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Food data collection in household consumption and expenditure surveys

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Guidelines for low- and middle-income countries

Prepared by

The Inter-Agency and Expert Group on Food Security,

Agricultural and Rural Statistics

and

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Preface

The measurement of food consumption and expenditure is a fundamental component of any analysis of poverty and food security, and hence the importance and timeliness of devoting attention to the topic cannot be overemphasized as the international development community confronts the challenges of monitoring progress in implementing the 2030 Agenda for Sustainable Development.

In 2014, the International Household Survey Network published a desk review of the reliability and relevance of survey questions as included in 100 household surveys from low- and middle-income countries. The report was presented in March 2014 at the forty-fifth session of the United Nations Statistical Commission (UNSC), in a seminar organized by the Inter-Agency and Expert Group on Food Security, Agricultural and Rural Statistics (IAEG-AG).

The assessment painted a bleak picture in terms of heterogeneity in survey design and overall relevance and reliability of the data being collected. On the positive side, it pointed to many areas in which even marginal changes to survey and questionnaire design could lead to a significant increase in reliability and consequently, great improvements in measurement accuracy. The report, which sparked a lot of interest from development partners and UNSC member countries, prompted IAEG-AG to pursue this area of work with the ultimate objective of developing, validating, and promoting scalable standards for the measurement of food consumption in household surveys.

The work started with an expert workshop that took place in Rome in November 2014. Successive versions of the guidelines were drafted and discussed at various IAEG-AG meetings, and in another expert workshop organized in November 2016 in Rome. The guidelines were put together by a joint FAO-World Bank team, with inputs and comments received from representatives of national statistical offices, international organizations, survey practitioners, academics, and experts in different disciplines (statistics, economics, nutrition, food security, and analysis). A list of the main contributors is included in the acknowledgment section. In December 2017 a draft of the guidelines was circulated to 148 National Statistical Offices from low- to high-income countries for comments. The document was revised following that consultation and submitted to UNSC, which endorsed it at its forty-ninth session in March 2018 (under item 3(j) of the agenda, agricultural and rural statistics. The version presented here reflects what was endorsed by the Commission, edited for language. The process received support from the Global Strategy for Agricultural and Rural Statistics.

The document is intended to be a reference document for National Statistical Offices, survey practitioners, and national and international agencies designing household surveys that involve the collection of food consumption and expenditure data.

Acknowledgments

These guidelines were drafted under the aegis IAEG-AG. Members of the IAEG-AG are a mix of national and international institutions. The Food and Agriculture Organization of the United Nations (FAO) chairs the IAEG-AG. National members are from the National Statistical Offices of Australia, Brazil, Ecuador, Ethiopia, Ghana, Indonesia, Peru, and the Philippines; the Ministry of Agriculture and Fisheries of Morocco, the Swedish Agricultural Board, and the United States Department of Agriculture (USDA). The following international organizations are members of the IAEG-AG: African Development Bank; Asian Development Bank; Eurostat, International Fund for Agricultural Development (IFAD); International Labour Organization (ILO); Secretariat of the Pacific Community; United Nations Economic and Social Commission for Asia and the Pacific; United Nations Economic Commission for Western Africa; United Nations Economic Commission for Africa; United Nations Economic Commission for Latin America and the Caribbean; United Nations Children's Fund (UNICEF); World Bank; World Food Program (WFP); and World Health Organization (WHO).

The document was drafted under the guidance of Pietro Gennari (Chief Statistician, FAO) and Gero Carletto (Living Standard Measurement Study Manager, World Bank). The drafting team was coordinated by Nathalie Troubat (FAO) and Alberto Zezza (World Bank) and included staff from FAO (Cristina Alvarez, Andrea Borlizzi, Carlo Cafiero, Ruth Charrondière, Piero Conforti, Klaus Grunberger, Catherine Leclercq, Ana Moltedo, and Valentina Ramaschiello), and the World Bank (Josefine Durazo, Gabriela Farfan, Dean Jolliffe, Talip Kilic, Espen Beer Prydz, Marco Tiberti, and Renos Vakis). John Gibson (University of Waikato), Kathleen Beegle, Eric Metreau, and Kristen Himelein (World Bank) provided inputs and comments on advanced drafts that helped shape its final draft.

The team relied on inputs and comments from a large pool of experts from national statistical offices, international organizations, research institutions, and academia. In particular, contributions were made by Ahmad Avenzora, Alessandra Garbero, Amparo Palacios-Lopez, Anna Herforth, Anna Lartey, Arthur Shaw, Bertrand Buffière, Carlo Azzarri, Celeste Sununtnasuk, Dalisay (Dax) S. Maligalig, Diane Steele, Erika Taidre, Giovanni d'Alessio, Jay Variyam, Jean Charles Leblanc, Jed Friedman, Jennifer Coates, Joachim Winter, Joao Pedro de Azevedo, John (Jack) Fiedler, John Gibson, José Rosero Moncayo, Kathleen Beegle, Maria Laura Louzada, Mario V. Capanzana, Mark Denbaly, Mourad Moursi, Niall O'Hanlon, Nicoletta Pannuzi, Olivier Dupriez, Philippos Orfanos, Philomena Nyarko, Raka Banerjee, Redouane Arrach, Reina Engle-Stone, Renata Micha, Sharad Tandon, Silvio Daidone, Terri Ballard, Tharcisse Nkunzimana, Thomas Crossley, Vikas Rawal, and Wynandin Imawan.

The guidelines are based on original material and material that members of the group have authored and published elsewhere.

The document was edited by Alan Cooper and support throughout the publishing process was provided by Ilio Fornasero (FAO).

Acronyms

BMI	body mass index
COICIOP	Classification of Individual Consumption According to Purpose
CBI	Cost of Basic Needs
CPI	consumer price index
DEC	dietary energy consumption
FEI	Food Energy Intake
GDP	gross domestic product
HCES	household consumption and expenditure surveys
IAEG-AG	Inter-Agency and Expert Group on Food Security, Agricultural and Rural Statistics
IFAD	International Fund for Agricultural Development
ILO	International Labour Organization
INEI	Instituto Nacional de Estadística e Informática (INEI)
OECD	Organization for Economic Co-operation and Development
PoU	prevalence of undernourishment
UEMOA	West Africa Economic and Monetary Unit
UNICEF	United Nations Children's Fund
UNSC	United Nations Statistical Commission
UNSD	United Nations Statistics Division
USDA	United States Department of Agriculture
WFP	World Food Programme

Executive summary

Food constitutes a key component of a number of fundamental welfare dimensions, such as food security, nutrition, health, and poverty. It makes up the largest share of total household expenditure in low-income countries, accounting, on average, for about 50 percent of the household budget (United States Department of Agriculture, 2011), and accordingly, constitutes a sizeable share of the economy. Proper measurement of food consumption is, therefore, central to the assessment and monitoring of various dimensions of well-being of any population, and hence of interest to multiple international, national, and local agencies, and to several development domains – social, economic, and human.

Food consumption data are needed to monitor global targets, such as the newly adopted Sustainable Development Goals. The measurement of food consumption is crucial to assess and guide the mandate of the Food and Agriculture Organization of the United Nations (FAO) to *eradicate hunger, food insecurity and malnutrition*, as well as the World Bank's twin goals of *eliminating extreme poverty; and boosting shared prosperity*. It is also important for national accounts measures of the overall size of the economy, such as gross domestic product (GDP). Finally, it is of interest to national and local governments and non-governmental organizations to guide local and regional analysis and policy, as the mismeasurement of food consumption can lead to the misallocation of funds and compromise the design, monitoring, and evaluation of relevant policies and programs.

The main vehicle used to collect information on food consumption for these purposes are household consumption and expenditure surveys (HCES). However, current practices for collecting consumption data differ widely across types of surveys, between countries, and over time, compromising the quality and comparability of resulting data and measures. In the interest of improving food consumption measures and to ensure that data collected respond to the needs of a wide range of users, several development partners have come together around a common agenda aimed at harmonizing practices and recommendations for design of food consumption modules in HCES. In the present report, a preliminary set of internationally agreed recommendations to adopt in future HCES is proposed in order to collect food data aimed at improving the measurement of food consumption.

Taking stock of current practices

Since the early 1990s, unprecedented progress has been made with regard to the quantity of household consumption and expenditure data across the developing world. In 1990, the *World Development Report* published by the World Bank, was based on data from only 22 countries, and no country had more than one survey (Jolliffe *et al*., 2014). To date, at least 137 countries have consumption or expenditure information, and many of them conduct multiple surveys, adding to a total of more than 845 surveys. The number of countries with no poverty data (which is primarily estimated from consumption expenditure data) between

2002 and 2011 declined from 33 percent to 19 percent, while the share of countries with three or more data points increased from 27 to 41 percent over the same period (Serajuddin *et al*., 2015).

Depending on their primary objective, the surveys that collect information on household consumption or expenditure can take different forms, such as household budget surveys, income and expenditure surveys or "multi-purpose" or "integrated" household surveys, such as the Living Standards Measurement Study surveys. This family of surveys, which are often nationally representative, is referred to as household consumption and expenditure surveys. While the variety of purposes naturally translates into different designs, the dramatic increase in the number of household surveys in developing countries has been associated with a proliferation of instruments and methods in the collection of food data that cannot be explained only on the basis of their different purposes or of country-specificity. To a large extent, this is a manifestation of the lack of globally agreed standards to guide the collection of food consumption in household surveys, which is evident by the heterogeneity in methods observed within the same type of survey across countries and within countries across time.

In a recent desk review, jointly led by the International Household Survey Network, FAO, and the World Bank (Smith *et al.*, 2014), the multiple purposes those household surveys served were identified, and a method to assess the reliability and relevance of survey questions was proposed and applied to 100 household surveys from low- and middle-income countries. Only the most recent nationally representative household surveys from each developing country for which enough documentation was available were part of the sample. The assessment found large differences in data-collection methods across surveys and paints a bleak picture with regard to the comparability and quality of resulting measures. It points to many areas in which survey design and questionnaires can be significantly improved. The multiplicity in methods, variation in quality, and diversity of uses are of increasing concern in academic and policy circles, leading to calls for a more systematic approach to survey design and a better understanding of its consequences when it comes to measuring food consumption or expenditure.

Survey design does matter

The international statistical community is well aware that poverty and hunger estimates are inconsistent across countries and over time, and that the lack of harmonization of survey methods contributes to that situation. The notion that survey design matters is not new, as indicated in the work of Mahalanobis and Sen (1954) or Neter and Waksberg (1964). While the issue has been largely neglected in the economics literature for a long time (Browning, Crossley and Winter, 2014), in recent years, there has been a surge of interest in the measurement of household expenditure also among economists, mostly spurred by two factors: 1) an increasing body of evidence suggests that inferences from comparisons of survey estimates across space and time can be seriously compromised by variations in survey design and practice, and 2) the persistent fall in the quality of consumer expenditure surveys across several developed countries, particularly associated with non-response and underreporting.

With respect to evidence from developing countries, Deaton and Grosh (2000) provide a comprehensive review of the issues and data needs for the measurement of consumption in household surveys, drawing on the lessons learned from Living Standards Measurement Study surveys. A recent special issue in the journal *Food Policy* includes case studies from a diverse set of developing and Organization for Economic Co-operation and Development (OECD) countries analyzing, theoretically and empirically, how different surveys design options affect the quality of the data being collected and, in turn, the implications for statistical inference and policy analysis (Zezza *et al.* 2017). In several other studies the implications of particular aspects of survey design for total expenditures, poverty and inequality measures have been analyzed. For example, Jolliffe (2001) and Pradhan (2001) evaluated the impact of varying the length of the consumption list in El Salvador and Indonesia, respectively; Gibson, Rozelle, and Huang (2003) looked at the effect of changing the length of the data-collection period for the case of China; Beegle *et al*. (2012) compared results from eight questionnaire designs, which include variations in methods of data capture, level of the respondent, length of reference period, number of items in the recall list, and nature of the cognitive task required of the respondent; and Backiny-Yetna, Steele and Yacoubou (2017) compared different data-collection methods, which include a seven-day recall period, a seven-day diary, and a "usual month." In all of those studies, it was found that the design and implementation of survey instruments for collecting food consumption affects resulting measures considerably.

As economies develop, implementing quality surveys is bound to become more difficult and require changes to current approaches in many countries. First of all, respondents tend to become less compliant and harder to survey as their incomes increase, leading to greater non-response, attrition, and bias. Second, inequality rather than poverty *per se* becomes a more common objective for measurement efforts; even countries that have escaped mass poverty have policy concerns over inequality, and poverty itself becomes more sensitive to inequality the more the poverty rate falls. This change in focus places additional demands on surveys. Meanwhile, with lower levels of poverty, errors have a greater effect on the measurement of poverty and hunger, especially when attention turns to the contribution of transitory poverty and transitory hunger. Finally, existing survey methods that may do well for staple ingredients do less well for income elastic food items and for changes in consumption patterns. For instance, as consumption of food away from home increases, the person responsible for reporting the household's food consumption is less aware of the amount or type of food consumed by other household members.

On the road to better food data

There is arguably need for more systematic research before general recommendations for the collection of food consumption or expenditure data in HCES can be provided. While the lack of broadly accepted practices affects all aspects of household consumption or expenditure analysis, it is significantly pronounced in the case of food consumption. This is not only because few existing papers focus explicitly on food (one example is the work by Backiny-Yetna, Steele, and Yacoubou (2017), but also because the research has almost exclusively looked at *mean* expenditure, and poverty or inequality measures. However, the impact of survey design on other measures is less well understood,

and there is an increasing interest in using the data to analyse other dimensions of well-being, such as food security, health, and nutrition.

The United Nations Statistical Commission endorsed, in 2012, the creation of IAEG, as part of the governance framework of the Global Strategy to Improve Agricultural and Rural Statistic, with the mandate of "*guiding methodological developments in statistics for food security, sustainable agriculture, and rural development*" (UNSC, 2012, p.10). In the spirit of that mandate, a workshop was convened in Rome, in November 2014, bringing together experts to discuss the measurement of food consumption derived from HCES. The workshop included presentations of the latest methodological developments and a discussion of the main limitations in current practices. Also, during the workshop, priority areas for future research were identified. Following the workshop, another expert consultation was organized, in Rome, in November 2016 to discuss possible guidelines and form the first set of recommendations. The first draft of the present guidelines document was discussed by the members of the IAEG-AG and presented in an open seminar during the forty-eighth session of UNSC in New York in March 2017. The results of those discussions are reflected in the present document.

Conclusion and recommendations

The recommendations in these guidelines are intended to assist practitioners in improving survey design, while taking into account the cost of organizing a survey and the constraints statistical offices in low- and middle-income countries face. To stay relevant, the recommendations will have to evolve over time as additional research and new technologies become available. For instance, changes in consumer behaviour and in how food systems change may lead to a rethinking of the underlying survey design principles, such as the priority placed on collecting data on ingredients and relying primarily on quantities reported. The main recommendations of the guidelines can be summarized as follows:

- **Recall versus diary, and length of reference period.** For HCES, a seven-day recall period for food consumption measurement should be adopted. In low- and middle-income countries, recall surveys are generally preferable to diary surveys, which should only be deployed with careful and continuous supervision and should not exceed 14 days. While a *well-implemented* diary is generally held as the gold standard for food expenditure data collection, there is ample evidence that in low-income settings with a prevalence of illiterate respondents, diaries are often implemented as a series of short recall interviews, with issues of respondent and enumerator fatigue affecting data quality, and with unsustainable implementation costs. Any change in the recall period or method should be accompanied by an experimental component that assesses the impact of methodological changes on survey estimates and enables temporal reconciliation.

- **Seasonality and number of visits**. The data collection for HCES should be spread out in order to capture seasonal variation in food

consumption and expenditure patterns. Two main approaches can be adopted: one visit per household with the sample spread over a 12-month period; or two visits per household over a 12-month period.

- **Acquisition and consumption**. Data from HCES should be collected on the main modes of acquisition (food purchases, own production, and food received in kind) and it should be made clear to respondents, enumerators, and data users whether the survey is collecting data on food acquisition or food consumption or both (with or without waste). Survey design should avoid sources of incomplete or ambiguous enumeration, such as food consumed from own production versus food harvested and routine month versus specific months, and equivocal leading questions.

- **Meal participation**. Information should be collected on the number of meals and the number of individuals (household and non-household members) who participated in each meal. It is recommended that in all HCES, adding an individual household member-based meal module should be considered.

- **List of food items**. Data should be collected on all types of foods and beverages that make up a country's human diet. Lists should be kept up to date to take into account changes in dietary habits and should be made having in mind that products that account for minimal budget shares can have particular nutritional values. A list of general principles that can guide the design of a food list is in the guidelines, and includes the following criteria:
    - Ensure that survey food lists are sufficiently detailed to accurately capture consumption of all major food groups making up the human diet. To facilitate data integration and analysis, the categories used in the Classification of Individual Consumption According to Purpose (COICOP), FoodEx2, but also in food composition tables, should be considered;
    - Include exclusively food (no other commodities);
    - Processed foods (from moderately to highly processed) need to be adequately represented;
    - All food groups need to be represented and include a reasonable number of food products;
    - Broad categories, such as fish, meat, fruits, and vegetables, should be avoided and for each basic food group list the most common items and add "other" category as needed. Items from subsidized programs, food fortification programs, and micronutrient rich foods should be listed individually.

- **Non-standard units of measurement.** Surveys should allow respondents to report in both standard and non-standard units, according to what they are most familiar with for each item reported. It is critical to establish (define or collect) conversion factors for all non-standard units that will be used. Additional features to improve the accuracy of reported non-standard units quantities, such as market surveys, to establish accurate non-standard units and conversion factors, photo reference aides, and on-the-spot value verification using

computer assisted personal interviewing, may also be considered. National statistics offices and implementation partners should work together to establish non-standard units databases that can be used across surveys, effectively increasing the standardization of the units, while also limiting the cost of their implementation. To this end, survey implementers should thoroughly document all non-standard unit protocols and related conversion factors and make them publicly available.

- **Food away from home**. The practice of collecting food away from home information with just one question should be discontinued. The importance of food away from home warrants the design of a separate module based on a clear definition of food away from home. In particular, surveys should be clear in identifying how to collect information on potentially ambiguous categories of food: "food prepared at home and consumed outside" and "food prepared outside and consumed at home." The latter can be integrated in the food at home module, such as takeout food, provided there is clarity to enumerators, respondents, and data users that that is the case.

  Data collection should be organized around meal events, including snacks and drinks. At a minimum, surveys should collect information on the monetary value of each meal consumed away from home (breakfast, lunch, dinner, solid snacks, and drinks). The meal events list should be adapted to the local context. Food away from home is best collected through individual-level interviews of adults. A proxy respondent can be used to report on children's meals away from home and other adults. Surveys should use the same reference period for food away from home as the one used for the food consumed at home module. The data to estimate food away from home-related nutrient content, when feasible, will have to come from other data sources integrated to HCES, such as a survey of food establishments or administrative data on the content of public meals (e.g. schools and social programs).

1.Introduction

1.1. Background and motivation

Food is an important component of many fundamental dimensions of welfare, such as food security, nutrition, and health. It comprises the largest share of total household expenditure in low-income countries, accounting for about 50 percent of the average household budget (USDA, 2011) and accordingly, it is key for consumption and poverty analysis. Low levels of food access play a role in explaining why around 815 million individuals were estimated to be chronically undernourished in 2016 (FAO, WFP, IFAD, UNICEF, and WHO, 2017). Data on food consumption and expenditure underpin the most widely used measures of poverty and of food security. The collection of high-quality food consumption data is, therefore, central to the assessment and monitoring of the well-being of any human population, and is of interest to governments, international agencies, and anyone concerned with monitoring and understanding trends in social, economic, and human development.

Data on food consumption are needed, for example, to build the indicators and monitor some of the targets set for Sustainable Development Goals 1 and 2 (ending poverty and hunger). Similarly, data on food consumption are needed to assess and guide the mandate of FAO to help eradicate hunger, food insecurity, and malnutrition and the twin goals of the World Bank to eliminate extreme poverty and boost shared prosperity.[1] Even more importantly, national and local governments and non-governmental organizations need high-quality food consumption data to guide local and regional analysis and policy, as the mismeasurement of food consumption can lead to the misallocation of funds and may compromise the design, monitoring, and evaluation of relevant policies and programs.

Box 1

The concepts of food consumption

Food data collected in HCES can be diverse, and often refer to diverse concepts. Even the term "food consumption" lends itself to multiple meanings. When the focus of the analysis is expenditure, the term "consumption" can designate the purchase of foods, disregarding the end-use of what was purchased. At the opposite end, analyses and surveys that focus on nutrition use the term "food consumption" to designate the intake of a food, possibly net of unusable parts. Throughout this document the term "food consumption" is used in a general sense and encompasses concepts or data that include food consumption, acquisition, expenditure, and intake. Additional descriptive are specifically used in places where their specific meanings are addressed or contrasted, or for details that relate to that precise terminology.

[1] For a list of indicators that can be derived from food data collected in HCES, see Moltedo *et al.* (2014); Foster *et al.* (2013).

During the past two decades, unprecedented progress was made in the production and dissemination of household consumption and expenditure data across the developing world. In 1990, the *World Development Report* published by the World Bank was based on data from only 22 countries, and no country had more than one survey (Jolliffe *et al.*, 2014). To date, at least 137 countries compile consumption or expenditure information, and many of them have multiple surveys, adding to a total of more than 845 surveys[2] (Ferreira *et al.*, 2016). The number of countries with no poverty data (which is primarily estimated from food consumption data) between 2002 and 2011 declined from 33 percent to 19 percent, whereas the share of countries with three or more data points increased from 27 to 41 percent over the same 10-year period (Serajuddin *et al.*, 2015).

When FAO started publishing estimates of the prevalence of undernourishment to monitor the hunger targets set by the World Food Summit in 1999, it used food consumption data collected in household surveys for only 15 countries, relying on indirect estimates of the distribution of food consumption for most countries. The most recent assessment, conducted in 2017, used data from 57 surveys for 39 countries.

Despite that progress by 2011, 29 countries still lacked a survey to measure poverty, and another 28 had just one survey that would enable estimating national poverty figures (Serajuddin *et al*., 2015). Without such data, it is impossible for those countries or for international development actors to analyze trends and progress (or lack thereof) in poverty eradication, a fact that has prompted the World Bank President to pledge to assist 78 of the poorest countries in the world to conduct at least one such survey every three years. At the same time, UNSC established the Intersecretariat Working Group on Household Surveys at its forty-sixth session "to foster coordination and harmonization of household survey activities across agencies and member countries" (UNSC, 2014). Those initiatives will result in a surge in the number of household surveys in developing countries in the coming years, underscoring the urgent need for more rigorous guidance on survey design.

A challenge facing low- and middle-income countries is that implementing quality surveys is bound to become more difficult in many respects as their economies develop. One aspect national statistics offices need to prepare for is that people become less compliant and harder to survey as their incomes increase. Another is that, with per capita income growth, policy concerns relate more to issues of inequality rather than to poverty *per se*. Moreover, even when poverty remains a concern, measures of poverty become increasingly sensitive to measures of inequality as the poverty rate falls. Thus, from a measurement point of view, this means that inequality and variance of welfare measures become more important. At the same time, with lower levels of poverty, errors have a larger effect on the measurement of poverty and hunger, especially as interest grows in the transient components of those welfare shortfalls. Furthermore, existing survey methods that may be effective for staple ingredients and the traditional view of the household sharing food from a common pot, are less effective for income elastic food items and for changes in consumption patterns. For instance, as an increasing share of food consumption happens away from home resulting from actions and decisions of individual household members, it

[2] These figures are based on a count of consumption surveys available from PovcalNet, Eurostat and the United States Bureau of Labor Statistics, as of September 2017.

will become increasingly difficult for "the main food preparer" to report on the content and value of those consumption episodes (meals or snacks).

Depending on their objectives, surveys collecting information on household consumption take different forms and labels, such as household budget surveys, income and expenditure surveys, or "multi-purpose" or "integrated" household surveys, such as the Living Standards Measurement Study surveys. This family of surveys, which are almost always nationally and sub nationally representative, is collectively referred to as Household Consumption and Expenditure Surveys (HCES).

The primary objectives of HCES are to measure poverty and consumption levels, derive consumption patterns needed for the calculation of consumer price indices, and provide inputs to the compilation of national accounts. In many cases, those surveys are the only available source of information to estimate the distribution of food consumption in the population. While the variety of HCES purposes naturally translates into different survey designs, the dramatic increase in the number of household surveys in developing countries is associated with a proliferation of approaches and methods of food data collection, which is not only the result of different purposes or country-specific considerations. This is because international guidelines and recommendations for the design and implementation of each of the distinct types of household consumption and expenditure surveys that exist are specific to each type of survey, are generally not prescriptive, often lack coherence, and usually leave much flexibility to national survey statisticians and to the consultants and donors who may support their survey efforts. Consequently, heterogeneity in methods is observed across countries and within countries over time.

Household consumption and expenditure surveys are also increasingly being used to address the food and nutrition information gap, even though they may not necessarily have been designed for that purpose, because they contain a wealth of information about food acquisition and consumption, are conducted with increasing frequency in an increasing number of countries (Serajuddin *et al.*, 2015), have large samples, and are often statistically representative at subnational levels. These multi-purpose surveys are also much less costly than other (stand-alone) dietary assessment data sources, as they are already being conducted and paid for by government agencies (Fiedler, 2013). Increasingly, HCES data are repurposed and used to calculate food security indicators,[3] compile food balance sheets, plan and monitor food-based nutrition interventions, serve the information needs of the private sector, and contribute to other research work. The degree to which a survey dataset is "fit for purpose" is specific to each one of these particular uses (Smith, Dupriez and Troubat, 2014).

While there has been a surge of interest in HCES analyses of food security and nutrition issues, to date, food security analysts and nutritionists have been overwhelmingly passive users of already-collected household consumption and expenditure surveys data. As a result, the full potential of those particular types of

[3] Food consumption data are used in the calculation of not only the prevalence of undernourishment indicator of FAO, but also of other indicators, such as the food budget share and dietary diversity indicators, such as simple food counts or counts of food groups. Other common food security indicators, such as the Food Insecurity Experience Scale, the Household Food Insecurity Access Scale, the Household (and Individual) Dietary Diversity indicators, and the World Food Program Food Consumption Score are collected using purposely designed survey modules.

repurposing of household consumption and expenditure surveys has yet to be realized. There is a lack of awareness among non-economists about what those data contain and need for further research and action to improve the quality and utility of those data and the methods that can be applied to analyze them from a food security and nutrition lens. If the food security and nutrition community — with its unique skills and experiences — were to become more proactively involved in the design, implementation, and analyses of household consumption and expenditure surveys, such surveys could be strengthened substantially as tools for evidence-based food and nutrition programming and policymaking.

There are a few recent antecedents to the present document in terms of attempts to create a common ground for international household survey data on poverty and consumption. One highly relevant document is the report of the seventeenth International Conference of Labour Statisticians on Household Income and Expenditure Statistics (ILO, 2003). That report is very useful as a reference for internationally agreed upon definitions and concepts It contains an excellent discussion on many of the survey design issues relevant to the present document, but lacks specific recommendations on survey design, which is the main objective of this document.

Other documents provide guidelines for the implementation of high-quality consumption surveys in Europe, such as the guidelines provided by Eurostat for the implementation of the European Union Statistics on Income and Living Conditions,[4] and by the Household Finance and Consumption Network.[5] Both surveys have sections on measuring consumption, and both are supported by documents providing specific guidelines for survey design. While those surveys and the supporting documentation can provide ideas on how to design consumption surveys elsewhere, they are at best only partially relevant for the issues faced by statistical offices and food consumers in low- and middle-income countries.[6]

The United Nations *Handbook on Poverty Statistics* (UNSD, 2005) is intended to assist practitioners by providing clarity with regard to poverty measurement issues and the key decisions involved in choosing and applying methods for poverty measurement. Though in the handbook issues with consumption data were explicitly covered (Gibson, 2005), it did not provide specific guidance for survey design. The Living Standard Measurement Study surveys "Blue Book" (Grosh and Glewwe, 2000), on the other hand, provided such guidance in the chapter on consumption, authored by Deaton and Grosh (2000). The present document builds on that chapter, revisiting the same themes but with new evidence accumulated over almost two decades of experience since that publication. The focus of this document is also somewhat different as those guidelines also provide guidance that is relevant to the different users of HCES surveys (including food security and nutrition analysists and consumer price

[4] Available online at http://ec.europa.eu/eurostat/web/microdata/european-union-statistics-on-income-and-living-conditions

[5] Available online at https://www.ecb.europa.eu/pub/economic-research/research-networks/html/researcher_hfcn.en.html

[6] FAO guidelines are also available for nutrition assessments (e.g. EFTA, 2014; visit FAO website: http://www.fao.org/nutrition/assessment/en), but those are less relevant for designing HCES.

index (CPI) and national accounts compilers, whereas Deaton and Grosh were mainly targeting an audience of poverty economists using Living Standards Measurement Survey data.

In this document, a set of recommendations for practitioners engaged in the collection of food consumption data in HCES is presented. The recommendations are drawn from the results of a desk assessment of questionnaires from 100 nationally representative surveys conducted in low- and middle-income countries, commissioned by the International Household Survey Network (IHSN), the World Bank and FAO (Smith, Dupriez, and Troubat, 2014). That assessment revealed an unwarranted level of variation in survey practices around the world, identifying clearly suboptimal practices still being used in a number of countries. Based on the assessment, it was concluded that while many basic reliability criteria are met by the large majority of current HCES, only 13 percent of the questionnaires analyzed met the seven criteria used to classify a survey as reliable.

As a result, FAO and the World Bank initiated a collaborative effort to identify and disseminate best practices for food consumption measurement through HCES, which includes methodological work and the publication of guidance material, of which this document is the first output. This work program was presented at the first meeting of IAEG-AG, held in February 2015, and endorsed by the IAEG-AG members. The guidelines were finalized through an extensive consultation process, drawing on inputs from experts on relevant disciplines and from representative national statistical authorities from all developing regions and presentations at the margin of the UNSC sessions held in 2015 and in 2017. The current version of those guidelines also draws on expert workshops organized by the Global Strategy for Agricultural and Rural Statistics, in Rome, in November 2014, and in November 2016, and by the World Bank in Washington DC, in November 2015.

The guidelines stop short of articulating recommendations in a strongly prescriptive manner, particularly given that for several survey design decisions, there is no consensus among experts or not enough evidence from methodological research or both for there to be a clear best practice to be recommended for adoption.[7] While more methodological research is needed in most of the areas covered by the guidelines, survey practitioners and national statistical authorities need to implement surveys, and international organizations are requested to provide technical support to data-collection efforts. The guidelines are intended to offer users a set of recommendations proposed by a group of experts and national statistical offices given the current status of knowledge. At the same time, in the document, it is explicitly recognized that as more knowledge is generated through survey experience and methodological research, and with technological advances in survey data collection, the guidelines will need to be periodically updated to keep or increase their relevance.

[7] The guidelines are also limited to issues pertaining to questionnaire design and major decisions in field implementation (timing, number of visits). Other survey implementation features that are as important for data quality, such as training and data entry, are not covered by the guidelines. Important emerging issues in which consolidated international practices are still lacking, such as the measurement of food waste, are also not covered in the document.

Additionally, it should be noted that as food consumption data are used for different purposes, not all decisions are of the same degree of relevance to all users. In that sense Smith, Dupriez, and Troubat (2014) distinguish issues around the reliability of survey data (i.e. whether the survey design and method comply with good practice) and their relevance (i.e. whether the data provide the information or indicators needed by different users). For instance, users interested in consumption data for the calculation of CPI are less interested in details of the quantities of specific food items consumed compared with users interested in analyzing nutrient consumption and deficiency. Following the guidelines in full would allow for HCES data to satisfy the needs of all the main uses (poverty, CPI calculations, national accounts, food security and nutrition).

Given the costs involved in data collection, there are clear advantages to ensuring that food consumption data include information relevant to as many users as possible, yet without compromising quality. Survey design requires striking an appropriate balance between those competing demands. It is important that all core users of the data are consulted while developing the questionnaire, sampling plan and fieldwork. There should also be realistic and pragmatic recognition, however, of the extent to which repurposing is feasible. A household consumption and expenditure survey will never be a substitute for an assessment of dietary intake, and analyses of food consumption based on HCES data will always have limitations compared to analyses based on purposely designed surveys.

1.2. Objectives and audience

These guidelines are put forward as a draft document for consultation among the international statistical community. As noted above, the objective is for the draft guidelines and the consultation process to result in a finalized set of guidelines the international statistical community can agree on and possibly submit to UNSC for endorsement by member countries at its next session. This would allow the use of the guidelines not only as a reference document for practitioners, but also as an instrument for promoting international harmonization of survey instruments and comparability of the resulting data. Against the backdrop of this institutional context, the guidelines have multiple aims:

- First, they will provide survey practitioners tasked with designing and implementing HCES in low-income settings with a harmonized set of guiding principles. The aim is to inform the main decisions that need to be taken when designing HCES, factoring in the objective of serving a wide range of users, without compromising data quality.

- Second, by putting forward a vision for some of these principles, the guidelines can serve as the basis for an international dialogue between practitioners and data users coming from different disciplines and looking for different features in the data.

- Third, a set of guidelines that can be widely shared and agreed upon will increase the harmonization of the surveys that are implemented (and the

resulting data) and give greater coherence to the advice that national statistical offices receive from the international statistical community. Often, different users and institutions head in different directions, resulting in countries adopting very different approaches. Resulting survey design can end up reflecting priorities of donors rather than those of countries and detract from the comparability of data across countries and with other surveys within the same country.

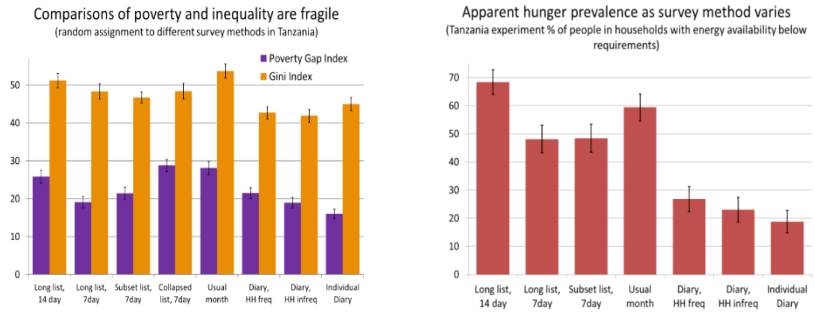
- Fourth, by identifying areas in which the consensus is based on a limited evidence-base, the guidelines can be used to chart the way for an internationally agreed survey methodology research agenda. Importantly, the guidelines can be an entry point for sustaining an interdisciplinary dialogue for the advancement of this agenda, which can bring together statisticians, economists, food security analysts, and nutritionists to contribute to an effective repurposing of HCES that can increase the surveys' "value for money."

1.3. Emerging issues

The international statistical community is well aware that poverty and hunger estimates are inconsistent across countries and over time, and that lack of harmonization of survey methods plays an important part in that. During the consultative process that generated these draft guidelines, national statistics offices in several low- and middle-income countries expressed their concern that they were not well-equipped to adapt survey practices to the changes that are happening in their societies and food systems, making it difficult to continue to collect relevant and reliable data. More concretely, the urgency to address outstanding and emerging methodological issues in survey design for measuring food consumption is immediately apparent if one looks at how adopting different survey design approaches results in markedly different estimates of poverty and hunger, as exemplified in **Figure 1** (based on data from the United Republic of Tanzania SHWALITA study).

Figure 1

Differences in poverty, inequality and hunger measures associated with different survey design options



Sources: Beegle *et al.* (2012) (left panel); De Weerdt *et a*l. (2016) (right panel).

It is also important for this document to be explicit about a number of areas in which the current state of knowledge is not able to provide satisfactory solutions. Some of those challenges are likely to become increasingly important for statistical offices as economies grow and poverty is reduced. To contribute to addressing such questions (some long-standing, some recently emerging), the priorities for future methodological research are identified in the document. Deaton and Grosh (2000) identified a number of outstanding methodological research issues in measuring consumption in household surveys. To date, remarkably little research has been conducted on many of them since their study was published. Furthermore, the research that has been carried out is mostly from a few countries, such as Bangladesh and the United Republic of Tanzania, casting some doubts on the validity of the findings to other settings. More research is, therefore, needed to pin down all the relevant survey design issues. The stance taken in the present document is that while those gaps in knowledge are being filled, surveys still need to be implemented and advice needs to be given; accordingly, it is useful to be pragmatic and agree on what is practical, while also be mindful that some perspectives may change as new evidence emerges.

National statistical offices and researchers will face the difficult challenge of keeping up with some of the emerging concerns. First, some aspects of the measurement task get harder, not easier, with rising affluence. Respondents become less compliant and harder to survey, particularly in the higher income strata, and national statistics offices will have to learn to deal more with non-response than is currently the case in low- and middle-income countries. Lessons can be learned from countries that have dealt with those issues, but some degree of new learning will be required. To the extent that the recommendations included in the guidelines entail a greater burden on respondents, this might aggravate issues of item and unit non-response and increase implementation costs. Countries should, as a result, carefully evaluate those trade-offs when implementing changes to their data-collection methods. Training, enhancing field supervisions, and using technology, on the other hand, can help keep some of those concerns in check when the complexity in implementing the survey increases.

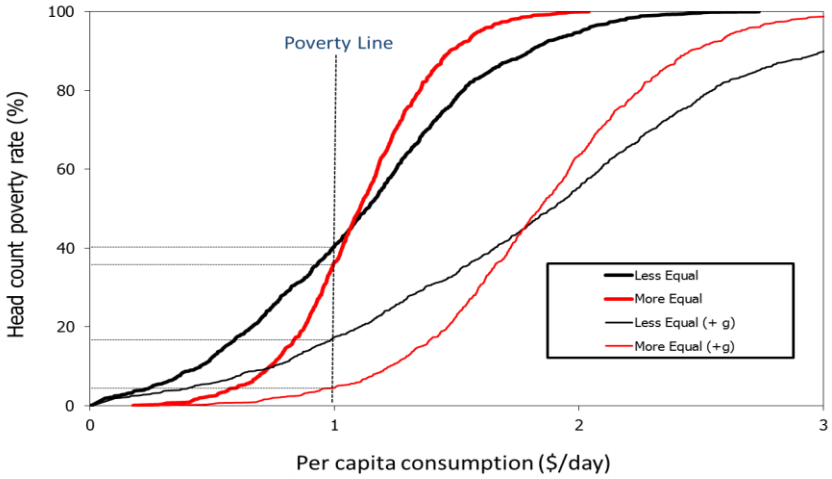
From a policy perspective, inequality has become higher on the global agenda, but what matters even more for a measurement agenda is that as countries escape mass poverty, headcount poverty measures become more sensitive to differences in the distribution. The intuition for this argument is conveyed in **Figure 2**. The comparison of the distributions in the figure shows that the same degree of inequality has a much larger impact on the poverty headcount (given a poverty line) when average per capita consumption is higher. Accordingly, as economies grow and people rise out of absolute poverty, it will become more important for surveys to be able to do a good job of measuring inequality and mean consumption. Most of the available methodological survey work is informative about the impact of survey design on central tendency measures, but much less so on what happens to the shape of the distribution.[8]

Compounding that is the fact that, with per capita income growth, diets become more diverse – income elastic consumption items and foods not eaten from a common household pot become rapidly more important, and these are the food (and non-food) items that surveys are generally less well-equipped to capture. That is associated with larger measurement error, and measurement error has a greater bearing on distribution-sensitive measures of welfare, such as the severity of poverty and hunger, which are also the measures receiving increasing political attention. It is also difficult to separate measurement error from transitory fluctuations, and as more people escape chronic poverty, it is likely that more attention will be paid to transitory welfare shortfalls. In these guidelines some of the key questions survey methods research should prioritize in order to provide practitioners with the tools to address these challenges are singled out.

[8] This statement might be somewhat less true for high-income countries in which the preoccupation of capturing the income at top of the distribution has been is long-standing. For low- and middle-income countries measurement error at both ends of the consumption distribution is much less well researched.

Figure 2

Headcount becomes more sensitive to inequality as poverty rate falls



Source: John Gibson (2016).

The target audience for the guidelines is comprised of all those who have an interest in the design, implementation, and analysis of high-quality, relevant HCES in low- and middle-income countries. First and foremost, are the national statistical authorities that are tasked with implementing HCES to generate high-quality data for the formulation and monitoring of national policies and programs, and need to meet the challenges of monitoring progress in achieving the Sustainable Development Goals under the 2030 Agenda for Sustainable Development. The guidelines are also directed at staff in international and national technical organizations that give advice to national statistical authorities in HCES design and implementation.

As mentioned in the previous section, while there are some antecedents to this document, currently there is no single reference document that experts can refer to when advising countries on survey design choices regarding the collection of food consumption data. This results, on the one hand, in shortcomings of survey design, such as those identified by Smith, Dupriez, and Troubat, 2014, and on the other, in a high degree of heterogeneity in survey designs, which limits comparability. Finally, the guidelines are also directed at survey method researchers and other parties interested in engaging in a global research agenda to advance knowledge on the data quality implications of different survey design choices from the perspective of different users. The vision is to update these guidelines periodically as new knowledge is generated by methodological research and survey practice, as new challenges to survey design and implementation emerge, and as new opportunities emerge as a result of advances in technology.

The remainder of this document is organized in two parts. In Section 2, there is a brief summary of the main uses of food consumption and expenditure data, and desirable features for each of these uses. Then, the arguments, theory, and empirical evidence that can inform specific survey design choices are reviewed. This section is organized around a selection of key choices in the process of

designing a quality survey to collect food consumption or expenditure data. Based on that discussion and evidence, Section 3 offers practical guidance, summarizing the main findings and offering specific recommendations.

2.Review of the evidence and summary of the main issues

A comprehensive review of the different uses of HCES is provided in Smith, Dupriez, and Troubat (2014). Among those uses are poverty measurement, informing food security assessment, providing inputs in the compilation of food balance sheets, providing information for the planning and monitoring of nutrition interventions, informing the compilation of national accounts, and collecting data for compilation of CPI. As a result of the different uses, and the constituencies of users associated with them, the demands from the data vary, and depending on the exact nature of HCES being designed, there are going to be different sets of constraints and opportunities for repurposing. Any attempt at adjusting the design of a survey needs to take into account the analytical needs of the different users. In this document, the main uses considered in setting the criteria for guiding survey design are food security assessments, poverty measurement, and nutrition policy and programming.

Some key issues in the measurement of poverty and food security, and for monitoring nutrition interventions, that are useful for understanding the data needs connected to those uses are presented in the Annex 1.[9] In what follows, the document contains a summary of the literature on key choices that confront practitioners as they design and implement HCES questionnaires. Those aspects were identified as priority areas in a review conducted by Smith, Dupriez, and Troubat (2014) and by experts that participated in the consultation process convened by IAEG-AG and led by FAO and the World Bank. Several of those issues are also treated, theoretically and empirically, in a recent issue of the journal *Food Policy*. The volume includes case studies from a diverse set of developing and OECD countries, analyzing how different surveys design options affect the quality of the data being collected and, in turn, the implications for statistical inference and policy analysis (Zezza *et al.*, 2017).

2.1. Recall versus diary and length of reference period

Data on household food consumption (and acquisition) is commonly collected either by asking households to keep a diary over a reference period (e.g. days or weeks) or through interviews in which respondents are asked to recall consumption for a specific period (e.g. the past week or the past 30 days). A large body of evidence from research and practical experience shows that the method chosen can significantly affect the resulting estimates of consumption.

[9] See Annex 1

The *recall period* is referred to as the period over which respondents are asked to recall the consumption of food items. The recall period differs from the *reference period* when households are interviewed multiple times during multiple visits to the household (Smith, Dupriez, and Troubat, 2014). For example, if households are interviewed about their food consumption in the last seven days over four weekly visits, the recall period is seven days and the reference period is 28 days.

In diary methods, households are generally asked to record consumption at the moment in which it takes place (e.g. at meal times or at time of purchase). However, in practice, households often fill in information about their consumption at the end of the day, or during supervised visits from enumerators (for example, for two-day recall periods if visited every other day). This blurs the line between diary and recall methods, especially when respondent illiteracy is high and supervisors support completion of the diary with visits every few days.

The choice of recall period has long been a critical element of survey design for which there has been limited agreement and evidence of best practice. Scott and Amenuvegbe (1990) suggested the "wide variations [in recall period] reflect the almost total absence of evidence for developing countries on the level of recall error and its relation to recall duration." Similarly, Deaton, and Grosh (2000) commented that "there are no definitive answers about the optimal recall period (…). In the meantime, however, surveys must be designed."

This uncertainty is reflected in the large variation observed in the choice of recall periods across surveys. The review of 100 HCES undertaken by Smith, Dupriez, and Troubat (2014) reveals that of the 56 surveys using exclusively interview methods, 26 surveys were using multiple recall periods depending on the source of acquisition or the nature of the purchase (frequently or less frequently purchased). Of the 30 surveys using only one recall period, 13 used a recall period of seven days, four used a recall period of 14 to 15 days, two used a recall period of one month, five used the "usual month" or "usual week" approach, and the rest used a different recall period.

The "usual month" or "usual week" approach uses a recall period longer than the month (usually the past 12 months) and is aimed at capturing seasonality and other short-term fluctuations in food consumption. Households are asked to recall their average monthly or weekly consumption over the past year, sometimes by breaking this into questions about the number of months per year that they consume (or acquire) the food in question, the times per month that they acquire it in those months and the typical quantity and value on each acquisition occasion. Consequently, the recall period is the year and the reference period is meant to be the typical month within that year, although there is evidence that respondents anchor their answers in the economic conditions of the most recent month (Gibson, 2007).

For recall surveys, the challenge is to choose an effective method for measuring the concept of interest while avoiding biases resulting from two main sources: memory decay and telescoping. A longer recall period may be desirable to better capture items consumed infrequently and to obtain a better sense of the true distribution of consumption over a longer time period (addressing the seasonality of consumption). However, one common effect of longer recall periods is

memory decay (or "progressive forgetting" on the part of the respondent), to use the terminology of Deaton and Grosh (2000), which can lead to under-reporting of consumption. Scott and Amenuvegbe (1991) investigated the magnitude of recall error in Living Standards Measurement Study style surveys in experiments with the Ghanaian Living Standards Survey. For 13 frequently purchased items, expenditure reported in the survey fell an average of 2.9 percent per additional day of recall. For seven-day recall, expenditure was 87 percent of what it was for single-day recall; after two weeks, the recall error levelled out at around 20 percent. Similarly, the Indian National Sample Survey conducted experiments on recall period using "last week" and "last month" in which it was found food expenditure estimates in the weekly recall was more than 20 percent higher than in the monthly recall (NSSO, 2003).

Although a shorter recall period reduces error caused by memory decay, choosing a short recall period introduces another set of problems. As noted by Deaton and Grosh (2000), even under perfect recall, when the recall period is shorter than the period used for analysis, the measure includes variance that does not reflect the true distribution of living standards. A short recall period of one day may eliminate bias in the mean,[10] but it poorly reflects the distribution of expenditure and consumption over a longer time period, such as a month or a year, which generally is the key statistic of interest for household surveys. While the "usual month" approach was advocated by Deaton and Grosh as a way to structure a long recall period to make it more feasible for respondents to answer, while providing analysts with a measure of more typical living standards than is available from a short recall period, the evidence is that this method is not able to overcome the tension between what is feasible to ask and what is desirable to know. In particular, the "usual month" method has proven to be cognitively burdensome, and it, therefore, introduces educational-related inequality into the measure of consumption inequality, takes almost twice as long to field as a fixed recall survey over the same foods, and introduces errors on both the extensive and intensive margins (Friedman *et al*, 2017).

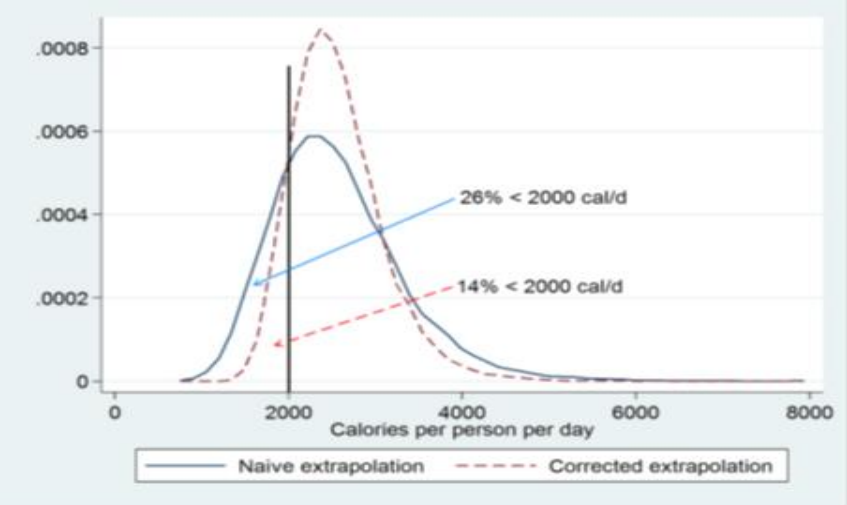
Another strategy used in some surveys is to break the longer reference period into a series of short, adjacent, recall periods. For example, in the Ghana Living Standards Measurement Study, households are visited up to 10 times over a one-month period, so that there are only short recall periods between each visit. A similar design is present in many diary-keeping surveys for illiterate respondents, who may be visited every day or second day over the 14 to 28-day reference period. While there may be some novelty for a respondent being interviewed the first time, a high frequency of repetitious interview visits is likely to induce non-compliance, and clear evidence of that is shown in the Ghana Living Standards Measurement Study by Schündeln (2017), who finds that data quality is highest for the first interview and falls monotonically with each successive interview. Thus, measured food poverty would be 13 percentage points higher if all 10 interviews of the same household are used, compared with using just the data from the first visit.

[10] Assuming the sample of household is sufficiently distributed throughout seasons.

The trade-off between shorter reference periods that allow recall over that same period to be less prone to forgetting, but provide a poor guide to typical, long-run living standards also affects studies focused on estimating average daily per capita dietary energy consumption (DEC).[11] In particular, shorter reference periods are found to affect the variability in energy and nutritional estimates. Using data for Myanmar collected over two monthly rounds per household approximately six months apart, Gibson (2016) annualizes estimates of daily calories per capita from each survey round in two ways: a naïve extrapolation that multiplies estimates from each round by six and then adds them, and a corrected extrapolation, which is based on the intra-year correlation in daily calorie per capita across survey rounds of 0.45. The implications for measures of hunger by doing this correction is exemplified in **Figure 3**. Given two distributions with the same median calories per capita per day, the one based on naïve extrapolation of the monthly data will have a greater dispersion compared to the adjusted one, resulting in a greater incidence of hunger for a given threshold (2000 kcal/day in this case).[12]

Figure 3

Chronic hunger overstated by naïve extrapolation from monthly calories to annual



Source: Gibson (2016).

An analysis performed by the FAO Statistics Division using the 2010 data of the Bangladesh Household Income and Expenditure Survey illustrates how the variance of the per capita DEC is significantly reduced over longer observation periods. (Box 1).

[11] This is a key variable in the measurement of undernourishment, as estimated by FAO and reported in the *State of Food Insecurity in the World Report* series.

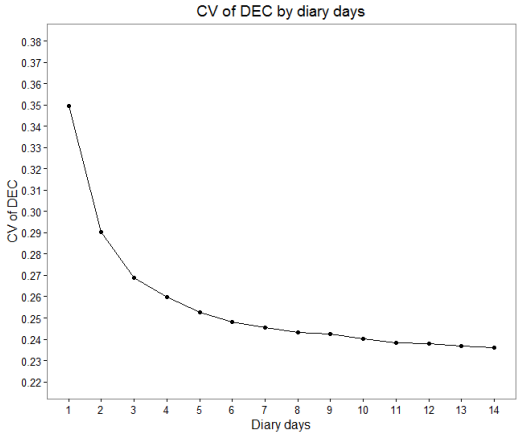
[12] To estimate the prevalence of undernourishment (Sustainable Development Goals indicator 2.1.1), FAO is using the minimum dietary energy requirement that depends on the age, sex structure of the population, the fifth percentile of the body mass index distribution for adults, the height of the individuals in the population and the average of the sedentary lifestyle range for physical activity levels in the country. This threshold is not fixed and varies from one country to the other.

Box 2

Case study: Bangladesh 2010 Household Income and Expenditure Survey

The Bangladesh Household Income and Expenditure Survey 2010 was carried out from February 2010 to January 2011. Within those 12 months of investigation, the survey was divided into 18 periods, each 20 days. Food consumption was collected through a diary over a period of 14 days. Throughout the period, households were visited frequently (from 7 to 14 visits).

The Dietary Energy Consumption (DEC) was estimated for each day of the diary. The figure below shows the coefficient of variation (CV) of DEC obtained using different numbers of diary days. From the plot, it can be clearly seen that the variability is highest (CV=35 percent) when using observations from the first day only and decreases convexly and converges at a value of CV of around 24 percent after the seventh day. After the first week, the variability does not seem to decrease much, suggesting that a reference period of seven days might be enough for estimating the variability of DEC.



Source: Grünberger (2017a)

Short recall periods can also lead to telescoping in which respondents report consumption that has taken place outside the reference period, also causing a bias in estimates. Several studies suggest that there cannot be one optimal recall length, as, depending on the type of good and the frequency of consumption, telescoping or decay may be observed (Bradburn 2010; Hurd and Rohwedder, 2009). In general, telescoping is more likely for large and infrequently purchased or consumed items under shorter recall periods, while a longer recall period leads to recall decay and underreporting of more common and frequent purchases (Deaton and Grosh, 2000; Moltedo *et al*, 2014; Neter and Waksberg, 1964). The Indian National Statistical Office designed an experimental survey including three types of data collections: daily visits with direct measurement (benchmark), seven-day recall, and 30-day recall by food group. The report of the Indian National Statistical Office (NSSO, 2003) shows that optimal recall period depends on the food group and frequency of consumption. The 30-day recall works better than the seven-day recall in measuring staple food like cereals and is not inferior in measuring high-frequency items. One explanation for those

patterns is that staple foods, and other high-frequency items, lend themselves to more accurate "rule of thumb" reporting, based on their regularity (Friedman *et al*, 2017), so strictly speaking they are being "estimated" rather than "recalled", and with a 30-day period, the effect of any telescoping is diluted compared with a seven-day period.

A possible solution for dealing with telescoping is a bounded recall approach, suggested by Neter and Waksberg (1964). In that approach, a first visit to the household by the enumerator is used to establish the bound of the recall period for a second visit, which is when the actual interview takes place. The enumerator can, accordingly, ask the respondent about consumption since the first interview, reducing the likelihood of respondents reporting consumption or acquisitions taking place outside the recall period. This approach can, however, be costly to administer as it requires two visits to the same household, and despite having a long history (including within the Living Standards Measurement Study program), there have not been enough studies to provide convincing evidence that it offers a significant advantage in terms of data quality (Deaton and Grosh, 2000; Gibson, 2005). This is, therefore, an area in which future methodological research could usefully focus on to establish whether such advantage exists in practice.

Diaries present an approach which in theory can deal with important shortfalls of regular (longer) recall methods, such as telescoping and recall bias. They are in fact the method of choice and are successfully implemented in many countries for collecting data on food and other frequent expenditures. However, they can be practically challenging to implement in the conditions prevalent in many low- and middle-income countries. Diaries are far more demanding in terms of supervision, especially with illiterate respondents, when they are implemented as a series of short recall interviews, and as a result, become more expensive and demand higher capacity. While a well-implemented diary is generally considered the gold standard for measuring consumption, poorly implemented ones are often inferior to a good recall survey. Even in the context of the United States of America, where the set of challenges for diaries and recall may be different than in lower income countries, evidence suggests that recall surveys might outperform diaries (Bee, Meyer and Sullivan, 2012).

A growing body of research has shown how the diary method causes considerable response burden and fatigue, particularly when the length of the diary increases, ultimately affecting data quality and reliability. Studying the Canadian Food Expenditure Survey, Ahmed, Brzozowski, and Crossley, (2006) find a decrease in reporting because of "diary exhaustion" with reporting decreasing by 10 percent from the first to the second week of filling diaries. Similarly, studying the United States, Stephens (2003) finds significantly higher values in the first diary week and on the first day of each diary week relative to the remaining days, attributable to respondent fatigue. Analyzing the 2009/10 data of Papua New Guinea, Gibson (2013) also finds that the total value of consumption transactions declined by 4.4 percent per day during the diary-keeping period. A large set of other studies, such as Kemsley (1961), Turner (1961), Sudman and Ferber (1971), McWhinney and Champion (1974), and

Silberstein and Scott (1991), find similar evidence of fatigue and decay in information collection in diaries over time.

With high levels of supervision and careful implementation, diaries can and are being implemented in some countries, with good results. In analyzing the Bangladesh 2010 Household Income and Expenditure Survey, the FAO Statistics Division reported a negligibly low decrease of DEC because of fatigue, likely because of very good respondent supervision practices, with enumerator visits taking place every one or two days.[13] Such levels of supervision lead to a mix of diary and interview methods that are not likely to be affordable; diaries do not, therefore, appear to be the most suitable method for resource-constrained statistical offices in low- and middle-income countries. Furthermore, even for well-implemented diaries, the evidence clearly suggests that longer periods of implementation do not add to the quality of information (they actually detract from it) and entail higher implementation costs. Expanding mobile phone coverage throughout the world opens possibilities for remotely assisting diary completion (as well as recall interviews) at a fraction of the cost. This is an emerging trend (or an established one in some high-income countries), but not an area for which there is enough experience at scale in low-income settings for it to be recommended as a common practice during the time these guidelines are being formulated.

One final aspect of diary implementation is that often the analyst is presented with data that have already been to some extent aggregated (e.g. by adding up the 7 or 14 days of data), which does not allow for detecting and correcting possible patterns in the data, such as diary fatigue (Troubat and Grünberger, 2017). When diaries are implemented, it is important that they are reported together with full metadata, allowing the user to evaluate the data-collection process, including the role of the enumerator in aiding the data-collection process, the number and timing of supervision visits, and similar details.

In the Living Standards Measurement Study handbook, Deaton and Grosh (2000) provided a discussion of the issues outlined above and concluded by recommending only changes on the margins of the Living Standards Measurement Study status quo. Specifically, that meant using bounded recall for purchases, coupled with a usual month question for purchases and consumption of food from own production, plus one 12-month recall question on the value of food gifts received by the household. Deaton and Grosh has already observed, however, a decline in the actual use of bounded recall in the Living Standards Measurement Study survey practice for reasons related to the added cost and burden (for enumerators and respondents) of the additional household visit. While pointing to the pros and cons of the usual month and of shorter recall periods (progressive forgetting, telescoping, difference from the "true" variance) as discussed above, in recommending the usual month approach, they also recognized that this was based on weak and often contradicting evidence, and mostly motivated by the desire to modify the "status quo" at the margins, in the absence of stronger evidence in favour of a particular approach.

[13] Food consumption reporting dropped on average by less than 0.1 percent per diary day.

Despite the lack of conclusive evidence lamented by Deaton and Grosh, and their call for "every survey [to] have a budget for experimentation", there has been a limited number of new studies undertaken in low- and middle-income countries focusing on those methodological questions. One that has been particularly influential is the SHWALITA study ("Survey of Household Welfare and Labour in Tanzania") (Beegle *et al*., 2012; Gibson *et al*., 2015; de Weerdt *et al*., 2016). New evidence has also been produced through the work reported by Backiny-Yetna, Steele, and Yacoubou (2017) in Niger. Based on those studies and increased practical experience, practitioners involved in living conditions surveys have come to favour a seven-day recall period over longer reference periods. Deaton and Grosh had already noted signs of the bounded approach falling out of fashion with practitioners because of its higher complexity.

The SHWALITA study (Beegle *et al.*, 2012) provides convincing evidence, from an experimental setting, that recall interviews inquiring about "usual" monthly consumption food underestimated household consumption expenditure when compared to the benchmark assisted individual diary (see **Figure 1**), whereas the seven-day recall was reasonably close to the benchmark. At the same time, the usual month interviews also had the longest completion times (76 minutes compared to just under 50 minutes for the 7- and 14-day recall), and were not associated with a significantly smaller coefficient of variation when compared to the shorter recall methods. In addition to the resource implications of longer fieldwork time, the longer completion time for the usual month approach is suggestive of a greater burden on the respondent who, with the enumerator, needs to engage in a demanding estimation procedure to work out the response for a typical month starting from recalling consumption episodes over a 12-month period. Taken together, this evidence indicates that the usual month may be a lose-lose proposition if it is less accurate and more cumbersome to implement when compared to a seven-day recall. This is possibly the most important single development in the evidence base since the publication of Deaton and Grosh (2000).

Importantly, another plea made by Grosh and Deaton (2000) two decades ago remains unanswered and just as valid today. As changing the recall period or method leads to incomparability issues with previous surveys using other methods, changes in survey methods over time should be accompanied by an experimental study to make it possible to reconcile the figures produced by the survey before and after the change in methods. Experiments, such as Beegle *et al.* (2012) and Backiny-Yetna, Steele, and Yacoubou (2017) have provided good practical examples of how changes in methods can be assessed and thus allow for valid comparisons when methods are changed.

2.2. Seasonality, number of visits

Consumption and expenditure patterns often show seasonal variations that are linked to the agricultural production season, cyclical events, such as floods and droughts, or cultural events (e.g. Ramadan, Christmas), which affect food availability, prices and customary consumption practices. The existence of

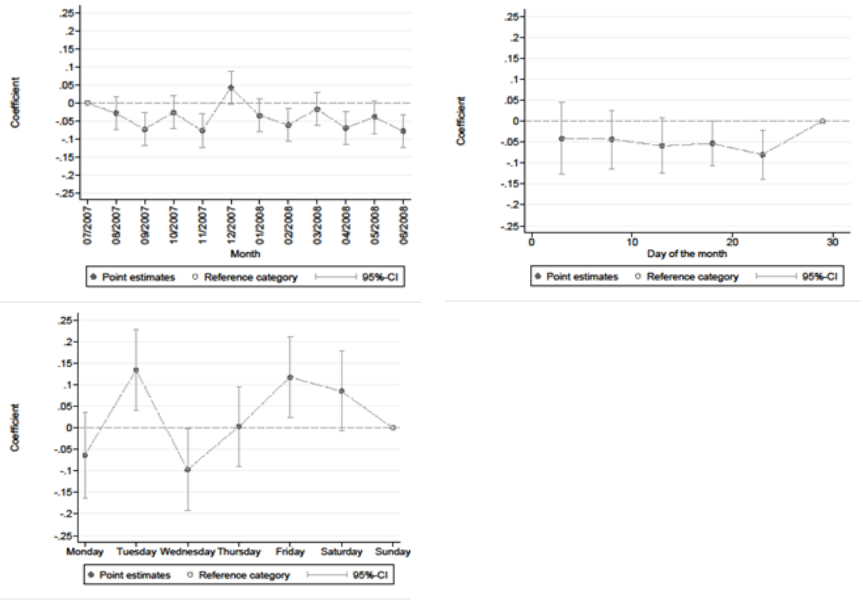
seasonality in food consumption patterns is well-established (Paxson 1992, 1993; Alderman, 1996) but its extent depends greatly on the context.
Seasonality can be particularly important for food consumption because seasonal variations in dietary patterns, overall quantities of food consumed, and the consumption of particular nutrients can be pronounced, partly because of its relationship with food production cycles (Coates *et al.*, 2012). D'Souza and Jolliffe (2012) find that household consumption in Afghanistan can be as much as one third lower in the lean season compared with the post-harvest season. The different levels of consumption, if taken at face value, would result in estimates of the poverty headcount doubling from 23 percent in the fall to 46 in the following summer (D'Souza and Jolliffe, 2012). Seasonality in food prices is a key concern as it is found to be significant and can affect estimates of poverty and consumption (Gilbert, Christiaensen, and Kaminski, 2016). That is of course a major issue for surveys collecting data for the calculation of CPI.

Seasonal variations can also originate from increased expenditure during festivals and holidays. In the United States, it has been established that consumption is higher during holidays and summer months (Barsky and Miron, 1988). In low- and middle-income countries, expenditure can vary significantly with holidays, festivals, and religious observances. Jolliffe and Serajuddin (2015), using data for Jordan, note that during the period of Ramadan, consumption levels are 11 percent greater than during other periods of the year. The festive expenditures can be difficult to capture in surveys because it is often difficult for survey fieldwork to operate as normal during festive periods. A few surveys, such as the Living Standards Surveys in Viet Nam, use a special recall module for food consumption during festive periods, with analysis typically then spread over the consumption estimates for the households observed in the rest of the year.

Within-year temporal variation can originate from other patterns, such as those associated with payment schedules for wages or social assistance (Stephens, 2003). Troubat and Grünberger (2017), in studying the urban subsample of the Household Socio-Economic Survey 2007-2008 of Mongolia, have found cyclical variations in food acquisition levels not only between months but also within months and weeks. Because of Independence Day, a major national holiday occurring in December (see **Figure 4**, left panel), results in the mean consumption in that month are substantially higher than for the other months of the year. A systematic pattern is also apparent for data collected at the end of each month when food consumption is significantly higher (centre panel). Households also tend to spend significantly more on food on Tuesday and Fridays as compared with Mondays and Wednesdays (right panel).

Figure 4

Variation in mean food consumption by month, day of the month, and day of the week, urban Mongolia



Source: Troubat and Grünberger (2017)**.**

Even if such patterns are difficult to generalize given the context specificity, they remain an important example of sources of bias that should be mitigated to the extent possible in survey design (Fielder and Mwangi, 2016). If seasonality is not taken into account when there is marked seasonal variability in food consumption, the use of short reference periods bias the estimates of the mean and the standard deviation of the distribution of habitual food consumption in the population. Recorded mean consumption may be higher or lower, depending on the season when the data are collected, and estimates of the coefficient of variation may be biased by the confounding effect of seasonal variation.

A survey carried out at a specific time of the year (say a season, month, or week), misses seasonal variation in consumption and risk being unrepresentative of typical consumption across the year, even when it manages to accurately capture consumption over the period of data collection. Also, surveys that are not adequately capturing the entire year pose problems for international comparability. Comparisons of consumption data for a country conducting a survey in the lean season and one conducting it in the harvest season are difficult to make in the absence of elements that enable the habitual consumption levels in both countries to be gauged. Even over time, comparisons of surveys undertaken within the same country and during the same period of the year might be invalidated if major events correlated with consumption patterns move in and out of the survey implementation period. This may happen with Ramadan, the dates for it move from year to year, or when harvest periods are delayed or pushed forward by weather events. For all those reasons, it has been recommended that

HCES should cover a full year to properly capture seasonal variations in expenditures (ILO, 2003), although this is by no means a universal practice.

Deaton and Grosh (2000) suggest the use of a "usual month" approach to overcome seasonal variation, but in the previous section, it was shown how the reliability of that approach appears questionable, and is associated with longer interview times and heavier cognitive burden on the respondents. Deaton and Zaidi (2002) suggest that for capturing household consumption, the optimal survey implementation and design is the one likely to provide the most precise estimate of annual consumption for each household, not just for households on average. Based on this objective, the ideal design is one in which households are visited each "season" and habitual consumption is then derived as an average over the year of seasonal consumption. For variance-based measures, those intra-year revisits make possible corrected extrapolation, along the lines of what is shown for estimates of hunger in Gibson (2016). A drawback of revisiting the same households is the cost and the trade-off with overall sample size, as for any given sample size, the survey costs increase with the number of multiple visits.

Just over half (53 percent) of the surveys reviewed by Smith, Dupriez, and Troubat (2014) considered seasonality by using one of two approaches. The first approach (used in 41 percent of assessment surveys) is to distribute data collection throughout a year by surveying subsets (usually one twelfth of the households in the sample) in each month of the year, with subsamples representative nationally for each quarter. This approach (which conforms to the ILO recommendation) requires careful planning of the sampling strategy and survey implementation, but it can ensure that the seasonal variation across space and time is captured, at least for a "synthetic" household albeit not for any particular household in the sample, and represents a lower burden on households as they are visited only in one period of the year. This method can present advantages in terms of organization when survey staff are employed to just work on one survey, as it smooths the need for the workforce over the survey year and can allow working with smaller teams, hence ensuring tighter supervisions.

The second approach (used in 12 percent of the surveys reviewed) is to conduct two to four visits during the year on the same households. It was noted above how additional visits to the same households come at a cost, pose logistical challenges, and increase the burden on the respondents. This option can, however, be attractive when the survey also has other objectives, such as collecting data on agricultural activities, to the extent that the visits can be timed around salient moments for both objectives; for example different points in the agricultural season (e.g. post-planting and post-harvest) as is done in the Nigeria National Panel Survey (2010–2011, 2012–2013, 2014–15) and in Enquête Nationale sur les Conditions de vie des Ménages et l'Agriculture (2011, 2014) conducted for Niger. Finally, three of the surveys reviewed by Smith, Dupriez, and Troubat (2014) collected data in four visits over a 12-month period. This approach is widely deemed to be very difficult to implement and excessively cumbersome in terms of organization, with the burden on respondents at its highest. Some countries implement two rounds of data collection in different periods of the year, but on a different cross-section of households. That does away with the added interview burden for the household, but it only allows

controlling for seasonality for the sample aggregate and not for each specific household. Also, it does not provide an opportunity for correcting variance-based measures for excess variability due to intra-year fluctuations.

Forty-seven percent of the surveys reviewed by Smith, Dupriez, and Troubat (2014) do not satisfactorily account for seasonality in their design, as they are implemented through one household visit over the span of a few months. This approach returns data that are subject to all the biases discussed at the beginning of this section, but it is quite common because the approach is easy to implement. When staff are employed by different surveys implemented by the same statistical office, the approach allows the office to move them on to the next project when the household income and expenditure survey fieldwork is completed. It is often also motivated by the idea that if the period of implementation does not vary, then at least over time, comparison would be safeguarded. This is, however, a questionable assumption, as the extent and timing of seasonal variations may not be the same from one year to the next. Also, any unforeseen implementation issues that would delay the onset of the fieldwork from its planned schedule would invalidate over time comparability of the data. These are very serious concerns that point to the need to abandon this practice for one that takes seasonality fully into account.

A hybrid approach that could be experimented, which at least partly limits the more serious shortcomings of the "one visit over a few months" approach, would entail complementing that one visit with a second visit on a subsample of households. This additional subset visit could provide the information required to correctly annualize the data from the first visit. This is, however, only a hypothetical survey design that would need to be carefully tested before being applied at scale, and as such, it represents at best an indication for further research.[14]

2.3. Acquisition versus consumption[15]

Early on, food consumption data were mainly collected in HCES (in particular, in household budget surveys) to construct the consumer price indices or to inform national accounts. For such uses, the interest was mainly in collecting data on food items acquired through expenditures. Obtaining food through expenditures is now widespread throughout the world and has become the prominent form of food acquisition in many locations, especially in urban areas. However, in many countries, a considerable share of households obtains some food from their own production, such as from crop cultivation, livestock rearing, fishing and aquaculture, or hunting and gathering. It is also quite common for households to obtain some of their food in kind, in the form of

[14] An example of this design, using a 20 percent subsample who were revisited approximately five months after the initial visit, is provided by Gibson (2001). The second visit was estimated to add about 10 percent to total survey costs, and made it possible to partition poverty estimates into chronic and transient components.

[15] This section is based on and reproduces parts of Conforti, Grünberger, and Troubat (2017).

gifts from other households, payments from an employer, or public or private assistance (school feeding, food assistance programs, or social or private transfers in kind).

As HCES are increasingly used for poverty and food security analysis, the emphasis of the surveys has shifted to also collecting data on food items obtained through not only expenditures, but also through other sources of acquisition. Accessibility is one of the dimensions of food and nutrition security, as defined by FAO, which includes access to food from all possible sources. For poverty analysis, all sources of food acquisition enter the consumption aggregate, not only those that imply an outlay of cash. With regard to nutritional assessments, what is actually ingested matters. Again, that implies a focus on consumption (or more specifically, intake) of food regardless of how it was acquired. Understanding how food systems work and evolve, what share of foods households in different socio-economic groups acquire from different channels, what the relative prices are for households in different locations, and what the nutrition and welfare implications are, requires having access to food data.

For national accounts, food produced for own consumption is part of the household final consumption expenditure. Getting information on own-account production and consumption of food (as well as other goods) by households is, therefore, critical, even though agriculture surveys or censuses may also provide that information. Such food should be valued at "basic prices" of similar goods, which can be approximated by the price of similar goods sold on a local market, or the price declared by the household producer if he or she had sold the food rather than consumed it. Information on food and meals acquired through in-kind transfers is also important. Valuation should be based on actual cost if actually purchased by the provider or production cost, both being unknown and difficult to evaluate by the beneficiary.

Not all surveys, however, are designed to capture information on all the food that is consumed or available for consumption in a household from all the sources of acquisition. Three different approaches to collecting food data can be identified, following Conforti, Grünberger, and Troubat (2017):

- *Acquisition*. Households report on food they acquired through purchases, own production and in-kind transfers. Actual consumption of the same food is not reported.

- *Combination of acquisition and consumption*. Households report on acquisition for food they incurred an expenditure for purchases, without specifying the amount of food consumed. Food consumption derived from own production or received from transfers is reported.

- *Consumption*. Households report on food consumed, and on whether that same food was purchased, own-produced or received as a transfer.

Differences in food measurement among surveys focused on acquisition and consumption are not always clear. In principle, the difference between the two measures is essentially a change in stocks, and food wasted in households. For surveys based on efficient representative samples homogeneously spread across

time and space, changes in stocks should on average be close to zero. In any given reference period, some households may build stocks while others may consume food from stocks. However, surveys with less effective timing of household visits may show significant differences between acquisition and consumption (e.g. if the survey is implemented in one visit when most households are stocking or destocking).

Smith Alderman & Aduayom (2006) provide a general discussion about the difference between estimates of consumption and acquisition. Depending on the length of survey coverage and reference period, the distribution of acquired food is expected to have a higher variance and a higher mean than the distribution of consumption. The variance of acquisition surveys is higher because daily food consumption is smoother than acquisition. This difference is expected to decrease to zero as the length of the survey period increases. During the reference period, households can either consume from stocks (underestimating household consumption using an acquisition survey) or build stocks (overestimating household consumption using an acquisition survey). As a consequence, households can have zero expenditure during a given reference period, albeit consuming from stocks (Gibson and Kim, 2012). Acquisition surveys should be used to approximate aggregated consumption of population groups, rather than habitual consumption of individual households. Acquisition data are assumed to have a higher mean than consumption because food waste, rotten stocks, or food given to pets is already detracted in consumption estimates (Smith Alderman and Aduayom, 2006). However, empirical studies suggest that the difference between averages of food acquisition and consumption is not always positive, but they can sometimes be close to zero or even negative (Kaara and Ramasawmy, 2008; Martirosova, 2008; Smith, Alderman, and Aduayom, 2006; Bouis, Haddad, and Kennedy, 1992; Bouis, 1994). Conforti, Grünberger, and Troubat (2017) analyzed 81 HCES[16] conducted between 1988 and 2014 and found that the average dietary energy consumption from surveys focusing on acquisitions was only slightly higher than that from surveys focusing on consumption, but the variability was, in turn, much higher (an average coefficient of variation of 76 compared to 52).

Though the difference in the aggregate measure is not that significant, the difference in the coefficient of variation is of real concern for FAO, which is using the coefficient of variation derived from food data collected in HCES to estimate the prevalence of undernourishment. FAO has developed a methodology to overcome the issue of excess variability encountered in the food consumption measurement (Wanner *et al*., 2014). Troubat and Grünberger (2017) applied this methodology to the Household Socio-Economic Survey 2007/2008 of Mongolia, which collected food consumption and food acquisition.[17] They found that the difference in variability that exists between DEC from acquisition and DEC from consumption disappears after both distributions are corrected for excess variability (coefficient of variation decreased from 63 to 31 percent for food

[16] Surveys analysed by the FAO food security and nutrition statistics team from 2006 to 2014, using the ADePT-FSM software developed jointly by FAO and the World Bank (Moltedo *et al*., 2014).

[17] The latter survey measures a household's food acquisition, and food stocks at the beginning and the end of the reference period. Combining the information of acquisition and stock variation, the household's food consumption can also be derived from food acquisition.

consumption measurement based on acquisition-type data and from 52 to 30 percent for food consumption measurement based on consumption-type data).

The decision to collect acquisition or consumption data is not expected to have a large impact on the estimate of the prevalence of undernourishment, nor poverty, as there is no significant effect on the mean and the impact on variability can be reduced using the control for excess variability. However, for countries with a large population and low average DEC, a small difference in kilocalories per capita per day can still affect food security and nutrition assessments.

In addition to those general questions, there is a more specific – but not less important – set of risks associated with survey design that does not explicitly take into account the difference between consumption and acquisition. According to the review performed by Smith, Dupriez, and Troubat. (2014), in surveys based on recall interviews, it is not uncommon for questionnaires to include poorly worded leading questions or other forms of design ambiguity that can lead to incomplete enumeration of foods consumed. Such issues arise when the survey design fails to properly consider that not all the food acquired by a household is consumed during the survey reference period, and that food can be consumed during the reference period that was acquired earlier. Their findings are reproduced with minor changes in the remainder of this section and summarized in **Table 1**.

Table 1

Completeness of enumeration of food acquisition or food consumption or both

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.

Source: Smith, Dupriez, and Troubat (2014).

For the food data in HCES to be reliably collected, there must be full accounting of either all acquired food intended for consumption or all food that was consumed over the recall period. Additionally, only the food intended for

consumption (when acquisition focused) or consumed (when consumption focused) during the reference period must be included, not any additional food. The following exclusion and inclusion accounting errors can adversely affect 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," collection of further data on the acquisition of the food can be ruled out. In this case, respondents are first asked whether they consumed each food item in the food list for a recall period of up to one year before the time of the survey. Then, they are asked how much was purchased, consumed from own production, or received in kind over the survey recall period for food data collection. However, if the respondent answers "no" to the leading question, the instructions skip to the next item, then, the 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 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 affect 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 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 a food item, then no further information is collected on other forms of acquisition of that food item. As home-produced or in-kind receipts 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 interviewees declare food harvested instead of food consumed from own production or food from own production for consumption, the quantities and expenditure 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. A similar situation occurs when there are household animals, such as poultry and pigs, that may eat some of the food that was harvested from household food gardens (e.g., undersized tubers, and food that is deemed as otherwise unfit for human consumption given the food availability at the time).

(5) Ambiguity about whether to report on acquisition or consumption. The question asked to respondents does not make it clear whether they are expected to report on their acquisitions or consumption of each food item over the recall period. This problem leads to inaccuracies in the calculation of the mean acquisition or consumption for the population and measures of inequality.

(6) Routine month surveys: Ambiguity about whether respondents should report on the routine month in the recall period or only on those months in which the food item is actually consumed. In many routine-month surveys, respondents are first asked to report on the number of months in the past 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 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 underestimation 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, which affects only 2 percent of the surveys. 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 8 percent of the surveys. Overall, 25 percent of the surveys had not met the reliability criterion for completeness of enumeration, that is, they were affected by some of the identified problems of incomplete enumeration. Note that the large majority of the surveys with those types of accounting problems are interview surveys.

2.4. Meal participation

The size of a household is only a proxy for the number of food consumers in the household during the reference period. Per-capita measures of food consumption should be based on the number of people who actually take part in the meals (food partakers) in the household (Smith, Dupriez, and Troubat, 2014; Weisell and Dop, 2012). People other than household members who could take part in the household's meals include employees who had their meals in the household, guests, and visitors. The number of food partakers should exclude household members not present in the household during the reference period.

Adjustment for food partakers may not be an issue for poverty measures, but collecting that information is essential for the analysis of habitual per capita food consumption and food security estimates. Indeed, nutrient inadequacy is assessed with reference to requirements that are expressed in a per person basis.

Household surveys collect information on total amount of food consumed by households over a certain reference period. To convert this information to a per capita basis, it is important to account for meal participation in the household. The most common way to do this is to consider the number of people who consumed the total amount of food reported by the household.

Box 3

Estimating average per capita dietary energy consumption

Based on household size and the number of partakers, per capita DEC of a household *i* can be calculated in two ways. First by dividing the total number of daily calories consumed in a household by the exact number of people who participated in the meals

$$DEC_i^P = \frac{TotalDEC_i}{Partakers_i}$$

or, if the above is not available, by dividing total household calories by the number of household members

$$DEC_i^{HH} = \frac{TotalDEC_i}{HHsize_i}$$

In the latter case, food consumption is underestimated if mean consumption is calculated on the basis of household size. When food is provided also to non-household member partakers, the total food consumption in the household increases. The household's mean consumption should be correctly calculated by dividing total household food consumption by household size plus additional partakers minus absent household members. In omitting the additional partakers from the calculation, the denominator is smaller and the household's mean consumption is overestimated. If absent household members are not subtracted from household size, the denominator is higher and household's mean consumption is underestimated.

However, there is no standard approach to capturing information on meal participation in households, and many surveys fail to collect that information. Smith, Dupriez, and Troubat (2014), in their survey assessment, find that only 15 of 100 surveys ask whether non-household members were present or consumed meals in the household during the recall period. Even within this small number, there is variability on the additional information collected, with 11 asking about the number of visitors in the household, 10 about the number of meals they consumed, and a handful also asking information on the length of stay, type of meals they consumed, and age and sex of the guests. Fiedler and Mwangi (2016) provide a thorough description of approaches to collecting partakers. Reviewing 17 recent surveys, they found 16 different possible questions combined in various ways, with no two countries collecting the same information on partakers (**Table 2**).

Table 2

Approaches to collecting information on partakers in 17 household consumption and expenditure surveys

Household Consumption and Expenditure Survey data for developing more detailed estimates of meal attendance by number and type of meal, and number and level of participation

Topic	Data item collected	No. of HCES collecting
A. Meals		
	1. Usual number of meals eaten daily	7
	2. Type of meal eaten (breakfast, lunch, dinner, snack)	1
	3. Type of meal eaten away from home (breakfast, lunch, dinner, snack)	3
	4. Total number of meals served	2
B. Person-specific data		
B1. Household members		
	5. Present during the reference period? (yes/no)	8
	6. At least 1 meal eaten at home during the recall period ?	10
	7. Number of days ate in the household during recall period?	2
	8. Meals eaten away from home? (yes/no)	2
	9. Number of meals away from home	2
	10. Number of days away from home	1
B2. Non-household members/guests		
	11. Were any guests present during the reference period? (yes/no)	8
	12. Number of guests present	7
	13. Number of days guests were present	4
	14. Number of meals served to guests	4
	15. Type of meals served to guests	1
	16. Characteristics of the guests (age, gender)	7

Source: Fiedler and Mwangi (2016).

Partaker correction should in theory have no impact on the overall sample mean of per capita food consumption because positive and negative deviations from the household size balance out.[18] On average, the household size should be equal to the number of partakers. The multivariate analysis of 81 HCES[19] that were conducted between 1988 and 2014 (Conforti, Grünberger, and Troubat, 2017) indicated no significant difference between the mean and the coefficient of variance of DEC per capita accounting for partakers, when controlling for other survey characteristics. However, there is empirical evidence to believe that not accounting for partakers distorts the distribution of per capita DEC.

In analyzing surveys from Kenya and the Philippines that collect information on partakers, Bouis, Haddad, and Kennedy (1992) and Bouis (1994) show that the relative difference between mean DEC of the first and fourth quartile is much lower when partakers are accounted for. Similarly, using an urban survey, Gibson and Rozelle (2012) show how using the roster of meal partakers lowers the apparent calorie availability of the richest quartile by 7 percent and raises the calories of the poorest, in cases in which this pattern results from a coping

[18] If meals consumed in another household have a corresponding entry as meals given to another household.

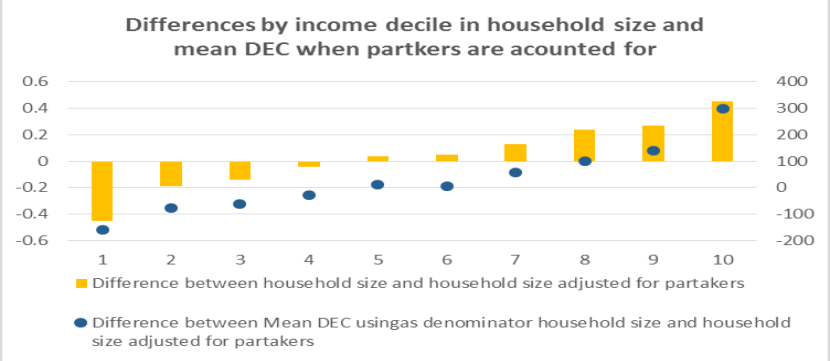
[19] Surveys analysed by the FAO food security analysis team from 2006 to 2014, using the ADePT-FSM software developed jointly by FAO and the World Bank (Moltedo *et al.*, 2014).

strategy of the poor, which is to visit their wealthier kinfolk at meal times. Those studies, therefore, provide evidence that the variability of DEC conditional on household income is lower if data are adjusted for partakers.

Results in line with those of Bouis, Haddad, and Kennedy (1992) were confirmed by a similar analysis conducted by FAO on food data collected in the 2010 Bangladesh survey (Grünberger, 2017b). In that survey, information was collected daily on the number of people partaking in the meal, by gender and age groups. The variability of DEC conditional on income is much lower once DEC was adjusted for partakers, and the difference between household size and the number of partakers increased monotonically with income (**Figure 5**). A clear upward trend in the difference between per capita and partakers-adjusted mean DEC can be observed between the bottom and the top decile.

Figure 5

Differences in household size and mean dietary energy consumption per capita when adjusting for partakers



Source: Grünberger (2017b).

Researchers from the FAO Statistics Division analyzed five surveys that collected information on partakers and found that the coefficient of variation of DEC was systematically lower when household size was adjusted for partakers, even though the five surveys used different approaches to collect data on partakers (**Table 3**). In the 2010 Bangladesh Household Income and Expenditure Survey, the respondents were asked to report daily on the number of people present in the household and their demographic characteristics. In the Household Socio-Economic Survey 2007-2008 of Mongolia, information on the number of visitors and the number of days they stayed in the household was collected. In the 2007-08 Afghanistan National Risk and Vulnerability Assessment and a survey conducted by Niger in 2011, respondents were asked to report on the number of meals and number of days that visitors stayed in their house. Finally, in the 2010/11 Uganda National Household Survey, information was collected on the number of people present in the household during the reference period. The reference period is sometimes different than that of the food module, which was observed for the Household Socio-Economic Survey 2007–2008 of Mongolia.

Despite the difference in approaches, in all five countries, the coefficient of variation of DEC is systematically lower when household size is adjusted for

partakers. The method designed by FAO to correct for excess variability fails to correct it because of the omission of partakers.[20] In terms of overall impact on the estimate of the prevalence of undernourishment, the effect of not-corrected partakers may lead to an over- or underestimation, as a higher per capita DEC may counterbalance the effects of the higher variability.

Table 3

Comparisons of the coefficient of variation of dietary energy consumption when adjusting for partakers

	Coefficient of variation of DEC per capita without		**Coefficient of variation of DEC per capita after**	
	Not accounting for partakers	Accounting for partakers	Not accounting for partakers	Accounting for partakers
Afghanistan 2007/08 National Risk and Vulnerability Assessment	0.36	0.35	0.25	0.24
Bangladesh Household Income and Expenditure Survey	0.32	0.24	0.26	0.22
Household Socio-Economic Survey 2007–2008 of Mongolia	0.48	0.46	0.32	0.30
Niger 2011 Enquête Nationale sur les Conditions de vie des Ménages et l'Agriculture	0.63	0.58	0.35	0.34
Uganda 2010/11 Uganda National Household Survey	0.63	0.61	0.38	0.35

One must be careful not to conclude from this evidence that meal participation is not an important issue; indeed, it still needs to be addressed.[21] Household socio-economic surveys that currently attempt to make those adjustments are few and highly diverse. In several countries, the questionnaires appear to capture only a portion of the requisite information and the results are likely subject to considerable measurement error.

[20] The FAO methodology should be able to correct for the excess variability because of the non-adjustment for partakers: for two (Bangladesh and Uganda) of the five countries analysed, the coefficient of variation corrected based on DEC using household size and the coefficient of variation corrected based on DEC using partakers were found to be different.

[21] This discussion is based on Fiedler and Mwang (2016).

Furthermore, there are several reasons why it is believed that the importance of, and need for, those adjustments is increasing; foremost is the secular, seemingly universal trend of the growing practice of consuming food away from home. It is noteworthy that, by implication, those studies may not provide an accurate portrayal of the actual situation in several of the studied countries: i.e. the findings may be false negatives regarding the importance of making adjustments for meal participation. This is especially likely to be the case in countries where there is greater travel away from home and where, more generally, there is a more widespread practice of eating away from home. It is, therefore, difficult to make any definitive assessments about the value of making adjustments for meals, or about the feasibility or best practices of collecting the requisite information to make the adjustments.

A review of select questionnaires of more recent household socio-economic surveys have revealed that over the course of the past few years a number of countries — India, Malawi, Mali, Niger, Nigeria, Uganda, and the United Republic of Tanzania, among others — have introduced new questions to identify who among the household's members were meal partakers and which meals were eaten away from home, and by whom. Several of the surveys have also inquired about meals that households provide to non-household members. Those modifications appear to have been motivated by concerns that food away from home is increasing in frequency, is significantly underreported, and is distorting the precision of food security analyses.

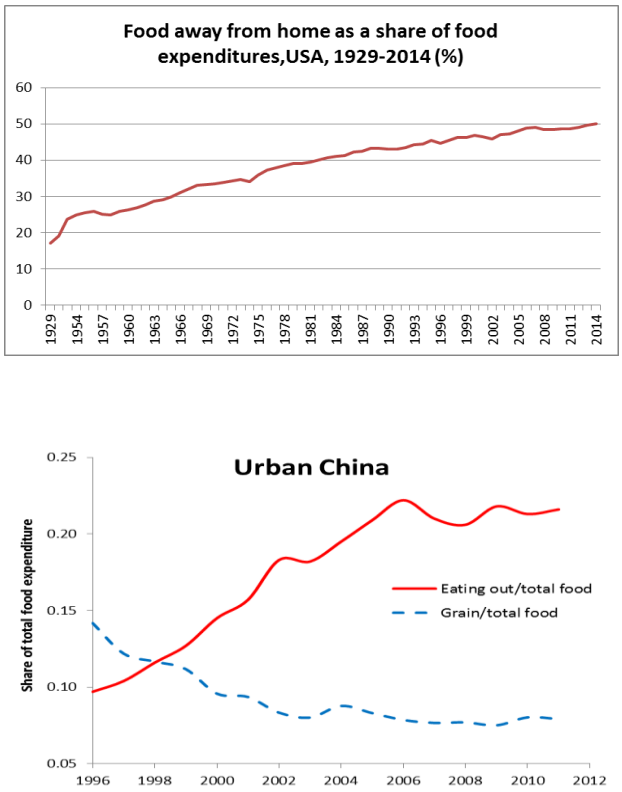
2.5. Food away from home

Consumption patterns are rapidly changing across the developing world, with prepared and packaged meals and meals consumed outside the home taking an ever-growing share of the households' food budget. Amid rising incomes, urbanization, women entering the labor force, and children eating at schools, among various reasons, this trend is expected to persist as economies transition to middle-income status (Maxwell and Slater, 2003; FAO, 2006; Popkin, 2008; Smith, 2013; USDA, 2011). As food away from home gains importance, failing to appropriately measure this component of food consumption and expenditure will make comparisons of consumption patterns and poverty less and less meaningful.

In the United States, the share of food away from home in total food expenditure increased from 10 to 50 percent during the twentieth century. In urban China, total expenditure on food away from home increased by 63 percent between 1995 and 2001 (Ma *et al.*, 2006; see **Figure 6**). Household per capita expenditure on food away from home rose at an average annual rate of 9.5 percent in China from 2002 to 2011, while the share of food away from home in total food expenditure increased from 18.2 percent to 21.5 percent (You, 2014). In Egypt and India, the prevalence of meals eaten away from home almost doubled in less than 20 years.

Figure 6.

The rapid rise of food away from home in the United States and China

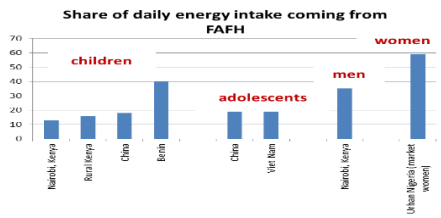


Source: Calculated by the Economic Research Service, USDA, from various data sets from the U.S. Census Bureau and the Bureau of Labor Statistics. USDA-ERS (26/1/2016) (left panel); Gibson (2016) (right panel).

Taking into account food away from home consumption is particularly important for measuring calorie consumption, as food consumed outside the home tends to be more calorie-dense than food consumed at home (Poti, Duffey, and Popkin, 2011; Mancino, Todd, and Lin, 2009) and the amount of food consumed away tends to increase more rapidly, in line with increases in income.

Figure 7.

Energy intake from food away from home (%)



Sources: R. Vakis, Improving measurement of Food Away from Home (FAFH) – presentation

Food away from home has been found to contribute to as much as 36 percent of the daily energy intake among men in urban Kenya, and 59 percent among women in urban Nigeria (Oguntona and Tella, 1999; van't Riet *et al*., 2003). Among the younger population, food away from home contributes, for example, to 18 percent and 40 percent of the daily energy intake among Chinese children and school-going adolescents in Benin, respectively (Liu *et al*., 2015; *Nago et al*., 2010).

Most nationally representative household surveys have not kept up with the pace of change in food pathways and collect very limited information on food away from home. Smith, Dupriez, and Troubat (2014), when assessing the relevance and reliability of their sample of 100 surveys, found that 90 percent of the surveys consider food away from home in some form, but that most of the approaches are "ad hoc and unsatisfactory." For example, 25 percent of the surveys aim to capture all related household consumption from food away from home using just one question; one in five surveys considers multiple places of consumption; only 35 percent take snacks explicitly into account (when most snacking is expected to take place out of the home); and close to 50 percent of the surveys do not include food away from home received in kind.

While it is widely recognized that food away from home is subject to considerable measurement error, the exact amount it contributes to underestimating consumption is unknown. However, as food away from home is expected to increase as a proportion of total food consumed and total food expenditure, if no changes are made in the way that information is collected, the magnitude of that underestimation is expected to increase. As it does, it will exacerbate the instability of household consumption and expenditure surveys based on estimates of food insecurity and under-nutrition as currently measured, (Tandon and Landes, 2011; D'Souza and Tandon, 2014; Smith, 2015), obfuscate trends, and prompt more researchers to question whether even the general order of magnitude of the estimates of global under-nutrition should be accepted (Banerjee and Duflo, 2011). The inadequate collection of food away from home data urgently needs to be better understood and systematically improved.

Only a few studies have analyzed the implications that failing to account for food away from home can have on food security analysis.[22,23] In a study conducted in India, Smith (2013) argues that the great Indian calorie debate, originated by an

[22] With obesity increasingly becoming a pressing health issue in some middle-income countries, the link between eating out and obesity is also drawing attention in the developing world (Bezerra and Sichieri, 2009).

[23] The literature on food away from home in the developed world has a longer history in which the main focus has been on health and nutrition issues. There is widespread interest in studying the differences in the caloric and nutritional composition of the food provided by commercial outlets relative to home-made food, with the objective of understanding the health consequences of eating out (Vandevijvere *et al.*, 2009). In particular, high calorie concentration found in certain meals raised particular concern, giving rise to a body of research devoted to understanding the link between obesity and eating out, among other health outcomes (Burns, Jackson, and Gibbons, 2002; Guthrie, Lin, and Frazao, 2002; Kant and Graubard, 2004; Binkley, Eales, and Jakanowsky. 2004). There is also interest in establishing food-based dietary guidelines to prevent obesity and related chronic diseases developed later in life (Phillips *et al.*, 2013).

apparent increase in undernourishment at the time of falling poverty rates, can be partly explained by inaccurate data on calorie intake because of the lack of measurement of food away from home. Similarly, Borlizzi, del Grossi, and Cafiero (2017) show in Brazil how the distribution of food consumption by income strata changes once food consumed at school is taken into account. In particular, they show that proper accounting for food received through a school feeding program targeted at the poorer strata of the population results in a more equal distribution of food consumption than previously thought. Capturing food away from home increases mean DEC, as it is an important food source, especially in urban areas. Smith (2015) shows that food away from home is positively correlated with the estimated mean dietary energy consumption. In many household consumption and expenditure surveys, food away from home is only measured in terms of monetary value. However, as meals eaten outside the home are different than meals at home (Rimmer, 2001), the conversion of monetary value into calories can be misleading if home food consumption is used as a benchmark to calculate calories from food away from home.

Using data for Peru, Farfán, Genoni, and Vakis (2017) evaluated the impact of accounting for food away from home on poverty and consumption inequality estimates. They show that from a theoretical point of view the direction of the effect on poverty or inequality cannot be predicted ex ante. Empirically, they demonstrate that failure to adequately capture food away from home may generate serious biases in estimates of households' expenditure patterns and welfare measures and may change the underlying profile of the poor.

There is considerable evidence about a large variety of socio-economic factors associated with eating away from home. Measurement error from neglecting food away from home may, therefore, bias welfare analyses along those lines. In several countries, geography, household size and composition have been shown to be systematically related to the incidence and level of food away from home consumption and expenditure (Meenakshi and Ray, 1999; Mihalopoulos and Demoussis, 2001; Yen and Jones, 1997; Mutlu and Gracia, 2006; Meng et al., 2012). Households composed mainly of the elderly have also been found to have lower probabilities of relying on, and lower expenditure on, food away from home (Redman, 1980; Meng *et al.*, 2012; Liu *et al.*, 2015).

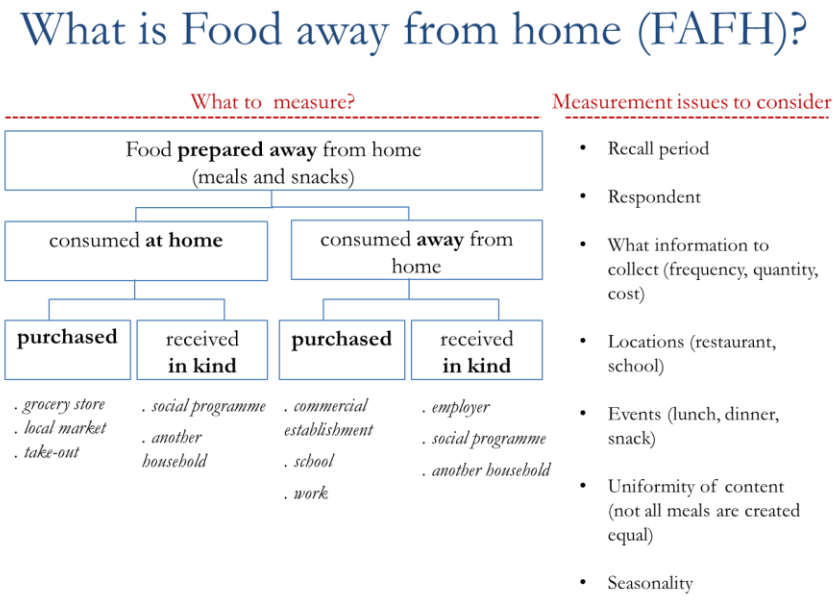
Conceptual and practical challenges make integrating food away from home in household surveys a complex exercise. First, a clear definition of what is meant by food away from home is needed.

Figure 8 contains an outline of a useful way to conceptualize and measure food away from home along with some key measurement issues to consider. Food away from home can refer to food *produced* outside, regardless of whether the food is consumed outside or inside the home. In that case, takeout meals would be considered food away from home. Alternatively, it can refer to food *consumed* outside irrespective of the origin of the food. Under that scenario, home-made meals consumed at work or at school would be a component of food away from home. While there is a general preference towards defining food away from home based on the place of preparation of the food, a clear protocol that takes into account all the different pieces is required to be well defined regardless of

the concept that is adopted. A second element to consider when collecting information on food away from home is snacks, which in modern eating habits are more likely to be consumed outside the home. Finally, there can be different modes of acquisition of the food, including purchased food or food received in kind, each of which can originate from multiple sources, such as from commercial establishments, social programs, and other households. While a great deal of attention has been paid to food that household member purchases and, to a lesser extent, food (or meals) that household members receive free as part of a social intervention (most commonly a school meal), there is evidence from China and India that "hosted" meals provided free to friends or relatives are also an important, distinct category (Bai *et al*., 2010; Fiedler 2015). In China, "hosted" meals were found to account for nearly 50 percent of all food away from home and to be disproportionately important for lower income groups. In India, they accounted for 29 percent of all meals away from home, and 36 percent of all persons with at least one meal away from home reported having at least one hosted meal provided by another household.

Figure 8

Defining food away from home (FAFH)



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

Of the issues covered in the guidelines, this is probably the area which is the most difficult to trace one set of agreed upon international practices. The discussion that follows is centred on a food away from home definition based on where the food is prepared. The inclusion of food prepared at home but eaten outside would most likely result in double counting as the ingredients would already be

accounted for under the category food available in the household from different sources. In addition, while for food at home, the main food preparer is likely to be adequately informed about the food consumed by all household members, no one individual will be in such a privileged position to report about the food consumption patterns of other household members away from home. Food away from home may, therefore, needs to be captured at the individual level, interviewing different respondents when possible.[24]

An additional question relates to what information to collect from respondents. For nutrition and food security analysis, it is be important to have information (from within the survey or from other sources that can be integrated into the survey) on what is eaten, which is a challenge for food away from home, as meal content is likely unknown to the consumer.[25] Options include: differentiating between meal, drink and snacks; asking by eating occasion (breakfast, midday snack, lunch, afternoon snack, dinner); reporting the source of preparation (commercial, government or social program, employer, other household); differentiating by the type of establishment (fine dining, fast-food restaurant, street vendor); reporting day of the week (or weekday or weekend). Note that snacks can be as if not more important than some meals in terms of both calories and expenditure. As a result, it is very important that they are adequately captured in the data-collection instrument.

In recognition of those challenges, several low- and middle-income countries have in recent years adopted innovative approaches to food away from home data collection. Details of experiences from India, Peru and the West Africa Economic and Monetary Union are detailed in the Annex 2.[26] In the United States, USDA has recently introduced the Household Food Acquisition and Purchase Survey, which collects data at the individual level through food books. Attention to food away from home is ensured by including a reminder in the food books to record meals, snacks and drinks consumed at a number of different outlets, such as at school, work, a relative's home, or recreational sites. Kirlin and Denbaly (2017) provide a detailed account of data collection in this survey.

With all their differences, those approaches to collecting food away from home in recent Household Consumption and Expenditure Surveys in such different settings have a number of aspects in common that can be useful in developing

[24] In a small-scale study in an urban slum in India Sujatha *et al*. (1997) interviews husbands and wives about the men's dietary intake, and find that women are not aware of the foods consumed by their spouses outside of their home. Similarly, Gewa, Murphy, and Neumann (2007) find that mothers of rural school-aged Kenyan children missed 77 percent and 41 percent of the energy intake originated in food away from home in the food shortage and harvest seasons, respectively (where food away from home contributes to 13 percent and 19 percent of daily energy intake in each season. Collecting data from children is particularly challenging and not commonly done in household surveys in low- and middle-income countries. The report recommends a proxy respondent for children mainly because this is a widely accepted approach in practice and there is no established viable alternative implemented at scale. This is a topic that warrants further research given the growing importance of food away from home and publicly financed feeding programs, on children's diets.

[25] The caloric and nutritional content of meals consumed away from home can be sourced through complementary data sources, either purposely run surveys (as the survey of food establishments conducted in Lima and described in (Farfán, Genoni, and Vakis, 2017) or via administrative data, such as in the case of school meals.

[26] See Annex 2

international standards for data collection directed at low-income countries: all surveys collect data at the individual level and all surveys differentiate meal types and make explicit reference to snacks.

2.6. List of food items

The design of the list of food items included in a survey affects how food consumption is reported by respondents (Deaton and Grosh, 2000; Gibson, 2005). As a list with more items is likely to help respondents more accurately remembering their consumption or acquisition events, a longer and more disaggregated food list results in higher reported consumption (Beegle *et al*., 2012; Carrol, Crossely and Sabelhaus, 2015). However, very long food lists can quickly lead to greater respondent and interviewer fatigue (Gibson, 2005). The choice of items to be included needs also to be country specific to reflect differences in diets. An "optimal" food list length should balance the lower memory lapses and the lower costs and interview time associated with short lists, with the better recall and more comprehensive reporting associated with the longer list.

Interview-based surveys, in which food items are predefined and listed, should include a sufficient number of food items to help respondents accurately remember what has been acquired or consumed or both. The list should fit all households in a given population, from poorest rural to richest urban households consuming a very wide variety of foods. Diary-based surveys can use a predefined list or be open-ended. The sample of surveys analyzed in Smith, Dupriez, and Troubat (2014)[27] reveals substantial variability in the number of food items in HCES globally. The mean number of food items in diary-based surveys in their review is far higher than in interview-based surveys (229 and 102, respectively). The number of food items spans greatly across surveys, from a low of 19 to a high of 677.

When the number of food items recorded by respondents is not predetermined, the aggregated list of items is usually far longer than the predefined list, which, in turn, affect the value of reported consumption. Tucker and Bennett (1988) report that diaries of an experimental United States survey with preprinted items lead to higher total expenditure estimates than blank fill-in diaries, especially for older persons (see also Tucker, 1992).

Several studies in low- and middle-income countries indicate that longer disaggregated lists result in higher food consumption reporting than shorter aggregated lists. In the experimental study of Beegle *et al.* (2012), seven-day recall interviews with lists of 58, 17 and 11 food items were tested; the list with 58 items returned the highest consumption estimate. Jolliffe (2001) reports that for a survey in El Salvador, a longer food item list (72 items) resulted in 20 percent higher food consumption compared to questionnaires with only 18 aggregated food categories. Food data collected in a Jamaican experimental

[27] The numbers reported herein exclude the Brazil diary survey, which is a significant outlier at 5,407 items. Many of the items are, however, simply similar items named or spelled differently.

survey show 26 percent higher consumption with 119 items compared to 37 items (Statistical Institute and Planning Institute of Jamaica, 1996).

In Indonesia's SUSENAS survey, questionnaires with extensive item lists (218 items) showed about 7 percent higher food consumption than questionnaires that had only 15 aggregated food categories (Pradhan, 2009). The longer list required a much smaller than proportionate increase in time relative to the increase in the number of items, although published figures from the study combined the food and non-food consumption lists (52 minutes for 23 items and 82 minutes for 320 items).

Similarly, in the United Republic of Tanzania (Beegle *et al.* 2012), reducing the list length by as much as 80 percent resulted in a reduction in interview times by only 17 percent (49 and 41 minutes for the 58- and 17-item lists, respectively). Additionally, Bradburn (2010) has noted that grouping questions (and food types) can help to minimize the cognitive effort for respondents to recall the requested information, leading to lower recall error. This implies, for example, that food away from home questions should be reported in a separate group.

Friedman *et al*. (2017) decompose the error response in food consumption measurement into two different components: the omission of any consumption item, and the error in reporting the value. The shorter food list has lower consumption incidence as compared to a diary survey benchmark for the large majority of food groups, while for consumption value (conditional on positive consumption) the subset list module, which is characterized as having the most over-reports of consumption in comparison to the diary benchmark.

Analyses of the Food Frequency Questionnaires (FFQs) often used by nutritionists also support the use of longer lists. Wakai (2009) finds that long FFQs (97+ foods) display higher correlation with weighed food records (r=0.42 to 0.52), than short FFQs (< 70 food items, r=0.31 to 0.45). Similarly, Henríquez-Sánchez (2009) finds that FFQs with >100 food items correlated more strongly with weighed food records (r=0.52) than FFQs with less than 100 items (r=0.47). A longer, more qualitatively differentiated food list is preferable.

In summary, given that the incremental interview time required for additional items is relatively small, having a relatively long list is recommended. On the other hand, one should not underplay the possibility that a longer interview time may prompt enumerators to take shortcuts in interviewing (Finn and Ranchhod, 2015) and respondents to refuse to participate or terminate the interview ahead of the required time (Deaton and Grosh, 2000). This is particularly the case when a questionnaire has a cascading structure, as respondents are more likely to not report some expenditure to skip other questions (Kreuter *et al*., 2011). In the following paragraphs, some criteria that can help practitioners deal with this complex balancing act are discussed.

A major recommendation in drawing a food list is to align the food list with standard international classification systems. The United Nations COICOP provides the reference international classification for individual consumption expenditures. It is an integral part of the System of National Accounts, intended for use in household consumption and expenditure surveys and for the

compilation of consumer price indices, as well as international comparisons of gross domestic product and its component expenditures through purchasing power parities. Between 2012 and 2017, COICOP went through a major revision, resulting in COICOP 2018.[28] This version, which was endorsed by UNSC in March 2018,[29] provides greater granularity as compared to the past, thanks to the introduction of an additional level of detail (from a three- to four-level structure).[30] FAO actively participated in the process, leading the revision of Division 01 on food and non-alcoholic beverages, particularly taking into account and advocating the need to ensure relevance for low- and middle-income countries. To supplement the official structure, and to guide countries expanding Division 01 in their national versions, FAO also developed an official annex to COICOP, which includes 307 additional food products at the fifth level. The annex is included in the COICOP publication

Another source for standard classification is FoodEx2, a comprehensive food classification carried out by the European Food Safety Authority, which was recently updated to cover global needs (European Food Safety Authority, 2014). FoodEx2 is an additional reference classification of particular relevance when a survey is expected to be used to conduct nutrition analysis.

An important external reference to consider when drawing a survey food list is food composition tables. Included items in the food list must match unambiguously to an entry in the food composition table in order to convert food quantities into nutrient quantities (FAO/INFOODS, 2012). [31] This is extremely important if the data are to be used for nutrition and food security analysis, as calorie and nutrient composition can only be derived if the food items can be matched at the analysis stage to a corresponding relevant food composition table. The conversion table should ideally be finalized before the survey goes to the field to ensure that the breakdown of the food items is compatible and that the availability of nutrient content data can inform the design of the survey food list.[32]

The length and composition of the food list should be formulated, bearing in mind how data are supposed to be used. From a welfare perspective, it is essential that the items representing the large majority of food expenditures are included. From a nutrition perspective, the food items that are important sources of nutrients in individual diets must be included; items that contribute little to the understanding of individual nutrient intake are less important. As a result, welfare and nutrition requirements do not necessarily correspond. Accordingly, choices pertaining to the food list tend to be "topic oriented", even if surveys are meant to be designed for a wide range of users. A nutrition-oriented food list is likely to

[28] COICOP 2018 can be downloaded at https://unstats.un.org/unsd/statcom/49th-session/documents/BG-Item3l-Classification-2-E.pdf

[29] *Official Records of the Economic and Social Council, 2018, Supplement No. 4* (E/2018/24-E/CN.3/2018/3).

[30] Sixty-eight new classes at the third level and 337 new subclasses at the fourth level.

[31] It is also recommended that countries invest in the development of good reference food composition tables and in keeping them up to date.

[32] If a food composition table is available, it can also be used to pre-program computer-assisted personal interviewing software to perform built-in checks for excessive consumption and speed up data analysis and cleaning.

include more items than a welfare-oriented list. One common solution in HCES is to list the most common food items consumed by the population, and include "other, specify" items in each category in the parts of the survey in which acquisition or consumption of additional food items can be recorded. However, this entails additional challenges if the intention is to estimate nutrient contents, as the matching with a food composition table becomes uncertain.[33]

Finally, when the objective is to collect data in order to evaluate the impact of a nutrient fortification program, the food list should include all food items that are directly fortified with such nutrients and their products. For example, if there is an interest in assessing the nutritional impact of fortified wheat flour, the list of foods should include fortified wheat flour and the products made with that type of flour, such as bread, biscuits, and pies.

As diets evolve, food lists must be regularly updated to reflect dietary changes. This is particularly relevant in urban areas where a wider variety of foods is typically eaten, and processed foods[34] and prepared foods form a larger share of the diets (Popkin, Adair, and Ng, 2012) and budgets. Again, a nutrition perspective entails a higher specificity of the food list, including and distinguishing different levels of food processing, from minimally processed foods such as yogurt, cheese, bread and frozen vegetables, to highly-processed and ultra-processed foods rich in sugar, fat, and salt, which have been shown to be associated with obesity and other diet-related diseases.[35] Using data from Brazil, for instance, a recent paper by Louzada *et al*. (2017) concludes that HCES hold potential in reporting consumption of ultra-processed foods, as there is substantial convergence between the data collected in an individual dietary intake survey and HCES data in terms of relative energy consumption from ultra-processed foods.

2.7. Non-standard units of measurement

To be meaningful, food quantities collected through HCES need to be standardized; this allows for the aggregation and comparison of consumption across food items and geographical areas, or for translation into nutrient content.[36] In many surveys, units are not standardized, especially in those

[33] See Fiedler and Mwangi (2016) for a discussion on this issue.

[34] Processed food is 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).

[35] The Brazilian dietary guidelines include a classification of foods by level of processing. See, for example Brazil, Ministry of Health (2015).

[36] 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. Nevertheless, quantities can be estimated if respondents report on the foods and dishes that were consumed rather than only their total expenditures (see Smith and Subandoro (2007) for the detailed methodology to be used when this information is available at https://unstats.un.org/unsd/statcom.

conducted in sub-Saharan Africa where non-standard units are commonly used in daily life (Deaton and Dupriez, 2011).
Smith and Subandoro (2007) have identified seven primary methods for collecting information about consumption quantities, and advocate using a combination of those methods, as one method may be the optimal solution for certain items, but it may not be appropriate for others.

1. Metric (i.e. standard) units: Respondents report quantities in metric units, such as kilograms or liters.
2. Monetary value: Respondents report the monetary value of the quantity consumed.
3. Local (i.e. non-standard) units, such as piles, baskets, or bunches.
4. A count of pieces: a type of non-standard unit.
5. Volumetric equivalents: respondents demonstrate how much space the food they consumed would take up.[37]
6. Linear dimensions: respondents provide linear measurements (length and width or circumference) for the amount of food consumed. As Smith and Subandoro (2007) point out, this method likely takes more time to complete, as it requires physical measurement rather than a simple vocal response.
7. Food models: respondents choose a two- or three-dimensional depiction of a food item that best corresponds to their consumption. Three-dimensional models can provide very accurate estimates, but it can be costly to prepare the models and calculate their weights.

For all but the first method, additional data are required to convert the reported information into standardized, comparable (metric) quantities. Collecting quantities in non-standard units or restricting respondents to only reporting in standard units involves trade-offs in accuracy and feasibility. In the sample of HCES analyzed by Smith, Dupriez, and Troubat (2014), the most common method employed is requiring respondents to report in a metric unit of measure. This method is usually the easiest to administer with the lowest budget and time cost; it also requires the least amount of post-data processing, as the units are already comparable across items.

However, restricting respondents to using only standard units may result in inaccurate estimates, especially when respondents are not accustomed to using them for all of the items they consume. Reporting quantities in non-standard units is quite common for a wide range of commodities, especially in sub-Saharan Africa. For example, in the second wave of the Ethiopia Socioeconomic Survey from 2013 to 2014 in which non-standard units were allowed, nearly 50 percent of farmers chose to report their harvests in non-standard units. In the Malawi National Panel Survey, respondents chose non-standard units about 73 percent of the time. This strongly indicates that many respondents are more comfortable reporting quantities in non-standard units. Accordingly, allowing them to be used

[37] An advantage of bounded recall is that the initial visit to begin the recall period also allows survey teams to distribute standardized volumetric containers, such as an empty sack. This can be especially helpful in cases in which bulky root crops or plantains are dietary staples because a rural household might fill a sack several times over in the course of a week, with root crop consumption of 50 kg or more. The Papua New Guinea survey used by Gibson (2001) distributed empty 25 kg sacks and these were the preferred non-standard units for all root crops and vegetables, with local weighing trials for converting sacks (and partial sacks) into kilograms.

eases the burden on respondents in terms of memory recall and conversion calculations, reducing the accuracy of the resulting data.

Recent studies show that asking respondents to combine memory recall with cognitive tasks, such as abstracting consumption to a "typical week or month," leads to less accurate self-reporting (Beegle *et al.*, 2010). The forced conversion from non-standard to standard units similarly combines cognitive and memory recall; respondents must (a) have a clear understanding of what a standard unit of the food item is (e.g. how much is a kilogram of rice); (b) estimate how many standard units correspond to the non-standard unit they are familiar with; and (c) use the conversion from step two to convert the quantity consumed into standard units. The three stages place a cognitive burden on the respondent and can lead to a sizable measurement error. It is also common practice for such calculations to be conducted *in-situ*, often on-the-fly (as the respondent makes the calculations in their head, perhaps prompted or assisted by an interviewer), further increasing the likelihood for error.

Accordingly, the most important and overriding benefit of allowing respondents to report quantities using non-standard units is that they will likely report more accurately on consumed quantities. Results from a recent methodological study of land area measurement support the preference for non-standard units. Carletto *et al.* (2016) finds that when respondents are allowed to report land area in non-standard units – instead of being forced to convert an area to standard units – the self-reported estimates are much more accurate. The additional costs and challenges associated with this method broadly fall into two categories: those associated with preparation and implementation of a survey with non-standard units; and ensuring that non-standard units measurements can be converted into comparable standard units.

Before non-standard units can be used, country-specific information on common non-standard units is needed to determine the list of allowable item-unit combinations. Non-standard units must also be accompanied by standard unit conversion factors. To directly compare and aggregate quantities, the data user must convert all quantities into a common standard unit, such as kilograms. Capéau (1995) and Capéau and Dercon (2006) suggest using econometric techniques to compare unit values and estimate conversion factors that are relatively simple to implement. The challenge with that approach is that unit values can vary as a result of quality differences (Deaton, 1997), or from price discounts on larger units (Attanasio and Frayne, 2006), or over time and space because of the impact of transport and storage costs (Gibson and Kim, 2015). The sources of variability in unit values that are unrelated to mass or volume can result in distorted or imprecisely estimated conversion factors (Oseni, Durazo, and McGee, 2017).

An alternative method is to collect weights for each allowable item-unit combination and use them to create conversion factors. This is a relatively straightforward concept. However, there are a whole set of challenges involved in in properly implementing this concept. The standard weight for the same item-unit combination can vary, even within a country. For example, Casley and Kumar (1988) found that in Nigeria, an average "bundle" of sorghum weighed

between 26 and 49 kilograms, depending on the area. Thus, region-specific conversion factors also need to be considered. Complicating matters further, different levels of processing (fresh, dried or powered) lead to different conversion factors for the same food item.[38] This method has also been recently implemented in the context of a project of survey harmonization in the countries belonging to the West African Economic and Monetary Union, following the recent guidebook published by the World Bank (Oseni, Durazo, and McGee, 2017) (see Box 4 for details).

Box 4

Collection of conversion factors in context of the Western Africa Economic and Monetary Unit project

As part of the Regional Program to Harmonize and Modernize Living Conditions Surveys in the West African Monetary Union, participating national statistical offices collect consumption data that allows reporting in non-standard units of measurement. To prepare for this, market surveys were conducted to establish conversion factors from non-standard units, such as bowls and heaps, to standard units (kg, litre) for commonly consumed food items. Following guidance from Oseni, Durazo, and McGee (2017), the national statistical offices conducted market surveys ahead of the main household surveys. In the spirit of harmonization, all countries involved in the program followed the same procedure.

(a) *Preparation phase*: included a review of previous surveys and preliminary markets visits to identify products and commonly used non-standard units. The resulting product-unit list – and options to report additional found units – were programd into Survey Solutions, a computer-assisted personal interview software for data collection.

(b) *Field work:* was conducted in the post-harvest season to ensure wider availability of products. Enumerators visited six markets (three rural, three urban) in each region, using tablets to collect measurements from up to three different vendors for each product-unit combination. They also took photographs of each measurement which, thanks to the computer-assisted personal interview application, were automatically linked to the measurement data.

(c) *Data analysis:* includes:
- Data cleaning to detect outliers and rearrange unit sizes according to the actual weights;
- Calculation of national- and regional-level conversion factors using the median measured weight for each product-unit combination; and
- Identification of the best photographs with actual weights closest to each conversion factor.

The resulting library of non-standard units materials will support the main household survey. Enumerators will use the photo albums to guide respondents in reporting food consumption quantities and the conversion factors will be used to flag unreasonable quantities for further verification, all ensuring greater data accuracy.

[38] This is similar to food crops harvested under different conditions, such as threshed, shelled, fresh, and dried, which are proven to have a large impact on reported harvest quantities (Fermont and Benson, 2011; Diskin 1999; Murphy, Casley, and Curry, 1991).

Unit conversion factors are often incomplete and lack supporting documentation, which decreases the number of usable observations and makes it difficult to cross-reference quantities or apply conversions across different datasets. Smith, Dupriez, and Troubat (2014) pointed out that calculating metric food quantities is feasible for only 53 percent of the surveys reviewed. Most of the difficulties associated with this method can be addressed by ensuring that unit conversion factor data are thoroughly collected and properly documented. When information on most common non-standard units used and unit conversion factors is limited or not available, the survey team must collect those data. This is most effectively done by consulting with local experts and conducting a market survey prior to the start of the regular data collection.

3.Conclusions and recommendations

This section presents the core of the guidelines, providing a set of recommended practices for data collection. The recommendations are based on the literature, empirical evidence, and considerations discussed in Section 2. The objective is to promote the adoption of good practices, and encourage the abandonment of some bad practices that are still employed in some surveys. Some of those recommendations are straightforward and easy to implement and some are grounded in firm empirical evidence, but some are based on balancing incomplete pieces of evidence with practical considerations. Additional research will be useful to reinforce the evidence base behind the entire set of recommendations. A set of guidelines can, therefore, be extremely useful in informing design decisions and fostering cross-country comparability in approaches.

Such guidelines can only be seen as temporary as best practices will evolve and depend on circumstances. As food consumption patterns evolve, statistical systems change, and new technologies become available, survey design will have to be adapted to stay relevant and cost- effective. It is anticipated that as more survey methodological work is performed and new lessons are learned from survey implementation, these guidelines will have to be periodically revised to incorporate the new knowledge being generated and to respond to additional or different data needs that may emerge. Furthermore, consumption patterns change with income growth, changes in food technology and the modernization of food systems, response rates tend to decline in higher income economies and technology is already proceeding at a rapid pace with new technologies relevant to survey operations entering the market every day. In such a rapidly changing environment, the shelf life of these guidelines is inevitably going to be limited. Accordingly, it would be desirable revise and update them at least every 10 years.

The overarching concern in drawing these recommendations has been to ensure the most appropriate balance between accuracy and cost effectiveness, keeping in mind the typical constraints facing low- and middle-income country statistical offices. In some cases, the recommendations offered might entail a costlier option than what is currently practiced while, in other cases, it might imply a cost saving. The benefits should be assessed not only in terms of greater accuracy and comparability of the data being collected, but also whether the data can be made relevant for a wider user base (e.g. nutritionists and food security analysts, as well as statisticians and economists).

While professionals from those four fields contributed to the preparation of the guidelines, future revisions would benefit from the involvement of an even broader range of scholars and experts. Food is part of our cultures and societies, and the way in which society (and survey respondents) relate to food is mediated by social and cultural constructs. Perhaps, anthropologists can be recruited to help in devising questionnaires that are better able to incorporate social and cultural aspects in data-collection processes and outcomes. Similarly, psychologists can help in designing more effective survey approaches by

providing insights on the cognitive process behind how respondents answer questions, when and how they shift from enumeration to estimation strategies, and how survey design should take that into account when thinking about such details as the recall period, the length of a list, and the sequencing of survey modules.

One notable gap in the guidelines is the discussion of price data collection. Prices are clearly an important element of any analysis of poverty, and are essential for welfare comparisons across households, regions and time. Price data collection is also a major goal of HCES when they are required to inform CPI calculations. However, even just from a perspective of analyzing food consumption, food prices are needed to properly value consumption quantities, and attaining information on prices is invaluable in cross-checking the plausibility of reported values and quantities, especially when non-standard units are used. Also, as food policy often relies heavily on price interventions, measuring food prices is an important item for analysis in its own right. However, price data collection was omitted from the guidelines because it has implications that go well beyond food consumption, and also because it is such an overarching topic, the view was taken that price data collection would probably be best served by its own set of guidelines. It would have been difficult to discuss and make recommendations about price data collection with reference to food alone, abstracting from all the other demands on price data from other uses and users.

It is also important to remind users that any change in method should have a controlled comparison to "bridge" the effects of the old and new methodologies on the resulting data. Concerns about losing comparability over time, and the difficulty of explaining to the public the difference in estimates that come with changes in methodology often prompt statistical offices to shy away from changes in survey design, even when it is clear that there would be gains in accuracy and cost savings in doing so. Building a controlled comparison in survey planning would ease those concerns somewhat. From that standpoint, this should be considered by statistical offices in low- and middle-income countries and the donors and international agencies assisting them whenever the implementation of a methodological change is being reviewed. One idea that was put forward as part of the international discussion leading to the guidelines was to create a global fund to support such controlled comparisons, as they are a source of invaluable learning and hence might be considered a global public good.

Box 5 contains a summary of priority research areas for the collection of data on food consumption, based on gaps identified during the preparation of the guidelines.

Box 5

A research agenda for food consumption data collection

The guidelines put forward clear recommendations based on existing evidence and experience accumulated in survey practices over the past decades, but also recognize that in several areas there is little sound methodological work to base recommendations on. A list of priority areas based on the gaps that were identified during the preparation of the document is provided below.

Food away from home is an area from which different approaches are emerging, but there are only a limited number experimental methodological studies available. Given the increasing importance of this component in calories and expenditure, this is probably the area in which methodological research would be the largest. Several national statistical offices have signaled their interest in participating in methodological studies that would help improve the quality of the data they collect on food away from home.

There are a number of different aspects of the choice between diary and recall, and the length of the recall period that would benefit from more methodological studies. Only a handful of experimental studies have been conducted on the topic in low- and middle-income countries and a larger evidence base would be required to make the extrapolation of results more robust. Specific questions in need of investigation in this domain are:

- *Bounding of recall*. One concern with a short recall period (such as seven-days) is telescoping. "Bounding" the recall period for a household with another visit to mark the beginning of the recall period can, in principle, help reduce telescoping and improve the quality of the recall. While this idea has been around for many years, it has not been formally tested and compared to unbounded recall in a low- and middle-income country setting.
- *Telephone interview aids*. Telephones are increasingly used in surveys, including in low- and middle-income countries, as the coverage of the mobile phone network increases. One way in which phones could help in person interviews is by using follow-up phone calls to aid the filling of a diary, or the collection of a second set of recall data.
- *Multiple visits*. One issue with seven-day recall discussed in the guidelines is that the data are affected by "excess variability". One way to reduce that is to perform a second non-consecutive interview to the same households (in person or possibly via telephone) (Gibson, 2016). This option is potentially attractive, but it has not been tested at scale.
- *Expand the evidence-base*. In general, many of the conclusions in the guidelines come from a small number of studies, with the SHWALITA dataset from United Republic of Tanzania exerting probably an excessive influence on the current consensus simply because of its uniqueness. Replicating more studies, in different settings and regions with a similar set-up would help to expand the knowledge base and provide more confidence when extrapolating results across countries.

There are other topics that might benefit from more research that the guidelines have not touched upon. Some of them, which were also brought up during the global consultation, include the measurement of food waste, the measurement of individual consumption of specific population subgroups, such as children and women of reproductive age, and the integration of different data sources. IAEG has called on countries to consider setting up a global fund that could finance the implementation of methodological studies and experiments to test and validate survey design options in those domains.

Finally, as with all survey design choices, countries implementing these recommendations should carefully evaluate the extent to which the adoption of them may increase the burden on the respondent, how that risk can be mitigated, and whether the return in terms of data quality is large enough to justify a

possible increase in non-response. As for the evaluation of survey costs, it is impossible to evaluate in principle those trade-offs with any level of accuracy and hence to be prescriptive about how to handle those survey design choices. When implementing the guidelines in practice, however, care must be taken in finding the right balance between keeping the overall length of the survey manageable so as not to compromise the quality of the information collected.

This section is developed as follows: for each domain discussed in Section 2, a summary of main findings is provided, followed by a set of recommendations.

3.1. Recall versus diary and length of reference period

Summary

The trade-offs between diary and recall and between shorter and longer recall periods have been highlighted in various survey experiments and analyses of diary and recall approaches. In low-income economies, evidence suggests that recall interviews are generally preferable to diary methods for capturing food consumption when balancing implementation costs and the reliability of the resulting estimates. The majority of the studies have found that food consumption or monetary value data collected with recall interviews provides estimates that are similar to or higher than those recorded in diaries. However, depending on the implementation methods, diaries often show patterns of rapidly declining consumption (and data quality) over the reference period. Lower and decreasing consumption recorded in diaries is frequently attributed to respondents' fatigue and illiteracy in combination with poor supervision. Under close supervision, diaries have proven to be reliable in several contexts and are sometimes considered to be the gold standard, but when implemented with appropriate levels of supervision (such as daily visits to households), they are generally costlier than recall surveys; the detailed cost calculations by Beegle *et al.* (2012), suggest that diaries are from 6 to 10 times more expensive than recall after taking into account the fieldwork and the time-consuming coding and data entry requirements.

Recall surveys are affected by memory decay (memory loss) as the recall period increases, and telescoping error (reporting of consumption outside of the recall period) for shorter periods. The experimental evidence suggests that a seven-day recall can perform as well as a diary in capturing food expenditures and their variability. Recall periods that exceed 14 days are adversely affected by significant memory decay, while diary fatigue already appears to be significant after the first week. Regardless of how accurately they capture mean consumption, surveys based on short recall periods ("snapshots") always overestimate the variability in habitual consumption.

For individual food items, short recall periods (such as a seven-day recall) are affected on the one hand by underestimation of the incidence of consumption, particularly for infrequently consumed items, and on the other by overestimation of the value of consumption (conditional on positive consumption) because of telescoping error. The recall error appears to be larger for less-frequently consumed items and on short recall periods. The "usual month" consumption was designed to deal with the conflict between a long reference period (to get "typical" living standards) and a short recall period for feasible interviewing. However, it has not worked as expected because "usual month" consumption results tend to overestimate the incidence of consumption, particularly for infrequently consumed items, and underestimate consumption values for staples. Importantly, the "usual month" approach also imposes a significantly higher burden on the respondent and results in longer interviews.

Bounding the recall period with an earlier visit and asking a household to recall their consumption since the last visit of the enumerator is a possible option for improving the quality of recall data. The evidence on the effectiveness of bounding is limited. As this approach requires an additional visit to the household, it is a costlier method. Accordingly, it cannot be recommended until more research is performed to evaluate its benefits. Another approach gaining ground recently is to complement seven-day consumption recall with data on the last purchase in the past 30 days. The purpose of that approach is to better capture the unit values of purchased food items. More methodological work is needed to assess the performance of those approaches.

Recommendations

The following recommendations are provided for the choice of methods in capturing food consumption in HCES surveys:

- Low-income countries are advised to adopt recall interviews and a seven-day recall period, as this method provides the best balance between accuracy and cost-effectiveness.
- Any survey using diary methods must be closely supervised to ensure proper and consistent completion, especially in areas where illiteracy rates are high. The reference period should not exceed 14 days. Detailed metadata on how the diary was administered and supervised should be distributed with the primary survey data.
- The "usual month" approach should not be used.
- Any change in the recall period or method (recall versus diary) should be accompanied by an experimental component aimed at assessing the impact of the change in survey estimates, which would allow for the reconciliation of estimates before and after the change in methodology. The studies by Backiny-Yetna, Steele, and Yacoubou (2017) and Beegle *et al.* (2012) provide examples on how this can be done in practice.

3.2. Seasonality, number of visits

Summary

Food consumption and expenditure can show systematic variation related to the time of the year, month or week, as well as for agricultural seasons, holidays, and festivals. Such seasonal patterns need to be considered in survey design and analysis, as they are possible sources of significant bias and measurement error.

A survey that only captures food consumption or expenditure data in one period of the year misses seasonal variations and is not likely to be representative of habitual consumption throughout the year. Many surveys collect data using one visit per household, concentrated over three to four months of fieldwork (48 percent of the surveys assessed by Smith, Dupriez, and Troubat, 2014). That approach cannot capture seasonality effects and is, therefore, not recommended. If it is adopted, to ensure that the timing of each round does not affect comparability in the estimates from one year to the other, maintaining maintain consistency in the timing of the fieldwork is imperative. It should be noted, however, that even that provision may not be enough to ensure comparability over time as seasonal weather patterns and dates of some important festivities affecting consumption events, such the dates of Ramadan may change from year to year. One possible way to capture seasonality may be to implement multiple visits on a subsample of households, but as that approach has not been tested widely, it is not offered as a recommendation.

The only way to accurately capture habitual consumption for each household is to survey them multiple times over the year, but this is also the most expensive option and in practice, is difficult to implement. Data collection spread over the year, but with only one interview per household (and using a short recall period) results in an accurate estimate of average consumption for the population, but excess variability around the mean (Deaton and Zaidi, 2002; Deaton and Grosh, 2000).

Recommendations

When interest is in analyzing the habitual consumption of a population through an extended period of time (usually one year), it is recommended that seasonality be taken into account in survey design. The two options to consider, in order of preference are:

- Conduct one visit per household, spreading the sample over 12 months of fieldwork. The overall sample should be stratified quarterly (e.g. split the overall sample into 12 monthly subsamples in a manner that allows them to be aggregated into quarterly, nationally representative subsamples).
- Conduct two visits per household, when the timing of the visits is scheduled to capture seasonal variations (for instance, the first visit could be during the lean period and the second after the main harvest).

Countries should carefully consider using more than two visits because of the higher cost and the difficulty in managing teams that are associated with more visits. Implementing more than two visits is not impossible, but in several cases in which it has been attempted, there have been implementation problems. Respondents' burden also increases more than proportionally with each additional visit.

Regardless of the approach chosen, care should be exercised to ensure that enumeration is equally spread throughout the days of the week and the month and change in timing in holidays, festivals, and harvest must be considered.

3.3. Acquisition versus consumption

Summary

Surveys differ as to whether and how they capture food consumption and acquisition. Typically, household budget surveys focus on collecting data to construct CPIs, and as a consequence, recording food items acquired through market purchases. However, as HCES are increasingly used for poverty and food security analysis, emphasis has shifted towards also collecting data on food items procured through own production, barter, gifts, and payments in kind, which are particularly common in rural areas. Information on own production, barter, gifts, and payments in kind is also important for national accounts statistics mainly because food acquired through those channels are included in the household final consumption.

Conforti, Grünberger, and Troubat (2017) classified food data-collection practices in three approaches: (a) *Acquisition*: Households report food acquired through purchases, own production, and in-kind transfers, while consumption of food is not reported; (b) *Combination of acquisition and consumption*: Households report food acquired through purchases without specifying the amount consumed and report food consumption from own production or in-kind transfers; and (c) *Consumption*: Households report food actually consumed, and indicate whether that same food was purchased, own-produced, or received as a transfer.

Irrespective of which of the three approaches is adopted by a survey, it is important that information is collected on all the food that becomes available to the household through all the possible means of acquisition. It is also important that the survey objectives are clear on whether the information being collected is on acquisition, consumption, or both. Regarding consumption, clarity is needed on whether surveys refer to food intended for consumption (i.e. including food waste) or food actually consumed, which excludes food waste. In the review by Smith, Dupriez, and Troubat. (2014), issues have emerged related to current practices on the neglect of food received in kind, which were not collected in 14 percent of the surveys (4 percent did not collect information on own-produced food).

When combining information on sources of acquisition and consumption, care should be taken to ensure that the question wording does not lead to incompleteness or ambiguity in enumeration. Smith, Dupriez, and Troubat (2014) have found that 38 percent of HCES have issues with the wording of rule out questions, namely ambiguity on whether acquisition or consumption is being asked.

Recommendations

- All surveys should collect data on all main modes of food acquisition, namely:
    - Purchases.
    - Household's own production.
    - Received in kind. Surveys need to explicitly inquire about in-kind sources that are otherwise likely to be missed, such as payments for labour and participation in social programs. Those in-kind sources can be aggregated, but care should be taken to avoid duplicating information captured in other sections of the survey (e.g. employment and social assistance). If public social assistance transfers are not captured elsewhere then it would be important to disaggregate the data.
- Surveys should be designed so that it is clear to respondents, enumerators, and data users exactly what information is requested and reported, whether the information required is on acquisition, or consumption, or both.
    - In the case of consumption, it should be clear whether the questions concern food intended for consumption (including food waste) or food actually consumed (net of food waste).
    - If total amount of food purchased over the recall period is the variable of interest, it is then recommended to add an additional question on the amount consumed out of those purchases to avoid mixing acquisitions from purchases with consumption from own production and in-kind transfers.
- Surveys should exercise care to avoid possible sources of incomplete or ambiguous enumeration commonly found in current survey practices.
    - When using a filter question (30 percent of surveys assessed by Smith, Dupriez, and Troubat (2015) have a leading or filter question):
        - Avoid leading or filter questions in cases in which respondents are asked first if they consumed a food over a certain recall period instead of details about consumption. A negative response to the first question results in skipping questions on quantities acquired but not consumed during the recall period. This leads to systematic underestimation of the quantities or expenditure of food acquired.
        - Avoid filter questions that focus on food purchases. This leads to underestimation of mean food acquisition for the population by failing to account for

food acquired through own production or in-kind transfers.

- For consumption from own production, the question must be worded to clearly indicate food *consumed* from own production rather than all food *harvested*. When this distinction is not made, the quantities or expenditure reported may include food entering the households' production stocks – not for immediate consumption – and as a result, food consumed from home production is systematically overestimated.

3.4. Meal participation

Summary

Household surveys collect information on the total amount of food to be consumed by a household over a certain reference period. To convert this information to a per capita basis and to conduct an analysis of the adequacy of food consumption and nutrient intake, it is important to know exactly how many people (partakers) consumed the total amount of food reported by the household. For food and nutrition security analyses, it is also useful to collect data on the physiological status of the partakers (e.g. pregnant or lactating status for women), as that affects nutrition requirements. Furthermore, food may be shared with non-household members, or household members may not be in the household when the food is consumed. Neglecting those occurrences adds measurement error to the distribution of per capita food consumption.

There are two main approaches to adjust household per capita consumption for the number of partakers. The first approach entails counting the number of people who shared the household's meals and then dividing the total household consumption by the number. That approach, however, is not very precise, as it is not easy to account for situations in which people participate only in some meals per day, such as employees. The second approach involves counting the number of meals taken by each household member and non-household members over the reference period for which food data are collected. It is more precise, but it is also more difficult to implement. As very little methodological work has been carried out to formally test the cost and benefits of adopting competing options for accounting for partakers, this is an area to focus on in future research. The recommendations provided below, therefore, are also somewhat more generic than those provided for other areas of survey design.

Recommendations

It is recommended that all HCES should consider adding an individual household member-based meal module. As collecting information on individuals is expensive and difficult, this can be implemented as part of the module collecting information on food away from home (see below). On the other hand, practitioners should realize that adding an individual household member-based

meal module would make it possible to eliminate other questions that are commonly used in surveys.[39]

If an individual member-based meal module cannot be adopted, a less preferred alternative, would be to collect the following information at the household level through a proxy respondent:

- How many meals does [NAME] usually take in a day?
- How many days in the past X days was [NAME] present in the household?
- How many meals during the past X days, did [NAME] purchase or receive, and eat away from home?
- How many meals during the past X days, did [NAME] eat at home?
- Does [NAME] get meals at school?
- How many meals were served to non-household members during the last X days?
- Did the household host a ceremony, party or festival in the past X days, during which a large number of meals (not just snacks) were served to non-household members? If "yes": How many attended?
- During the last X days, were there non-household members who stayed one or more nights in the household as a guest? If "yes": How many nights did they stay? How many meals were they (summed together) served during their stay? How many of the guests were children <15 years old? How many adults 16 and older?
- During the last X days, were any meals served to non-household members? (Other than those served guests who stayed overnight.)

3.5. Food away from home

Summary

Rapid urbanization and economic growth are typically associated with an increase in the consumption of food away from home in absolute terms and as a share of calories and food expenditure. Implementing traditional HCES questionnaires that are focused on household food consumption at home has the risk of underestimating food away from home by missing the increasing effect on the proportion of calories and expenditure through changes in food systems. Food away from home consumption is particularly important because food consumed outside the home tends to be more calorie-dense and less nutrient-dense than food consumed at home. The increase in the amount of food consumed away from tends to rise with increases in income.

Failing to account for food away from home has been shown to affect measures of poverty and inequality, including inequality in the distribution of dietary

[39] This includes questions such as "How many meals are usually taken per day in your household?", "How many days in the past X days was [NAME] present in the household?", "Did [NAME] eat meals in this household in the last X days?", "Does [NAME] get meals at school?", "Did [NAME] consume any meals/snacks/drinks outside the household in the past X days?". The information collected in these questions would now be captured in an individual level module.

energy consumption. There is a variety of sources for attaining food away from home, including, among them, restaurants, schools, places of work, and street vendors. Survey design needs to be able to account for all of them, as they can be of varying importance to different groups in the population. Failing to account for food away from home affects not only the mean, but also the distribution of the indicators of interest.

An additional challenge is that while the "main food preparer" can be expected to be reasonably informed about food at home, it is much more difficult for that person to respond to questions on food away from home, as they relate mostly to meal events taking place out of his or her sight. Proxy respondents may be able to report on which household members consumed which meals away from the households, but they are unlikely to be informed about the cost or content of those meals. Such information can only be reliably collected through individual interviews.

Recommendations

Data collection on food away from home should preferably be done at the individual level, asking the questions separately for each individual. For all individuals who report having consumed meals outside the home, the minimum information attained should be on the value of the meals by meal event (breakfast, lunch, dinner, and snacks). While more research on this topic is urgently needed, based on current knowledge, the following guidelines are suggested for the design and implementation of a survey module for the measurement of consumption of food away from home in recall surveys:

- The practice of collecting food away from home information with just one question should be discontinued.
- The importance of food away from home warrants the design of a separate module, based on a clear definition of food away from home. In particular, surveys should be clear in identifying how to collect information on potentially ambiguous categories of food: "food prepared at home and consumed outside" and "food prepared outside and consumed at home." The latter can be integrated into the food at home module (e.g. takeout food) provided that it is made clear to enumerators, respondents and data users that this is the case.
- Data collection should be organized around meal events, including snacks and drinks. At a minimum, surveys should collect information on the value of all meals consumed during a meal event away from home (breakfast, lunch, dinner, solid snacks or drinks). The meal events list should be adapted to the local context.
- Considerations regarding the feasibility, costs, and accuracy should inform the determination of which option to choose between individual modules and the proxy respondent. Food away from home is best collected though individual-level interviews of adults. A proxy respondent can be used to report on children's meals away from home and other adults. Possible variations include:
    1. Proxy respondents (i.e. a household level module) can be used to report on the number of individuals who consumed meals

away (as in block 4 of the sixty-eighth round of the India Survey). Detailed information on the meals, such as cost and meal content, should be collected directly from the relevant household member, including possibly on a targeted, carefully designed subsample.

2. Total expenditure on food away from home can be collected at the household level using a daily food away from home record sheet provided to a trained proxy respondent.

- Surveys should identify the most frequent place of consumption for each meal event, such as restaurants, street vendors, work, or schools, adapting the place of consumption categories to the local context.
- Surveys should use the same reference period for food away from home as what is used in the food consumed at home module.
- The data to estimate food away from home-related nutrient content, when feasible, should come from other data sources integrated to the HCES, such as a survey of food establishments (Farfán, Genoni, and Vakis, 2017) or administrative data on the content of public meals, such as those given by schools and social programs.

3.6. List of food items

Summary

The following basic principles should inform the design of the HCES list of food items:

- The number of food items should balance the lower memory lapses, costs, and interview time associated with short lists, with the better recall and more comprehensive reporting associated with the longer list.
- Food items representing the large majority of food expenditure, including nutrient-rich food items, should be included on the list.
- The description of the food items must be explicit enough to match only one entry in the reference food composition table.
- Each food item must be exclusive, each food group should be represented and each food item should belong to only one food group).

Adoption of a food classification system may help in meeting those criteria. Although the adoption of a standard classification system may involve some challenges given the country specificity of the diet, such a classification is recommended as it allows survey harmonization in terms of methodology, analysis and findings. For many of the basic purposes of HCES, such as for the computation of CPI or for input into national account systems, by far, the most widely adopted standard classification is COICOP. Harmonization eases cross-survey comparability, ensures international comparability of inflation and purchasing power parities, and allows for the assessment of the comprehensiveness of the food lists.

For surveys that are not intended to be used for the calculation of CPI calculation or for national accounts, COICOP list may be too extensive. There is a widely acknowledge trade-off in the number of items to be included in a food list. Aggregated item lists (usually about 15 items) provide lower estimates than more detailed item lists. On the other hand, a too detailed list of items might have a negative effect, increasing enumerator and respondent fatigue. A universally valid solution does not exist because the optimal quantity of items strongly depends on regional food consumption habits. Accordingly, a food list must be country specific, representative of the dietary and consumption habits of all segments of a population, and capture evolving trends in dietary patterns. Useful information about the frequency and importance of each food item's dietary and expenditure patterns can be drawn from previous HCES or dietary survey data carried out in a given country.

As noted, food lists will inevitably be country-specific. Even so, some rules-of-thumb or general guiding principles can be identified to help survey designers determine food lists to capture food consumption and expenditure information that is disaggregated in a way that can be useful for dietary quality analysis. Involving nutritionists in the design of the food lists can ensure that their data needs are properly taken into account. Fiedler and Mwangi (2016) suggest that to meet all of those requirements, in most cases a list of 100 to 125 items is needed. Many experts agree with that view, but it can only be seen as an indicative rule of thumb.

Recommendations

Different classifications can be used to harmonize data and foster comparability across surveys. These guidelines encourage survey designers to use the COICOP system, as it is currently the basis of classification used in a wide number of datasets, in line with the requirements specified in the System of National Accounts 2008. Food COICOP classifications are mainly structured using the basic food groups described in **Table 4**.[40] Additional regional or global food lists that can inform the development of a survey food list include the FoodEx2[41] classification, which is being tested in Asian countries (European Food Safety Authority, 2014).

[40] See http://unstats.un.org/unsd/cr/registry/regcst.asp?Cl=5 for the detailed list of all COICOP categories. See also the revisions discussed at the forty-ninth session of the United Nation Statistics Commission, which was held in New York, 6–9 March 2018 (Technical Subgroup for the Revision of COICOP (2018)).

[41] See https://www.efsa.europa.eu/en/supporting/pub/en-804 for more details on FoddEx2 classification.

Table 4

Basic Food Groups for COICOP classifications

Basic food group	Food items in each group
Bread and cereals	Rice Other cereals, flour, and other products Bread Other bakery products Pasta products
Meat	Beef and veal Pork Lamb, mutton, and goat Poultry Other meats and meat preparations
Fish and seafood	Fresh, chilled, or frozen fish and seafood Preserved or processed fish and seafood
Milk, cheese, and eggs	Fresh milk Preserved milk and other milk products Cheeses Eggs and egg-based products
Oils and fats	Butter and margarine Other edible oils and fats
Fruit	Fresh or chilled fruits Frozen, preserved, or processed fruit and fruit-based products
Vegetables	Fresh or chilled vegetables other than potatoes Fresh or chilled potatoes and other tubers Frozen, preserved, or processed vegetables and vegetable-based products
Sugar, jam, honey, chocolate, and confectionery	Sugar Jams, marmalades, and honey Confectionery, chocolate, and ice cream
Food products not elsewhere classified	Salt, spices, condiments Dessert preparations, soups, and broths Baby food and dietary preparations
Non-alcoholic beverages	Coffee, tea, and cocoa Mineral waters, soft drinks, fruit and vegetable juices
Alcoholic beverages	Spirits Wine Beer Stimulants
Catering services	Restaurants, cafés, and others Canteens

Data should be collected on all of the types of foods and beverages that make up the country's human diet. Lists should be kept up to date to take into account changing dietary habits, while keeping in mind that that products that account for minimal budget shares can have particular nutritional values. A list of general principles that can guide the design of a food list includes the following criteria:

- The presence of foods from all the main food groups (e.g. the 16-food group classification on which the Household Dietary Diversity Score is based (Kennedy, Ballard, and Dop, 2011).

- An adequate representation of processed foods (with all the degree of processing from highly processed to moderately processed).

- The inclusion of only foods and no other commodities (principle of "food exclusivity"; e.g. the food list should not include an item composed by food and non-food items, such as "alcohol and tobacco".

- The list needs to include a reasonable number of individual items (the most common ones) for each of the main food groups. An "other" category should be added when relevant (e.g. "other fruits" or "other vegetables") to record the acquisition or consumption of additional food items. It is important that such categories remain marginal as quantities cannot be collected under those categories and food matching is imperfect.

- Food items (other than prepared dishes) should not span multiple food groups (e.g. avoid "eggs or milk products" as one group). Only group food items with similar nutritional properties in one question (e.g. avoid "Mineral water or soft drinks"). Avoid grouping different status of the same food item with different nutritional properties (e.g. fresh or dried fish, fresh or dried milk).

- Avoid broad categories that do not allow identifying the type of food, such as "snacks", "canned foods" and "baby food."

- Food items that are the object of product-specific government-subsidized programs should be listed individually on the food list.

- Foods that are fortified or have the potential to be the vehicle of food fortification programs (e.g. iodized salt, fortified flour or cooking oil) should be listed individually in the food list.

- Micronutrient (e.g. vitamin-A or iron) rich foods, such as sweet potatoes and liver should be listed individually.

- Food lists can be built from national food composition tables or databases to ease later food matching. Because of the importance of having good and updated food composition tables or databases, it is also recommended that countries invest in the update or development of country or regional food composition tables.

3.7. Non-standard units of measurement

Summary

To date, there is no standard methodology applied to the collection of food quantities in cases in which respondents (and enumerators) are less familiar with standard measurement units. Common practice has been either to require households to report everything in standard units, or for enumerators to estimate the standard unit conversions on an ad hoc basis. Both approaches are problematic and lead to inaccuracies and inconsistencies in the data reported. Several national statistical offices maintain a library of conversion factors for local units, but they are often incomplete, not updated, and tend not to be consistently implemented. Units of measurement are critical for many aspects of data collection and quality assurance. Qualitative feedback from field practitioners, and extensive feedback from initial piloting of those methods, suggest that allowing non-standard units of measurement can increase the accuracy of reported quantities, primarily by reducing respondent burden. To properly benefit from allowing non-standard units options, reporting must be paired with a framework for consistently converting non-standard units into standard units, based on reliably documented conversion factors. As conversion factors typically involve weighing and measuring, which are some of the activities carried out in price surveys – at least for unpackaged foods, such as root crops and vegetables – the treatment of non-standard units should also be covered in guidelines for price surveys.

Recommendations

- The decision on whether to allow the use of non-standard units of measurement should be addressed during the design phase. By doing this, the tendency for units of measurement to be determined on an ad hoc or inconsistent basis during fieldwork is reduced.
- Though non-standard units are used around the world (in countries of all income levels) the cost-benefit ratio of incorporating them into each survey should be evaluated, focusing particularly on their prevalence of use. If needed, conduct a pilot survey to determine the extent to which respondents need non-standard units– extensively, minimally, or not at all.
- When feasible, allow households to report in both standard and non-standard units of measure based on what they are most familiar with for each item reported. If avoiding formal use of non-standard unit still leads to ad hoc field conversions, then even a rather limited set of non-standard units with less of an implementation burden, may still be worthwhile.

- It is critical to establish (define or collect) conversion factors for all non-standard units that are to be used. Additional features to improve the accuracy of reported non-standard units quantities, such as market surveys to establish accurate non-standard units and conversion factors, photo reference aides, and on-the-spot value verification using computer-assisted personal interviews, may also be considered.

- National statistical offices and implementation partners should work together to establish non-standard units databases that can be used across surveys, effectively increasing the standardization of the units, while also limiting the cost to implement them. To this end, survey implementers should thoroughly document all non-standard units protocols and related conversion factors and make them publicly available.

Analytical uses of household consumption and expenditure survey data

Poverty assessments

The data collected in national HCES have been used to measure absolute poverty regularly for an extended period, that is the percentage of people in a country's population whose total income or expenditure fall below a money-metric poverty line anchored to some measure of needs.[42] This indicator is widely used for monitoring poverty, targeting, and planning interventions, as well as for conducting research that supports policies and programs to combat poverty. The primary users of the data for that purpose are the national and international institutions tasked with estimating and monitoring poverty levels, trends, and strategies. At the national level, they 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 Global Poverty Database of the World Bank and the monitoring of the United Nations Sustainable Development Goals,[43] and are used by donor agencies, international non-governmental organizations, 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) (Ravallion 1998; UNSD 2005). Those methods rely on two essential pieces of information: a welfare measure − households' total income or, more often, total expenditure;[44] and a poverty threshold for determining whether a household is poor. A substantial percentage of households' expenditure is devoted to food in most developing countries (typically more than 50 percent, (Smith and Subandoro 2007). Thus, the quality of the food data used to calculate total expenditure is of concern regardless of which method is employed.

[42] 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 those measures have their own merits, they are less relevant for this discussion 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 those 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.

[43] In September 2015 the Millennium Development Goals were replaced by a new set of internationally agreed development goals, the Sustainable Development Goals. Poverty has continued to be a key indicator within the new set of goals.

[44] A UNSD survey of national statistical offices undertaken in 2004-2005 found that almost 50 percent of them base their poverty calculations on expenditure data, 30 percent on income, and 12 on both of them (UNSD 2005).

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 non-food needs. They, therefore, depend on an accurate estimation of households' total expenditure,[45] while differing in the formulation of the poverty line.

The CBN approach is most commonly used, but it is also more computationally demanding. Its poverty line is the level of total expenditure that allows a household to cover its energy requirement plus non-food basic needs, such as housing, education, health, and transport. HCES food data are used to identify a "basket" of foods that 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 non-food 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 they are then used to value the food and non-food items to arrive at the amount of expenditure needed to acquire them, and to account for relative price differences that allow consistency of poverty definitions across time and space.

The FEI 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). That method is less computationally demanding when compared to CBN, as it does not require price data and it implicitly accounts for the non-food allowance. Those computational advantages, however, come at 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.[46]

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 countries in the world and a welfare measure that makes national data comparable internationally by deflating them using a purchasing-power-parity exchange rate (Chen and Ravallion, 2010).[47] These are the poverty estimates produced by the World Bank used to monitor the Sustainable Development Goal 1, to eradicate poverty by 2030.

Food Security assessments

The prevalence of undernourishment was one of the official indicators used to monitor target 1.c of the Millennium Development Goals and has been recently adopted as indicator 2.1.1 of the Sustainable Development Goals. The prevalence of undernourishment corresponds to the "proportion of the population below the minimum level of dietary energy consumption". HCES collecting food

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

[46] 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 favoured by some users over CBN.

[47] The poverty line used for the most recent estimates is $1.25 (Chen and Ravallion 2010).

consumption data have been used in many countries to inform the compilation of that indicator.

The simplest way this has been done is by converting recorded expenditure on food and/or quantities of food acquired by households into corresponding amounts of dietary energy to estimate a household daily per capita DEC. Then, counting the proportion of households in the sample for which such daily household DEC is below a certain reference threshold, set at or around 2,100 kcal/person/day, which is an estimate of the recommended level of daily dietary energy intake for an average individual, or at a given percentage of that level (e.g. 70 percent of the recommended dietary energy intake level)[48].

The relative simplicity of this approach, however, hides several problems. First, given that energy requirements vary considerably, depending on sex, age, physiological status, body mass, and physical activity, the condition of insufficient dietary energy consumption should be determined at the individual level rather than at the household level. The percentage of households with *average* DEC below the *average requirements* may not correspond to the percentage of *individuals* with insufficient food consumption in the population, as there may be individuals consuming enough food even in households reporting insufficient overall quantities or undernourished individuals in household with sufficient overall food consumption. To reduce the risk of estimation error, an estimate can be made of the household-specific average dietary energy requirement by considering the sex, age, physiological status, normative body size for actual height, and normative physical activity level for actual life style (see, for example, Smith and Subandoro, 2007) of the household members. However, the energy requirements were developed for groups of healthy individuals and should not be applied to single individuals. Furthermore, energy requirements are determined per unit of body mass and different body sizes compatible with good health (as captured by normative values of the body mass index (BMI), ranging approximately from 18.5 to 24.5). Also, there are a number of different lifestyles associated with a range of physical activity levels compatible with good health. Consequently, there is also a range of energy requirement levels compatible with good health *within* a group of individuals that are of the same sex, physiological status and a similar age. Because of this range, of energy requirements compatible with good health, using household-specific average energy requirements results in an overestimation of the actual extent of undernourishment as individuals who eat according to their individual requirement but less than the average recommended level for the entire group are falsely identified as being undernourished.

For those reasons, the assessment of the percentage of people undernourished based on the observation of food consumption data – at household or individual levels – should take into consideration the existence of a range of acceptable energy requirements induced by a range of body size and different lifestyles compatible with good health in a group. That is done by using the *minimum of the range of energy requirement instead of the average requirements*.

The second problem in using food consumption data as collected in surveys is that these data provide only a rough approximation of the level of *habitual* daily energy consumption of households or individuals. Food expenditure, acquisition, or consumption data collected in surveys usually refer to short reference periods, and as a result, may reflect the impact of *temporarily higher or lower* food consumption levels associated with seasonality or other phenomena that may

[48] This approach is followed, for example, in Indonesia and several other countries in Asia when computing the percentage of households with inadequate food consumption.

cause the food consumption level observed during a week or a month to depart from the habitual consumption level of the household or the individual. Failing to recognize such excess variability may also lead to biases in estimating the extent of undernourishment.

Those difficulties have led to some doubts that household-level food consumption data collected with surveys may never be sufficient to inform a reliable assessment of the prevalence of undernourishment in a population, and that data collected through carefully conducted individual dietary intake surveys are needed instead.

Fortunately, this is not the case. In its *State of Food Security in the World (SOFI)* publication, FAO has compiled an indicator of the prevalence of undernourishment (PoU) (i.e. the percentage of individuals likely consuming on a regular basis amounts of food that provide less dietary energy than their own energy requirements) for most countries and all regions in the world since 1974, using a procedure developed in the early 1960s by P.V. Sukhatme (former Chief of the FAO Statistic Division). The method is based on a statistical model that represents the probability distribution of habitual levels of dietary energy consumption in a population. PoU can be estimated by contrasting such distribution with the one that would prevail in the same population if everybody were well-nourished, which means that everybody would be eating according to their requirements (as inferred from data on the composition of the population by sex, age, physiological status, height, and physical activity level).

The statistical approach informing the FAO method combines the information on the distribution of dietary energy consumption in the population, as revealed by data from household surveys, with additional information on food consumption available, for example, through macroeconomic accounts of food supply and utilization, and with demographic information on the characteristics of the population that determines energy requirements (sex, age, height, and physical activity levels), in a model that takes into consideration the idiosyncratic nature of individual energy requirements and the possible errors that affect individual household habitual food consumption levels.

Although indirect methods have also been proposed to estimate the parameters of the PoU model, the information collected through HCES, and particularly the quality of the food consumption data (quantities or expenditure of food consumed/acquired are converted into amounts of dietary energy) is essential to estimate as precisely as possible the parameters in the model that reflect the mean, variability, and asymmetry of the distribution of habitual dietary energy consumption within the population.

To establish whether individuals within a population are consuming an adequate amount of dietary energy, data are needed on habitual food consumption levels. Food consumption data collected over short reference periods can be used as a proxy, but they will always contain significant measurement error.

Independently of the survey design, variability of DEC can be increased by simple data entry error (Smith *et al*. 2006). The nature of this measurement error is important for econometric modelling. Gibson *et al.* (2015) showed in the United Republic of Tanzania experiment that the measurement error has a negative correlation with the true value of consumption. Conventional statistical corrections do not work in that case. Regressions using consumption as both dependent or independent variable, will be biased.

This raises the issue of the trade-off between the extent to which a reported measurement approaches the true value of the quantity measured and the degree of exactness in the measurement. Both are affected by method, instrument, or human errors.

Informing food-based nutrition interventions

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.[49] Other examples of food-based nutrition interventions are biofortification, food supplementation, the establishment of horticultural and home garden projects, and nutrition education. The goal of those 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, folate, iron, zinc, and iodine (Fiedler Sanghvi, and Saunders 2008; Bailey *et al*., 2015). Because micronutrient deficiencies among children under five and their mothers make a significant contribution to mortality and disease burdens among those 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). Previously, program planners relied by necessity on food balance sheet data to obtain the needed information. However, being based on national averages, food balance sheet data 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, therefore, are rarely implemented at that level.[50] 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 and Macdonald, 2009), (a) Which foods should be fortified?; and (b) What amount of micronutrients should be added to fortify them? To answer those questions, analysts need to know:

- *The percent of households consuming foods that are potential fortification vehicles*. This indicator of "coverage" is needed to determine which foods are most widely consumed. Commonly fortification vehicles are vegetable oil, wheat flour, salt, and sugar.
- *The percent of households purchasing potentially fortifiable foods*. A food can only be fortified if it is produced at a commercial facility and distributed through 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 determine whether a

[49] 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).

[50] Fiedler, Martin-Prével and Moursi (2013) 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 analysing data from a pre-existing HCES. Note also that, as discussed in Coates *et al*. (2012), for the purposes of producing information needed for decision making in food fortification programs, neither of those 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.

food would be a good fortification 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) may 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, to enable them to set fortification levels. Fortification levels are set with the goal of maximizing the potential for reducing micronutrient deficiencies and protecting people from the risk of excess intake because of 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, namely Guatemala, India, the United Republic of Tanzania and Uganda, (studies cited in Coates *et al*. 2012), and Zambia (Fiedler *et al*. 2012). The need for conducting such evidence-based analyses in additional countries with high prevalence of micronutrient deficiencies is high. 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).

Examples of food away from home experiences from India, Peru and the West Africa Economic and Monetary Unit

This appendix outlines three examples that can be useful starting points to develop a proposal for an international standard for collecting data on food away from home. The three examples are a module adopted by the National Survey Sample Organization (NSSO) of India, a module implemented by Instituto Nacional de Estadística e Informática (INEI) of Peru (and by other countries in Latin America), and the approach recently designed by the West Africa Economic and Monetary Union (UEMOA, by its French acronym) in an effort to harmonize household survey approaches in the region. The three approaches collect some information at the individual level, use meal events as an organizing principle to aid the data collection, and attempt to collect information on both values and quantities and use a separate module for food away from home from the standard food consumption one.

The 2011/12 India National Sample Survey (sixty-eighth round) questionnaire contains three different sets of questions about meals.[51] One set is designed to develop an understanding of each household members' usual daily meal consumption pattern over the past 30 days. It consists of a series of seven questions about the number of meals usually consumed in a day, whether each individual household member was away from home for more than 24 hours, the number and sources (or types) of meals individual household members ate away from home, and the number they ate at home. It asks specifically about four categories of meals away from home; meals obtained at school, from employers, from others (other households, government and non-governmental organization-related programs), and meals received on payment.[52]

The responses to the seven questions together constitute a unifying conceptual framework that comprises a memory aid sensitizing the respondent and the interviewer to each individual household member's pattern of meal consumption and consumption of food away from home during the reference period. It provides a tool for both the respondent and the interviewer to perform various consistency checks across the different numbers and types of meals consumed.

The second section, which includes questions about meals, is part of the food consumption module's food list-related questions. The respondent is asked the

[51] This discussion of the Indian experience reproduces text in Fielder and Yadav (2017).

[52] The NSSO Instruction to field staff guidelines notes: "A meal will be considered to be taken at home if the meal is prepared at home irrespective of the place where it is consumed" (NSSO 2012: Chapter Three, paragraph 3.4.12). It also notes that if "school/*balwadi*'s etc." (column 10 of the schedule) are "received free it will be recorded in column (10). Meals received at subsidized rate will be recorded in column (13)" (NSSO 2014: Chapter Three, paragraph 3.4.14). (This suggests that the common, ambiguous appellation "food away from home" would be more accurately labeled as "food that is purchased and consumed away from home").

quantity and the value of the household's consumption during the past 30 days of each of the items in the questionnaire's 132 item food list. Prior to 2011/12, the questionnaire had two items, "cooked meals received from as assistance or payment" and "cooked meals purchased," on the food list that captured food away from home. In round 68, the question had five items on that food list.[53]

In the Indian approach, the place of food away from home consumption is not identified. However, it does identify distinct types of meals, which may provide similar insights into systematic differences in individuals' and households' food away from home, and, in turn, can be helpful in devising ways to better capture food away from home. In other countries it may be that substituting specific places at which food away from home is consumed for the type of free meals provided would be more useful.

A priori, one would expect that the Block 4 data (**Figure 1** in this annex) would be more accurate because it asks specifically about each individual household member's behavior, rather than requesting the respondent to recall all of the meals consumed away from home by all of the household members over the reference period. As noted earlier, answering household-level questions is a more demanding cognitive task and is subject to greater memory and computational errors. Both approaches, however, rely on a single household respondent to provide information on all household members, which likely makes them subject to measurement error, as the respondent may simply not know about all of the meals all of the household members ate away from home. This is especially true when household members have stayed away from home for more than 24 hours, which in India is highly correlated with the number of meals eaten away from home. In both approaches, the magnitude of the measurement error is likely to be highly correlated with household size, owing to the increasing difficulty of tracking the behavior of larger numbers of household members. It is also likely to be correlated with other variables that are associated with increased consumption of food away from home, including more frequently staying away from home for 24 hours or more, urban residence, source of meal, male, the age of the household members and other factors and variables that were captured in the two distinct typologies of meals away from home discussed earlier.

The meals away from home-linked approach facilitates the cognitive process of developing those estimates by providing a tool to break down the recalling (estimating) process into several steps, making it more manageable, and a less memory- and arithmetically demanding activity, and is likely to yield results that are considerably more accurate. A study by Fiedler and Yadav (forthcoming) demonstrates that, notwithstanding the concern about one respondent providing information on other household members, combining information of individual-specific meal data that can be linked with the HCES food list for capturing at-home consumption can capture a substantially larger quantity of food away from home, which the authors infer constitutes a significant reduction in the measurement error in that source of consumption.

It is worth noting that although this discussion has focused on meals, another, related improvement in the round 68 questionnaire was the introduction of cooked snacks (food item 283).Earlier rounds contained no food item for cooked snacks, although they may have been partially captured in "other processed food" (food item 308 in round 64) and perhaps elsewhere.[54]

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[53] The five items are: cooked meals purchased; cooked meals received free in the workplace; cooked meals received as assistance; cooked snacks purchased; and other served processed food.

[54] Snacks are included in other items as well—especially in the category of packaged processed foods (food list items 290-296), which includes sweets, cake, pastry, biscuits, chocolates, chips,

The National Sample Survey interviewer field guidelines have long attempted to distinguish between meals and snacks, and yet the questionnaires prior to round 68 have not included any explicitly identified item to capture snacks. With the introduction of the three types of cooked meals and a cooked snack variable, the snack component is found to account for 25 percent of the total value of the sum of the three cooked meals and cooked snack values. The introduction of "cooked snacks" may, therefore, have been another a source of reduced measurement error — in particular, the under-reporting of consumption — compared with earlier rounds.

The National Household Survey of PERU (ENAHO by its Spanish acronym) has collected detailed information on food away from home since 2004. The questionnaire is more detailed when compared to the one used by India, as each adult is required to report about their food away from home over the past seven days. Meals are broken down by meal events (breakfast, lunch, dinner, and snack) and by place, such as street vendor, restaurant and work), and information is collected on the frequency and cost of the meal events. ENHAO complements this adult individual questionnaire with Information on food away from home for children and on takeout meals (both through a household informant). It attempts to reduce measurement error linked to the use of proxy respondents, at least for adults and meals eaten outside.

Instituto Nacional de Estadísticañ e Informática has also started implementing a survey of food establishments to assess the nutritional contents of meals eaten outside in different types of establishments, currently limited to the capital city (Farfan Genoni, and Vakis, 2017). This is certainly a valuable addition in terms of information gathered, but it comes at a cost in terms of fieldwork organization and response burden, as it requires contact with all adults in the household.

Most recently, UEMOA member countries have undertaken a collaborative effort to harmonize their HCES at the regional level. For food away from home, the UEMOA module asks for each individual in the household to report separately on whether they have, in the past seven days, consumed any breakfast, lunch, dinner, snacks, hot beverages, non-alcoholic beverages, or alcoholic beverages outside of the house – and if so, the amount spent or the estimated value in the case of gifts. That approach also organizes data collection at the individual level, and around meal events. It does not, however, collect information on the location of the even, the frequency, or the origin of the in-kind food (with meals not paid for generically referred to as "gifts").

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papad, bhujia, namkeen, and chanachur.

Figure 1
The Indian HCES roster Block 4 meal questions

[4] demographic and other particulars of household members													
srl. no.	name of member	relation to head (code)	sex *(male=1, female=2)*	age (years)	marital status (code)	general educational level (code)	no. of days stayed away from home during last 30 days	no. of meals usually taken in a day	no. of meals taken during last 30 days				
									away from home				at home
									free of cost			on payment	
									from school, balwadi, etc.	from employer as perquisites or part of wage	others		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)

Figure 2
The Indian HCES Block 5 questions introduced in 2011/12, round 68

item	code	consumption out of home produce		total consumption		source[$]
		quantity@ (0.000)	value (Rs.)	quantity@ (0.000)	value (Rs.)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)
cooked meals purchased (no.)	280					
cooked meals received free in workplace[K] (no.)	281					
cooked meals received as assistance[K] (no.)	282					
cooked snacks purchased [samosa, puri, paratha, burger, chowmein, idli, dosa, vada, chops, pakoras, pao bhaji, etc.]	283					*
other served processed food**	284					*
served processed food: sub-total (280-284)	**289**					

Figure 3

Food consumed away from home as collected in ENAHO of Peru

559. ALIMENTOS CONSUMIDOS FUERA DEL HOGAR

(559) LA SEMANA PASADA, ¿EL ALIMENTO O BEBIDA QUE CONSUMIÓ FUERA DE SU HOGAR, CORRESPONDIÓ A: (PASE A LA SIGUIENTE LÍNEA)			(559-A) GENERALMENTE, ¿CUÁNTAS VECES A LA SEMANA?	(559-B) GENERALMENTE, ¿DÓNDE LO CONSUMIÓ? Ambulante, mercado ..... 1; Comedor popular ..... 2; Club de madres y Cocina popular ..... 3; Iglesia ..... 4; Restaurante, bodega, etc ..... 5; Otro (especifique) 6		(559-C) GENERALMENTE, ¿PAGÓ POR ÉL? (PASE A LA SIGUIENTE LÍNEA ó 560)		(559-D) GENERALMENTE, ¿CUÁNTO PAGÓ CADA VEZ?		(559-E) ¿LA CUENTA FUE INDIVIDUAL? (PASE A LA SIGUIENTE LÍNEA ó 560)		(559-F) ¿CUÁL ES EL NÚMERO DE PERSONAS QUE CONSUMIERON INCLUYÉNDOSE UD.?	
	Sí	No				Sí	No	MONTO S/. Enteros	Dec.	Sí	No	TOTAL	MIEMBROS DEL HOGAR
1. DESAYUNO?	1	2		1 2 3 4 5 6		1	2			1	2		
2. ALMUERZO?	1	2		1 2 3 4 5 6		1	2			1	2		
3.CENA?	1	2		1 2 3 4 5 6		1	2			1	2		
4. OTRO (alimentos en video pub, karaoke, etc.)? __ (Especifique)	1	2											
4.1 _____	1	2		1 2 3 4 5 6		1	2			1	2		
4.2 _____	1	2		1 2 3 4 5 6		1	2			1	2		
4.3 _____	1	2		1 2 3 4 5 6		1	2			1	2		
4.4 _____	1	2		1 2 3 4 5 6		1	2			1	2		
4.5 _____	1	2		1 2 3 4 5 6		1	2			1	2		

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5.Glossary

Coefficient of Variation (CV) – it is a measure of dispersion of a (frequency or probability) distribution, and is defined as the ratio of the distribution's standard deviation to the mean.

Cost of basic needs – cost of acquiring enough food for adequate dietary energy – usually 2,100 calories per person per day –with the addition of the cost of other essentials, such as clothing and shelter.

Diary – method of data collection. One or more individuals in the household are asked to record at a daily level the household's or individual's food acquired or consumed or both during the reference period of food data collection.

Dietary energy consumption (DEC) – measure of calories consumed by a population group. It is expressed in kilocalories per capita per day, and is estimated from households' food quantities collected in the survey after being adjusted for non-edible portions (e.g. bones and peels). DEC is calculated by converting consumed quantities into calories using a food composition table.

Food acquisition – food (in terms of quantity or monetary values or both) acquired by households during the reference period of food data collection for the purpose of proper consumption. It includes food from purchases, own production and from other sources, such as food received as a gift, aid or as a payment.

Food away from home – (from the United States Bureau of Labor Statistics) food away from home includes all meals (breakfast and brunch, lunch, dinner and snacks and nonalcoholic beverages), including fast food, takeouts and deliveries, meals consumed at concession stands, buffets and cafeterias, and full-service restaurants, and meals purchased at vending machines or from mobile vendors. Also included are board (including at school), meals as pay, special catered affairs, such as weddings, bar mitzvahs and confirmations, school lunches, and meals away from home on trips.

Food composition table – table with information on nutritional properties of foods usually consumed in a country (national) or a group of countries (regional), which includes information on the content of selected macro and micronutrients and the fraction of edible portions. It is generated according to international guidelines to be comparable and reliable.

Food consumption – food (in terms of quantity or monetary values or both) consumed by a household over the reference period of food data collection. The consumed food can come from food acquired during the same reference period or from household stocks.

Food expenditure – monetary value that was paid to purchase a specific amount of food.

Food exclusivity – The food list must include only foods and no other commodities, such as tobacco or chewed stimulants.

Food from own production – food acquired by one or more household members from the household's own production for household's at-home consumption.

Food monetary value – includes food expenditure for purchases and the amount of money that a respondent would have spent if he or she purchased food acquired from own production or received in kind.

Food purchased – food acquired by one or more household members. It includes food consumed at-home or away from home.

Food from other sources – food acquired or consumed at-home from sources different from purchases and own production (e.g. gift, charity, as part of payment, government programs, excluding those from which food is consumed away from home, such as a school feeding program)

Fortified food – food to which the content of a vitamin or mineral was deliberately increased irrespective of whether the nutrient was in the food before processing it. The aim of food fortification efforts is to improve the nutritional status of individuals who consume that food.

Household – usually defined as an individual or group of individuals, related or unrelated, who live together in the same dwelling unit, who acknowledge one adult male or female as the head of household, who share the same living arrangements, who pool some, or all, of their income and wealth, and who consume certain types of goods and services collectively, mainly housing and food, and are considered as one unit.

List of food items – foods listed in a pre-filled food consumption module.

Memory decay – refers to the process of forgetting details (e.g. quantities, monetary values, or foods) linked to consumption or acquisition.

Non-standard units – measurement units for food consumption (or acquired for consumption) different from those included in the metric system (e.g., kilogram and liter). Quantities expressed in non-standard units need to be converted into standard (metric) units to derive nutritional properties from food composition tables. Non-standard units can vary between and within countries.

Partakers – number of individuals who actually consumed the total amount of food reported by the household during the reference period of food data collection. The household size may be different from the number of food partakers because foods may be shared with non-household members, such as

guests, employees, and relatives, and household members may have been absent in the household during the reference period.

Percentile – within a probability distribution, identifies the value of the observed variable below which a percentage (equal to the percentile) of the observations falls. For example, the twentieth percentile corresponding to 940 Kcal/caput/day means that 20 percent of the population consumed less than 940 Kcal/caput/day.

Prevalence of undernourishment – Measure of the proportion of individuals in a population suffering from chronic hunger (a state, lasting for at least one year, of inability to acquire enough food, defined as a level of food intake insufficient to meet dietary energy requirements). Within a probability distribution framework is the probability that a randomly selected individual from a population has an inadequate habitual access to food to satisfy his or her dietary energy requirements.

Processed foods – The term "processed food" applies to any food that has been altered from its natural state in some way, either for safety reasons or convenience.

Recall interviews – method of data collection. One or all individuals in the household are asked to recall the household's or individual's food acquired and consumed during the reference period of food data collection (recall period).

Recall period – reference period of data collection of a food recall interview. Respondents report the amount of food consumed or acquired during the recall period.

Reference period – time period for which respondents are asked to report food acquisitions and consumption.

Relevance (as defined in Smith, Dupriez and Troubat, 2014) – whether the data provide the information or indicators needed by different users.

Reliability (as defined in Smith, Dupriez and Troubat, 2014) – whether the survey design and method comply with good practice, on the basis of a number of criteria.

Respondent burden – effort required by the respondent to answer a questionnaire. A longer questionnaire usually increases the respondent burden and may decrease the response rate and the accuracy of the response.

Round – the total period (usually 12 months) over which a survey is carried out.

Seasonality – effect on variation of food acquired or consumer or both and related expenditure over a long period (e.g., six months, one year). Seasonality is usually linked to agricultural production season. Other cyclical events, such as floods and droughts, may cause such variation affecting both food availability and prices.

Telescoping – the action of reporting food consumption or acquisition or both that actually occurred before or after the recall period. The most common type of telescoping is including events that occurred before a short recall period, leading to an overestimation of consumption or acquisition or both.

Usual month – a typical month (during the previous year or other reference period such as six months) over which respondents are asked to remember their food acquisition and consumption.

Visit – refers to the visit of enumerators conducting the interviews. Over a survey round, multiple visits may be made.

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