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Assessment of the Reliability and Relevance of the Food Data Collected in National Household Consumption and Expenditure Surveys

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Acronyms

AFINS	Assessing Food Insecurity
AME	Adult male equivalent
BFG	Basic Food Group
BLS	Bureau of Labor Statistics (USA)
CBN	Cost of basic needs
COICOP	Classification of Individual Consumption According to Purpose
CPI	Consumer price index
DFID	Department for International Development (UK)
EC	European Commission
FAO	Food and Agriculture Organization
FBS	Food balance sheet
FCAFH	Food consumed away from home
FCT	Food composition table
FEI	Food energy intake
GDP	Gross domestic product
HBS	Household budget survey
HCES	Household consumption or expenditure survey
HIES	Household income and expenditure survey
IHSN	International Household Survey Network
IFPRI	International Food Policy Research Institute
ILO	International Labour Organization
IMF	International Monetary Fund
IRD	Institut de Recherche pour le Dévelopement
MDGs	Millennium Development Goals
MENA	Middle East and North Africa
NGO	Non-governmental organization
NSO	National statistics office
OECD	Organisation for Economic Co-operation and Development
PPP	Purchasing Power Parities
SNA	System of National Accounts
SUT	Supply-and-use table
UNSD	United Nations Statistics Division
UNU	United Nations University
USDA	United States Department of Agriculture
WB	World Bank
WEF	World Economic Forum
WHO	World Health Organization

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Executive summary

Food consumption data are collected in most countries through a variety of household surveys. The primary objective of these surveys is usually to measure poverty, to derive consumption patterns needed for the calculation of consumer price indices, or to provide input to the compilation of national accounts. Increasingly, these data are re-purposed and used to calculate food security indicators, to compile food balance sheets, to plan and monitor food-based nutrition interventions, to serve information needs of the private sector, and for other research work. What makes a survey dataset "fit for purpose" is specific to each one of these particular uses. In this report, we propose a method to assess the reliability and relevance of survey questions, which we apply to 100 household surveys from low- and middle-income countries. This report is thus based on a desk review of survey questionnaires and methods, not on an assessment of the data themselves.

Reliability assessment

Assessing the reliability consists of assessing how the information is collected, i.e. whether the survey design and method complies with good practice. We assess reliability based on seven areas of investigation.

1. ***Recall period for at-home food data collection***. We consider that recall periods greater than two weeks (such as the "typical month") would not provide accurate report of household consumption or expenditures. A full 30 percent of surveys employed recall periods greater than two weeks.

2. ***Modes of food acquisition included***. All surveys should collect data on food purchases, food consumed from own production, and food received in kind. Overall, 85 percent of countries collected data on all three sources, leaving 15 percent of surveys not meeting the reliability criteria. Among these 85 percent, 14 percent did not collect data *individually* for each one of the three methods, raising a relevance issue for some uses.

3. ***Completeness of enumeration*** of either food acquisition or food consumption. Not making a clear distinction between acquisition and consumption in the questionnaire design may result in incomplete reporting. Overall, 25 percent of surveys do not meet our reliability criterion for completeness of information.

4. ***Comprehensiveness of the at-home food list***. Data must be collected on all of the types of food and beverages that make up the modern human diet. We judge the comprehensiveness of survey food lists using a set of 14 basic food groups. Each food group must be represented by at least one item in the survey questionnaire. Just over 80 percent of surveys meet the criterion. We also expect that at least 40 percent of products would be processed food items. The majority of surveys (87 percent) meet the criterion. A last criterion is that of "exclusivity": food items should not be merged with other commodities in the questionnaire. Most surveys (97 percent) pass the criteria. Overall, 72 percent of surveys meet all three criteria of comprehensiveness.

5. ***Specificity of the at-home food list***. Specificity of the food list refers to the degree of detail with which food items are classified. We identify (somewhat arbitrarily) a minimum number of food items that should be included in each one of the 14 basic food groups. This ranges from one for "Eggs" to 10 for "Vegetables" or "Fruits". As there are some countries in which specific food groups are likely to be under-represented because the foods are not traditionally consumed by the population, we expect the minimum number criteria to be met for at least 10 of the 14 food groups. Only 63 percent of surveys meet this criterion. Another criterion of specificity is that no more than 5 percent of the food items listed in the questionnaire should span more than one basic food group; this criterion is met by 77 percent of surveys. Only 54 percent of surveys meet both criteria, indicating that there is great room for improvement in this area.

6. ***Quality of data collected on food consumed away from home***. Ninety percent of the assessed surveys collected data on food away from home. Data were collected for multiple places of consumption in only 23 percent of them. Data were collected on (a small number of) specific food items consumed away from home for 33 percent of the surveys. Data are collected at the individual level for only 17 percent of the surveys. The quality of data collected on food away from home is very low, despite evidence of

the fast growing share of food away from home in household food consumption.

7. ***Accounting for seasonality in food consumption***. Only 53 percent of surveys take seasonality into account in a way that meets our criteria.

Relevance assessment

To assess the relevance of surveys for particular uses and users, we first discuss the following five methodological issues.

1. Measuring quantities of food consumed.
2. Calculation of calorie consumption.
3. Calculation of edible portions and the nutrient content of foods.
4. Calculation of per-capita indicators and nutrient insufficiencies and the importance of collecting data on the number of food partakers.
5. Use of acquisition data to measure consumption.

We then propose a set of twelve indicators, identify which one(s) is (are) needed by each category of users, and by report the extent to which each survey allows the production of each indicator in a reliable manner.

- Quantities consumed of individual foods
- Calorie consumption and undernourishment
- Calories consumed from individual foods/ food groups
- Protein and micronutrient consumption/ insufficiencies
- Dietary diversity
- Percent of households consuming individual foods
- Percent of households purchasing individual foods
- Percent of expenditures on individual foods/ food groups
- Expenditures on individual foods by source
- Percent of expenditures on food
- Estimating subsistence production
- Consistency checks of FBS consumption patterns

Based on this assessment, we conclude that:

- Roughly half of the surveys can be used for **calculating poverty lines**. Detailed, spatially disaggregated price information, coupled with the issues related to accurately measuring calorie consumption (see next), are the main constraining factors in employing HCES data for measuring poverty using the most well established methods.

- In the case of **food security**, survey relevance depends on the indicator of interest. Calorie consumption and undernourishment, important indicators of diet quantity, can be measured for just under half of the surveys. Obtaining accurate indicators of dietary quality is limited to a minority of surveys: when food consumed away from home is taken into account, 10 percent of the surveys can be used to calculate quantities consumed of individual foods, nine percent for calculating macro and micronutrient consumption and insufficiencies, nine percent for calculating the percent of expenditures on staples, and 14 percent for calculating dietary diversity. By contrast, the measure of economic vulnerability to food insecurity—the percent of expenditures on food—can be calculated for 100 percent of the surveys.

- Close to half of all surveys can be employed for **informing food balance sheets** (FBS) in two important ways: (1) providing consistency checks of per-capita dietary energy supply and undernourishment estimates; and (2) estimating subsistence production of foods. Near 20 percent of surveys can be used to provide consistency checks of FBS consumption patterns and 10 percent can be used to help estimate production of foods using estimates of the quantities of foods consumed.

- Turning to informing **food-based nutrition interventions**, all or nearly all surveys can be used for measuring the percentage of households consuming and purchasing individual foods, an important piece of information needed for identifying fortifiable foods. Note, however, that if consumption and acquisition frequencies differ greatly, food acquisition data will give inaccurate estimates of the percentage of households consuming individual foods. On the other hand, less than 10 percent of surveys can be used for estimating the quantities of individual foods consumed and micronutrient insufficiencies.

- Although many surveys meet some of the relevance criteria for **national accounts, consumer price indices and private sector**

information needs, half of them only meet all criteria.

Conclusion and recommendations

The assessment found great variety across surveys in data collection methods and paints a bleak picture. It points to many areas where survey design and questionnaires can be improved. Small improvements can sometimes lead to a significant increase in reliability and thus great improvements in measurement accuracy. The assessment identified three priority areas that must be addressed:

- ***Food consumed away from home.*** Collect data on food consumed away from home in all future HCES. Employ a recall period of two weeks or less, and collect data on both purchases and food received in kind.

- ***Accounting for seasonality.*** All HCES survey designs should spread data collection across a full year's time in order to capture seasonal variation in food consumption and expenditure patterns.

- ***Specificity of survey food lists.*** Ensure that survey food lists are sufficiently detailed to accurately capture consumption of all major food groups making up the human diet.

Addressing these three key areas alone will lead to major improvements in the accuracy of indicators measured using the data.

Other basic best practices that should be followed, but are not for many, in the design of all surveys are to:

- Collect data on all three sources from which food can be acquired, including purchases, consumption of home-produced food, and food received in kind;
- Rectify accounting errors in the design of survey consumption and expenditure modules to ensure complete enumeration of either all food acquired or all food consumed over the recall period;
- Ensure that survey food lists cover all foods consumed by populations, including processed foods; and
- Employ a recall period of two weeks or less for the collection of data on food consumed at home.

The following priority areas would greatly increase the relevance of the data.

- **Collect the appropriate data for calculating metric quantities of foods**. Doing so enables calculation not only of metric quantities of foods consumed, which are useful in and of themselves, but also calorie, protein and micronutrient consumption and insufficiencies.

- **Collect data on the specific foods and prepared dishes consumed away from home.** This improvement would also greatly increase the accuracy of estimates of metric quantities of foods consumed and enable more accurate estimation of nutrient consumption and insufficiencies.

- **Ensure that survey food lists are sufficiently detailed such that foods can be identified for classification into food groups and conversion to nutrient content.** This is especially critical for accurate estimation of nutrient consumption and dietary diversity.

Additional recommendations that would benefit multiple users are to:

- **Clearly distinguish among the sources from which food is acquired (purchases, home production, and received in-kind)** so that consumption and/or acquisition of food from these sources can be enumerated individually.

- **Collect data on food given to non-household members**, which are needed for accurate calculation of per-capita indicators and nutrient insufficiencies.

The assessment has identified the following important areas for future research, including collecting existing evidence and conducting new empirical studies where necessary.

1. How well are food and nutrient consumption measured when food acquisition data are collected in HCES?

2. How well is food consumption measured using HCES consumption data? Can it be reliably measured using recall periods greater than 24 hours, the traditional norm?

3. Which methods of converting collected food acquisition/consumption data to metric units yields the most accurate estimates of metric quantities? Does this vary by setting?

4. What are the data collection requirements for capturing "usual" consumption?

5. What is the best method for collecting data on food away from home?

6. How well can age and sex -specific food and nutrient consumption be estimated using HCES data? Can energy-equitable distribution be assumed? Can statistical modeling techniques instead yield accurate estimates?

1. Introduction

Most countries in the world periodically collect data on household consumption or expenditure through sample surveys. Household budget surveys (HBS) and household income and expenditure surveys (HIES) are conducted primarily to provide input to the calculation of consumer price indices (CPI) or the compilation of national accounts. In developing countries, nationally-representative data on household consumption or expenditures are also obtained from various types of socio-economic or living standards surveys conducted to measure and monitor poverty or provide data for informing poverty reduction policies. This report refers to this diverse set of surveys as household consumption and expenditure surveys (HCES).

Increasingly, statistical agencies that implement HCES disseminate the survey microdata. When well documented HCES microdata are made easily accessible, they are extensively used by secondary analysts, often for purposes other than the ones pursued by the primary investigators. This re-purposing of data offers the potential to add much value to datasets, as it extends and diversifies the uses of the data at no cost to the data producer. Feedback provided by an enlarged community of analysts can help data producers increase the reliability and relevance of their surveys.

Considering this growing and diverse community of users, the issue of data quality takes on a new dimension. Survey design and methods differ considerably across countries--and sometimes over time within countries. To what extent do HCES provide reliable and relevant data for both their traditional purposes and for new, additional ones? And if quality issues are identified, how can they be addressed to better meet the needs of users? Data collection is expensive, and puts a high burden on respondents. It is the duty of statistical agencies that implement such surveys to maximize the return on their investments by making data as reliable and relevant as possible. And it is the role of the international statistical community to contribute to the development of guidelines and recommendations to support the improvement of these surveys.

Under the auspices of the International Household Survey Network (IHSN), the World Bank and the Food and Agriculture Organization of the United Nations (FAO) undertook a large-scale assessment of HCES conducted in low and middle income countries. This project had two key objectives. The first was to develop a method to assess the reliability and relevance of food consumption data as collected through HCES. The second one was to implement this method to conduct a large-scale assessment and report on the relevance and reliability of the data contained in a large number of surveys to identify opportunities for improvements.

The first step in developing the assessment consisted of identifying the main categories of uses and users of household food consumption data: poverty analysts, national accountants and CPI compilers, food security experts, planners of food-based nutrition interventions such food fortification programs, and the private sector. The next step was to define the criteria for assessing reliability and relevance of the data for each user. An assessment form was then developed, which was used to compile information on the design of food consumption or expenditure survey modules from 100 countries. The reliability and relevance of each survey's food consumption (or expenditure) module(s) were then assessed using this meta-database. Reliability refers to the capacity of the survey to provide a "true" or "accurate" measure of household consumption or expenditures. Relevance refers to the fitness of the survey data for a specific purpose.

The assessment is based purely on a review of survey questionnaires and related documentation. Clearly, the reliability and relevance of survey data also depends on the quality of the sample frame and sampling design, training and supervision of interviewers, the data entry and editing work, and the collaboration of respondents. These factors are however not covered in this study. Also, the assessment is limited to food consumption, although all HCES cover a broader spectrum of goods and services. The reason for focusing on this subcomponent of household consumption is that many of the newer users are primarily interested in the food data. Further, global forces are leading to changes in dietary patterns that raise new reliability and relevance issues specifically related to food. Another assessment, covering non-food household expenditures, is being undertaken separately by the World Bank and IHSN, with different partners.

The report is structured as follows. Chapter 2 provides an overview of the key uses and users of HCES food consumption data. Chapters 3 and 4 report respectively on the reliability and relevance of 100 survey questionnaires reviewed with respect to the needs of the uses and users identified in Chapter 2. Conclusions and recommendations are formulated in Chapter 5.

2. Uses and users of the food data collected in national HCES

1. The main uses of food data collected in national HCES are:
2. Poverty measurement
3. Food security indicators
4. Compilation of Food Balance Sheets
5. Planning and monitoring of food-based nutrition interven tions
6. Calculation of Consumer Price Indices
7. Informing National Account Statistics
8. Meeting private sector information needs

The first recorded use of HCES data was by David Davies, a clergyman who in 1795 collected and analyzed family budget information to draw attention to the living conditions of the working poor in England (Deaton 1997). The history of *national* surveys of household expenditures began as early as 1888, when the United States Bureau of Labor Statistics launched its first nation-wide Consumer Expenditure Survey (BLS 2012). India's continuous National Sample Survey, launched in 1950, was the first to be administered in a developing country. Initial surveys focused on poverty and living standards, and on providing information for constructing Consumer Price Indices (CPIs) and compiling national accounts (Deaton 1997). These uses, which are all in some way dependent on food data, continue to be a primary focus of HCES.

Use of the food data collected in HCESs to measure indicators of food security started with Purvis' (1966) analysis of food consumption in Malaysia in the 1960's. At the time FAO, which was charged with monitoring global hunger, based its assessment of the world food situation mainly on food supply data. Purvis' and several similar country-level analyses were used by Schultheis (1970) to argue for the inclusion of HCES data in the estimations. Sukhatme (1961) had already clarified that an analysis of food supply only could not be sufficient to assess the extent of undernourishment, and had been proposing a method that included information on the distribution of food consumption from household surveys. By the time of the release of its *Fifth World Food Survey* in 1987, FAO had begun to apply the method suggested by Sukhatme (FAO 1987), and HCES-derived data on food distribution within countries became one key element to inform its estimates of the prevalence of undernourishment in all monitored countries. More recently, nutritionists have begun to exploit HCES food data for planning nutritional interventions such as mass food fortification programs (Fiedler, Carletto and Dupriez 2012), and FAO is using them to inform its food supply estimates from Food Balance Sheets (FBSs). Further, information from HCESs is increasingly sought by the private sector to inform its marketing endeavors. It should be noted that HCESs are not typically designed with the information needs of these more recent uses in mind.

This chapter provides an overview of the main uses and users of the food data collected in today's HCES. It starts with the long-standing, traditional application to measuring poverty. It continues with the more recent applications of measuring food security, compiling FBSs, and informing food-based nutrition interventions. It then moves to the use of HCES to inform CPIs and national accounts systems (NASs) and to answer private sector information needs.

Other uses could have been considered, such as the assessment of the impact of food consumption changes on the environment. We are confident that, if the issues identified in the assessment of the seven abovementioned uses of data can be solved, the HCES will be made fit for most other purposes.

2.1 Measuring poverty

National HCES are key to measuring absolute income poverty, whether the Food Energy Intake method or the more computationally demanding Cost of Basic Needs method are used.

The data collected in national HCES's have long and regularly been used for measuring absolute poverty, that is, the percentage of people in a country's population whose total income or expenditures fall below a money-metric poverty line anchored to some measure of needs[1]. This indicator is widely used for monitoring poverty, targeting and planning interventions, and con-

1 The discussion here is limited to absolute measures of income poverty. Poverty can also be expressed in relative terms, or based on more dimensions that just income, or on subjective perceptions. While all these measure have their own merits, they are less relevant for the discussion here because they are either less commonly applied in developing countries (relative poverty measures), or have less direct implications for food consumption expenditure data collection (multidimensional and subjective poverty measures). For a discussion of these measures, see Ravallion and Bidani (1994), Ravallion (1998), Coudouel et al. (2002), Alkire and Foster (2011), and Kapteyn (1994). In what follows the term poverty is used to refer to absolute consumption-based poverty, unless otherwise noted.

ducting research that supports policies and programs to combat poverty. The primary users of the data for this purpose are the national and international institutions that estimate and monitor poverty levels, trends, and strategies. At national level these are mainly the national statistical offices mandated with estimating official poverty numbers, and the ministries (usually of economy, planning, or finance) charged with monitoring national progress in poverty reduction. At the international level, the same data are inputs for the World Bank's Global Poverty Database, the monitoring of the United Nations Millennium Development Goals (MDGs[2]), and are used by donor agencies, international non-governmental organizations (NGOs), researchers and policy analysts interested in monitoring and understanding poverty.

The two most commonly used methods for measuring absolute income poverty are the Cost of Basic Needs (CBN) and the Food Energy Intake (FEI) methods (Ravallion 1998; UNSD 2005). Both rely on two essential pieces of information: 1) a welfare measure - households' total income or, more often, total expenditures[3]; and 2) a poverty threshold with which to determine whether a household is poor. A substantial percentage of the households' expenditures is devoted to food in most developing countries (typically over 50 percent, Smith and Subandoro 2007). Thus the quality of the food data used to calculate total expenditures is of concern regardless of which method is employed.

The two methods are "anchored in some absolute standard of what households should be able to count on in order to meet their basic needs" (Coudouel et al. 2002: p. 33) which generally relate to a minimum food basket plus some allowance for nonfood needs. They therefore both depend on an accurate estimation of households' total expenditures[4], while differing in the formulation of the poverty line.

The Cost of Basic Needs approach is the most commonly used, but also the more computationally demanding. Its poverty line is defined by the level of total expenditures that allows a household to cover its energy requirement in addition to a range of non-food basic needs, for example, housing, education, health and transport. HCES food data are used to identify and cost a "basket" of foods that will cover the energy requirement. To do so information on the calorie content of foods commonly consumed by the poor is needed. Some arbitrary allowance for nonfood basic needs is added to the food component, usually also based on the observed consumption patterns of the poor. Detailed price data are needed for the version of the CBN that is most commonly used in practice as these are then used to value the food and non-food items to arrive at the amount of expenditures needed to acquire them, and to account for relative price differences that allow consistency of poverty definitions across time and space.

The Food Energy Intake method, "proceeds by finding the consumption expenditure or income level at which a person's typical food energy intake is just sufficient to meet a predetermined food energy requirement" (Ravallion and Bidani, 1994: p. 78). This method is less computationally demanding when compared to the CBN as it does not require price data, and implicitly accounts for the nonfood allowance. These computational advantages, however, come to the expense of a lack of consistency in the poverty estimates as households with the same 'command' over resources may be classified differently as poor and non-poor depending on variables such as their place of residence, as differences in cost of living and relative prices are not being taken into account[5].

International poverty comparisons of absolute poverty level are based on the CBN method, but with a poverty line that is identified as the mean poverty line among the poorest world's countries and a welfare measure that makes national data comparable internationally by deflating them using a purchasing-power-parity exchange rate (Ravallion and Chen, 2010).[6] These are the poverty estimates produced by the World Bank which are used to monitor the first Millennium Development Goal (MDG), to halve, between 1990 and 2015, the proportion of people living with less than one dollar per person a day.

2 Starting in 2015 the MDGs will be replaced by a new set of internationally agreed development goals. Poverty is most likely to continue being a key indicator within the new set of goals.

3 A United Nations Statistics Division survey of National Statistical Offices (NSOs) undertaken in 2004-2005 found that almost half base their poverty calculations on expenditure data, 30 percent on income, and 12 on both (UNSD 2005).

4 See Deaton and Zaidi (2002) for a primer on estimating measures of total household consumption from household surveys for poverty analysis.

5 In principle, cost of living adjustments can be used with the FEI method, but that implies the use of detailed price data, and giving up part of the computational simplicity for which the method may be favored by some users over CBN.

6 The poverty line used for the most recent estimates is PPP$1.25 (Chen and Ravallion 2010).

2.2 Measuring food security

Food security is a complex, multidimensional phenomenon involving much more than food consumption alone. However, national HCES food data are essential to building several of the key indicators used for food security analysis and monitoring, such as the FAO undernourishment indicator used for monitoring the MDG goal 1 Target 1.C); dietary diversity indicators; and the share of food on total household's expenditures.

Food security is essentially about whether people have assured access to enough food of adequate quality for living an active healthy life.[7] The food data collected in HCES's allow calculation of a number of key indicators of food security including those of dietary quantity, dietary quality, and vulnerability to food insecurity (Smith and Subandoro 2007). Similar to poverty, the indicators can be used to monitor food security across and within countries and over time, target and plan interventions, and conduct research that informs policies and programs aimed at overcoming food insecurity. The main primary users of HCES data for these purposes are Food and Agriculture Organization (FAO), government statistical services and line ministries, and data analysts associated with donor and international relief and development agencies.

With respect to dietary quantity, food is the most fundamental basic need of human beings and helping to ensure that people have access to enough of it is a major goal of international development. Energy from food is arguably the most important nutrient for immediate survival, physical activity and health. Thus, per-capita calorie consumption is the key summary indicator used to capture dietary quantity for population groups. The percent of countries' populations lacking adequate dietary energy, termed "undernourishment", is the main indicator used to monitor food insecurity across the developing countries. It is also used to track progress in reaching MDG No. 1(c) "to halve, between 1990 and 2015, the proportion of people who suffer from hunger".

FAO is the primary data user for these purposes. As noted above, it has been using the food data in HCES's as an input into its measurement of undernourishment since the 1980s, with estimates reported annually since 1999 for all developing countries by region and for the developing world as a whole in its flagship publication *State of Food Insecurity in the World* (FAO 2013). Historically the role of HCES data in measuring undernourishment has been limited to providing reliable estimates of the distribution of calorie consumption across populations, with national food availability[8] (Food Balance Sheet) data serving as the basis to estimate the average habitual daily food consumption. More recently, FAO has initiated an extensive program of work in collaboration with national statistical agencies to derive food security indicators at national and sub-national levels and for demographic groups based fully on HCES data (Sibrian 2008). It has also produced publicly-available software for doing so (ADePT-FSM 2013; FAO 2013).

With respect to dietary quality, it is increasingly recognized that inadequate consumption of protein and micronutrients such as iron, vitamin A, and iodine is becoming the main dietary constraint facing poor populations across the globe (Ruel et al. 2003; Graham, Welch, and Bouis 2004). "Hidden hunger" associated with micronutrient deficiencies is estimated to affect one-third of the world's population, more than two billion people (Ramakrishnan 2002). The food data in HCES can be used to address this problem by allowing measurement of three indicators of dietary quality (Smith and Subandoro 2006). The first, household dietary diversity is a summary index of the quality of people's diets. It reflects the economic ability of households to consume a variety of foods (FAO 2013). The second, the percentage of food energy derived from staples such as rice, maize and cassava is an indicator of dietary quality because energy-dense, starchy staples have only small amounts of bioavailable protein and micronutrients leaving those consuming large amounts of them vulnerable to nutrient deficiencies. Finally, per-capita protein and micronutrient consumption and deficiencies in that consumption, as indicated by the micronutrients available to households,[9] are direct measures of dietary quality focused on individual nutrients.

Estimates of the quantities of individual foods consumed by households are often of interest to policy makers aiming to improve dietary quality because un-

7 It is formally defined as "a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life" (FAO 2002).

8 See Section 2.3 on Food Balance Sheets below.

9 The data collected in HCESs cannot be used to directly measure micronutrient consumption or intakes because the micronutrient content of the food acquired or consumed by households can change with the type of storage, cooking techniques, etc. (FAO 2012d). It can however be used to estimate micronutrient available for consumption.

derstanding dietary patterns allows them to single out which types of foods to focus on in planning interventions. Such an understanding is particularly important in a world of fast-paced dietary shifts that come with increases in income, urbanization and globalization. This "nutrition transition" is bringing with it increases in the consumption of fats, sugars and processed foods that are contributing to increasing obesity and non-communicable diseases such as diabetes even in relatively poor developing countries, many of which are facing a double burden of under- and over- nutrition (Popkin, Adair and Ng 2012; FAO 2006). European countries have begun using the food data collected in HCES for monitoring these types of dietary changes (Trichopoulou 2012), but the data collected in developing countries have not yet been taken advantage of for this potential use.

A final indicator of food security that can be measured using HCES data is the percent of expenditures on food, a measure of current economic vulnerability to food insecurity that captures the economic consequences of rising food prices and poverty. A related indicator, the share of food expenditure of the poor is now reported by FAQ for 80 countries (FAQ 2013).

2.3 Compiling food balance sheets

Food balance sheets (FBS) are an essential component of the measurement of a country's ability to feed itself via domestic production and international trade. They are also a fundamental building block of the international monitoring of global food security trends. HCES data play an ancillary role in FBS construction, by complementing other data sources for some particularly problematic items, and serving to perform consistency checks, especially on the utilization side of the food balance equation.

Food balance sheets (FBS) provide information about the total supply and use of food in a country (FAO 2001; Jacobs and Sumner 2002; Cafiero 2012a).[10] For each food item, they first give the total annual supply from various sources, including production, imports and draw-downs from stocks. They then break down the quantities allocated to various uses of the food that are not destined for human consumption, including exports, livestock feed, seed, industrial uses and losses during storage and transportation. The amount of food available for human consumption can then be estimated as the difference between the supply and these other uses. In turn, the data on food available for consumption can be used to estimate calorie, protein and micronutrient availability.

FBSs are currently compiled for 180 countries by FAO, with the underlying data mainly coming from government statistical services. They are widely used by governments, researchers, and international aid and donor agencies for monitoring trends in global and national food availability, food production, trade, supply and demand. They also help determine whether the food supply is adequate for meeting nutritional needs in a country and to track changes in dietary patterns, which are important for nutrition policy. As noted previously, the per-capita dietary energy supply data derived from FBS is used as input into the calculation of FAO's measure of undernourishment.

There are a number of problems with the completeness and accuracy of the basic data from which the FBS are constructed that data from HCES's can help rectify. In regard to food production, some food crops are continuously harvested over long periods of time (e.g., cassava and certain fruits and vegetables), incompletely harvested (e.g., cassava and plantains), or are quickly perishable, which hampers accurate measurement. Further, production statistics are mostly confined to commercialized major food crops. Non-commercial or subsistence production, including home production of food crops and food acquired from hunting, fishing and gathering by households for their own consumption is not usually included. However, these might be an appreciable portion of total production in some countries and, in the case of game, wild animals and insects, may contribute substantially to protein availability. In general, the availability and quality of official food production data has been on the decline since the early 1980s. As of 2005 only one in four African countries were reporting basic crop production data (World Bank 2010). Other areas of concern are import and export data due to unrecorded trade across national boundaries and in measurement of the utilization of food for non-food purposes (feed, seed and stocks, industrial uses and waste). Because of these issues, estimates of the amount of individual foods available for human consumption and of the total available, measured as per-capita dietary energy supply, can be subject to significant error (Naiken 2003).

While FBSs derive food availability as a residual (supply - utilization elements), HCESs estimate it directly and this direct measure can therefore help to resolve some of the measurement issues mentioned above. First, HCES consumption data can be used

10 The information in this section is taken from these three sources unless otherwise noted.

to help estimate the production of particularly problematic crops, at least among the main ones within a country. The surveys can also be used to approximate subsistence food production and some elements of the utilization side of the food balance sheets, for example stocks and waste[11]. Second, taking into account differences in concepts, definitions, methodology and coverage, broad consistency checks of the FBSs can be made by comparing consumption patterns with those derived from HCES data[12]. Doing so can help determine which foods are the source of any discrepancies (FAO, undated). Finally, HCES data can serve as an independent estimate of per-capita calorie availability that can be used for validation purposes as in Smith, Alderman and Aduayom (2006) and Smith and Subandoro (2005).

2.4 Informing food-based nutrition interventions

HCES food data have the potential to provide useful information for assessing the feasibility of food fortification and for estimating the coverage, impact and cost of fortifying various foods. The HCES data potential for such uses is to date largely untapped.

In recent years there has been increased interest among nutritionists in using the food data collected in HCES to inform nutrition interventions that aim to increase consumption of micronutrients in deficient populations. The type of interventions that this report focuses on are food fortification programs in which a government regulates the addition of micronutrients to commonly consumed foods.[13] Other examples of food-based nutrition interventions are bio-fortification, food supplementation, the establishment of horticultural and home garden projects, and nutrition education (Clark 1995). The goal of these programs is to improve the health and nutrition status of a population by providing a predictable, supplementary quantity of micronutrients in a widely-consumed food. The micronutrients of most interest are Vitamin A, iron, zinc and iodine (Fiedler et al. 2008). Because micronutrient deficiencies among children under five and their mothers make a significant contribution to mortality and disease burdens among these groups (Black et al. 2008), they are often targets of the interventions.

The historical lack of data on national food consumption patterns has been a major obstacle for planning, implementing and evaluating food fortification programs (Neufeld and Tolentino 2012). In the past, program planners relied by necessity on Food Balance Sheet data to obtain the needed information. However, being based on national averages, these do not contain the appropriate data for answering key distributional questions. What are regarded by some to be the "gold standard", 24-hour recall food consumption surveys, are prohibitively costly to implement on a national scale and rarely implemented at that level.[14] Thus planners are increasingly turning to HCES data for more precise evidence (Fiedler, Carletto and Dupriez 2012).

Two core pieces of information are needed to plan and implement a national food fortification program (Fiedler 2009). These are: 1) Which foods should be fortified?; and 2) With what amount of micronutrients should they be fortified? To answer these questions, in turn, analysts need to know:

The percent of households consuming foods that are potential fortification vehicles. This indicator of "coverage" is needed so that it can be determined which foods are most widely consumed. Commonly fortification vehicles are vegetable oil, wheat flour, sugar and salt.

The percent of households purchasing potentially fortifiable foods. A food can only be fortified if it is produced at a commercial facility and distributed via market channels. Thus food purchases (as opposed to food produced by households) are the acquisition mode of interest in food fortification programs.

The quantities consumed of potentially fortifiable foods by entire populations, for purchasers of the foods, and for target age and sex groups. This information is needed in order to both determine whether a food would be a good forti-

11 Household surveys would not provide a direct measure of waste; but a comparison of average food availability from FBS and average food consumption from survey would provide some indication of the possible amount of wasted food.

12 See forthcoming paper by Klaus Grunberger (FAO) on "Reconciling Food Balance Sheet and Household Surveys".

13 Food fortification is defined as "the addition of one or more essential nutrients to a food, whether or not it is normally contained in the food, for the purpose of preventing or correcting a demonstrated deficiency of one or more nutrients in the population or specific population groups" (FAO/WHO 1994).

14 Fiedler, Martin-Prével and Moursi (2012) estimate that the cost of conducting a 24-hour recall survey with a sample size of a typical HCES to be 75 times the cost of analyzing data from a pre-existing HCES. Note also that, as discussed in Coates et al. (2012b), for the purposes of producing information needed for decision making in food fortification programs neither of these two data sources can be considered a perfect gold standard, each having strengths and weaknesses depending on the specific purpose to which it is applied.

fication vehicle (is enough of it consumed to warrant its fortification?) and to set fortification levels. Age and sex disaggregation of the information is highly desirable because targeted groups (e.g., women and children) can consume different foods in different quantities from the general population.

The quantities of micronutrients consumed by entire populations, for purchasers of the potentially fortifiable foods, and by target age and sex groups. Planners need to know which micronutrients are insufficient in the population's diet, and by how much, so they can set fortification levels. Fortification levels are set with the goal of both maximizing the potential for reducing micronutrient deficiencies and protecting people from the risk of excess intake due to fortification. Thus the full distribution of micronutrient consumption across populations likely to purchase and consume potentially fortifiable foods is needed. Information on micronutrient consumption is desired by age and sex group because specific groups may have different micronutrient needs and degrees of insufficiency.

To date, HCES data have been used to investigate the feasibility of food fortification and to estimate the coverage, impact and cost of fortifying various foods in only a few countries, including India, Tanzania, Guatemala, Uganda (studies cited in Coates et al. 2012), and Zambia (Lividini, Fiedler and Bermudez 2012). The need for conducting such evidence-based analyses in additional countries with high prevalences of micronutrient deficiencies is great. The nutrition community is working to identify and find ways to address the shortcomings in HCES data related to informing food-based nutrition interventions so that this need can be met (Fiedler, Carletto and Dupriez 2012).

2.5 Calculating consumer price indices

Consumer price indices (CPIs) are a fundamental component of several national economic statistics and have important implications for the decision making of both public and private sector actors. HCES data mainly enter the CPI production process by providing the weights for the relevant food consumption baskets. For this purpose the HCES must provide a true and detailed description of household consumption, for the various populations of interest.

The uses and users of the consumer price indices are best described by the United Nations *Practical Guide to Producing CPI* (United Nations 2009, p.1): "Consumer price indices measure changes over time in the general level of prices of goods and services that households acquire, (use or pay for) for the purpose of consumption. In many countries they were originally introduced to provide a measure of the changes in the living costs faced by workers, so that wage increases could be related to the changing levels of prices. However, over the years, CPIs have widened their scope, and nowadays are widely used as a macroeconomic indicator of inflation, as a tool by governments and central banks for inflation targeting and for monitoring price stability, and as deflators in the national accounts. (…)

The method of construction (…) allows (or should allow) CPIs to be adapted for a wide range of specific uses. For example, they can be adapted to calculate specific inflation rates for social groups such as pensioner or low-income households. Their product coverage can be adapted so as to show what the rate of inflation is in particular sectors such as energy or food, or excluding particular sectors such as alcohol and tobacco. They can shed light on the effect of tax changes or government-regulated price changes on the rate of inflation. They can be compiled on a regional basis, showing different inflation rates within different parts of a country or between urban and rural areas."

Different methods can be used to calculate the CPI. The choice of a method depends very much on the intended use of the CPI. In practice, most CPIs are calculated as an approximation of a Laspeyres index, i.e. by calculating weighted averages of the percentage price changes for a specified "basket" of consumer products. Prices are collected regularly and frequently from shops or other retail outlets. The weights are derived from HCES, often complemented by other sources of data (in particular in countries where HCES data are significantly outdated). (United Nations 2009 and ILO/ IMF/ OECD/ UNECE/ Eurostat/ The World Bank 2004).

Food data obtained from HCES are thus critical for the compilation of the overall CPI and of more specialized series like the CPI for food which measures the changes in the retail prices of food items only. "Forecasting the CPI for food has become increasingly important due to the changing structure of food and agricultural economies and the important signals the forecasts provide to farmers, processors, wholesalers, consumers, and policymakers." (USDA 2012)

2.6 Informing national accounts statistics

The relevance of HCES food data for national accounts varies greatly with the methods used in producing the accounts: the production, expenditure, or income approach. The latter is not commonly used in developing countries. For the expenditure approach, the use of HCES food data is critical although this expenditure component of the national accounts is often obtained as a residual..

In all countries, statistical agencies or central banks compile national accounts by recording economic flows and stocks to measure and monitor their economic activity. National accounts are the source for many economic indicators essential for macroeconomic analysis and for the formulation and monitoring of economic policies. Most countries compile their national accounts according to the System of National Accounts (SNA), the internationally agreed standard set of recommendations (the latest version being the 2008 SNA). (EC/ OECD/IMF/UN/WB 2008).

The annual gross domestic product (GDP), a measure of the market value of final goods and services produced within the country in a year, is the most frequently used measure for the overall size of an economy. Derived indicators such as GDP per capita – for example, in local currency or adjusted for differences in price levels – are widely used for a comparison of living standards. (Eurostat website).

National accounts can be compiled alternatively – and in principle equivalently- using three different approaches: the production (or value added) approach, the income approach, and the expenditure approach. Theoretically, the three methods give the same results. Practically, estimates obtained from each method would differ and would thus need to be "reconciled", as each one of them would make use of different, incomplete and imperfect data.

The production approach is the most commonly used in developing countries. Also known as the value added method, it consists of calculating the total value of the outputs of every class of enterprise during one year.

The expenditure method works on the principle that all of that is produced must also be bought, so that the value of total product must be equal to total expenditures. The GDP is obtained as the sum of private consumption expenditure of goods and services, investment, government spending, and net exports of goods and services. Private (household) consumption is typically the largest component of the GDP.

The expenditure approach is generally not developed as an independent series. It complements the production approach, and often makes use of one of the expenditure items to reconcile the estimates, i.e. to "close" the gap between the production estimates and the sum of the other expenditure categories. In such cases, household consumption is often used as this "residual" component. All estimation errors and data gaps become part of the household consumption estimate, which therefore has no meaning as an independent indicator series.

The income approach works on the principle that the incomes of the productive factors ("producers," for short) must be equal to the value of their product, and determines GDP by finding the sum of all producers' incomes. This includes wages and other labor income, corporate profits, investment income, and income from and non-farm enterprises. This approach is not used in developing countries, both because of lack of reliable data, and because much of the income in developing countries is entrepreneurial and can only be divided between capital and labor in an arbitrary way.

To reconcile GDP estimates obtained from these different methods, statisticians often use supply-and-use tables (SUTs). SUTs provide a balancing framework. "The supply table describes the supply of goods and services, which are either produced in the domestic industry or imported. The use table shows where and how goods and services are used in the economy. They can be used either in intermediate consumption — meaning in the production of something else — or in final use, which in turn is divided into consumption, gross capital formation and export. (Eurostat website)

The use of HCES food data for national accounts varies greatly with the three methods. For the production approach while survey information on production for own consumption/subsistence agriculture is critical, there is virtually no use for food expenditure data. The only relevant exception is the use of HCES data for the CPI/National Accounts deflators required to compile estimates of GDP in constant prices. This applies to the three approaches and is discussed in a separate section.

For the expenditure approach, the use of HCES food data is critical if this expenditure component is not treated as a residual. However, HCES data lack coverage of persons living permanently in institutional

households, such as retirement homes or religious institutions, and therefore needed to be complemented by other sources to account for the total of the household sector's consumption.

How much use will be made during a particular year of different sources of data, including HCES data, will depend on how extensively the accounts are updated. Countries do not implement major updates every year. When a major upgrade is undertaken, e.g. when the base year for the accounts is updated, and when a Supply and Use Table is to be prepared, large volumes of detailed information are required. If only the "standard" accounts are prepared, the compilation requires much less information and this information can also be at a much more aggregated level.

2.7 Meeting private sector information needs

HCES are an important – although still largely unexploited – source of data for developing a better knowledge base on food consumption levels and patterns and their change over-time. Detailed data on food consumption provide a valuable input to project the volume and the composition of the demand for food commodities

The private sector in low and middle-income countries have not traditionally been users of HCES data. When HCES are designed, the private sector is rarely mentioned as a stakeholder and is not consulted. This is however slowly changing. The majority of the world's population lives in developing countries. Empirical measures – based largely on HCES - of "their behavior as consumers and their aggregate purchasing power suggest significant opportunities for market-based approaches to better meet their needs, increase their productivity and incomes, and empower their entry into the formal economy." (Hammond et al. 2007) Globalization, growing population, urbanization, and the emergence of a middle class in developing countries are having a significant impact on household consumption levels and patterns, and therefore on national and global food markets. The fast rising middle class in transition countries is also expected to result in significant changes in the volume and patterns of consumption. As their disposable income increase, households tend not only to spend proportionally less on food, but also to adopt new consumption habits, in particular by exacerbating the demand for energy-intensive food categories (Dobermann and Nelson, 2013) According to some projections, "At least 70 million new consumers are expected to enter the global middle class each year, (…) mainly due to the growth in large emerging markets such as China. As incomes rise, people typically shift from grain-based diets to diets dominated by "high-value" foods such as meat, fish, dairy products, fruits and vegetables." (Deloitte 2011, and WEF and Deloitte 2009).

Monitoring and projecting the volume and the composition of the demand for (and supply of) food commodities is of obvious interest for large national and multinational corporations. Detailed information on food markets is also potentially highly relevant for smaller, local businesses. Indeed, feeding a growing and changing population requires new business models for smallholder farming. New forms of small-medium enterprises at all levels of the value chain, from food production to processing and marketing, will emerge. (Dobermann and Nelson, 2013)

Many studies have produced projections of global food demand. But they are usually based on large commodity groupings. More granularity is needed to properly characterize the future demand. "In addition, important assumptions such as feed conversion, feed efficiency, technology, etc. are often not explicitly identified in the presentation of the results. These studies often do not explicitly discuss dietary change and income growth in the context of cultural and ethnic issues which shape this change." (Kruse 2010)

HCES is still an under-exploited source of information to improve the knowledge base on levels and changes in food consumption.

2.8 Summary

As seen in this chapter, the food data collected in HCES have a broad set of current and potential uses and users, some with unique and some with overlapping information needs. Many important aspects of international development decision making are currently based on HCES data, ranging from tracking MDG Goal Number 1 to implementing mass food fortification programs. Given reliably collected data in HCES and availability of the appropriate information, the food data have the potential to be used by an expanded set of users, which can greatly improve the evidence base for development decision making.

3. Assessment of the reliability of the food data

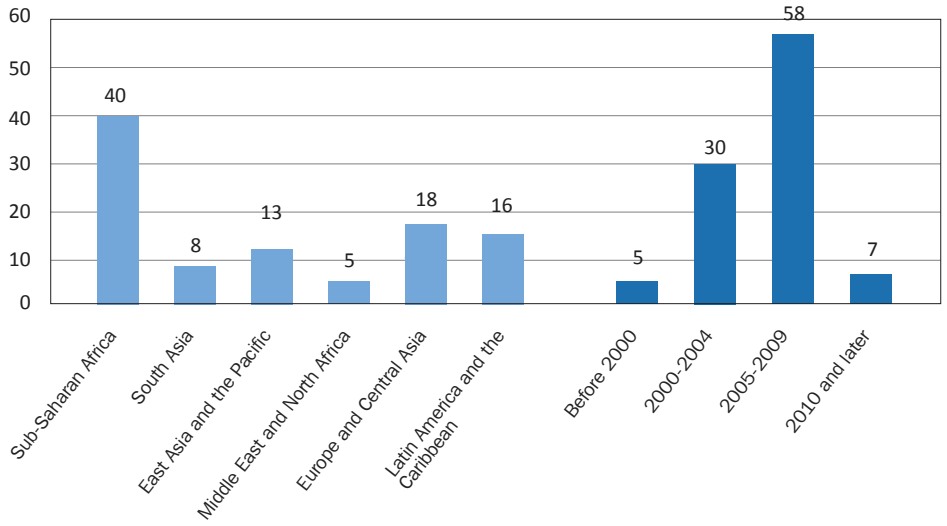
The design of HCES surveys needs to meet certain criteria for the data to provide the reliability required by the data user. Meeting these minimum criteria, and thus ensuring that the data collected are reasonably accurate, is a concern of all users of the food data in HCES's, from national accounts statisticians to planners of nutrition interventions.

In this chapter, the basic reliability of the food data collected in current national HCES's is assessed. "Reliability" is defined here as the degree to which a survey collects data on the actual or "true" food consumption and/or expenditures of households in a country's population.

The assessment is based on the most recent HCES from each developing country for which sufficient documentation with which to conduct the assessment was available to us. Only nationally representative surveys are included in the assessment. The final set of 100 surveys thus represents a sample of recent, sufficiently-documented, nationally-representative surveys conducted in developing countries. Appendixes 1 and 2 contain respectively a detailed account of the implementation of the assessment and a list of the surveys.

Figure 1 reports the regional breakdown and years of data collection of the surveys. The highest number (40) is from Sub-Saharan Africa, and the lowest (5) from the Middle East and North Africa region (MENA). Overall, 70 percent of the developing countries are represented, with South Asia having the highest representation—all eight of its countries—and MENA the lowest.[15] The earliest year of data collection for a survey is 1993 (Guinea-Bissau), and the latest is 2012 (Vanuatu). The majority of the surveys were administered between 2005 and 2009.

Figure 1: Regional and time distribution of the assessment surveys



An attempt was made to identify clear, quantitative cut offs for defining assessment criteria in order to avoid ambiguity and maintain objectivity. While these cut-offs are in many cases by necessity based on intuitive judgments rather than scientific evidence, they are intended to serve as a point of reference for prioritizing areas in need of improvement and for tracking reliability and relevance across countries and over time. In future studies it will be useful to conduct sensitivity analyses to determine the robustness of the cut-offs with respect to accurate measurement of indicators of interest.

15 Sub-Saharan Africa is represented by 85% of its countries, East Asia and the Pacific by 54%, Middle East and North Africa by 39%, Europe and Central Asia by 78%, and Latin America and the Caribbean by 55%. World Bank country and lending groups are used for regional classifications (World Bank 2012).

The assessment is based on seven areas of investigation:

- Recall period for at-home food data collection;
- Modes of food acquisition included (food purchases, food consumed from own production, and food received in kind);
- Completeness of enumeration of either food acquisition or food consumption;
- Comprehensiveness of the at-home food list;
- Specificity of the at-home food list;
- Quality of data collected on food consumed away from home;
- Whether seasonality in food consumption patterns is taken into account; and

For each area, a set of minimum criteria for basic reliability is established and then tested using the data collected on the country assessment forms. Meeting these criteria, and thus ensuring that the data collected are reasonably accurate, is a concern of all users of the food data in HCES's, from national accounts statisticians to planners of nutrition interventions. It should be emphasized that the criteria set here are *minimum* criteria, and even when met, many leave ample room for improvement.

The following methodological issues are also discussed in the chapter:

- Whether metric (or other standard) quantities of foods consumed are provided.
- Calculation of calorie consumption;
- Calculation of edible portions and the nutrient content of foods;
- Calculation of per-capita indicators and nutrient insufficiencies and the importance of collecting data on the number of food partakers; and
- Use of acquisition data to measure consumption.

3.1 Recall period for at-home food data collection

A wide variety of recall periods are used in national surveys, ranging from 1 to 365 days. The pros and cons of each are discussed, and a minimum standard of two weeks or less proposed for HCES data to be considered reliable. Using this benchmark, for 70 percent of the assessment surveys the data collected can be considered reliable with respect to the recall period.

The recall period for food data collection is the amount of time over which respondents are asked to remember their food acquisitions and/or consumption.[16] The longer the recall period, the more difficult it is for respondents to make accurate reports. A recall period that is too long leads to "recall error" in which true acquisition or consumption is under reported. On the other hand, the shorter the recall period the more likely a respondent is to include events that occurred before the recall period. Such "telescoping error" leads to over-reporting.[17] The relatively high frequency and small size of food (versus non-food) acquisitions/consumption means that recall error and thus under-reporting is believed to be more of an issue than telescoping error (Deaton and Grosh 2000).

There is no obvious or commonly agreed-upon number of days that a recall period should be for reliable measurement. A recall period of no more than two weeks, however, is within minimally safe limits, as confirmed by studies showing considerably lower expenditure estimates when 30 days (or one month), which is the next highest recall period in use, is employed.[18] In this assessment, two-weeks will therefore be considered the longest recall period to obtain reliable data. A one-week period may have an advantage over two weeks in that it is easier for respondents to remember what happened since the same day last week (for example, Monday). The day of the week can help set up a specific "memory post" at the beginning of the recall period in respondents' minds, bounding the period.[19] The exact point in time two weeks prior to the day a survey is administered is likely to be more fuzzy, although a preliminary visit two weeks before the interview can help.

Among the 100 surveys included in the assessment, 33 percent employed multiple recall periods. The peri-

16 The survey's recall period should be distinguished from its "reference period". The latter is the total amount of time for which respondents are asked to report their food acquisitions or consumption. The only circumstance under which the recall and reference periods differ is when households are interviewed more than one time in consecutive visits. For example, households may be visited four times to ask about their food acquisitions in the last seven days, giving a recall period of seven days and a reference period of 28 days.

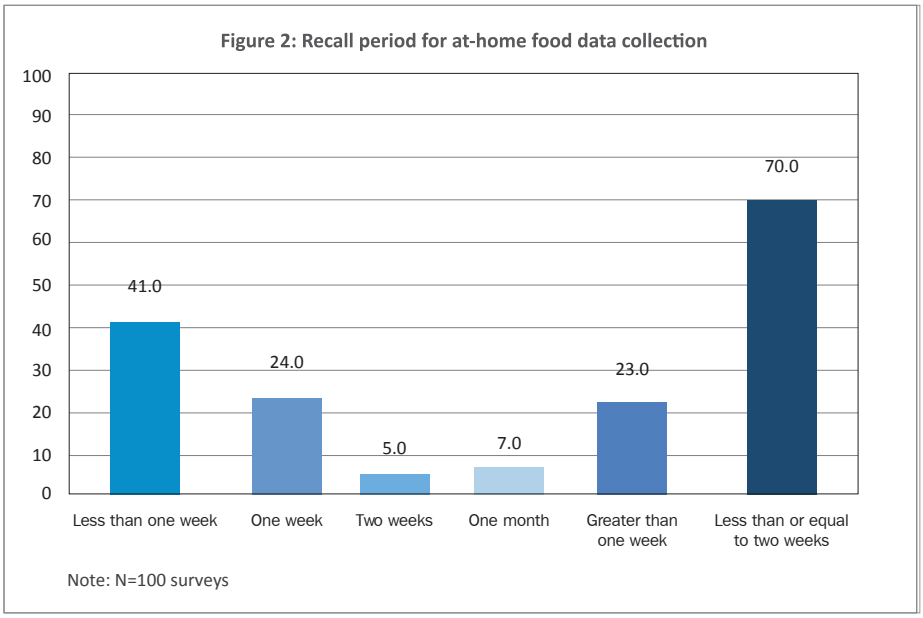
17 Beegle et al. (2012) provide a review of the literature on the influence of the recall period on expenditure estimates as well as recent evidence from an experiment undertaken in Tanzania.

18 For a commonly-cited example, see the description of an experiment undertaken using India's HCES in Gibson (2005).

19 A visit a week before the interview (as has been implemented in many Living Standards Measurement Study surveys) in which preliminary data are collected, helps to set this memory post.

od can vary by population (e.g., different for urban and rural areas), by source of acquisition (e.g., purchases versus home produced food), and/or by type of food. In these cases, for the purposes of judging reliability the *maximum* recall period employed is considered. For example, if the recall period for food purchases is seven days but for home-produced food consumed it is one month, then one month is used. In a few cases multiple recall periods were employed for all foods for which data are collected, a design implemented for research purposes. For these surveys, reliability is assessed using the *minimum* recall period. For example, if data were collected using both a seven-day and one-month recall period for all foods then seven days is used for this assessment. The recall period is considered to be one day for diary surveys.[20]

Figure 2 reports on the percent of assessment surveys employing various recall periods. The most common is less than one week, utilized by 41 percent of countries. Among these surveys, the most common recall period is one-day, because the large majority use the diary method. Nearly one-quarter of the countries used recall periods of one-week, five percent used two weeks, [21] and seven percent used one month.



A full 30 percent of the assessment surveys employed recall periods greater than two weeks.[22] One-third of the surveys that did not meet the minimum reliability criterion employed a 365-day recall period in the context of the "usual month" approach. Here respondents are asked to recall their food acquisitions and/or consumption for a typical month in the last year.[23] While this method has the intended advantage of obtaining estimates of usual consumption specific to each household rather than only for population groups, the length of the period over which respondents are asked to recall is unreasonably long for accurate estimation.[24]

Overall, the percent of the assessment surveys for which the data collected can be considered reliable with respect to the recall period used is 70. It should be kept in mind that all of the diary surveys, having a one-day recall period, meet the criterion.

Traditionally HCES were designed to collect data on food acquired for consumption rather than food consumed itself, thus the titles "Household Expenditure Survey" or "Household Budget Survey" (United Nations 1989). Today, more than half collect data on food consumed, whether in conjunction with food acquired or alone (see Section 3.3). Collecting food consumption data through HCES survey instruments poses new issues for reliability with respect to the recall period for data collection because of the additional cognitive bur-

20 In some cases the diaries of households without a literate member are completed by interviewers for time periods greater than one day. While as part of this assessment an attempt was made to collect information on how long this period was and for what percent of households, in most cases the information was not available in the survey documentation.

21 Some of the "two-week" recall surveys actually had 15-day periods, presumably to represent half a month.

22 Four of these surveys had an undefined recall period which could potentially extend beyond two weeks, because respondents were either asked to report on the expenditures/quantities the "last time" a food was acquired or to simply report on how often a food was acquired, with options being daily, weekly, monthly or yearly and the usual expenditure/quantity each time.

23 Two of the assessment countries employed a "usual week" approach, one with a recall period of six months and another with a recall period of one year.

24 For recent evidence, Beegle et al. (2011) find that usual month food expenditure estimates for a sample of households in Tanzania are considerably lower than those from a 7-day recall. The authors point out that this difference is partially due to the more difficult cognitive burden required for reporting usual month information.

den of remembering the behaviors of more people (in fact, all household members since, hopefully, all household members eat, versus only the food acquirers) and more events (eating occasions versus food acquisition occasions). Further, in the case of interview surveys, respondents must remember the wide mix of foods that can be combined into prepared dishes, the latter which are likely to be the focus of respondents' memory, rather than food-specific ingredients as they are acquired (Smith and Subandoro 2006). The nutritional science literature on the collection of food consumption data recommends a recall period of no more than 24 hours[25] yet, as seen in this section, the majority of surveys (near 60 percent) use a longer recall period. The reliability of the consumption data collected for these longer recall periods must be the subject of future research.

3.2 Modes of acquisition for which at-home food data are collected

For many users, it is important that information on the main possible modes of food acquisition (purchases, own production, in-kind receipts) be collected in HCES. Overall most surveys comply with this requirement, with the most problematic being in-kind receipt, which are not collected in 14 percent of the surveys reviewed for the assessment. In some cases surveys do not allow specifying multiple sources for each food item, which is a problem for some uses.

Inclusion of the following three sources from which food can be acquired for at-home consumption is crucial for reliable measurement of both food acquisition and consumption using HCES's:

(1) Market purchases;[26]
(2) Food consumed from households' own production; and
(3) Food received in-kind (wages received in kind, social transfers in kind, or gifts).

Obtaining food through market purchases is now widespread throughout the world and is the prominent form of food acquisition in many locations, especially urban areas. In many countries, a considerable share of households obtain some of their food from their own production, whether from crop fields, home gardens, or orchards. This category also includes wild food gathered and consumed, fish and seafood fished or gathered, and the consumption of the meat of domestic animals reared by households. It is also quite common for households, especially developing-country households, to obtain some of their food in kind, whether in the form of gifts from other households, payments from an employer, or public or private assistance. For the purposes of this assessment, the food data collected in a survey is considered to be unreliable if any of these three sources is excluded from data collection.

Figure 3 shows the percentage of assessment surveys for which data were collected for each source, as well as for all three sources.[27] All of the assessment surveys collected data on food purchases. Almost all surveys also collected data on food consumed from own production, with just four exceptions. The only source for which a noticeable percent of countries did not collect data (14 percent) is in-kind receipts of food. Overall, 85 percent of countries collected data on all three sources, leaving 15 percent not meeting the minimum reliability criteria in this area.

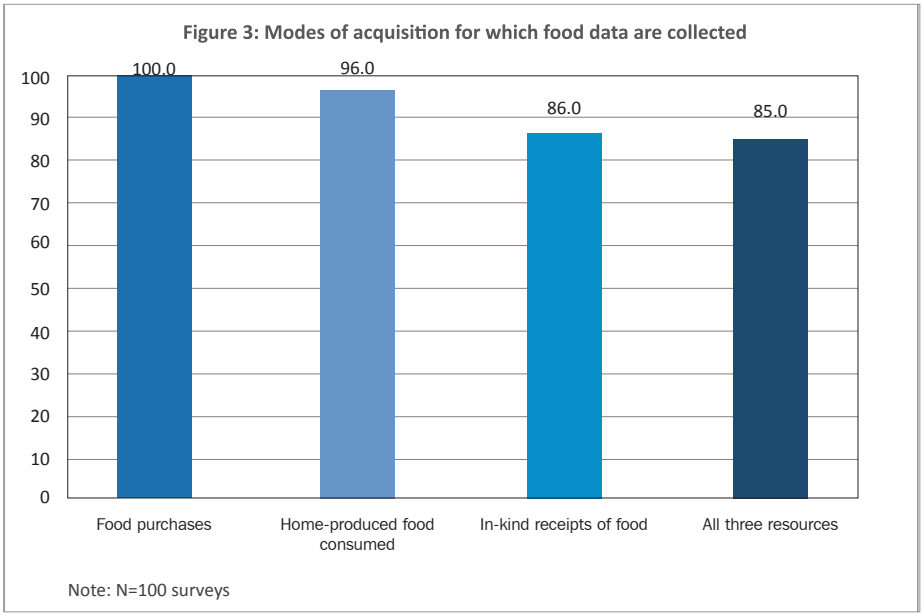
For some types of analysis, such as calculating CPIs, it is important that data be collected *individually* on the three food sources. The assessment found that for many surveys the data were collected in such a way that the quantities and/or expenditures on foods obtained from the three sources could not be distinguished. This was the case for 13 of the 84 surveys for which data were collected on *all* of the three sources. In some cases respondents were asked to report on consumption of home-produced food and in-kind receipts combined, with no distinction made between the two. In others, respondents were asked to specify only one single source for the food item acquired or consumed, with no allowance for acquisition from more than one source, thus effectively ruling out accurate enumeration by source. In still other surveys, respondents were asked to identify the source of acquisition but could choose a combined source, such as "both purchased and home produced", again ruling out individual enumeration. Finally, two

25 In their guide to measuring food consuming Swindale and Ohri-Vachaspati (2005) write that "Information on household food consumption should be collected using the previous 24-hour period as a reference (24-hour recall). Lengthening the recall period beyond this time often results in significant error due to faulty recall" (p. 4). Ferro-Luzzi (2003) concurs that "The 24-hour recall method relies on the subject's capacity to remember what they have eaten. As memory declines rapidly beyond one day, the recall method usually retrieves information only on the previous day's consumption" (p. 105).

26 Barter is sometimes included as a fourth source (e.g., United Nations 2009). However most surveys do not collect data on barter separately, instead considering it part of purchases.

27 The analysis for this section could be undertaken only for 98 of the assessment countries. For the remaining two it was not possible to determine whether the three sources were included in the data collection from the available documentation.

surveys gathered information on consumption by asking about consumption from purchases, home-produced food and food received in kind over the recall period (the usual sources), but also from "own stock," which includes all food acquired before the recall period. Therefore it is not possible to break down the consumption that came from the three sources separately.



Note that for surveys collecting data individually on in-kind food received, very few enumerated all of the various sources separately so as to obtain a full accounting. Data were collected specifically and individually on "gifts" for 62 percent of countries for which in-kind food received was enumerated individually, on in-kind payments from employers for 25 percent of countries, and on food assistance received for 21 percent. Four surveys from Latin America and the Caribbean collected data on food received from households' own businesses. For countries where any of these sources are important modes of acquisition, their exclusion could lead to substantial under-reporting.

3.3 Completeness of enumeration of foods acquired or consumed

It is important for the analyst to have clarity on whether surveys are collecting data on food acquisition, consumption, or both, and for the survey to collect data according to the stated goal. Only the food intended for consumption or consumed must be included and not additional food (e.g. by not mistaking agricultural produce harvested for consumption.) The assessment found 25 percent of the surveys to be problematic in some respect, all of them being interview surveys (diaries appear to be immune by problems in this domain).

As noted in the introduction, modern HCES's intend to collect data on either the foods acquired by households for consumption or directly on foods consumed. Among the assessment surveys, 41 percent collected data solely on food acquisition, 26 percent solely on food consumption, and the remaining 33 percent on both (see Table 1).[28] Food acquisition data were more likely to be collected as part of diary surveys than interview surveys, whether exclusively or in conjunction with food consumption data.

For the food data in HCES to be reliably collected, a full accounting of all acquired food intended for consumption or that was consumed over the recall period must take place. Additionally, *only* the food intended for consumption or consumed must be included and not additional food. The following exclusion and inclusion accounting errors can plague the collection of HCES food data:

(1) *Acquisition surveys: Rule-out leading question on consumption*. If a leading or "filter" question on *consumption* of each food item over the recall period is answered "no," it rules out collection of further data on the *acquisition* of the food. In this case, respondents are first asked whether or not they consumed each food item in the food list for a recall period up to a year before the time of the survey. Then they are asked how much was purchased, consumed from own production, and/or received in kind over the survey recall period for food data collection. If the respondent answers "no" to the leading question, however, and the leading question recall period is the same (or close to) the recall period

28 The surveys for which acquisition (consumption) data were collected for both food purchases and in-kind receipts were classified as acquisition (consumption) surveys. Those for which both acquisition and consumption data were collected for either food purchases or in-kind receipts, or for which consumption data were collected for purchases and acquisition data for in-kind receipts and vice versa, were classified into the "both" category.

Table 1: Completeness of enumeration of food acquisition and/or food consumption			
	Interview	Diary	All
	(percent)		
Whether acquisition or consumption data are collected			
Acquisition	36.1	48.7	41.0
Consumption	36.1	10.3	26.0
Both	27.9	41.0	33.0
Problems of incomplete enumeration			
Rule-out leading question on consumption	13.1	0.0	8.0
Rule-out, short-recall-period leading question on acquisition	3.3	0.0	2.0
Rule-out leading question on food purchases	1.6	0.0	1.0
Own production question refers to food harvested rather than consumed	3.3	0.0	2.0
Ambiguity whether to report on acquisition or consumption	6.6	5.1	6.0
"Usual month" surveys: Ambiguity whether to report consumption in any month or months with positive consumption	13.1	0.0	8.0
Percent of surveys with problems of incomplete enumeration	37.7	5.1	25.0

Note: N= 100 surveys.

for food data collection, her or his household receives a zero for acquisitions of the food item regardless of whether or not it was acquired. This leads to systematic underestimation of the quantities and/or expenditures on food acquired. A rule-out leading question on consumption is considered to be a problem when the two recall periods are less than or equal to two months apart. Note that this issue does not afflict diary surveys because there is no pre-listing of foods to rule out.

(2) *Acquisition surveys: Rule-out, short-recall-period leading question on acquisition*. Here, if answered "no", a short-recall-period leading question on acquisition of each food item rules out collection of further data collection on the acquisition of the food over the (longer) survey recall period. In this case respondents are first asked whether or not they acquired each food item over the short recall period (e.g., two weeks). Further information is collected on the acquisitions of the food for the longer recall period for food data collection *only* for those food items that were acquired over the shorter recall period. This leads to underestimation of mean food acquisition for the population.

(3) *Acquisition surveys: Rule-out leading question on food purchases*. In this case if a respondent reports that the household did not purchase any of one food item, then no further information is collected on that food item. Since home-produced or in-kind receipts of the food are left out, this problem also leads to underestimation of mean food acquisition for the population.

(4) *Data collected on food harvested rather than food consumed from home production.* When this error occurs, the quantities and/or expenditures on food acquired include those entering into the households' production stocks – not the household pantry for immediate consumption – and are systematic overestimates of food consumed from home production.

(5) *Ambiguity about whether to report on acquisition or consumption*. The question asked of respondents does not make it clear whether they are expected to report on their acquisitions of each food item or consumption of each food item over the recall period. This problem could pertain to food purchases, food received in-kind or both (but not home produced food consumed) and leads to inaccuracies in calculation of the mean acquisition or consumption for the population as well as measures of inequality.

(6) *Routine month surveys: Ambiguity about whether respondents should report on the routine month in the recall period or only those months in which any food item is consumed*. In many routine month surveys respondents are first asked to report on the number of months in the last year in which each food item was consumed. Immediately following, they are asked about the usual or average amount per month. Some questionnaires, however, fail to specify whether or not the average should be for those months in which it was consumed or for any month in the last year. When this type of accounting error occurs, some households may report on the former and some the latter leading to over- or under- estimation of their consumption of any

food item for which a positive number of months was reported for the initial question.

As can be seen in Table 1, 11 percent of the assessment surveys suffer from the use of the three types of rule-out leading questions. The collection of data on food harvested rather than food consumed from home production is a relatively rare problem from which only two percent of the surveys suffer. A full 14 percent of the surveys had problems of ambiguity in what is to be reported, which likely leads to incomplete enumeration for some households. The problem of ambiguity in expected reporting for routine month surveys was identified in eight percent of the surveys. Overall, 25 percent of the surveys did not meet the reliability criterion for completeness of enumeration, that is, they were afflicted by some of the identified problems of incomplete enumeration. Note that the large majority of the surveys that have these types of accounting problems are interview surveys.

3.4 Comprehensiveness of the at-home food list

As diets evolve, sometimes, quite rapidly, it is important for survey designers to keep up with the changes by updating the food lists. Benchmarks for reliability in this domain refer to the presence of foods from all the main food groups, an adequate representation of processed foods, and the fact that the list should not include non-food items. Overall, 72 percent of the assessment surveys met the criteria set in these three domains.

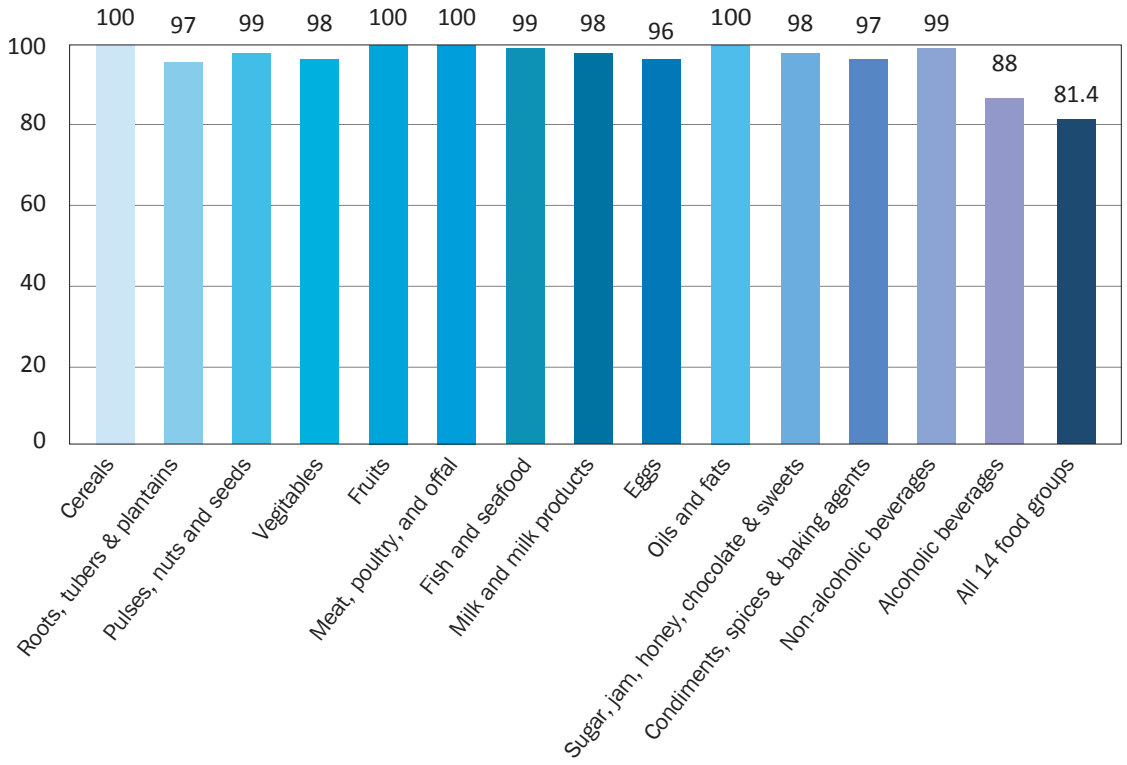
Equally important for reliable collection of food data in HCES's is that data are collected on all of the types of foods and beverages that make up the modern human diet. This is especially so given that urbanization, globalization and trade openness are leading to consumption of a wider variety of foods than in the past when populations tended to rely on foods that could be grown locally. These processes are also leading to greater consumption of processed foods (Popkin, Adair and Ng 2012), defined as "Any food other than a raw agricultural commodity and includes any raw agricultural commodity that has been subject to processing, such as canning, cooking, freezing, dehydration, or milling" (USDA 1946). Because the food modules of developing-country household expenditure surveys were originally set up to collect data on the acquisition of individual foods destined for in-home preparation (Smith 2012), this poses a challenge to countries employing the interview method of data collection to continually update their food lists.

To judge the comprehensiveness of survey food lists a set of 14 "basic" food groups that represent the types of foods making up the contemporary human diet can be used as starting point. The Basic Food Groups (BFGs) are listed in Table 2. Common food items in each group are listed in Appendix 3. Each survey's food list is used to catalogue the number of food items in these groups. For interview surveys, the list is printed directly on the questionnaire. For diary surveys, the actual number of food items recorded by all sample respondents can run into the thousands, far too high for most types of data analyses. In the process of data analysis the detailed recorded items are thus categorized into broader items for inclusion in the actual data set. The food list used for this assessment is this broader list of items, or the "analytical" food list, with the rationale that it is what is eventually used for analysis. Even with this shorter food list, the mean number of food items represented in the diary surveys, at 369, is far higher that of the interview surveys, which is 102 (see Table 2),[29] reflecting that fact that the diary method makes it possible to itemize food items much more specifically. Note that the number of food items varies greatly across the assessment surveys, ranging from a low of 19 to a high of 5,407.

Figure 4 shows the percent of assessment surveys that include foods in each BFG. At 12 percent, alcoholic beverages are a group that is left out of a significant number of surveys. While alcohol is a sensitive issue in some countries with large Muslim populations, its exclusion is not limited to surveys from these countries. Also notable is that the food group "Eggs" is not represented in four percent of surveys.

29 The number of food items for the Brazil survey (a diary survey), at 5,407, is far higher than the country with the next lowest number, which is 677. When Brazil is excluded from the calculation, the mean number of food items overall falls to 150 and for the diary surveys to 229.

Figure 4: Comprehensiveness of the at-home food list: Food groups represented



Note: N=96 surveys

Three criteria are combined to judge the comprehensiveness of survey food lists. The first is that all 14 BFGs must be represented by at least one food item. As can be seen in Table 2, just over 80 percent of the assessment surveys meet this criterion. The percentage rises to near 100 among the diary surveys.

off is imposed: At least 40 percent of food items must be processed as a reliability criterion, which allows for some processed items to be included in the other food groups (e.g., bread and other baked goods in the cereals group). The large majority of the surveys, 87 percent, meet this criterion, indicating that many countries have been updating their HCES food lists over time.

Table 2: Comprehensiveness and specificity of the at-home food list

	Interview surveys	Diary surveys	All
Mean number of food items	102	369	204
Minimum	19	44	19
Maximum	411	5407	5407
Comprehensiveness of the food list		(Percent of surveys)	
All 14 Basic Food Groups are represented	71.7	97.3	81.4
At least 40% of food items are processed	86.7	86.5	86.6
Food items are all food-exclusive	96.7	97.3	96.9
Specificity of the food list			
(A) Minimum number of food items in each Basic Food Group a/			
Cereals (5)	95.0	100.0	96.9
Roots, tubers and plantains (5) b/	46.7	56.8	50.5
Pulses, nuts and seeds (5)	51.7	70.3	58.8
Vegetables (10)	63.3	91.9	74.2
Fruits (10)	51.7	86.5	64.9
Meat, poultry, and offal (5)	80.0	97.3	86.6
Fish and seafood (5)	35.0	89.2	55.7
Milk and milk products (5)	61.7	94.6	74.2
Eggs (1)	93.3	100.0	95.9
Oils and fats (5)	46.7	89.2	62.9
Sugar, jam, honey, chocolate and sweets (5)	50.0	91.9	66.0
Condiments, spices and baking agents (10) c/	28.3	70.3	44.3
Non-alcoholic beverages (5)	65.0	97.3	77.3
Alcoholic beverages (5)	35.0	78.4	51.5
(B) Minimum number of food items in at least ….			
10 food groups	46.7	89.2	62.9
11 food groups	28.3	86.5	50.5
12 food groups	20.0	70.3	39.2
13 food groups	10.0	54.1	26.8
14 (all) food groups	6.7	37.8	18.6
(C) Less than 5% of food items span the basic food groups	**71.7**	**86.1**	**77.1**

a/ The minimum number of food items for each group is given in parentheses.
b/ Includes potatoes.
c/ Includes vegetable-based stimulants (e.g., cola nuts).
Notes: N=100 for the information presented on the number of food items; N=96 for that presented on comprehensiveness and specificity.

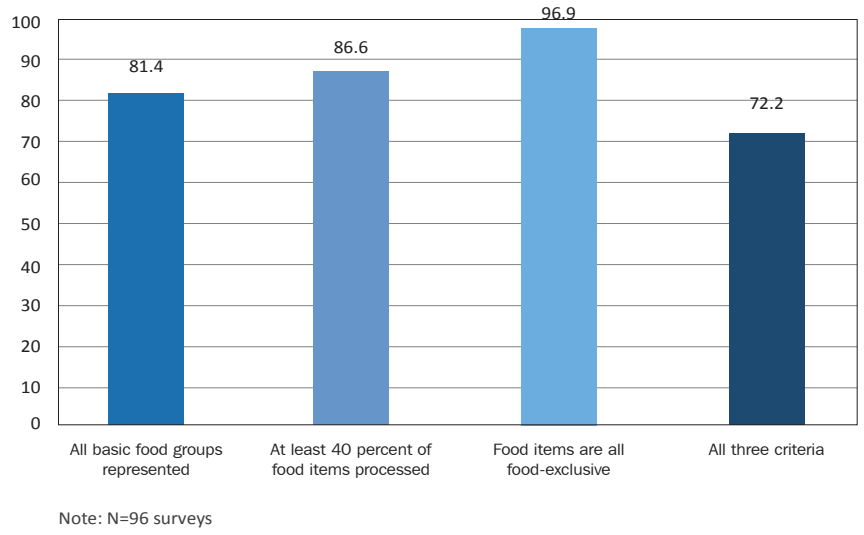
The second reliability criterion relates to the percentage of foods that are processed, including prepared dishes. Five of the food groups listed in Table 2 contain only or almost all processed food items: Milk and milk products, oils and fats, sugar, jam, honey, chocolate and sweets, condiments, spices and baking agents, and both beverage groups. On average, these foods alone make up roughly 30 percent of the total foods. A cut-

The final food list comprehensiveness reliability criterion assessed here is the "food exclusivity" of the list, that is, the food list must include only foods and no other commodities. Among the assessment countries, there are only three for which this criterion is not met (with the non-exclusive item being "alcohol and tobac-

co" in two cases and "tobacco and kola nuts"[30] in one), leaving 97 percent of surveys meeting the criterion.

Figure 5 summarizes the percentage of countries meeting the three assessment criteria of comprehensiveness, and the percentage meeting them all. Overall, 72 percent of the assessment surveys met all three criteria.

Figure 5: Percent of surveys meeting the food list comprehensiveness criteria



Note: N=96 surveys

3.5 Specificity of the at-home food list

There are two main aspects to food list specificity: the list needs to include a reasonable number of individual items for each of the main food groups, and non-processed food items should ideally follow into just one group.

Specificity of the food list refers to the degree of detail with which food items are classified. For an interview survey, in which foods are pre-listed, the goal is to include a sufficient number of food items to jog respondents' memories of what has been acquired and/or consumed that is applicable to *all* households in a population. This population must include countries' better-off urban households whose members tend to eat a very wide variety of foods in a variety of forms, including raw, processed, prepared and packaged. There is an accuracy trade-off involved, however, because very long food lists can quickly lead to respondent and interviewer fatigue (Beegle et al. 2012). One way that surveys can bridge this tradeoff is to list the most common food items consumed by the population and then include an "other" category where the acquisition/consumption of additional food items can be recorded. When they are present, these "other" food categories are included in the food list counts for this assessment.

To judge the specificity of surveys' food lists, a first step is identifying a minimum number of food items that should be included in each of the 14 BFGs. While these numbers are somewhat arbitrary, they were chosen based on the authors' judgment of the typical variety found within each (see Table 2, where the minimum numbers are in parentheses). It ranges from one for "Eggs" to ten for "Vegetables", "Fruits", and "Condiments, spices and baking agents". The table reports the percentage of assessment surveys meeting these minimums. Almost all surveys meet the minimum for the "Cereals" food group. Food groups where the minimum is met by notably low percentages of surveys are "Roots, tubers and plantains", "Fish and seafood", "Condiments, spices and baking agents", and "Alcoholic beverages". The food group "Condiments, spices and baking agents" is likely underrepresented because it is made up of more modern processed food items. Given the increased importance of these items in people's diets (e.g., Popkin 2002) and budgets, however, especially in urban areas, it is important that they be included in food lists in their appropriate relative variety. This point is underlined by the fact that they have a much higher representation in diary than interview surveys.

There are some countries in which specific food groups are more likely to be underrepresented simply because the foods are not consumed widely among their populations. For example, "Roots, tubers and plantains" are not consumed in some countries because they cannot be grown there and are not easily imported. Very few distinct items in the "Fish and seafood" category may be appropriate for land-locked countries. Because of these inherent country-specific variations, the first assessment criteria used for judging food specificity is that the required minimum number of food items be met for at least 10 of the 14 food groups. Sixty-three percent of countries meet this criterion (see Panel B of Table 2).

30 Kola nuts are a vegetable-based stimulant.

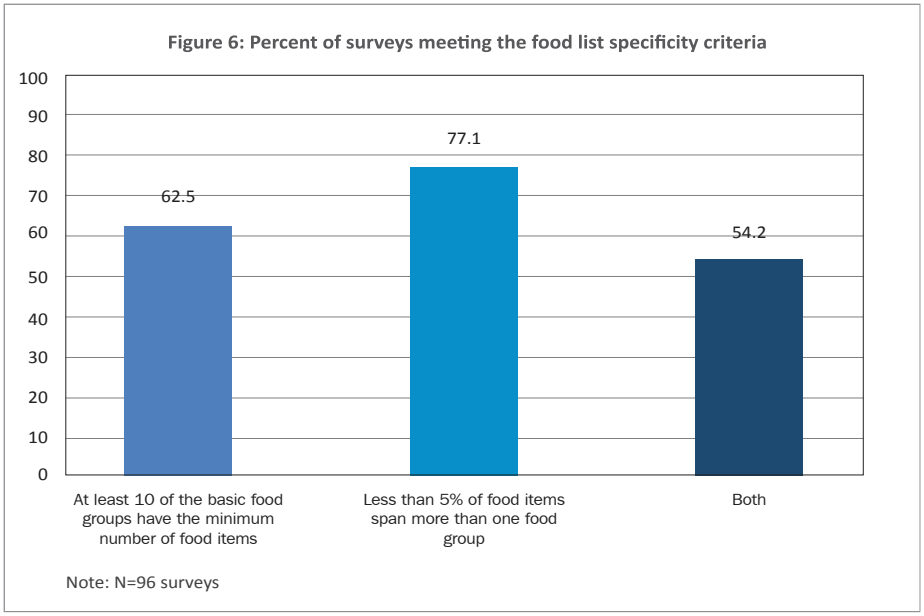
The second and last criterion used to judge the specificity of HCES food lists relates to food items that span more than one of the basic food groups. Most prepared dishes will span these food groups because they have multiple ingredients, and this is not considered a problem. Indeed, specificity is increased when these types of food items are listed in detail. A large number of food items (other than prepared dishes) spanning food groups is an indication that a food list is not specific enough for accurate enumeration of food consumption/acquisition, however. In the case of diary surveys, it could be both a reflection of a lack of instructions to diary keepers to be specific about their food consumption/acquisition and/or of how food items recorded have been aggregated for analysis. The second specificity criterion is that less than five percent of the food items (apart from prepared dishes) span more than one BFG. When this condition is met, the large majority of food items, 95 percent or more, fall into one and only one food group.

Note that 93 percent of the assessment surveys had a least one food item (not including prepared dishes) that spans more than one of the BFGs. Among those with any, the average percent of such items in the food list ranges from 0.45 to 26 percent. Some span just two food groups. Examples of these are:

- "Beverages" (spanning the Non-alcoholic beverages and Alcoholic beverages groups);
- "Butter, margarine and cheese" (spanning the Milk and milk products and Oils and fats groups)
- "Other milk, cheese and eggs" (spanning the Milk and milk products and Eggs groups)
- "Other meats, poultry, seafood" (Spanning the Meat, poultry and offal and Fish and Seafood groups); and
- "Canned fruits or vegetables" (Spanning the Fruits and Vegetables groups).

Others could span a large number of food groups. These include residual "catch-all" categories such as "All other foods", "Other food products", "Miscellaneous other food," designed to catch any food expenditures that haven't already been covered by another food group. They also include broad categories that don't allow identification of which type of food is being referred to, such as "Snacks", "Canned foods", "Baby food", "Soups", and "Sauces" that may be difficult for interview respondents to easily recall.

Figure 6 shows that only 54 percent of surveys meet both food list specificity criteria, indicating that there is great room for improvement in this area.



3.6 Quality of data collected on food consumed away from home

Food Consumed Away from Home constitutes a large and increasing percentage of food expenditure in countries thorough the developing regions. It also makes for one of the trickiest items to capture in household surveys. While 90 percent of the surveys assessed did try and capture this item, only 42 percent do so by meeting the minimum reliability criteria.

The rapid urbanization and globalization that began in the last decades of the 20th century have brought with them "nutrition transition" across the globe. Such a transition is marked by changes from traditional diets towards those higher in fat, sugar, caloric beverages in place of water and, as noted above, processed foods. Another important change that has typically occurs during the nutrition transition is a rise in the consumption of food outside of the home (Maxwell and Slater 2003; FAO 2006; Popkin 2008; WHO 2002). Urbanization

drives this trend by bringing together increasingly large concentrations of people in one location, making commercial eating establishments profitable. Globalization drives it by bringing with it new imported foods and advertising messages that urge people to eat them. A number of other factors support the trend towards out-of-home food consumption, including: increased incomes, which make eating more expensive, prepared foods affordable; new sources of transportation, which increase the ease with which people can travel or commute farther away from their homes; increases in the *supply* of prepared foods in commercial establishments such as restaurants and street stalls as the demand for prepared foods increases; and the fact that as people, especially women, begin to take on paid jobs, the time for shopping and preparing foods is more limited, making it more cost-effective to purchase cooked foods (Pingali and Kwaja 2004).

There have been precipitous increases in the consumption of food outside of people's homes over the last decades in both developing and developed countries (Schmidhuber and Shetty 2005; Drichoutis and Lazaridis 2005; WHO 2002). The example of the United States, for which the longest time series is available, is telling: food away increased from 10 to 49 percent of total food expenditures between 1900 and 2010 (USDA 2012a). Other evidence comes from Egypt, where the percentage of meals away from home rose from 20 to 46 between 1981 and 1998,[31] and Mauritius, where (inflation adjusted) expenditures on prepared foods rose five times between the 1960s and 1990s (Galal 2002; Mauritius Ministry of Economic Development 1997, both cited in WHO 2002). In urban China total expenditure on food away from home increased by 63 percent between 1995 and 2001 (Ma et al. 2006). And in India the percentage of households reporting consuming full meals away over a month's period rose from 23 to 39 between 1994 and 2010 (Smith 2012). According to Schmidhuber and Shetty (2005), trends in consumption patterns associated with the nutrition transition, including increased food consumed away from home, will accelerate more in developing than in developed countries.

Taking food away consumption into account is particularly important for measuring calorie consumption because food consumed outside the home tends to be more calorie-dense than food consumed at home (Poti and Popkin 2011; Mancino, Todd and Lin 2009) and the amount of food consumed away tends to increase faster with increases in income (Senauer 2006; Gale and Huang 2007). The food may also contain more protein and specific micronutrients.[32] Because food consumed away is a substitute for food consumed at home, the consequences of not taking it into account is a progressively more unreliable measurement of poverty and food security, possibly including incongruent trends in their indicators that send conflicting messages to policy makers (Smith 2012).

For background, Figure 7 gives a typology of food consumed away from home (or "FCAFH"), which delineates its various components. The overarching concept is food *prepared* away from home, which may be consumed either at home or away from home. Focusing on food consumed away from home, a key distinction to make is the mode of acquisition, of which there are two: Purchased or received in kind. It is very important to take the latter into account as it can be a large proportion of food away for some populations.[33] Another key distinction is the place of consumption. In the case of purchased food this may be a commercial establishment--such as a restaurant, bar, street stall, or mobile vendor--or a canteen or cafeteria at a school or work place. Food received in kind outside of the home may be provided by a school, an employer, through food assistance (e.g., feeding), or as a gift from another household. The latter includes food eaten as a guest at another person's home or eaten at a commercial establishment and paid for by others. Snacks, which become an increasingly important part of the diet as nutrition transition proceeds (Popkin 2008), can make up a large proportion of FCAFH since people are less likely to convene in the home for snacks than meals.

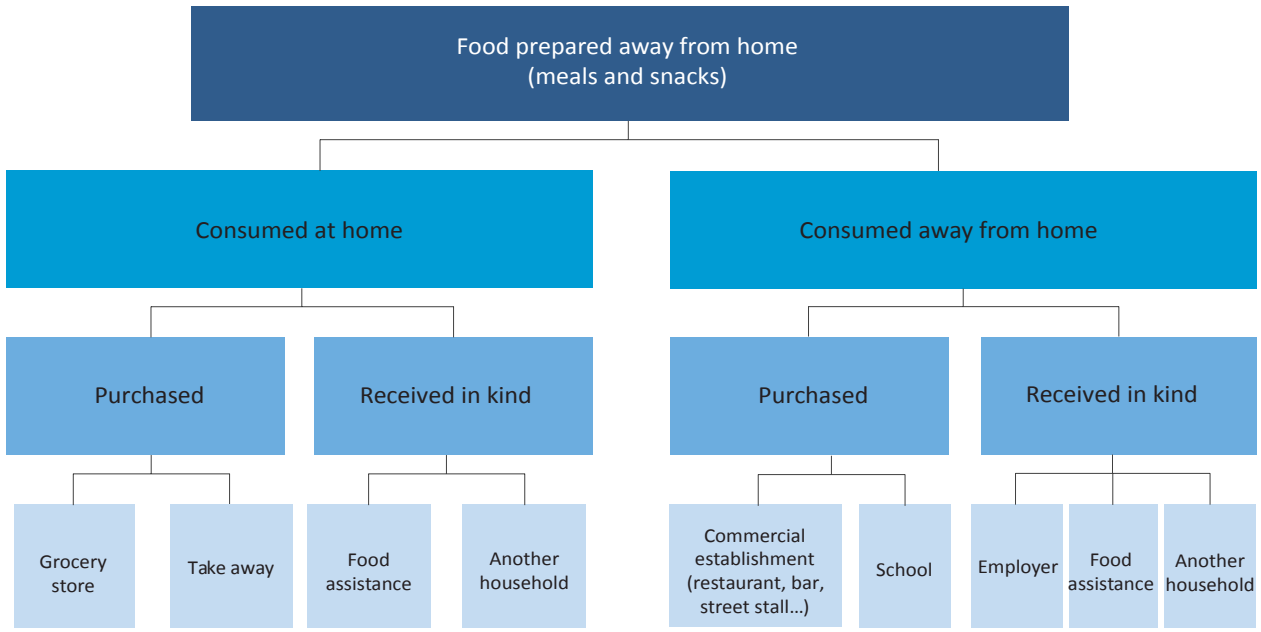
Before considering the minimum reliability criteria for the data collected on FCAFH, Table 3 describes features of the data collection. Data on FCAFH were not commonly collected in HCES until recently. Ninety percent of the assessment surveys collected some data on FCAFH, rising to 100 percent for the diary surveys. For interview surveys, data were considered to have been collected on FCAFH if any food item in the food list itself, the title of the section in which it is found, or a question regarding the item contains the following words (or variations on them): "Food eaten out, restaurant foods, foods eaten in restaurants and other establishments, food away from home, food eaten away,

31 These percentages include meals consumed at the homes of relatives.

32 See for example Ma et al. (2006), who show that the rapid rise of food away from home in urban China has been accompanied by a rapid increase in meat demand.

33 For example in India more households report consuming in-kind food away from home than purchased (Smith 2012).

Figure 7: Typology of food away from home



Source: Smith and Frankenberger (2012).

Table 3: Food away from home data collection

	Interview surveys	Diary surveys	All
	(Percent of surveys)		
Whether any data collected on food consumed away from home a/	83.3	100.0	90.0
Detail of data collection b/			
Only one line item (e.g., "Restaurant food")	36.0	7.9	23.9
Data collected for multiple places of consumption	14.0	35.0	23.3
Data collected on food received in-kind	46.0	65.0	54.4
Data collected on specific food items	28.0	40.0	32.9
Snacks explicitly referred to	26.0	35.1	29.9
Alcoholic beverages explicitly referred to	36.0	32.4	34.5
Data collected at the individual level	12.0	23.7	17.0
Recall period b/			
Less than one week	6.0	100.0	47.8
One week	48.0	0.0	26.7
Two weeks	12.0	0.0	6.7
One month	14.0	0.0	7.8
Greater than one month	20.0	0.0	11.1

a/ N=100 surveys.
b/ Calculations are only for surveys for which any data are collected on food consumed away from home (N=90).

food eaten out of the home, food eaten at other people's homes, meals eaten out, or meals away". The diary surveys were judged partially on this same requirement, but also on whether the diary instructions or instructions to interviewers explicitly mention food consumed away from home.

The detail or specificity with which data are collected is as important for reliable collection of data on food consumed away from home as it is for food consumed within the home. As noted above, the more detail with which data are collected, the better is respondents' ability to recall and the higher is the likelihood that all of the food acquired and/or consumed will be captured given reasonable overall time limits to survey administration. While the large majority of the assessment surveys did indeed collect data on FCAFH, compared to the data collected on food consumed at home the detail with which data are collected is very poor.

In the case of interview surveys, 36 percent of those collecting any FCAFH data attempted to capture this broad component with only one line item in the entire questionnaire. Examples of these line items are:

- Food and drinks consumed outside the home
- Meals taken outside home
- Restaurant food, meal eaten at restaurant
- Cooked food and beverages consumed away from home
- Outdoor meals (breakfast, lunch, dinner).

For surveys employing this method, respondents are typically asked to report on the total expenditures of all household members on these food items over the recall period.

Data were collected for multiple *places* of consumption in only 23 percent of the surveys for which any FCAFH data were collected. The most common place was a restaurant, followed by bars, street stalls and educational institutions. Data are collected on in-kind receipts of food consumed outside of the home as opposed to only purchases for 54 percent of the surveys. Finally, detail on the types of foods and beverages consumed is scarce as well. Data were only collected on specific food items consumed away from home for 33 percent of the surveys, and very few dishes were listed, certainly not the wide variety that people are likely to eat in restaurants and other commercial establishments, especially in urban areas. Snacks and alcohol, both of which tend to be prominent in the expenses and nutrient intake of people eating food away from home were specifically referred to in 30 and 35 percent of the surveys, respectively. The level of detail with which the data on food consumed away from home are collected tends to be greater for diary than interview surveys. Note that data are collected at the individual (as opposed to household) level for only 17 percent of the surveys; doing so accommodates the reality that most food consumed away from home is eaten away from other family members and, most particularly, the survey respondent.

The reliability of the data collected on FCAFH is judged using three criteria:

1. Whether data are explicitly and deliberately collected on FCAFH (as defined above);
2. Whether the recall period for collection of the data is less than or equal to two weeks; and
3. Whether data are collected on in-kind receipts.

If all three of these criteria are met, the data on FCAFH are considered to be minimally reliable. Note that these criteria fall far below optimal data collection, which would entail detailed recording of the actual foods and/or meals consumed for food purchases and multiple sources of food received in kind--including from other households, food assistance, and free food received at schools and work places. Hopefully data collection will improve over the coming years, and the quality bar can be raised.

Figure 8 reports on the percentage of surveys meeting the three minimum criteria. As mentioned above, 90 percent of surveys explicitly collect data on FCAFH. Seventy three percent have a recall period less than or equal to two weeks. Only 49 percent collect data on in-kind food received, however. Overall 42 percent of the assessment surveys satisfy the three minimum reliability criteria for the quality of data on food consumed away from home, signaling that the quality is indeed quite low at this point in time.

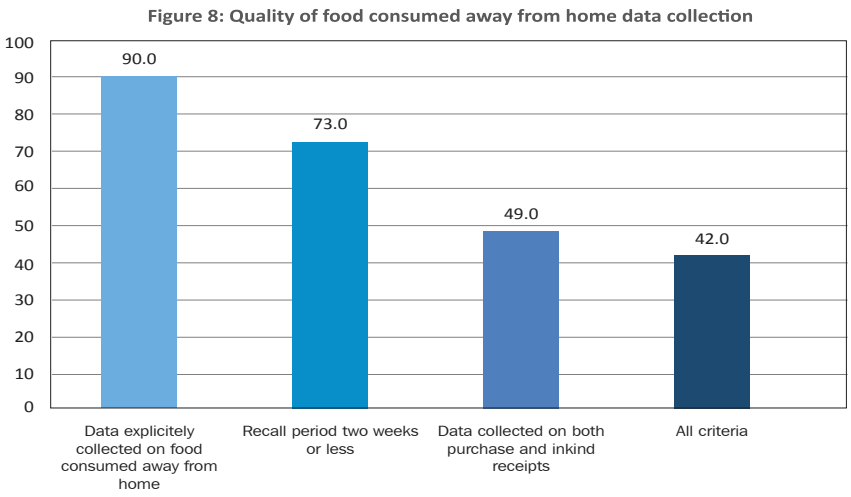


Figure 8: Quality of food consumed away from home data collection

Note: For second and third criteria, households without data collected on food consumed away from home are included in the percentage.

Note: N=100 surveys

surveys were conducted in this manner (Figure 9).[34] The second method distributes data collection throughout a year by surveying sub-sets, usually one-twelfth, of households in the sample in each month of the year. This method is employed for just over forty percent of the assessment surveys. To capture differences in seasonal patterns across geographic areas within countries, survey primary sampling units should be randomly assigned to the different months. Given the information available, it was not possible to determine whether this geographical randomization was carried out for each survey.

3.7 Accounting for seasonality of food consumption patterns

Seasonal patterns in the consumption of many food items are highly pronounced. 53 percent of the surveys reviewed try to take this into account by conducting the survey two to four times a year (for the same households or a new sample) or by surveying sub-sets, usually one-twelfth, of households in the sample in each month of the year.

As recognized in the report of the Seventeenth International Conference of Labour Statisticians on Household Income and Expenditure Statistics (ILO 2003), HCES's should cover a full-year accounting period to take into account seasonal variations in expenditures. This is especially important in the case of food, because seasonal variations in dietary patterns, overall quantities of food consumed, and the consumption of particular nutrients can be pronounced (Coates et al. 2012a), partly due to the relationship with cyclical food production cycles.

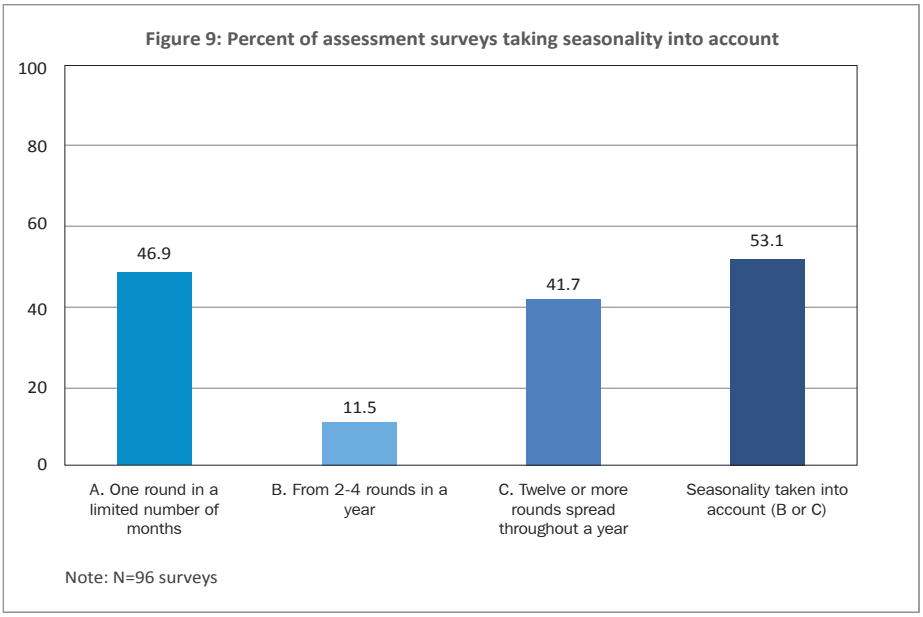
Seasonality in food consumption patterns is captured by repeating a survey multiple times throughout a year's period. The assessment surveys that account for seasonality in some way can be divided into two groups: The first are those for which the survey is conducted two to four times a year, either for the same households or a new sample. Twelve percent of the assessment

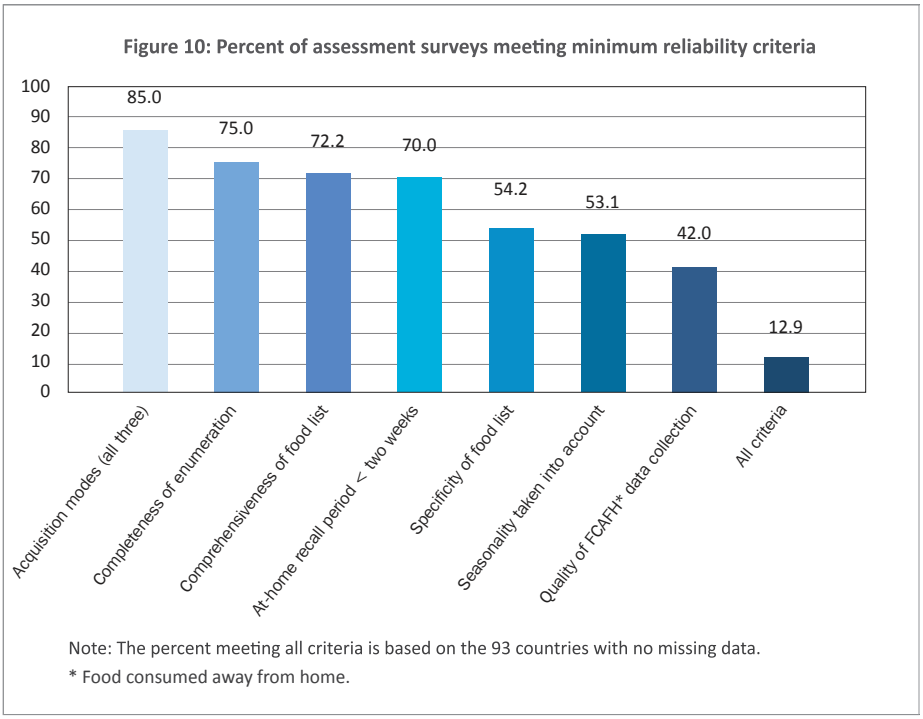
The overall minimum reliability criteria for whether seasonality is taken into account is that either one of the two methods is used. Just 53 percent of the surveys meet the criterion. The surveys that are instead undertaken over a limited time during a year's period risk collecting data on food acquisition or consumption, and estimating indicators derived from them, that are not an accurate reflection of the overall, annual pattern in the population.

One issue related to seasonality is that concerning measurement of "usual" consumption at the household (as opposed to population) level. For indicators that depend on the distribution of consumption across households rather than only means or totals—measures such as prevalences of poverty and calorie, protein and micronutrient insufficiencies—it is important that such usual consumption be captured for each survey household rather than just the sample as a whole. If data are only collected one time for each household for a "short" observation period, then usual consumption may not be captured because random shocks are included along with the real between-household inequality in consumption, leading to overestimates of population prevalences (Deaton and Grosh 2000; Murphy, Ruel and Carriquiry 2012).

34 It was not possible to assess whether the specific times of year for which data were collected are appropriate for capturing seasonality for each of the surveys within the time frame of this assessment.

But what defines "usual" consumption?[35] To assess usual consumption, how many times should data be collected from households and for what observation or "reference" period? [36] What difference will extending reference periods and conducting repeat visits actually make to estimates of poverty and nutrient insufficiencies? According to Gibson (2005), a one-time, 7 to 14 day observation period is insufficient for accurate poverty measurement. On the other hand, it is commonly agreed among nutritionists that a 24-hour observation period repeated at least twice on two nonconsecutive days is sufficient to capture usual nutrient intakes (Coates et al. 2012b). Therefore, the answers to these questions are far from clear and must be considered in future studies.





3.8 Summary

Figure 10 gives a summary of the extent to which the assessment surveys meet the minimum criteria for reliability of the food data collected. The good news is that many criteria are being met by the large majority of HCES. The criterion most often met was that data are collected on all three modes of acquisition. Other criteria that were met by large majorities of surveys are those regarding completeness of enumeration and comprehensiveness of the food list. While the majority of surveys met the criterion that the recall period for food data collection be two weeks or less, a full thirty percent did not. Just over fifty percent of countries did not meet the criteria for specificity of the food list and for seasonality to be taken into account. The criterion that was met by the lowest percentage of households, just 42 percent, relates to the quality of data collected on food consumed away from home, a source of food that is likely to rapidly increase over the coming decades.

35 Deaton and Grosh (2000) write that a year is a "sensible" period over which to judge people's living standards for poverty measurement. Murphy, Ruel and Carriquiry (2012) define usual nutrient intake simply as the "long-term average intake of a nutrient by an individual" (p. S236).

36 A reference period is the total period over which a household's consumption and expenditures is observed. The reference period is longer than the recall period if households are visited multiple consecutive times.

4. Assessment of the relevance of the food data

In this chapter the focus shifts to the relevance of the food data collected in HCES, and ask whether the data collected meet the needs of the current and potential users of the surveys. Table 4 lists the uses identified in Chapter 2 along with the associated indicators that need to be measured. Some indicators are unique to a particular use while others span multiple uses. Two - quantities consumed of individual foods and calorie consumption- are quite complex to measure and needed for many uses. The chapter begins by determining whether these indicators can be measured along with a discussion of some key related measurement issues. Following, an assessment is made of whether the needs for each use can be met with the food data collected in the reviewed surveys. As for the assessment of reliability, concrete minimum relevance criteria to ensure reasonably accurate measurement of indicators employed by the users are imposed.

In some cases a number of alternative methods can be employed for measuring the same indicator, each with markedly differing reliability of the resulting estimates. In these cases, the methods are ranked based on reliability (i.e. "first-best", "second-best", etc.) to lay out the range of options and clearly demarcate them in terms of the expected quality of indicator estimates.

4.1 Calculation of key indicators employed by multiple users

4.1.1. Measuring quantities of foods consumed

The lack of familiarity of respondents with standard units of measurement is one of the main challenges in accurately estimating food quantities. There are several approaches to solving the issue in survey practice, but a lack of hard evidence and clear guidelines on what method works best. The assessment reveals that the most common method in survey practice is to rely on the respondents' own report of quantities in standard units. Demonstration methods have the potential to greatly improve measurement accuracy for some important types of foods, but are used by only 5 out of the 100 surveys in the assessment.

Estimates of the quantities consumed of individual foods are an important foundation for measuring indicators employed by a wide variety of users. On their own, they are needed for informing National Account Statistics, Food Balance Sheets, food-based nutritional interventions and food security interventions. They are a stepping stone for estimating calorie, protein, and micronutrient consumption. Therefore they are also needed for measuring poverty and the diet quantity dimension of food security, and for setting fortification levels for food fortification programs.

Table 4: Indicators needs for various uses of the food data in Household Consumption and Expenditure Surveys

Indicators	Uses/users							
	Measuring poverty		Calculating Consumer Price Indices	Informing National Account Statistics	Measuring food security	Informing food balance sheets	Informing food-based nutritional interventions	Meeting private sector needs
	Food-energy intake method	Cost of Basic Needs method						
Quantities consumed of individual foods								
Calorie consumption and undernourishment								
Calories consumed from individual foods/food groups								
Protein & micronutrient consumption and insufficiencies								
Dietary diversity								
Percent of households consuming individual foods								
Percent of households purchasing individual foods								
Percent of expenditures on individual foods or food groups								
Expenditures on individual foods by source								
Percent of expenditures on food								

Direct use

Indirect use

The total quantity of a food consumed is the sum of the amounts consumed at home and away from home. With respect to at-home food, assuming that a survey food list allows full identification of the foods of interest, the primary measurement issue is whether it is possible to obtain quantities in some standard (or metric) unit of weight given the data collected, which may be reported in local units such as heaps or bunches. Without converting to standard weights it is not possible to use the information on the quantity of a food in a meaningful way, for example to compare with the consumption of other foods or across geographical areas, or to translate into its nutrient content. A number of methods can be used for doing so, each with unique data requirements and accuracy concerns. Estimating the quantities of foods consumed *away* from home poses its own set of issues, mainly concerning the paucity of data broken down by individual food items, an issue that will be discussed at the end of this section. It is important to note that even though the word "consumed" is used here, reasonably accurate estimates of average quantities consumed for population groups (although not individual households) can likely be obtained even when data are collected on food acquisition rather than directly on consumption (see Section 4.1.3.3 below).

The assessment identified five methods for estimating metric quantities of at-home food consumed, discussed here in turn (see Smith and Subandoro 2007 for more detail).

(1) ***Require respondents to report in a metric unit of measure.*** Respondents are asked to report all quantities directly in metric units. In this case there is obviously no need to translate into a standard unit of weight. This method is the least costly because it requires no additional information beyond that reported directly by households. However, it has low applicability in most developing-country settings where many respondents do not usually obtain food in metric units or are otherwise unfamiliar with the metric weights of foods. In these cases, estimates of quantities consumed using this method can be highly inaccurate.

(2) ***Respondents can report in a metric unit of measure or "unities".*** Respondents are asked to report all quantities directly in metric units or in unities or "counts". In the latter case they simply report the number of individual pieces of the item that was acquired or consumed.[37] Metric conversion factors are only needed for the foods reported in unities. They are simply the metric weights of the foods themselves, involving no added measurement complications of a vessel or container. These scale weights can easily be obtained by weighing foods from local markets or referring to an existing database (e.g., USDA 2012).

(3) ***Respondents choose the unit of measure; metric conversion factors collected separately are used for conversion.*** In this case respondents choose the unit of measure with which they feel most comfortable for each food. This, and the fact that in most cases the chosen unit is likely that in which the item was originally acquired, enhances the accuracy of quantity estimates. The reporting unit of measure could be metric, or it could be non-metric or "local". To convert to metric quantities for local units of measure, information on metric conversion factors must be available for each food and unit of measure in which it is reported. These can be collected at the community or higher level, with the best accuracy achieved the more locally they are obtained. The accuracy achieved also depends on how much the size of the unit of measure varies across households, with units of fixed size (e.g., a 0.5 liter beer bottle) having the greatest accuracy potential.[38] Examples of commonly-employed units of measure that can vary greatly in size across households are bundles, heaps, bunches, cups, bowls, plates, baskets, sacks and calabashes. Applying one conversion factor to all households for these units can lead to large estimation error. Demonstration methods, where respondents show the interviewer how much food has been acquired using volumetric equivalents, linear dimensions and food models, or photos improve accuracy.

(4) ***Respondents choose the unit of measure; interviewers convert to metric in the field.*** Here again respondents can chose which unit of measure to report in. The interviewer then converts any quantities reported in non-metric units of measure into a metric one. In some cases interviewers appear to use their own

37 According to Smith and Subandoro (2007) the unit of measure unities "…can be used only for specific kinds of foods, that is, those that can be acquired in their entirety and are big enough in one contiguous piece to be counted. It is best used for items for which there is little variation in size (and thus weight). Examples of these foods are eggs, shellfish, fruits, vegetables, and some commercial baked goods such as bread or slices of bread" (p. 20).

38 A secondary source is a local unit conversion factor data base created as part of the International Food Policy Research Institute's AFINS (Assessing Food Insecurity) project (Smith and Subandoro 2007).

"expert" knowledge or common sense.[39] In others, they may have a list of conversion factors for common local units of measure as an aid. Rarely, the interviewer actually weighs foods on a portable scale.

(5) ***Respondents report monetary values; metric prices are used for conversion.*** For this final method, respondents report only their expenditures on each food or, in the case of own production or food received in kind, the approximate value of that food. To estimate metric quantities, the reported expenditures are divided by a metric price. This is not normally a pre-meditated method but the only solution when solely expenditures data are collected. While the burden on respondents is very low, price data collection at the community or higher levels is required if prices are not already available from secondary sources for the same time period as the survey, the same locations, and matched to the same food items. An important concern is that actual food prices faced can vary greatly across households due to differences in food quality, the amount of food purchased at a given time (that is, whether it is a bulk purchase), and the purchaser's negotiating skills and personal relationship with vendors. Such variations mean that household-level estimates are imprecise.[40]

Some of these methods are obviously likely to yield more accurate estimates of metric quantities than others, but more research is needed to determine how much estimates differ by method, and which is overall most reliable. For this assessment, the assumption is made that they all yield reasonably accurate estimates.

Beyond the five discussed so far, one other method of metric conversion is in common use when both expenditures and quantity data are collected, and the latter are reported in both metric and non-metric units of measurement. In this case, rather than collecting metric conversion factors through weighing with scales, it is possible to convert using the existing household data if quantities are reported in metric units for each food of interest by a sufficiently large number of households. This is achieved by calculating estimated metric prices as unit values and then dividing the expenditures of households reporting in non-metric units of measure by these unit values, similar to method (5) above. The same information can be used to calculate metric conversion factors for, say a community or region: Using the example of a heap, if the average metric unit value of a food is 200 CFA/kg and that of a heap is 400 CFA/heap, then the local unit conversion factor of a heap is 2 kgs. However, estimates achieved using these methods can be highly inaccurate: If "prices" differ between survey respondents who feel comfortable reporting in metric units of measure and those who feel comfortable reporting in local units, systematic bias in quantity estimates occurs. For an extreme example, if high-income, urban populations are more likely to use metric units of measure but also face higher food prices, such method will result in downward biased estimates of quantities consumed for low-income, rural populations. This is therefore not considered a valid metric conversion method.

Table 5 gives the percentage of the assessment surveys for which each method can be used. Because the methods often differ depending on source of data collected—purchases, home produced, or received in kind—the results are broken down by source. The most common method employed for all three sources is requiring respondents to report in a metric unit of measure. Methods (2) and (4) are the next most common. The least common methods are (3) and (5). Among the surveys employing method (3), only 5 used the demonstration methods that have the potential to greatly improve measurement accuracy for some important types of foods. Overall, given the information available in the survey documentation, calculation of metric at-home food quantities for all three sources is possible for 53 percent of the assessment surveys.

With respect to food consumed away from home, quantities can be estimated if respondents report on the foods and dishes that were consumed rather than only their total expenditures.[41] From Section 4.6 above, data were collected on the specific foods and prepared dishes consumed for 15.4 percent of the assessment surveys.

39 It is not clear from survey documentation exactly how the conversions are made by interviewers for every survey in which this conversion method is used.

40 Unlike the other methods, unit values (expenditure/quantity) cannot be calculated to detect reporting, recording and data entry errors, making this an even more "risky" method when it comes to reliable estimates.

41 Smith and Subandoro (2007) outline a method that can be used when this information is available. In the case of raw foods or single-ingredient processed foods (such as pasta), the same techniques as those described above for food consumed at home can be used. In the case of prepared foods containing multiple ingredients, respondents are asked to describe the dishes consumed and report their price or estimated monetary value. Subsequently, information is collected from food preparers, whether households or vendors, on the amounts of ingredients used to prepare each dish and the metric unit price of each dish. The proportionate weight of ingredients and price are then used to estimate the weight of each ingredient given the monetary values reported by households.

Table 5: Percent of surveys for which it is possible to calculate metric quantities of foods acquired or consumed (at home)

Conversion method	Purchases	Home produced	Received in kind	Method used for all sources b/
Method 1. Respondents are required to report in a metric unit of measure a/	17.0	16.5	18.6	13.0
Method 2. Respondents can report in a metric unit of measure or unities	12.0	12.4	12.8	12.0
Method 3. Respondents choose the unit of measure; conversion factors collected separately are used for metric conversion	9.0	11.3	7.0	7.0
Method 4. Respondents choose the unit of measure; interviewers convert to metric in the field	12.0	13.4	12.8	11.0
Method 5. Respondents report monetary values; metric prices are used for conversion	6.0	4.1	5.8	5.0
Metric conversion is possible given available data and information in survey documentation	56.0	57.7	57.0	53.0

a/ Required units of measure are specified for each food; respondents may be required to report in "unities" for one or two food items.
b/ Calculated based on the total number of sources for which data were collected in each survey.
Notes: Percentages by source calculated only for surveys for which data on each source were collected.
N=100 surveys.

Even among surveys for which these data are available, it is not possible to convert to metric quantities for all.[42] Overall, the metric quantities of foods consumed away from home could be calculated for 9.9 percent of the surveys for which information was available.[43]

In sum, it is possible to calculate metric quantities of food consumed at home with reasonable accuracy for 53 percent of the assessment surveys and for food consumed away from home for 9.9 percent. Taking both of these food sources into account, they can be calculated for 9.9 percent of the surveys (Tables 5 and 6).

4.1.2 Calorie consumption

A precise count of calorie consumption within a household is only possible if information of food quantities is available for both at home and away from home food consumption. The latter is only available in 10 percent of the assessed surveys and is therefore the greatest limiting factor. For 40 to 48 percent of the surveys calorie consumption can be calculated, using less accurate methods. For over half of the surveys in the sample, calorie consumption cannot be estimated with acceptable accuracy due to lack of quantity information on too large a number of food items.

The data needs and estimation procedures become more complex when attempting to measure calorie consumption using the food data in HCES's. These estimates are needed for measuring poverty, measuring food security, and informing FBSs. The basic steps are:

1. Calculate the metric quantity of all foods acquired or consumed, which is necessary for converting to calorie contents;[44]
2. Determine the calorie content of the foods
3. Add up the total calories for each household.

A number of methods can be used to achieve this process, depending on whether metric quantities can be calculated for all at-home foods and for foods consumed away. For the purposes of this assessment, the methods are broken into "first best", "second best", and "third best". The first-best method is based on all the appropriate information needed for implementing steps one through three above and yields the most accurate estimates. The second through third methods yield increasingly less accurate estimates due to assumptions made that are not founded in the actual data collected from households.

First-best method: Metric quantities are available for foods consumed at home and away from home. The first-best method relies on data on the metric quantities of all foods acquired or consumed, both at home and away from home. When these quantities are available, calculation of calorie content is straightforward: the quantities consumed at home and away

42 For any given survey it is assumed that metric quantities can be calculated from the food away data if they can be calculated for food purchases.

43 Recall that information would also be needed on the ingredients in recorded prepared dishes (the availability of which is not assessed here).

44 Food composition tables typically give nutrient contents per 100 grams of food, that is, is terms of a metric units of measure.

from home are added together, and their calorie content determined from food composition tables.

Second-best method: Metric quantities are available for foods consumed at home but not away from home. The second-best method sacrifices some accuracy by using the calorie content of food consumed at home to estimate that of food consumed away. It can be used when the only information on food consumed away is the total expenditure over the recall period. To estimate calorie content, expenditure is divided by the price-per-calorie of food acquired for consumption in the home. Estimates of calorie consumption based on this method can be highly inaccurate for populations for which food consumed away is an important part of the diet for two reasons. First, the food people eat away tends to be more energy-dense than the food eaten at home (see Section 3.6). Second, expenditures for the same quantities of foods consumed away are likely to be higher because of the added labor and facilities charges. While a standard markup to the estimated price-per-calorie can be added to account for these charges, since it is likely to differ across households such a markup masks variability across households.

Third-best method: Metric quantities are available for most, but not all, at-home foods and not available for foods consumed away from home. The third-best method further sacrifices accuracy by using the calorie content of identifiable foods consumed at home to estimate that of all of the unidentifiable foods consumed at home in addition to foods consumed away from home. As for the second-best method, to estimate the unknown energy content, the total expenditure on unidentifiable foods consumed at home is divided by the price-per-calorie of the identifiable foods consumed at home. Because the calorie content of unidentifiable foods and foods consumed away from home is unknown, this method can lead to great inaccuracies if the proportion of expenditures on these foods is substantial.

Table 6 reports the percent of the assessment surveys for which the first- through third-best methods can be used and the three underlying criteria employed to make this determination. The first criterion relates to the ability to identify what the at-home food items are. Such a "food identification" condition is necessary for being able to translate food quantities into their calorie content since the foods must be matched with a food in a food composition table (see Section 5.1.4 below). The identification condition used here is that 95 percent

Table 6: Percent of surveys for which it is possible to calculate calorie consumption

Methods and assessment criteria	(Percent)
First-best method: Metric quantities are available for foods consumed at home and away from home	
1. At least 95% of food items in the at-home food list other than prepared dishes fall into one and only one of the Basic Food Groups	77.1
2. Reasonably accurate estimates of metric quantities are calculable from the at-home food data	53.0
3. Data are collected on the specific foods and prepared dishes that are consumed away from home, and metric quantities can be calculated from them	9.9
All criteria	**9.2**
Second-best method: Metric quantities are available for foods consumed at home but not away from home	
1. At least 95% of food items in the at-home food list other than prepared dishes fall into one and only one of the Basic Food Groups	77.1
2. Reasonably accurate estimates of metric quantities are calculable from the at-home food data	53.0
3. Total expenditures on food consumed away from home can be calculated.	90.0
All criteria	**39.6**
Third-best method: Metric quantities are available for most, but not all, at-home foods and not available for foods consumed away	
1. Expenditures on unidentified foods consumed at home can be calculated (and they are less than 20 percent of foods)	96.9
2. Reasonably accurate estimates of metric quantities are calculable from the at-home food data	53.0
3. Total expenditures on food consumed away from home can be calculated	90.0
All criteria	47.9

Notes: First-best method: N=87; Second-best method: N=96; Third-best method: N=96.

of the food items in the at-home food list fall into one and only one of the Basic Food Groups given in Table 2. Note that this is one of the criteria used to judge the specificity of survey food lists in Section 3.5. The second criterion, which is applied to all three methods, is that reasonably accurate estimates of metric quantities can be calculated from the at-home food data. The third criterion relates to data collection on food consumed away from home.

The first-best method can only be used for 9.2 percent of the surveys, with the most limiting factor being that the appropriate data on food consumed away from home are available for only 10 percent of the surveys. The second-best method can be used for 40 percent of the surveys. Here the increase over the first-best percentage occurs because only total expenditures on food away, which allow the price-per-calorie procedure to be used, are needed. The percentage of surveys for which the third-best method can be used rises only slightly to 48 when the price-per-calorie method is allowed for the calories in unidentified foods consumed at home. In this case an upper limit of 20 is set on the percent of unidentified at-home foods.

4.1.3 Important measurement issues to keep in mind

Devoting attention at the survey design stage to the calculation of edible portions, the number of partakers in household food consumption, and to capturing the distinction between acquisition and consumption are difficult issue which, when solved, can greatly improve the accuracy of food consumption measurement for many relevant uses.

4.1.3.1 Calculating edible portions and the nu trient content of foods

Two important steps in estimating the consumption of calories and other nutrients are to calculate the edible portion of foods consumed, that is, the portion that can be eaten by human beings, and calculating the nutrient content of that portion. Both edible portions and the nutrient values of foods can be obtained from country or regional Food Composition Tables (FCT), which are increasingly available on line (FAO 2012c).[45]

A key issue in using FCTs to obtain this information is the quality of food matching, that is, linking the foods in a survey food list with the highest quality match in a FCT. Food characteristics that can influence nutrient values and that must be known for quality food matching are: the processing and preparation state of the food, its color, cultivar, variety or breed, its maturity stage, whether it is wild or domesticated, and the part of the food (e.g., meat cut) (FAO 2012d).

It was not possible to assess whether the survey food lists made the appropriate distinctions among food items based on these characteristics, but it can be safely said that HCES food lists are not planned with these distinctions in mind. Some food lists do take into account the need to distinguish among different forms of a food for determining their edible portion and nutrient content, however. As part of the assessment, data were collected on whether the forms especially relevant to the calculation of calorie consumption was specified for a number of commonly-consumed food items of concern. Those for which the majority of surveys listing them as a food item appropriately distinguished by form are: wheat, sorghum, and millet (grain or flour), bananas (sweet or plantain), fish (with bone, de-boned, fresh or dried/smoked), milk (liquid or powdered), alcohol (beer, wine or distilled), and beans (fresh or dry). Those for which the majority did *not* appropriately distinguish by form are: rice (paddy or husked), maize (cobs, grain, flour, green or "sweet"), ground nuts (shelled or unshelled), peppers (fresh or dry), shelled sea food (in shell or out of shell), meat (with bone, de-boned, fresh, dried/smoked), condensed milk (sweetened or unsweetened), and tea/coffee (liquid or dry). When distinctions such as these are not made, survey processors are forced to make assumptions on the form of the food which, especially if a food is widely-consumed in large quantities, can lead to significant inaccuracies in estimates of nutrient consumption.

45 Some Food Composition Tables do not contain edible portions. A list of edible portions for 165 foods collected in various world regions is given in Smith and Subandoro (2007), Appendix 6. The new ADePT Food Security Module developed by FAO and the World Bank available on line allows food composition analysis with conversion factors for energy, macronutrients (of which protein) and many micronutrients (ADePT-FSM 2013).

4.1.3.2 Calculating per-capita indicators and nu trient insufficiencies: The importance of collecting data on the number of food par takers

Estimates of the amount consumed of foods or nutrients such as calories are only meaningful when related to the number of people consuming them. To do so measures of per-capita consumption are calculated by dividing by the number of people (thereby assuming that food is equally distributed across individuals of the household). For households, it is typically approximately by household size, but to correctly attribute food to consumers, per-capita measures should optimally be based on the actual "partakers" of food consumed. Because these people may or may not be households members, the importance of gathering information on the participation of non-household members or "guests" at household meals is increasingly being recognized (Weisell and Dop 2012).

It was not possible to thoroughly investigate this aspect of food and nutrient consumption measurement as part of this assessment. However, some useful information on meal participation and the presence of visitors was gathered. As shown in Table 7, data were not collected on meal participation for the large majority of surveys. Fifteen percent collected data on whether non-household members were present or consumed meals in the household during the recall period. Some surveys collected data on the number of visitors in the household, their length of stay, or the number of meals they consumed that can be used for estimating the number of food partakers.

4.1.3.3 Using acquisition data to measure con sumption

The discussion in Section 3.2 showed that nearly three-quarters of HCES collected data on food acquisition, as opposed to directly on food consumption, with just over forty percent collecting exclusively food acquisition data. Because most foods are perishable and consumed with high frequency, and people try to smooth their consumption of food over time, one would expect their acquisitions to match fairly well with consumption, even over a short time period. However, some foods (e.g., grains), are not perishable and can be stored. Thus over any given time period there will be households who are drawing down stocks acquired before the period in order to meet current consumption; there will also be households who are accumulating stocks that will be consumed after the period. This means that at the household level food acquisition and food consumption data, and measures based on them, can differ greatly. Because households in a large population are equally likely to be drawing down on stocks as accumulating them, population mean estimates of food and nutrient consumption derived from consumption and acquisition data are likely to be equal (Deaton and Grosh 2000; Smith, Alderman and Aduayom 2006). The many studies comparing food acquisition data to food consumption data collected through dietary techniques such as 24-recall food consumption surveys need to be reviewed to determine whether additional research is needed in this area.[46]

However when it comes to nutrient *deficiencies* (undernourishment and micronutrient deficiencies), estimates derived from acquisition and consumption data may well differ because of the higher variability in acquisition data (Smith, Aduayom and Alderman 2006;

Table 7: Collection of data on food given to non-household members (Percent of surveys)

Data are collected on the presence and/or household meal consumption of non-household members during the recall period	15
Data collected on the number of visitors in the household	11
Data collected on visitors' length of stay	5
Data collected on the number of meals consumed by visitors/guests	10
Data collected by type of meal (breakfast, lunch, dinner)	7
Data collected on the age of visitors/guests	7
Data collected on the sex of visitors/guests	6

Note: N=100 surveys.

46 Examples are: Bouis, Haddad and Kennedy (1992), Naska et al. (2007), Trichoupoulou and Naska (2001); Sekula et al. (2005); the various studies in Sibrian (2008).

Cafiero 2012b). How much they differ and whether they differ enough to rule out the use of acquisition data for measurement of nutrient insufficiencies is an empirical question requiring a meta study of the existing evidence (including the validity of this evidence)[47] and further empirical research. One possible way to get around the problem and uncover the underlying consumption data is to measure household stocks of food along with their food acquisitions. Specifically, households can be asked to report on their "pantry stocks" (as distinct from production stocks) of each food at the beginning of the observation period and then again at the end. The final interview includes collection of the standard acquisition data as well (measuring the inflow to pantry stocks). In this way consumption can be estimated as the food acquired over the period plus beginning stocks minus ending stocks.[48]

Another issue that arises in the use of acquisition data for measuring consumption is that while most of the food acquired by a household is likely eventually consumed by its members, some of it may be wasted, given to other people, or given to pets, leading to overestimation of consumption. The overestimation tends to be greater the richer is a household (Smith, Alderman and Aduayom 2006; Coates et al. 2012a).[49] Thus estimates of the relationship between income and nutrient consumption and insufficiencies are biased when acquisition data are used to estimate the latter. One way to overcome these issues would be to directly collect data on food waste, food given to others, and food given to pets. This would of course lead to additional burden on respondents and, in the case of waste, such direct self-reports may be untenable.

The issues arising from using acquisition data to measure consumption raised here should be kept in mind when considering the relevance of the food data collected in HCES for various users in the next section. It is not obvious that the solution is for all surveys to collect data on food consumption (see Section 3.1 on the issue of data reliability when recall periods are greater than 24 hours). This is an area on which more research is certainly needed.

4.2 Relevance of the food data for various uses

Detailed, spatially disaggregated price information, coupled with the issues related to accurately measuring calorie consumption, are the main constraining factors in employing HCES data for measuring poverty using the most well established methods.

4.2.1 Measuring poverty

As discussed in Section 2.1, the two methods in common use for setting national absolute poverty lines are the Food Energy Intake (FEI) method and the Cost of Basic Needs (CBN) method. For the purposes of measuring national poverty prevalence the food data in HCES are used to obtain two pieces of information, total household expenditures and a poverty line below which households or people are considered poor. The first piece of information, total household expenditures, can be calculated from the data in all of the assessment surveys.

Calorie consumption, required by both methods for defining the poverty line, can be calculated for 47.9 percent of the surveys, although the "first-best" method—which requires data collected on the specific foods and prepared dishes consumed away from home, and metric quantities can be calculated from them—can be used for only 9.2 percent (see Table 6). In setting the poverty line the FEI method targets a line that approximates the total expenditure level at which food energy intake is sufficient to meet energy requirements. This method can hence be implemented without the need for price data, which are instead required when applying the CBN method.

The data needed for implementing the CBN method are: (1) household expenditures on each food item, (2) metric[50] quantities consumed of individual food items (from which calories in the foods can be determined), and (3) prices of individual food items.

A first-best and second-best method to calculate (1) and (2) can be identified. The first corresponds to the

47 Evidence on undernourishment (calorie insufficiency) from Kenya, Philippines and Bangladesh can be found in Smith, Alderman and Aduayom (2006) and from Armenia, Kenya and Cape Verde in Sibrian (2008).

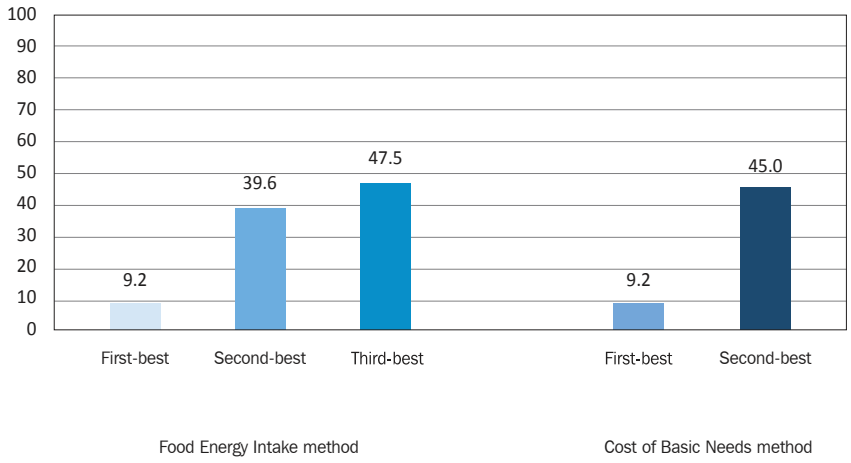
48 Among the 100 assessment surveys 11 collected data on food (pantry) stocks. Further review of the survey questionnaires is needed to determine whether data on both beginning and ending stocks were collected.

49 Evidence can be found in Smith, Alderman and Aduayom (2006) and the various studies in Sibrian (2008).

50 Although we refer to metric units in the report, Imperial units would be valid as well.

first-best method for measuring calorie consumption (see Table 6). In this case it is possible to identify at least 95 percent of the foods consumed at home (thus allowing calculation of the food proportion of total expenditures using data on the large majority of foods), metric quantities of foods consumed at home can be calculated, and data are collected on the specific foods and dishes consumed away from home, which allows calculation of the total metric quantities of individual foods consumed.[51] The first-best method criteria are met by 9.2 percent of the assessment surveys (Figure 11).

Figure 11: Percent of surveys for which absolute poverty can be measured



Note: See text for definitions of the First-best, Second-best and Third-best methods.

The second-best method assumes that a poverty line can be based solely on foods consumed at home (or acquired for at-home consumption). In this case, only two criteria must be satisfied: It must be possible to identify at least 95 percent of the foods consumed at home and metric quantities of foods consumed can be calculated. The assumption that the only food that needs to be accounted for when setting the poverty line is that consumed at home will of course be unfounded in cases where poor people are reliant on foods consumed away.[52] Forty five percent of the assessment surveys meet the criteria for the second-best method (Figure 11).

The availability of food prices could not be determined as part of this assessment, often due to lack of sufficient documentation. It is safe to say, however, that prices that can be matched to individual food items are collected in some surveys and, in some cases, monthly or quarterly CPI prices, available in the majority of developing countries, can be used.[53] There is less certainty on the extent to which spatially disaggregated price data are available within surveys. An important feature of the CBN method is that it readily allows for the spatial deflation of the consumption expenditure (or the poverty line) in order to account for cost of living differentials in the calculation of poverty rates (Ravallion and Bidani 1994; Deaton and Zaidi, 2002).

4.2.2 Measuring food security

HCES data are an essential source for several of the most commonly used food security indicators. While most of the assessed surveys score well in terms of reliability when expenditure based indicators need to be calculated, the variability is much greater for some of the other indicators. The measurement of food quantities and the accurate identification of specific food items are the main constraining factors for greater accuracy.

Six indicators of food security can potentially be measured using the food data collected in HCES (see Table 4): the percentage of expenditures on food; dietary diversity; quantities consumed of individual foods; calorie consumption and undernourishment; percentage of calories from individual foods/food groups; and protein and micronutrient consumption and insufficiencies. To determine whether they can be measured, it is useful to start with the simplest indicator -the percentage of expenditures on food- and proceed through to the more complex indicators of calorie, macro and micronutrient consumption.

51 For formulating the food basket the amounts of an individual food consumed at home and away from home must be entered into the list separately since their prices likely differ.

52 An example where this is the case is India, where a 2005 national survey showed that a full 46 percent of urban slum households reporting having a member eating outside of the home in the previous month (Gaiha, Jha and Kulkarni 2009).

53 Sometimes calculated metric unit values are employed as prices when some food quantities are reported in non-metric units. As discussed in Section 3.8, this procedure can lead to biased estimates.

Percentage of expenditures on food. This indicator is calculated simply as the ratio of total expenditures on food to total overall expenditures, multiplied by 100. As expected given that the primary purpose of HCES's is to calculate households' total expenditures, all of the 100 assessment surveys collected the appropriate data to measure this indicator (Figure 12).

Dietary diversity. Dietary diversity is measured as the number of nutritionally significant food groups from which food households consume food. Examples of such food groups can be found in Table 2, where the Basic Food Groups (BFGs) are listed.[54] This indicator is easily measured from the food data collected in HCES, but one key condition must be satisfied to do so: Food identification. That is, the analyst must know which foods are being consumed so they can be properly classified into food groups.

To assess whether dietary diversity can be measured using the food data collected in an HCES, first-best and second-best methods are identified. For the first-best method, which yields the most accurate estimates, the following two criteria must be met:

1. All food items in the at-home food list other than prepared dishes fall into one and only one of the BFGs; and
2. Data are collected on the specific foods and prepared dishes that are consumed away from home;[55]

The first-best method, therefore, requires full food identification. Note that there is a third piece of information needed for food identification, which is that the individual foods contained in prepared dishes are known. Given the information available for this assessment, it was not possible to determine whether this condition is met for each survey. It can only be noted that the ingredients in prepared dishes are not normally collected as part of HCES, but could potentially be gathered by interviewing households or vendors of the dishes. Ingredients could also be obtained from secondary sources, such as recipe data collected as part of a food consumption survey or book of common recipes in a country (Swindale and Ohri-Vachaspati 2005)[56].

The second-best method relies on a less stringent condition for at-home food items, requiring that at least 95 percent of the at-home food items fall into one and only one of the BFGs ("partial food identification"). In this case, only those 95 percent of food items would be used in the calculation of dietary diversity, leaving the others out. While such a condition means that reasonably accurate estimates of dietary diversity can be achieved, there will be some error in the estimates, especially if the spanning food items compromise a large part of the household diets. Thus any analyst using the second-best method should carefully check the excluded food items to ensure they are not highly important in the diet.

Figure 12 gives the percentage of the surveys meeting the assessment criteria for relevance in calculating dietary diversity. Starting with the first-best method, all food items in the at-home food list fall into one and only one of the BFGs for seven percent of the surveys, and data were collected on the specific foods and prepared dishes consumed away from home for 16.5 percent. Only 1.2 percent of the surveys meet both of these criteria for the first-best method.[57] At the root of this very low percentage are poor food specificity afflicting HCES (see Section 3.5), and the very low detail with which data are collected on food consumed away from home (Section 3.6). A higher percentage of surveys can succeed in calculating dietary diversity using the second-best method, but it is still quite low, at only 15 percent.[58] The conclusion must therefore be that the large majority of HCES do not contain the appropriate information for calculating dietary diversity.

Quantities consumed of individual foods. As shown in Section 3.8, given that foods of interest can be identified, it is possible to measure metric quantities consumed of individual foods for 53 percent of the assessment surveys when only food consumed at home

54 While this list contains 14 food groups, dietary diversity indices can contain a wide range of numbers of groups. For example, the index used by Arimond and Ruel (2004) contains seven groups while the index used by FAO (2013) contains 16.

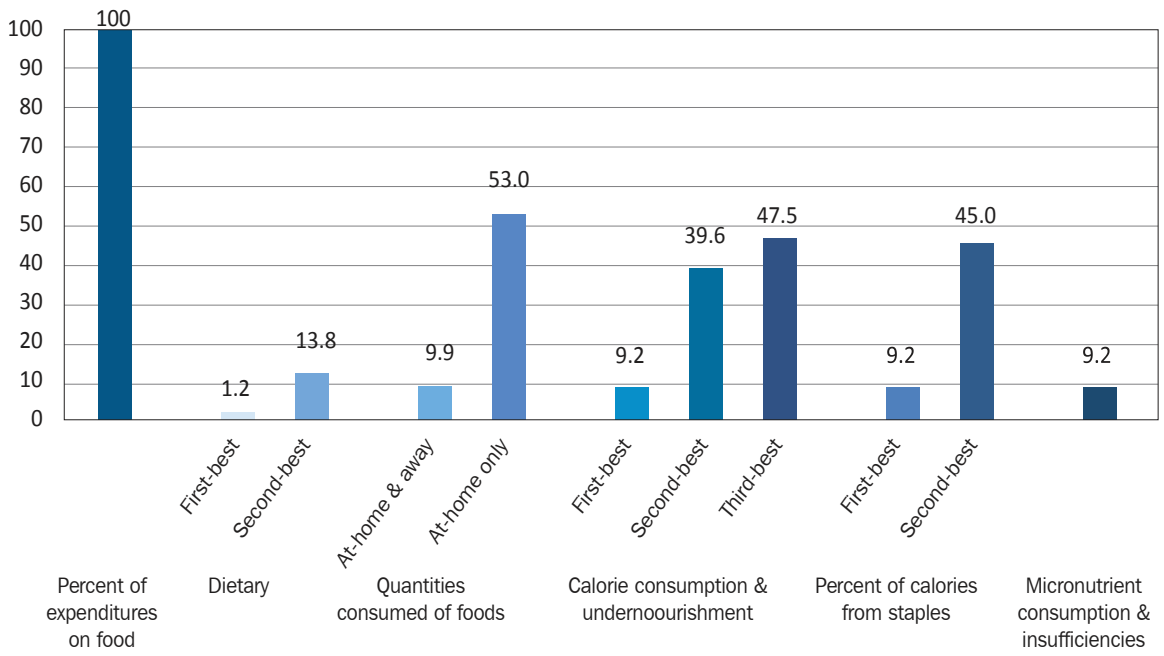
55 A more stringent condition for future assessments would be that, as for foods consumed at home, all food items consumed away from home other than prepared dishes fall into one and only one of the BFG food groups.

56 Only one of the 29 assessment surveys for which data were collected on more than one specific food and dishes consumed away from home collected data from which is it possible to determine the ingredients in multi-ingredient dishes.

57 This percentage is based only on the 87 surveys with no missing data.

58 This percentage would be even lower if the criteria were restricted to include only consumption surveys. Such a restriction would make sense since, strictly speaking, food acquisition data do not perfectly map food consumption data over limited time periods (e.g., one month or less) because of different frequencies of consumption and acquisition for some foods.

Figure 12: Percent of surveys for which various food security indicators can be measured



Note: See text for definitions of the First-best, Second-best and Third-best methods.
For "Quantities consumed of foods" the two options presented correspond to assumptions that (1) both food consumed at home and away from home must be included in estimates; and (2) only at-home food needs to be counted.

is considered. When food consumed away is considered as well, it is possible for 9.9 percent of the surveys. Analysts will need to determine whether a substantial enough proportion of a food of interest is consumed away from home to necessitate its inclusion for accurate calculation of total consumption.

Calorie consumption and undernourishment. From Section 4.1, calorie consumption and undernourishment can be estimated using the data in nine percent of the surveys using the first-best (most accurate) method, 40 percent of surveys using the second-best method, and 48 percent using the third-best method (see Table 6).

Percentage of calories from individual foods/food groups. To calculate the percentage of calories from staples, use the first-best and second-best methods applied to the Cost of Basic Needs (CBN) method of measuring a national poverty line. Both of these measures require food identification and the ability to measure metric quantities of individual foods consumed. The first-best method can be used for 9.2 percent of the assessment surveys and the second-best for 45 percent.

Protein and micronutrient consumption and insufficiencies. The same basic data required for estimating calorie consumption are required for estimating protein and micronutrient consumption. In this case, however, it is not possible to estimate the nutrient content of unidentified foods consumed at home or away from home using the data on identifiable foods with any reasonable accuracy. This is because, as compared to calories, protein and micronutrients are very food-specific, found only in high concentrations in particular sub-sets of food. For example, Vitamin A is concentrated in liver, milk, egg yolks, green leafy vegetables and certain yellow fruits and vegetables. Iron is most plentiful and bio-available in meat (Caulfield et al. 2006). Thus, only the first-best method applies, and 9.2 percent of the assessment surveys can be employed for measuring protein and micronutrient consumption (Figure 12).

If prior information is available that the unidentified foods consumed at home and food consumed away are

of minimal importance in the diet, however, reasonably accurate estimates of protein and micronutrient consumption can be made when these foods are not considered in the analysis. In this unlikely case, the ability to convert to metric quantities for the identified at-home foods is all that is needed for measuring protein and micronutrient consumption.[59]

Note that the discussion of edible portions and nutrient conversion, as well as food partakers for measuring per-capita nutrient consumption and nutrient insufficiencies, applies here as well. With respect to nutrient conversion, a commonly cited issue is that since micronutrient composition can vary greatly depending on form and variety, some food items are listed far too ambiguously for matching with the appropriate food item in a food composition table.[60]

To summarize, when it comes to food security the food data collected in current HCES are more relevant for measuring some indicators than others. All surveys can be used for measuring the percent of expenditures on food. In the unlikely circumstance that food is only consumed by at country's population at home, it is possible to measure quantities of foods consumed using the data collected in just over half of the surveys. When food consumed away from home is also part of the diet, these quantities can be calculated for only 10 percent of the surveys. When the least-accurate, "third-best" method is used for measuring calorie consumption and undernourishment, 48 percent of surveys can be used for this purpose. The assessment finds that two important food security indicators —dietary diversity and micronutrient consumption and insufficiencies— can be measured with reasonable accuracy for only a few current HCES (less than 15%).

59 As seen above, conversion to metric quantities is possible for 53 percent of surveys when only at-home food is considered and for 9.9 percent when both at-home and away-from-home food are included.

60 With respect to variety, Rambeloson Jariseta et al. (2012) cite the example of the Uganda HCES in which "beans" is listed as a food item yet the FCT employed contains two types of beans: "white, dried, boiled", which has 90 mg. of calcium, 2.7 mg. of iron and 2.7 mg of zinc per 100 grams, and "kidney, fresh, boiled", which has 31 mg. of calcium, 1.7mg of iron, and 0.6 mg of zinc per 100g. With respect to form, the micronutrient content of many foods changes depending on whether it is in its raw or cooked form. In some cases special adjustment factors that take into account changes in nutrient content due to processing and cooking can be used to estimate nutrient consumption (Gibson and Ferguson 1999).

4.2.3 Informing the compilation of food balance sheets

HCES data can serve different functions in the compilation of food balance sheets, and different factors come into play in facilitating or hindering the different tasks. Even in the best of cases, HCES data provide only a partial contribution to food balance sheet compilation, which hinges on the availability of other data as well (e.g. food production, imports and export).

As discussed in Chapter 2, the food data collected in HCES can be used to inform FBSs in four ways: (1) The quantities consumed of particular foods can be used to help estimate the production of the foods; (2) The quantities of own-produced foods consumed can be used to estimate subsistence food production; (3) Quantities consumed of all foods can be used to provide consistency checks of consumption patterns, with the FBS patterns being based on the 19 FBS food groups; and (4) Calorie consumption estimates can provide consistency checks of per-capita dietary energy supply estimates from FBS.

Assuming the particular foods of interest can be identified, (1) above requires that metric quantities of foods consumed can be estimated. This is the case for 9.9 percent of the assessment surveys when both food consumed at home and away from home are considered. For foods for which it can be determined that consumption only takes place at home, metric quantities can be calculated for 53 percent of the surveys (see Section 3.8).

The second use requires that data are collected on the consumption of home-produced food and that it is clearly distinguished from other sources, which is the case for 84 percent of the surveys. It also requires that metric quantities of at-home foods can be calculated (53 percent of surveys). Both conditions are met by 44 percent of surveys.

For the third use, consistency checks of consumption patterns full representation of all 19 FBS food groups (listed in Table 8) in sufficient detail for analysis is needed in addition to metric quantities. At a minimum, this requires that:

- All of the FBS food groups be represented;
- Each FBS food group contains a sufficient number of food items for representing the food group; and

- All, or almost all, food items can be classified into one and only one FBS food group.

The first column of Table 8 reports on the percent of the surveys for which each food group is represented. Those most commonly left out are Tree nuts, Oil crops, Animal oils and fats, Alcoholic beverages, and Pulses. Thirty percent of the surveys meet the condition that all 19 food groups are covered. This is notably lower than that for the BFGs, which are more aggregated (see Table 2). To judge whether the FBS food groups contain a sufficient number of food items a threshold is identified according to which at least 15 of the groups contain a minimum number of items, with the minimums give in parenthesis in Table 8.[61] Thirty percent of the surveys meet this condition. Note that only four percent of the surveys contain the specified minimum number of food items for all 19 food groups. Lastly, for evaluating whether almost all food items fall into one and only one food group, the same minimum condition employed for judging the specificity of survey food lists is used, which is that less than five percent of food items must span the FBS food groups. This condition is met by 82 percent of the surveys. Overall 19 percent of the surveys meet all three conditions and can thus be used for consistency checks of FBS food consumption patterns.

Table 8: Comprehensiveness and specificity of survey food lists in relation to the Food Balance Sheet food groups

Food Balance Sheet food groups a/	Percent of surveys listing food items in group	Percent of surveys with minimum number of food items in food group
Cereals and products (5)	100.0	96.9
Roots and tubers and products (5)	96.9	44.8
Sugars and syrups and products (5)	97.9	57.3
Pulses (3)	87.5	52.1
Tree nuts (3)	52.1	16.7
Oil crops (3)	66.7	42.7
Vegetables and products (10)	99.0	74.0
Fruits and products (10)	100.0	69.8
Stimulants (3)	92.7	63.5
Spices and additives (5)	92.7	49.0
Alcoholic beverages (5)	87.5	51.0
Meat (5)	100.0	86.5
Eggs (1)	96.9	96.9
Fish and fish products (5)	99.0	55.2
Milk and cheese (5)	97.9	71.9
Vegetable oils and fats (2)	94.8	77.1
Animal oils and fats (2)	78.1	51.0
Non-alcoholic beverages (5)	93.8	25.0
Miscellaneous and prepared food (5)	93.8	59.4
All food groups	30.2	
Minimum number of food items in		
at least 15 food groups		30.2
at least 16 food groups		22.9
at least 17 food groups		18.8
at least 18 food groups		9.4
at least 19 food groups		4.2

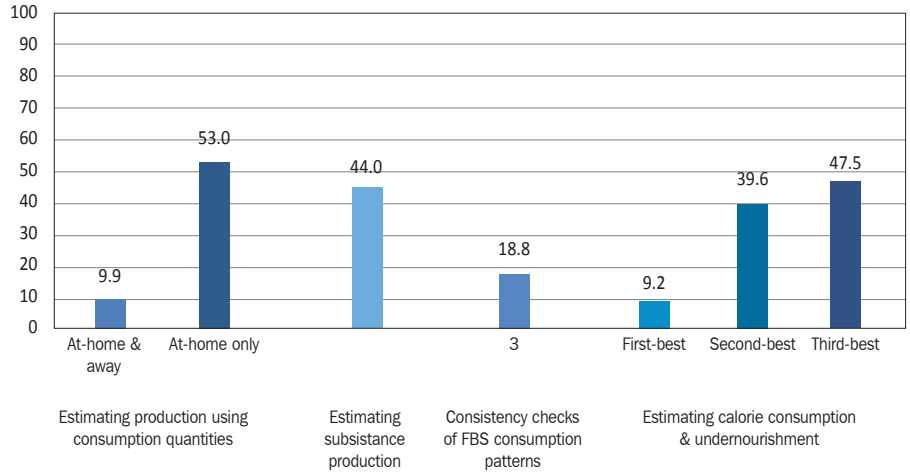
a/ The minimum number of food items for each is given in parentheses.

61 As for judging the general specificity of survey food lists (see Section 3.5), the lower-than-maximum number of 15 food groups is justified by the fact that certain food groups may be rarely consumed from among populations of some countries, and the food-group-specific minimum number of food items are chosen somewhat arbitrarily, being based on the authors' judgment of the typical variety found in each.

Finally, using calorie consumption estimates to provide consistency checks of estimates of per-capita dietary energy supply derived from FBS (number [4] above) requires that it be possible to estimate per-capita calorie consumption. Using at least the third-best method, this is the case for 47.9 percent of the assessment surveys.

Figure 13 summarizes of the percentage of surveys satisfying the requirements set for each of the four uses. If a food is judged to be only or largely consumed at home, estimates of its quantity consumed can be used to help estimate its production for just over half of the surveys. Forty four percent of surveys can be used to estimate subsistence production. Twenty five percent can be employed for providing consistency checks of FBS-based consumption patterns, and 48 percent for consistency checks of estimates of per-capita dietary energy supply using the third best method.

Figure 13: Percent of surveys for which indicators informing Food Balance Sheets can be measured



Note: See text for definitions of the First-best, Second-best and Third-best methods.

For "Estimating production using consumption quantities" the two options presented correspond to assumptions that (1) both food consumed at home and away from home must be included in estimates; and (2) only at-home food needs to be counted.

4.2.4 Informing food-based nutrition interventions

Virtually all the reviewed HCES provide the information necessary to estimate the most basic indicator for informing food-based nutrition interventions, the percentage of households consuming potentially fortifiable foods. Micronutrient consumption, on the other hand, can only be reliably estimated for a small fraction of surveys.

Focusing on food fortification, the two key pieces of information needed are (1) Which foods should be fortified? and (2) With what amount of micronutrients should they be fortified? To answer these questions, data are needed to calculate the following measures:

- The percentage of households consuming potentially fortifiable foods
- The percentage of households purchasing potentially fortifiable foods
- Quantities consumed of potentially fortifiable foods by entire populations and target age and sex groups
- Micronutrient consumption of entire populations and of target age and sex groups.

Before determining whether the assessment surveys can be used to calculate these measures, it is important to address what is considered to be a basic shortcoming of HCES for informing food-based nutrition interventions. Food lists often do not contain all of the food items containing potentially-fortifiable foods of interest, including primary commodities and processed foods (Fiedler, Carletto and Dupriez 2012; Coates et al. 2012). It was not possible to assess this food list problem for the assessment surveys as a group because which specific foods are consumed varies by setting. Data were collected on whether survey food lists contain some common fortifiable foods individually, however. A full 81 percent of the surveys listed sugar, a common vehicle for Vitamin A fortification, as a separate food item. Salt, an iodine vehicle, was listed individually for 75 percent of surveys, and vegetable oil and margarine 64 and 47 percent, respectively. The key staple grains, whether maize, wheat or rice, are contained in all survey food lists. Processed foods containing these grains, however, may not be. Some common processed foods containing staple grains along with the percentage of surveys listing them are: Flour or meal (74 percent), pasta (69), bread (81), biscuits, pastries, cakes and/or

cookies (70), and breakfast cereals or porridge (24). The assessment of the relevance of HCES for measuring the four indicators above assumes that food list identification is not a problem, but the percentages reported here confirm that it is an area in need of improvement.

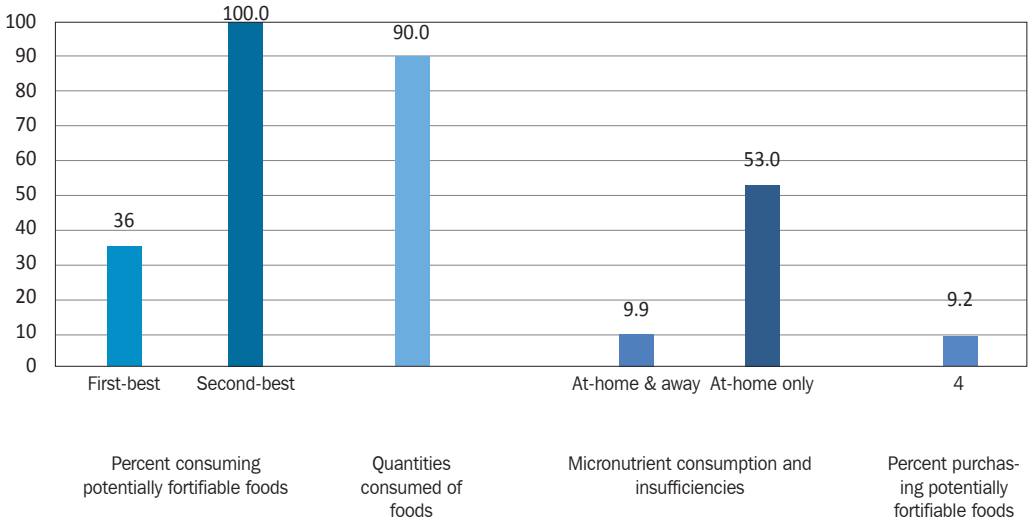
Percent of households consuming potentially fortifiable foods. This indicator is best measured using food consumption, as opposed to food acquisition, data. Food acquisition data are not always a useful proxy because the frequencies with which foods are consumed and acquired can differ greatly. Further, the difference in frequency can vary across foods, hampering identification of the optimal food vehicle. For example, households may acquire purchased salt every six months yet consume it every day. By contrast they may acquire rice every other day and eat it every day. Relying on acquisition data to compare the percentage of households consuming salt and rice over a survey recall period would lead to large underestimates for salt compared to rice.

It is therefore considered that a first-best method for measuring this indicator be applicable for the 36 percent of the assessment surveys that collected *consumption* data for all three modes of acquisition (purchases, home produced and received in kind) (see Figure 14). A second-best alternative can be used when either food consumption or acquisition data are available, which is the case for 100 percent of the surveys. Analysts should keep in mind that the second-best method can lead to highly inaccurate estimates when only acquisition data are employed and acquisition and consumption frequencies differ, as in the example in the previous paragraph.

Percent of households purchasing potentially fortifiable foods. Whether a food is amenable to being fortified with a micronutrient is reflected in whether it is industrially processed and widely obtained through market channels (Coates et al. 2012b). Thus project planners need information on the percentage of households purchasing them. This measure can be calculated using consumption or acquisition data as long as the amounts recorded are enumerated separately for food purchases. This is the case for 90 percent of the assessment surveys.

Note that what is needed is actually the percentage of households *usually* purchasing a food that is a potential fortification vehicle. Yet HCES that collect reliable food data employ a recall period of two weeks or less, and the majority is not repeated for consecutive periods over time.[62] This means that for foods that are purchased very infrequently (e.g., salt in some settings) HCES will not give an accurate idea of the percent purchasing. Further, if foods are purchased with different frequencies, relative rankings of the percentage purchasing will not be valid.

Figure 14: Percent of surveys for which indicators informing food-based nutritional interventions can be measured



Note: See text for definitions of the First-best, Second-best and Third-best methods.

For "Quantities consumed of foods" the two options presented correspond to assumptions that (1) both food consumed at home and away from home must be included in estimates; and (2) only at-home food needs to be counted.

62 See Section 3.7 for more discussion of usual consumption.

Metric quantities consumed of potentially fortifiable foods per capita and for age and sex groups. If it is assumed that the foods of interest are identifiable, then the only condition needed for measuring metric quantities consumed per capita is the ability to convert to metric quantities. When both food consumed at home and away are included, this is possible for 10 percent of surveys: it is possible for 53 percent of surveys when only at-home food is included.

The data from HCES cannot be directly used for estimating quantities consumed of foods for particular age and sex groups, such as preschool children and women. Some analysts have used the Adult Male Equivalent (AME) technique (Weisell and Dop 2012) to assign food quantities to individuals in households based on their energy needs, assuming energy-equitable distribution. Even if energy is distributed equitably according to need among household members, however, as has been found in many settings (Berti 2012), it cannot be assumed that the consumption of specific foods will also be distributed equitably. For example, children and women may not eat the same foods as men due to different preferences and social norms and place of consumption, whether at home or away from home (including work places).[63] Validation studies conducted in Cameroon (Engle-Stone 2012) and Uganda (Omar and Rambeloson 2012) comparing results between HCES data using the AME approach and from data collected in individual food consumption surveys all show significant differences for at least some foods. Although further research is needed, it may be possible to overcome this problem using statistical modeling in which the sample-wide age-sex composition of households is used to predict quantities of foods consumed by individuals (Rogers, Coates and Blau 2012; Naska, Basdekis and Trichopoulou 2001).[64]

Micronutrient consumption per capita and for age and sex groups. As discussed in Section 4.2.4, taking both food consumed at home and away from home into account, it is possible to calculate micronutrient consumption per capita for 9.2 percent of the assessment surveys.

Similar to estimation of metric quantities consumed, the data from HCES cannot be directly used for estimating the micronutrient consumption of individuals and thus age and sex groups. Using the AME approach can lead to even more inaccurate estimates than in the case of food quantities not only because of energy-inequitable distribution of food consumption but also because micronutrients are so food-specific. And, unlike energy, there is no reason to expect a behavioral component here, where household members will attempt to allocate according to needs. Validation studies conducted in Mozambique (Moursi et. al 2012), Uganda (Rambeloson Jariseta et al. 2012) and Bangladesh (Rogers, Coates and Blau 2012) comparing HCES-based AME estimates to those derived from data collected in individual food consumption surveys all show significant differences for at least some nutrients. Here again a statistical modeling approach may prove to be useful.

In general, it may be necessary for countries wishing to implement a food fortification program to alter their survey questionnaires to accommodate the program's special information requirements. Such requirements might include listing supplementary food items containing potentially fortifiable foods and collecting data on the place of acquisition of foods and the brand name purchased. For food acquisition surveys, special provision for collecting food consumption (versus acquisition) data on potentially fortifiable foods may be needed as well as clearly distinguishing between purchases and non-monetary sources of acquisition. Another important piece of information needed for planning a food fortification program is the age in months of children less than one year, whether or not women are pregnant or lactating and the breastfeeding status and duration of women and children, which are used for determining the depth of micronutrient deficiencies (Fiedler 2009; Fiedler, Carletto and Dupriez 2012).

4.2.5 Calculating consumer price indices

To provide reliable weights to calculate CPIs, HCES data must provide a detailed and comprehensive description of the (food) purchases of the population or subset of the population. All surveys provide estimates of household food purchases. Seventy-two percent satisfy the conditions of completeness of the food list, but only fifty-four percent satisfy the specificity criteria.

As mentioned in section 2.5, CPIs are calculated as weighted averages of the percentage price changes for

63 Evidence from India, for example, validates that males tend to eat out more than females (Gaiha, Jha and Kulkarni 2009; Barker et al. 2006).

64 Various techniques are available, including Engle's method, Rothbarth's method (see Deaton 1997 on "equivalence scales") and non-parametric techniques developed by Chesher (1997) and Vasdekis and Trichopoulou (2000) (cited in Vasdekis, VGS, S. Stylianous and A. Naska 2001).

a "basket" of consumer products representative of the population of interest. To be relevant, survey data must meet criteria of identification of the mode of acquisition, comprehensiveness and specificity of the food list, and (optionally) accounting for seasonality.

The goods and services consumed by the households can in principle be acquired in six ways: (i) purchase in monetary transactions, (ii) from own production, (iii) as payment in kind, (iv) social transfers in kind, (v) barter, and (vi) as transfers or gifts from other economic units. For the CPI as a general measure of inflation the more relevant would be to include only goods and services purchased in monetary transactions by the households. The weight must therefore represent the share of goods and services purchased by the consumer. A first criterion of relevance is therefore that food purchases can be distinguished from food obtained from other sources. All of the assessment surveys meet the criteria (Figure 3). Information on the place of acquisition (type of outlet) may be useful to design the sample of the price survey, but such information is rarely collected in HCES and we do not retain it as a criterion of relevance.

The HCES must also provide an accurate and relatively detailed estimate of the consumption patterns of the populations of interest, be it the national population or a subset of it (e.g., the poor). The survey food list must therefore be comprehensive and specific.

In section 3.4, we assessed the comprehensiveness of survey food lists using a set of 14 "basic" food groups that represent the types of foods making up the contemporary human diet can be used as starting point (Table 2). Three criteria were combined to judge the comprehensiveness of survey food lists. The first is that all 14 BFGs must be represented by at least one food item. Just over 80 percent of the assessment surveys meet this criterion (Table 2). The second reliability criterion relates to the percentage of foods that are processed, including prepared dishes. At least 40 percent of food items must be processed as a reliability criterion. The large majority of the surveys, 87 percent, meet this criterion. The final comprehensiveness reliability criterion is the "food exclusivity" of the list, that is, the food list must include only foods and no other commodities; 97 percent of surveys meeting the criterion. Figure 5 summarizes the percentage of countries meeting the three assessment criteria of comprehensiveness, and the percentage meeting them all. Overall, 72 percent of the assessment surveys met all three criteria.

In section 3.5, we assessed the specificity of the at-home food list using two criteria. First, a minimum number of items are expected to be listed under each one of the 14 BFGs (the criteria is actually that the condition be met for at least 10 of the 14 BFGs). Sixty-three percent of surveys meet this criterion (see Panel B of Table 2). Second, these items should belong to one and only one BFG (the criteria allowed for up five percent of the food items spanning more than one BFG). Seventy-seven percent of surveys meet the second criteria. Only 54 percent of surveys meet both food list specificity criteria (Figure 6).

Note that for assessing the comprehensiveness of the food list in the context of the CPI compilation, a different list – the Classification of Individual Consumption According to Purpose or COICOP[65] – would be more relevant. COICOP has become the *de facto* international standard for CPI classifications, in line with the requirement of SNA 2008 to use COICOP in the national accounts. The adoption of a standard classification fosters international comparability of inflation data, and is critical for specific international comparison projects such as the International Comparison Program (ICP) which produces estimates of purchasing power parities at the global level. Regional economic integration also imposes harmonization of statistical methods and practices, and COICOP is often used as the basis of classification to compile CPIs in a comparable way. (United Nations 2009)

An assessment based of the comprehensiveness and specificity of the food list based on the COICOP classification gives results which are very close to those obtained using the Basic Food Groups (sections 3.4 and 3.5). As shown in Table 9, almost all surveys cover all COICOP classes of products, with the exception of alcoholic beverages which are typically excluded from the food list in Muslim countries. But this high level of coverage masks some issues at a lower level of disaggregation. Some specific but important items are omitted in some surveys, and many surveys collect data on items that span over multiple COICOP categories, especially for fruits (48 percent of surveys), vegetables (52 percent) and alcoholic beverages (55 percent).

The last – but optional - criteria of relevance of the HCES data relates to the accounting for seasonality of food consumption patterns. "Changes over periods of less than a year are of course subject to seasonal factors and, in order to differentiate seasonal factors from

65 See Appendix 4 for a list of food products and others by COICOP categories.

Table 9: Coverage and specificity of the food list by COICOP class			
COICOP class / basic heading	**% surveys covering the class or basic heading**	**% surveys covering all basic heading in the class**	**% surveys with at least one "spanning" item in the class**
Bread and cereals	100.00	69.79	29.17
Rice	*94.79*		
Other cereals, flour and other products	*98.96*		
Bread	*91.67*		
Other bakery products	*84.38*		
Pasta products	*81.25*		
Meat	100.00	59.38	37.50
Beef and veal	*82.29*		
Pork	*76.04*		
Lamb, mutton and goat	*76.04*		
Poultry	*93.75*		
Other meats and meat preparations	*88.54*		
Fish and seafood	98.96	81.25	41.67
Fresh, chilled or frozen fish and seafood	*84.38*		
Preserved or processed fish and seafood	*83.33*		
Milk, cheese and eggs	100.00	65.63	39.58
Fresh milk	*86.46*		
Preserved milk and other milk products	*91.67*		
Cheese	*71.88*		
Eggs and egg-based products	*95.83*		
Oils and fats	100.00	85.42	23.96
Butter and margarine	*85.42*		
Other edible oils and fats	*96.88*		
Fruits	100.00	77.08	47.92
Fresh or chilled fruits	*94.79*		
Frozen, preserved or processed fruit and fruit-based products	*80.21*		
Vegetables	100.00	89.58	52.08
Fresh or chilled vegetables other than potatoes	*98.96*		
Fresh or chilled potatoes, and other tuber vegetables	*96.88*		
Frozen, preserved or processed vegetables and vegetable-based products	*91.67*		
Sugar, jam, honey, chocolate and confectionery	97.92	73.96	23.96
Sugar	*94.79*		
Jams, marmalades and honey	*84.38*		
Confectionery, chocolate and ice cream	*81.25*		
Food products n.e.c	96.88	96.88	34.38
Non-alcoholic beverages	98.96	90.63	39.58
Coffee, tea and cocoa	*92.71*		
Mineral waters, soft drinks, fruit and vegetable	*94.79*		
Alcoholic beverages	91.67	15.63	55.21
Spirits	*68.75*		
Wine	*61.46*		
Beer	*72.92*		
Stimulants	*28.13*		
All COICOP food class representation *	**89.58**		

N=96 (Brazil, Georgia, Montenegro, and Russia); * Excluding pork and alcoholic beverages = 95.83 %

other factors, it is necessary to make estimates of seasonal effects and to note them as factors that have contributed to changes in the index. Although the CPI itself is not usually seasonally adjusted, some variants of the CPI may be seasonally adjusted, perhaps because they are more subject to seasonality and because they can be revised in retrospect if necessary. If such variants are seasonally adjusted, it is important to explain why. Seasonal adjustment usually leads to a smoother series than the original unadjusted one. There are also other ways of smoothing a monthly series, for example using three-month moving averages. Statistical offices do not usually smooth the CPI series in their published presentations. Consumer price changes are not usually so erratic from month to month as to disguise price trends. If there is an erratic change, the producers of the index can usually explain the reasons for it." (ILO/IMF/OECD/UNECE/Eurostat/WB 2004, p.228) As shown in Section 3.7, only 53 percent of surveys account for seasonality in a satisfactory manner.

4.2.6 Informing national account statistics

National accounts are compiled using data from multiple sources. This is one area where "some (good) data is better than no data", even if the data are not ideal. There is however much ground to improve the relevance of HCES data for national accounts. The necessary improvements are the same that would benefit other uses and users.

The compilation of national accounts is a complex exercise which relies on a large and diverse set of data from multiple sources. As mentioned in section 2.6, the way HCES data are used depends both on the approach (production, expenditure or income) used to generate the accounts, and on the type of update (simple update or full upgrade including change in the base year).

The income approach is the "primary" method for the compilation of national accounts in low and middle-income countries. The expenditure approach is "secondary", and household consumption is typically used as a residual component to reconcile the estimates obtained using both methods.

HCES are however an important source of data on household own production (which is needed for the income approach), and on household expenditures (if only for cross-validation of other sources of data).

The relevance of HCES for national accounts can be assessed based on the following criteria:

- For the CPI, the food list must be comprehensive and specific. Seventy-two percent satisfy the conditions of completeness of the food list as described in section 4.2.5, but only 54 percent satisfy the specificity criteria. An assessment based on the COICOP classification would lead to similar conclusions.
- Contrary to CPI, data must be available (separately) for each one of the main three sources from which food can be acquired for at-home consumption (market purchases, own production and received in-kind). Overall, 85 percent of countries collected data on all three sources, leaving 15 percent not meeting the minimum reliability criteria in this area (see Figure 3 and section 3.2).
- Last, the data should represent the household consumption over the whole year, and seasonality should thus be accounted for. Only 53 percent of surveys account for seasonality in a satisfactory manner (see section 3.7).

4.2.7 Meeting private sector information needs

If HCES data are made more reliable and relevant for CPI and national accounts, their reliability and relevance for use by the private sector will be equally increased.

The private sector will be mainly interested in measuring and projecting the levels and patterns of consumption. For this purpose, the criteria of completeness and specificity of the food list, and of comprehensiveness (i.e. identification of the mode of acquisition), must be met. The use of HCES data by the private sector – a non-traditional user of these data – do not add any particular requirement to the list of requirements for other uses identified above, in particular the compilation of CPI and national accounts. The results of the assessment can thus be found in sections 4.2.5 and 4.2.6.

4.3 Summary

Table 10 gives a snap shot of this study's findings on the relevance of current HCES for the various users. It repeats Table 4 in designating the indicators needed for various uses, but adds the percentage of assessment surveys for which the appropriate data are available for calculating each needed indicator. In cases where more than one method is available, the method applicable to the highest percentage of surveys is given. It should be kept in mind that this is also the method likely to yield the least accurate, yet still reasonably reliable, estimates.

Roughly half of the surveys can be used for measuring poverty, whether using the FEI or the CBN method.

In the case of food security, survey relevance depends on the indicator of interest. Calorie consumption and undernourishment, important indicators of diet quantity, can be measured for just under half of the surveys. Obtaining accurate indicators of dietary quality is limited to a minority of surveys: When food consumed away from home is taken into account, 10 percent of the surveys can be used to calculate quantities consumed of individual foods, nine percent for calculating macro and micronutrient consumption and insufficiencies, nine percent for calculating the percent of expenditures on staples, and 14 percent for calculating dietary diversity. By contrast, the measure of economic vulnerability to food insecurity—the percent of expenditures on food—can be calculated for 100 percent of the surveys.

Close to half of all surveys can be employed for informing FBSs in two important ways: (1) providing consistency checks of per-capita dietary energy supply and undernourishment estimates; and (2) estimating subsistence production of foods. Near 20 percent of surveys can be used to provide consistency checks of FBS consumption patterns, and 10 percent can be used to help estimate production of foods using estimates of the quantities of foods consumed.

Turning to informing food-based nutrition interventions, all or nearly all surveys can be used for measuring the percentage of households consuming and purchasing individual foods, an important piece of information needed for identifying fortifiable foods. Note, however,

that if consumption and acquisition frequencies differ greatly, food acquisition data will give inaccurate estimates of the percentage of households consuming individual foods. On the other hand, less than 10 percent of surveys can be used for estimating the quantities of individual foods consumed and micronutrient insufficiencies.

Although many surveys meet some of the relevance criteria for national accounts, CPI and private sector, half of them only meet all criteria.

Clearly, improvements could be made in the ways the food data are collected in contemporary HCES that would enable much greater use of them by a wide field of users.

Table 10: Summary of results on relevance, by use and indicators needed (Percent of surveys for which indicators can be calculated)

Indicators	Uses/users							
	Measuring poverty		Calculating Consumer Price Indices	Informing National Account Statistics	Measuring food security	Informing food balance sheets	Informing food-based nutritional interventions	Meeting private sector needs
	Food-energy intake method	Cost of Basic Needs method						
Quantities consumed of individual foods				9.9 a/	9.9 a/	9.9 a/	9.9 a/	
Calorie consumption and undernourishment	47.5				47.5	47.5		
Calories consumed from individual foods/food groups		45.0			45.0			
Protein & micronutrient consumption and insufficiencies					9.2		9.2	
Dietary diversity					13.8			
Percent of households consuming individual foods							100 b/	
Percent of households purchasing individual foods							90	
Percent of expenditures on individual foods or food groups								
Expenditures on individual foods by source								
Percent of expenditures on food					100			
Estimating subsistence production						44.0		
Consistency checks of FBS consumption patterns						18.8		

a/ If only food consumed at home is taken into account 53 percent of surveys can be used.

b/ If it is not appropriate to use food acquisition data due to large differences in relative consumption/acquisition frequencies, then 36 percent of surveys can be used.

5. Conclusions and recommendations for improving reliability and relevance

The food data collected in national developing-country HCES are currently being used for a wide variety of purposes and by a wide variety of users; they have the potential to be exploited by an even broader set of users. The surveys are a primary information base for critical development decisions, both at the country level and worldwide. These decisions pertain to important dimensions of human well-being such as poverty, food insecurity and nutritional well-being, and to the effective running of national economies. Most of the women and men who are survey respondents give freely of their time to impart such valuable information. The international development community bears responsibility for ensuring that the data are reliably collected and made full use of for bettering their lives and those of their fellow citizens. The reliability and relevance of HCES are not only efficiency issues from a resource point of view but are also crucial to the success of the development mission.

5.1 Recommendations for improving reliability

As shown in this report, many basic reliability criteria are met by the large majority of current HCES, including those regarding the inclusion of data from all three acquisition modes, accounting fully for all food acquired or consumed, ensuring comprehensive coverage of the foods consumed by countries' populations, and the recall period for at-home food data collection. Close to or less than half of all current HCES, however, did not meet the criteria regarding seasonality, the specificity or detail of foods lists, and the quality of data collected on food consumed away from home. The assessment thus identified three priority areas that must be addressed to ensure a reliable information base for development decision making in the future. Improvements in these areas are a concern of all users of the data regardless of which indicators they aim to measure. These priority areas, listed in order of the percentage of the assessment surveys for which they are deemed to be problems, are:

Food consumed away from home. Collect data on food consumed away from home in all future HCES. Employ a recall period of two weeks or less, and collect data on both purchases and food received in kind.

Accounting for seasonality. All HCES survey designs should spread data collection across a full year's time in order to capture seasonal variation in food consumption and expenditure patterns.

Specificity of survey food lists. Ensure that survey food lists are sufficiently detailed to accurately capture consumption of all major food groups making up the human diet.[66]

Addressing these three key areas alone will lead to major improvements in the accuracy of indicators measured using the data.

Other basic best practices that should be followed, but are not for many, in the design of all surveys are to:

- Collect data on all three sources from which food can be acquired, including purchases, consumption of home-produced food, and food received in kind;
- Rectify accounting errors in the design of survey consumption and expenditure modules to ensure complete enumeration of either all food acquired or all food consumed over the recall period;
- Ensure that survey food lists cover all foods consumed by populations, including processed foods; and
- Employ a recall period of two weeks or less for the collection of data on food consumed at home.

5.2 Recommendations for improving relevance

The assessment finds that much can be done to increase the relevance of the food data collected in developing-country HCES so that they can be more widely used. The following priority areas would greatly increase the relevance of the data, enabling a substantial number of additional surveys to be used for a wide breadth of uses: Poverty measurement, NAS compilation, food security measurement, and informing FBSs and food fortification programs.

- **Collect the appropriate data for calculating metric quantities of foods**. In most developing country settings this requires (1) actually collecting data on quantities of

66 In the case of diary surveys the food list referred to is the "analytical" food list compiled by data processors post data collection and included in the survey data set.

food acquired or consumed; and (2) collecting complementary data on the metric weights of foods reported in local units of measure. Doing so enables calculation not only of metric quantities of foods consumed, which are useful in and of themselves, but also calorie, protein and micronutrient consumption and insufficiencies.

- **Collect data on the specific foods and prepared dishes consumed away from home.** This improvement would also greatly increase the accuracy of estimates of metric quantities of foods consumed and enable more accurate estimation of nutrient consumption and insufficiencies.
- **Ensure that survey food lists are sufficiently detailed such that foods can be identified for classification into food groups and conversion to nutrient content.** This would improve the reliability of almost all of the indicators needed by contemporary users, but is especially critical for accurate estimation of nutrient consumption and dietary diversity.

Additional recommendations that would benefit multiple users are to:

- **Clearly distinguish among the sources from which food is acquired (purchases, home production, and received in-kind)** so that consumption and/or acquisition of food from these sources can be enumerated individually. Doing so enables the estimation of purchasing frequencies, cash expenditures on food items, and subsistence production;
- **Collect data on food given to non-household members**, which are needed for accurate calculation of per-capita indicators and nutrient insufficiencies.

It is important to keep in mind that the needs of some users may be best met by temporarily modifying existing surveys in specific countries of interest, perhaps for a random sub-set of households. For example, for planning food fortification programs it may be useful if data were collected in more detail on commonly fortifiable foods of interest. Further, additional data not normally collected in HCES could be collected on individual household members, such as detailed ages of children and the pregnancy and breastfeeding status of women. This country-specific approach might also be applicable to the information needs of FBS, since the FBS food groups are especially detailed.

5.3 General recommendations

We also recommend the following.

Produce practical guidelines for collecting and processing the food data in HCES.

General guidelines are needed for data producers that ensure minimum reliability of the resulting data. Further guidelines, in some cases updates of existing guidelines, are needed for specific uses of HCES data, such as measuring poverty, calculating CPIs, measuring various indicators of food security, and producing the information needed for planning food fortification programs. There is particularly urgent need for practical guidance in (1) measuring food consumed away from home using HCES data; (2) calculating the number of food partakers; and (3) creating food lists that can be matched with food items in FCTs.

Improve survey documentation

A number of problems were encountered in getting the basic information needed for conducting the assessment due to poor documentation of the survey methods and/or process. To guarantee the replicability of the survey operation, and to reduce the risk of improper use of the data, detailed documentation of all stages of the survey life cycle and of the dataset is critical. International recommendations and metadata standards are available for this purpose.[67]

Make HCES microdata more accessible to the research community

HCES are complex and expensive undertakings. But the data they provide are potentially relevant for many uses and users. To maximize the return on these significant investments in data collection—and to further justify these investments—the datasets should be made more accessible to the research community. Ethical and legal considerations must obviously be taken

67 See for example as the Generic Statistical Business Process Model (GSBPM) and the Generic Statistical Information Model (GSIM) (www1.unece.org/stat/platform/display/metis/METIS-wiki), or the Data Documentation Initiative (DDI) metadata standard (www.ddialliance.org).

into account, and the privacy of respondents must be guaranteed. Techniques are available to manage the disclosure risk, and appropriate dissemination policies will offer additional guarantees that the data will be used for legitimate purposes by *bona fide* users. (Dupriez and Boyko 2010)

Conduct research needed to improve the reliability and relevance of HCES

During the assessment many unresolved issues were encountered. We recommend that the research outlined in the next section be conducted to resolve these issues.

5.4 Key outstanding research questions

This assessment has identified the following important areas for future research, including collecting existing evidence and conducting new empirical studies where necessary.

1. How well are food and nutrient consumption measured when food acquisition data are collected in HCES? Can population mean consumption be adequately approximated as the theory implies? Can nutrient deficiencies, including undernourishment, be estimated with reasonable accuracy based fully on the food acquisition data, or must a (nonparametric) modeling approach be used?
2. How well is food consumption measured using HCES consumption data? Can it be reliably measured using recall periods greater than 24 hours, the traditional norm?
3. Which methods of converting collected food acquisition/consumption data to metric units yields the most accurate estimates of metric quantities? Does this vary by setting?
4. What are the data collection requirements for capturing "usual" consumption? How many times would data need to be collected from households (in a panel) and for what length of observation period to be able to capture it? What difference does extending reference periods and conducting repeat visits actually make to estimates of poverty and nutrient insufficiencies? Is it worth the extra resource investment?
5. What is the best method for collecting data on food away from home? Can reasonably accurate estimates of calorie consumption be calculated when the shortcut method of collecting only total expenditures on food away is employed?
6. How well can age and sex -specific food and nutrient consumption be estimated using HCES data? Can energy-equitable distribution be assumed? Can statistical modeling techniques instead yield accurate estimates?

5.5 Conclusion

The primary purpose of this assessment is to determine the degree to which the food data in contemporary HCES are reliably collected—that is, reflect the "true" food consumption of households in a country's population—and are relevant to users, or fit for specific purposes. The assessment found great variety across surveys in data collection methods and thus in both reliability and relevance. This points to many areas where survey design and questionnaires can be improved. Small improvements can sometimes lead to a significant increase in reliability and thus great improvements in measurement accuracy. They can also dramatically increase use of the data, leading to wider development benefits in terms of information for research, development policy making, and program implementation at little or no additional cost.

We understand that changes in questionnaire design may cause breaks in data series, and some may entail costs to statistical agencies. But the wider benefits certainly outweigh these costs. And making the recommended changes at this point in history is particularly timely: household consumption habits are shifting with urbanization and globalization, and HCES must adapt to these changes as well.

Appendix 1. Methodology of the assessment

A1.1 Formulation of the assessment criteria

In preparation for selecting the criteria used for assessing the food data collected in HCES, an annotated bibliography was prepared to ensure that all current knowledge on the subject was fully taken into account. Next, a list of the main current and potential uses and users of the food data in HCES was produced, and a review of their data needs was conducted, which formed the basis of Chapter 2 of this report. After discussion among representatives of the participating institutions a preliminary list of criteria was prepared. In January 2012 the representatives and other knowledgeable experts met at FAO in Rome to finalize the criteria and discuss technical issues related to their incorporation into an assessment form.

An attempt was made to identify clear, quantitative cut offs for meeting assessment criteria in order to avoid ambiguity and maintain objectivity. While these cut-offs are in many cases by necessity based on intuitive judgments rather than scientific evidence, they are intended to serve as a point of reference for prioritizing areas needing improvement and for tracking reliability and relevance across countries and, eventually, over time. It would be useful in future studies to conduct sensitivity analyses to determine the robustness of the cut-offs with respect to accurate measurement of indicators of interest.

A1.2 Assessment form development, external review and pre-testing

A preliminary draft of the assessment form was prepared in February 2012. Following, an external review was conducted, with comments received from experts from the following institutions: FAO's, Nutrition and Consumer Protection Division, Tufts University Friedman School of Nutrition Science and Policy, International Food Policy Research Institute, the Department of Economics of the University of Waikato, and the Food Security Analysis Unit of the United Nations World Food Program. Taking into account the comments, a final draft was completed in March 2012. A pre-test was conducted on 8 surveys selected to cover the wide variety of data collection modes found in contemporary HCES. Three analysts independently filled in the assessment form for each survey. After revisions based on the pre-test, the final form was prepared, and the assessment was launched on April 6, 2012. It was completed in August 2012.

The assessment form, which was put into electronic format using Adobe Livecycle Designer ES 8.2, can be found on the IHSN website at http://www.ihsn.org/home/sites/default/files/resources/HCES_Food_Assessment_Questionnaire_v3.pdf.

It should be noted that while the form served its main intended purposes, during the course of the data collection and analysis areas for improvement of the form for future assessments were identified. In addition to corrections of minor coding errors, in some cases instructions for filling the form need clarification. In others, additional answer options are needed to reflect the full variety of data collection methods encountered.

A1.3 Surveys and documentation employed

The priority in selecting the assessment surveys was to include the most recent HCES from each developing country. However for some countries either no survey was available, there was insufficient documentation with which to conduct the assessment, or insufficient documentation with which to assess the most recent survey. The final set of 100 surveys thus represents the most recent, sufficiently-documented surveys conducted in developing countries. Appendix 2 contains a list of the surveys. Only surveys that are intended to be nationally representative are included in the assessment.

Figure 1 reports the regional breakdown and years of data collection of the surveys. The highest number (40) is from Sub-Saharan Africa, and the lowest (5) from the Middle East and North Africa (MENA). Overall, 70 percent of the developing countries are represented, with South Asia having the highest representation—all eight of its countries—and MENA the lowest.[68] The earliest year of data collection for a survey is 1993 (Guinea-Bissau), and the latest is 2012 (Vanuatu). The majority of the surveys were administered between 2005 and 2009.

Most of the information used to conduct the assessment was obtained from survey questionnaires, interviewer manuals, and survey reports. In some cases additional information was obtained from research publications and survey implementing organizations. It was agreed that in order to preserve impartiality and to as far as possible ensure equality of information across surveys, the actual data collected would not be used for the assessment.[69]

A1.4 Data analysis

The majority of the analysis for this report is based on the data set extracted from the assessment forms. This data set in excel format can be found on the IHSN web site at http://www.ihsn.org/home/node/34. In cases where a criterion could not be assessed using the data obtained directly from the forms themselves, additional information was taken from the country survey questionnaires. In these cases the additional information is recorded in the STATA SE 11 syntax files used for the data analysis.

Note that in some cases information was not available for all 100 surveys for assessing whether a criterion was met. In such cases the data are treated as missing values, and the percent of surveys meeting the criterion is recorded in real number format rather than as a whole number. Thus readers will find some percentages recorded, for example, as "79.6" rather than the "80" that would be expected when the calculation was made for all 100 surveys. Note also that the report does not present the assessment findings by region because of their highly unequal representation.

68 Sub-Saharan Africa is represented by 85% of its countries, East Asia and the Pacific by 54%, Middle East and North Africa by 39%, Europe and Central Asia by 78%, and Latin America and the Caribbean by 55%. World Bank country and lending groups are used for regional classifications (World Bank 2012).

69 Not all the survey data sets for the surveys included in the assessment were available for analysis.

Appendix 2. List of assessment surveys

Country	Year	Survey
Afghanistan	2007	National Risk and Vulnerability Assessment (NRVA) 2007-2008
Albania	2005	Living Standards Measurement Survey (LSMS) 2005
Angola	2008	Inquérito Integrado Sobre o Bem Estar da Populaçao (IDR II e MICS III) 2008-09
Armenia	2009	Integrated Living Conditions Survey (ILCS) 2009
Azerbaijan	2001	Household Budget Survey (HBS) 2001
Bangladesh	2010	Household Income and Expenditure Survey (HIES) 2010
Belarus	2002	Household Sample Survey (HSS) 2002
Belize	2008	Household Expenditure Survey (HES) 2008-2009
Benin	2003	Questionnaire des Indicateurs de Base du Bien-être (QUIBB) 2003
Bhutan	2007	Bhutan Living Standards Survey (BLSS) 2007
Bolivia	2007	Encuesta Continua de Hogares (ECH) 2007
Bosnia and Herzegovina	2004	Living Standards Measurement Survey (LSMS) 2004 (Wave 4 Panel)
Brazil	2008	Pesquisa de Orçamentos Familiares (POF) 2008-2009
Bulgaria	2003	Multitopic Household Survey 2003
Burkina Faso	2009	Enquête sur les Conditions de Vie des Ménages (ECVM) 2009-2010
Burundi	2006	Questionnaire des Indicateurs de Base du Bien-être (QUIBB) 2006
Cambodia	2009	Cambodia Socio-Economic Survey (CSES) 2009
Cameroun	2007	Troisième Enquête Camerounaise auprès des Ménages (ECAM3) 2007
Cape Verde	2001	Inquerito as Despensas e Receitas Familiares (IDRF) 2001
Chad	2003	Enquête sur la Consommation et le Secteur informel au Tchad (ECOSIT) 2002-2003
Colombia	2010	Encuesta Nacional de Calidad de Vida (ENCV) 2010
Congo, Dem. Rep.	2004	Enquête Nationale du Type 1-2-3 auprès des Ménages 2004
Côte d'Ivoire	2008	Enquête sur le Niveau de Vie des Ménages (ENVM) 2008
Djibouti	1996	Enquête Djiboutienne auprès des Ménages - Indicateurs Sociaux (EDAM-IS) 1996
Dominica	2002	Survey of Living Conditions (SLC) 2002
Ecuador	2005	Encuesta Condiciones de Vida – Quinta Ronda (ECV) 2005-2006
Egypt	1999	Egypt Integrated Household Survey (HIS) 1999
El Salvador	2009	Encuesta de Hogares de Propósitos Múltiples (EHPM) 2009
Ethiopia	2004	Household Income, Consumption and Expenditure Survey (HICES) 2004-2005
Fiji	2002	Household Income and Expenditure Survey (HIES) 2002-2003
Gabon	2005	Enquête Gabonaise pour l'Evaluation et le Suivi de la Pauvreté (EGEP) 2005
Gambia	2003	Integrated Household Survey on Consumption Expenditure and Poverty Level Assessment (HIS) 2002-2003
Georgia	2007	Household Integrated Survey (HIE) 2007
Ghana	2006	Ghana Living Standards Survey IV (GLSS IV) 2006
Guatemala	2006	Encuesta Nacional de Condiciones de Vida (ENCOVI) 2006

Guinea	2007	Enquête Légère pour l'Evaluation de la Pauvreté (ELEP) 2007
Guinea-Bissau	1993	Inquerito ao Consumo e Orçamentos Familiares)ICOF) 1993
Honduras	2004	Encuesta Nacional de Condiciones de Vida (ENCOVI) 2004
India	2009	National Socio-Economic Survey Sixty-Sixth Round (NSS) 2009-2010
Indonesia	2002	National Social Economic Survey (SUSENAS) 2002
Iraq	2006	Household Socio Economic Survey (HSES) 2006
Jamaica	2007	Jamaica Survey of Living Conditions (JSLC) 2007
Kazakhstan	2009	Household Budget Survey (HBS) 2009
Kenya	2005	Integrated Household Budget Survey (KHIBS) 2005
Kosovo	2000	Living Standards Measurement Survey (KLSS) 2000
Lao PDR	2007	Household Expenditure and Consumption Survey (HECS) 2007-2008
Latvia	2007	Household Budget Survey (HBS) 2007
Lesotho	2002	Household Budget Survey (HBS) 2002-2003
Liberia	2007	Core Welfare Indicators Questionnaire (CWIQ) 2007
Lithuania	2003	Household Budget Survey (HBS) 2003
Madagascar	2005	Enquête Permanente auprès des Ménages (EPM) 2005
Malawi	2004	Second Integrated Household Survey (IHS) 2004
Maldives	2004	Vulnerability and Poverty Assessment Survey II (VPA) 2004
Mali	2006	Enquête Légère Intégrée auprès des Ménages (ELIM) 2006
Mauritania	2004	Enquête Permanente sur les Conditions de Vie des Ménages (EPCVM) 2004
Mexico	2010	Encuesta Nacional de Ingresos y Gastos de los Hogares (ENIGH) 2010
Mongolia	2007	Household Socio-Economic Survey (HSES) 2007-2008
Montenegro	2009	Household Budget Survey (HBS) 2009
Morocco	2000	Enquête nationale sur la Consommation et les Dépenses des Ménages (ENCDM) 2000-2001
Mozambique	2008	Inquérito aos Orçamento Familiares (IOF) 2008-2009
Myanmar	2006	Household Income and Expenditure Survey (HIES) 2006
Nepal	2010	Nepal Living Standards Survey (NLSS) 2010
Nicaragua	2005	Encuesta Nacional de Hogares sobre Medición de Nivel de Vida 2005
Niger	2007	Enquête Nationale sur le Budget et la Consommation des Ménages (ENBC) 2007
Nigeria	2010	Nigeria General Household Survey (GHS) 2010
Pakistan	2004	Pakistan Social and Living Standards Measurement Survey (PSLM) 2004-2005
Panama	2008	Encuesta de Niveles de Vida (ENV) 2008
Papua New Guinea	1996	Papua New Guinea Household Survey (HS) 1996
Paraguay	2000	Encuesta Integrada de Hogares (ENH) 2000
Peru	2010	Encuesta Nacional de Hogares - Condiciones de Vida y Pobreza 2010
Philippines	2006	Family Income and Expenditure Survey (FIES) 2006
Republic of Congo	2005	Enquête Congolaise Auprès des Ménages pour l'Evaluation de la Pauvreté (ECOM) 2005
Republic of the Marshall Islands	2002	Household Income and Expenditure Survey (HIES) 2002

Romania	2007	Household Budget Survey (HBS) 2007
Russia	2008	Household Budget Survey (HBS) 2008
Rwanda	2005	Enquête Intégrale sur les Conditions de Vie des Ménages (EICVM) 2005
Sao Tome e Principe	2000	Enquête sur les Conditions de Vie des Ménages (ECVM) 2000
Senegal	2005	Enquête de Suivi de la Pauvreté au Sénégal (ESPS) 2005
Seychelles	1999	Household Expenditure Survey (HES) 1999-2000
Sierra Leone	2003	Sierra Leone Integrated Household Survey (SLIHS) 2003
South Africa	2005	Household Income and Expenditure Survey (HIES) 2005-2006
Sri Lanka	2006	Household Income and Expenditure Survey (HIES) 2006-2007
St. Lucia	2005	Survey of Living Conditions and Household Budgets (SLCHB) 2005-2006
Sudan	2009	National Baseline Household Survey (NBHS) 2009
Swaziland	2000	Household Income and Expenditure Survey (HIES) 2000-2001
Tajikistan	2009	Living Standards Measurement Survey (TLSMS) 2009
Tanzania	2008	National Panel Survey (NPS) 2008-2009 (Round 1)
Thailand	2009	Household Socio-Economic Survey (HSES) 2009
Timor-Leste	2006	Timor-Leste Survey of Living Standards (TLSLS) 2006
Togo	2006	Questionnaire des Indicateurs de Base du Bien-être (QUIBB) 2006
Tunisia	2005	Enquête Nationale sur le Budget et la Consommation des Ménages (ENBCM) 2005
Turkmenistan	2003	Living Standards Measurement Survey (LSMS) 2003
Uganda	2009	Uganda National Household Survey (NHS) 2009-2010
Ukraine	2006	Household Living Conditions Survey (LCS) 2006
Union des Comores	2004	Enquête Intégrale auprès des Ménages (EIM) 2004
Uzbekistan	2000	Household Budget Survey (HBS) 2000
Vanuatu	2012	Hybrid Survey 2012-2013
Vietnam	2008	Household Living Standard Survey (HLSS) 2008
Yemen	2005	Household Budget Survey (HBS) 2005-2006
Zambia	2006	Living Conditions Monitoring Survey V (LCMS V) 2006

Appendix 3. Basic Food Groups with list of some common food items

Note: More detailed listings for the food groups "Cereals", "Roots, tubers and plantains", "Vegetables", "Fruits", and "Pulses, nuts and seeds" can be found in FAO (2013).

1. Cereals

- Wheat, amaranth, rice, maize, fonio, barley, oats, quinoa, millet, sorghum, teff

2. Roots, tubers, and plantains

- Potatoes, sweet potato, arrow root, yam, cocoyam, cassava, water chestnut, taro, sago, plantain bananas

3. Pulses, nuts, and seeds

- Beans, dry peas, lentils, chickpeas, pigeon peas, green/black grams, groundnuts (peanuts), coconuts, cashews, almonds, walnuts, sesame seeds, sunflower seeds, soybeans

4. Vegetables

- Leafy vegetables: bean sprouts, beet greens, brussels sprouts, cabbage, cassava leaves, celery, kale, lettuce, spinach, parsley, pumpkin leaves, sweet potato leaves, collard, seaweed
- Roots, bulbs, and tubers: beets, carrots, kohlrabi, leeks, onions, garlic, okra, radishes
- Other: tomatoes, broccoli, cauliflower, cucumbers, eggplant, sweet corn, pumpkins, squashes, gourds, fresh peppers, fresh beans, fresh peas, mushrooms, chives, bamboo shoots, asparagus, artichoke, zucchini

5. Fruits

- Sweet bananas, citrus fruits (orange, tangerine, grapefruit, lemon, lime)
- Fat-rich fruits: avocados, olives
- Other: apples, apricots, berries, cherries, guavas, mangoes, melons, papayas, passion fruit, kiwi, peaches, pears, pineapples, plums, jack fruit, watermelon, grapes, durian, star fruit, cactus pear, tamarind

6. Meat, poultry and offal

- Beef, pork, goat, mutton, buffalo, camel, horse, rabbit, chicken, duck, geese, pigeon, turkey, Guinea hen, insects, antelope, yak, deer, frog snake, rat

7. Fish and seafood

- Fresh fish: salmon, trout, herring, mackerel, cod, haddock, shark, whale
- Shell fish: lobster, crawfish, crab, shrimp, oyster, clam, mussel

8. Milk and milk products

- Liquid milk (cow, goat, sheep, buffalo, camel)
- Milk products: evaporated or condensed milk, powdered milk, cheese, cream, yoghurt, ice cream, cottage cheese, buttermilk, curd

9. Eggs

- Chicken eggs, duck eggs, geese eggs, turtle eggs, quail eggs

10. Oils and fats

- Vegetable oils, nut oils, palm oil, margarine, shortening, butter, ghee, lard, shea butter

11. Sugar, jam, honey, chocolate and sweets

- Sugar, honey, syrups, molasses, jams, marmalade, sugarcane, chewing gum, chocolate, candies

12. Condiments, spices and baking agents

- Vinegar, ketchup, mustard spread, mayonnaise, soy sauce, Maggi cubes, spices, baking powder, baking soda

13. Non-alcoholic beverages

- Fruit juices, soft drinks, coffee, tea

14. Alcoholic beverages

- Beers, wines, spirits

Appendix 4. Classification of Individual Consumption according to Purpose (COICOP) - Extract

Detailed description is provided for food and beverages categories only. (ND) = Non durable.
Source: http://www.ilo.org/public/english/bureau/stat/download/cpi/coicop.pdf for more detail)

01 FOOD AND NON-ALCOHOLIC BEVERAGES

01.1 FOOD

The food products classified here are those purchased for consumption at home. The group excludes: food products sold for immediate consumption away from the home by hotels, restaurants, cafe´ s, bars, kiosks, street vendors, automatic vending machines, etc. (11.1.1); cooked dishes prepared by restaurants for consumption off their premises (11.1.1); cooked dishes prepared by catering contractors whether collected by the customer or delivered to the customer's home (11.1.1); and products sold specifically as pet foods (09.3.4).

01.1.1 Bread and cereals (ND)

- Rice in all forms;
- maize, wheat, barley, oats, rye and other cereals in the form of grain, flour or meal;
- bread and other bakery products (crispbread, rusks, toasted bread, biscuits, gingerbread, wafers, waffles, crumpets, muffins, croissants, cakes, tarts, pies, quiches, pizzas, etc.);
- mixes and doughs for the preparation of bakery products;
- pasta products in all forms; couscous;
- cereal preparations (cornflakes, oatflakes, etc.) and other cereal products (malt, malt flour, malt extract, potato starch, tapioca, sago and other starches). Includes: farinaceous-based products prepared with meat, fish, seafood, cheese, vegetables or fruit. Excludes: meat pies (01.1.2); fish pies (01.1.3); sweetcorn (01.1.7).

01.1.2 Meat (ND)

- Fresh, chilled or frozen meat of:
  - bovine animals, swine, sheep and goat;
  - horse, mule, donkey, camel and the like;
  - poultry (chicken, duck, goose, turkey, guinea fowl);
  - hare, rabbit and game (antelope, deer, boar, pheasant, grouse, pigeon, quail, etc.);
- fresh, chilled or frozen edible offal;
- dried, salted or smoked meat and edible offal (sausages, salami, bacon, ham, paté , etc.);
- other preserved or processed meat and meatbased preparations (canned meat, meat extracts, meat juices, meat pies, etc.). Includes: meat and edible offal of marine mammals (seals, walruses, whales, etc.) and exotic animals (kangaroo, ostrich, alligator, etc.); animals and poultry purchased live for consumption as food. Excludes: land and sea snails (01.1.3); lard and other edible animal fats (01.1.5); soups, broths and stocks containing meat (01.1.9).

01.1.3 Fish and seafood (ND)

- Fresh, chilled or frozen fish;
- fresh, chilled or frozen seafood (crustaceans, molluscs and other shellfish, sea snails);
- dried, smoked or salted fish and seafood;
- other preserved or processed fish and seafood and fish and seafood-based preparations (canned fish and seafood, caviar and other hard roes, fish pies, etc.). Includes: land crabs, land snails and frogs; fish and seafood purchased live for consumption as food. Excludes: soups, broths and stocks containing fish and seafood (01.1.9).

01.1.4 Milk, cheese and eggs (ND)

- Raw milk; pasteurized or sterilized milk;
- condensed, evaporated or powdered milk;
- yoghurt, cream, milk-based desserts, milkbased beverages and other similar milkbased products;
- cheese and curd;
- eggs and egg products made wholly from eggs. Includes: milk, cream and yoghurt containing sugar, cocoa, fruit or flavourings; dairy products not based on milk such as soya milk. Excludes: butter and butter products (01.1.5).

01.1.5 Oils and fats (ND)

- Butter and butter products (butter oil, ghee, etc.);
- margarine (including "diet" margarine) and other vegetable fats (including peanut butter);
- edible oils (olive oil, corn oil, sunflower-seed oil, cottonseed oil, soybean oil, groundnut oil, walnut oil, etc.);
- edible animal fats (lard, etc.). Excludes: cod or halibut liver oil (06.1.1).

01.1.6 Fruit (ND)

- Fresh, chilled or frozen fruit;
- dried fruit, fruit peel, fruit kernels, nuts and edible seeds;
- preserved fruit and fruit-based products. Includes: melons and water melons. Excludes: vegetables cultivated for their fruit such as aubergines, cucumbers and tomatoes (01.1.7); jams, marmalades, compotes, jellies, fruit pure´es and pastes (01.1.8); parts of plants preserved in sugar (01.1.8); fruit juices and syrups (01.2.2).

01.1.7 Vegetables (ND)

- Fresh, chilled, frozen or dried vegetables cultivated for their leaves or stalks (asparagus, broccoli, cauliflower, endives, fennel, spinach, etc.), for their fruit (aubergines, cucumbers, courgettes, green peppers, pumpkins, tomatoes, etc.), and for their roots (beetroots, carrots, onions, parsnips, radishes, turnips, etc.);
- fresh or chilled potatoes and other tuber vegetables (manioc, arrowroot, cassava, sweet potatoes, etc.);
- preserved or processed vegetables and vegetable-based products;
- products of tuber vegetables (flours, meals, flakes, pure´ es, chips and crisps) including frozen preparations such as chipped potatoes.
- Includes: olives; garlic; pulses; sweetcorn; sea fennel and other edible seaweed; mushrooms and other edible fungi. Excludes: potato starch, tapioca, sago and other starches (01.1.1); soups, broths and stocks containing vegetables (01.1.9); culinary herbs (parsley, rosemary, thyme, etc.) and spices (pepper, pimento, ginger, etc.) (01.1.9); vegetable juices (01.2.2).

01.1.8 Sugar, jam, honey, chocolate and confectionery (ND)

- Cane or beet sugar, unrefined or refined, powdered, crystallized or in lumps;
- jams, marmalades, compotes, jellies, fruit pure´es and pastes, natural and artificial honey, maple syrup, molasses and parts of plants preserved in sugar;
- chocolate in bars or slabs, chewing gum, sweets, toffees, pastilles and other confectionery products;
- cocoa-based foods and cocoa-based dessert preparations;
- edible ice, ice cream and sorbet. Includes: artificial sugar substitutes. Excludes: cocoa and chocolate-based powder (01.2.1).

01.1.9 Food products n.e.c. (ND)

- Salt, spices (pepper, pimento, ginger, etc.), culinary herbs (parsley, rosemary, thyme, etc.), sauces, condiments, seasonings (mustard, mayonnaise, ketchup, soy sauce, etc.), vinegar;
- prepared baking powders, baker's yeast, dessert preparations, soups, broths, stocks, culinary ingredients, etc.;
- homogenized baby food and dietary preparations irrespective of the composition. Excludes: milk-based desserts (01.1.4); soya milk (01.1.4); artificial sugar substitutes (01.1.8); cocoa-based dessert preparations (01.1.8).

01.2 NON-ALCOHOLIC BEVERAGES

The non-alcoholic beverages classified here are those purchased for consumption at home. The group excludes non-alcoholic beverages sold for immediate consumption away from the home by hotels, restaurants, cafe´ s, bars, kiosks, street vendors, automatic vending machines, etc. (11.1.1).

01.2.1 Coffee, tea and cocoa (ND)

- Coffee, whether or not decaffeinated, roasted or ground, including instant coffee;
- tea, mate´ and other plant products for infusions;
- cocoa, whether or not sweetened, and chocolate-based powder. Includes: cocoa-based beverage preparations; coffee and tea substitutes; extracts and essences of coffee and tea. Excludes: chocolate in bars or slabs (01.1.8);
- cocoa-based food and cocoa-based dessert preparations (01.1.8).

01.2.2 Mineral waters, soft drinks, fruit and vegetable juices (ND)

- Mineral or spring waters; all drinking water sold in containers;
- soft drinks such as sodas, lemonades and colas;
- fruit and vegetable juices;
- syrups and concentrates for the preparation of beverages. Excludes: non-alcoholic beverages which are generally alcoholic such as non-alcoholic beer (02.1).

02 ALCOHOLIC BEVERAGES, TOBACCO AND NARCOTICS

02.1 ALCOHOLIC BEVERAGES

The alcoholic beverages classified here are those purchased for consumption at home. The group excludes alcoholic beverages sold for immediate consumption away from the home by hotels, restaurants, cafe´ s, bars, kiosks, street vendors, automatic vending machines, etc. (11.1.1). The beverages classified here include low- or non-alcoholic beverages which are generally alcoholic such as non-alcoholic beer.

02.1.1 Spirits (ND)

– Eaux-de-vie, liqueurs and other spirits. Includes: mead; aperitifs other than wine-based aperitifs (02.1.2).

02.1.2 Wine (ND)

– Wine, cider and perry, including sake;

– wine-based aperitifs, fortified wines, champagne and other sparkling wines.

02.1.3 Beer (ND)

– All kinds of beer such as ale, lager and porter. Includes: low-alcoholic beer and non-alcoholic beer; shandy.

02.2 TOBACCO

02.3 NARCOTICS

03 CLOTHING AND FOOTWEAR

03.1 CLOTHING

03.2 FOOTWEAR

04 HOUSING, WATER, ELECTRICITY, GAS AND OTHER FUELS

04.1 ACTUAL RENTALS FOR HOUSING

04.2 IMPUTED RENTALS FOR HOUSING

04.3 MAINTENANCE AND REPAIR OF THE DWELLING

04.4 WATER SUPPLY AND MISCELLANEOUS SERVICES RELATING TO THE DWELLING

04.5ELEC TRICITY, GAS AND OTHER FUELS

05 FURNISHINGS, HOUSEHOLD EQUIPMENT AND ROUTINE HOUSEHOLD MAINTENANCE

05.1 FURNITURE AND FURNISHINGS, CARPETS AND OTHER FLOOR COVERINGS

05.2 HOUSEHOLD TEXTILES

05.3 HOUSEHOLD APPLIANCES

05.4 GLASSWARE, TABLEWARE AND HOUSEHOLD UTENSILS

05.5 TOOLS AND EQUIPMENT FOR HOUSE AND GARDEN

05.6 GOODS AND SERVICES FOR ROUTINE HOUSEHOLD MAINTENANCE

06 HEALTH

06.1 MEDICAL PRODUCTS, APPLIANCES AND EQUIPMENT

06.2 OUTPATIENT SERVICES

06.3 HOSPITAL SERVICES

07 TRANSPORT

07.1 PURCHASE OF VEHICLES

07.2 OPERATION OF PERSONAL TRANSPORT EQUIPMENT

07.3 TRANSPORT SERVICES

08 COMMUNICATION

08.1 POSTAL SERVICES

08.2 TELEPHONE AND TELEFAX EQUIPMENT

08.3 TELEPHONE AND TELEFAX SERVICES

09 RECREATION AND CULTURE

09.1 AUDIO-VISUAL, PHOTOGRAPHIC AND INFORMATION PROCESSING EQUIPMENT

09.2 OTHER MAJOR DURABLES FOR RECREATION AND CULTURE

09.3 OTHER RECREATIONAL ITEMS AND EQUIPMENT, GARDENS AND PETS

09.4 RECREATIONAL AND CULTURAL SERVICES

09.5 NEWSPAPERS, BOOKS AND STATIONERY

09.6 PACKAGE HOLIDAYS

10 EDUCATION

10.1 PRE-PRIMARY AND PRIMARY EDUCATION

10.2 SECONDARY EDUCATION

10.3 POST-SECONDARY NON-TERTIARY EDUCATION

10.4 TERTIARY EDUCATION

10.5 EDUCATION NOT DEFINABLE BY LEVEL

11 RESTAURANTS AND HOTELS

11.1 CATERING SERVICES

11.1.1 Restaurants, cafe´ s and the like (S)

- Catering services (meals, snacks, drinks and refreshments) provided by restaurants, cafe´s, buffets, bars, tearooms, etc., including those provided:
    - in places providing recreational, cultural, sporting or entertainment services: theatres, cinemas, sports stadiums, swimming pools, sports complexes, museums, art galleries, nightclubs, dancing establishments, etc.;
    - on public transport (coaches, trains, boats, aeroplanes, etc.) when priced separately;
- also included are:
    - the sale of food products and beverages for immediate consumption by kiosks, street vendors and the like, including food products and beverages dispensed ready for consumption by automatic vending machines;
    - the sale of cooked dishes by restaurants for consumption off their premises;
    - the sale of cooked dishes by catering contractors whether collected by the customer or delivered to the customer's home.
- Includes: tips. Excludes: tobacco purchases (02.2.0); telephone calls (08.3.0).

11.1.2 Canteens (S)

- Catering services of works canteens, office canteens and canteens in schools, universities and other educational establishments. Includes: university refectories, military messes and wardrooms. Excludes: food and drink provided to hospital in-patients (06.3.0).

11.2 ACCOMMODATION SERVICES

12 MISCELLANEOUS GOODS AND SERVICES

12.1 PERSONAL CARE

12.2 PROSTITUTION

12.3 PERSONAL EFFECTS N.E.C.

12.4 SOCIAL PROTECTION

12.5 INSURANCE

12.6 FINANCIAL SERVICES N.E.C.

12.7 OTHER SERVICES N.E.C.

References

ADePT-FSM. 2013. ADePT Food Security Module. http://www.fao.org/economic/ess/ess-fs/fs-methods/adept-fsn/en/

Alkire, Sabina and Foster, James. 2011. Counting and multidimensional poverty measurement. *Journal of Public Economics*, vol. 95(7-8), pp. 476-487.

Arimond, M. and M.T. Ruel. 2004. Dietary diversity is associated with child nutritional status. *Journal of Nutrition* (134) 2579-2585.

Barker, Barker, Mary, Ginny Chorghade, Sarah Crozier, Sam Leary and Caroline Fall. 2006. Gender differences in body mass index in rural India are determined by socio-economic factors and lifestyle. *The Journal of Nutrition,* No. 136, pp. 3062-3068.

Beegle, Kathleen, Joachim De Weerdt, Jed Friedman and John Gibson. 2012. Methods of household consumption measurement through surveys: experimental results from Tanzania. *Journal of Development Economics* 98(1): 3-18.

Berti, Peter R. 2012. Intrahousehold distribution of food: A review of the literature and discussion of the implications for food fortification programs. *Food and Nutrition Bulletin* (33)3: S163-S169.

Black, Robert E., Lindsay H. Allen, Zulfiqar A. Bhutta, Laura e. Caulfield, Mercedes de Onis, Majid Ezzati, Colin Methers, Juan Rivera, for the Maternal and Child Undernutrition Study Group. 2008. *The Lancet*. 371: 243-260.

Bouis, H., L. Haddad and E. Kennedy. 1992. Does it matter how we survey demand for food? Evidence from Kenya and the Philippines. *Food Policy* 17(5): 349-360.

Cafiero, Carlo. 2012a. What do we really know about food security? Mimeo. Economic and Social Statistics. Food and Agriculture Organization of the United Nations, Rome.

Cafiero, Carlo. 2012b. Advance in hunger measurement: Traditional FAO methods and recent innovations. Mimeo. Economic and Social Statistics. Food and Agriculture Organization of the United Nations, Rome.

Caulfield, Laura E., Stephanie A. Richard, Juan A. Rivera, Philip Musgrove and Robert E. Black. 2006. Stunting, wasting and micronutrient deficiency disorders. Chapter 28 in Dean T Jamison, Joel G Breman, Anthony R Measham, George Alleyne, Mariam Claeson, David B Evans, Prabhat Jha, Anne Mills, and Philip Musgrove, eds. Disease Control Priorities in Developing Countries, 2nd edition. Washington, D.C., World Bank.

Chen, Shaohua and Martin Ravallion. 2010. The developing world is poorer than we thought, but no less successful in the fight against poverty. *Quarterly Journal of Economics* (125)4:1577-1625.

Chesher, A. 1997. Diet revealed?: Semiparametric estimation of nutrient intake-age relationships. *J R Statist Soc* 160: 389-428.

Clark, Renata. 1995. Micronutrient fortification of food: technology and quality control. Paper prepared for the Technical Consultation on Food Fortification: Technology and Quality Control. November 20-23, 1995. Rome, United Nations Food and Agriculture Organization.

Coates, Jennifer, Brooke Colaiezzi, Jack Fiedler, James Wirth, Keith Lividini, and Beatrice Rogers. 2012a. Applying dietary assessment methods for food fortification and other nutrition programs. GAIN Working Paper Series No. 4. Global Alliance for Improved Nutrition, Ferald J. and Dorothy R. Friedman School of Nutrition Science and Policy and HarvestPlus.

Coates, Jennifer, Brooke Colaiezzi, John L. Fiedler, James Wirth, Keith Lividini, and Beatrice Rogers. 2012b. A program needs-driven approach to selecting dietary assessment methods for decision-making in food fortification programs. *Food and Nutrition Bulletin* (33) 3(supplement): S146-S156.

Coudouel, Aline, Jesko Hentschel and Quentin Wodon. 2002. Poverty Measurement and Analysis. PRSP Sourcebook, World Bank, Washington D.C.

Deaton, A. 1997. *The analysis of household surveys: A microeconometric approach to development policy*. World Bank and John's Hopkins University Press, Baltimore and London.

Deaton, A., and M. Grosh. 2000. Consumption. In Designing household survey questionnaires for developing countries: Lessons from 15 years of the Living Standards Measurement Surveys, ed. M. Grosh and P. Glewwe, 91133. Washington, D.C.: World Bank.

Deloitte. 2011. Consumer 2020 – Reading the signs.

Dobermann, A. and R. Nelson. 2013. Opportunities and Solutions for Sustainable Food Production. Background paper for the High-Level Panel of Eminent Persons on the Post-2015 Development Agenda. Prepared by the co-chairs of the Sustainable Development Solutions Network Thematic Group on Sustainable Agriculture and Food Production.

Drichoutis, Andreas and Panagiotis Lazaridis. 2005. Food consumption issues in the 21st century. Intensive Program project: Business Management with emphasis on food industry. Agricultural university of Athens, Greece. http://works.bepress.com/andreas_drichoutis/25

Dupriez, Olivier and E. Boyko. 2010. Dissemination of Microdata Files - Principles, Procedures and Practices. IHSN Working Paper No 005.

Engle-Stone, Reina. 2012. Fortifiable food consumption in Cameroon: Comparison of FRAT, 24-hour recall, and HCES methods. Presentation at the International Scientific Symposium on Food and Nutrition Security Information: From valid measurement to effective decision-making. United Nations Food and Agriculture Organization, Rome January 17-19, 2012.

European Commission (EC), International Monetary Fund (IMF), Organisation for Economic Co-operation and Development (OECD), United Nations (UN) and the World Bank (WB). 2009. System of National Accounts 2008. ISBN 978-92-1-161522-7

Eurostat website. Statistics Explained. Accessed on January 16, 2013. http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home/

FAO. 2013. Guidelines for measuring household and individual dietary diversity. Food and Agriculture Organization of the United Nations, Rome.

FAO. 2012a. Food security statistics from national household surveys. ADePT Food Security Module—Input data files. FAO Statistics Division. Food and Agriculture Organization of the United Nations, Rome.

FAO. 2012b. *The state of food insecurity in the world 2012*. Food security indicators (on line). Food and Agriculture Organization of the United Nations, Rome. Accessed October 25, 2012. http://www.fao.org/publications/sofi/food-security-indicators/en/

FAO. 2012c. International Network of Food Data Systems: About INFOODS. Food and Agriculture Organization of the United Nations, Rome. http://www.fao.org/infoods/en/.

FAO. 2012d. FAO/INFOODS Guidelines for Food Matching. Version 1.2. Food and Agriculture Organization of the United Nations, Rome.

FAO. 2006. The double burden of malnutrition: case studies from six developing countries. FAO Food and Nutrition Paper #84. Food and Agriculture Organization of the United Nations, Rome.

FAO. 1987. The fifth world food survey. Food and Agriculture Organization of the United Nations, Rome. http://www.fao.org/economic/the-statistics-division-ess/methodology/methodology-systems/food-balance-sheets-and-the-food-consumption-survey-a-comparison-of-methodologies-and-results.

FAO, undated. Food balance sheets and the food consumption survey: A comparison of methodologies and results. Economic and Social Statistics. United Nations Food and Agriculture Organization, Rome.

FAO. 2001. Food balance sheets: A handbook. United Nations Food and Agriculture Organization, Rome.

FAO/WHO. 1994. Codex Alimentarius, Volume 4, 2nd edition.

Ferro-Luzzi, Anna. 2003. Individual food intake survey methods. In *Measurement and assessment of food deprivation and undernutrition*. Proceedings of International Scientific Symposium on Food Deprivation and Undernutrition, Rome June 26-28 2002. United Nations Food and Agriculture Organization, Rome.

Fiedler, John L., Calogero Carletto, and Olivier Dupriez. 2012. Still waiting for Godot? Improving Household Consumption and Expenditures Surveys (HCES) to enable more evidence-based nutrition policies. *Food and Nutrition Bulletin* (33)3: S242-S251.

Fiedler, John L., Yves Martin-Préval, Mourad Moursi. 2012. Towards overcoming the food consumption information gap: A nutrition analysis view of the costs of 24-hour recall and Household Consumption and Expenditure Surveys. Mimeo. HarvestPlus/IFPRI and IRD. International Food Policy Research Institute, Washington, D.C.

Fiedler, John L. 2009. Strengthening Household Income and Expenditure Surveys as a tool for designing and assessing food fortification programs. IHSN Working Paper No. 001. International Household Survey Network, Washington, D.C.

Fiedler, John L., Marc-Francois Smitz, Oliver Dupriez, and Jed Friedman. 2008. *Food and Nutrition Bulletin* 29(4): 306-319.

Gaiha, Raghav, Raghbendra Jha and Vani S. Kulkarni. 2009. How pervasive is eating out in India? ASARC Working Paper 2009/17. Australia South Asia Research Centre, Arndt-Corden Division of Economics. Australian National University, Canberra.

Galal, O.M. 2002. The nutrition transition in Egypt: obesity, undernutrition and the food consumption context. *Public Health Nutrition* (5): 141-148.

Gale, Fred and Kuo Huang. 2007. Demand for food quantity and quality in China. ERS Report Summary, Markets and Trade. Economic Research Service, U.S. Department of Agriculture, Washington, D.C.

Gibson, R. S., and E. L. Ferguson. 1999. An interactive 24-hour recall for assessing the adequacy of iron and zinc intakes in developing countries. United States Agency for International Development and International Life Sciences Institute, Washington, D.C.

Gibson, John. 2005. Statistical tools and estimation methods for poverty measures based on cross-sectional household surveys. Chapter 5 in United Nations Statistics Division. United Nations handbook on poverty statistics. Special project on poverty statistics.

Grunberger, Klaus. Forthcoming. Reconciling Food Balance Sheet and Household Surveys. FAO.

Hammond, A. Kramer W.J., Tran J., Katz, R. and C. Walker. 2007. The Next 4 Billion. Market Size and Business Strategy at the Base of the Pyramid. International Finance Corporation (IFC) and World Resources Institute (WRI)

ILO (International Labour Organization). 2003. Report II: Household income and expenditure statistics. Seventeenth International Conference on Labour Statisticians. Geneva, 24 November-3 December 2003.

ILO/IMF/OECD/UNECE/Eurostat/The World Bank. 2004. Consumer price index manual: Theory and practice. Geneva, International Labour Office

Jacobs, Krista and Daniel A. Sumner. 2002. The food balance sheets of the Food and Agriculture Organization: A review of potential ways to broaden the appropriate uses of the data. Mimeo. University of California, Davis. Davis, California.

Kapteyn, A. 1994. The measurement of household cost functions. Revealed preferences versus subjective measures, *Journal of Population Economics*, 7, pp. 333–50.

Kruse, J. 2010. Estimating Demand for Agricultural Commodities to 2050. Global Harvest Initiative (pre-publication draft)

Lividini, K., J. Fiedler and O. Bermudez. 2012. Using HCES to inform nutrition policy: The Zambia micronutrient portfolio study. Presented at the 8th International Conference on Diet and Activity Methods. Methodological Challenges for Measuring the Achievements of International Policies. May 14-17, Food and Agriculture Organization of the United Nations, Rome.

Ma, Henguyn, Jikun Huang, Frank Fuller and Scott Rozelle. 2006. Getting rich and eating out: consumption of food away from home in urban China. *Canadian Journal of Agricultural Economics*, 54(2006): 101-119.

Mancino, Lisa, Jessica Todd and Biing-Hwan Lin. 2009. Separating what we eat from where: Measuring the effect of food away from home on diet quality. *Food Policy* 34(6): 557-562.

Ma, Henguyn, Jikun Huang, Frank Fuller and Scott Rozelle. 2006. Getting rich and eating out: consumption of food away from home in urban China. *Canadian Journal of Agricultural Economics*, 54(2006): 101-119.

Mauritius Ministry of Economic Development. 1997. Household budget survey 1998/97. Central Statistical Office. Ministry of Economic Development, Productivity and Regional Development. Republic of Mauritius.

Maxwell, Simon and Rachel Slater. 2003. Food policy old and new. *Development Policy Review*. Volume 21, Issue 5-6, pp. 531-553.

Moursi, Jourad, Howarth E. Bouis, Patrick Eozenou, Christine Hotz, and J.V. Meenakshi. 2012. How do Household Consumption and Expenditure Surveys compare to 24-hour recalls in terms of macro and micronutrient intakes? Evidence from Mozambique. Presented at the 8th International Conference on Diet and Activity Methods. Methodological Challenges for Measuring the Achievements of International Policies. May 14-17, Food and Agriculture Organization of the United Nations, Rome.

Murphy, Suzanna, Marie Ruel and Alicia Carriquiry. 2012. Should Household Consumption and Expenditures Surveys (HCES) be used for nutritional assessment and planning? *Food and Nutrition Bulletin* (33) 3(supplement): S235-S241.

Naiken, L. 2003. FAO metholdogy for estimating the prevalence of undernourishment. In *Measurement and assessment of food depreivation and undernutrition,* United Nations Food and Agriculture Organization, Rome.

Naska, A. V. Basdekis, and A. Trichopoulou. 2001. A preliminary assessment of the use of household budget survey data for the prediction of individual food consumption. *Public Health Nutrition* (4): 1159-65.

Naska, A., E Oikonomou, A. Trichopoulou, K. Wagner and K. Gedrich. 2007. Estimations of daily energy and nutrient availability based on nationally representative household budget survey data. The Data Food Networking (DAFNE) project. *Public Health Nutrition* 10(12), 1422-1429.

Neufeld, L.M. and L. Tolentino. Nutritional surveillance, developing countries. In B. Cabellero, A. Prentice and L. Allen (eds). *Encyclopedia of Human Nutrition*. Third edition. Elsevier Press, Oxford.

Omar, Dary and Zo Rambeloson Jariseta. 2012. Validation of dietary applications of Household Consumption and Expenditure Surveys (HCES) against a 24-hour recall method in Uganda. *Food and Nutrition Bulletin* (33)3(supplement): S190-198.

Pingali, Prabhu and Yasmeen Khwaja. 2004. Globalization of Indian diets and the transformation of food supply systems. ESA Working Paper No. 04-05, February 2004. Agricultural and Development Economics Division. Food and Agricultural Organization of the United Nations, Rome.

Popkin, Barry M. 2008. The world is fat: the fads, trends, policies and products that are fattening the human race. Avery-Penguin Press, New York.

Popkin, Barry M., Bing Lu and Fengying Zhai. 2002 (updated in 2006). Understanding the nutrition transition: measuring rapid dietary changes in transitional countries. *Public Health Nutrition* 5(6A): 947-953.

Popkin, Barry. 2002. Stages of the Nutrition Transition: Dynamic Global Shifts Appear to be Accelerating. (Need full reference).

Poti, J.M. and B.M. Popkin. 2011. Trends in energy intake among US children by eating location and food source, 1977-2006. *J Am Diet Assoc* 111(8): 1156-64.

Ramakrishnan U. 2002. Prevalence of micronutrient malnutrition worldwide. Nutr Rev. 60(5 Pt 2):S46-52.

Rambeloson Jariseta, Z., O. Dary, J.L. Fiedler, and N. Franklin. 2012. Comparison of estimates of the nutrient density of the diet of women and children in Uganda by Household Consumption and Expenditures Surveys (HCES) and 24-hour recall. *Food and Nutrition Bulletin* 33(3): S199-S208.

Ravallion, Martin. 1998. Poverty Lines in Theory and Practice. Living Standards Measurement Study Working Paper No. 133. World Bank, Washington, D.C.

Ravallion, Martin and Benu Bidani. 1994. How Robust is a Poverty Profile? *World Bank Economic Review*, Volume 8, Issue 1, pp. 75-102

Ravallion, Martin and Shaohua Chen. 2010. The Developing World is Poorer than We Thought, But No Less Successful in the Fight Against Poverty. *The Quarterly Journal of Economics* 125(4): 1577-1625.

Rogers, Beatrice, Jennifer Coates, and Alexander Blau. 2012. Estimating individual consumption from national household consumption and expenditure survey data for nutrition programming decisions. Presented at the 8th International Conference on Diet and Activity Methods. Methodological Challenges for Measuring the Achievements of International Policies. May 14-17, Food and Agriculture Organization of the United Nations, Rome.

Ruel, M. T., L. Haddad, M. Arimond, D. Gilligan, N. Minot, K. Simler, and X. Zhang. 2003. Diet quality and diet changes of the poor: A global research program to improve dietary quality, health, and nutrition. A proposal for a global research program (GRP24). International Food Policy Research Institute, Washington, D.C.

Schmidhuber, Josef and Prakash Shetty. 2005. The nutrition transition to 2030: Why developing countries are likely to bear the major burden. *Food Economics* (2)3/4: 150-166.

Sekula, W., M. Nelson, K. Figurska, M. Oltarzewski, R. Weisell, and L. Szponar. 2005. Comparison between household budget survey and 24-hour recall data in a nationally representative sample of Polish households. *Public Health Nutrition*. 8(4): 430-439.

Senauer, Ben. 2006. "The growing market for high-value food products in developing and transition countries." *Journal of Food Distribution Research* 37(1): 22-27.

Sibrian, Ricardo, ed. 2008. Deriving food security information from national household budget surveys; experiences, achievements, challenges. Food and Agriculture Organization of the United Nations, Rome.

Smith, Lisa C. 2012. The great Indian calorie debate: Explaining rising undernourishment during India's rapid economic growth. TANGO, International, Tucson, AZ.

Smith, Lisa C and Timothy R. Frankenberger. 2012. Typology of food away from home. TANGO, International, Tucson, AZ.

Smith, Lisa C. and Ali Subandoro. 2007. *Measuring food security using household expenditure sur-*

veys. Food Security in Practice Series. International Food Policy Research Institute, Washington, D.C.

Smith, Lisa C., Harold Alderman and Dede Aduayom. 2006. *Food insecurity in Sub-Saharan Africa: New estimates from household expenditure surveys*. IFPRI Research Report #146. International Food Policy Research Institute, Washington, D.C.

Smith, Lisa C. and Ali Subandoro. 2005. Improving the Empirical Basis for Assessing Food Insecurity in Developing Countries: Asia. Project Final Report. Submitted to the Department for International Development of the United Kingdom and the Australian Agency for International Development. International Food Policy Research Institute, Washington, D.C.

Swindale, A., and P. Ohri-Vachaspati. 2005. *Measuring household food consumption: A technical guide*. Food and Nutrition Technical Assistance (FANTA) Project and Academy for Educational Development (AED), Washington, D.C. http://www.fantaproject.org/publications/householdcons.shtml.

Trichopoulou, Antonia. 2012. Dietary patterns and their socio-demographic determinants in 16 countries: Data from the DAFNE-ANEMOS databank. Presentation at the International Scientific Symposium on Food and Nutrition Security Information: From Valid Measurement to Effective Decision-Making. United Nations Food and Agriculture Organization, Rome, January 16-19 2012.

Trichopoulou, Antonia and Androniki Naska. 2001. The DAFNE Initiative: Assessment of dietary patterns across Europe using household budget survey data. Special Issue. *Public Health Nutrition*, Volume 4, Number 5(B).

United Nations. 2009. Practical guide to producing consumer price indices. United Nations, New York and Geneva.

United Nations. 1989. Household income and expenditure surveys: A technical study. National Household Survey Capability Programme. United Nations Department of Technical Co-operation for Development and Statistical Office. New York.

UNSD (United Nations Statistics Division). 2005. United Nations handbook on poverty statistics. Special project on poverty statistics.

UNU, WHO, and FAO (United Nations University, World Health Organization, and Food and Agriculture Organization of the United Nations). 2004. *Human energy requirements: Report of a joint FAO/WHO/UNU expert consultation, Rome, October 17-24, 2001*. FAO Food and Nutrition Technical Report Series 1. FAO, Rome.

USDA. 2012a. USDA expenditures data Table 1: "Food and alcoholic beverages: Total expenditures". http://www.ers.usda.gov/datafiles/Food_Expenditures/Food_Expenditures/table1.xls

USDA. 2012b. Food consumption and demand: food away from home. United States Department of Agriculture, Economic Research Service. http://www.ers.usda.gov/topics/food-choices-health/food-consumption-demand/food-away-from-home.aspx.

USDA. 1946. Title 7—Agriculture; Subtitle B -- Regulations Of The Department Of Agriculture; Chapter I - Agricultural Marketing Service H1 (Standards, Inspections, Marketing Practices), Department Of Agriculture; Subchapter C - Regulations And Standards Under The Agricultural Marketing Act Of 1946 And The Egg Products Inspection Act; Part 52 - Processed Fruits And Vegetables, Processed Products Thereof, And Certain Other Processed Food Products H1,Subpart - Regulations Governing Inspection And Certification ,Definitions.

U.S. Department of Agriculture. 2012. USDA National Nutrient Database for Standard Reference, Release 25. Nutrient Data Laboratory Home Page, http://www.ars.usda.gov/ba/bhnrc/ndl

Vasdekis, V.G.S, S. Stylianou and A. Naska. 2001. Estimation of age- and gender-specific food availability from household budget survey data. *Public Health Nutrition* 4(5B): 1149-1151.

Vasdekis, V.G.S and A. Trichopoulou. 2000. Nonparametric estimation of individual food availability along with bootstrap confidence intervals in household budget surveys. *Statistics Probability Lett*. 46: 337-345.

Ward, K. and F. Neuman. 2012. Consumer in 2050. The rise of the EM middle class. HSBC Global Research. Global Economics.

Weisell, Robert and Marie Claude Dop. 2012. The adult male equivalent concept and its application to Household Consumption and Expenditure Surveys (HCES). *Food and Nutrition Bulletin* 33(3): S157-S162.

Welch, R. 2004. Micronutrients, agriculture, and nutrition: Linkages for improved health and well being. USDA-ARS, U. S. Plant, Soil and Nutrition Laboratory, Ithaca, N.Y. **(**http://www.css.cornell.edu/FoodSystems/Micros%26AgriMan1ref.html**)**

World Bank. 2012. Country and lending groups. (Accessed online November 2012). World Bank, Washington, D.C.

http://data.worldbank.org/about/country-classifications/country-and-lending-groups

World Bank. 2010. Global strategy to improve agricultural and rural statistics: Report of the friends of the chair on agricultural statistics. World Bank, Washington, D.C.

World Economic Forum and Deloitte Touche Tohmatsu. 2009. Sustainability for Tomorrow's Consumer. The Business Case for Sustainability

World Health Organization (WHO). 2002. Globalization, diets and noncommunicable diseases. World Health Organization, Geneva.

About the IHSN

In February 2004, representatives from developing countries and development agencies participated in the Second Roundtable on Development Results held in Marrakech, Morocco. They reflected on how donors can better coordinate support to strengthen the statistical systems and monitoring and evaluation capacity that countries need to manage their development process. One of the outcomes of the Roundtable was the adoption of a global plan for statistics, the *Marrakech Action Plan for Statistics* (MAPS).

Among the MAPS key recommendations was the creation of an International Household Survey Network. In doing so, the international community acknowledged the critical role played by sample surveys in supporting the planning, implementation and monitoring of development policies and programs. Furthermore, it provided national and international agencies with a platform to better coordinate and manage socioeconomic data collection and analysis, and to mobilize support for more efficient and effective approaches to conducting surveys in developing countries.

The IHSN Working Paper series is intended to encourage the exchange of ideas and discussion on topics related to the design and implementation of household surveys, and to the analysis, dissemination and use of survey data. People who whish to submit material for publication in the IHSN Working Paper series are encouraged to contact the IHSN secretariat via info@ihsn.org.

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