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Advances in Developing Country Food Insecurity Measurement

Measuring Household Food Insecurity: Why It's So Important and Yet So Difficult to Do^{1,2}

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ABSTRACT Food insecurity is a daily reality for hundreds of millions of people around the world. Although its most extreme manifestations are often obvious, many other households facing constraints in their access to food are less identifiable. Operational agencies lack a method for differentiating households at varying degrees of food insecurity in order to target and evaluate their interventions. This chapter provides an overview of a set of papers associated with a research initiative that seeks to identify more precise, yet simple, measures of household food insecurity. The overview highlights three main conceptual developments associated with practical approaches to measuring constraints in access to food: 1) a shift from using measures of food availability and utilization to measuring "inadequate access"; 2) a shift from a focus on objective to subjective measures; and 3) a growing emphasis on fundamental measurement as opposed to reliance on distal, proxy measures. Further research is needed regarding 1) how well measures of household food insecurity designed for chronically food-insecure contexts capture the processes leading to, and experience of, acute food insecurity, 2) the impact of short-term shocks, such as major floods or earthquake, on household behaviors that determine responses to food security questions, 3) better measurement of the interaction between severity and frequency of household food insecurity behaviors, and 4) the determination of whether an individual's response to survey questions can be representative of the food insecurity experiences of all members of the household. J. Nutr. 136: 1404S–1408S, 2006.

KEY WORDS: • food insecurity • risk • vulnerability • measurement

It is 25 y since Amartya Sen published his book, *Poverty and Famines* (1), which helped redefine the way that "food security" is discussed in the development literature. His conceptual contribution centered on the fact that people often fall prey to food deprivation not so much because food is unavailable on the market but rather because their access to such food is

constrained. The lack of clarity that preceded Sen's reconceptualization of famine was arguably the reason why many policies failed to alleviate food insecurity. For example, the then-common practice of conflating "famine" with a lack of food availability, and food availability with producing more food, led to an overreliance on domestic agricultural solutions to problems that typically had other roots. Yet improved theoretical understanding of the "access" dimension, though a critical evolution in food policy, was not accompanied by an improved understanding of how to measure access to food, which is the next logical step in linking theoretical advances to the design and evaluation of policies that would help overcome access constraints.

Development analysts and practitioners have now spent a quarter of a century seeking ways to measure the "access" dimension of food security, with only varying degrees of success. Proxy measures are commonly used, be they centered on agricultural productivity and food storage or on children's nutritional status. Yet, each of these proxies is only a partial, usually indirect, measure of what is a larger, multifaceted phenomenon. Similarly, the relationship between caloric (or other nutrient) sufficiency and household food security has been shown to be unpredictable across a range of circumstances (2).

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Indeed, a recent international meeting on the measurement and assessment of food deprivation (3) concluded that no "perfect single measure that captures *all aspects* of food insecurity" had yet been found [Authors' emphasis]. In other words, although the international community has broadly accepted that food insecurity is not a monolithic condition easily measured in monetary or energy-availability terms, it has not found a way to identify how, when, and where different facets of the concept are more important than others.

There is a sense of urgency underlying the search for better measures. Food insecurity is a daily reality for hundreds of millions of people around the world. The most extreme forms are obvious in the widespread malnutrition and preventable mortality of children in Niger, the micronutrient deficiency disease outbreaks in refugee camps in Nepal, the recourse among food-deprived households of North Korea to foraged wild foods such as tree bark, acorns, and rotting seaweed. As Sen himself put it, in relation to measures of poverty, "much about poverty is obvious. One does not need elaborate criteria, cunning measurement, or probing analysis, to recognize raw poverty and to understand its antecedents. But not everything about poverty is quite so simple. Even the identification of the poor and the diagnosis of poverty may be far from obvious when we move away from extreme and raw [conditions]. Different approaches can be used, . . . and there are technical issues to be resolved within each approach" (1).

Sen's observation is equally relevant to food insecurity. Some households are food insecure but not immediately experiencing hunger, and others are in desperate straits. The latter can be seen and counted, the former less readily so. And yet, identifying at-risk households and targeting interventions to reduce their risk of further worsening is increasingly recognized as critical to preventing the physical and economic consequences that accompany a slide into hunger. However, many agencies are confronted with the practical problem of assessing needs, targeting food security-enhancement interventions, and measuring their impact without a clear sense of how to differentiate food-secure from food-insecure households, and those facing immediate hunger from those who are not. This has recently led to a growing demand for measures that more accurately reflect the experiences of households faced with difficulties in accessing food.

The papers in this special volume respond to such demand. They stem from a household food insecurity measurement initiative, sponsored by the United States Agency for International Development (USAID)⁴-funded Food and Nutritional Technical Assistance (FANTA) Project managed by the Academy for Educational Development (AED), whose mandate includes providing guidance in monitoring and evaluation to USAID-implementing partners (such as nongovernmental organizations using Title II food aid). As such, the papers share a common aim of seeking to develop and validate ways of measuring household food insecurity more comprehensively, more validly, and more easily than before. The family of approaches presented here has its parentage in the U.S. Household Food Security Survey Measure (HFSSM), designed for use in the United States by Cornell (4-7) and Tufts Universities (8) working closely with US Department of Agriculture (USDA) and antihunger advocacy groups (9). The HFSSM is a validated set of 18 questions about self-reported behaviors and attitudes

that collectively distinguish households experiencing different degrees of food insecurity. Included since 1995 into the annual Current Population Survey (CPS) and, more recently, the National Health and Nutrition Examination Survey (NHANES) and other data-collection efforts, the estimates of food security and hunger generated by this measure are widely used by government agencies, the media, and advocacy groups to report on prevalence, trends, and links with public interventions such as food stamps and special nutrition programs. The core of the research reported here builds on this earlier work by considering if, and how, the approach developed in this work can be adapted and enhanced for use in developing country settings.

Evolving measures of food insecurity

The papers presented in this volume illustrate a number of important advances (and accompanying challenges) in understanding and measuring access to food. These advances have centered on 3 main conceptual developments: 1) a shift from using measures of food availability and utilization to measuring "inadequate access"; 2) a shift from a focus on objective to subjective measures; and 3) a growing emphasis on fundamental measurement as opposed to reliance on distal, proxy measures.

Limited availability to inadequate access. Before Sen, the main locus of debate on food insecurity was food supply, with the bulk of analysis focused on trends in domestic supplies, the role of natural disasters, price effects of economic policies, and global food balance sheets. There was a parallel concern with the physiological manifestations of extreme food deprivation (malnutrition) as experienced by individuals and measured in terms of weight and height.

After Sen, the debate shifted from macro supply and micro physiological concerns to household-level issues relating to food access; that is, the ability of households to obtain food in the marketplace or from other sources (such as transfers or gifts). Purchasing power is the key to access, and this varies in relation to market integration, price policies, and temporal market conditions. This change happened in part because of the accumulation of findings that demonstrated only weak links between food availability and nutritional status, either at national or household and individual levels. It also reflected a rapid broadening of the food security agenda, such that by the mid-1990s the definition adopted by signatories of the World Food Summit of 1996 (reconfirmed in 2002) acknowledged 3 equally important core concepts: 1) food availability, 2) food access, and 3) food utilization (10): "Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life" (10). Availability, access, and utilization are hierarchical in nature: food availability is necessary but not sufficient for access, and access is necessary but not sufficient for utilization. In addition, a fourth concept is increasingly becoming accepted, namely, the risks such as climatic fluctuations, conflict, job loss, and epidemic disease that can disrupt any one of the first 3 factors. In that sense, risk represents a crosscutting issue that affects all domains of the food insecurity framework (11,12).

Although widely accepted proxies exist for food supply failure (such as food price hikes, lack of food in stores) and for impaired utilization (malnutrition, morbidity, disease outbreaks, excess mortality, etc.), there are no exact indicators of access failure. Households become food insecure when they are unable to mitigate negative shocks to, or erosion of, food availability, access, and/or utilization. Such households balance their uses of private and community resources (including soil, water, and

⁴ Abbreviations used: AED, Academy for Educational Development; CPS, Current Population Survey; FANTA, Food and Nutritional Technical Assistance Project; NHANES, National Health and Nutrition Examination Survey; PVO, private voluntary organization; USDA, United States Department of Agriculture; USAID, United States Agency for International Development; U.S. HFSSM, United States Household Food Security Survey Measure.

vegetation) in an attempt to meet immediate consumption needs while reducing the risk of future shocks. In this sense, insecure households make essentially rational decisions with a view not only to survival but also to the protection of assets and potential longer-term income streams. But the ways in which households manage the process of disinvestment of assets or reduce their food intake or take greater risks to obtain income do not lend themselves to conventional measures of the stock or flow of physical goods (as reflected in cash income, the price of goods, or nutritional status). As a result, the recent search for measures of access failure has focused increasingly on iconic household behaviors that are known to reflect not only increased severity in food stresses but also the actual experience of becoming hungry.

The search for fundamental measures. Lord Kelvin may have gone too far in claiming, "When you cannot measure [something] . . . your knowledge is of a meager and unsatisfactory kind. It may be the beginning of knowledge, but you have scarcely, in your thoughts, advanced to the stage of science, whatever the matter may be" (13). Measurement is important not for elevating thought to the level of science but for aiding us in the process of inquiry. Recognizing the instrumental nature of measurement, Kaplan (14) lists 3 important functions: First, measurement allows standardization, enabling greater certainty of just how much one is purchasing, for instance, or receiving. Better measurement also facilitates "subtle discriminations and correspondingly more precise descriptions" (14). Most importantly, measurement also enables the application of mathematical techniques "for verifying, predicting, or explaining a phenomenon" (14).

Measurement can be classified as "fundamental" or "derived" (15). Whereas fundamental measurement "presupposes no others," derived measurement is a calculation that assumes a "known empirical relationship" with an established measure. What is often deemed "food security measurement" in developing countries is more appropriately described as "derived measurement," which relies on proxy measures of household food insecurity, such as food consumption, or income, or assets, that are presumed to be closely related determinants or consequences of the phenomenon. These are weak derived measures, however. Without first having a clear delimitation of the phenomenon, such indicators are used without empirical evidence of their association to the construct of interest.

A second problem with derived measures is that, even if the phenomenon itself is fixed or universal, relying on correlates is risky because causes and consequences may differ in the strength of their association to food insecurity, depending on context. In order to make sense of a proxy indicator, 2 pieces of information are necessary: the amount of the correlate (e.g., income level) and its association to food insecurity in that context. For example, income will relate differently to food insecurity in a situation where most of the food consumed is home grown rather than purchased. Alternatively, a lack of access to food may better explain nutritional status in a country like the United States, where primary health care, water, and sanitation are not as great contributors to malnutrition as in many developing countries.

A third problem is that a reliance on derived measures to the exclusion of understanding and quantifying the phenomenon itself means that potentially policy-relevant causes and consequences of food insecurity may be overlooked (because we lack an appropriate mathematical representation that can be placed in the regression equation). For instance, in the United States, the "uncertainty" element of food insecurity (manifested in questionnaire items pertaining to worry about food) has been shown to have a large and significant effect on physical and

psychological health outcomes, even when a household has not experienced actual food deprivation (16). These types of policy-relevant findings about the consequences of food insecurity were not possible before this core element of the experience of food insecurity was measured in the U.S. HFSSM.

Thus, the papers in this volume reflect a retreat from exclusive reliance on derived indicators and a relative refocusing on fundamental measures. This does not imply a rejection of other measures, some of which will still need to be collected. Even the new fundamental measures alone will not provide all information needed to assess the complexity of any given situation or to design effective interventions. This refocusing has involved qualitative investigation of the phenomenon followed by a transformation of "grounded insight" into something that can be manipulated statistically, namely scales and indices. The additive scales developed in some of these papers enable a relative ordering of households along a continuum. The interval scales produced by fitting the data to a Rasch model enable even greater flexibility: not only are households ordered along a continuum, but the nature of the model makes it possible to determine quantitatively the difference in food insecurity status between 2 households. The ability to order households according to the degree of the phenomenon should help practitioners to prioritize and target interventions. Being able to pinpoint the distance between 2 intervals increases the scale's usefulness for quantifying changes in food insecurity for monitoring and evaluation. This way, a change in household (or population average) food insecurity from a score of 2 to 4 represents the same degree of worsening as a change from 6 to 8. With the type of information yielded from a more fundamental measure, the functional consequences of different degrees of food insecurity can be tested and, ultimately, predicted (How does increasingly severe food insecurity affect investment behavior, all else remaining equal?). Proxy measures of food insecurity can be calibrated based on a "known empirical relationship" to the phenomenon of interest.

From objective standards to behavioral markers. The evolution of food insecurity measurement has paralleled some of the developments taking place in the field of poverty measurement despite limited crossover between these 2 related but separate domains. For example, Pradhan and Ravallion (17) argue that approaches to measuring poverty became polarized during the 1990s between what they call "objective-quantitative schools" and "subjective-qualitative schools", with rather little effort at cross-fertilization. The objective-quantitative school continued (and still continues) to refine measures based on poverty lines, expressed as a monetary measure of individual economic welfare, such as expenditure on goods and services, for which nutritional requirements are met or not met at given prices. Critics of this approach have argued that it is too theoretical, too focused on monetary imputation of values, and too remote from the de facto experience of extreme poverty (18,19). Indeed, it is the latter argument that has gained most resonance recently. Despite much rhetoric about "listening" to the poor since the 1980s, international attention to "perceptions of the poor" is a relatively recent addendum to the macro development agenda (20). The visibility of large-scale studies on the experience of poverty (such as the World Bank's Voices of the Poor Project) led to the development of alternative schools seeking "subjective-qualitative" measures of poverty that would allow room for less tangible factors that emerge more from the words people use to describe their experiences (21).

Moving almost in parallel to this search for subjective measures of poverty was an identical search for experience-based measures specific to food insecurity. As noted by Maxwell

and Slater (22), the definition and measurement of food insecurity have evolved rapidly with exploration of the “subjective nature of food poverty” foremost among the changes. Indeed, numerous analysts have highlighted the fact that “a shift from objective to more subjective indicators of food shortage [represents] a major shift in thinking about food security and has become a recurrent analytic theme” (22).

But what is a subjective or, more accurately, an “experiential” assessment of food insecurity? So-called subjective approaches often connote qualitative data collection methods that range from the work of anthropologists describing how villagers express concepts of hunger and food insecurity to more rapid techniques using focus groups or peer assessments of food insecurity status. “Subjective” and “experiential,” in this case, do mean that the assessment builds on information about how individuals express their own, and their household members’, perceptions and responses to insecurity. It also means that the information provided is relative to their cultural and personal values and thus reflects their sense of deprivation, which may or may not always coincide with some external or absolute standard. But Hentschel (23) usefully distinguishes between the manner in which data are collected and the ways in which they are ultimately used; the approaches discussed in this volume integrate a family of methods that relied on qualitative insights to develop quantitative measurement tools, implemented in surveys to capture self-reported information from household members, analyzed using highly sophisticated econometric and psychometric techniques, and resulting in quantifiable empirical data.

A measure based on reports of experiences, perceptions, and subjectively assessed patterns of behavior known to correspond with trying to avoid, or at least manage, hunger, what might be called *revealed aversion* rather than the more conventional economists’ term *revealed preference*, risks criticism from the positivists who regard such intangibles as unmeasurable. However, Pradhan and Ravallion (17) propose that this is a challenge worth facing. In their view, “it is important . . . to test whether objectively measured income or consumption has power in explaining subjective measures of welfare in a developing country context; if it does not, then many of the policies that are typically promoted in the name of ‘economic development’ may bring disappointing outcomes in terms of human satisfaction” (17).

Facing the challenge of measuring the access dimension. A panel set up under the auspices of the Committee on National Statistics of the National Academies to review the concepts, methodology, and uses of the U.S. measure recently concluded that, “food insecurity is important to measure. It is a multifaceted concept, each facet of which is appropriate to consider as latent and continuous” (24). However, the panel’s recommendations, including the suggestion that the USDA should “refine its definition and measurement of hunger and how . . . it relates to the concept of food insecurity” (24), suggest that the job in the United States is not yet done. The papers in this volume have had the advantage of building on lessons learned from the U.S. measurement effort in the hope of avoiding some of the problems identified by the National Academies report.

For example, Frongillo and Namama (25) ground their food insecurity measure for Burkina Faso in a thorough understanding of the experience as informed by ethnographic research used to formulate and test questionnaire items. The study finds that the process produced a locally relevant food insecurity measurement tool that met several validity criteria in discriminating among food-secure and food-insecure households in Burkina Faso and in tracking those conditions over time. A

three-country comparison (Bolivia, Burkina Faso, and The Philippines) by Melgar-Quinonez, Zubieta, McNelly, Nteziyaremye, and Dunford (26) suggests an alternative to this qualitative phase of item formation. The study used a short set of items directly translated from the U.S. HFSSM and found that a food insecurity score created with responses to these items was strongly associated with comparator measures such as shares of food expenditure and spending on diet quality (not just quantity). The authors conclude that this translation approach, although useful, would benefit from additional qualitative input into the item design.

The paper by Coates, Wilde, Webb, Rogers, and Houser (27) goes deeper into a process of integrating quantitative and qualitative methods in developing a scale. The National Academies report noted that “it is appropriate to use item response models to measure [the] multifaceted dimensions of food insecurity, as is commonly done in the United States context” (24); however, such statistical models are technically complicated and impractical for practitioners to use. As a result, this paper compares a simpler, qualitative approach to developing a scale with an approach using an item response model and finds that, based on Bangladesh data, the 2 different approaches located 90% of households in the same food insecurity category, and the 2 resulting scales were highly correlated. This convergence of methods lends confidence to the use of either kind of approach and suggests value-added in combining approaches for establishing the food insecurity status of geographically and socioeconomically diverse households.

The paper by Coates, Frongillo, Houser, Rogers, Webb, and Wilde (28) explores commonalities of the food insecurity experience as captured by 22 separate scales and related ethnographies derived from 15 different countries. The purpose was to investigate whether there are domains that represent the core of the food insecurity experience across several cultures. The study found that the 4 domains identified in the United States (uncertainty/worry, insufficient quantity, inadequate quality, and social unacceptability) plus several important subdomains appear to form the basis of the universal food insecurity experience at a household level. The authors recommend that these domains and subdomains be considered in all future attempts to assess food insecurity.

Finally, the Swindale and Bilinsky paper (29) serves to place the results of these field studies in the context of FANTA’s goal of developing a generic measure of access that will be valid, easy to use, and allow some degree of comparability across regions and countries. The authors recount the participatory process, involving private voluntary organizations (PVOs), donors, and universities, of taking research results and transforming the products into a usable food insecurity indicator. At the first Food Insecurity Measurement Workshop in 2004, participants reached consensus around the 4 primary domains of the household food insecurity (access) experience and agreed on a set of generic items that appeared to represent these 4 domains along a range of severity. A draft guide was prepared to assist PVOs and other organizations in a simple process of adapting these generic items to the local context. Recent progress at the second Food Insecurity Measurement Workshop in 2005 further narrowed these items to a 9-question set and laid the framework for agreement on best ways to use information from the 9 items to develop continuous and categorical indicators of food insecurity. With a revised guide available [see the online supporting material of Swindale and Bilinsky (29)], PVOs and other organizations or researchers are well positioned to begin to apply this tool for their programming and evaluation purposes. Their use of the tool will generate empirical data that will be analyzed to further validate and refine the generic scale.

Conclusions and next steps. This volume represents the latest theoretical and empirical work on a rapidly evolving area of study. The papers advance our understanding of basic concepts by focusing on how people themselves behave and report on their own behavior in the context of food stress in places as diverse as Bangladesh, Bolivia, and Burkina Faso, and they draw implications about the universal applicability of locally grounded results. In considering technical issues around how to capture this experience using scientifically developed measures, they evaluate various methodologies and demonstrate how food insecurity is related to, but different from, other concepts such as poverty and malnutrition. They also highlight knowledge gaps and present an agenda for further operational research, clearly acknowledging that the ultimate goal of such research is improved practice leading to improved conditions on the ground. The consultative and participatory process that has driven this research is reflected in results that are not only rigorous and scientific but also responsive to the practical needs and constraints of practitioners in the field. As evidenced in these papers, the search for better and/or alternative measures has in many cases forced a reassessment of conventional assumptions about the nature of food insecurity, whom it affects and how, and the dynamics of the experience over time.

Yet, as noted above, this is still work in progress, and many questions and further challenges remain. More information is needed, particularly in terms of 1) how well short-questionnaire surveys function in conditions of widespread, acute hunger, rather than less severe chronic food insecurity (is there sufficient range in a short set of questions to allow for differentiation when the majority of households are already bunched at the bottom end of a conventional scale that was designed to cover a "normal distribution" of hunger); 2) how do short shocks (such as major floods or earthquakes) impact on household behaviors that determine responses to food security questions; that is, are investment time horizons shifted forward by recent shocks, and if so, whether that distorts trend lines; 3) can the interviewer always be sure that interviewing a single member of a household (usually an adult woman) produces responses that are invariably representative of the food constraint experiences of *all* members of the household? (30); and finally, 4) can the kinds of methods described here validly inform the targeting of food security interventions and thus be useful in measuring impact?

Answers to this next set of questions, all of which have important operational implications, are still urgently needed given the continuance of food insecurity on a tragic and immoral scale across the globe. That the answers and applications can at least build on the carefully compiled evidence offered here suggests that we are at least on the right track.

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