areas, compounds those of weight-cycling. Childhood obesity may be a result.

Luncheon Address:

What Can Be Learned From Past Research on Measuring Poverty, Material Hardship, and Child Development Outcomes?

Susan E. Mayer

When I first heard about the efforts to develop a measure of food security, I was skeptical. But I have been impressed by the effort to conceptualize and measure food security. I was asked to reflect on lessons we can learn about the measure of food security from our experiences, with other measures of important social phenomena. Rather than focusing on technical issues, I will focus on how the food security measure is likely to be used and interpreted.

As measured, food security is mainly a measure of relative, not absolute, food insufficiency. This is in contrast with many other important measures of social phenomena, including the official poverty measure and measures of housing adequacy, which are at least intended to measure absolute deprivation. For example, the official poverty line is supposed to measure a constant level of purchasing power or a constant living standard over time. It is changed annually only for changes in prices, not changes in tastes or distance from the average living standard. Thus in principle, the United States could eradicate poverty by raising mean income (so long as inequality did not increase at the same time).

Some people think that we should have a relative measure of poverty, one that reflects changes in tastes and norms, because they think that both absolute and relative deprivation affect people. Others are content with the concept of absolute poverty, but they think that the way we measure absolute poverty is all wrong. And some people propose something in between: an absolute measure periodically updated to reflect changes in needs and tastes and spending patterns.

The food security measure differs from an absolute measure of this sort. It is relative in three ways. First, it is relative in its intent. Food security specifically includes "an assured ability to acquire acceptable foods," not just any foods, and in "socially acceptable ways," not just any old way.

Second, many of the questions that make up the food security scale are about deviations from expected or normal food intake patterns. This means that the deprivation measured by the scale changes as normal or expected food intake patterns change. For example, a couple of the components depend on respondents' ideas about what a balanced meal is, or their ideas about how much they ought to eat.

In fact, Americans' ideas about what people ought to eat have changed a great deal over time. In her book, *American Living Standards*, Clare Brown tells us that in 1918 the typical breakfast consisted of two homemade muffins, biscuits, or pancakes; two slices of bread with butter; 6 ounces of milk; 6 to 12 ounces of coffee for adults; oatmeal or two eggs for adults; and bacon or sausage for the men but not for the women. If this were the prevailing idea of a normal breakfast today, many people could not afford it. I have no idea what most people think of as a normal breakfast today, and I do not know if expectations vary by income. I doubt that normal food-eating patterns correspond to what nutritionists recommend or even on what they consider minimally adequate diets, because so many people do not get all the recommended nutrients on a regular basis. But, without some idea of what a normal diet is, it is difficult to know whether deviations from normal are likely to be harmful.

In a recent *New York Times* article, a low-income mother laments that she could not buy her children Nike shoes and Gap clothes, that this made her depressed and she, therefore, stole money from her employer, which landed her in jail. Her kids then had to go live with their grandmother. I do not mean to malign this particular mother. I am sure her circumstances were more complex than the article suggests. But few Americans would have much sympathy for someone because she could not buy their children Nikes or clothes at the Gap, even if that is normal in some places.

The fact that food insecurity emphasizes deviations from normal eating patterns also means that a homemaker who manages to consistently provide low-quality meals so she can avoid cutting back or have her family go without food may appear to provide more food security than a less competent homemaker who spends more on food but doesn't make it last, even when their families' food intake is identical. Because food security depends to a large extent on deviations from normal food intake patterns and not on the nutritional value of the overall diet, families with more inconsistent lifestyles are likely to have more food insecurity.

Third, the food security measure is relative because the seriousness of food insecurity depends on the prevailing food-intake patterns. When most families consume a low level of nutrients and calories, cutting back on food consumption is quite serious. When most families have an abundance of food and overeating is the most serious nutrition problem, cutting back on food consumption is a less serious problem. As countries get richer and normally eat higher quality diets, the deviations from normal become less severe, even if the deviations do not change in frequency.

According to Clare Brown's 1935 book, among low-income groups, 90 percent consumed too little calcium, over 80 percent consumed too little iron, over 80 percent consumed too little vitamin A, over 60 percent consumed too little vitamin B-1, and 75 percent consumed too little vitamin C. These and other deficiencies arose not mainly because families skipped meals or went a day without eating, but because their overall diets were woefully inadequate.

Today, as in 1935, there are important differences in the degree of food security between rich and poor Americans. One of the background papers alluded to this morning used the one-question measure of food insecurity to classify households as food insufficient or food sufficient. Food-insufficient households consumed 20 percent less vitamin C, 20 percent less iron, 12 percent less phosphorus, and 15 percent less thiamin than food-sufficient households. But both groups consumed over 100 percent of these nutrients. The food-insufficient group also got less vitamin E, B-6, magnesium, and zinc than the food-sufficient group. But neither group got 100 percent of these nutrients. The absolute intake of the nutrients matters as much as the difference between the groups. The normal diet for food-insecure people today is probably superior to the normal diet of even food-secure people in 1935.

Other questions that are part of the food security scale have this same quality. For example, the seriousness of a positive response to "Did you ever eat less than you should because there was not enough money for food?" depends on the steady-state diet, which changes as countries get richer or as norms about adequate diets change.

I want to now turn to how people are likely to understand the measure of food security. Constructed measures that tap a concept, such as food security, for which most people have no clear intuition, can often take on a peculiar meaning. Constructed measures of concepts for which people do have a clear intuition also can be misinterpreted if the measure does not correspond with people's intuition. I think that is the case with, for example, measures of price changes. Everyone knows what a price change is—inflation is when things get more expensive. Yet measuring the exact amount of inflation is very difficult. The Consumer Price Index does not measure the everyday understanding of a price increase, yet that is what most people think it measures.

In classes, when I ask my students what they think to be poor means, they overstate the amount of material deprivation associated with poverty. They also tend to think of poverty as static—that is, as the same people being poor year after year. They tend to have two visions of poverty. One is the poverty in high-rise public housing and the second is rural shacks. These preconceptions about poverty, not its true nature, influence the political debate over what to do about the poor. Similarly, the popular view of food security or hunger, not the careful and narrow meaning that USDA gives it, will influence

the political debate over what to do about food security.

USDA has done, I think, a careful job of saying exactly what it means by food insecurity and hunger. And as long as those who use the measure are careful researchers and policymakers, the scope for misunderstanding seems modest. But the measure is bound to be used by more than the few who understand it.

The food security measure actually combines one concept for which people have a lot of intuition, hunger, and one for which they have little intuition, food security. I wondered whether the way the USDA defines hunger corresponds with how Americans will interpret the measure of hunger. So I chose a sentence from Andrews, Bickel, and Carlson's article in the *Family Economics and Nutrition Review*,[7] which I thought was carefully worded to convey a precise message and exactly the kind of message one might put in a press release. The statement is "There were 4.16 million households in which one or more person experienced some form of hunger in the 12-month period preceding April 1995."

First, I read this statement to eight people from the University of Chicago. This is admittedly a very small sample. I then asked each person what he or she thought hunger meant. All eight agreed that hunger meant that a person could not afford to buy food for some period of time. But they disagreed about what that length of time was. Most thought it meant that to be hungry a person had to go without food for more than a day because, as one person put it, "Going without food for a day won't hurt many Americans."

Some thought to be hungry, a person had to go without food for at least a day several times over some period like a year. Only one person thought there had to be some physical harm related to not eating for someone to be hungry. All in all, this seemed to me pretty consistent with the spirit of the USDA meaning of hunger.

Next I asked a different set of people not what they thought hunger meant, but what they thought the statement meant. These four replies capture the spirit of the responses:

"I do not get what you mean by a household being hungry. Aren't people hungry?"

"There are at least four million hungry people in the United States. No, even more than that because these are households."

"Does that mean that 4 million people were hungry for a day or 4 million on some day?"

"Well, it means just what it says. Four million Americans are hungry on any day . . . . Can that be right?"

Well, of course, it is not true and I will come back to that.

I also wanted to see how people would report a statement like this if they had, say, read it in the *New York Times,* then went to work and told a colleague who told another colleague. In other words, I wanted to see how this kind of statement would get translated in the conversations of people. I read the statement to two people, asked them to tell another person what I had said, then to ask that person to tell yet another person, who would then come tell me what they had heard. Thus, I got two responses. The first was "One person in 4 million is hungry on any day in the United States." The second was "On any day in 1994, over 4 million Americans went hungry."

The way food security is measured does not allow a very precise estimate of how many people are hungry on a day. But we can estimate that if there are 4.16 million households with two people who are hungry for a total of 3 days each per year (for a total of 6 hunger days), this averages about 70,000 people who are hungry on any 1 day. The actual number could be double that or half that, but I am pretty sure that 4.16 million people are not hungry on any day.

[7] Andrews, Margaret, Gary Bickel, and Steven Carlson. "Household Food Security in the United States in 1995: Results from the Food Security Measurement Project," *Family Economics and Nutrition Review*. Vol. 11. pp. 17-28. 1998.

The lesson is that the more you can express a measure in terms of how people actually think, the more likely they are to understand it. People think of hunger as an attribute of individuals, not households. If you said in 1995, X million parents reported that their child went a whole day without eating because the family couldn't afford food, almost everyone would understand what it meant. The idea that someone was hungry some time over some period is not very intuitive to people, so they are likely to misinterpret a measure of that concept.

Thus, there could be a public relations problem in the way the food security measure is used that might cause misunderstandings about the amount of hunger and food insecurity in the United States.

Not only is the measure of food security likely to be misinterpreted, it is also likely to be misused just as the poverty rate and other measures have been misused. A couple of potential misuses make me nervous. The first is using the food security measure as though it were a more general measure of economic distress. I have already seen a couple of papers that do this. It is very important to be clear that a measure of food security tells you only about food security. It does not tell you about overall economic distress or material hardship. Imagine two families who are equally well off. One skips meals to be able to pay the rent. The other fails to pay the rent so that all the family members get all their meals. If we only looked at food insecurity, we might think that the first family was worse off than the second.

The point is that if we want to know how many people are hungry, we cannot infer it from how many are poor. That is exactly why so much effort went into developing this measure of food security. But it is also the case that if we want to know how many are poor or economically distressed, we cannot infer it from the food security measure.

If we really want to measure economic well-being, material well-being, or living standards, we would need to put our minds to doing just that.

Using the food security measure to assess progress in the Food Stamp Program is also likely to cause problems. First, it is hard to imagine that food stamps will further reduce the overall incidence of food insecurity. It appears that only about half of the households reporting food insecurity are close enough to the poverty line to get food stamps. And many households below the poverty line who report food insecurity are already getting food stamps. Furthermore, food stamps are basically an income transfer and many of the causes of food insecurity seem to be related to things other than income. For example, holding poverty status constant, food insecurity declines with age, is lower for Asians and Pacific Islanders than for other races, and is greater for families with children than for families without children. This implies that learning to manage a budget and to prepare food, having lots of time, and having some types of food preferences rather than others are related to food security. Food stamps can hardly be expected to change these factors.

Finally, it is not clear that, in the current political climate, success in reducing food insecurity with government programs will be viewed as success at all. The definition of appetite in the *Devil's Dictionary* is "Appetite is an instinct thoughtfully implanted by providence as a solution to the labor problem." This definition seems to correspond to current views.

This brings me to my final point and that is that politics matters. Virtually no one thinks that the official poverty line is right, and there is considerable consensus about how it could be changed for the better. Yet no changes are on the horizon. The Consumer Price Index almost surely overstates changes in prices. The technical issues associated with measuring inflation are complicated, but still changes are slow to come. The reluctance to change these measures comes from the fact that both have great political prominence. This prominence is a sign of their success; unsuccessful measures do not get political attention.

By all indications, the food security measure is already becoming successful, at least in the sense

that it gets a lot of attention. It will, no doubt, also become politicized. Once it is, it will have a life of its own. If you think people at the University of Chicago misinterpreted the hunger-prevalence sentence that I read you, that is nothing compared with how it will be misinterpreted on the floor of Congress. The measure will end up misused and abused. No one will like it and no one will want to change it. Once politicized, all the careful planning and framing of the idea of food security will be lost. Politicians and advocates will change the meanings of food security to serve their agendas. Some will claim it understates hunger and food insecurity. Others will swear it counts too many. Half will scoff at the measure without having any idea how it is created. The other half will use it as though it had no limitations. Academics will find every flaw. Meetings will be held, conferences convened, task forces organized, and recommendations made. And the measure will endure. No critique will be enough to get it changed.

Now this is perhaps yet another way that appetite resolves the labor problem. It means that we are all secure in our jobs. It also means that we will have yet another occasion to meet for lunch, I am sure.

Session III: Food Security Measurement Applications

Food Insecurity Findings From the 1997 Child Development Supplement to the Panel Study of Income Dynamics

Lori Reid

I have become interested in child well-being because human capital affects labor market outcomes. Factors that create differences in adults may start among children. My project examines the effect of food insecurity on some aspects of child well-being. I look at indicators of child health, school achievement, and behavior problems in school.

As many people have already mentioned today, health may be an important outcome from experiences with food insecurity. I am also interested in consequences that may occur for the schooling experiences of children. Child health problems may have consequences for school achievement, and there may be some other mechanisms in between. In particular, even if children are not experiencing health problems, if they are experiencing the sensation of hunger in school, they may be distracted from learning and learn less. In addition, the stress that occurs within families experiencing food insecurity may have an effect on a child's ability to learn in school as well. These are some effects or consequences we might see as a result of food insecurity.

I cannot tell you much about those outcomes today since the data I am using were assembled in just the past couple of weeks. Instead, I am going to give very preliminary results focusing on the first part of this model.

I am using the 1997 Child Development Supplement to the Panel Study of Income Dynamics. It is a nationally representative sample of children ages zero to 12 and their households. The Child Development Supplement includes age-rated assessments of the cognitive, behavioral, and health status of just under 3,600 children. The Child Development Supplement included the 18 items on the CPS. I used these items to construct the food security scale, and then also the food security status measure.

I also use the 1994 through 1996 survey waves of the Panel Study of Income Dynamics itself to provide background information on children's families. I can get information on the family income, family structure, parental education, and other background variables.

The prevalence of food insecurity among children zero to 12 years old in the sample is quite close to the figure presented for households in general for 1995: just a little over 12 percent of all children zero to 12 years of age live in households that experience some level of food insecurity. About 3 percent of children experience a more severe level of food insecurity.

White/non-Hispanic children experience the lowest levels of food insecurity, about 6.5 percent, while Native American and Hispanic children experience the highest levels with about 36 percent of Native American children and about 28 percent of Hispanic children experiencing some level of food insecurity. About 22.5 percent of Asian or Pacific Islander children experience some level of food insecurity, compared with about 15 percent of African American children.

Next, I introduce a simple division of households into those at or below the poverty line versus those above the poverty line. So what we see here is a very strong relationship between poverty status in 1997 and household food insecurity. About 27 percent of children in households at or below the poverty line experience some level of food insecurity, compared with just under 9 percent of children in households above the poverty line. Although there is a strong correlation here, it is not a one-to-one correlation. This suggests that knowing the poverty status of children will not help us identify with a great degree of accuracy which children are likely to experience food

insecurity. If we were to use measures of income or poverty status, we would miss some food insecure among those who are not below the poverty line. This supports the notion that it is much better to have direct indicators of material hardship such as food insecurity as opposed to relying on indicators of income or poverty.

Next, I look at a very preliminary model of what factors are important in explaining why some children experience food insecurity. I am using a measure of wealth in 1994 because that is the latest measure available on the PSID. Family structure variables measure the percentage of a child's life spent in various types of family structures, for example, a two-parent family, a never-married father, never-married mother, *et cetera*. I wish to see whether any of these factors are an important influence on determining a child's level of severity of food insecurity over and above the effect of the income measure. Homeownership has an effect, as does mother's education. Children who spend greater proportions of their life in any kind of single-female household experience greater levels of food insecurity.

Some important factors are missing here, such as regional difference in prices of food and housing and other such things. I plan to add them later. Other factors include transportation issues or other sorts of financial constraints.

To sum up this preliminary work, using results from a nationally representative sample of children lends support to the idea that it is important to measure and analyze food insecurity directly rather than indirectly through measures of income and poverty, which supports a theme of this conference.

Discussion

Cheryl Wehler

The proposed research sounds promising, and I look forward to hearing more about your analyses, especially the multivariate analyses of predictors and consequences of food insecurity. Your preliminary findings on predictors are for the most part expected. I was initially concerned that we did not see a correlation with income. But it was not a step-wise regression. There were many other variables that co-vary with income and so you lost the significance. These results are similar to what we have seen in other data sets.

As we heard this morning, a child measure is being developed. It may be available when you conduct your analyses on the consequences of food security on the cognitive, behavioral, and health status of children. I encourage you to use that measure of children's hunger in addition to the household hunger measure.

It may also be useful to create a type of children-to-adult ratio variable, given your preliminary results on household size and percentage of life spent in a female-headed household.

I do have a few concerns about Lori's work and my own work. When we use a 12-month measure of hunger and we are studying the health and behavioral consequences of hunger, we have almost no way yet to know whether a child has been hungry 70 days out of the last year or 1 day out of the last year. And then we try to ascribe the consequences in terms of their negative health outcomes or their developmental outcomes partially to this need deprivation. In my work, I am trying to think about the mediating versus the moderating role of hunger in terms of health status, school achievement, and development.

My colleagues, John Buckner and Ellen Bessick, had a model in which they were thinking that homelessness, another basic need, was a predictor of poor health and behavioral health outcomes. One of the things that we found in that data set was that it was not as important as mothers' distress level. If we used measures of mom's anxiety and depression, we actually understood children's behavioral health, current behavioral health consequences better.

Parenting practices, the child's history of physical abuse, life stressors such as foster care place-

ment, and a death of a close friend or relative were better predictors of the child's behavioral health than was homelessness. I caution us when we consider behavioral or health outcomes of food insecurity that we do not overstate our ability to make that connection. I am not convinced that we measure the severity of children's hunger.

Assessment of Food Insecurity Among Asians and Pacific Islanders

Joda P. Derrickson

This work was conducted jointly with Jennifer E. Anderson and Anne G. Fisher. We are indebted to Dr. Gary Bickel for support and assistance in designing this project.

The underlying purpose of our work has been to determine whether the instrument used to assess household food security in the United States, the Core Food Security Module (CFSM), is a reliable and valid instrument to use in Hawaii, where at least 50 percent of the population is of Asian or Pacific Islander descent. This presentation focuses on our preliminary findings as of February 1999. All our data were collected in Hawaii. The question "Which ethnic group do you identify with most?" was used to assess ethnicity in each study. The ethnic groups of focus were Caucasians, Hawaiians and part-Hawaiians, Filipinos, and Samoans from American Samoa.

Sixty-one charitable food recipients completed a total of nine focus groups, with at least two focus groups within each ethnic group under study. Responses confirmed the operational framework or conceptual basis of the CFSM for each ethnic group studied. Question 4, "We couldn't afford to eat balanced meals," posed problems. Respondents predominantly described a balanced meal as one with meat, starch, and vegetables—but not fruit and not dairy products.

The publication *Household Food Insecurity in the United States: Guide to Implementing the Core Food Security Module*[8] was used to guide data collection. For stability testing, a convenience sample of 77 charitable food recipients was chosen. Sixty-one, that is, 79 percent, completed the survey again over the phone 10 to 14 days later. For scale assessment, a total sample size of 1,664, that included a population sample and samples of food pantry recipients was chosen. Data from 362 respondents who responded affirmatively to one or more indicators were available for the CFSM scale measure assessment. Fifty-five percent were of Asian or Pacific Islander descent. Scale validation was confirmed through item calibration and goodness of fit statistics, using the FACETS Rasch computer program.

Overall, the Hawaii data exhibited a similar scale when compared with the 1995 USDA CFSM data.[9] Most importantly, the Hawaii and USDA scales had significant gaps in food indicators used to differentiate the food secure from the food insecure.

Goodness-of-fit of each indicator was assessed. We found that questions 8 and 8a "adults cut the size or skip meals/often" were redundant, and that question 4, "unable to eat balanced meals," and question 2, "worried food would run out," did not fit well. Similar item fits were noted in USDA's original work.[10]

The overall rate of item misfit for all measurable responses was 4.1 percent, less than 5 percent, which is commonly found acceptable. However, in question 4 "balanced meals" had a 6.7-percent misfit.

Seventeen respondents, that is, 4.7 percent, were misfits. Each had two or more responses that were quite different than expected. Although there were no apparent differences in fit by site of the sample or by household type, 5 of the 17 misfitting persons were Samoan.

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[8]Price, Cristofer, William L. Hamilton, and John T. Cook. *Household Food Insecurity in the United States: Guide to Implementing the Core Food Security Module.* U.S. Department of Agriculture, Food and Consumer Service (currently the Food and Nutrition Service), Office of Analysis and Evalution. Alexandria, VA. 1997.

[9]Hamilton, William L., John T. Cook, William W. Thompson, Lawrence F. Buron, Edward A. Frongillo, Jr., Christine M. Olson, and Cheryl A. Wehler. *Household Food Security in the United States in 1995: Technical Report of the Food Security Measurement Project.* U.S. Department of Agriculture, Food and Consumer Service (currently the Food and Nutrition Service), Office of Analysis and Evaluation. Alexandria, VA. 1997. p. 42.

[10]Hamilton, William L., John T. Cook, William W. Thompson, Lawrence F. Buron, Edward A. Frongillo, Jr., Christine M. Olson, and Cheryl A. Wehler. *Household Food Security in the United States in 1995: Technical Report of the Food Security Measurement Project*. U.S. Department of Agriculture, Food and Consumer Service (currently the Food and Nutrition Service), Office of Analysis and Evaluation. Alexandria, VA. 1997. p. 21.

USDA researchers interested in measurement of hunger among individuals developed the Individual-Level Core Food Security Module (ICFSM) (see next page). It consists of the original 18 CFSM questions, 10 questions asked to assess the extent of hunger among the individual respondent or an individual child; and 3 additional "follow-up" questions asked in an attempt to improve the scale, that is, questions 9a, 10a, and 14a. Despite a total sample size of over 1,600, item fit of the ICFSM items could not be adequately assessed. Interviewers found these new questions to be threatening and demeaning to the respondents, particularly the whole series of questions about hunger among children. Completion of the entire instrument took up to 15 minutes and emotionally drained interviewers. We also found that questions 9a, 10a, and 14a, asked in an attempt to improve the scale, had item calibrations similar to current indicators, and therefore did not assist in filling the gaps in the scale.

The CFSM and ICFSM appear reasonably stable over time. Correlations between items over time were all statistically significant or approached significance ($p = 0.05$) except for items with an inadequate number of responses. The correlation coefficient between scale measures over time was 0.75.

According to the CFSM categorical measure, three or more affirmative responses are required for classification as food insecure. We found what appeared to be a consistent categorization over time ($X2$, $F = 68.6$, $p = 0.006$). Each time, about a quarter of the sample was defined as food secure (25 and 26 percent). However, of the 27 households classified as food insecure at time one, only 16, in other words, 59 percent, were consistently classified as food insecure at time two.

We found that the set of six questions suggested by NCHS experts—questions 3, 4, 8, 8a, 9, and 10—did not meet Rasch criteria for a scale; questions 3 and 4 did not fit well, while questions 8 and 8a were redundant. We found an alternative six-question scale consisting of question 3, "food bought didn't last"; question 4, "balanced meals"; question 9, "respondent ate less than should"; question 10, "respondent hungry"; question 12, "adults did not eat for a whole day"; and question 14, "children hungry" to fit much better with our data. The correlation coefficient between this revised 6-question scale measure and CFSM 18-question scale measure was 0.87.

In summary, our preliminary findings suggest that: (1) the CFSM is a valid and stable instrument for use among Asian and Pacific Islanders in Hawaii, except possibly with American Samoans, with whom additional research is needed; (2) the question pertaining to consumption of balanced meals is not well understood in Hawaii; (3) use of the 6-item food insecurity scale did not fit data from Hawaii; and (4) the ICFSM may place an unfair burden on respondents and interviewers.

These findings lead us to recommend that: (1) prior to any conclusions regarding the robustness of the CFSM, research should be conducted with other ethnic groups; (2) additional food insecurity indicators should be tested to fill gaps found in the item calibration of indicators and to more accurately and consistently classify the food secure from the food insecure; (3) the individual-level indicators should not be added to the CFSM; (4) wording of the "balanced meal questions" should be revised; and (5) the CFSM measure and NCHS subset of six indicators should be reassessed.

Discussion

Donald Rose

I congratulate Joda Derrickson on her presentation. I think since the last food security conference, Dave Smallwood and I and others at ERS have wondered how some of these questions would fare among different ethnic groups. A number of the questions on the survey instrument originated from research done among the rural white population in upstate New York. There was the question of how they would do in a population of urban African Americans, or Latinos, or Asians and Pacific Islanders. I think Joda has answered that latter question.

Individual-Level Core Food Security Module (CFSM, individual and additional items)

Indicator type	Essence of Indicators: In the last 12 months. (Question)…because there wasn't enough money for food/couldn't afford it?
CFSM	2. Worried about whether food would run out, etc.[a, b]
CFSM	3. The food we bought just didn't last and we didn't have money to get more.[b]
CFSM	4. We couldn't afford to eat balanced meals.[b]
CFSM	5. We relied on only a few kinds of low-cost foods to feed our children.[b]
CFSM	6. We couldn't feed our children a balanced meal.[b]
CFSM	7. Children were not eating enough because couldn't afford enough food.[b]
CFSM	8. Any adult in household ever cut the size of meal or skip meals?[c]
CFSM	8a. How often?[d]
Individual	8I. Did you ever cut size of your meals or skip means?[c]
Individual	8Ia. How often?[d]
CFSM	9. Did you ever eat less than you felt you should?[c]
Additional	9a. How often?[d]
CFSM	10. Were you ever hungry but didn't eat?[c]
Additional	10a. How often?[d]
CFSM	11. Did you lose weight?[c]
CFSM	12. Any adult ever not eat for a whole day?[c]
CFSM	12a. How often?[d]
Individual	12I. Did you ever not eat for a whole day?[c]
Individual	12Ia. How often?[d]
CFSM	13. Did you ever cut the size of any of your children's meals?[c]
Individual	13I. For child with most recent birthday. Did you ever have to cut the size of this child's meals?[d]
CFSM	14. Were the children ever hungry, but you could not afford more food?[c]
Additional	14a. How often?[d]
Individual	14I. For child with most recent birthday was he/she ever hungry?[c]
Individual	14Ia. How often?[d]
CFSM	15. Did your children ever skip meals?[c]
CFSM	15a. How often? Three or more months.[d]
Individual	15I. For child with most recent birthday did he/she ever skip meals?[c]
Individual	15Ia. How often?[d]
CFSM	16. Did any child ever not eat for a whole day?[c]
Individual	16I. For child with most recent birthday, did he/she ever not eat for a whole day?[c]

Notes:

a. USDA, 1998. The four-part food insufficiency question, which was item number 1, is not part of the CFSM, but is the first question used for screening households: Which of these statements best describes the food eaten in your household in the last 12 months, that is, since July 1997? (1) We always have enough and the kinds of foods we wanted; (2) We have enough to eat but not always the kinds of foods wanted; (3) Sometimes we don't have enough to eat; or (4) Often we don't have enough.

b. Affirmative responses are "often true" or "sometimes true," a negative response is "never true."

c. An affirmative response was "yes."

d. An affirmative response was "almost every month" or "some months but not every month." A negative response was "in only 1 or 2 months."

Nonetheless, it would be interesting to see more detail on the samples used in the study. What percentage of each ethnic group comprised those samples? I would like to see more on the focus groups. How were they conducted? How did respondents view hunger and food insecurity in their own words? That sort of qualitative information, I think, is invaluable, and it is the kind of thing that we cannot get in office buildings in Washington. Another possible research topic is to compare what was found in your work with the Asian and Pacific Islander population to the CPS data set. Now, you mentioned that there was only 2 percent, but perhaps you could pool the '95, '96, and '97 surveys.

Joda recommended that we eliminate individual-level questions. In part because of the burden on respondents and interviewers, I think that is really important. Besides the burden on respondents, it could jeopardize the whole rest of the information that we gather on the household measure.

I am not against individual-level measures. I think it might make more sense to put individual-level questions on a nutrition and health survey in which the unit of analysis is the individual. I think that it would not be a good idea to add individual-level questions to the food security module on the CPS. I think CPS has historically provided information on economic conditions and labor force participation, and that by keeping it at a household level, we continue that economic focus.

Joda also mentioned a number of other changes, such as changing the balanced food question and changing the algorithms. As we see this research blossom, we are going to see a number of suggestions about how to improve our measurement technology. There is a tension between making improvements in this technology and losing the ability to monitor change over time, which was the initial purpose of this whole endeavor.

I would suggest that we have a balanced approach. Perhaps we use the same measurement tool and analysis techniques for a while, as we gather more information on how to improve the technology. Then at some point maybe 3, 5, or 10 years down the road, people can make a judgment call and we can institute a number of those changes at once. Thereafter, we can still get a sense for how things change over time. At the point where we make the changes, we do a bridging study in which we look in depth at how the differences go, one rotation group versus another. That would give us a chance to maintain this focus of being able to monitor changes over time across the two types of measures.

Contextual and Dietary Factors Associated With Reported Food Insecurity Among a Sample of Canadian Women Using Food Banks

Valerie Tarasuk

The data and analysis are derived from a larger study of dietary adequacy and food insecurity among a sample of women and families using food banks in metropolitan Toronto. In Canada, the term "food banks" refers to *ad hoc* community-based charitable food assistance programs. They are a hybrid between U.S. models of food banks and food pantries. In Canada, food bank usage is considered to be the primary indicator of food insecurity. We see the use of these programs as part of the problem and not at all a solution, unlike the conceptual framework I heard articulated today.

The study recruited women age 19 to 49 seeking emergency food assistance. To be included, they had to have at least one child under the age of 15 living with them, to have used a food bank at least once in the previous 12 months, and have enough English for oral interviews. Less than 10 percent of eligible women refused to participate. Each participant had three interviews, 95 percent of which were conducted within a 30-day window. At each interview, we conducted a 24-hour dietary intake recall, using standardized methods developed by Health Canada and portion-size models to prompt recalls. At interview 1, we weighed and measured the women. At interview 3, we administered the USDA food security module, which I knew about because I had the good fortune to be at the 1994 conference. I used the full 53 questions of the draft instrument, with some modifications for the Canadian context.

We decided to omit, in interview 3, the question about perceived weight loss, an item that turned out to be part of the 18-item scale.

Of the 153 participants, 65 percent were sole-support mothers, about 90 percent had household income less than two-thirds of the Canadian poverty line, most received social assistance, only 18 were working outside the home, and only one had a full-time job.

The food security status measures used the scaling methods developed by Hamilton and colleagues. With the 12-month scale, 94 percent were food insecure and about 70 percent were classified as food insecure with moderate or severe hunger. With the 30-day scale, about 57 percent were classified as food insecure with moderate or severe hunger.

We did not find relationships between poverty scores and food insecurity, perhaps because so many of the households were poor. I turn next from the question "Who is food insecure?" to "What can we learn from our data about predictors of severity or consequences of severity?"

We asked each participant about strategies for coping with running out of food and lacking money to buy more food. For example, essential goods and services can be foregone as a way to free-up money in times of threatened food deprivation. The empirical results showed that the odds of engaging in any one of these strategies are greater for someone who is also reporting household-level hunger in the 12-month period. These are not coping strategies, but rather indications that women are not coping.

For 105 women, we used an open-ended question to learn about precipitating events that lead to an experience of having little food and no money to buy more. Forty-two percent reported that money simply runs out at the end of the month—an answer that suggests a cyclical phenomenon. A few other people had a total interruption in the receipt of income. Another 24 percent of women said that they had to pay off debts such as accumulated utility bills. The most common unusual expense that depleted their resources for food was the cost of moving house. Most often, relocation followed eviction due to too many delays in rent payments. Another kind of unusual expense related to food deprivation was what I would think of as trivial expenses: the cost of a child's birthday or the cost of Christmas. For any one of these people, there are times when

essential goods and services are foregone to free-up money for food, and there are times when food is foregone to free-up money for other essential goods and services, precipitating experiences of absolute deprivation.

Dietary intake data collected within a 30-day window were compared with food security status on the 30-day scale. For energy and a number of nutrients, there were systematic intake differences across food security status, and many of those differences are significant. We reran these analyses controlling for energy by expressing nutrient intakes per 1,000 kilo-calories. Any differences evaporated, suggesting that observed differences of nutrient intakes by food security status are likely based on the amounts of food, not differences in food selection.

I ran simple linear regressions to relate energy or selected nutrients to hunger. Here, hunger is a dummy variable that combines those who experience moderate or severe hunger into one group; the other group consists of women who probably were food insecure but who did not report hunger. Other typical economic and socio-cultural independent variables were included in an adjusted model and excluded in an unadjusted model. In the adjusted model, the hunger effect was significant for energy and most nutrients. The coefficients in the unadjusted model differ little from the adjusted model, suggesting that the hunger effect is independent of the other variables in the model.

We also analyzed the ratio of energy intake to the estimated basal metabolic rate (BMR). Using Schofield's equation and data on a woman's age and weight, we calculated the basal metabolic rate. Next, we used work by Goldberg and colleagues who proposed that the expected relationship between usual energy intake and energy expenditure in a normal sedentary adult population should be 1.55. This factor recognizes that energy expenditure is influenced by the basal metabolic rate and physical activity levels. The factor can be adjusted for the number of days of intake data available. The nutrition literature frequently uses the energy-BMR ratio to identify whether there is under-reporting of intake; if you assume energy balance and if people report intakes lower than what one would estimate, they cannot be telling you the truth because they could not survive on those intakes. I did those calculations using Goldberg's equation, and the minimum expected ratio for this data set would be 1.04. Fifty-five percent of the women had ratios of energy intake, based on their 3-day intake means, that were less than 1.04 of their estimated basal metabolic rate. The odds of being below 1.04 were much higher for women who reported household food insecurity. We are loath to call this evidence of under-reporting given that there are many assumptions in the Goldberg comparison that are particularly problematic when applied to this group.

We also examined prevalences of inadequacy, using the probability approach. For the entire sample of 153 women, we adjusted the 3-day intake estimates to get an estimate of the distribution of usual intakes in the sample, using the work of the Iowa State group, adjusting for within-subject variation and one identified sequence effect. We compared the adjusted distributions with estimates of mean and standard deviation for requirements. We worked with the requirement estimates in use at Health Canada. The iron requirement was drawn from FAO/WHO work. We estimated fairly high prevalences of inadequacy for some nutrients, notably iron, vitamin A, folate, and protein. Taken together with our earlier work about the relationship between intake and household security status, we conclude that women's subjective appraisals of their household food security appear to be reflected in the adequacy of their diets, and that women in households reporting very severe levels of food insecurity appear to be at risk of inadequate nutrient intakes. In the short term, such inadequacy may not be a problem, but were the consumption levels reported here to be chronic, there would be reason to be concerned about these people's health.

To repeat the other conclusion, it is worrisome to dismiss a relationship between poverty and food insecurity, even though people do not get the expected relationships between income and household food security status based on these measures.

Discussion

Beth Osborne Daponte

Tarasuk compares the sample's 29 percent of clients who were food insecure with no hunger with those who were hungry. She finds that the hungry are nearly five times more likely to send a child to friend's or relative's for a meal, and three times more likely to give up services such as cable TV to cope with food insecurity. These results mirror what we found in Allegheny County in Pittsburgh, Pennsylvania.

The brief discussion that Valerie provides on the circumstances leading up to food shortages needs to be expanded. I found this material intriguing. Thirty-five percent of her sample attribute the food shortage to unusual expenses, which range from paying for a move to buying birthday presents. In a focus group of food pantry clients in Pittsburgh in 1992, we found that all of the nonelderly clients had medical debts that they were paying and they attributed these debts as the cause of their food pantry use.

How households budget their income and whether they have saved for a rainy day is central to understanding food pantry use and food insecurity.

In the version of the paper I received, Tarasuk asks very explicitly if food insecurity and financial insecurity are synonymous. Is a meticulous characterization of food insecurity the most efficient or effective means to assess financial insecurity?

Income, financial security, and food security are three distinct concepts. Many think that when a household's income is high, there is more room for error to make up for poor budgeting and savings behavior. There are credit markets available. However, apparently wealthy people also end up at food pantries. In my research, I am examining how a food pantry can exist in some very wealthy communities in Connecticut. Michelle Budwitz, the Community Relations Director at the Connecticut Food Bank, said it very succinctly: "When you make a lot you spend a lot." Thus, there is not a lot of room for error, after all, even among people who make a lot.

Food insecurity and use of food pantries are not functions only of absolutely low-income for a household. Indeed, the CPS results that Chris Hamilton presented show that 60 percent of households with incomes less than 50 percent of poverty are food secure.

In my opinion, household budgeting and the ability and willingness of persons in the household to cook from scratch determine whether the household reports itself as food insecure. We need to look at cooking behavior. Where they are shopping? How much time do they spend shopping, especially when grocery stores are closing in low-income neighborhoods? Many factors affect whether a household reports itself as food insecure.

I also think that understanding household budgeting and a household's taste for using outside assistance needs to be the next step on the research agenda.

Valerie's work reminds us that hunger and the community's response to it are international issues. What we see in Canada does not differ from what we see in Pittsburgh. Amartya Sen's work on famine shows hunger to be a function of a household's ability to command the resources necessary to purchase food. Similarly, food insecurity in industrialized countries is a function of managing the resources. Understanding household resource management will become more critical as people go from welfare to work and become ineligible for food stamps—and possibly ineligible for use of the food pantries, depending on the rules of a particular pantry. It will also become more critical as people have less time to prepare food. The resources that hunger researchers need to examine are income, access to inexpensive stores, and the time and skills to cook nutritious meals from scratch.

Session IV: Toward a Research Agenda: Establishing a Framework

Christopher S. Jencks

The food security measure under discussion at this conference is an impressive technical achievement. Five or 10 years ago, I would have doubted the feasibility of constructing a one-dimensional food security measure of this kind.

The questions in the CPS food security survey constitute something like a Guttman scale or, in the language of the summary report, *Household Food Security in the United States in 1995*,[11] "they more or less follow a modal pattern." That finding is important and useful, making the task before us easier. But if these items perfectly followed a modal pattern—if they were exactly a Guttman scale—then we would not need the full methodology of the food security scale. If the data perfectly fit the Guttman-scale model, then we could easily define and measure levels of food security by identifying what percentages of people answered the questions on each side of the scale's thresholds. We would not need to have anything more in our scale.

Simplicity would be a big advantage. Everybody would intuitively understand exactly what these categories meant. For instance, consider a household with no children. The question at the threshold of the severe hunger category asks, "Was there an adult in the household who went hungry for a whole day?" If the scale fit the Guttman model perfectly, then the number of households in which an adult went hungry for a whole day would exactly equal the number of households classified as suffering from severe hunger by the food security scale. But, of course, that is not exactly what happens.

The report shows on page 48 that among households with no elderly adults and no children, 1.2 percent are classified as having severe hunger. The report's appendix B-1 shows 2.1 percent of the same set of households contain an adult who went hungry for a day. Therefore, the number of households that answered yes to the adult hungry question—households that in some sense appear on the threshold of severe hunger—is almost twice the number of households actually classified as having severe hunger by the food security scale. The difference arises because some people who answered yes to the hunger question did not answer yes to some previous question, so they fell below the scale's threshold for hunger. There is nothing wrong with the logic by which this happens, but there is a problem nonetheless.

Suppose an advocacy group asks why it is that 2.1 percent of households say an adult was hungry for a whole day, but that only a little over half of those households were classified as having severe hunger. An average person might not be persuaded by the answer that the household was not really hungry because it did not answer some less stringent question about hunger positively. The intricacies of Rasch modeling are not easy to convey. Nor is it obvious that the underlying logic of the model really applies to hunger. Hunger is not an indicator of a latent trait called "food security." Hunger is hunger. It can have many causes, but that is another issue.

I suggest that we consider whether there are more transparent ways of making this information available. There is, obviously, always a trade-off between transparency and precision in measuring almost everything, but it would be productive to investigate whether there are simpler and clearer means of conveying the information captured by this scale. For example, the rule for classifying a household to the severe hunger category could be stated in terms of response patterns, that is, a requirement that the household answer positively two out of three questions near the current threshold. Does this requirement of two-out-of-three positives capture less information than the current scale score? If it does, then so be it. But if it does not, there is a huge advantage to pub-

[11] Hamilton, William L., John T. Cook, William W. Thompson, Lawrence F. Buron, Edward A. Frongillo, Jr., Christine M. Olson, and Cheryl A. Wehler. *Household Food Security in the United States in 1995: Summary Report of the Food Security Measurement Project*. U.S. Department of Agriculture, Food and Consumer Service (currently the Food and Nutrition Service), Office of Analysis and Evaluation. Alexandria, VA. 1997.

lishing information in a form that the average person can understand.

The methodology employed in developing the scale has three potential advantages. First, it can handle missing data, which is always a desirable property. However, there are almost no missing data, so this potential benefit solves a nonproblem.

A second problem that the scale solves is that it can rank households with and without children on a single scale. However, I believe it is a bad idea to combine those two groups. First, as a political matter, people think about these problems totally differently, so numbers ought to be produced separately for children and adults. Second, for households with children, it may be better to use the questions that focus on children, for reasons described in Mark Nord's paper presented earlier at this conference.

The third argument for the scale is that, in principle, it allows you to fix bad questions. I find that point much more compelling than the first two. That property is a big advantage of this method.

Now let me turn to a different issue, the length of time about which the question inquires. Earlier, I worried about advocates using the hungry adult question to argue that there is more hunger in America than the food security scale measures. But skeptics can also argue that there is less hunger than the scale implies. The length of the window of a survey has a huge effect on how many people turn out to suffer from a problem.

When the window is changed from a year to a month, my rough estimate from the Abt report is that prevalence falls by about half. If you cut the window to a day, it falls even more. Of the people who reported any hunger problem in the past month, between half and two-thirds reported more than 5 days of hunger. (I must stress those numbers are very imprecise.) The point is that the numbers can be either big or small, depending on what point you want to make and whether a day, a month, or a year is chosen as the window.

I do not offhand see any strong rationale for saying one of those windows is correct politically, nutritionally, or any other way, and that some other window is incorrect. It is certainly true that the 1-year estimates have much nicer statistical properties. However, statistical properties are not a sufficient argument in favor of a method. Using exclusively statistical arguments to select a question is like looking for the keys under the lamppost because that is where the light is. I do not know how you choose between these windows. My instinct is to report a range here to provide full information. It is problematic to report only the 1-year estimates and ignore the fact that most people who have a problem in a year did not have it last month, much less yesterday.

The results do have a troubling feature. As far as I could tell, the annual and monthly rates do not behave the way I intuitively expected. In the data, there are half as many people who had a problem last month as had it last year. I would have expected the people who had a problem last month to be a poorer subset of those who had the problem in the past year, because they would have had the problem in a larger percentage of months. But the 30-day estimates looked to me like those who had the problem in the past year.

My final issue is one that Susan Mayer raised at the conference's luncheon address. What can we tell from all this about the causes of food insecurity and hunger? The question is particularly critical if we want to think about the policy uses of this scale.

When examining the proportions of households with different income levels in the various hunger categories, ranging from food secure to severe hunger, we saw this morning that the results from the scale make sense. Poor people are at higher risk than rich people. On the other hand, it has been mentioned but not particularly stressed that even in the lowest income category, that is, people with incomes less than half the poverty line, the majority report no food insecu-

rity. A metaphor for this result is the half-full glass. To understand this process, we need to devote a lot more attention to the majority of low-resource families not reporting any food insecurity, and compare them with similar food insecure families.

One could hypothesize that hunger is at bottom purely a case of limited resources. The cause-and-effect chain is that income affects food expenditures and food expenditures affect food insecurity. This reasoning suggests that there should be a stronger relationship between what people spend on food and food insecurity than between income and food insecurity. But in fact the statistical results are exactly the opposite. The correlation between income and food security is 0.32, so income explains about 10 percent of the variance in food security, leaving 90 percent unexplained. The income measure is not ideal, and we know 30 percent of the variance in the food security measure is noise. So perhaps 20 percent instead of 10 percent of the variance in food security is related to income. Using grocery budgets instead of income, the reported correlations are down near 0.1.

These results mean that food insecurity is not confined to people who normally spend very little on food. At one level, this makes perfectly good sense. Other people have said that food insecurity results from some kind of deviation from usual weekly spending. Deviations occur when a household's patterns of life are disrupted in some way, and the household has no income to deal with the change in the situation. The data certainly suggest that substantial numbers of households report food security problems, even though they have quite high levels of grocery spending per capita, say $40 per person, which comes close to the grocery expenditure of some people in this room.

These results invite a question about the kinds of instability or unpredictability or management failures that these households experience. Several papers talked about the possibility of a sudden drop in income. The evidence is fairly strong that income drops do play a role. It also appears that food spending adjusts much more quickly to current income than almost any other form of major expenditure. To use an extreme example to illustrate the process, candy bars probably adjust even faster than total food spending to changes in current income. In contrast to relatively fixed, slowly adjusting items such as housing and automobiles, people run out of food at the end of the month. The simple statement that people run out of food at the end of the month means that those who run out are adjusting their grocery expenditure not to their monthly budget but to their weekly or daily budget.

The issue of instability and unpredictability relates to demographic results. Holding income constant, older households are less likely to be food insecure or, indeed, to suffer from any given material hardship that I have ever examined. Older people regulate their affairs in much more predictable ways than do younger people. Everybody in this room who has a child will know that this is the case. My teenage son at college has an ample budget and has eaten four meals on some days, but then on others has skipped meals—just like everybody he knows at college. We think a responsible parent should plan ahead and budget until the end of the month. But that does not always happen. Lots of us had shorter time horizons at 25 than at 60.

Let me summarize. First, we need to consider whether there are ways to distill more transparent measures out of this set of questions. Second, we need to remember the older traditions of thinking about nutrition, traditions which placed somewhat less emphasis on pure economic constraints and somewhat more emphasis on what people know, how they plan, and why they make the choices they do. Work done on this project and the work that I did, have neglected these other factors. We need to think about not just the 10 percent of the food security variance explained by income but also the 90 percent that is not.

Angus S. Deaton

Like Sandy Jencks, I was not previously familiar with food security. And although there are clearly a lot of economists here, the topic is unfamiliar to many mainstream economists. I also want to

repeat Sandy in saying that I see an astonishingly impressive research program. In the work that I do, I will be thinking about these methodologies on difficult topics like hunger and poverty.

Many speakers said today that there has been real progress in deriving feasible, useful, and relatively cheap-to-collect measures of food insecurity and, possibly, of hunger. From an outside perspective, though, typical economists—and I suspect that I am here to represent them—might be skeptical about or possibly uninterested in these measures, and it is worth trying to understand why this might be so.

The first issue is welfare measurement. Economists do measure household welfare at a general level and think about poverty and deprivation. But they do not usually look directly at hunger. Instead, economists typically think of poverty in terms of low income or low expenditure. The official U.S. poverty guidelines, even with their many problems, work from this broad idea of resources, and this would be the typical approach among economists. They would not focus on particular areas of deprivation such as food, housing, or clothing. Poverty is low income or low expenditure, not a low intake of food *per se*, or being poorly housed or poorly clothed.

At lunch, Susan noted that components of welfare can be misleading because different people have different choices, and these choices might be driven by relative prices or just by preferences. Many people in India fast regularly, which economists would classify as having to do with preferences. The food security questions do stipulate that the household's problems are due to a lack of money, and so they seem to exclude fasting as a motive. On the other hand, someone who is fasting might still answer the hunger questions affirmatively, that is, that the food intake reduction is due to the lack of money. After all, not fasting certainly has financial implications.

When economists move away from their traditional, money-based measures of living standards, they tend to look not at hunger but at broader measures of health status—for example, using mortality data for populations—or at education for populations or individuals. Of course, food adequacy and nutrition contribute toward general health status, and for that reason, the food security and hunger measures would be of interest.

Even so, ideas about hunger are closely woven into most people's notion about poverty. The official U.S. poverty line was originally derived from a food standard, or at least that is the rhetoric if not the reality. Hunger and poverty seem inextricably tied to one another—at least at first glance. But even though an ideal measure of poverty can hardly be based on food alone, the language about food and hunger is part of poverty measurement, and that language is tremendously important in the United States and around the world. When people are asked about poverty, they start thinking about hunger, and I am not sure we can or should break that connection. The difficulty of separating hunger and poverty precludes easily declaring some measures to be measures of hunger and other measures to be measures of poverty.

There are a couple of areas of economic analysis where hunger plays an important role. Nobel Laureate Bob Fogel argues European economic development was hampered for hundreds of years by food inadequacy. Until roughly the time of the Industrial Revolution, Europe suffered from a nutritional trap in which people could not work hard due to limited food and they had limited food because they could not work hard. Partha Dasgupta and others argue that this same vicious circle of poverty is the main explanation for deprivation in poor countries today.

The main counterargument to this theory is a point that no one has talked about here today. Food is cheap. Even in India, food is incredibly cheap—at least in normal times. In the rural areas of Maharashta 20 years ago, when incomes were a good deal lower than they are now, it was possible for 5 percent of the daily wage to buy 2,000 calories of the standard basic food that Indian day-wage laborers eat on a normal basis. Although such foods are not particularly appetiz-

ing, neither are they some horrible nutritional paste. If there are situations of a nutritional trap, in terms of calories, they are extraordinarily easy traps to get out of. This reasoning makes the Fogel story unconvincing to many people. Similarly, many development economists tend to think that nutrition is not the crucial part of the underdevelopment story or of poverty.

For the United States, is poverty really the root of food insecurity? The food security reports and today's discussions all emphasize that people are hungry because they do not have enough money, that is, that a lack of resources is a crucial part of these food security and hunger measures. But the relationships between consumption and socio-economic status, or income, are complex. A related example is smoking, which conceivably could be a larger health problem for children and mothers than is nutrition. Smoking is associated with lower socioeconomic status even though it costs money, and despite evidence that repeatedly shows the vast majority of smokers understand the risks. They may even overstate the risk of smoking. Some people think that smoking is a coping mechanism for low-income people. At any rate, might it be that other behaviors including perhaps poor food choices relate to low socioeconomic status in a manner similar to smoking? What are the ultimate determinants? Income, education, or something else? Clearly, food insecurity is a complicated matter that might not be due just to a lack of money. Smoking is a harmful behavior that people do, in spite of low income. I would be interested to know the cross-correlations between smoking behavior and the food insecurity numbers.

In 1983, the regular National Sample Survey in India asked 123,000 households whether all members of the household got two square meals a day throughout the year. The question is a simpler version of the food security questions. A household answered (a) "Yes, " (b) "in some months of the year," or (c) "No, not in any months." A household that answered "yes" can be thought of as food secure. A household answering "in some months of the year" can be interpreted as food insecure. A household that answered "No, not in any months" would have a chronic shortage of food, in contrast to the seasonal problems experienced by households answering "in some months of the year."

Only 2.4 percent of rural and 0.8 percent of urban households answered "No, not in any months." If we somewhat impertinently adapt our categories to this Indian context and call this group "food insecurity with hunger," then the Indian and American numbers are extremely close. In addition, 18.4 percent of rural households and 6.3 percent of urban households replied either "In some months of the year" or "No, not in any months." These broader numbers are somewhat different for the United States and India, but not vastly dissimilar. Yet in India, 50 percent of the rural households and 58 percent of the urban households were below 2,700 calories a day. Although the calculations are based on expenditure bundles rather than nutritional monitoring, the bundles were very detailed. Of course, the countries' living conditions are quite different: India had a per capita income of $380 in 1990-96, an infant mortality rate of 65 per 1,000, and 48 percent illiteracy, with 52.5 percent of the population living on less than $1 per day, and fully 88.8 percent living on less than $2 per day.

The comparability of food insecurity prevalence for two such different countries suggests that food insecurity may be based on a household's experience relative to its neighbors instead of anything like a uniform human standard. Even so, we must think about the effects of such comparisons on the public acceptability of our measures of hunger. Will policymakers and the public at large be prepared to accept as correct a hunger measure that gives much the same results in India as it gives in the United States? I suspect not.

Many of you have said that hunger is of interest irrespective of its validity as an indicator of poverty. If we think of hunger and poverty as separate things, what about other ways of defining and measuring the concept of hunger or its associated variables. Direct calorie and nutrient monitoring is extremely expensive, especially on a national scale. Malnutrition or direct anthropometric measurement is similarly problematic.

The solution adopted by the food security scale is to ask people directly about their experience. This self-reported approach has pros and cons. Against it, one could say the scale just ducks the issue of definition. In its favor, defenders would say it puts the onus of definition where it belongs, that is, the person experiencing the hunger. And in this case, the scale's questions are extremely well designed.

Although I have almost been persuaded by listening to several people today, I remain skeptical about the interpretation of responses to the question "In the last 12 months, a child did not eat for a whole day because there was not enough money for food." I do not think that a positive answer to this question is equivalent to "food insecurity with severe hunger," which is a label that is convenient because it produces a hunger measure out of the scale. An honest characterization of the category is that it is an extreme point on the food insecurity scale. Why not simply report the number affirming that question without creating the label?

The underlying definition of hunger is "the uneasy feeling due to not having enough to eat." But that definition is not directly present in the questionnaire. Calling a category "severe hunger" is a difficult issue, especially when you take into account the reporting period phenomenon that Sandy explained. That a measure of hunger is inherently so sensitive to the reporting period—something that is often missed by users—is surely a strike against it.

I also want to raise some general points with self-reported measures. One significant weakness is that perceptions get normed over time. It has plausibly been argued that the decline of self-reported health in the 1970's was due not to any real change in the health status of the population but instead to increased social awareness of disability and the increased availability of benefits. Perceptions often go along with possibilities. Another striking example is again from India, where the level of self-reported health among poor people exceeds the level among rich people even though no one believes that the poor are healthier than the rich. The data are consistent with the notion that poor people do not expect as much as rich people. Undoubtedly self-reported measurements can potentially be affected by such phenomena.

Self-reported hunger questions can have the same drawback as self-reported health questions. Terms and phrases in the survey such as "food you want to eat" or "afford to eat balanced meals" are not unambiguous. Does the definition of a "balanced meal" include vitamin supplements? Advertisers for vitamins may make people feel guilty about not feeding their children balanced meals. I guess the guilt personally worked for me and I recently decided that I have to buy vitamins to have balanced meals. But these supplements are not cheap, even for a Princeton professor, and I hesitate to buy them all. In consequence, if I were answering the survey, I might respond "I do not have enough money to have a balanced meal" simply because the multivitamins are so expensive.

We do not want the success of policy to be measured against perceptions because perceptions can change over time for no obvious reason or, on the other hand, remain stubbornly steady. For instance, school-based nutrition might be very successful as directly measured by child nutritional status, and yet not cause reductions in food insecurity as perceived by people or as measured in the survey. Similarly, the usefulness of a new hospital may be poorly measured by local people's subsequent self-perceptions of their health. Yet both policies might be quite beneficial, and we would not always want to monitor government programs based on self-perceptions in surveys. Because the current survey's questions are so well designed, such a problem is less acute than for other measures but it is still present.

I have some remarks on the food security scale and on the way it is currently reported in the documents before us. First, many users will want to see a precise mathematical statement of the model and its estimation showing, for example, what is being maximized by the algorithm and the interpretations and statistical properties of its estimated parameters. Otherwise, the methodology is not replicable without calling up the people

who did the work. We also need a precise description of the algorithm that determines the households' scores. Reporting the name of the algorithm is not an adequate mathematical description.

The second issue that, at least to date, the internal validation seems to be much stronger than the external validation. Sandy Jencks and I share the same concern that correlations between food security and food expenditure are -0.12. The negative sign is right, but the magnitudes are small, only 0.12 for the 12-month scale and 0.07 for the 30-day scale. Those correlations mean that either the food expenditure data are bizarre, or something is wrong with the scale, or perhaps some other factors are present, such as the issue discussed earlier of whether management matters more than poverty. What we need research on is how some households manage to spend lots of money on food and yet report these terrible outcomes of depriving themselves or their children of meals, or vice versa, how other households spend little on food and yet report good outcomes. I doubt whether a large-scale survey will answer that puzzle. Perhaps an intensive anthropological follow-up of certain survey households could be fruitful. This puzzle must be a research priority.

This morning we saw that food security measures seem to track poverty quite well from 1995 to '96, a period of a small decrease in both. Food insecurity decreased more rapidly in '96 to '97, but that large decrease is not matched by the poverty figures in the March CPS. These results are preliminary and there is more work to be done.

I have spent a lot of my life thinking about economies of scale between costs of children and household size. The food security data actually offer a means by which to measure those terms by identifying what tips households of different sizes to the same point on this scale and inferring the costs or economies of scale.

More importantly, I want to argue that individual measures are vitally important. I understand the costs of developing individual measures. However, the benefit of such measures is huge because all of our poverty monitoring in this country uses household data, and yet we are ultimately interested in the welfare of individuals, not the welfare of households. We constantly hear statements about different demographic groups, for example, that a smaller fraction of old people than that of children is in poverty. Yet these numbers are not measured but largely invented; we do not have individual data, but data on households filtered through a set of sometimes absurd equivalence scales that have been built into the official poverty statistics for 30 years. For example, the official scales have a built-in discount for old people. Upon removing the discount, old people become more likely to be poor than other adults in the United States. To avoid these sort of absurdities, we need data on the welfare of individuals.

An individual measure of food insecurity is conceptually clear. Development of an individual measure is a huge potential advantage of this research area and you should not be giving it up. You should be selling that advantage by saying that measures of food insecurity can do something that cannot be done with the official poverty counts. The food security scale could portray individual welfare, and that is what people really want to know.

I would also like to suggest a link with the National Longitudinal Mortality Survey, which has merged death certificates from the National Death Index into the CPS and censuses from the late '70's and early '80's. Merging food insecurity measures with mortality would permit important and useful epidemiological work that is currently not possible including an investigation of the links between hunger and mortality.

Finally, people are aware that the CPS does not cover the homeless, but the problem deserves more attention. We need to get those people covered, if we are to talk confidently about hunger in America.

Johanna T. Dwyer

Jean Mayer, who was my mentor and dear friend, said that nutrition was actually an agenda for solving problems.

Biology, social issues, and economics are three important aspects of nutrition. I begin by reviewing secular advances in health, because I specialize in nutrition as a biological phenomenon. I am not an economist, so when I review present conditions, I see the glass half full rather than half empty. Finally, I have recommendations for future research.

We have made enormous advances in health and public health. We understand that disease is multifactorial. We intervene on risk factors and do primary prevention rather than wait until people start dying and do body counts. Diet and nutrition have roles in chronic disease far more complicated than we ever thought. Monitoring systems to assess disease prevalence and risk factors in sentinel groups have improved. Age-specific morbidity and mortality information is better. Disease control has advanced. Our health base as well as the fundamental science is improved.

We realize now that nutritional status is a multifactorial concept, involving diet, biochemical, anthropometric, and clinical factors. Malnutrition includes not only under-nutrition and deficiency disease but also over-nutrition, obesity, and imbalances and excesses in toxicities. These conditions can coexist, resulting in different forms of malnutrition. Gordon Janson's work in rural Pennsylvania found obese women and men with deficiency disease.

Not only does malnutrition cause disease, but disease causes malnutrition perhaps especially among the elderly. There are iatrogenic effects of negative drug-drug and drug-nutrient interactions.

Special nutrient needs are better defined than ever before, for example, between folic acid deficiency and neural tube defect, and between vitamin B-6 excess and peripheral neuropathies among women taking it for premenstrual syndrome.

Finally, population-based estimates of NHANES, CSFII, and others identify malnutrition better than in the past.

There now seems to be a greater consensus for action based on dietary information and on health and nutrition objectives. Healthy People 2010 is a health plan for the Nation for disease control, prevention and risk reduction, and healthy lifestyles.

Valid and reliable measures of food security are becoming available. Food insecurity can be an early warning sign of later nutrition risk. Food security measures are becoming incorporated into health work in our clinics. In our hospital, we incorporate outcomes of quality-of-life and function.

I am optimistic about current conditions. The biological science and social science base, and perhaps the connections between the two, are better than ever. Links between food insecurity, hunger, and nutritional status are recognized. As Dr. Mayer has said, economists must have something to count before they will do anything, and so the first task is to make up something for them to count. Food security metrics are now available. You may not like them but at least the *Boston Globe* likes them, even if their interpretation is inexact. State and local estimates are now feasible.

Specialized tools are being developed for target groups at special risks, such as the work on the elderly in New York by Jan Dodds and others. Handicapped kids and their families need more attention, as do those with mental health problems wandering outside of institutions.

In the future, we need to expand dialogue and collaborative efforts across disciplines and specialties. We need to expand the conceptual framework of food insecurity to include those at high medical or social risk. Poverty may not be the root of all food insecurity. I work in a hospital where I see food insecurity that results from the ravages of disease and people not having anybody who cares about them. Most old people need funds, friends, or family. We also need to

expand the severe range of the food insecurity scale to identify those in dire situations.

We need to better describe food insecurity problems. My specialty is kidneys and hemodialysis patients. Because everybody is covered under one of the amendments to the Social Security Act, the Federal Government spends billions on dialysis. Yet we have dialysis patients, perhaps about 10 percent, who beg for relatively low-cost oral nutrition supplements because they do not get enough money.

We have to better capture periodic or occasional acute food insecurity and to address the limits imposed by the ceiling or the floor-side of severe food insecurity.

It is wonderful to hear the presentation of Val's paper from Canada. We also have to remember our colleagues down South and develop measures that deal with their problems, as we are neighbors.

We need to explore uses of food insecurity data as potential sentinel measures among the children and the elderly. Individual measures, not group measures, are need for high-risk groups such as the ill, frail, and elderly. Already certain questions pertain to households with children. We should consider developing other specialized food security measures for use with specific groups, such as homebound elderly with chronic diseases; adults discharged from health care facilities with chronic conditions, because people are being discharged quicker and sicker and they cannot get to the store; the mentally retarded and others with developmental needs; the severely handicapped; and migrant children. We need to improve the sensitivity of condition- and illness-specific measures and make them more useful for nutrition screening.

We need to develop studies of health outcomes for those who are ill and food insecure. We need to expand life-cycle, age-specific food insecurity measures. We also need to determine if food insecurity and hunger measures have predictive value in determining health outcomes in longitudinal studies.

There are a lot of studies over at the National Institutes of Health where they are following people with various problems, usually a disease, for many years. The natural history of food insecurity among those at risk from these biological standpoints would be of great interest.

We also need to capitalize on the potential of the new combined CSFII/NHANES survey to further the synthesis among food insecurity, economic, and biological data. We need to develop standardized methods for measuring food security and hunger that are exportable to States and localities, which would use common methods that link the local results to national surveys. We need to relate food insecurity indices to the Dietary Reference Intakes; Dr. Tarasuk's and Dr. Beaton's presentation is a model.

Conjoint efforts are useful. We need to study the associations between food insecurity and other factors using a variety of cross-sectional and longitudinal studies, and to examine the short- and long-term effectiveness of interventions because nutrition is actually a set of problems to be solved.

Session V: Food Security Measurement Applications

Dynamic Determinants of Food Insufficiency

Craig Gundersen

Joseph Gruber is a co-author of this paper.

A household's current well-being depends not only on its current income, but also, in part, on past actions and its expectations of the future. Economists have incorporated into many analyses the effects of past actions and expectations. For example, our wages today depend on past human-capital investments; current consumption depends upon past savings; and the decision to participate in an assistance program depends, in part, on a household's expectation of future income.

A household may face unexpected changes to its expenditures, such as an emergency health expense or a large car repair, or to its income. High- and middle-income households may weather negative shocks through savings and other assets. Low-income households, however, may experience more negative consequences because they may lack this savings buffer and may be more likely to be liquidity constrained. Our model relates food insecurity to asset positions, shocks, liquidity constraints, and lack of savings in the context of a household's dynamic decisionmaking process. Chris Hamilton raised some of these matters about dynamics yesterday.

Current income clearly matters in predicting food insufficiency. In 1992, of those households with income less than 50 percent of the poverty line, 10.2 percent are food insufficient, while of those households above 150 percent of the poverty line, only 2.6 percent are food insufficient. But why are only 10 percent of the very poor households food insufficient and the other 90 percent food sufficient? Furthermore, if an income of 150 percent of the poverty line suggests that income is sufficient for food sufficiency, why are 2.6 percent of such households food insufficient? Our paper provides some answers to these questions.

Our model begins with a standard dynamic optimizing framework. Current-period utility is defined over two goods, food consumption and other goods. Expected utility is maximized, subject to an intertemporal budget constraint and initial assets A_0; interest and subjective discount rates are ignored. A household knows its mean income Y and the variance of its income, although it does not know the size or timing of income shocks. Consumption is the sum of food and other goods expenditures. Upon solving the model, optimal consumption C_t equals $Y + (1/T) A_0$.

A household is food insufficient in a period if its food falls below a level $\underline{F}$, and a household is "other goods insufficient," for example, inadequately sheltered, if other goods consumption falls below $\underline{OG}$. Minimum expenditures $\underline{Z}$, given by $p_F\underline{F} + p_{OG}\underline{OG}$, is necessary to avoid both types of insufficiency. If a household has $Y + (1/T) A_0 < \underline{Z}$, it has the possibility of being food insufficient. As Professor Mayer said yesterday, low income by no means implies food insufficiency. In our model, a household can trade-off: it may choose to be food sufficient at the cost of other-goods insufficient or, conversely, a household may choose to be food insufficient to maintain sufficiency in other goods. Households with low initial assets are more likely to face such a choice. Hereafter, for discussion I will suppose that such households will be food insufficient after all. Thus, the first explanation for food insufficiency is that the household has low income, at least on average over the planning horizon, and low initial assets. Such a household cannot maintain food sufficiency in every period. The model allows for other explanations of food insufficiency, including the role played by cross-household variation in prices or the levels of household-specific $\underline{OG}$, which can vary across households due, for example, to medical needs.

If $Y + (1/T) A_0 > \underline{Z}$ for a household, it has income and assets sufficient to maintain food sufficiency on average. However, even this household can face a negative income shock so large that it may become food insufficient. If current period assets, based in part on past saving, are small relative to the income shock and a household faces liquidity constraints, food insufficiency can be a consequence of the shock.

In the empirical sections, we compared food-sufficient and food-insufficient households to see if food-insufficient households have more income shocks, less savings, and more liquidity constraints. We do find that these factors are relevant.

We used the 1991 and 1992 panels of the Survey of Income and Program Participation, the only nationally representative data set with monthly information before and after a household is food insufficient. Because 80 percent of all food-insufficient households are below 200 percent of the poverty line and only 0.06 percent of households above 200 percent of the poverty line are food insufficient, we confined our sample to households with incomes below 200 percent of the poverty line in Wave 3 of 1992 panel and Wave 6 of 1991 panel. A household is classified as food insufficient if it answers that they sometimes or often do not get enough of the kinds of foods they want to eat. The food-insufficiency status is observed for a household in months 9 through 12. The first bout of food insufficiency for a household can be in any of those last 4 months, and we look at households in the 8 months leading up to that event.

We used descriptive statistics rather than an econometric panel model or some other treatment because we did not have food-insufficiency data for every period and because the SIPP does not contain long-term consumption data.

The paper provides detailed results, including those variables that, at 95-percent confidence, turned out not to affect food sufficiency. Here we focus on certain variables that do make a difference.

We say that a household lost earnings if its earnings fell to zero in any month, even if it later regained its earnings. In the sample, only 14.8 percent of food-sufficient households lost earnings, while 23.6 percent of food-insufficient households lost earnings. Income shocks are also more common among food-insufficient households.

Losing food stamps may have a bigger impact on food sufficiency than losing an equivalent amount of earnings due to the greater marginal propensity to consume out of food stamps than out of cash. In the sample, only 5.9 percent of food-sufficient households had lost food stamps, while 14.8 percent of food-insufficient households had lost them. Although some households lose food stamps due to an increase in income, we find that an income-increase is present in only about 15 percent of the households, and about the same for food-sufficient and food-insufficient households.

At the conference yesterday, people were speculating about the effect of savings on the ability to weather shocks. We classified a household as one with liquid savings if it earns interest in every month. We found that food-sufficient households are much more likely to have savings than are food-insufficient households, 26.7 versus 3.6 percent.

Homeownership is not a liquid asset, but you can borrow against equity and it has other advantages. Health insurance, including Medicaid and Medicare, is not a marketable asset, but it is a buffer for unexpected health shocks. In the data, food-sufficient households are much more likely to be homeowners and have health insurance than are food-insufficient households.

We also examined differences across households in the subgroup of those that experienced an income shock. For example, in that subgroup food-sufficient households were more likely to have savings than were food-insufficient households.

The SIPP does not have a direct question about access to credit. Neither can we conduct a formal indirect test for liquidity constraints, as in Zeldes' 1989 paper,[12] because it requires consumption data and a long time period. However, Jappelli's paper shows that liquidity-constrained households have lower incomes and lower savings and are more likely to be renters and non-white than households not liquidity constrained.[13] Similar characteristics are more likely to hold for food-insufficient households than for food-sufficient households. Thus, liquidity constraints of some sort—be it low savings or limited access to credit—do seem to characterize the types of households that are food insufficient.

In conclusion, we make four points. First, that current economic status has a major impact on who is food insufficient. The work of Prasanta Pattanaik, Amartya Sen, Susan Mayer, Christopher Jencks, and many others has shown that current income is not always well correlated with more direct indicators of well-being. We have shown this is the case with food insufficiency as well.

Second, the level of savings and liquidity constraints are important determinants of food insufficiency. In terms of policy, we can encourage households to plan over a longer time horizon while still recognizing the serious constraints that low-income households face. We can also encourage a larger presence of the mainstream banking in low-income areas and other ways to improve access to credit for low-income households.

Third, the asset test as part of the eligibility criteria of the Food Stamp Program appears to be accurately screening out households with lower probabilities of food insufficiency. Hence, if food stamp funds are limited, using the asset test appears to be effective at better targeting those more in need, at least in terms of food insufficiency.

Fourth, we emphasize the important role food stamps play in our efforts to eradicate food insufficiency. Our work has shown the serious consequences faced when households lose food stamps, and policymakers may wish to take this into consideration when changing the Food Stamp Program. The recent Personal Responsibility and Work Opportunity Reconciliation Act eliminated the eligibility of most unemployed able-bodied adults without dependents (ABAWD's) and non-citizen immigrants, and there is some evidence that people leaving TANF are also leaving food stamps for unexplained reasons, despite their continued eligibility. Our work indicates that these households may be at greater risk of becoming food insufficient. Whether this is the case is an important area for future research.

Discussion

Thesia Garner

Craig related food insufficiency to current income, savings, and ability to borrow. For a given income—even if it is a somewhat higher income—a household without savings and facing liquidity constraints is more likely to be food insufficient. That implication fits the comment yesterday of a discussant, Beth Osborne Daponte, that when you make a lot, you spend a lot.

Advantages of the model in this paper include its examinations of trade-offs and of the dynamic processes. A major criticism of our current poverty measure, that is, current annual income, is that it is not dynamic. At the Census Bureau, there has been work using SIPP to look at dynamic poverty. For the paper presented here, the advantage of using SIPP is that it reports the number of months, as well as the specific months, in which food insufficiency was experienced by a household, thus avoiding the time problem of the 18-item CPS scale.

Craig and Joseph have done an excellent job on the two issues of financial assets and constraints.

[12]Zeldes, Stephen. "Consumption and Liquidity Constraints: An Empirical Investigation," *Journal of Political Economy*. Vol. 97, No. 2. pp. 305-346. 1989.

[13]Jappelli, Tullio. "Who is Credit Constrained in the U.S. Economy?" *The Quarterly Journal of Economics.* Vol. 105. pp. 219-234. 1990.

But what about the value of home production and in-kind transfers? Or other constraints such as time or skills? Time may be the key constraint for single parents. Could we collect more data on uses of time? Skills in financial management, food management and preparation, and shopping are important too. Another constraint is medical expenditures, which is under consideration in revising the official poverty line. Medical expenditures enter the theoretical model through "other goods." What about some other shocks such as births, deaths, or morbidity?

I have some concerns. The theoretical model was not formally tested. I also suggest that the study limit the sample to those who do not have enough to eat due to "not enough money" rather than to other reasons such as "no working stove." You might consider subjective poverty lines, as in some work done at the World Bank. I also encourage you to use the results to come up with food-insufficient gaps similar to poverty gaps from income-distribution analysis. I think the Department of Agriculture is uniquely situated for developing food-insufficiency gaps using some of the best family and resource management economists.

Food Insufficiency and Children's Health Status in the United States: Findings From NHANES III

Katherine Alaimo

This work was jointly conducted with Christine Olson and Edward Frongillo, Jr. I would also like to acknowledge the input of Dr. Ronette Briefel.

The data we studied are from the Third National Health and Nutrition Examination Survey conducted by the National Center for Health Statistics, which is one of the Centers for Disease Control and Prevention. The survey was a cross-sectional representation of the U.S. population who were not homeless, living in an institution, or in the military. It lasted from 1988 to 1994 and included interviews and medical examinations of over 34,000 people, including the approximately 3,000 children, 6 to 11 years old, that we used for our study.

For the purposes of NHANES III, food insufficiency was defined as an inadequate amount of food due to a lack of resources. We combined those children who lived in families that answered they sometimes and often did not get enough food to eat and called those children food insufficient. From 1988 to 1994, over 1 million children were food insufficient, approximately 14 percent in the low-income population, defined as below 131 percent of the poverty line, and approximately 2 percent in the middle-income population. In the middle-income group, most children who were food insufficient were below 200 percent of the poverty line.

To measure health status, we used the question: "Would you say your child's health in general is excellent, very good, good, fair or poor?" We combined those who replied "fair" or "poor" into a single group, leaving four categories. This question has been used extensively with adults, and to some extent with children. In adults it has been shown to be valid and reliable and a strong independent predictor of mortality and the onset of disabilities.

To examine how well the replies were associated with other health indicators in children, we ran an ordinal logistic regression model between the 4-part question as the outcome and 10 separate health indicators: physician-reported health status, colds, stomach aches, headaches, ear infections, coughs, iron deficiency, blood lead level, infections, and school-restricting impairment. Proxy-reported health status was associated with almost all of the health indicators. We concluded that by using this question there is a minimal risk of reporting bias.

Physicians rated less than 1 percent of the children in fair- or poor-health status. Mothers were a little more critical of their children's health status—they rated 4 percent of their children in fair- or poor-health status. Food-insufficient children were much more likely to be reported in fair- or poor-health status. The prevalence was about 14 versus 3 percent for the food-sufficient children.

Among low-income households, 14 percent of the food-insufficient children had fair or poor health, while only 7 percent of low-income children had fair or poor health if they were food sufficient. The figures for the middle-income group are 9 versus 2 percent.

Was the difference in health status between food-sufficient and food-insufficient children due to food insufficiency itself, or was it due to some other factor that could be associated with food insufficiency and health status? To answer this, we ran ordinal logistic regression models to control for other variables. The NHANES III survey provided data about family income, health insurance coverage for children, age of children, gender, race and ethnicity, family size, marital status of family head, the family head's educational level, employment status of the family head, mother's age at the child's birth, and metropolitan or nonmetropolitan residence. Each of these factors can potentially affect the child's food insufficiency status and health status. NHANES III also provides data on children's health care, specifically, access to a regular source of health care, as well as environmental and past health factors, including blood lead level, low birth weight, birth complications, prenatal exposure to

smoke, and attendance at day care or nursery school before the age of 4. We ran an ordinal logistic regression with the 18 factors to see whether food insufficiency was an independent predictor of the child's health status.

Ordinal logistic regression compares each category of health status with the category above it. The odds ratios it calculates are the odds of the child being in a poorer health status. I will show just the odds ratios that were statistically significant.

As expected, the children's family income was significantly related to their health status. The children in low-income families were 2.6 times more likely to be in poorer health status than children in high-income families, while in the middle-income families, the odds ratio was 1.6.

Mexican-American children whose proxy answered the health status question in Spanish were 4.5 times more likely to be in a poor health status. I think that at least part of the difference is an artifact of a nuance of language: English-speakers tend to answer "good" when asked about health and Spanish-speakers tend to answer "fair." This nuance leads to classifying the health of Spanish-speakers' children as poorer than it actually is. However, Mexican-American children whose proxy answered in English were still more likely than non-Hispanic white children to have poorer health status, as were non-Hispanic black children.

Educational attainment of the family head was significantly related to children's health status. Those children whose family heads did not have a high school diploma were 1.9 times more likely to be in poor health status than those whose family head had at least a high school diploma.

Employment status of the family head was also significant, with an odds ratio of 1.5.

Interestingly, whether the child attended day care or nursery school before the age of 4 was significantly related to their health status. The odds ratio was 1.6.

Finally, food insufficiency was associated with health status, even after controlling for all of these other factors. Children who were living in food-insufficient families are 1.6 times more likely to have poor health status than children living in food-sufficient families.

I want to emphasize that because this data is cross-sectional, causality cannot be determined. We cannot conclude that food insufficiency necessarily causes children to have poorer health status. Nevertheless, this study demonstrates an association between food insufficiency and children's health status and, once again, highlights that our poor children are vulnerable and are at an increased risk for negative outcomes.

Discussion

Kathy Radimer

I am going to use Katherine's well-presented paper as a jumping off point for my points about measurement and issues in outcome analyses. My views are based upon the 32 women I interviewed for my research, as well as the 7 years I spent living in developing countries.

First, I believe that adult hunger is important to measure, not just children's hunger. A household with a woman who eats a piece of toast a day for a month, but who is able to feed her children is classified as not hungry. I think that this is hunger and that it needs acknowledging.

Second, I advise that we not lump those who say they are worried about food and are running out of food with the food-secure households. Maybe we could call them at risk. There is a fluidity between categories for these households, presumably depending on the security of their additional food resources. If they are going to mom's and something happens to mom, or if they are going to the food pantry and the food pantry runs out, then they suddenly drop to a food insecurity category. Analyses should separate this at-risk group from the food secure.

Third, while outcome-type analyses, such as the one that Katherine did, are important and inter-

esting, I would not like us to think of them as validation. If a household is food insufficient, but no health or behavioral problems are detected, it still matters that somebody went without food. I do not know that we can eliminate all hunger, but food insufficiency matters, even if we do not detect any health effects.

Fourth, for stronger outcome analyses, more precise indicators are needed. Maybe we should separate children, adult, and household items, and look at each individually. For example, children's food security status specifically could be used to analyze children's diets. Of course, that doesn't mean that only children's items can be used to examine effects on children. As Cheryl pointed out yesterday, if a household or mother is having food problems that can affect her child's behavior, school performance, and mental health, we might want to look at those associations. Women who are spending time trying to scrape together enough food to feed their families can't spend that time with their children, and the psychological stress they feel from the situation affects their children.

Fifth, we need to think about how to distinguish between a person who went hungry, say, every day for a month or two from a person who went hungry, say, several days each month. Outcome indicators, such as diet and weight loss, may be different for these groups, so we need to try to separate them in analyses.

Sixth, we need to find out more about what's causing these problems. Different causes suggest different courses of action. Craig covered many of the income issues. I talked with women whose husbands did not get paid for work they had done. This can be dealt with legally. Others just had extra expenses: medical expenses, or a husband came back and food stamps did not cover him, or they tried to help a relative's food problems. Emergency food stamps could help here. Some people who I talked to had low competency levels or management skills. Help for these people requires more than just extra money.

Finally, the people we are talking about are Americans. They do not want to be outcasts in their own society. They don't want to live in a way that might be acceptable in other countries. Their kids want to be like other kids. They do not want to be told to accept standards from other times and other societies; they want to be a part of today's American society.

Food Insecurity and Medical Conditions Observed in an Adult Population

Karin Nelson

I did this work in collaboration with Margaret Brown and Nicole Lurie in response to our involvement with patients during a residency at Hennipen County Medical Center. As physicians, we became interested in this area through several cases including K.J., who is a 32-year-old woman with Type 1 diabetes. She was admitted to the hospital for ketoacidosis, a condition that is precipitated by a deficiency of insulin. Usually, either the body does not use the insulin correctly, for example, with an infection, or the patient stops taking the insulin. Some patients wrongfully think that if they get too sick, they should not take their insulin. K.J. came in with ketoacidosis. She had stopped taking her insulin because in the previous week she kept on having insulin reactions. These are low blood sugars that can actually cause you to faint and feel really sick. She was having these insulin reactions because she could not afford food and kept on taking her prescribed insulin. Even though it was a county hospital, we had not seen this circumstance before.

K.J. had been recently unemployed and had lost her food stamp benefits. I interviewed about 10 other diabetics and found that people were having similar sorts of problems. We decided to do a survey to see if the problem was prevalent in our patient population.

The purpose of our study was twofold. We wanted to know the prevalence of hunger in our adult patients and to identify the impact of hunger on diabetics. In 1997, we interviewed all people who were admitted to the medical, surgical, and neurological services for 2 weeks. We also wanted to get an outpatient sample: we interviewed all patients who had attended our general medicine clinic for a week. To get a subsample of diabetics, we got pharmacy data and called all the people who had received insulin for a month. We also collected self-reported data for demographics, health status, lifestyle habits, health insurance information, and any changes in food stamp benefits.

We used an eight-item measure for hunger and food insecurity, which we divided into two groups. The questions that we considered hunger items were not having enough food or the kind of food you wanted, cutting down on the size of meals or skipping meals, not eating for a whole day, and going hungry but not eating.

We added an atypical question about food quality because we were interested in diabetics: we asked for the numbers of fruits and vegetables eaten in the last 2 days before hospitalization. We interviewed a total of 567 patients in the inpatient/outpatient sample. Our response rate was 80 percent.

There were several differences between the inpatient and outpatient sample: the inpatients were more likely to have an income of greater than $25,000 and to be older and white. We also had 170 diabetics. Our analysis included descriptive statistics, chi-square comparisons, and a logistic regression to understand independent predictors of hunger and food insecurity.

In the total sample of 567 patients, the average age was 47, with 50 percent being white, 34 percent black, and 7 percent Native American. The patients were poor, with 50 percent annually earning less than $10,000. The current employment rate was 32 percent, and 32 percent had less than a high school education.

We found fairly high levels of food insecurity and hunger. We asked questions for the last year and the last month. I will report the 12-month items. Thirty-five percent of our patients had reported worrying that their food would run out. Twenty-eight percent said their food did not last. Twenty-eight percent said they put off paying a bill to buy food. Twenty-seven percent had gone to an emergency food bank, and 13 percent went to a soup kitchen.

Somewhat fewer patients affirmed the hunger items. Twenty-four percent reported that they had cut down on the size of meals or had skipped

meals. About one in eight patients said they did not have enough food. Similar proportions affirmed that they did not eat for a whole day, they went hungry, and did not eat. Interestingly, almost 20 percent of our patients said that they had no fruits and vegetables in the 2-day period.

Compared with people who did not report hunger, people who reported not eating for an entire day were more likely to have an income of less than $10,000. They were more likely to have their food stamps reduced or eliminated in the prior year, and they were more likely to report illicit drug use. Alcohol and cigarette use was not significantly different between the two groups.

A total of 226 patients in the primary sample, or about 40 percent of our sample, had received food stamps. Half of the food stamp recipients interviewed had their benefits reduced or eliminated in the prior year.

The people who had their food stamps reduced or eliminated were more likely to report food insecurity and hunger on all the measures that we used. For example, 53 percent of those with food stamp reductions worried that their food would run out, while only 41 percent of food stamp recipients without a reduction worried that their food would run out and just 29 percent of those who had never received food stamps had worried that their food would run out. Thirty-three percent of patients who had a reduction in food stamps reported that they cut size of meals or skipped meals in contrast to 27 percent of food stamp recipients without a reduction and 20 percent of those who never received food stamps. All these differences were statistically significant.

In the logistic regression analysis, the independent predictors of food insecurity included an annual income of less than $10,000, non-white race, reduction in food stamps, and illicit drug use. For these analyses we defined food insecurity as a positive response to any food insecurity item. We analyzed each hunger item separately and similar predictors were found for hunger.

The diabetic sample showed rates of hunger and food insecurity similar to the other sample.

In addition, we asked our diabetic sample about insulin reactions and hypoglycemic reactions; 103, or 61 percent, reported having insulin reactions in the previous year. We then asked if any of these reactions were due to not being able to afford food. Thirty-one percent of these insulin reactions were attributed to being unable to afford food. Of these, 26 percent, or eight people, said they passed out, went to the emergency room, or were hospitalized.

In addition, we asked if the diabetics had to cut down or stop their insulin because they could not afford food and they were trying to adjust at home. Eight percent of the sample did report this behavior.

In conclusion, we found that hunger was prevalent in this urban public hospital population. We found that reductions in food stamps were associated with several measures of food insecurity and hunger, and that one-third of our hypoglycemic reactions reported by our diabetic sample were due to an inability to afford food.

Discussion

Gail Harrison

I think that the paper is important for several reasons. First, it relates food insecurity and its causes to the management of adult chronic disease and indirectly to health care costs, a topic near to the hearts of all policymakers. On a worldwide basis, many developing countries must deal with emerging adult chronic diseases along with continued malnutrition and food insufficiency. The World Health Organization estimates diabetics will double by the year 2020, with huge implications for health care costs. Russia and parts of Europe have very high levels of adult chronic disease, and they are experiencing the economic and political shocks that create hunger and food insufficiency. Yesterday, somebody mentioned the percentage of household income going to food in Russia is 40 percent and rising.

Aspects of the paper attend to what Johanna Dwyer yesterday called "groups at high medical and social risk." These people not only are at high-risk of food insecurity but are often outside the sampling frames of our national surveys.

It is interesting but not very surprising that illicit drug use predicted hunger in this population. A recent study at UCLA compared a population of cocaine-using pregnant women with income-comparable women who were not using cocaine. They were each interviewed immediately after delivering a baby. The interesting thing was that the women using illicit drugs were experiencing something like maternal depletion syndrome, a condition has long been observed in the poorest countries of the world. In it, a woman's prepregnant weight and body mass index declined with age and parity—in direct contrast to the usual process that occurs in North America and other industrialized areas, where body mass index of women increases with age and with each pregnancy. The predictors of the severity of this decline included housing instability, which was measured along a continuum as opposed to simply the extreme of homelessness, and food insecurity, which was measured in a crude way simply by asking how many times in the previous 6 months the individual had gone 24 hours without eating for lack of money. The difference in birth weights between the cocaine-using group and the non-drug-using group was fairly well explained by the differences in prepregnant body mass index and the measured life stressors, including housing instability and food insecurity.

The paper creates questions about health care costs. In a vulnerable population, does food insufficiency have the potential to precipitate a downward spiral of poor health or other kind of dynamics? Such outcomes might relate to the dynamic process that was mentioned earlier by Craig.

The paper reminds me of an early literature on food insecurity, in which households were classified as secure, resilient, or fragile. Resilient households were conceptualized as those who could become food insufficient in the short term in response to a shock, such as an income shock, but who had the resources to recover. A shock to a fragile household could precipitate a downward trend ultimately resulting in homelessness and other outcomes that would not be easily reversible.

Over the last several years, I have worked on food insufficiency in several low-income countries where stunting in children is fairly prevalent. The condition is certainly correlated with food insecurity. I am beginning to be convinced that it is more a marker of a vulnerable household than it is necessarily the other way around. Perhaps there are markers we need to be able to begin to look at also in the United States for a vulnerability to the extreme bad effects of food insufficiency.

Session VI: Toward a Research Agenda: A Dialogue on Priority Setting

Facilitator, Barbara Cohen

In yesterday's discussions, certain topics came up repeatedly: an individual scale, subgroup sensitivity, abbreviated scales and their appropriate use, household management, time differences in the questions, sequencing of questions, as well as how to communicate our findings so that they are useful in various public settings, appropriate comparative data, and predictors and outcome data. Consider these topics and others as you engage in group discussion and prepare to report your group's list of priorities.

International Issues

Donald Rose

There was concern in our group about the proper use of domestic indicators in overseas situations. Some wanted to use the domestic experience to improve measurement elsewhere; while others thought it would be best to learn from what has been done in other countries to improve domestic activities. Ultimately, we concluded that we need to increase the communication and dialogue between those who work overseas in international settings and those who work domestically. We thought one way to improve the knowledge base would be to commission a set of review articles. Also, another conference could draw people together to discuss alternatives.

Health and Nutrition Outcomes

Christine M. Olson

Our group focused on the need for individual-level scales since health characteristics are an individual-level outcome. It was acknowledged, however, that to look at the relationship between food insecurity and health, we probably ought to look at it at the household level as well as the individual level, especially for high-risk groups such as those with chronic illnesses and the elderly.

The timeframe of the food insecurity may need to vary with the health outcome under study and perhaps by age group. Poverty and possibly food insecurity experienced before the age of 5 might have a long-lasting effect. For diabetics, a very short timeframe may be best for looking at food insecurity and certain immediate health consequences such as hypoglycemia.

We talked about the need to refine some questions, such as those involving food safety and nutritional quality. Food-insecure people may exploit unsafe food sources such as contaminated fish or home butchering in basements. The idea of balanced meals may vary across sociocultural groups.

We know very little about the 18-item scale's ability to detect changes caused by educational interventions or participation in food assistance programs.

The last issue is whether NHANES IV is assessing all the health and nutrition outcomes that we might suspect would be associated with food insecurity.

Community Food Security

Bruce Klein

The group had several conclusions. They considered "Information for Solutions" and "Research for Action" to be important concepts. So, we need to alert policymakers that there is a problem that needs to be solved, and we need to get the research out to involve community lay people, Federal Government, and State and local governments. Household food security needs to be linked with community food security. One way to accomplish this is to link through specialized surveys that match the characteristics of respondents in certain subgroups and geographical areas. For example, people who live in the Delta region are unique, as are the economic and social characteristics of their community. The 18-item scale must function in that survey within that community.

What makes a good community survey? What do you add to the 18 items to make the survey more useful not only to government, but also to the people you are surveying? Respondents might worry why the questions are being asked, and how their answers might affect them in terms of food aid, cash benefits, and even child custody.

There is a need to look at community food security within program evaluation. If community food insecurity exists, what does that imply about the millions of dollars in food assistance that is going to that community?

There are two kinds of solutions. An immediate solution addresses: "I cannot feed my family right now." A long-term solution addresses the condition: "If I had a job that paid about $8 an hour and if I could get child care, I could do a lot better. I could feed my family and help myself."

Surveys must stand up to scientific accuracy to get scholarly credibility in the professional community, and have face validity so that the results are believable in the general community.

The entire community needs to be educated about food security. People who volunteer at soup kitchens, food pantries, and food banks need to see food-insecure people not as "the others" but as people in the community having problems.

Methodological Issues

Jean Opsomer

We noted that already there is quite a bit of data available from surveys that have been conducted or that are being conducted right now that could help to address many questions that I will talk about in the other points.

The current measure based on a 12-month scale does not capture the frequency and duration of food insecurity. Other data are available because we have a 30-day measurement in the current survey. We have measurements of how many days in the last 30 days something happened.

The reason people like the 18-item scale, or the abbreviated scale, is to obtain comparability across surveys. But is it reliable to move questions from one survey to another? Context is important. Is the survey instrument a personal or a phone interview? Has the interviewer built a rapport to get truthful answers to sensitive questions?

The other topic we talked about was whether to use 6 or 18 questions, depending on the objective of the survey. Is the survey about adult hunger, children's hunger, or both?

Program Evaluation

Parke Wilde

People do not use this scale only on its own, but as part of program evaluation. We have data about income and other variables. With income data alone, you might miss people whose income rose but who are still experiencing hardship. Some in our group felt the food security measure is useful for addressing this problem, but others did not.

The subgroup sensitivity issue was less interesting and involved, because current surveys give information by geography and types of household.

Our main question involved public communication. Do the conceptions correspond to a reality that is salient to the public debate? People with experience on Capitol Hill cautioned that you cannot overpromise what this area of research is going to deliver. The response was that we need to communicate that this measure has a scientific basis.

In terms of more practical suggestions, once you found out who has these problems, you should followup with them in greater detail so that you know more than just this 18-question scale for that group.

Economic Issues

Jennifer Olmsted

We need better qualitative data, obtained by carrying out focus groups or in-depth interviews, to learn more about time-use issues, coping strategies, financial management, and the impact of culture. Can some issues be addressed by increased education? One idea was to have a pilot project for educating food stamp recipients on financial management. However, some recipients might not be very functional.

Other issues were whether food stamp eligibility requirements are right, and why there are non-participating eligibles. One or two people in the group wanted us to look at the asset test. We need better continuous longitudinal data rather than spotty observations to understand dynamics.

There was some skepticism about this scale and the fact that it was very complex. Some were skeptical that it could be applied to other countries for an international comparison.

Session VII: Toward a Research Agenda: The Next Steps

Christine Olson

It is widely quoted that $3 in Medicaid expenditures is saved per WIC dollar spent for a pregnant woman. That figure is used to build support for food assistance programs in a society that sometimes uses savings in public expenditures as a metric. Johanna Dwyer said that we need to look at consequences of hunger and food insecurity that have major costs to society. What consequences might these be? Children, school failure and academic achievement; adults, depression, disability, and other hindrances to work and productivity; and the elderly and those with chronic diseases, hospitalization and other health care costs are examples of consequences of hunger and food insecurity with major social costs. I would like to think that as a society we care about hunger and food insecurity in and of itself. Kathy Radimer gave an eloquent plea for that perspective. But I fear that to keep hunger and food insecurity on the social policy agenda, we must talk about dollars saved by investments in alleviating food insecurity.

How should we operationalize food insecurity in research on health and nutrition? Food insecurity exists whenever the availability of nutritionally adequate and safe foods or the ability to acquire acceptable foods in socially acceptable ways is limited and uncertain. In past work, we have looked at the quantitative component, the total amount of food. In addition, the balanced meals question involves nutritional quality. To look at health and nutritional outcomes, the psychological component of food insecurity may need more attention in research. We talked about anxiety related to the certainty of food availability, which potentially could be linked to depression in women. We may also need to look more at the temporal pattern to eating and its health implications. To illustrate, we studied body mass index (BMI) and obesity in adult women in a random sample from a county in upstate New York. In our linear regression model, BMI is the outcome. Control variables included income, education, marital status of the mothers and their employment status. We had three distinct food insecurity variables, each capturing a different level of severity along a continuum of severity: household-level food insecurity, individual adult insecurity, and child hunger in the household. We also had an eating pattern measure that came from a Stanford University set of items that captures binge eating. Household-level food insecurity was the only food insecurity variable significantly related to BMI. The eating pattern was by far the most significant predictor of BMI when added to the model with the control and food insecurity variables. The result says that food insecurity may relate to BMI through its effect on the temporal pattern of eating. It may not be that the quantity and nutritional quality of food are all that are important as mediating mechanisms between food insecurity and BMI.

It is worth noting that in the model each level of food insecurity was a separate variable; we did not put these together in a continuous scale. In studying health and nutrition outcomes, it may be misleading to construct a continuous variable and expect it to be related in a linear way to certain health outcomes. Hopefully the above example illustrates this in an understandable way.

We are making a major social investment in food assistance programs for low-income Americans. We know poverty is related to poor health in adults and children and is also related to food insecurity. The questions now are: How is food insecurity related to poor health consequences and is it one of the possible explanations for poorer health among low-income persons in our country?

Lynn Parker

My topic today is research priorities in State and local surveys. I feel that we have come full circle. Back in the early 1980's, FRAC, the Food Research and Action Center, was instrumental in beginning this whole discussion about measuring hunger. We had the first national conference on measuring hunger in 1984, where we brought together academics and some local anti-hunger

organizations. Each had been looking in isolation at the issue of hunger and trying to measure it in their own very different ways. In the early 1980's, there was an enormous change across the country. All of a sudden, people were lining up at food pantries and soup kitchens who had never been there before. They had not suddenly forgotten how to do time management or budgeting. Rather, there were major economic and political changes that were going on. The reason people ultimately created hunger measures like the CCHIP measure was because they needed to document a problem that they were seeing. They needed to bring the problem to the attention of policymakers and community members, and it was not enough to say, "Fifty more people showed up at our food pantry." Community people, city council members, mayors, governors, and Federal officials were skeptical that there could be this problem in this country at that time. We needed a hunger measure that had scientific validity and would stand up to scrutiny.

The local studies CCHIP did can help us a lot in thinking now about local and State research with the hunger measure. At each local site, we had an advisory committee made up of two groups: technical members, who tried to keep the study scientific; and community members, such as the bank president or the city council member, who recognized by the end of the study that a problem existed and felt committed to ending hunger, and who started thinking of solutions. Solutions included making school breakfast available in all the elementary schools, increasing the emergency food assistance money available to soup kitchens and food pantries, or doing outreach on the Food Stamp Program. Solutions varied a lot from place to place. Thus, the local CCHIP studies were a kind of public alert that there was a problem in the community that could be documented, and their results were meaningful to community leaders and compelling enough to push them into action.

Now we have a national measure, and we are talking about how to use it at the State and local level. The same need exists today as existed in the early 1980's. For example, in California, there was a concern about what would happen to some immigrants when food stamps were cut off. The California Food Policy Advocates looked at the impact of the cut-off on the prevalence of food security using the new food security measure. The need still exists to document the problem of hunger and work toward a policy solution.

My recommendations for research on the State and local level include, first, encouraging communities to do this kind of research by making the instruments available to their people. Social workers, physicians, pediatricians, and anti-hunger organizations can do surveys comparable to the larger surveys. Experts such as those attending this conference need to provide the technical assistance that the people need, put them in touch with the local university and extension people who can be part of their technical advisory committees, and think about shorter surveys to save resources for local groups.

Two other efforts also could help local groups. One is to help them look at specific policy issues. For example, it would be useful to compare a State that has a wavier for able-bodied working poor and one that does not have a waiver, or to help local groups study how a specific population is affected by recent changes in public policy. The second effort is to help them conduct some demonstration projects where we actually say, "Let's create a hunger-free community" and we think about all the resources that could be brought to bear. A baseline study could be carried out before the community project is implemented, and several years later the study could be repeated to gauge impact.

It would also be useful to look at the issue of stress on families and its relationship to food insecurity. A local small-scale survey could be done on this. Local studies could also look at causes and consequences of hunger. This would put important information into the hands of people who are trying to solve problems at the local level.

Finally, there are two issues that I would like to raise related to discussions that occurred during this conference. First, I want to stress the importance of having a stable hunger measure released

on an annual basis. We can talk a long time about what the best measure is or how to refine it, but we have thousands of people suffering from food insecurity every day, and we have a measure that comes closer than anything we have ever had to documenting this problem. We need to get the results out to the public on an annual basis, just as we do poverty data and unemployment data, so that concerns can be raised and policy solutions can be developed.

Second, I want to discuss the issue of nutrition education. I am a proponent of nutrition education. I am certainly familiar with the issues of time management and food preparation skills. But from my experience of working for years in this field, the reality is that the major issue when it comes to hunger is a lack of resources. That is not to say that people could not use more information. Certainly the poorest and the most constrained people need as much information as they can get, but that is not the solution to the problem of hunger, although I wish it were. Income and food stamps matter, not just time management and food preparation skills.

Richard Bavier

As results from including the food security questions on more surveys become available and are used to educate the public and policymakers, they will be subject to a kind and level of scrutiny different from the vigorous differences of opinion among experts who characterized the developmental process. In fact, the more effectively the data are used, the more critical scrutiny they will receive.

I suggest a couple of areas where outside scrutiny may eventually be focused. I may be suited for this task as someone who has not been involved with the development of the current food security measure. But I, as a staff employee at the Office of Management and Budget, have asked skeptical questions about proposals to add food security questions to several national surveys.

In the CPS data reported in *Household Food Insecurity in the United States in 1995*,[14] 38 percent of the households classified as "food insecure with moderate hunger" answered "No" every time they were asked a direct question about hunger. All household respondents were asked question 35, "In the last 12 months, since May 1994, were you ever hungry but didn't eat because you couldn't afford enough food?" In addition, households with children were asked question 47, "In the last 12 months, (was child's name/were the children) ever hungry, but you just couldn't afford more food?"

Moreover, only about 38 percent of the households with moderate hunger on the 12-month scale had calendar year 1994 pre-tax money incomes below poverty. Less than half (46 percent) of the households with severe hunger were poor in 1994. What's more, more than one-third of the moderate-hunger households, and more than one-fourth of the severe-hunger households, had money incomes above 185 percent of their poverty lines, meaning they were not even in the poorest third of all households. Around 15 percent of the moderate-hunger households and around 10 percent of the severe hunger seemed to have 1994 incomes above the median for all households!

A year is a long time, and episodes of hunger may have occurred while a household's income was low, even though the household's annual income was not. We don't have the results from including the food security questions on the Survey of Income and Program Participation, which provides monthly data. However, food-sufficiency questions were asked on Wave 3 of the 1992 SIPP panel, and Wave 9 of the 1993 panel, including asking whether households had insufficient food in each of the 4 preceding months.

In both panels, only half of households reporting food insufficiency in a month had pre-tax money income below the poverty line in the same month. Less than one-third were between pover-

[14]Hamilton, William L., John T. Cook, William W. Thompson, Lawrence F. Buron, Edward A. Frongillo, Jr., Christine M. Olson, and Cheryl A. Wehler. *Household Food Security in the United States in 1995: Summary Report of the Food Security Measurement Project.* U.S. Department of Agriculture, Food and Consumer Service (currently the Food and Nutrition Service), Office of Analysis and Evaluation. Alexandria, VA. 1997.

ty and 185 percent of poverty; 17 percent in the 1992 panel and 24 percent in the 1993 panel had incomes above 185 percent of poverty, meaning they were not in the poorest third of all households. Six to 8 percent were actually above 300 percent of poverty, which is around median income.

Critics of the food security measure are likely to focus on this sort of data and argue that many households classified on the basis of inability to afford food either as hungry deny being hungry or don't look like they can't afford food.

In response, defenders of the food security measures will argue that you shouldn't pay too much attention to answers to individual questions. The Summary Report states, " . . . it is important to bear in mind that households are classified on the basis of their overall pattern of responses to the entire sequence of questions making up the measurement scale. No single question, no single condition is used to classify households."[15]

This logic is drawn from item response theory developed in the fields of educational and psychological testing. The total number of conforming answers is all that matters, not the answer to any individual questions.

The problem that defenders of the current food security measure will run into is that their critics will be citing types of evidence, which item response theory is not designed to handle. Item response theory, of which the Rasch model employed with the food security questions is an application, is designed to measure latent traits, such as intelligence or personality. It is reasonable to assume that we all have such traits to one degree or another, although they cannot be directly observed. So education and psychological tests are measuring how much of the trait is present—its intensity. A wrong answer on an aptitude test or a negative answer on a personality test only fails to add to the measured intensity of the trait. In this logic, "No" doesn't count.

However, hunger is neither a trait nor latent. It is an experience or sensation with observable physiological etiology. Neither are the two unifying phenomena that underlie the food security concept—increasingly severe disruption of normal food intake and increasingly severe economic distress—latent traits. Hunger, disrupted food intake, and economic stress may look like good candidates for the application of item response theory, because they all present themselves in varying degrees of intensity with no clear boundaries. However, not one is a trait that everyone has and none are latent. They are all directly observable.

We could observe disruption of normal food intake directly if survey field staff somehow were present at all meals eaten by sample households. Instead, we ask respondents to make the direct observations for us. And, although gross money income and official poverty thresholds may not be the right measure for being able to afford food, in theory, we could have sufficient direct observations to know for certain whether a family with disruption of normal food intake could afford to buy food. Even hunger is directly observable. We should not confuse the subjective nature of hunger with the unobservable nature of a latent trait, such as intelligence. We can observe hunger directly when it is our own. In fact, the food security battery asks respondents for reports on their own direct experience of hunger.

Consequently, invoking the elegance of Rasch analysis probably will be useful only as a delaying tactic against criticism that the number of hungry households was inflated by including households that did not report hunger. Critics will cite direct evidence of the absence of the phenomenon of interest—hunger. Rasch models do not weigh such evidence. Instead, a dispute over the prevalence of hunger will eventually

[15]Hamilton, William L., John T. Cook, William W. Thompson, Lawrence F. Buron, Edward A. Frongillo, Jr., Christine M. Olson, and Cheryl A. Wehler. *Household Food Security in the United States in 1995: Summary Report of the Food Security Measurement Project.* U.S. Department of Agriculture, Food and Consumer Service (currently the Food and Nutrition Service), Office of Analysis and Evaluation. Alexandria, VA. 1997. p. 36.

turn on more familiar scientific rules of evidence. Do responses to several other questions about behavior, that is, in the words of the technical report,[16] "consistent with" the presence of hunger in a household outweigh direct reports of the absence of hunger?

I'll just offer my own view that reports of not eating balanced meals and skipping or eating reduced portions in as few as three meals over the course of a year don't seem to make a strong case that moderate hunger was present in a household that denied hunger. My message, at last a positive one, I think, is that these points argue for rethinking so much reliance on item response theory to justify food security measures. A prevalence of hunger measure that will stand up to scrutiny and be understood by the general public and policymakers will need to be based on questions that do a better job of discriminating frequency, intensity, and duration of disrupted food intake and hunger. That would seem to require more questions in the food security battery, rather than reliance on a small subset shown to produce reliable scale scores.

Let me try to reinforce this theme when it comes to the economic well-being of food-insecure households. I mentioned two unifying phenomena underlying the food security concept. One is increasingly severe disruption of normal food intake, and the other is increasingly severe economic distress. These two underlying phenomena are related as cause and effect. We are interested in cases of the disruption of food intake insofar as they are caused by economic distress, and not, for example, due to discretionary dieting.

Logically, if a household is food insecure, then it must be experiencing economic distress. If we observe directly that the cause is not present, no scale score, however high, will demonstrate the presence of the effect. High income in a household classified as food insecure again represents a kind of evidence not contemplated in item response theory—strong evidence of the absence of the phenomenon of interest. The difference, compared with reports of the absence of hunger, is that in the case of economic distress, the negative evidence comes from questions not included in the scaling process.

So my other positive suggestion is that we need to establish a closer empirical link between food insecurity and what is, by definition, its cause. Researchers attempting to validate the food security and food sufficiency measures typically declare victory if they can show that poverty rates of households with food insecurity or food insufficiency are significantly higher or incomes are significantly lower than for food-secure and food-sufficient households. I, however, think we would all agree that this is a pretty weak test in this context. First, it is weak because this kind of test validates any construct consistent with degrees of economic distress. Second, such validation is weak because we have good reasons to expect a much stronger correlation. Estimates of the prevalence of hunger are especially powerful because the public associates hunger with an especially severe level of poverty. If a household is experiencing chronic hunger, we assume that all discretionary spending has been eliminated and even spending on other necessities may have been cut back. If many households reporting food insufficiency are classified as food insecure with hunger do not seem very poor, we need to consider that we possibly are not measuring what we want people to think we're measuring, or at least that we're not measuring it very well.

Maybe a stronger empirical link between responses to food security questions and economic distress can be forged by showing that responses to the current questions are closely correlated with more sensitive resource measures, such as those that reflect spending on other needs. Or maybe questions that do a better job of discriminating more severe levels of intensity, frequency, and duration of reduced food intake and hunger will also do a better job of discrimi-

[16]Hamilton, William L., John T. Cook, William W. Thompson, Lawrence F. Buron, Edward A. Frongillo, Jr., Christine M. Olson, and Cheryl A. Wehler. *Household Food Security in the United States in 1995: Technical Report of the Food Security Measurement Project.* U.S. Department of Agriculture, Food and Consumer Service (currently the Food and Nutrition Service), Office of Analysis and Evaluation. Alexandria, VA. 1997.

nating cases of hunger caused by insufficient resources.

Gary Bickel

I knew that Richard Bavier would give us a very valuable perspective that otherwise would not be heard much at the conference. A thoughtful and extended response needs to be developed to all the points Richard raises. I will mention just a couple of things here.

The Rasch model underlying the new food security scale has been developed primarily in educational testing, but it has been used by psychologists and social scientists in many kinds of applications. Bill Thompson, who was a young Ph.D. working for Abt Associates when they won the contract to work on developing the food security measure, had a lot of recent experience with this form of scaling. He had just completed his dissertation, using Rasch modeling to examine a phenomenon occurring among Vietnam War veterans. That work is just one example of substantial, experiential material handled by Rasch measurement that is quite unlike the measurement of educational level that Richard described.

The pharmaceutical industry is another place that uses Rasch measurement to gauge the severity of effects. Symptomatic responses to the effects of a drug—the desired effect and undesired side effects, either of which can range from light to strong—can be tracked by this same measurement methodology. An application in pharmaceuticals is far removed from the kind of psychological or latent trait of individuals that measuring educational level or intelligence might involve. So Rasch measurement has widespread applications. I have come to understand that it can be used with any kind of phenomenon that varies through a range of severity from very light to very heavy, each level of which is captured by a dichotomous indicator variable. The direct experience of food insecurity and hunger is just this sort of phenomenon that Rasch measurement is designed to capture.

Richard is right in that we do emphasize the whole pattern of response to the entire sequence of indicator items across the full range of severity of food insecurity, rather than selected items, in deciding where to draw cut points on the scale. The food security scale estimated from the data is nearly continuous. Placing cut points on this scale defines several ranges of food insecurity and creates the simpler categorical measure that, of course, attracts popular attention. Defining these categories in relation to the entire pattern of response within the population—instead of in relation to isolated, specific items based simply on face validity—does involve judgment, but reflects the underlying logic of Rasch measurement.

We did our best to avoid being driven by the apparent face validity of individual items in creating these severity-range categories and instead tried to identify behavioral thresholds within the sequence of items. We drew from Peter Basiotis' work, which showed that there is a definite threshold where people who have inadequate budgets switch from economizing through reducing the quality of their food, which is what everybody does first, to only being able to economize further by reducing the quantity of their food.[17] It was that behavioral threshold at which hunger begins to be likely or, perhaps, inescapable for at least some member of the household that we wanted to identify as the initial boundary of the "food insecure with hunger" category.

We did not want to be driven by considerations of face validity, by the question: "What will the public think about this?" I believe it is very useful to emphasize the distinction what we might call "hunger, comma, the direct experience of"—which is what the food security scale is designed to capture—and what we can call "hunger, comma, the public perception of a social problem." Now that's important too, and it's what the face validity of the individual indicator items is

[17] Basiotis, Peter P. "Validity of the Self-Reported Food Sufficiency Status Item in the U.S. Department of Agriculture's Food Consumption Surveys," *American Council on Consumer Interests 38th Annual Conference: The Proceedings.* (V.A. Haldeman, ed.) Columbia, MO. 1992.

all about, but it simply is a different phenomenon than the one we are measuring.

Richard's point is good, and we certainly considered it at length within the technical group working with Abt: How can we call one of the severity-range categories "food insecure with hunger" if the respondent himself does not say he is hungry? However, I think the fact that a person does not respond affirmatively to that one question is not evidence that the condition defining hunger—the painful or uneasy sensation resulting from not having enough food—is not present, if the person also responded affirmatively to several other questions getting at the same thing. We know that people may have various kinds of inhibitions in responding to these questions. From the Cornell experience, we learned about one of their respondents, an elderly woman, who had no food in the house whatsoever but who simply would not say that she was hungry. She would not even say that she worried about running out of food. Instead, she said: "No, no, we do not worry. The good Lord will provide. We just pray."

An interesting research question that we have thought about is to contract with Gallup or a similar public-opinion organization to develop a questionnaire asking a cross-section of the public: "If you heard that somebody went a whole day without eating, would you consider that person hungry?" And it would ask: "If you heard that somebody had a pattern of cutting the size of meals or skipping meals over the year because they did not have enough money for food, would you consider that the person was hungry?" and so on, through all the key items in the scale. And in each case it also would ask: "Well, if it were so, do you think that is a serious problem?" This would be an entirely different kind of research, which you would need to do to develop a measure of hunger as a perceived social problem, in contrast to the measure of food insecurity and hunger as something directly experienced, which is what our measure tries to provide.

Before the conference, I had a good idea of what I thought were the priorities among needed research steps to continue to strengthen, test, further validate, and refine the food security measure that has been developed. We could move beyond the single household-level scale to separate individual-level adult scale and individual-level child scales. We could make it more user-friendly for wide application at the State and local levels, especially for use in local community surveys. Maybe we could encourage a clearinghouse function to bring out the fruits of all this research in a more timely way. We compiled and prioritized a long list of such ideas as part of our 1999 research and evaluation planning process. But the real judgment about the most important research priorities concerning food security will be in the hands of all of you and other researchers who will be proposing ideas, preparing careful research designs, and applying for financing to carry out the next wave of research in this area. So many good, fresh ideas have been presented at this conference that it is going to cause all of us to go back and re-think how best to prioritize all of this.

Helen H. Jensen

A basic question about a food insecurity index is: "What are the uses of the index?" The first important use is to estimate the prevalence of food insecurity in the country, for the population or various subgroups of interest. Another use is for research purposes, where a measure can be obtained for each household in the survey. There are multiple uses, and it is easier to use the current data for some purposes than others. For the purpose of obtaining estimates of prevalence, the Rasch model is not strictly necessary. In this case, we are interested in broad categories, and subject-matter knowledge is required to set the category demarcation. The categories should be easily interpretable and relevant. In this way, communicating about food insecurity does not differ from other commonly used measures like unemployment.

Another use of the index is to provide a measure of food insecurity status for each household that can be used to study cause and effect of household-level food insecurity. For this application, estimation of a food insecurity measure for individual households is required. The Rasch model

provides such estimates. I would like to comment on several aspects of the index construction that relates to its use for prevalence estimates, for comparisons over time or across subpopulations, and to research on factors associated with food insecurity.

One of the assumptions of the Rasch model is that the items are assumed to be independent of each other, that is, each is an independent measure of food insecurity. However, in fact, we know that they are not independent because of the skip patterns; the resulting pattern of responses (and non-response) is linked to the previous question. This is a problem that is likely to be even greater in the 1998 survey and other surveys that incorporate skip patterns. It would be useful to consider alternative approaches to the skips.

Because of constrained resources and limited survey time, it is important to make full use of the information available in the questions. The current index methods take categorical responses and reduce them to dichotomous responses. Researchers from Mathematica Policy Research and others have looked at this approach and didn't find much difference in estimates. However, further investigation is required on the effects of combining questions, especially when comparing across subpopulations.

The distribution of food insecurity for the population is assumed to be continuous under the Rasch model. However, in fact, there are only a small number of values for the estimates in the current scale. The index construction leads to different nodes of values or, as Ohls put it, to "lumpiness." Even though we observe many people, we do not observe many values of the index. If the number of questions were less, this problem would be even more serious. An important statistical question will be to develop an improved approach to estimate the distribution while maintaining the sampling design information and the Rasch framework of food insecurity modeling.

Another aspect of the food insecurity index involves time periods of reference. We know that people recall things better over a short period of time than a long period of time. However, episodes of food insecurity may not occur with the same frequency in each month. Whether the problem happened all in 1 month or it happened a little bit every month makes a difference. Gundersen addressed issues of the dynamics of food insecurity. There may be better ways of understanding the frequency or the length of duration than we are now capturing. For example, ask the items in more than one period to get multiple observations, or ask questions with short periods of recall. These approaches are more likely to result in measures closer to our notion of food risk or food insecurity than the 12-month recall period.

In sum, having robust measures of food insecurity that are easily interpretable and relevant is key. Better measurement will lead to a better understanding of what food insecurity is—what is the context of that measure, what are the causes, what are the correlates, and how may it differ across subpopulations.