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Food Insecurity Measures: Experience-Based Versus Nutrition-Based Evidence From India, Bangladesh, and Ethiopia

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Food Insecurity Measures: Experience-Based versus Nutrition-Based Evidence from India, Bangladesh, and Ethiopia

Nzinga H. Broussard and Sharad Tandon

Abstract

Using data from three household surveys in Bangladesh, Ethiopia, and India, this report compares two commonly used measures of household food insecurity: a measure of caloric consumption (reported undernourishment) and an experiential measure. In the second measure, a single affirmative response to whether the household experienced certain conditions or behaviors due to insufficient food designates a household as food-insecure (experiential-based measure). The authors demonstrate that a significant share of households categorized as undernourished because their caloric consumption is below 2,100 calories do not report experiencing any form of food insecurity. This finding is robust across different experiential food security metrics and different contexts. For India, which used a single indicator of experienced food insecurity, the experiential measure had the least overlap with the caloric consumption measure compared with the measure used in the other two country case studies. Although the measure from the Ethiopian survey, which contained nine experiential questions, had the most overlap with the caloric consumption measure of food insecurity compared with the measures used in India and Bangladesh, there was still substantial misclassification of food security status among households. These findings suggest that even if the overall prevalence of food security is similar when estimated with experiential and other measures of food security, experiential measures appear to be classifying a different subset of the population as food-insecure.
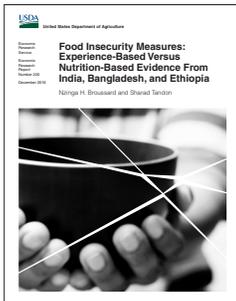
Keywords: Food security, food insecurity, food security measurement

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Food Insecurity Measures: Experience-Based Versus Nutrition-Based Evidence From India, Bangladesh, and Ethiopia

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What Is the Issue?

Quantitative assessments of food security take a number of different approaches: they may be based on national food availability data, household expenditures, or household food experiences. Two commonly used measures of food insecurity are based on either nutritional adequacy (nutrition-based) or on household perspectives on food security (experience-based or experiential). Like other methods of assessment, these are used by policymakers and the international donor community to develop programs and interventions aimed at the food-insecure and to assess the efficacy of such interventions. However, experience-based measures of food security, created from responses to surveys that elicit the relationship of households and individuals with food security over a period of time, are becoming more popular among both policymakers and researchers. This information is less costly to collect and easier to integrate into existing surveys than nutrition-based measures. Given the role of food security measures in policy development and implementation, it is important to understand how experiential measures compare with other measures of food security in identifying food-insecure households.

What Did the Study Find?

The authors used experiential measures to identify food insecurity in the share of survey households whose reported food intake had identified them as food-insecure according to a benchmark measure of caloric sufficiency. The surveys in Bangladesh and India asked questions that pertain only to the most severe forms of inadequate access to food (e.g., having to skip a meal), while the Ethiopia survey asked a more complete list of questions about household experiences with food insecurity. Comparing nutrition-based (per capita calorie consumption) and experiential measures, the authors found:

- A number of households (between 65 and 83 percent) reporting food intake that identified them as undernourished in calories did not report experiencing food insecurity. This inconsistency occurred in both the survey in Ethiopia that elicited a wide range of food-inadequacy experiences (e.g., worrying about food security) and the surveys eliciting experiences with only the more severe forms of food insecurity, in Bangladesh and India (e.g., skipping meals).

- Conversely, among households that were classified as adequately nourished in calorie consumption, 34 percent reported experiencing mild food insecurity. However, where the survey questions denoting food insecurity were restricted to experiences that specifically implied a shortage of food (e.g., skipping meals), these households did not report experiencing food insecurity.

- Household per capita expenditure, years of schooling of the household head, household size, and experiencing a shock to household income were all correlated with the likelihood that an undernourished household would not report experiencing food insecurity.

- Differences between the two reported measures—undernourishment and experienced food insecurity—varied substantially across regions. Similar rates of food insecurity between these measures at the national level masked more substantial regional differences in Bangladesh, Ethiopia, and India between the two measures.

The findings suggest that even if the prevalence of food insecurity between experiential and undernourishment responses is similar nationally, experiential measures and caloric consumption benchmarks appear to be classifying different subsets of the population as food-insecure. Most importantly, the measures do not agree on the identity of the households that are most food insecure, the subset households whose consumption most needs to be tracked.

The differences in identifying food-insecure households can be due to a number of factors. These include inaccuracy in reporting household consumption or varying interpretations of the survey questions on which experiential measures are based (such as different expectations about adequate food consumption and societal and cultural norms), as well as differences in survey design such as the period of time for which calorie consumption and food insecurity experiences are reported (7 days, 30 days, or 12 months).

Research is needed to better understand how experience-based measures and reported undernourishment might better align, as well as whether experience-based measures do indeed track the most food-insecure households. These results highlight important limitations to relying on a single measure of food insecurity, given the complexity of measuring food insecurity. But when multiple measures are available, they can be used to complement each other in achieving goals for policy development and program targeting and implementation.

How Was the Study Conducted?

Using data from three household surveys—from Bangladesh, Ethiopia, and India—ERS researchers compared two commonly used measures of food insecurity: a household calorie-consumption measure and a household experiential measure. For each individual household in the three surveys, ERS calculated both daily per capita calorie consumption based on the household's reported food consumption over a given period and an experiential food security perspective. A household with daily per capita calorie consumption below 2,100 calories was classified as food insecure. In the second measure, a single affirmative response to whether the household experienced certain conditions or behaviors due to insufficient food designated a household as food-insecure (experience-based measure). Prevalence rates were calculated nationally, subnationally, and by monthly per capita expenditure. The authors then used nonlinear regression techniques to investigate the association between experienced food insecurity and household food access, measured as the household's daily per capita calorie consumption.

Food Insecurity Measures: Experience-Based versus Nutrition-Based Evidence from India, Bangladesh, and Ethiopia

Introduction

There are a variety of quantitative assessments of food security, based on national food availability (e.g., FAO, 2015; Rosen et al., 2016), household expenditures (e.g., National Survey Organization, 2007; Deaton and Dreze, 2009), and household experiences (e.g., Headey, 2013). These measures are used by policymakers and the international donor community to determine whether to provide assistance to the food insecure, to develop programs and interventions aimed at the food insecure, and to assess the efficacy of such interventions. However, experiential-based measures of food security—created from survey responses designed to directly elicit the experiences households and individuals have with food security over a period of time—are becoming more popular among both policymakers and researchers, given the low cost to collect the data and the ease of integrating the measures into existing surveys. With the importance of household food security measures for policy development and implementation and the growing use of experiential-based measures, it is important to understand how experiential measures compare to more traditional, nutrition-based measures.

Because most surveys allow only a single measure of food insecurity to be assessed, few studies have been able to directly assess how different measures of food security compare with each other (Maxwell et al., 1999 and 2008).[1] Using data from three household surveys in Bangladesh, Ethiopia, and India, this report compares two commonly used measures of food insecurity: (1) a measure of household caloric consumption (reported undernourishment),[2] and (2) a household experiential measure, where a single affirmative response to whether the household experienced a number of different conditions or behaviors due to insufficient resources for food designates the household as food insecure (experiential-based measure). The two measures of food security used in this report are consistent with the Food and Agriculture Organization of the United Nations (FAO) definition of food security. Food security as defined by the FAO "exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life" (FAO, 1996).

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[1]Smith et al. (2006) compare food insecurity calculated from household expenditure surveys to FAO's estimates of food insecurity for 12 Sub-Saharan African countries. Maxwell et al. (2014) compare seven indicators of food insecurity using data from rural Ethiopia.

[2]Caloric consumption is only one component of healthy nutritional status, which is also determined by adequate nutrients in food and the body's ability to digest, absorb, and use the nutrients consumed (FAO, 2012).

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The three countries used for analysis are particularly important to global food security, accounting for over 40 percent of the world's food-insecure population. In 2011, India and Bangladesh were ranked first and second in Asia in the number of individuals who were food insecure; Ethiopia was ranked second in food-insecure people in Sub-Saharan Africa (Meade and Rosen, 2011).[3] Each of these countries could significantly benefit from an assessment methodology that is cheaper and easier to implement given their respective size and diversity.

The household-level experiential-based measure of food insecurity calculates whether households have experienced food insecurity based on questions regarding food access. Each survey has a different list of experiential measures. The surveys conducted in Bangladesh and India ask questions that pertain only to the most severe forms of access to food (e.g., "were you forced to skip a meal?"), while the Ethiopia survey asks a more complete list of questions. The surveys used from the three representative countries allow us to calculate food insecurity with a variety of measures (including the two measures of interest for this report), using the same set of households.

In our main findings, we show that a significant share of households categorized as undernourished because of consumption below 2,100 calories did not report experiencing any form of food insecurity. This discrepancy occurred in the Ethiopian survey eliciting a wide range of ways of coping with food uncertainties (e.g., worrying about food security), as well as in surveys eliciting experiences with only more severe forms of food insecurity in Bangladesh and India (e.g., skipping meals). We found that of the households reported to be undernourished in Ethiopia, only 35 percent reported experiencing food insecurity, and in Bangladesh and India, only 16.7 and 1.1 percent, respectively, did so.

Furthermore, we found that a number of households reporting to be adequately nourished by caloric consumption in Ethiopia reported experiencing milder forms of food insecurity not specifically related to caloric consumption. However, when restricting the survey responses to those that necessarily imply lower caloric consumption (e.g., skipping meals), these households no longer reported experiencing food insecurity.

The findings suggest that even if the overall prevalence of food insecurity identified by experiential and other measures is similar, experiential measures appear to be classifying a much different subset of the population as food insecure. Most important, the measures do not agree on the identity of the households that are the most food insecure, the subset of households whose consumption most needs to be tracked. These differences can be caused by a number of factors, including measurement error in reported consumption or in the survey questions on which experiential measures are based (e.g., from households interpreting experiential questions differently and differences in expectations regarding food consumption, in cultural norms, and in survey design). More research is needed to better understand how experiential-based measures and reported undernourishment might better align, and whether these measures do indeed track the most food-insecure households.

Given the versatility of experiential measures in quantifying dimensions of food security, researchers and policymakers need to be careful to compare metrics that focus on similar dimensions. For example, before comparing experiential measures to traditional measures that primarily address only caloric consumption, researchers should take care to focus on responses that translate

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[3]These rankings are based on national food availability measures of food security.

directly to reductions in caloric consumption as opposed to other experiences, such as worrying about consumption and the quality of the calories consumed.

This report contributes to the literature that analyzes the validity of experiential measures of food security (e.g., Maxwell et al., 1999 and 2008; Smith et al., 2006; and Maxwell et al., 2014). The report is most closely related to Maxwell et al., who found that a number of different metrics of food security in Ethiopia gave significant differences in the prevalence of food insecurity. Aside from similarly demonstrating in a wider set of countries that a measure of household caloric consumption and an experience-based measure are not strongly correlated, we delve into the identity of those households that the metrics categorize differently, demonstrating that the two metrics do not agree on the identity of the households that are most or least food insecure. In addition, we demonstrate that focusing on particular dimensions of food security gives results that align more closely.

The analysis contributes to the growing literature on the use of experiential measures of food insecurity. For example, Headey (2013) and Verpoorten et al. (2013) both investigated the impact of the global food crisis of 2007-2008 on self-assessed food insecurity. Headey used a sample of 69 low- and middle-income countries, while Verpoorten and colleagues used a sample of 18 Sub-Saharan African countries. Both studies used a single indicator of whether an individual was unable to purchase enough food for the household due to limited resources. Both articles found that global food insecurity was not impacted by the global food crisis.[4] However, Bickel et al. (2000) argued that the full range of food insecurity cannot be measured by a single indicator, suggesting the need for a suite of questions to fully capture household or individual food insecurity status.

Measures of Food Security

Several approaches have been used to measure different dimensions of food insecurity, and this report focuses on the measurement of access to food at the household level. Alternatively, ERS, in its Global Food Security Assessment, uses a national-level approach to assess the availability of food for each country, which is based on the food gap between domestic food consumption (calculated as the sum of production plus imports minus exports, waste and losses, and change in stocks) and a consumption target (Meade and Rosen, 2015). Analysis of food consumption by income deciles provides a measure of access to food, but no information on the geographical distribution of food insecurity within countries. Similarly, the method used by the Food and Agriculture Organization of the United Nations (FAO) is based on national food supply data. These measures, while useful for capturing national estimates of food insecurity, fail to identify the food insecure and their distribution within a country, information important to policymakers and the donor community. Additionally, the ERS and FAO food-balance approach measures food security based on caloric consumption, as opposed to the nutritional quality of the diet or reported worries about food insecurity.

To measure access to food at the household or individual level, several food security indicators have been developed. Indicators based on food consumption count the number of different food groups consumed over a given period. These measures include the food consumption score (FCS), devised by the World Food Programme (WFP), and the Household Dietary Diversity Score (HDDS) developed by the Food and Nutrition Technical Assistance (FANTA) project of the United States Agency for International Development (USAID). Alternatively, measurements of food utilization can also be conducted at the individual level. For example, anthropometric measurements, including body mass

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[4]Both articles found that the impact of the global food crisis on food insecurity varied by country.

index (BMI), height-for-age Z-scores, and weight-for-height Z-scores, are regularly used to assess the nutritional status of individuals and to collect data for population-based nutrition surveys.

This report assesses two household-level measures of one of the pillars of food security: access to food, a household caloric consumption measure (reported undernourishment), and a household experiential measure. Data are collected on household or individual food consumption over a given recall period, usually 7 days. Households are asked about food consumed from own production, from food purchases, and from food donations or gifts-in-kind. This information is used to determine if the household consumed sufficient food to allow each household member to meet minimum energy requirements. Undernourishment is defined as the inability to acquire a sufficient amount of food to meet the daily minimum dietary energy requirements over a period of 1 year (FAO, 2012).

While many household surveys contain a food consumption module, the time and cost associated with collecting such data can be substantial. Experiential measures of food insecurity, which are fairly new, are gaining popularity due to their relatively low cost to implement (e.g., FAO, 2013). The development of experiential measures began in the early 1990s as a way to measure food insecurity among women and children (Radimer et al., 1992). Experiential measures are based on a respondent's answer to either a single question or a series of questions about the household's or individual's behaviors and attitudes toward having too little food. Between 2005 and 2013, the Gallup World Poll included a single question on self-assessed food insecurity, administered in approximately 150 countries.[5] Since 2001, the Afrobarometer surveys have also included a single question on self-assessed food insecurity.

The U.S. Department of Agriculture has been using an 18-item food security scale since 1995 as part of the Current Population Survey (CPS) Food Security Supplement, to assess the prevalence and severity of food insecurity in the United States. Similar experiential-based multi-item food insecurity scales have been used in developing countries, for example the Latin American and Caribbean Food Security Scale and the Food and Nutrition Technical Assistance (FANTA) Household Food Insecurity Access Scale (HFIAS) (Deitchler et al., 2010). An FAO initiative, Voices of the Hungry Project, incorporated the Food Insecurity Experiential Scale (FIES) into the 2014 round of the Gallup World Poll questionnaire. The FIES contains eight questions to capture an individual's experiences with food insecurity. The questions have been tested and validated to be cross-culturally comparable (Ballard et al., 2013).

Unlike the single-question food insecurity indicator, food insecurity scales ask a series of questions that capture a household's or individual's experiences with food insecurity. The different items that make up the measure capture the different domains of food insecurity found to be common among households who are experiencing it (Coates, Swindale, and Bilinsky, 2007). The three main behaviors and attitudes toward food insecurity covered by most food insecurity scales include:

1. Anxiety about insufficient quantity of food;

2. Compromising on the quality of food; and

3. Reducing the quantity of food.

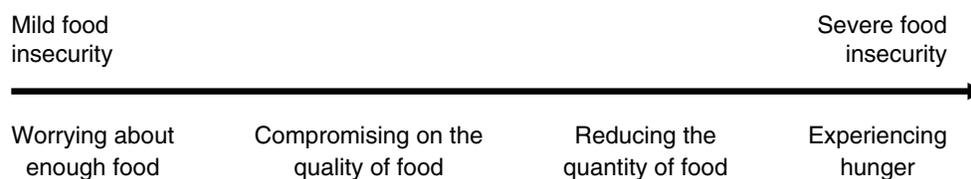[5]See Headley (2013) and Tandon (2015) for studies that have used the Gallop World Poll food insecurity indicator.

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Because the questions are asked in order of the level of severity, households can be grouped by their severity of food insecurity (fig. 1). Converting food insecurity scale values from their continuous form into a binary classification of food secure/food insecure varies by measures. For example, the FIES records a household as (mildly) food insecure if they report experiencing any of the food insecurity conditions. The HFIAS collects information on the frequency with which the household experiences the food insecurity behaviors and classifies a household food secure if the household does not experience any of the food insecurity conditions or reports only rarely worrying about having enough food (Coates, Swindale, and Bilinsky, 2007).

Experiential measures of food insecurity are often referred to as subjective measures of food insecurity because individuals define "adequate" consumption from their own perspective, as opposed to an external definition of adequate consumption. How households perceive a sufficient food bundle and their food needs may differ by socioeconomic status (Headley, 2013); wealthy households may be accustomed to a different diet than poor households. However, Ballard et al. (2013) assert that the responses are not based on perceptions of food insecurity but actual behaviors and experiences associated with food access.

Figure 1
Food insecurity severity along a continuous scale[1]

Mild food insecurity → Severe food insecurity

Worrying about enough food — Compromising on the quality of food — Reducing the quantity of food — Experiencing hunger

[1]Adapted from Ballard et al., 2013.
Source: USDA, Economic Research Service.

Data

A. India

The data for India come from the 2009/10 consumer expenditure survey conducted by India's National Sample Survey Organization (NSSO). The NSSO conducts annual surveys on a range of topics and conducts a more detailed survey of both consumption and employment every 5 years. Given that the sampling necessitates estimating the prevalence of food insecurity in the States of India for rural and urban areas separately, the survey that we use is restricted to the approximately 59,000 households of the 2009/10 survey in rural India. The survey includes detailed demographic information, household characteristics, and household food expenditure.

The NSSO survey provides quantity and value of consumption over the past 30 days of approximately 170 separate food items, along with the sources of each food item (e.g., homemade or purchased) and information on meals consumed outside the household. Additionally, the survey reports a range of household and individual characteristics, including the household location, the number of household members, and their ages and education.

The experiential measure of food security reported in 2009/10 focuses only on the most severe form of lack of access to food. However, the survey uses the entire previous year as the reference period. (See table 1 for a list of the questions).

Table 1
India: food insecurity questions

Q1	Do all members of your household 'get two square meals every day'?
Q2	If code is 2 in item 1, during which calendar months did any member of the household not 'get two square meals every day'?
Q3	Was information on item 1 actually obtained from informant?

Source: USDA, Economic Research Service. 2009/2010 National Sample Survey.

B. Bangladesh

Data for Bangladesh come from the 2011/2012 Bangladesh Integrated Household Survey (BIHS). The survey was designed and supervised by the International Food Policy Research Institute (IFPRI) with funding provided by USAID. The BIHS surveyed approximately 5,500 households and is representative of rural Bangladesh and of each of the 7 administrative divisions of the country: Barisal, Chittagong, Dhaka, Khulna, Rajshahi, Rangpur, and Sylhet. The survey contained detailed information on household food consumption and information related to food security and coping mechanisms. The survey also included information on household characteristics.

The BIHS collected the quantity of consumption of over 300 food ingredients used in final recipes, including food bought on the market, produced, or obtained through other methods like food aid or gifts, based on a 7-day recall period. There were also questions about the household expenditure on more than 30 types of foods prepared outside the household, including both processed foods and common ready-to-eat preparations.

The household-level experiential measure of food insecurity in Bangladesh was obtained from the survey module on food security. This module contained questions from the Household Hunger Scale (HHS). The HHS originated from the Household Food Insecurity Access Scale (HFIAS). The HFIAS was adapted from the United States household food security module for use in developing countries and consists of nine frequency-of-occurrence questions about experiences of food insecurity. The questions capture increasing levels of the severity of food insecurity, followed by questions to determine how often the condition occurred ("rarely," "sometimes," "often"). Because the HHS contains only the three most severe food-insecure experiences of the HFIAS, it is likely to underestimate mild-to-moderate food insecurity (Ballard et al., 2011). The HHS was developed and validated for cross-cultural use (Deitchler et al., 2010).[6] The survey uses a 30-day recall period. (See table 2 for a list of the questions.)

The two modules of the HHS (Food consumption and Food insecurity) were asked to the same female household member who was primarily responsible for the cooking, supervising, and serving of food. However, the recall periods for the two modules differed; the household food consumption module used a 7-day period and the household food security module a 30-day period.

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[6]Refer to Coates et al. (2007) and Ballard et al. (2011) for a more detailed discussion of the HFIAS and HHS and their use.

Table 2
Bangladesh: food insecurity questions

Q1	In the past 4 weeks, was there ever no food to eat of any kind in your house because of lack of resources to get food?
Q1a	How often did this happen in the past 4 weeks?
Q2	In the past 4 weeks, did you or any household member go to sleep at night hungry because there was not enough food?
Q2a	How often did this happen in the past 4 weeks?
Q3	In the past 4 weeks, did you or any household member go a whole day and night without eating anything at all because there was not enough food?
Q3a	How often did this happen in the past 4 weeks?

Source: USDA, Economic Research Service. 2011/2012 Bangladesh Integrated Household Survey.

C. Ethiopia

The data for Ethiopia come from the 2011/2012 Ethiopian Rural Socioeconomic Survey (ERSS). The survey was administered by the Central Statistics Agency of Ethiopia in collaboration with the team of the World Bank Living Standards Measurement Study Integrated Surveys of Agriculture. The ERSS surveyed approximately 4,000 households and is representative of all rural and small towns of Ethiopia except for 3 zones of Afar and 6 zones of Somalie regions. The data are representative at the regional level for 4 of the 11 regions in Ethiopia: Amhara, Oromia, Southern Nations, Nationalities, and People's Region (SNNP), and Tigray. The survey includes detailed demographic information, household characteristics, household food expenditure, experiences with shocks, and additional detailed information related to food security and coping mechanisms. The ERSS recorded the amount consumed in Ethiopia of 25 major food items based on a 7-day recall period.

The household-level experiential measure of food insecurity was obtained from the ERSS module on food security. The food security module consists of a series of frequency-of-occurrence questions about short-term coping strategies the household employed when there was insufficient food in the household or money to buy food. The module contains nine questions, presented in table 3, concerning the household's coping strategies during the 7 days prior to the survey.[7] The questions capture the severity of food insecurity from the most mild form of food insecurity (worrying about having enough food) to the most severe form (going an entire day without food).[8]

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[7]There are only eight frequency-of-occurrence questions, Q2-Q9 in table 3. We include Q1, which asks about the household's feelings about the food available to the household. The results are not sensitive to the inclusion of this question.

[8]The index of coping strategies developed in this report has not been tested or validated as an official experiential scale.

Table 3
Ethiopia: food insecurity questions

Q1	In the past 7 days, did you worry that your household would not have enough food?
Q2	In the past 7 days, how many days have you or someone in your household had to rely on less preferred foods?
Q3	In the past 7 days, how many days have you or someone in your household had to limit the variety of foods eaten?
Q4	In the past 7 days, how many days have you or someone in your household had to limit portion size at meal-times?
Q5	In the past 7 days, how many days have you or someone in your household had to reduce number of meals eaten in a day?
Q6	In the past 7 days, how many days have you or someone in your household had to restrict consumption by adults for small children to eat?
Q7	In the past 7 days, how many days have you or someone in your household had to borrow food or rely on help from a friend or relative?
Q8	In the past 7 days, how many days have you or someone in your household had to have no food of any kind in your household?
Q9	In the past 7 days, how many days have you or someone in your household had to go a whole day and night without eating anything?

Source: USDA, Economic Research Service, Ethiopian Rural Socioeconomic Survey.

Questions from the two modules (Food Consumption and Food Insecurity) were asked to the household member primarily responsible for the preparation of food, guaranteeing that the same respondent answered both modules. Additionally, the household questionnaire was administered between January and March, during the peak period for food consumption. Both modules used a 7-day recall period.

Methodology

For each country, the household-level caloric-consumption measure of food insecurity was calculated by comparing each household's total daily household calories to a consumption target. To calculate total daily household calories, we mapped nutritional information to quantities for each of the food items included in the modules.[9] For Bangladesh and India, nutritional information was obtained from *Nutritive Value of Indian Foods* by Gopalan, et al., (1989).[10] For Ethiopia, nutritional information was obtained from the 2010/2011 Ethiopian Household Income, Consumption, and Expenditure survey.

However, there are a number of difficulties in estimating overall household caloric consumption. First, inaccuracies may arise in converting processed food purchases into their caloric values.

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[9]We convert liquid amounts to grams using the density of each liquid.

[10]In certain instances, it is difficult to match the survey code to the more detailed foods that are recorded in *Nutritive Value of Indian Foods* (Gopalan et al., 1989). However, in most cases, the difference in calories is likely to be small (e.g., in matching up particular forms of rice, nearly all calorie values are identical, so any error is likely inconsequential).

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Many processed food categories, such as "Salted Refreshment," "Cake/Pastry," and "Other Processed Food," are difficult to match to precise nutritional information. Further, because some of these vague food categories come in a variety of different forms and it is difficult to report quantities, the data sets for India and Bangladesh report only the value of a number of processed food categories.[11]

In order to estimate calories contained in these sources, we followed Deaton and Subramanian (1996), first calculating the amount of nonprocessed calories consumed per rupee spent on those food items. We then assumed that processed foods are twice as expensive as nonprocessed calories,[12] and we obtained an estimate of calories from processed foods by multiplying the value spent on processed foods by one-half of the calories the household obtains from per rupee spent on nonprocessed foods.

Household members consume meals outside the home, and the calories in these meals must be accounted for to accurately compute the number of calories consumed by the members. For example, if poorer households are more likely to eat meals at their place of employment, then looking only at food items they purchase is likely to understate their caloric consumption. While the NSSO and BIHS data sets provide detailed information on the number of outside meals received by household members, it is still necessary to devise a method to accurately assign a caloric value to those meals.

Following the methodology introduced by Deaton and Subramanian (1996), the calories contained in meals consumed outside the household are estimated by analyzing how many fewer calories the household consumes for every additional away-from-home meal. Using simple regression techniques, the most complete estimate suggests that households consume 475 fewer calories for each meal consumed outside the household, and we added that figure to household caloric consumption for each outside meal. Furthermore, we subtracted 475 calories from household consumption for each meal given to nonhousehold members. Although the approach is far from ideal and introduces a significant amount of measurement error into estimates of undernourishment (e.g., Tandon and Landes, 2011), a number of other studies use similar approaches (e.g., Deaton and Dreze, 2009).

Thus, estimates of total household caloric consumption were obtained by adding nonprocessed calories consumed, the estimate of processed calories consumed, and the estimate of calories consumed in meals outside the household. Once the baseline estimates of total caloric consumption were calculated, caloric consumption totals for individuals requiring approximately 2,100 calories per day (adult equivalents) were computed to permit comparisons with individual consumption benchmarks. We used the age and gender of children and adults to adjust household size to "adult equivalents," based on a requirement of 2,100 daily calories.[13] A household was considered food insecure if the daily calories per adult equivalent were less than 2,100 calories (reported undernourished).

For Bangladesh, the HHS score was calculated by first recoding each frequency-of-occurrence response. If the frequency response of "rarely" or "sometimes" was recorded, the household received a score of 1 for that question. If the frequency response of "often" was recorded, the household

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[11]Although it is difficult to estimate how many calories were consumed from processed foods, the baseline estimation strategy in this report estimates that households consume approximately 5 percent of overall calories in the form of processed foods.

[12]This reflects processing margins.

[13]For example, children and the elderly have different minimum daily energy requirements, and in normalizing the total caloric consumption of each household, they would count as less than a whole adult who would require 2,100 daily calories. The exact concordance that we used describing the minimum daily energy requirement of each age and gender was derived from the National Sample Survey Organization (2007).

received a score of 2 for the question. If the household recorded "No" to the experiential question, the question received a score of 0. The HHS score was calculated by summing the score to each of the three experiential questions. Therefore, each household's HHS score fell within the range of 0-6. A score of 0 indicated that the household never experienced any of the events within the 30-day recall period, whereas a score of 6 indicated that the household "often" experienced each of the three experiences within the 30-day recall period.

For Ethiopia, a raw score was created based on the number of coping strategies the household employed within the 7-day recall period. If the household reported adopting the coping strategy during the period, the household received a score of 1 for that question. The raw score is calculated by summing the score to each of the nine coping strategy questions. Each household's coping strategy raw score (CSRS) fell within a range of 0-9. A score of 0 indicated that the household never needed to employ any of the coping strategies for insufficient resources for food, while a score of 9 indicates that the household employed all of the coping strategies.

The HHS, administered in Bangladesh, has commonly used cutoff points to convert the HHS into categories (Ballard et al., 2011). An HHS score of 1 indicates little food insecurity in the household. We use a score of 1 or greater to classify a household as food insecure.[14] The index of coping strategies constructed for Ethiopia does not have clear guidelines for choosing a cutoff to classify a household as food insecure. We classify a household as food insecure if the household has a raw score of 1 or more. For India, we proxy for a household being food insecure if the household reported not consuming "two square meals every day."

Differences in Results from Experiential Food Security and Undernourishment Measures

In this section, we present prevalence rates of food insecurity in tables and maps for the rural populations, using the two measures of food insecurity. We quantify the magnitude of the differences in prevalence rates between experiential food insecurity and undernourishment. We first describe differences in experiential food insecurity and undernourishment for rural India, the survey with the least extensive experiential measure. We then present differences between the two measures for rural Bangladesh from the survey that has only three experiential questions but limits them to the most severe food insecurity experiences. Last, we present differences in experiential food insecurity and undernourishment for rural Ethiopia, the survey with the richest set of experiential questions, which capture a broad spectrum of food insecurity experiences.

Only 550 households in all of rural India, of a total of 59,097, actually reported experiencing food insecurity. Given this irregularity, we compare undernourishment to a nearly identical experiential food security metric collected by the Gallup World Poll (GWP) that asks if there was a time in the past 12 months when the respondent did not have enough money to purchase food. If respondents answered affirmatively, we categorized them as having experienced food insecurity.

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[14]A score of 1 or 0 is grouped under little-to-no food insecurity in the household. For the purposes of this study, we separated households with a score of 1 from households with a score of 0.

Table 4 presents the prevalence of food insecurity for rural India by State. Column (1) shows the prevalence using reported undernourishment as the measure; and column (2) presents the prevalence using the GWP experiential-based measure. States are ordered from lowest to highest by their prevalence of food insecurity using reported undernourishment. Although column (1) demonstrates that a significant share of the rural population is reported to be undernourished, column (2) demonstrates that fewer respondents actually reported that their household was food insecure in the past year in a majority of Indian States. The average prevalence of undernourishment for the entire country is nearly double the share of individuals who reported experiencing food insecurity.

Across Indian States, we found a high degree of variability in both the reported undernourishment in column (1) and the GWP experiential measure reported in column (2). Most notably, States with higher food insecurity in reported undernourishment did not report the highest amount of food insecurity in the experiential measures. These patterns are further documented in figures 2 and 3. Figure 2 provides a graphical representation of the prevalence rates by State for the reported undernourishment and the GWP experiential measure, and figure 3 depicts the differences in prevalence rates between the two measures of food insecurity in a single graph. For 7 of the 20 States, the difference between the prevalence rates exceeded 45 percentage points.
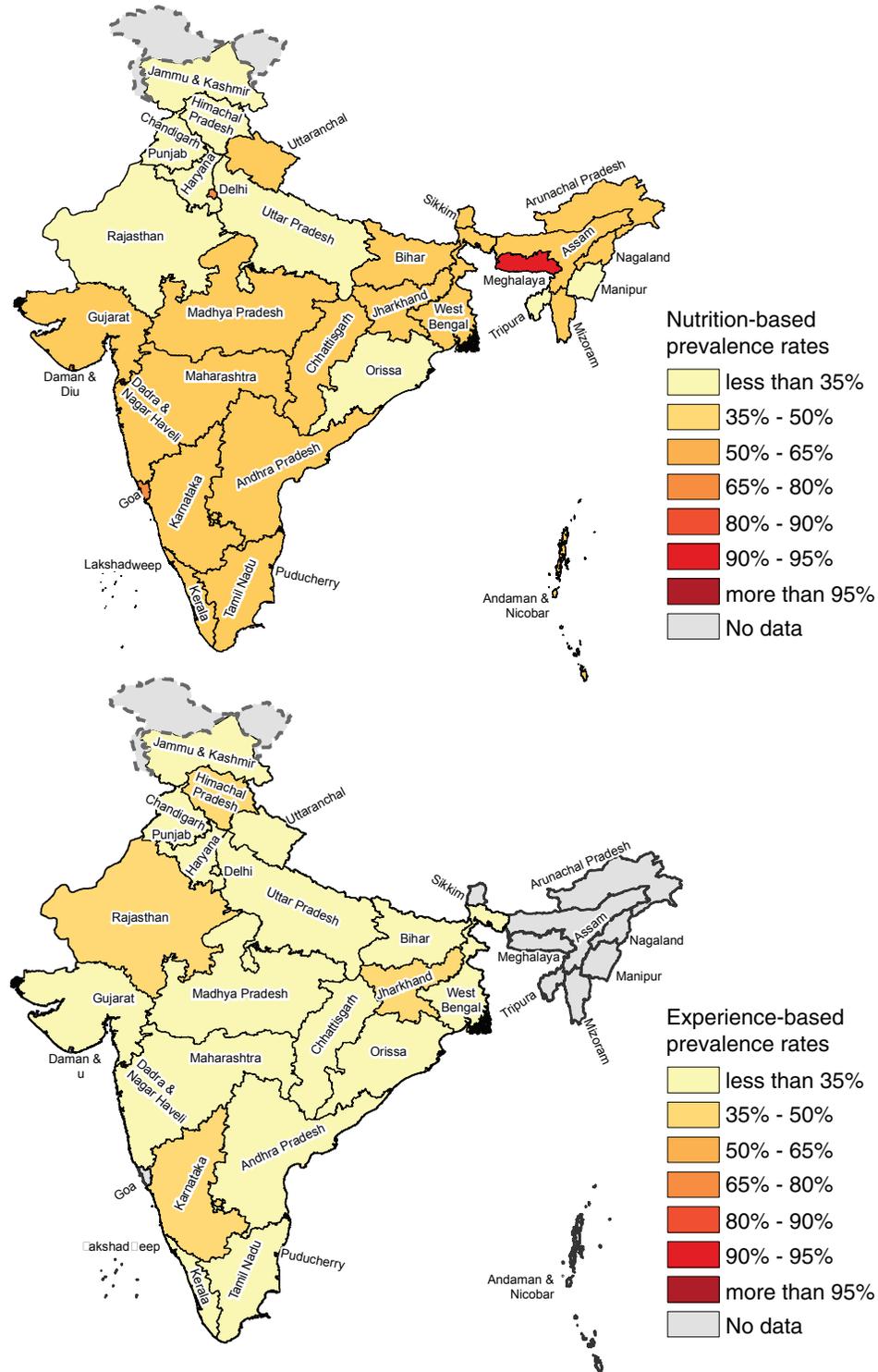
Table 4
Prevalence of food insecurity by State, India

State	Nutrition-based (1)	Experiential-based,severe (2)
	Percent	
Jammu & Kashmir	29.39	1.67
Himachal Pradesh	33.55	43.33
Haryana	42.36	3.33
Rajasthan	43.34	35.33
Punjab	47.56	18.75
Uttar Pradesh	49.70	15.38
Orissa	49.83	23.08
Bihar	56.74	32.75
Uttaranchal	56.94	10.00
Chhattisgarh	61.47	30.00
Madhya Pradesh	62.66	29.72
Jharkhand	65.81	46.88
Andhra Pradesh	66.82	16.46
Gujarat	70.12	18.67
West Bengal	71.13	31.60
Maharashtra	72.18	23.83
Tamil Nadu	75.02	22.60
Karnataka	78.07	49.69
Kerala	79.36	24.09
Total	60.19	32.62
Number of observations	59,097	6000

Source: USDA, Economic Research Service; 2010 Gallup World Poll and 2009/2010 Indian National Sample Survey.

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Figure 2
Prevalence of food insecurity, India

India: prevalence of food insecurity by state

Nutrition-based
prevalence rates

less than 35%

35% - 50%

50% - 65%

65% - 80%

80% - 90%

90% - 95%

more than 95%

No data

Experience-based
prevalence rates

less than 35%

35% - 50%

50% - 65%

65% - 80%

80% - 90%

90% - 95%

more than 95%

No data

Notes: Prevalence rates are for rural and urban areas.
Source: USDA, Economic Research Service. 2010 Gallup World Poll and the
2009/2010 National Sampe Survey.

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Figure 3
Absolute difference in prevalence rates, India

India: prevalence of food insecurity by state
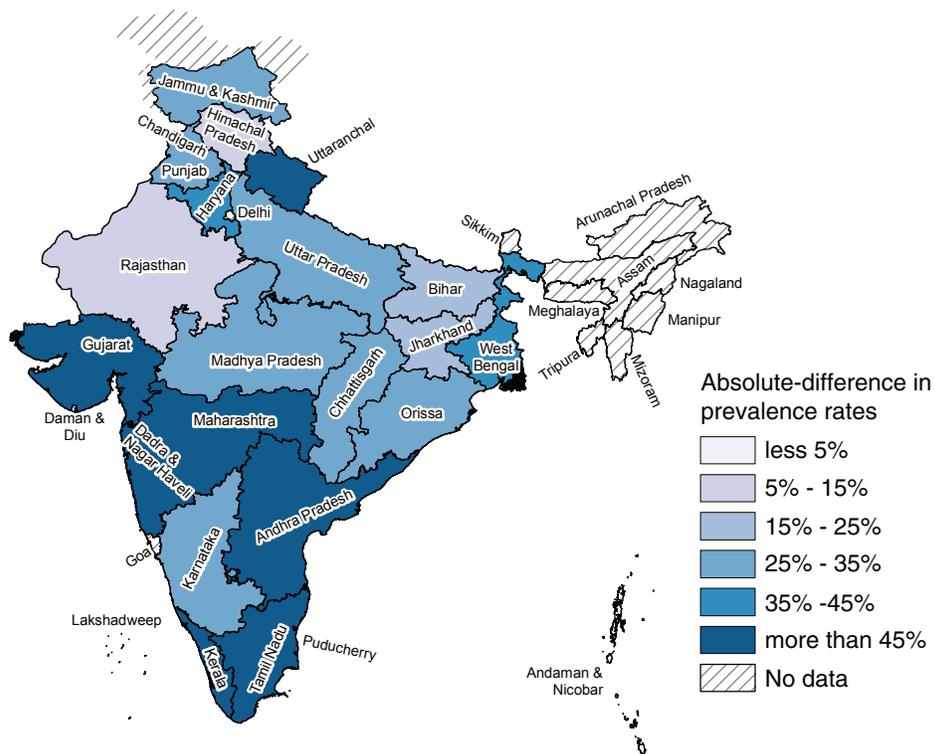
Absolute-difference in prevalence rates

- [ ] less 5%
- [ ] 5% - 15%
- [ ] 15% - 25%
- [ ] 25% - 35%
- [ ] 35% -45%
- [ ] more than 45%
- [ ] No data

Notes: Prevalence rates are for rural and urban areas.
Source: USDA, Economic Research Service. 2010 Gallup World Poll and the 2009/2010 National Sample Survey.

Table 5 presents the prevalence of food insecurity for rural Bangladesh by Division. Column (1) presents the prevalence using reported undernourishment as the measure of food insecurity; and column (2) presents the prevalence using the experiential-based measure of food insecurity. Divisions are ordered from lowest to highest by their prevalence of food insecurity using reported undernourishment.

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Table 5
Prevalence of food insecurity by division, Bangladesh

Division	Nutrition-based (1)	Experiential-based, severe (2)
	Percent	
Khulna	15.4	7.6
Dhaka	17.5	6.9
Sylhet	17.6	9.4
Rajshahi	18.9	6.1
Barisal	23.1	15.3
Rangpur	24.5	12.4
Chittagong	30.2	8.1
Total	21.0	8.5
Number of observations	5,493	5,493

Note: The nutrition-based measure of food insecurity is based on less than 2,100 daily caloric consumption per adult equivalent. The Experiential-based measure of food insecurity is based on a Household Hunger Scale of 1 or more.
Source: USDA, Economic Research Service; 2011/2012 Bangladesh Integrated Household Survey.

The prevalence of food insecurity for rural Bangladesh in 2011/2012 using reported undernourishment was 21 percent. This is similar to the prevalence rate calculated using the ERS food balance approach, which estimated that approximately 20 percent of the Bangladeshi population was food insecure in 2011 (Shapouri et al., 2011). Approximately 9 percent of the rural population was severely food insecure in 2011 based on the experiential-based measure. The substantial difference in the prevalence of food insecurity between the two measures is primarily due to the experiential measure capturing the most severe form of food insecurity: going a full day without eating.

Across the administrative Divisions of Bangladesh, the prevalence of food insecurity varied between a low of 15 percent in Khulna to a high of 30 percent in Chittagong using reported undernourishment. Using the experiential measure of food insecurity, Barisal and Rangpur divisions both had prevalence rates in the double digits at 15 and 12 percent, respectively.

Figure 4 provides a graphical representation of the prevalence rates by Division for the two measures of food insecurity. The figure depicts how the prevalence rates differ across Divisions for the different measures.

We do not observe similar trends in the two measures of food insecurity across Divisions. For example, Chittagong had the highest rate of food insecurity of the seven Divisions using reported undernourishment, with a prevalence rate of 9 percentage points above the rural average. However, using the experiential-based method, Chittagong was at the rural average of 8 percent of the population severely food insecure and ranked as the fourth-largest Division in terms of the share of the population severely food insecure. No discernible trend between the two measures can be reported from table 6.

Figure 4
Prevalence of food insecurity, Bangladesh

Bangladesh: prevalence of food insecurity by region
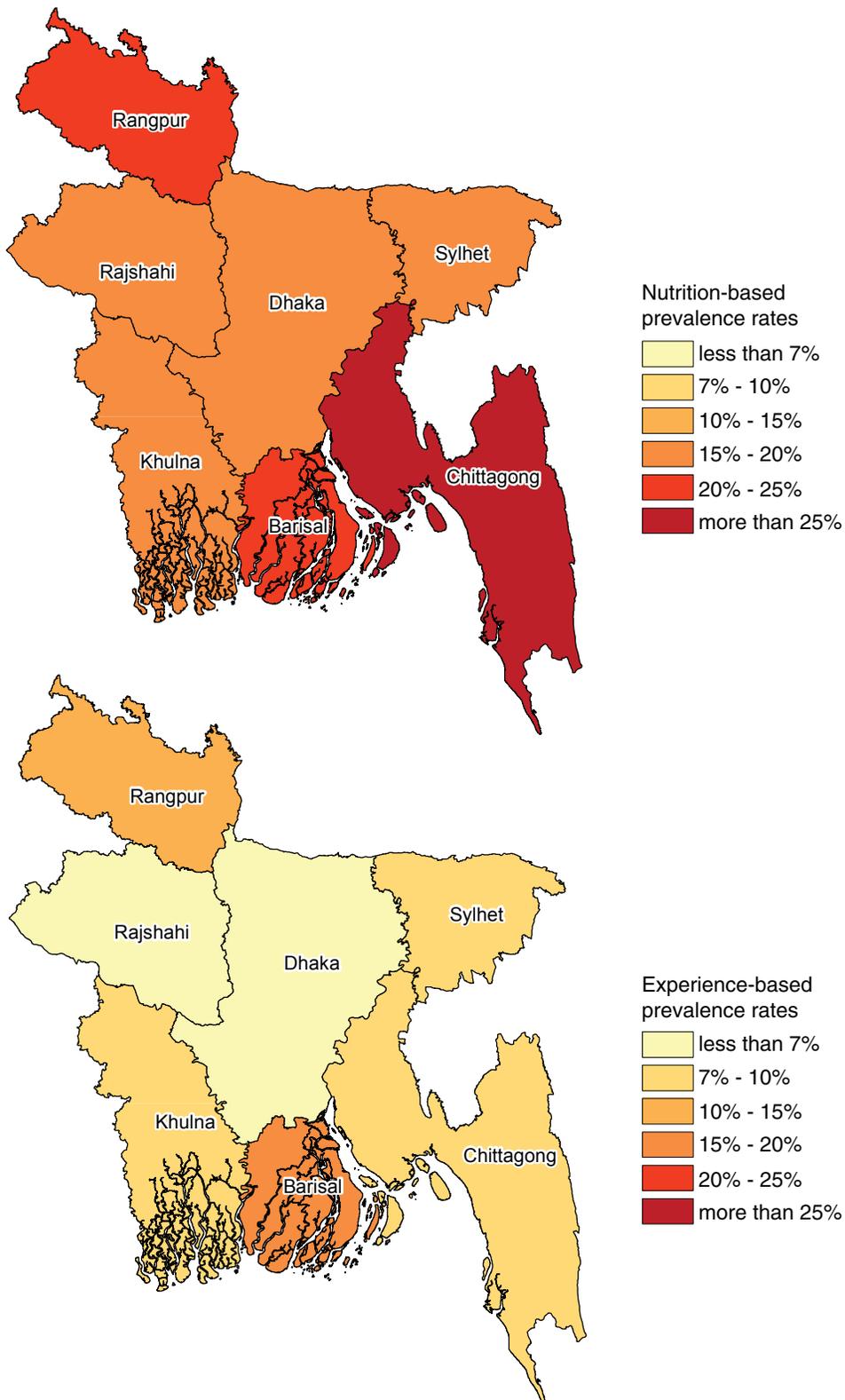
Nutrition-based
prevalence rates

- less than 7%
- 7% - 10%
- 10% - 15%
- 15% - 20%
- 20% - 25%
- more than 25%

Experience-based
prevalence rates

- less than 7%
- 7% - 10%
- 10% - 15%
- 15% - 20%
- 20% - 25%
- more than 25%

Notes: Prevalence rates are for rural areas.
Source: USDA, Economic Research Service. 2011/2012 Bangladesh Intregrated Household Survey.

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Table 6
Prevalence of food insecurity by region, Ethiopia

Region	Nutrition-based	Experiential-based	
		No restrictions	Restricted
	(1)	(2)	(3)
	Percent		
Oromia	23.2	36.5	25.9
Tigray	24.6	19.8	14.3
SNNP	38.7	57.5	47.6
Amhara	39.3	13.2	8.2
Other regions	40.3	40.4	32.6
Total	32.6	34.5	26.2
Number of observations	3,947	3,605	3,605

SNNP = Southern Nations, Nationalities, and Peoples' Region.
Source: USDA, Economic Research Service; 2011/2012 Ethiopian Rural Socioeconomic Survey.

,Figure 5 depicts the differences in prevalence rates between the two measures of food insecurity in a single graph. For six of the seven divisions the difference between the prevalence rates was between 5 and 15 percent. Chittagong had the largest differences in rates of food insecurity, ranging between 15 and 25 percent.

Unlike the Bangladeshi and Indian surveys, the Ethiopian survey contains a full set of experiential questions meant to capture the full range of food insecurity that households experience when confronted with insufficient food or resources to obtain food (Maxwell et al., 2008; Ballard et al., 2013). As discussed, food insecurity experiential scales have been used more recently for monitoring shocks and targeting food resources in developing countries. The availability of a full food insecurity scale will allow us to assess whether the large differences in prevalence rates between the experiential measure and the consumption measure in the Indian and Bangladeshi survey were partly due to the limited number of questions on experiences with food insecurity.

Table 6 presents the prevalence of food insecurity for Ethiopia by region. Column (1) shows percentages of food insecurity using reported-undernourishment measures. Column (2) shows the percentages using the experiential-based measure of food insecurity (whether the household answered affirmatively to any of the nine experiential questions).[15] Regions are ordered from lowest to highest by their prevalence of food insecurity using reported undernourishment.

The prevalence of food insecurity for rural Ethiopia in 2011/2012, using either reported undernourishment or the experiential-based method, was between 32 and 35 percent. This is similar to the prevalence rate calculated using the ERS food balance approach, which estimated that approximately 40 percent of the Ethiopian population was food insecure in 2011 (Meade and Rosen, 2011).

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[15]Unlike the HFIAS and some other experiential food-insecurity scales, there is no commonly used cutoff to classify households into food-secure/food-insecure categories. We adopt the least restrictive cutoff to classify households as food insecure. This approach minimizes the number of households that are misclassified but may overestimate the number of households that are food insecure. The Voices of the Hungry Food Insecurity Experiential Scale classifies households as food insecure if they report experiencing at least one of the food-insecurity behaviors or feelings (Ballard et al., 2013).

Figure 5
Absolute difference in prevalence rates, Bangladesh

Bangladesh: prevalence of food insecurity by region
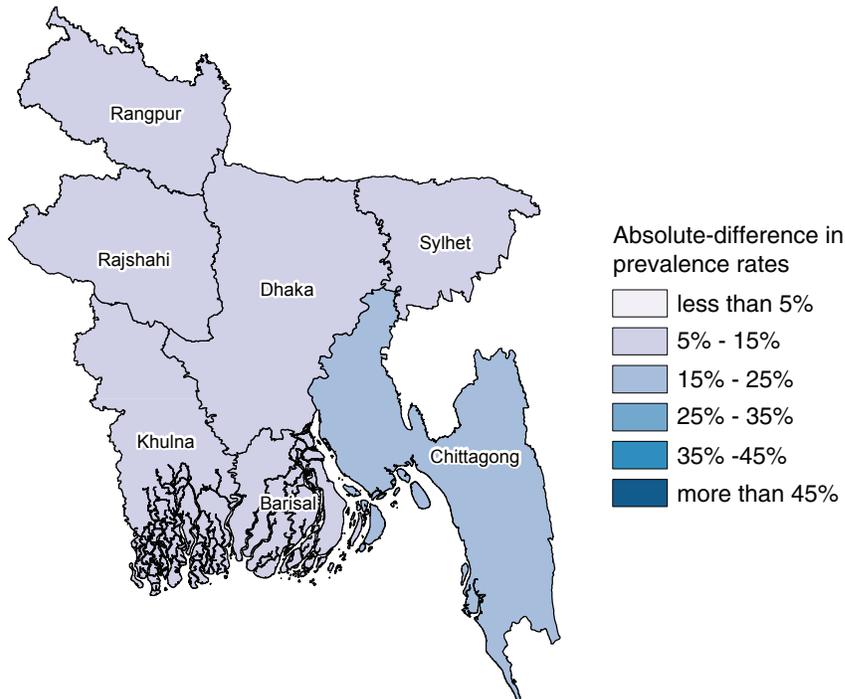
Notes: Prevalence rates are for rural areas.
Source: USDA, Economic Research Service. 2011/2012 Bangladesh Intregrated Household Survey.

At first glance, it appears that the richer experiential measure in the Ethiopian survey matches more closely with the calorie-consumption measure. However, the aggregate measures of food insecurity mask the within-country variation in food insecurity. Across the major regions of Ethiopia, the prevalence of food insecurity varied between a low of 13 percent in Amhara region to a high of 57 percent in the Southern Nations, Nationalities, and Peoples' (SNNP) region using the experiential-based method. Using reported undernourishment as the measure, food insecurity varied between a low of 23 percent in Oromia region and a high of 39 percent in SNNP.

Noticeable differences between the two measures of food insecurity appear when we compare the prevalence of food insecurity by region. For the northern regions Tigray and Amhara, the prevalence of food insecurity is higher using reported undernourishment than using the experiential-based measure of food insecurity. For Tigray, the prevalence of food insecurity in 2011/2012 was 20 percent with the experiential-based method versus 25 percent using reported undernourishment. In the Amhara region, the difference between the two measures exceeds 35 percentage points—13 percent of the population in Amhara experienced some form of food insecurity compared to 40 percent who reported insufficient household consumption to meet the recommended 2,100 calories per person per day.

For the southern regions, Oromia and SNNP, the reverse pattern exists. The prevalence of food insecurity is higher using the experiential-based measure than using reported undernourishment. In Oromia, the prevalence of food insecurity was 36 percent using the experiential-based measure

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compared to 23 percent using reported undernourishment. In SNNP, the prevalence was 57 percent using the experiential-based measure compared to 38 percent using reported undernourishment.

Several of the questions used to construct the experiential-based measure do not specifically relate to caloric consumption, such as those that assess whether households worried about food consumption or sacrificed the quality of calories consumed. In order to make the reported-undernourishment measure more precisely compare to the experiential-based measure, column (3) of table 6 restricts the classification of food insecurity, as measured by the experiential measure, to whether the household answered affirmatively to the questions that most reflect food access—that is, questions 4-9 from table 3. The national prevalence rate, as measured by the restricted measure, falls about 8 percentage points. For Tigray and Amhara regions, there is a larger discrepancy between reported undernourishment and the experiential-based measure. For Oromia and SNNP regions, there is a smaller discrepancy

Figure 6 provides a graphical representation of the prevalence rates, using the two measures of food insecurity, for the four major regions of Ethiopia, Tigray, Amhara, Oromia, and SNNP. The graphs show that food insecurity is higher in the southern part of the country when using the experiential measure of food insecurity than by the reported-undernourishment measure. This could be attributable to the southern part of the country having suffered a severe drought in 2011, which would account for households adopting more coping strategies without necessarily preventing them from consuming the recommended 2,100 calories per person per day. Alternatively, figure 7 depicts the differences in prevalence rates between the two measures of food insecurity.

To summarize, national prevalence rates of experiential food insecurity and undernourishment were more similar for Ethiopia than for India and Bangladesh. In Ethiopia, which contained a list of nine experiential questions meant to capture the full scale of coping strategies that households adopt when suffering from a lack of resources for food, the two prevalence rates were almost identical. However, for India and Bangladesh, national prevalence rates of experiential food insecurity and undernourishment differed substantially. The experiential measure in both the Indian and Bangladeshi surveys asked about the most severe experiences of the household due to a lack of resources for food, and it therefore fails to capture households that may adopt less severe coping strategies. In both countries, prevalence rates measured using the experiential measure were lower than the rates using reported undernourishment.

Additionally, we found substantial differences in the prevalence rates of experiential food insecurity and undernourishment subnationally, even for Ethiopia. The above findings suggest that even if overall prevalence of food insecurity between experiential and undernourishment is similar, experiential measures and caloric consumption benchmarks appear to be classifying a much different subset of the population as food insecure. In the next section, we further explore this by investigating the characteristics of food-insecure households.

Figure 6
Prevalence of food insecurity, Ethiopia

Ethiopia: prevalence of food insecurity by region
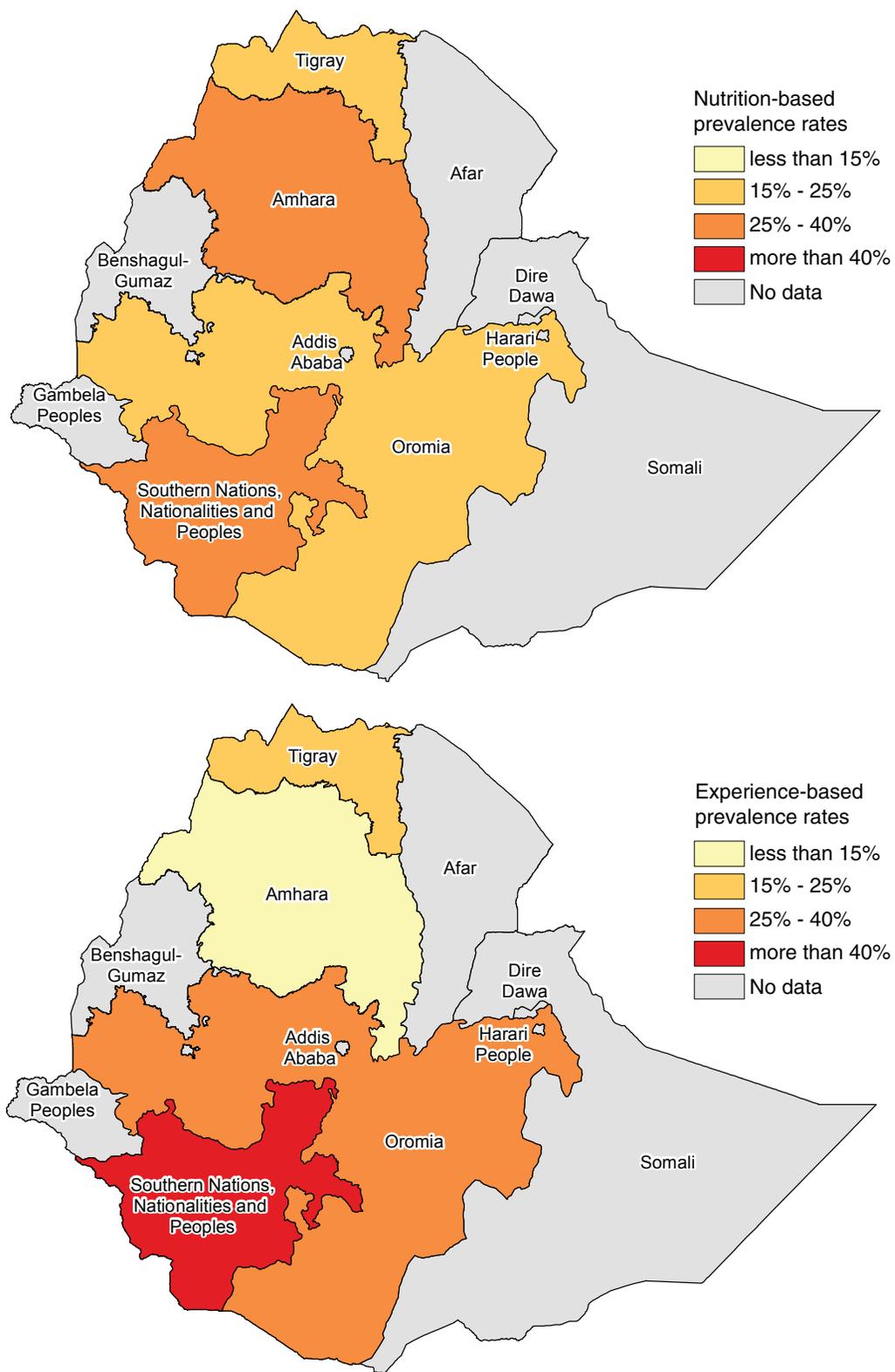
Notes: Prevalence rates are for rural and small town areas.
Source: USDA, Economic Research Service. 2011/2012 Ethiopian Rural Socioeconomic Survey.

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Figure 7
Absolute difference in prevalence rates, Ethiopia

Ethiopia: prevalence of food insecurity by region

Absolute-difference in
prevalence rates

less than 5%
5% - 15%
15% - 25%
25% - 35%
35% -45%
more than 45%
No data
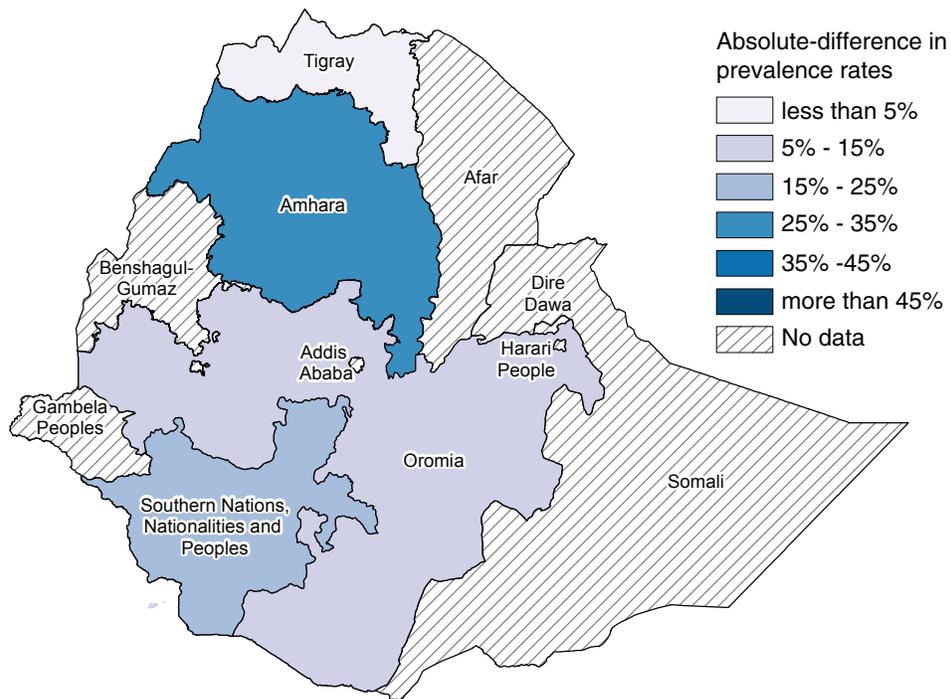
Notes: Prevalence rates are for rural and small town areas.
Source: USDA, Economic Research Service. 2011/2012 Ethiopian Rural Socioeconomic Survey.

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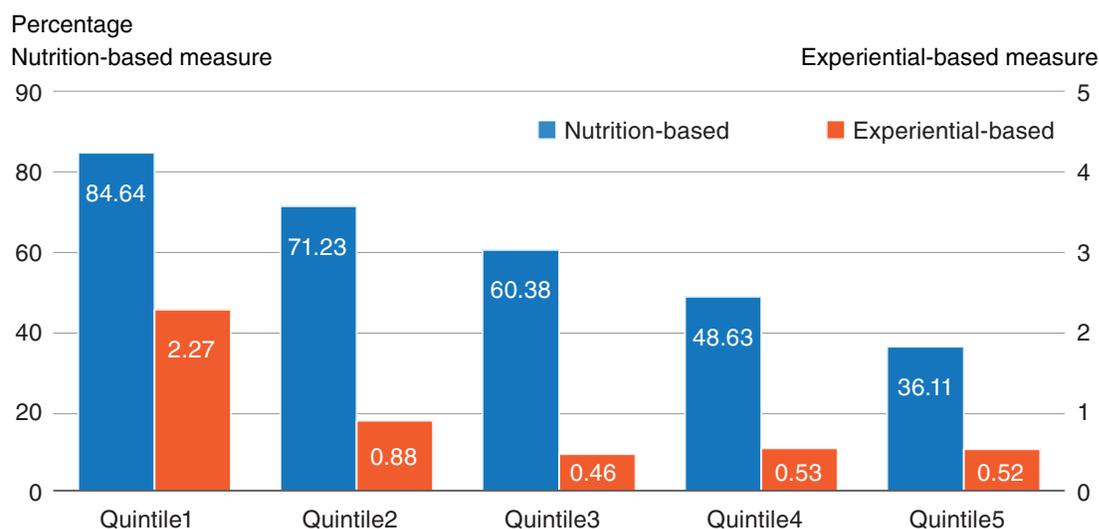Economic Research Service/USDA

Characteristics of Food-Insecure Households in India

For this section, we use the experiential measure and the caloric consumption measure from India's Household Consumer Expenditure Survey. Food-insecure households are most likely to be among the poorest households in both measures. Figure 8 depicts the prevalence of food insecurity by log per capita monthly expenditure. Total expenditure was measured as the sum of food and nonfood expenditure. Despite the large differences in the level of food insecurity, both measures demonstrate a robust negative relationship between the prevalence of food insecurity and expenditure.

We now more formally investigate whether the experiential measure of food insecurity is associated with household food access, measured as the daily per capita caloric consumption. Because the dependent variable, food insecurity, is a binary variable, we employ nonlinear regression techniques to model the association between the experiential measure of food insecurity and household food access. We estimate a probit regression, where the dependent variable is the indicator for whether the household is food insecure, based on whether the household reported skipping a meal in the past year. This is regressed on the log of household daily per capita caloric consumption. The coefficient on household daily per capita caloric consumption will tell us whether the experiential measure is correlated with caloric consumption, the direction of the association, and the magnitude of the association given a 1-percent change in daily per capita caloric consumption. A strong association would imply that the two measures are identifying similar subsets of the population as food insecure, whereas a less strong association would imply that the two measures are identifying at least partially different subsets of the population as food insecure.

The results from the probit are presented in table 7. Marginal effects are included. Columns (1) and (2) of the table present the coefficient estimate on the log daily per capita caloric consumption, not including additional control variables. An increase in a household's daily per capita caloric consumption is associated with a decrease in the probability of the household being food insecure based on the experiential measure of food insecurity. The association is statistically significant, but

Figure 8

Food insecurity by income-level percentage, India

Source: USDA, Economic Research Service. 2009/2010 Indian National Sample Survey.

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given the low share of the population that reports any food insecurity, the magnitude of the effect is not large. A 1-percentage-point increase in a household's daily per capita caloric consumption is associated with a .002-percent decrease in the probability of the household answering affirmatively to having skipped a meal. The magnitude and significance hold when including State fixed effects.

Columns (3) and (4) of table 7 control for household characteristics that are also associated with food insecurity. By including additional control variables, we are able to investigate whether the relationship reported in the bivariate case holds and was not driven by other factors correlated with food access and the household's responses to the experiential questions. We control for the age of the household head and age squared, the gender of the household head, the marital status of the household head, household size, and the dependency ratio, calculated as the number of children and elderly divided by the number of adults.

As shown in table 7, older households are less likely to report experiencing food insecurity; larger households and households where the household head is married are more likely to report experiencing it. Even after controlling for household characteristics, there remains a negative and significant association between a household's experience with food insecurity and the household's daily caloric consumption.

Table 7
Dependent variable: Indicator for food-insecure households (experiential), India

	(1)	(2)	(3)	(4)
Log caloric consumption	-0.002***	-0.002**	-0.002**	-0.002***
	(0.0006)	(0.0009)	(0.0006)	(0.0009)
Age of HH head			-0.0006***	-0.0006***
			(0.002)	(0.002)
Age squared			-0.003	-0.003
			(0.003)	(0.003)
Female head			-0.011	-0.011
			(0.005)	(0.005)
Marital status			0.006*	0.006*
			(0.003)	(0.003)
HH size			0.004***	0.004***
			(0.0014)	(0.0014)
Dependency ratio			0.001	0.001
			(0.001)	(0.001)
State fixed effects	No	Yes	No	Yes
Number of observations	59,097	59,097	59,097	59,097

HH = household.
Note: These estimates are derived using the 2009/2010 Indian National Sample Survey. The vast majority of respondents did not report skipping meals, and thus the dependent variable is zero in the majority of cases. All but 550 respondents reported that they did not skip any meals.
Source: USDA, Economic Research Service.

# Characteristics of Food-Insecure Households in Bangladesh

To investigate how the two measures of food insecurity vary with household expenditures, figure 9 depicts the prevalence of food insecurity by log per capita monthly expenditure. Total expenditure was measured as the sum of food and nonfood expenditure. Similar to the relationship reported with the Indian data, both measures demonstrated a strong negative relationship between the prevalence of food insecurity and expenditure. Poorer households were most likely to be food insecure. Over 70 percent of food-insecure households, regardless of the measure used, were in the bottom two expenditure quintiles. Of the households in the lowest expenditure quintile, 48 percent were undernourished and 23 percent reported being severely food insecure by the experiential-based measure. Among the wealthiest households, less than 5 percent of households reported being food insecure.

To formally assess the relationship between the experiential measure of food insecurity and household caloric consumption in rural Bangladesh, we ran a probit regression. The results from the probit are presented in table 8. Marginal effects are included. Columns (1) and (2) of the table present the coefficient estimate on the log daily per capita caloric consumption, not including additional control variables. An increase in a household's daily per capita caloric consumption is associated with a decrease in the probability of the household being food insecure based on the experiential measure of food insecurity. The association is statistically significant. A 1-percentage-point increase in a household's daily per capita caloric consumption is associated with a 0.15-percent decrease in the probability of the household answering affirmatively to one of the experiential questions. The magnitude and significance hold when including Division fixed effects.

Columns (3) and (4) of table 8 control for household characteristics that are also associated with food insecurity. The more years of schooling for the household head, the less likely the household

Figure 9
Food insecurity by income-level percentage, Bangladesh
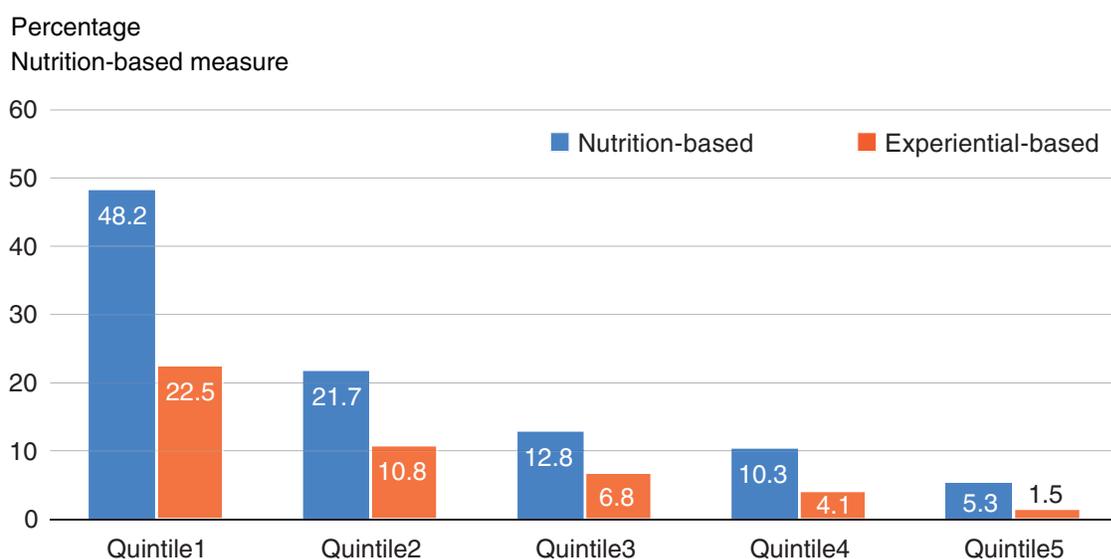
Percentage
Nutrition-based measure

Source: USDA, Economic Research Service. 2011/2012 Bangladesh Integrated Household Survey.

Table 8

Dependent variable: indicator for food-insecure households(experiential), Bangladesh

	(1)	(2)	(3)	(4)
Log caloric consumption	-0.151***	-0.148***	-0.151***	-0.145***
	(0.013)	(0.013)	(0.013)	(0.013)
Years of schooling			-0.010***	-0.011***
			(0.001)	(0.001)
Age of HH head			0.001	0.001
			(0.002)	(0.002)
Age squared			-0.000	-0.000
			(0.000)	(0.000)
Female head			-0.007	-0.006
			(0.011)	(0.011)
Marital status			-0.061***	-0.054***
			(0.020)	(0.019)
HH size			-0.015***	-0.015***
			(0.003)	(0.003)
Dependency ratio			0.018***	0.018***
			(0.005)	(0.005)
Division fixed effects	No	Yes	No	Yes
Number of observations	5,256	5,256	5,256	5,256

HH = household.
Notes: The Experiential-based measure of food insecurity is based on a HHS of 1 or more. Households with caloric consumption below 500 kcal and above 5,000 kcal were dropped from the analysis (kcal = kilocalorie, or 1,000 calories.)
Source: USDA, Economic Research Service. 2011/2012 Bangladesh Integrated Household Survey.

will report experiencing food insecurity. Older ho`useholds and households with a larger dependency ratio, calculated as the number of children and elderly divided by the number of adults, are more likely to report experiential food insecurity. Larger households and households where the household head is married are less likely to report experiential food insecurity. Even after controlling for household characteristics, there remains a negative and significant association between a household's experience with severe food insecurity and the daily caloric consumption. A 1-percentage-point increase in a household's daily per capita caloric consumption is associated with a .15-percent decrease in the probability of the household answering affirmatively to one of the experiential questions.

By reducing the experiential measure and the caloric measure of food insecurity to a single dichotomous variable, we are removing a lot of information that the two measures can provide, namely the severity of food insecurity. Table 9 depicts a correlation matrix between the continuous experiential scale and daily caloric consumption per capita. The table also includes the household dietary diversity score (HDDS) for comparison. Headey and Ecker (2013) compare several food security measures and conclude that dietary diversity indicators perform the best in measuring food insecurity. The HDDS was developed by the Food and Nutrition Technical Assistance (FANTA) Project of the United States Agency for International Development (USAID) and is based on consumption of 12 food groups (cereals, root and tubers, vegetables, fruits, meats, eggs, fish and seafood, pulses, milk products, oils, sugar, and other items) (Swindale and Bilinsky, 2006). The household receives a score of 1 for each food group it reports consuming during a 7-day recall period. The HDDS ranges between 0 and 12. A score of 12 indicates the household consumed all 12 food groups during the 7-day recall period.

Table 9 shows that the correlation between the continuous HHS and daily caloric consumption per capita was -0.14. The correlation between the continuous HHS and the continuous HDDS was -0.21. The correlation between the continuous HDDS and daily caloric consumption per capita was 0.27.

Table 10 shows how the average daily caloric consumption per capita varies with each score of the HHS. There is a clear negative relationship between the continuous HHS and caloric consumption. The standard deviation in average caloric consumption increases for higher scores of the HHS due to the small number of observations; however, table 10 shows that the likelihood of being undernourished increased along with the household hunger score.

Although the nonlinear regression analysis shows that the experiential measure of food insecurity is correlated with caloric consumption, the tables and figures presented above highlight that there is a substantial portion of the population for which reported undernourishment and experiential measures do not overlap, that is, where households classified as undernourished by caloric consumption do not report being food insecure. Of the households that were reported to be undernourished, only 16.7 percent reported experiencing food insecurity. We identify a household as misclassified where this inconsistency appears. For rural Bangladesh, 83.3 percent of the households that were reported to be undernourished were misclassified by the experiential measure of food insecurity.[16]

Table 9
Correlation matrix of food-insecurity measures, Bangladesh

	KCAL	HHS	HDDS
Caloric Consumption (KCAL)	1.000		
Household Hunger Score (HHS)	-0.141	1.000	
Household Dietary Diversity Score (HDDS)	0.272	-0.209	1.000

KCAL = 1,000 calories.
Note: Households with caloric consumption below 500 kcal and above 5,000 kcal were dropped from the analysis.
Source: USDA, Economic Research Service. 2011/2012 Bangladesh Integrated Household Survey.

Table 10
Average caloric consumption by Households, Bangladesh

Household Hunger Score(HHS)	Average	Observations
0	2,797.85	4,812
1	2,489.85	223
2	2,487.50	161
3	2,271.64	86
4	2,519.71	15
5	1,649.86	6
6	1,902.10	9
Total	2,763.39	5312

Note: Households with caloric consumption below 500 kcal and above 5,000 kcal were dropped from the analysis.
Source: USDA, Economic Research Service. 2011/2012 Bangladesh Integrated Household Survey.

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[16]We are unable to perform the same analysis for India given that so few households report experiencing any food insecurity in the National Sample Survey (NSSO) consumer expenditure survey. Although we get more believable estimates using the Gallup World Poll (GWP), the households surveyed in the GWP are not the same households surveyed in the NSSO consumer expenditure survey.

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In table 11, we further explore this discrepancy. Table 11 presents differences in means in household characteristics between undernourished households that report experiencing food insecurity and undernourished households that do not report food insecurity (misclassified).

Column (1) provides the mean values for food-insecure households, Column (2) provides mean values for misclassified households, and Column (3) provides the differences in means. Standard errors are presented in parentheses. Misclassified households—undernourished households that do not report experiencing food insecurity—have higher per capita expenditure and years of schooling, are slightly younger, and are more likely to be married.

We run a probit regression to explore whether the bivariate relationship between household characteristics and household misclassification reported in table 11 holds when conditioning on additional characteristics. Table 12 presents coefficients and standard errors from a probit regression. The dependent variable is an indicator variable for whether the household is misclassified.

Being misclassified is associated with higher per capita expenditure, more years of schooling, and larger household sizes. The higher the household's per capita expenditure, holding constant other household characteristics, the higher the probability that an undernourished household will not report experiencing food insecurity.[17]

Table 11
Difference in means in household characteristics, Bangladesh

	Food insecure	Misclassified	Difference
	(1)	(2)	(3)
Per capita total expenditure	1295.44	1835.24	-539.80***
			(56.84)
Years of schooling	1.71	3.08	-1.37***
			(0.25)
Age of head	39.51	36.81	2.70**
			(0.97)
Female head	0.24	0.17	0.07
			(0.03)
Marital status	0.88	0.95	-0.07**
			(0.03)
Household size	4.43	4.49	-0.06
			(0.13)
Dependency ratio	1.22	1.10	0.12
			(0.07)
Number of observations	178	896	

Note: A household is considered misclassified if the household is undernourished but does not report experiencing food insecurity.
Source: USDA, Economic Research Service. 2011/2012 Bangladesh Integrated Household Survey.

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[17]The positive and significant correlation between misclassified and expenditure exists whether expenditure is measured as per capita food expenditure, nonfood expenditure, or caloric consumption.

Table 12

Dependent variable: Indicator for misclassified households, Bangladesh

	Coefficient	Standard error
Log per capita total expenditure	0.219***	0.030
Years of schooling	0.006*	0.003
Age of HH head	-0.006	0.006
Age squared	0.000	0.000
Female head	-0.015	0.042
Marital status	0.072	0.063
HH size	0.026***	0.009
Dependency ratio	-0.002	0.017
Division fixed effects	Yes	
Number of observations	1,074	

HH = household.

Note: A household is considered misclassified if the household is undernourished but does not report experiencing food insecurity.
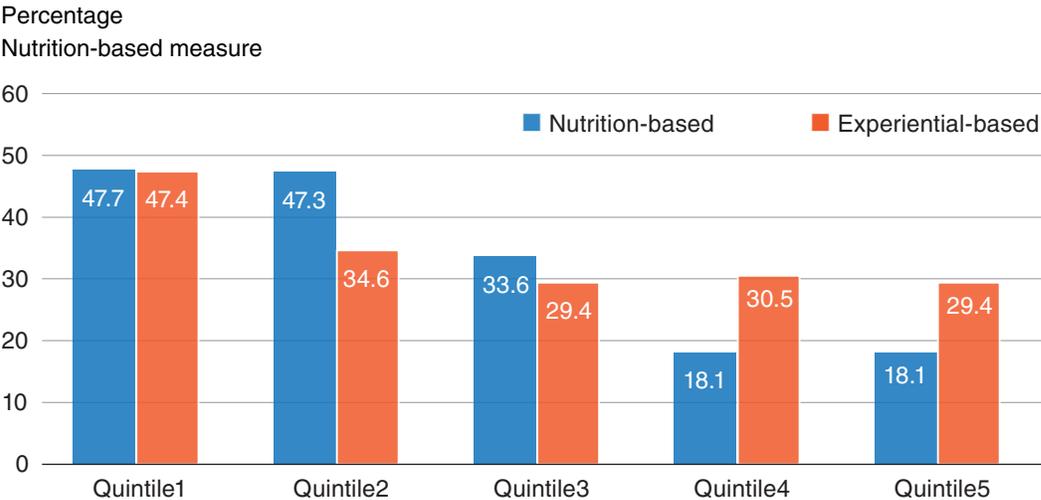
Source: USDA, Economic Research Service. 2011/2012 Bangladesh Integrated Household Survey.

Characteristics of Food-Insecure Households in Ethiopia

When investigating the relationship between food insecurity and expenditure in Ethiopia, we find that close to 60 percent of the households that were food insecure based on reported undernourishment were in the bottom two expenditure quintiles. However, less than 50 percent of the households that were food insecure based on the experiential-based measure of food insecurity were in the bottom two expenditure quintiles. This suggests that the experiential measure may not be as sensitive to expenditure as the reported-undernourishment measure.

Figure 10 depicts the prevalence of food insecurity in Ethiopia by log per capita monthly expenditure.[18] Both measures demonstrate a negative relationship between the prevalence of food insecurity and expenditure. However, food insecurity is still prevalent among the wealthiest households. Of the households in the fifth income quintile, 18 percent were reported to be undernourished. The share is close to 30 percent when measured by the experiential-based measure. This differs from observations using data from India and Bangladesh. For India and Bangladesh, less than 2 percent of the households in the fifth income quintile reported experiencing food insecurity. This is primarily due to the fact that the questions in the India and Bangladesh surveys ask about the most severe experiences of food insecurity.

Figure 10
Food insecurity by income-level percentage, Ethiopia

Percentage
Nutrition-based measure

Source: USDA, Economic Research Service. 2011/2012 Ethiopian Rural Socioeconomic Survey.

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[18]For food items consumed from own production, food expenditure was calculated by multiplying the quantity of the food item consumed by the local price of the food item. Local food prices were obtained from the community survey that was also part of the ERSS. For food items that had a missing local price, the price was imputed using either the Woreda (third-level district) or the zone mean price for the item. Nonfood expenditure was calculated as the sum of all nonfood items purchased during the previous month.
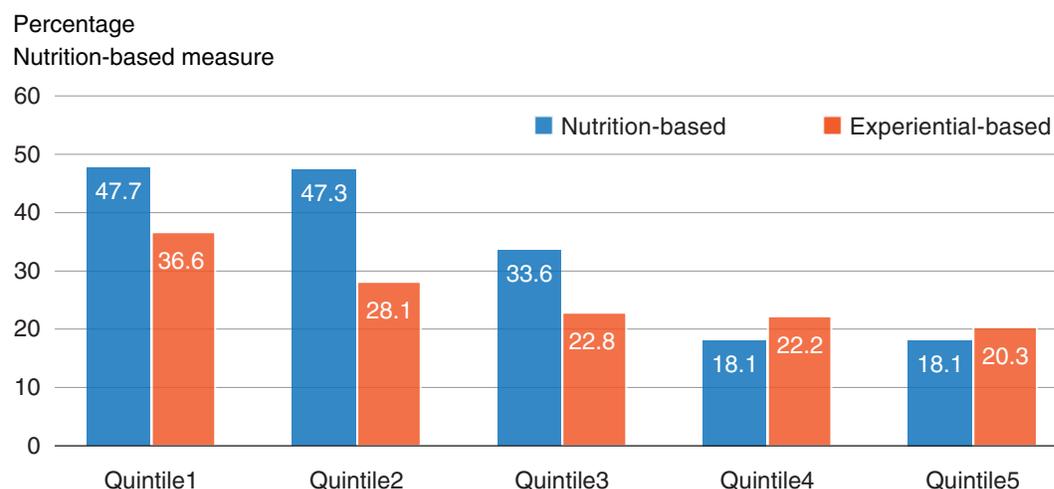
Figure 11 replicates figure 10, but uses the restricted version of the experiential measure. The difference in the prevalence of food insecurity among higher income households disappears when we restrict the experiential measure to questions that are most related to caloric consumption.

The results from the probit are presented in table 13. Marginal effects are included. Columns (1) and (2) of table 13 present the coefficient estimate on the log daily per capita caloric consumption, not including additional control variables. An increase in a household's daily per capita caloric consumption is associated with a decrease in the probability of the household being food insecure based on the experiential measure of food insecurity. The association is statistically significant. A 1-percentage-point increase in a household's daily per capita caloric consumption is associated with a .06-percent decrease in the probability of the household answering affirmatively to one of the experiential questions. The magnitude and significance hold when we include region fixed effects.

Columns (3) and (4) of table 13 control for household characteristics that are also associated with food insecurity. We include characteristics of the household head: years of schooling, age, age squared, gender, and marital status. We also control for household characteristics: household size and the dependency ratio. As shown in table 13, female-headed households and households with a larger dependency ratio are more likely to report experiences with food insecurity. The more years of schooling the household head has, the less likelihood the household will experience food insecurity. Even after we control for household characteristics, there remains a negative and significant association between a household's experience with food insecurity and the household's daily caloric consumption.

The experiential questions ask about coping strategies that the household employed in response to not having enough food. The responses may be sensitive to shocks experienced by the household and may explain the relatively large share of wealthy households that report being food insecure. Columns (5) and (6) include several shock variables to test whether the relationship between the experiential measure and caloric consumption holds. The first set of shock variables captures the loss of household income due to illness (Dercon, 2000). The measure is calculated by summing the total number of days of work each adult household member missed in the previous 60 days due to illness

Figure 11
Food insecurity by income-level (restricted) percentage, Ethiopia

Percentage
Nutrition-based measure

Source: USDA, Economic Research Service. 2011/2012 Ethiopian Rural Socioeconomic Survey.

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Table 13
Dependent variable: Indicator for food-insecure households (experiential), Ethiopia

	(1)	(2)	(3)	(4)	(5)	(6)
Log caloric consumption	-0.064**	-0.063**	-0.065**	-0.069**	-0.059*	-0.070**
	(0.032)	(0.030)	(0.033)	(0.031)	(0.032)	(0.031)
Years of schooling			-0.000	-0.007*	0.002	-0.005
			(0.004)	(0.004)	(0.004)	(0.004)
Age of HH head			-0.001	0.001	-0.001	0.001
			(0.004)	(0.004)	(0.004)	(0.004)
Age squared			0.000	0.000	0.000	-0.000
			(0.000)	(0.000)	(0.000)	(0.000)
Female head			0.048	0.055*	0.044	0.050
			(0.031)	(0.032)	(0.033)	(0.033)
Marital status			0.033	0.032	0.005	0.013
			(0.031)	(0.032)	(0.033)	(0.035)
HH size			-0.002	-0.009	0.000	-0.007
			(0.006)	(0.006)	(0.007)	(0.006)
Dependency ratio			0.026**	0.019*	0.015	0.012
			(0.011)	(0.011)	(0.011)	(0.011)
Female sick days					0.005**	0.004**
					(0.002)	(0.002)
Male sick days					0.006**	0.004*
					(0.003)	(0.003)
Drought/flood/crop shock					0.115**	0.066
					(0.048)	(0.046)
Price shock					0.178***	0.158***
					(0.040)	(0.041)
Livestock shock					0.089	0.091
					(0.063)	(0.063)
Other shock					0.193***	0.218***
					(0.059)	(0.058)
Region fixed effects	No	Yes	No	Yes	No	Yes
Number of observations = 2,871						

HH = household.
Notes: The experiential-based measure of food insecurity is based on a CSRS of 1 or more. Households with caloric consumption below 500 kcal and above 5,000 kcal were dropped from the analysis.
Source: USDA, Economic Research Service; 2011/2012 Ethiopian Rural Socioeconomic Survey.

divided by the total number of adult household members. This is constructed separately for male and female adult household members. The remaining shock variables are indicator variables for whether the household experienced the following shocks: drought, flood, or other crop damage; price shocks; livestock shocks; and other unspecified negative shocks. Many of the shock variables are positive and significant, as expected. More important, the coefficient on daily per capita caloric consumption is still negative and significant.

Unlike the HHS used in the Bangladesh survey, the questions on coping strategies used in the Ethiopia survey do not have a standard continuous form to construct an index. The questions used in Ethiopia are similar to questions used to construct a Coping Strategy Index (CSI), which weights the frequency of occurrence for each coping strategy by a weight that captures the severity of the coping strategy. Additionally, the questions asked in the ERSS are similar to the questions asked in the FIES, which sums the number of affirmative responses to the questions relating to an individuals' experiences with food insecurity. Because we do not have weights to assign to each question, we

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calculate a raw score for each household that equals the total number of coping strategies the household employed during the 7-day recall period.[19]

Table 14 lists the share of households that report adopting each coping strategy. As depicted in the table, the share of households adopting the strategy decreases with the severity of the question. Table 15 provides the raw score distribution. Tables 14 and 15 suggest that the raw score should capture the severity of food insecurity.

Table 16 depicts a correlation matrix between the continuous raw score and daily caloric consumption per capita. The table also includes the household dietary diversity score (HDDS) for comparison. Table 16 shows that there is a relatively weak correlation between the three measures of food insecurity. The correlation between the raw score and daily caloric consumption per capita was -0.04; between the raw score and the continuous HDDS, it was -0.08; and between the continuous HDDS and daily caloric consumption per capita, it was 0.09.

Table 14

Share of households answering affirmatively to food insecurity questions, Ethiopia

Food insecurity question		Mean	Observations
Q1	In the past 7 days, did you worry that your household would not have enough food?	17.6	3912
Q2	In the past 7 days, how many days have you or someone in your household had to rely on less preferred foods?	26.1	3728
Q3	In the past 7 days, how many days have you or someone in your household had to limit the variety of foods eaten?	25.6	3720
Q4	In the past 7 days, how many days have you or someone in your household had to limit portion size at meal-times?	22.3	3716
Q5	In the past 7 days, how many days have you or someone in your household had to reduce number of meals eaten in a day?	20.6	3708
Q6	In the past 7 days, how many days have you or someone in your household had to restrict consumption by adults for small children to eat?	11.7	3684
Q7	In the past 7 days, how many days have you or someone in your household had to borrow food, or rely on help from a friend or relative?	7.1	3663
Q8	In the past 7 days, how many days have you or someone in your household had to have no food of any kind in your household?	4.0	3655
Q9	In the past 7 days, how many days have you or someone in your household had to go a whole day and night without eating anything?	3.2	3649

Source: USDA, Economic Research Service; 2011/2012 Ethiopian Rural Socioeconomic Survey.

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[19]As previously noted, question 1, which asks whether the household worried about not having enough food, is not a coping strategy. The results of this report are not sensitive to the inclusion of question 1.

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Table 15
Raw score household distribution, Ethiopia

Raw Score	Number of HHs	Share of HHs
0	2,370	65.74
1	231	6.41
2	213	5.91
3	198	5.49
4	183	5.08
5	163	4.52
6	119	3.3
7	46	1.28
8	49	1.36
9	33	0.92

HH = Household.
Source: USDA, Economic Research Service. 2011/2012 Ethiopian
Rural Socioeconomic Survey.

Table 16
Correlation matrix of food insecurity measures, Ethiopia

	KCAL	CSRS	HDDS
Caloric Consumption (KCAL)	1.000		
Coping Strategy Raw Score (CSRS)	-0.042	1.000	
Household Dietary Diversity Score (HDDS)	0.089	-0.077	1.000

Note: KCAL = 1,000 calories. Households with caloric consumption below 500 kcal and above 5,000 kcal were
dropped from the analysis.
Source: USDA, Economic Research Service; 2011/2012 Ethiopian Rural Socioeconomic Survey.

Table 17 shows how the average daily caloric consumption per capita varies with the raw score. Although there is a negative relationship between the raw score and caloric consumption, the table shows a weak correlation. However, raw scores greater than 7 appear to identify undernourished households; average caloric consumption for households with raw scores of 8 and 9 are approximately 2,100 calories.

Table 17
Average caloric consumption by raw score, Ethiopia

Raw Score	Average	Observations
0	2,574.91	1977
1	2,569.09	190
2	2,404.81	175
3	2,418.92	159
4	2,563.01	143
5	2,563.24	123
6	2,624.28	92
7	2,513.06	40
8	2,178.47	44
9	2,099.61	23
Total	2,546.21	2,966

Notes: Households with caloric consumption below 500 kcal and above
5,000 kcal were dropped from the analysis.
Source: USDA, Economic Research Service. 2011/2012 Ethiopian Rural
Socioeconomic Survey.

The analysis above provides support for the correlation of the experiential measure of food inse-curity with caloric consumption. However, even with the richer set of experiential food-insecurity questions, the experiential measure still fails to capture a significant share of the undernourished households, similar to the reports for India and Bangladesh. Of the Ethiopian households that were undernourished, only 35 percent reported experiencing food insecurity.

Table 18 presents differences in means in household characteristics between undernourished households that report experiencing food insecurity and misclassified households, undernour-ished households that do not report experiencing food insecurity. For rural Ethiopia, 65 percent of the households that were reported to be undernourished were misclassified when using the experiential measure of food insecurity.BEGIN

Table 18
Difference in means: Households reporting food insecurity versus misclassified households, Ethiopia

	Food Insecure	Misclassified	Difference
	(1)	(2)	(3)
Per capita total expenditure	635.40	685.04	-49.64
			(300.09)
Years of schooling	1.76	2.36	-0.60**
			(0.22)
Age of household head	45.13	42.50	2.63**
			(0.91)
Female head	0.25	0.20	0.05*
			(0.03)
Marital status	0.76	0.80	-0.04
			(0.03)
HH size	5.59	5.52	0.07
			(0.15)
Dependency ratio	1.26	1.16	0.10
			(0.07)
Female sick days	1.83	1.21	0.63
			(0.32)
Male sick days	1.16	0.72	0.44*
			(0.22)
Drought/flood/crop shock	0.37	0.14	0.23***
			(0.03)
Price shock	0.42	0.23	0.19***
			(0.03)
Livestock shock	0.14	0.04	0.10***
			(0.02)
Other shock	0.07	0.03	0.04**
			(0.01)
Number of observations	376	706	

Notes: A household is considered misclassified if the household is undernourished but does not report experiencing food insecurity.
Source: USDA, Economic Research Service. 2011/2012 Ethiopian Rural Socioeconomic Survey.

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Column (1) provides the mean values for food-insecure households, Column (2) provides mean values for misclassified households, and Column (3) provides the differences in means. Standard errors are presented in parentheses. Misclassified households have more years of schooling, are slightly younger, and are less likely to be female-headed. Additionally, misclassified households are less likely to have experienced a shock.

We run a probit regression to explore whether the bivariate relationship between household shocks and household misclassification reported in table 19 holds when conditioning on additional characteristics. Table 19 presents coefficients and standard errors from a probit regression. The dependent variable is an indicator variable for whether the household is misclassified. Each of the shock variables, excluding shocks to household labor, remain negative and significant. Households that experience shocks are less likely to be misclassified, or, stated differently, undernourished households that experienced a shock are more likely to report experiencing food insecurity. Similar to Bangladesh, higher household per capita expenditure is associated with an increased likelihood of being misclassified.

The significant correlation between the shock variables and the likelihood of being misclassified demonstrates how well the food security questions capture food-related coping strategies to shocks.[20]

Table 19
Dependent variable: Indicator for misclassified households, Ethiopia

	Coefficient	Standard error
Log per capita total expenditure	0.043***	0.012
Years of schooling	0.008	0.005
Age of HH head	-0.004	0.007
Age squared	0.000	0.000
Female head	-0.073	0.054
Marital status	0.018	0.053
HH size	0.012	0.009
Dependency ratio	0.002	0.018
Female sick days	-0.004	0.004
Male sick days	-0.007	0.005
Drought/flood/crop shock	-0.121***	0.044
Price shock	-0.088**	0.038
Livestock shock	-0.211***	0.070
Other shock	-0.148*	0.084
Region Fixed Effects	Yes	
Number of observations	1,082	

HH = household
Note: A household is considered misclassified if the household is undernourished but does not report experiencing food insecurity.
Source: USDA, Economic Research Service. 2011/2012 Ethiopian Rural Socioeconomic Survey.

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[20]Although we have some shocks reported in the Bangladesh data, the types of shocks vary between the surveys. Additionally, given the small number of households that reported experiencing both food insecurity and a shock in the Bangladesh data, there was little evidence of any relationship.

Summary of the Relationship Between Experiential Measures and Nutrition-Based Measures

In the preceding sections, we found that there is a relatively small correlation between households being identified as food insecure by the calorie-based measures and the experiential measures. In each case, we can reject the hypothesis that the correlation is equal to 1. However, there is variation in the strength of the correlation across the surveys. Interestingly, in the survey in which the correlation is weakest (India), the recall period for the experiential measures is much longer than that for the calorie-based measure, which is a potential source of bias between the two measures.

Table 20

Summary of the relationship between experiential measures and nutrition-based measures

Country	Recall period		Correlation between nutrition-based and experiential measures
	Nutritional measure	Experiential measure	
Bangladesh	7 days	30 days	-0.145
Ethiopia	7 days	7 days	-0.065
India	30 days	365 days	-0.002

Source: USDA, Economic Research Service. Bangladesh Integrated Household Survey (2011/2012), Ethiopian Rural Socioeconomic Survey (2011/2012), and the Consumer Expenditure Survey of the National Sample Survey Organization (2009/2010).

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Distribution of Caloric Consumption by Experiential-Based Food Security Status

The previous sections demonstrated that the food security status of a large share of the population is different when using the experiential-based measure than when using reported undernourishment. Unsurprisingly, the average correlation between the measures is low, significantly below 1 in all three countries.

Figures 12A through 12C show estimates of the distribution of caloric consumption across households that are food secure and food insecure based on the experiential measure of food insecurity, providing a graphical representation of the distribution of caloric consumption by food security status. Figure 12A is the distribution for rural India, figure 12B the distribution for rural Bangladesh, and figure 12C the distribution for rural Ethiopia. Each figure includes a vertical line at 2,100 kcal/day, the cutoff for undernourishment.

For all three countries, the distribution of caloric consumption for food-insecure households is slightly to the left of the distribution for food-secure households. This is most pronounced for India and Bangladesh, where it captures the most severe behaviors associated with food insecurity. However, the two distributions are very similar, with food-insecure households only slightly more undernourished on average than food-secure households.
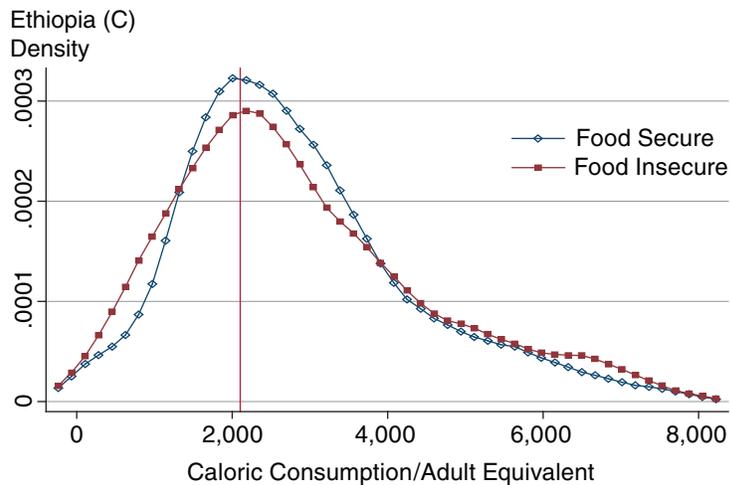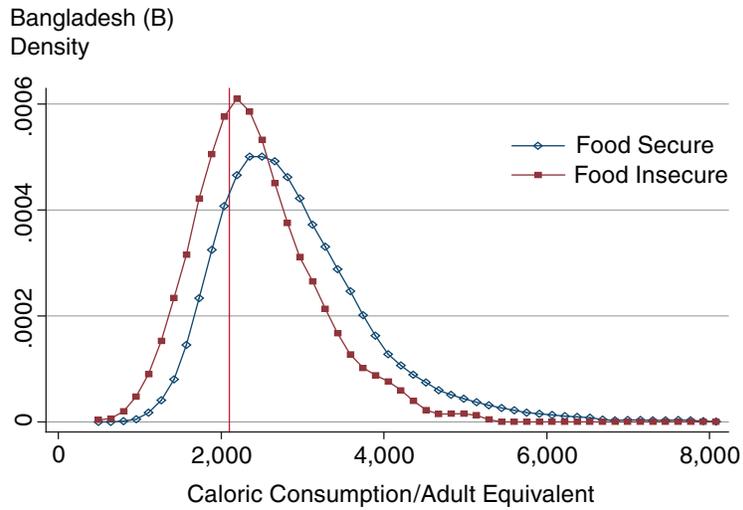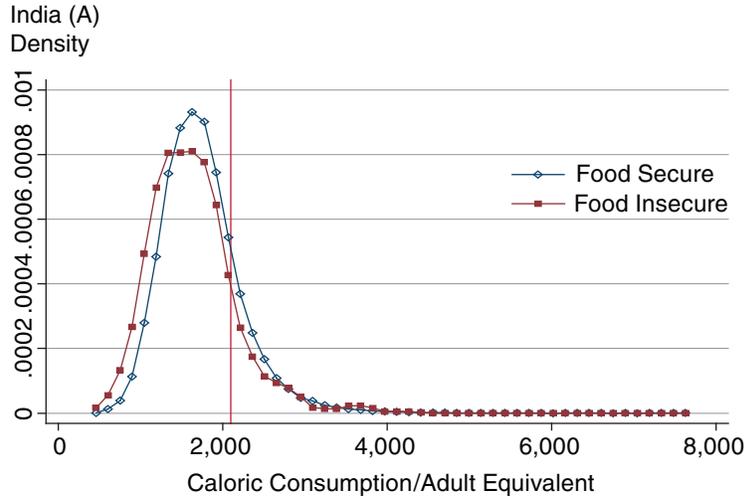
Two important patterns are demonstrated in the distribution of reported caloric consumption. First and more important, we find that there is a sizable portion of the sample that consumed well below the minimum daily energy requirement (2,100 kcal/day) but that did not report experiencing food insecurity. For example, of households consuming less than 1,800 daily calories per adult equivalent, in Bangladesh 79.5 percent, in Ethiopia 63.3 percent, and in India 98.7 percent did not report experiencing any food insecurity. Thus, the experiential-based measure does not capture a significant share of the households that are most food insecure as measured by reported undernourishment.

Second, in Bangladesh and Ethiopia, we found that a significant share of households consuming well over 2,100 calories reported experiencing food insecurity. For example, of households that consume more than 2,400 daily calories per adult equivalent, 20 and 34 percent reported experiencing food insecurity in Bangladesh and Ethiopia, respectively. Thus, among households that are the least food insecure as measured by reported undernourishment, a significant share report experiencing food insecurity.[21]

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[21]If experiential measures were exactly identifying the households who were food insecure by estimates of caloric consumption, then the two distributions could look very different than those reported for these three countries. For example, if the distribution of calories is symmetric about its mean (as is approximately the case for each of these three countries) and the mean of caloric consumption is less than the minimum daily energy requirement (MDER), truncating the distribution at the MDER and only graphing the density for consumption above that value would create a distribution where the highest mass is at the lowest level of consumption above the MDER. Such a distribution would then have lower mass at each additional level of consumption above the MDER.

Figure 12
Distribution of caloric consumption

India (A)
Density

Caloric Consumption/Adult Equivalent

Bangladesh (B)
Density

Caloric Consumption/Adult Equivalent

Ethiopia (C)
Density

Caloric Consumption/Adult Equivalent

Source: USDA, Economic Research Service. Data from the Bangladesh Integrated Household Survey, the Ethiopian Rural Socioeconomic Survey, and the 66th Round of the Consumer Expenditure Survey conducted by the National Sample Survey Organization.

Conclusions

In this report, we demonstrate that a significant share of households that are reported to be undernourished do not report experiencing any form of food insecurity. Despite the authors' finding of a positive correlation between calories consumed and whether a household reports experiencing food insecurity, there is a substantial portion of the population for which reported undernourishment and experiential measures do not overlap, where households that are classified as undernourished by caloric consumption do not report being food insecure. Most important, the two measures do not agree on the identity of the households that are the most food insecure, the subset whose consumption most needs to be tracked.

Experiential-based measures provide valuable information about self-reported experiences of food insecurity. In addition, the low cost to implement experiential-based measures makes their use more appealing than traditional measures of food insecurity such as caloric consumption. However, this analysis has shown that not all experiential measures of food insecurity provide valuable information. For India, which used a single indicator of experienced food insecurity, the experiential measure had the least overlap with the caloric consumption measure compared with the measure used in the other two country case studies. Although the measure from the Ethiopian survey, which contained nine experiential questions, had the most overlap with the caloric consumption measure of food insecurity compared with the measures used in India and Bangladesh, there was still substantial misclassification of food security status among households.

There are a number of remaining questions as to why experiential-based measures and reported undernourishment capture such different populations as food insecure. For example, these differences can be caused by factors such as measurement error in reported consumption or in the survey questions on which experiential measures are based (e.g., households interpreting experiential questions differently, differences in expectations regarding food consumption, societal and cultural norms, and differences in survey design). More research is needed to better understand how experiential-based measures and reported undernourishment might better align and whether experiential-based measures do indeed track the most severely food-insecure households.

This report does not try to ascertain the preferred measure for identifying food-insecure households. Instead, the research highlights important limitations of relying on a single measure of food insecurity and, more important, of relying on a single indicator when using experiential measures. Instead, the findings suggest that when multiple measures of food insecurity are available, the measures can be used collectively and can complement each other in achieving the goals for effective food-insecure household targeting and program development.

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