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Measuring Food Security Using Respondents' Perception of Food Consumption Adequacy

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Abstract

Food security is a complex and multi-dimensional phenomenon. As such, its measurement may entail and benefit from the combination of both 'qualitative-subjective' and 'quantitative-objective' indicators. Yet, the evidence on the external validity of subjective-type information is scarce, especially using representative household surveys. The aim of this paper is to compare information on self-perceived food consumption adequacy from the subjective modules of household surveys with standard quantitative indicators, namely calorie consumption, dietary diversity and anthropometry. Datasets from four countries are analysed: Albania, Indonesia, Madagascar and Nepal. Simple descriptive statistics, correlation coefficients, contingency tables and multivariate regression show that the 'subjective' indicator is at best poorly correlated with standard quantitative indicators. The paper concludes that while subjective food adequacy indicators may provide insight on the

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Keywords: food security, qualitative indicators, quantitative indicators, household surveys, Albania, Indonesia, Madagascar, Nepal

JEL classification: I31, I32, O57, C19, C81

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vulnerability dimension of food insecurity, they are too blunt an indicator for food insecurity targeting. An effort towards developing improved subjective food security modules that are contextually sensitive should go hand in hand with research into how to improve household survey data for food security measurement along other dimensions of the phenomenon, particularly calorie consumption.

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Acronyms

ALSMS	Albania Living Standards Measurement Survey (2002)
CAQ	consumption adequacy question
CBN	the cost of basic needs
FAO	Food and Agriculture Organization of the United Nations
FEI	food energy intake method
IFLS3	Indonesia Family Life Survey (2000)
LSMS	Living Standards Measurement Surveys of the World Bank
MHS	Madagascar Household Survey (2001)
NLSMS	Nepal Living Standard Measurement Survey (1995/96)

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1 Introduction

The 1996 World Food Summit brought in the development debate to centre-stage the issue of hunger and food insecurity as both cause and effect of poverty and slow growth. In the wake of this new push, reducing hunger and food insecurity also became one of the Millennium Development Goals, bringing with it the necessity for individual countries to measure progress in achieving the proposed targets.

The conceptualization of food security has evolved over time, partly preceding and partly paralleling similar evolutions in poverty. Since the World Food Conference of 1974, food security paradigms have shifted from the global and national level to the household and individual level; from a 'food first' to a 'livelihood' perspective and from objective indicators to subjective perceptions (Maxwell 1996). In this paper, we focus on the last of these issues, which is directly related to the increasing demand for rigorous measurement methods and to the debate over qualitative versus quantitative indicators.

Measuring and assessing food insecurity have proved to be challenging and daunting tasks for researchers and practitioners. Traditionally, a divide has persisted between objective-quantitative methods versus subjective-qualitative techniques for the measurement of poverty and food insecurity. More recently, these two types of measures and methods have been increasingly viewed as complementary, and it has become evident that a suite of indicators is necessary to capture the multifaceted nature of food security. In response, an increasing number of quantitative surveys now collect subjective-type information. Despite these methodological advances and the availability of better quality data, empirical evidence on the reliability and validity of the various subjective indicators in use remains scant. Even though much work has been done on alternative indicators, and the literature on subjective poverty lines is growing, relatively less progress has been made in terms of externally validating self-assessment indicators of food security that use representative household surveys. Towards this end, the use of household surveys containing both objective and subjective information on the same household provides a valuable workbench for this type of validation.

Most examples of validation are found in the poverty literature, as can be seen in Pradhan and Ravallion (2000); Ravallion and Lokshin (1999); Lokshin, Umapathi and Paternostro (2003) and Carletto and Zezza (2006). Pradhan and Ravallion (2000) and Lokshin, Umapathi and Paternostro (2003), using multivariate regression analyses, take the subjective perception of food consumption adequacy questions to construct a money matrix subjective poverty line, which is then compared to the standard objective poverty line. In terms of food security, Hamilton *et al*. (1997) compare the US subjective food security index to a variety of alternative indicators. Coates, Webb and Houser (2003) do the same for a prototype index in Bangladesh, as well as cite other studies in developing countries.

Our initial intention was to validate self-assessment indicators with respect to some standard quantitative indicators normally used as benchmarks, based on the assumption that the benchmark itself is a more direct and accurate measure of the 'true' food security status. Measures of consumption, poverty, anthropometry and other socioeconomic variables have all been used as benchmarks. In practice, per capita calorie consumption is utilized as the main benchmark measure. However, as our work

progressed, we realized that validation becomes problematic when the benchmarks themselves are problematic. More importantly, if food security is a multidimensional phenomenon and cannot be captured by a single indicator, how can we test alternative indicators against a single benchmark? As a result, this paper may appear to ask more questions than it answers, and the main objective is thus to contribute to these debates. Building on the analysis of four household surveys, we offer some recommendations on future research aimed at integrating objective and subjective indicators in household surveys.

The paper is structured as follows. The next section reviews the concept of food security and the search for alternative indicators. The third section briefly describes the datasets, and the fourth section presents the empirical results. The fifth section provides a discussion of the results and concludes.

2 Measuring food security

The most frequently cited definition of food security is still the one that was proposed almost two decades ago by the World Bank (1986: 1), which defines food security as 'access by all people at all times to sufficient food for an active and healthy life'. The operationalization of this concept presents many challenges. Measurements and assessment methodologies and methods can differ considerably, even within the boundaries of the qualitative and quantitative traditions. Food security, as with poverty, is a cross-cutting, complex and multifaceted phenomenon. The food security literature spans a wide range of disciplines, including anthropology, nutrition, sociology, economics, geography, public health and epidemiology (Chung *et al*. 1997). Conceptually, food security is generally broken down into four different components—availability, access, utilization and vulnerability—each capturing different, but overlapping, dimensions of the phenomenon. As discussed above, there is a consensus that no single indicator can capture all aspects of food insecurity while also providing policymakers with relevant and timely information in a cost-effective manner. For this reason, efforts have been put into finding easy-to-implement and reliable alternative indicators which complement each other.

Following FAO (2003a), we identify five general types of methods/indicators. The first indicator can be labelled *undernourishment*, a measure commonly identified with the Food and Agriculture Organization of the United Nations (FAO). This FAO method begins with an estimate of the per capita dietary food energy supply, derived from aggregate food supply data. Assumptions regarding the distribution of this supply across households are made on the basis of income or consumption distribution, or other available data. The proportion of the undernourished in the total population is then defined as that part of the distribution lying below a minimum energy requirement level (Naiken 2003). The FAO measure is useful for comparisons across countries and over time.

A second group of indicators, which can be termed *food intake*, measures the amount of food actually consumed at the individual or household level. Indicators at the individual level can be obtained directly by measuring actual food intake through a number of techniques. Food intake surveys, however, are relatively rare, given its cost considerations. Instead, food consumption is usually measured indirectly through household surveys. Household surveys in general, and multipurpose household surveys

in particular, are aimed at assessing living standards, not just food security. Although they are time-, resource- and skill-intensive, they are now regularly implemented in many countries. Household-level data can be used to construct a number of measures of food insecurity, including food energy deficiency and poor diet quality and diversity.

The third approach to the assessment of dietary deficiencies is to measure food utilization through *nutritional status*. Anthropometric measures of children are regularly collected in random sample surveys in many countries. Anthropometric measures, as outcome measures, are well suited for monitoring and evaluating interventions, and can be collected with socioeconomic information in order to analyse the determinants of malnutrition. Anthropometric attainment, however, is a nonspecific indicator, because it is the result not only of food intake, but also of factors such as sanitation, health and childcare practices.

Fourth, food availability is of little use if households or individuals do not have enough financial or productive resources to acquire food. The fourth group of indicators revolves around the concept of *access* to food and can be proxied by wealth status, measured by total consumption, expenditures or income. Access-to-food indicators, and in particular income, have served as the main food security indicator in many countries. The link between access and a given wealth proxy breaks down when local markets are not functioning, as in the case of war or disaster, for example.

Finally, the last approach revolves around the concept that even if households are not currently undernourished, they may be at risk or vulnerable to future deprivation. *Vulnerability* is an inherently dynamic concept which expresses *ex-ante* vulnerability and *ex-post* outcomes. Because it is an expression of a 'future state of the world' which, by definition, we do not know *a priori*, vulnerability is, in itself, difficult to measure (Dercon 2001). Vulnerability is often gauged through qualitative or 'self-assessment' indicators of food insecurity, capturing dimensions which are difficult to isolate with traditional quantitative measures, especially in the absence of panel data. Households may regard themselves as hungry, even if there are no recognizable signs of undernutrition. Further, even if households are not currently undernourished, they may have a significant probability, or well-founded fear, of future deprivation. Other measures of vulnerability to food deprivation also drawn from household surveys include the share of income spent on food and various coping-strategy indexes.

In terms of self-assessment indicators, the United States government pioneered the approach of assessing household food security on the basis of a score derived from 18 questions on food-related behaviours and conditions that are known to be associated with food deprivation (Kennedy 2003). A number of developing countries have successfully implemented similar methodologies (see, for example, Nord *et al*. 2002). This type of survey has been piloted extensively in Brazil (Segall Corrêa *et al*. 2003), and a module has recently been included in that country's biannual national income survey. It also recently formed the centrepiece of a large food security study in Yemen and has been tested and applied in Bangladesh (Coates, Webb and Houser 2003). Reduced forms of these subjective modules are found in many recent standard national household surveys, such as the World Bank's Living Standards Measurement Surveys (LSMS), and focus on respondents' perceived assessment of individual or household food security situation. One of the questions most commonly asked is called the *consumption adequacy question* (CAQ), and is generally worded as follows: 'Concerning your food consumption, which of the following is true?' Answers are

generally coded as: (i) more than adequate; (ii) just adequate, and (iii) less than adequate. This question, common to all selected surveys, is the focus of our analysis.

3 The data

We analyse four household surveys to estimate household calorie consumption and total expenditure/consumption, dietary diversity and anthropometry, which are compared with the answers to the subjective food CAQ. The surveys are: the Nepal 1995/96 Living Standard Measurement Survey (NLSMS); the 2000 Indonesia Family Life Survey (IFLS3); the Albania 2002 LSMS (ALSMS) and the 2001 Madagascar Household Survey (MHS).[1] Only for Albania were we able to construct all five variables. For Nepal we were limited to dietary diversity and the subjective indicators. For Madagascar, household calorie consumption, total expenditure and dietary diversity were constructed, as well as the subjective indicator. For Indonesia, only the subjective and anthropometric indicators were available. An interesting feature of the Indonesia survey is that it asked the CAQ for the whole household as well as just for the children of the household.

4 The results

4.1 Perception of food adequacy

Subjective indicators were included in all four household surveys, and the distribution of responses across countries can be seen in Table 1. In all cases, with the exception of Indonesia, approximately 50 per cent of those surveyed considered their food consumption (and in the case of Madagascar, food expenses) less than adequate. The incidence of subjective food insecurity is many times smaller in Indonesia, around 10 per cent, which allows us to make our first point. Subjective indicators, as defined here, are not comparable across countries. It is extremely unlikely that the real (though unknown) incidence of food insecurity in Madagascar is the same as Albania, a country with much higher per capita GDP, much lower incidence of poverty, and lower incidence of food insecurity according to the caloric threshold and FAO indicators.

A small percentage of households stated that they had more than sufficient food consumption/expenses—2 per cent in Nepal, 3 per cent in Madagascar and Albania, and 17 per cent in Indonesia. It is not clear how respondents interpret this question. Also, in all four countries, the percentage of households stating that they had sufficient food consumption is higher in rural than in urban areas, although the difference is slight in Albania.[2]

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1 Details on each survey, as well as details on the process by which calorie consumption was constructed for each country can be found in the appendices in Migotto *et al.* (2005).

2 In the case of Madagascar, the subjective question refers to food expenses, and not to food consumption, and we are unclear on how respondents interpreted the question. If the question is interpreted as referring only to purchased foods, then we might expect a downward bias in the percentage of households reporting less than adequate consumption, increasing in size as we move

Table 1
Percentage of food insecure households, using a variety of indicators

	Perception of food adequacy (% of 'less than adequate' answers)			Poverty headcount	Below caloric threshold	FAO measure
	National	Urban	Rural	National	National	National
Nepal	51	36	52	42	na	26
Madagascar	52	45	55	70	35	37
Albania	52	51	53	25	17	6
Indonesia*-household	10	7	13	16	na	6
Indonesia-children	9	6	10	na	na	na

Note: * The Indonesia survey asked the CAQ for the whole household as well as just for the corresponding children.

Source: Own calculations; FAO (2003b and 2004); Prennushi (1999); World Bank and INSTAT (2003); Strauss *et al.* (2004).

4.2 Caloric availability

How do the results for subjective measures of food insecurity compare to the other indicators? We first compare the subjective indicators with calorie consumption for Albania and Madagascar, the countries where the latter indicator is available.[3] Median per capita daily calorie consumption and the percentage of households below the caloric norm are given in Table 2 for Albania as a whole and at the urban/rural and regional level. Although the national median value of 2912 is plausible when compared to the FAO figure of 2940 (FAO 2003b), the results are somewhat counter intuitive and contrary to the incidence of poverty in Albania. Approximately 17 per cent of the Albanian population is found to be below the caloric threshold level. Calorie consumption is greater and a higher percentage of households are above the threshold in rural areas. Tirana has the lowest median calorie consumption, and the lowest share of households above the threshold (less than 75 per cent) of all regions, while the other regions are all roughly similar. In terms of the headcount index of poverty, Tirana has the lowest incidence of poverty, while the mountain region has an incidence 2 to 3 times higher. For the coastal region, the incidence of poverty and the percentage of households below the caloric threshold are roughly similar. Similar results are evident with Madagascar, as we shall see shortly.

The finding of higher calorie consumption in rural areas does not sit well with the common finding of higher poverty in rural areas, such as we find for Albania. There could be various reasons behind these results. First, because of heavier physical activities, rural people on average may consume more calories which are cheaper relative to the calories consumed by the urban population. In addition, or alternatively, there may be a systematic misreporting in rural or urban areas, or both, or

from urban to rural areas, as food purchases and calories from food purchases are higher in urban areas.

3 Results are presented only for those households whose estimated per capita per day calorie consumption lies in the range of 1000 to 6000 kcal. The sample size has thus been reduced from 5,075 to 4,558 for Madagascar (90 percent of the full sample) and from 3,599 to 3,456 for Albania (96 percent). Although point estimates are different with reduced samples, the overall results of the analysis—in particular the correlation with the subjective measure—do not change significantly.

overestimating consumption of home production in rural areas. Finally, there may be some kind of systematic nonsampling errors.

There is also a parallel here with the debate on poverty lines, namely the difference between the food energy intake (FEI) method and the cost of basic needs (CBN) method. It is not uncommon for poverty analyses based on the FEI method, where separate poverty lines are calculated, to indicate higher poverty rates in urban than in rural areas. At a given level of income, urban households tend to consume fewer, but more expensive, calories (Tarp *et al.* 2002). Therefore, higher calorie consumption in rural areas is not an uncommon result, and has been found in other similar empirical studies (Hoddinott and Yohannes 2002; Skoufias 2001).

Despite these difficulties, while we do not estimate the income elasticity of calories, we find a positive correlation coefficient of 0.53 between per capita calorie consumption and per capita real total consumption in Albania.

Table 2
Percentages of households above/below the caloric norm and median caloric consumption per capita per day—Albania

	National (n=3,456)	Urban (n=1,899)	Rural (n=1,557)	Coastal (n=955)	Central (n=954)	Mountain (n=971)	Tirana (n=575)
Caloric threshold							
Below (%)	17.3	21.8	13.4	17.7	15.0	15.0	26.3
Median kcal per capita	2,912	2,673	3,131	2,863	3,007	2,992	2,567
Poverty*							
Moderate (%)	25.4	19.5	29.6	20.6	25.6	44.5	17.8
Extreme (%)	4.7	4.1	5.2	3.6	4.6	10.8	2.3
Subjective							
Not adequate (%)	52.3	50.8	53.4	44.7	56.2	55.9	54.2

Note: * Extreme poverty headcount index is based on a food poverty line, or the cost of obtaining a minimum amount of calories. Moderate poverty headcount is based on the food poverty line plus essential nonfood items.

Source: ALSMS, own calculations; World Bank and INSTAT (2003); Azzarri *et al.* (2006).

Table 3
Real per capita total consumption and daily per capita caloric consumption by subjective food adequacy answer—Albania

	More than/just adequate (n=1,706)	Less than adequate (n=1,872)
Real per capita total consumption (New Leks)		
Median	7,963	5,877
Mean	9,261	6,566
	(n=1,622)	(n=1,813)
Daily per capita caloric consumption (Kcals)		
Median	3,042	2,833
Mean	3,157	2,944

Source: ALSMS, own calculations.

Table 4
Contingency table between per capita caloric availability and subjective food adequacy—Albania

	Above caloric threshold	Below caloric threshold	Totals	χ^2: 7.546
Food expenditure more than/just adequate	1,370 (40) (48)	248 (7) (42)	1,618 (47)	Design-based F: 4.337 P: 0.0379
Food expenditure less than adequate	1,473 (43) (52)	343 (10) (58)	1,816 (52)	Un-corrected Cramer's V: 0.0682
Totals	2,843 (83) (100)	591 (17) (100)	3,434 (100)	

Source: ALSMS, own calculations.

Going back to Table 1, contrary to the calorie consumption results, according to which rural areas have a significantly higher median, a marginally higher share of rural households (53 to 51 per cent) perceived their food consumption as inadequate. Despite these contradictory results, on average, some correlation between the two indicators is evident. The higher the per capita total consumption and the per capita calorie consumption, the more likely it is that a household reported adequate food consumption, as can be seen in Table 3.

However, this relationship holds only on average. Although the contingency table (Table 4) is significant at the conventional confidence levels, it shows that calorie consumption and subjective perceptions do not classify the same households as food insecure. More than half of the 83 per cent of households above the caloric threshold felt that their food consumption was less than adequate. About 58 per cent below the threshold felt the same way.

Similar results emerge for Madagascar. Using the figures based on the 30-day recall, overall median per capita calorie consumption is 2274 kcal, which is roughly approximate to the 2080 kcal estimated by the FAO method (FAO 2004).[4] As for Albania, median calorie consumption is higher in rural areas than in semi-urban areas, and in semi-urban areas greater than in urban areas (Table 5). Per capita calorie consumption and real per capita food and total expenditure (consumption aggregates) are positively correlated, with a correlation coefficient of 0.58 for food expenditure and 0.38 for total expenditure.

Also in the case of Madagascar there is an evident correlation between the subjective measure, on one side, and the calorie and total consumption measures, on the other side. The higher the per capita total consumption and the per capita calorie consumption, the more likely is that a household reported adequate food consumption, as it can be seen in Table 6.

Once again, however, this is true only on average. The correlation coefficient between subjective food adequacy and calories is only 0.1, while the correlation with total consumption is 0.23. While statistically significant, from the contingency table (not

4 Using the 7-day recall we obtain a slightly lower median, closer to the FAO estimate.

shown) just over half of the 68 per cent of households above the caloric threshold felt that they had less than adequate food expenditures. Similarly, approximately 45 per cent of the households below the caloric threshold considered that they had adequate food expenditures. Again, these two measures do not classify the same households as food insecure.

Table 5
Percentage of households below the caloric norm and median caloric consumption per capita, per day, by location—Madagascar

30 day recall	National (n=4,558)	Urban + Semi-urban (n=2,753)	Rural (n=1,773)
Below (%)	32.4	37.2	30.8
Median kcal per capita	2,274	2,158	2,317
Poverty			
Moderate (%)	69.6	44.1	77.1
Subjective			
Not adequate (%)	52.5	45.6	54.8

Source: MHS, own calculations; Rakutomehefa, Razakamanansoa and Romani (2002).

Table 6
Median and mean calorie consumption by subjective food adequacy and location. 30-day recall—Madagascar

	Kcal per capita per day	More than/just adequate	Less than adequate
National		(n=2,336)	(n=2,190)
	Median	2,425	2,140
	Mean	2,640	2,463
Urban		(n=928)	(n=731)
	Median	2,250	1,982
	Mean	2,438	2,247
Semi-Urban		(n=594)	(n=500)
	Median	2,248	2,210
	Mean	2,535	2,410
Rural		(n=814)	(n=959)
	Median	2,501	2,165
	Mean	2,696	2,498
National	Real monthly per capita total consumption	Malagasy Franc	Malagasy Franc
		(n=2,561)	(n=2477)
	Median	850,759	547,233
	Mean	1,347,280	757,999

Source: MHS, own calculations.

4.3 Dietary diversity

In her review of the literature, Ruel (2002) finds that while there is no consensus in terms of conceptualizing or measuring dietary diversity, various measures of dietary diversity have been positively associated with nutrition adequacy, child growth, per capita consumption and energy availability. In its simplest form, dietary diversity can be

defined as the number of different foods or food groups consumed over a given reference period (Hoddinott 1999a, 1999b; Hoddinott and Yohannes 2002). For Albania, Madagascar and Nepal, we tested the subjective variable against four different diversity scores:

i) Simple count of foods (as listed in the questionnaire);

ii) Simple count of food groups (as listed in the questionnaire);

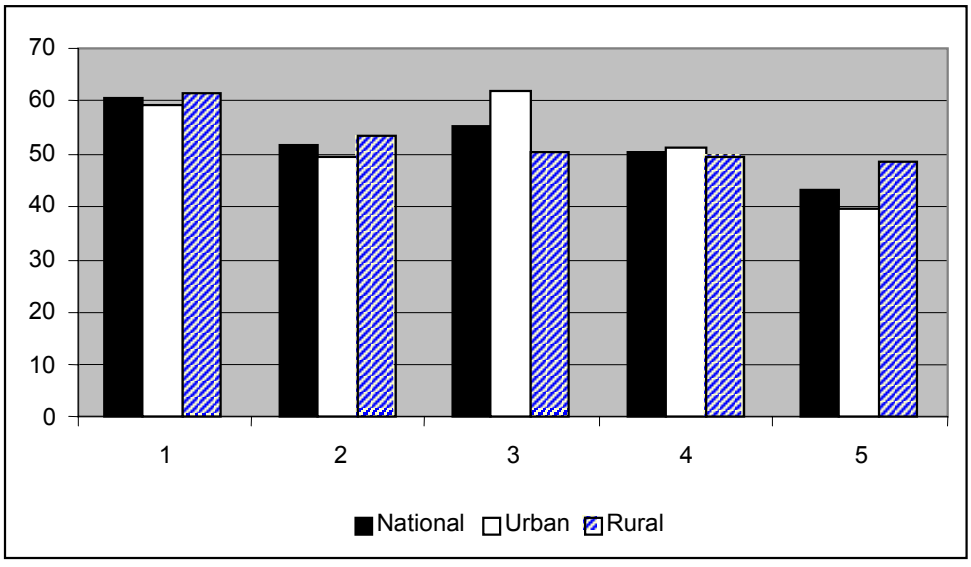
iii) Simpson Index, given by $1 - \sum \Pi_i^2$; and

iv) Shannon Index, given by $- \sum \Pi_i \log(\Pi_i)$.

where Π_i is the calorie share of food i (i=1,2...). If only one food item was consumed, the last two indexes would be zero, so variety increases with the index value, thus establishing a continuum between a 'diverse' and a 'non-diverse' diet. We present results only for the simple count of foods, as none of the indexes tested outperformed the others, and dietary diversity—however measured—are found to be poorly correlated with subjective food adequacy in all countries analysed.

Figure 1 shows that, for Albania, on average, as we move from the first to the fifth dietary diversity quintile, the percentage of households reporting less than adequate food consumption declines. These trends are similar nationally as well as separately between urban and rural households. The decrease, however, is not monotonic and the correlation coefficient is in fact quite low (0.15). Similar results are found for Madagascar, with a correlation coefficient of (0.16).[5]

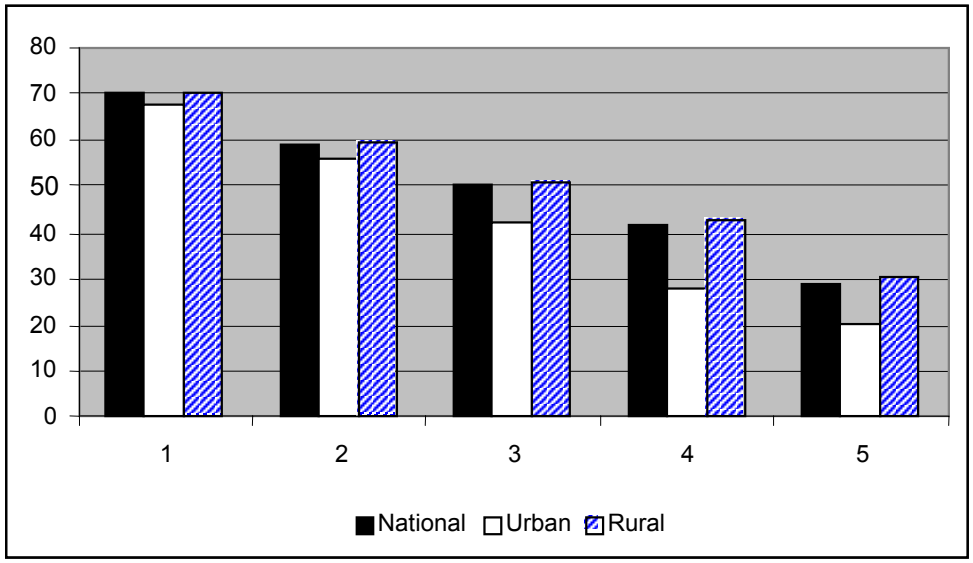
Figure 1
Food adequacy answers (percentage of 'less than adequate')
by simple food count quintiles and location—ALBANIA



Source: ALSMS, own calculations.

5 Note that a diversity index for Madagascar computed using only food purchases (to better compare with the subjective question) was also tested, but the results were similar.

Figure 2
Food adequacy answers (percentage of 'less than adequate')
by simple food count quintiles and location—NEPAL



Source: NLSMS, own calculations.

4.4 Anthropometry

Anthropometric indicators were calculated for Albania and Indonesia. Two anthropometric indices (z-scores) were calculated—wasting and underweight—and compared to the subjective food adequacy answers. In Albania, approximately 13 per cent of children were underweight, and 8 per cent wasted, with higher percentages in rural areas in both cases (16 versus 9 per cent, and 9 versus 8 per cent). In comparing with the subjective indicator, we find no correlation for both indices, and contingency tables are statistically insignificant (not shown).[6]

Indonesia at the national level has a higher incidence of underweight children (25 per cent) than Albania, but a similar prevalence of wasted children. For both indicators the percentages are similar across urban and rural areas. The Indonesia survey also collected data on child subjective food adequacy, which in theory is more likely to be correlated with the anthropometric measures.[7] However, all matrices are statistically insignificant, with little evident correlation (not shown).

4.5 Multivariate regression

If subjective food adequacy (as defined here) is only weakly correlated with calorie consumption and with dietary diversity, and not at all with anthropometry, what is behind the subjective indicator? Does it reflect real perceptions of households regarding

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6 As one would expect, similar results have been found for stunting. Results for stunting are not shown because stunting reflects long-term processes, which are less likely to be related to current food consumption. Note that these figures are not the same as those reported in World Bank and INSTAT (2003) because neither the age group nor flagging criteria are the same.

7 The age range here is between 3 and 59 months.

food insecurity, or is it too vague or blunt an indicator? Is it too subjective to lead to valid comparisons among households? One way to explore further the relationship across indicators is to use multivariate regressions to determine which socioeconomic characteristics are associated with perceptions of subjective food adequacy. We model the relation as a probit, where a positive coefficient of a given explanatory variable can be interpreted as being associated with a higher probability of food adequacy.[8]

Two models are estimated. The second model is identical to the first except for the use of per capita food expenditures in lieu of per capita calorie consumption to see whether subjective answers are more responsive to food expenditure than to calories, but also because the food CAQ for Madagascar asked about food expenses, not consumption.

We start by simply regressing the CAQ response on per capita calorie consumption (and food expenditure) to quantify how much of the variability of respondent's perception is explained by our objective indicators. In the case of Albania, even though the binary model is statistically significant and the marginal effect fairly high, including only per capita calorie consumption explains very little (1 per cent) of the variation of the subjective indicator. The same applies to per capita food expenditure (6 per cent). This confirms our earlier discussion: per capita calorie consumption has little overlap with subjective perceptions and that much remains to be explained of the variability of our dependent variable.

More formally, the full model can be expressed as:

$$CAQ = \alpha + \beta_1 C + \beta_2 D + \beta_3 A + \beta_4 NF + \beta_5 Z + \beta_6 M + \beta_7 O + \beta_8 R +$$

$$\beta_9 E + \beta_{10} G + \beta_{11} RD + \beta_{12} S + \varepsilon$$

where:

- C refers to the log of per capita calories per day or to the log of per capita food expenditure (two separate, identical models);[9]
- D refers to a dietary diversity index;
- Following Morris *et al.* (2000), A refers to a household asset index, including both agricultural and non agricultural assets;
- NF refers to the share of nonfood items in total consumption;
- Z refers to a vector of household characteristics including household size, dependency ratio, gender, age of the household head, pension status, gender of the respondent and age composition of the household;
- M refers to migration variables;
- O refers to occupation of the household head (skilled versus unskilled) and to whether the household head is employed;
- R refers to the religion of the head of the household;

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8 We also estimated ordered probit models (i.e. including all three categories of the subjective question), but results (not shown here) are similar to those of the standard probit.

9 Anthropometry has not been included due to the reduced number of observations.

- E refers to education;
- G refers to a series of geographical location variables;
- RD refers to relative deprivation, that is, a household's wealth position relative to other households in a given geographical area, which is calculated following Stark and Taylor (1989). For Albania, the reference community is the village, which is feasible given access to census data. For Madagascar, the reference community is the province, the lowest possible level of disaggregation;[10] and
- S refers to other subjective variables.

The results for the two full models can be found in Table 7 for Albania and Table 8 for Madagascar.

Once we add the full specification, the log of per capita calories becomes statistically insignificant. However, adding the remaining variables explains a larger part (36 per cent) of the variation in food adequacy perception. When per capita calorie consumption is replaced by per capita food expenditure, the model produces similar results. However, unlike per capita calories, per capita food expenditure remains statistically significant. This makes sense, as discussed earlier, given the tradeoff between calories and food quality as income increases.

Just as interesting is the role of the different types of variables in explaining perceptions of food adequacy in Albania. First, dietary diversity is highly correlated to subjective food adequacy. However, the dietary diversity index becomes insignificant when per capita calories are substituted with per capita food expenditure. This suggests that the dietary diversity index may convey similar information as food expenditure, and in fact the two are collinear, with a high coefficient of correlation (0.6). Second, a number of wealth indicators are associated with perceptions of greater food adequacy. These include the share of nonfood items in total consumption, ownership of assets and higher wage/skilled occupations. Greater levels of human capital, in the form of average years of education among adults in the household, are also associated with a higher probability of food adequacy. Third, differences in household size and gender and age composition do not appear to influence perceptions of food adequacy. However, in the case of Albania, at equal levels of calorie/food consumption, being a female respondent, a widow(er), or a pensioner is associated with a greater probability of food inadequacy.

Fourth, food adequacy is highly correlated with other subjective perceptions.[11] Households that are satisfied with their general current situation, who are little concerned about providing the family with food and other basic needs for the future, who do not perceive themselves as poor and who think that life has improved during the previous three years have a higher probability of considering their food consumption adequate. This suggests that perceptions of food consumption are influenced not only by the current situation (however the question was formulated), but also by changing status

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10 See Carletto, Davis and Stampini. (2005) for a detailed description of the construction of this variable in the case of Albania.

11 We should not infer a causal effect of the other subjective variables on subjective food adequacy, when in fact it is just as possible that perceptions of food adequacy influence these other subjective variables.

Table 7
Probit of perception of food adequacy—ALBANIA

Dependent variable (0 =less than adequate; 1 =more than/just adequate)

	Calorie consumption		Food expenditures	
	Coefficient	Robust z statistics	Coefficient	Robust z statistics
Per capita kcal/food expenditure				
Log of per capita calories per day	0.179	(1.53)		
Log of per capita food expenditure			0.34	(3.05)***
Dietary diversity				
Simpson Index of dietary diversity	1.386	(3.20)***	0.707	(1.62)
Wealth				
Household asset index	0.088	(2.73)***	0.074	(2.26)**
Share of nonfood items in total consumption	0.008	(2.96)***	0.011	(3.68)***
Household composition				
Household size	0.053	(1.18)	0.072	(1.60)
Age of HH head	0.002	(0.69)	0.002	(0.58)
Female headed HH, dummy	0.125	(1.04)	0.135	(1.13)
Dependency ratio	0.06	(0.34)	0.055	(0.32)
Respondent is female	-0.106	(1.69)*	-0.099	(1.58)
HH head is divorced	-0.03	(0.08)	-0.046	(0.12)
HH head is widow(er)	-0.215	(1.66)*	-0.226	(1.75)*
HH head is single	-0.137	(0.82)	-0.159	(0.95)
Whether HH member(s) received a pension or other assistance during the past 12 m	-0.148	(1.96)*	-0.153	(2.03)**
No. of HH members 0-14 yrs of age	-0.062	(1.25)	-0.063	(1.25)
No. of HH members 15-34 yrs of age	-0.049	(1.11)	-0.053	(1.20)
No. of HH members 35-59 yrs of age	-0.044	(0.80)	-0.047	(0.86)
Migration/remittances				
HH has permanent migrants in Italy	-0.024	(0.24)	-0.023	(0.22)
HH has permanent migrants in Greece	-0.351	(2.58)***	-0.353	(2.58)***
Occupation				
Occupational group of HH head; 0=unskilled, 1=skilled	-0.26	(2.01)**	-0.257	(1.99)**
Unemployed HH head, dummy	-0.063	(0.49)	-0.051	(0.40)
Health				
HH head suffers from chronic illness, dummy	-0.023	(0.34)	-0.026	(0.38)
Religion				
HH head is Catholic	0.638	(2.60)***	0.633	(2.62)***
HH head is Orthodox	-0.318	(1.37)	-0.347	(1.52)
HH head is Muslim	-0.033	(0.16)	-0.052	(0.26)
Education				
Average HH years of education	0.025	(2.02)**	0.021	(1.65)*
Location				
Urban	-0.242	(2.29)**	-0.229	(2.21)**
Central region (coastal region excluded)	-0.444	(4.02)***	-0.423	(3.79)***
Mountain region	0.104	(0.84)	0.111	(0.90)
Tirana region	-0.456	(3.55)***	-0.467	(3.61)***
Relative wealth				
Relative deprivation index	-0.117	(0.95)	-0.11	(0.91)
Subjective				
Satisfaction with current situation	0.483	(8.64)***	0.479	(8.57)***
Concern in providing family with basic needs in next 12 m	0.111	(2.61)***	0.111	(2.59)***
Ten-step wealth ladder	0.294	(9.04)***	0.282	(8.58)***
General situation past 3 years	0.369	(8.43)***	0.367	(8.35)***
Rating health condition with respect to one year ago, HH-head; 0=worse/same, 1=better	-0.116	(1.79)*	-0.117	(1.81)*
Constant	-6.175	(5.19)***	-7.054	(6.84)***
Observations	3351		3351	
Log Likelihood	-1484.99		-1479.61	
chi2	908.10		908.15	
Pseudo-R2	0.36		0.36	

Note: * significant at 10%; ** significant at 5%; *** significant at 1%

Table 8
Probit of perception of food adequacy—MADAGASCAR

Dependent variable (0 =less than adequate; 1 =more than/just adequate)

	Calorie consumption		Food expenditures	
	Coefficient	Robust z statistics	Coefficient	Robust z statistics
Per capita kcal/food expenditure				
Log of per capita kcal per day, 30-day recall	0.049	(0.69)		
Log of per capita food expenditure			0.196	(3.01)***
Dietary diversity				
Simple count of foods consumed, monthly recall	0.001	(0.25)	-0.004	(1.11)
Wealth				
Household asset index	-0.001	(0.06)	-0.000	(0.01)
Share of nonfood items in total consumption	0.005	(2.44)**	0.008	(3.73)***
Household composition				
Household size	-0.04	(0.48)	-0.069	(0.87)
Age of HH head	-0.002	(0.50)	-0.000	(0.10)
Female headed HH, dummy	-0.102	(1.29)	-0.122	(1.67)*
Dependency ratio	-0.185	(0.98)	-0.153	(0.88)
HH head is divorced	0.017	(0.09)	0.054	(0.31)
HH head is widow(er)	0.187	(1.69)*	0.234	(2.28)**
HH head is single	0.045	(0.37)	0.012	(0.10)
HH head entitled to pension	-0.019	(0.24)	-0.041	(0.55)
No. of HH members 0-14 yrs of age	0.025	(0.31)	0.061	(0.78)
No. of HH members 15-34 yrs of age	0.05	(0.57)	0.096	(1.16)
No. of HH members 35-59 yrs of age	-0.022	(0.28)	-0.007	(0.10)
Migration				
No. of temporary migrants: absent more than 1 month	-0.008	(0.22)	0.005	(0.16)
Housing				
Log of house surface (area)	0.089	(2.50)**	0.079	(2.39)**
Occupation				
Occupational group of HH head; 0=unskilled, 1=skilled	0.022	(0.27)	0.057	(0.72)
Unemployed, ILO definition: 1h worked per week, HH head	0.051	(0.50)	0.109	(1.13)
Member of HH with non-agric enterprise; 0=no, 1=yes	0.119	(2.08)**	0.096	(1.77)*
Health				
HH head suffered from disease/wound, dummy	0.066	(0.77)	0.105	(1.28)
HH head had medical attention, dummy	0.104	(0.92)	0.005	(0.04)
Religion (excl. traditional)				
HH head is Catholic	-0.06	(0.76)	-0.094	(1.27)
HH head is Protestant	0.013	(0.16)	-0.016	(0.21)
HH head is Muslim	-0.177	(0.96)	-0.199	(1.12)
HH head is of another religion	-0.03	(0.27)	-0.041	(0.39)
Education				
Highest diploma obtained by HH head	0.04	(2.93)***	0.038	(2.89)***
HH head has never studied, dummy	0.031	(0.44)	0.003	(0.04)
Location				
Urban	0.039	(0.40)	-0.143	(1.27)
Semi urban	0.067	(0.95)	-0.015	(0.22)
Fianarantsoa Province (excl. Antananarivo)	-0.399	(4.18)***	-0.28	(2.82)***
Toamasina Province	-0.423	(4.42)***	-0.325	(3.31)***
Mahajanga Province	0.057	(0.60)	0.099	(1.06)
Toliara Province	-0.196	(2.04)**	-0.184	(2.06)**
Antsiranana Province	0.045	(0.44)	0.081	(0.85)
Relative wealth				
Relative Deprivation Index	-0.000	(3.89)***	-0.000	(1.39)
Subjective				
Household's budget compared to last year	0.285	(8.30)***	0.272	(8.38)***
Current standard of living	0.748	(21.59)***	0.74	(22.73)***

Table 8 continues

Table 8 (con't)
Probit of perception of food adequacy—MADAGASCAR

	Calorie consumption		Food expenditures	
	Coefficient	Robust z statistics	Coefficient	Robust z statistics
Constant	-2.949	(4.48)***	-5.221	(5.39)***
Observations	3543		3952	
Log Likelihood	-1832.58		-2046.43	
chi2	1246.48		1384.32	
Pseudo-R2	0.25		0.25	

Note: * significant at 10%; ** significant at 5%; *** significant at 1%

over time ('relative' food security) and the perspectives for the future (vulnerability). If this is the case, then we should not be surprised that little correlation is found with *current* caloric adequacy. However, the statistical significance of other subjective answers may be simply capturing 'attitudinal characteristics' (Carletto and Zezza 2006; Lokshin, Umapathi and Paternostro 2003) rather than relative food insecurity and vulnerability. In other words, if a person is pessimistic about the present situation, it is likely that he/she is pessimistic also about the past and the future.

The probit models for Madagascar tell a similar story, albeit with some notable exceptions. Dietary diversity, occupation (except having a member of the household owning a non-agricultural enterprise), household asset score, religion and migration are statistically insignificant in both models. Household composition and characteristics still have little influence. However, the share of nonfood in total consumption and greater levels of human capital are also associated with a higher food adequacy. Furthermore, relative deprivation is statistically significant, suggesting that perceptions of food adequacy are influenced by relative wealth status. The poorer a given household is in comparison to a reference group, the higher the probability of perceived food inadequacy.

Also in the case of Madagascar, other subjective perceptions count. Those households whose budget has improved compared to the year before the interview and those who think that they are currently among the wealthy/wealthier households, have a higher perception of food adequacy. This makes eminent sense given the importance of relative wealth as measured by total per capita consumption.

5 Discussion and conclusions

The simple descriptive analysis presented suggests that, overall, calorie consumption, dietary diversity and anthropometry are at best weakly correlated to subjective perceptions of food consumption. 'Subjective' and 'objective' indicators do not classify the same households as food (in)secure. The weak correlations are similar to those found in other studies. Hamilton *et al*. (1997) find only a weak correlation between income and the US food security measure, with correlation coefficients ranging from -0.12 to -0.33, depending on the definition of income utilized. Coates, Webb and Houser (2003) find in a small sample in Bangladesh somewhat higher correlation coefficients (0.42-0.44), though they find particularly low correlation with calorie consumption. Both of these food security indicators were far more sophisticated than the CAQ utilized in our study, and were the result of extensive field testing.

The lack of correlation between anthropometry and perceptions is not surprising, at least for underweight. Anthropometric indicators reflect not only food consumption, but also care practices, health and other environmental factors. More surprising is the lack of correlation between wasting and perceptions, especially the (weakly) negative correlation found between wasting and subjective children's food consumption adequacy in Indonesia. Coates, Webb and Houser (2003) find a similar lack of association between anthropometric measures and the subjective indicator in Bangladesh.

From the multivariate analysis, dietary diversity appears to be more correlated with subjective perceptions than calories or anthropometry, at least for Albania. This corresponds to conventional wisdom on the relationship between food consumption, calories and wealth. As households become wealthier, instead of maximizing calories, they improve the quality of consumption (substituting better types of the same foods or expanding the diversity of foods eaten) and the type of consumption, such as eating out more often. This implies small marginal changes in caloric intake as incomes increase, but a large change in the composition of the diet and in the cost of each calorie. Hoddinott and Yohannes (2002), in their cross country study, find that as households diversify their diets, they increase the consumption of relatively prestigious nonstaple foods rather than increase the variety of consumption within the group of staples. Note, however, that dietary diversity is not interchangeable with dietary quality, but is instead only one component (Ruel 2002).

The multivariate results for Albania show that the responses to the food adequacy question depend on a variety of household level and wealth characteristics. This confirms the earlier work of Pradhan and Ravallion (2000) for Nepal and Lokshin, Umapathi and Paternostro (2003) for Madagascar, who perform similar regressions, albeit with a different objective. Also, both of these studies find that relative income or, more generally, the relative position in society, influence reported perceptions. In Madagascar, Lokshin, Umapathi and Paternostro (2003) find that households living in population clusters with a high mean income are more likely to perceive their food consumption expenditure as less adequate compared to an average household, and that higher intra-cluster inequality negatively affects perceptions of food consumption adequacy. We find similar results for both Madagascar and Albania.

We take their analysis a step further, however, and we find for Madagascar that households that are poorer compared to their neighbours (relative deprivation)—holding household and community level wealth constant—have a lower perception of food adequacy. Finally, if the household's economic situation has worsened in the past—holding wealth constant—the household is much more likely to have a lower perception as well. These two results together suggest that the food adequacy questions may be capturing relative food adequacy, in comparison with neighbours, and respondent's perception of changing status over time. As such, they would reveal perceptions of vulnerability and would denote something quite different from standard quantitative measures. Our multivariate regressions show that perceptions of food adequacy are highly correlated with perception of relative and absolute wealth, both in the past and in the present. Therefore, not surprising is the finding of a weak (or, lack of) correlation with *current* food security and wealth as measured by quantitative indicators, which cannot capture vulnerability. On the other hand, we have suggested that the correlation among subjective indicators may be due also to 'attitudinal characteristics' and not to relative food insecurity and/or to vulnerability. Panel data would be needed to control

for fixed individual effects and thus to determine whether perceptions are determined by vulnerability.

Finally, the measure of perception of food adequacy that we have been analysing in this paper is alarmingly simple when compared to the US food security index or to standard calorie consumption measures. While the relative imprecision of the CAQ compared to the more sophisticated US-type subjective food index may be sufficient for academic studies, this imprecision translates into missing food insecure households, when it concerns targeting food security interventions. While subjective food adequacy indicators may provide insight on the vulnerability dimension of food insecurity, the CAQ is a too blunt and ambiguous indicator for directly mapping food insecurity.

An effort towards developing subjective food security modules should go hand in hand with research into how to improve household survey data for food security measurement along other dimensions of the phenomenon, particularly calorie consumption. The recent trend in a number of countries such as Brazil, Yemen and Bangladesh to redesign a food security index based on local conditions and notions of food consumption is an important step forward, and should be encouraged in other countries carrying out LSMS-type household surveys.

This surely is not an easy task. The US food security module is the product of several years of methodological advances and of field testing. It measures the sufficiency of household food through food-related behaviours as directly experienced by people. One of its main drawbacks is that, while its *internal* validity and consistency have been extensively tested (at the population level, not at the level of an individual household), its *external* validity has not (Bickel *et al.* 2000). The inclusion of a contextually sensitive module similar to that of the US into household surveys in developing countries, reflecting also future vulnerability, provides an excellent opportunity to validate externally 'subjective' indicators, both at the population level and at the level of the individual household.

Bibliography

Azzarri, C., C. Carletto, B. Davis, and A. Zezza (2006). 'Monitoring Poverty without Consumption Data: an Application Using the Albania Panel Survey'. *Eastern European Economics*, 44 (1).

Bickel, G., M. Nord, C. Price, W. Hamilton, and J. Cook (2000). 'Guide to Measuring Household Food Security'. Revised 2000. Washington, DC: Office of Analysis, Nutrition and Evaluation, Food and Nutrition Service, United States Department of Agriculture.

Carletto, G., and A. Zezza (2006). 'Being Poor, Feeling Poorer: Combining Objective and Subjective Measures of Welfare in Albania'. *Journal of Development Studies*. Forthcoming.

Carletto, G., B. Davis, and M. Stampini (2005). 'Familiar Faces, Familiar Places: The Role of Family Networks and Previous Experience for Albanian Migrants'. ESA Working Paper 05-03. Rome: FAO.

CDC (2002). 'EpiInfo 2002. Revision 2'. Atlanta: Department of Health and Human Services.

Chung, K., L. Haddad, J. Ramakrishna, and F. Riely (1997). 'Alternative Approaches to Locating the Food Insecure: Qualitative and Quantitative Evidence from South India'. Discussion Paper No. 22. Washington, DC: Food Consumption and Nutrition Division, IFPRI.

Coates, J., P. Webb, and R. Houser (2003). 'Measuring Food Insecurity: Going Beyond Indicators of Income and Anthropometry'. Food and Nutrition Technical Assistance Project. Washington, DC: Academy for Educational Development.

Dercon, S. (2001). 'Assessing Vulnerability'. Oxford: Oxford University. Mimeo.

FAO (2003a). *Measurement and Assessment of Food Deprivation and Undernutrition. Proceedings of the International Scientific Symposium*, *Rome, 26-28 June 2002*. Rome: FAO.

FAO (2003b). *The State of Food Insecurity in the World 2003*. Rome: FAO.

FAO (2004). *The State of Food Insecurity in the World 2004*. Rome: FAO.

Hamilton, W. L, J. Cook, W. W. Thompson, L. F. Buron, E. A. Frongillo, C. M. Olson, and C. A. Wehler (1997). 'Household Food Security in the United States in 1995, Technical Report of the Food Security Measurement Project'. Alexandria: US Department of Agriculture.

Hoddinott, J. (1999a). 'Choosing Outcome Indicators of Household Food Security'. IFPRI Technical Guide No. 7. Washington, DC: International Food Policy Research Institute.

Hoddinott, J. (1999b). 'Operationalizing Household Food Security in Development Projects: An Introduction'. IFPRI Technical Guide 1. Washington, DC: International Food Policy Research Institute.

Hoddinott, J., and Y. Yohannes (2002). 'Dietary Diversity as a Food Security Indicator'. FCND Discussion Paper No. 136 Washington, DC: International Food Policy Research Institute.

Kennedy, E. (2003). 'Qualitative Measures of Food Insecurity and Hunger', in *Measurement and Assessment of Food Deprivation and Undernutrition. Proceedings of the International Scientific Symposium, Rome, 26-28 June 2002*. Rome: FAO, 165-84.

Lokshin, M., N. Umapathi, and S. Paternostro (2003). 'Robustness of Subjective Welfare Analysis in a Poor Developing Country: Madagascar 2001'. Washington, DC: World Bank. Mimeo.

Maxwell, S. (1996). 'Food Security: A Post-modern Perspective'. *Food Policy*, 21 (2): 155-70.

Migotto, M., B. Davis, C. Carletto, and K. Beegle (2005). 'Measuring Food Security Using Respondents' Perception of Food Consumption Adequacy'. ESA Working Paper 05-10. Rome: FAO.

Morris, S. S., C. Carletto, J. Hoddinott, and J. M. Christiansen (2000). 'Validity of Rapid Estimates of Household Wealth and Income for Health Surveys in Rural Africa'. *Journal of Epidemiology and Community Health*, 54 (12): 0-6.

Naiken, L. (2003). 'FAO Methodology for Estimating the Prevalence of Undernourishment', *Measurement and Assessment of Food Deprivation and Undernutrition. Proceedings of the International Scientific Symposium, Rome, 26-28 June 2002*. Rome: FAO, 7-42.

Nord, M., A. K. Satpathy, N. Raj, P. Webb, and R. Houser (2002). 'Comparing Household Survey-Based Measures of Food Insecurity across Countries: Case Studies in India, Uganda and Bangladesh'. Discussion Paper No 7. Boston: Friedman School of Nutrition Science and Policy, Tufts University.

Pradhan, M., and M. Ravallion (2000). 'Measuring Poverty using Qualitative Perceptions of Consumption Adequacy'. *The Review of Economics and Statistics*, 82 (3): 462-71.

Prennushi, G. (1999). 'Nepal: Poverty at the Turn of the Twenty-First Century. Main Report and Background Studies'. Report No. IDP 174, South Asia Region Internal Discussion Paper. Washington, DC: World Bank.

Rakutomehefa P., M. Razakamanansoa, and M. Romani (2002). 'Madagascar Poverty Profile 2001: Technical Report'. INSTAT Technical Report. Antananarivo, Madagascar; INSTAT.

Ravallion, M., and M. Lokshin (1999). 'Subjective Economic Welfare'. WB Policy Research Working Paper No. 2106. Washington, DC: World Bank.

Ruel, M. T. (2002). 'Is Dietary Diversity an Indicator of Food Security or Dietary Quality? A Review of Measurement Issues and Research Needs'. FCND Discussion Paper No. 140. Washington, DC: International Food Policy Research Institute.

Segall Corrêa, A., R. Pérez Escamilla, L. Kurdian Maranha, and F. Archanjo Sampaio (2003). 'Relatório técnico. Acompanhamento e avaliação da segurança alimentar de famílias brasileiras: validação de metodologia e de instrumento de coleta de informação'. UNICAMP, Faculdade de Ciências Médicas, Departamento de Medicina Preventiva e Social, August.

Skoufias, E. (2001). 'Changes in Regional Inequality and Social Welfare in Indonesia from 1996 to 1999'. *Journal of International Development*, 13 (1): 73-91.

Stark, O., and J. E. Taylor (1989). 'Relative Deprivation and International Migration'. *Demography*, 26 (1): 1-14.

Tarp, F., K. Simler, C. Matusse, R. Heltberg, and G. Dava (2002). 'The Robustness of Poverty Profiles Reconsidered'. FCND Discussion Paper No 124. Washington, DC: International Food Policy Research Institute.

World Bank (1986). *Poverty and Hunger: Issues and Options for Food Security in Developing Countries*. Washington, DC: World Bank Publications.

World Bank and INSTAT (2003). 'Albania: Poverty during Growth. A Poverty Profile of Albania'. Background paper for the World Bank Poverty Assessment. Washington, DC and Tirana: World Bank and INSTAT. Mimeo.