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# Food counts. Measuring food consumption and expenditures in Household Consumption and Expenditure Surveys (HCES).

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## **ABSTRACT**

This paper presents the results of an international multi-disciplinary research project on the measurement of food consumption in national household surveys. Food consumption data from household surveys are possibly the single most important source of information on poverty, food security, and nutrition outcomes at national, sub-national and household level, and contribute building blocks to global efforts to monitor progress towards the major international development goals.

The paper synthesizes case studies from a diverse set of developing and OECD countries, looking at some of the main outstanding research issues as identified by a recent international assessment of 100 existing national household surveys (Smith et al., 2014). The project mobilized expertise from different disciplines (statistics, economics, food security, nutrition) to work towards enhancing our understanding of how to improve the quality and availability of food consumption and expenditure data, while making them more valuable for a diverse set of users. The individual studies summarized in this paper analyze, both 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. The individual studies and a synthesis chapter (on which this paper is based) are forthcoming in a special issue of *Food Policy*.

The conclusions and recommendations derived from this collection of studies will be instrumental in advancing the methodological agenda for the collection of household level food data, and will provide national statistical offices and survey practitioners worldwide with practical insights for survey design, while providing poverty, food and nutrition policymakers with greater understanding of these issues, as well as improved tools for and better guidance in policy formulation.

**JEL Classification:** C81, Q18, I32

**Keywords:** Food Consumption; Household Surveys; Questionnaire Design

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## **1. Background: Why repurposing HCES for poverty, food security and nutrition is a smart idea**

Food constitutes a core component of several of the most widely used welfare indicators in the domains of food security, nutrition, health, and poverty. Accounting for about 50 percent of the household budget (USDA, 2011), it makes up the largest share of total household expenditure in low-income countries, on average. Low levels of access to food are an important factor contributing chronic undernutrition, which is now estimated to plague 793 million individuals worldwide (FAO, 2015). The collection of high quality food consumption data is therefore central to assessing and monitoring the well-being of any human population, and is a concern of national governments, international agencies, and anyone interested in understanding the levels of and trends in social, economic, and human development.

Data on food consumption are needed, for example, to construct and monitor the indicator and targets required to assess progress towards the achievement of Sustainable Development Goals 1 and 2 (end poverty and end hunger, respectively). Similarly, its measurement is crucial to assess and guide the FAO's efforts to monitor and address its mandate to eradicate hunger, food insecurity and malnutrition. It is also the primary data input for monitoring progress of the World Bank's twin goals of eliminating extreme poverty and boosting shared prosperity. Reliable food consumption data are also required by national and local governments, as well as non-governmental organizations, to guide their analysis, programming and policymaking. The lack of food consumption data or its mismeasurement may result in the misallocation of funding and may compromise the design, monitoring and evaluation of programs and policies.

The last two decades have witnessed unprecedented progress 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). Today, there are at least 99 countries with consumption or expenditure information, and most of them have multiple surveys, adding to a total of more than 687 surveys (Ferreira et al., 2016). The number of countries with no poverty data (which is primarily estimated from food consumption data) over a 10-year period declined from 33 percent to 19 percent since the 1990s, whereas the share of countries with 3 or more data points over a 10-year period increased from 27 to 41 percent over the same period (Serajuddin et al., 2015).

Despite this progress, there are still 29 countries without a single survey between 2002 to 2011 – and another 28 only have one survey in that time frame – that would enable estimating national poverty figures (Serajuddin et al., 2015). Without such data it is impossible for these countries or for international development actors to analyze trends and progress (or lack thereof) in poverty eradication, something that has prompted the World Bank President to pledge to assist all IDA countries in conducting at least one such survey every three years. At the same time, the UN Statistical Commission has established an Inter-Secretariat Working Group on Household Surveys at its forty-sixth session “to foster coordination and harmonization of household survey activities across agencies and member countries” (United Nations, 2014). These 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.

Depending on their primary objective, the surveys collecting information on household consumption or expenditure take different forms, including Household Budget Surveys (HBS),

Income and Expenditure Surveys (IES), or ‘multi-purpose’ or ‘integrated’ household surveys, like the Living Standards Measurement Study (LSMS) surveys. We refer to this family of surveys, which are usually nationally and sub-nationally representative, as Household Consumption and Expenditure Surveys (HCES).

While the variety of HCES 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 approaches and methods used in the collection of food data that is not only due to their different purposes or country-specific considerations. While there exist international guidelines and recommendations for the design and implementation of each of the distinct types of HCES surveys, they are specific to each type of survey, are generally not prescriptive, lack coherence and usually leave much flexibility to national survey statisticians. Consequently, we observe heterogeneity in methods, even within the same type of survey, both across countries, as well as within countries over time.

While HCES typically are not designed for the purpose of addressing food and nutritional information gaps, they are increasingly being used for this purpose. There are many reasons for the increase in use of the HCES surveys for this end, including that they contain a wealth of information about food acquisition and consumption; are being done with increasing frequency in an increasing number of countries (Serajuddin, 2015); have large samples, statistically representative at subnational levels; and are much less costly than other dietary assessment data sources because these multi-purpose surveys are already being conducted and paid for by other government agencies (Fiedler 2013).

While there has been a surge of interest and HCES analyses of nutrition and food security issues, the potential of this particular type of repurposing of HCES has yet to be realized for several

reasons. First, there is a lack of awareness of public nutritionists and food policy analysts about what these data contain. Second, there is a need for further research and action to improve the quality and utility of these data. To date, the nutrition community's role has been overwhelmingly that of a passive user of HCES data from surveys that have already been conducted. Many HCES shortcomings, however, stem from design and implementation issues. If the nutrition community—with its unique skills and experiences—were to get more proactively involved in the design, implementation and analyses of HCES, they could be strengthened substantially as a tool for evidence-based food and nutrition programming and policymaking (Fiedler et al., 2012).

In this paper we summarize a set of purposely assembled studies that provide a useful perspective on the challenges and opportunities for promoting a set of science-based guidelines for the food data component of HCES. The guidelines, if endorsed and widely adopted, would promote survey harmonization and increase HCES value for money by making these surveys more relevant to a wider set of potential users that includes nutritionists and food security analysts. The main commonality linking these studies is that they compare alternative approaches to data collection (from existing datasets as well as from data purposely collected for methodological studies), in order to identify the implication of survey design for measurement and analysis, and translate those approaches considered as “best” into recommendations for scalable approaches in future survey design efforts. The papers, and an introductory paper of which the present paper is the conference version, are due for publication in a special issue of *Food Policy*.

## **2. Putting new methodological research to work for survey design**

The work program summarized in this paper has been sparked by a desk review of the reliability and relevance of the food data collected in national household consumption and expenditure surveys, which was jointly led by the International Household Survey Network (IHSN), FAO and the World Bank (Smith et al., 2014). That assessment identified the multiple purposes these household surveys serve, proposed methods to assess the reliability and relevance of survey questions, and applied these methods to 100 household surveys from low- and middle-income countries (a sample that resulted from selecting the most recent nationally representative household survey from each developing country, with the only condition of having enough documentation). The assessment points to many areas where survey design and questionnaires can be significantly improved, among which five were selected as key themes for the research projects we summarize in this paper. They are the following:

- **Choosing diary or recall surveys, and the appropriate reference period.** Citing concerns about memory loss when collecting very detailed consumption or intake data, nutritionists generally favor shorter recall periods (e.g. 24-hour recall), whereas expenditure surveys commonly use recall of one week or more in order to be better able to capture “usual” behavioral patterns. The impacts of recall period decisions on the quality of the data for different uses are far from being fully understood, and some of the papers we summarize address questions related to quantifying the tradeoffs involved in having a longer recall period and increased memory loss. To assess usual consumption, how many times should data be collected from households and for what observation or “reference” period? What difference will extending reference periods and conducting repeat visits actually make to estimates of poverty and inadequate nutrient intakes?



- **Food consumed away from home (FAFH) and cooked/packaged meals.** FAFH and prepared foods represent an increasing share of food consumption, and will continue to be so as GDP per person grows, and food systems evolve. This is an area where many national surveys could be improved, but where evidence on the robustness of alternative methods is weakest. A sub-set of the papers look at the implication and methods for capturing FAFH, whether eaten in commercial or public establishments (e.g. restaurant, schools).

- **Measuring individual versus household consumption.** The food consumption/ expenditure modules of HCES capture household level information. Yet, food and nutrition policies and programs often require information about which foods and nutrients are consumed by which groups of individuals, and in what quantity. While individual dietary intake data are more appropriate for meeting these information needs, HCES are more widely available and conducted more regularly than individual-level dietary assessments. Furthermore, most dietary surveys do not assess the intake of all household members, making it difficult to plan programs, such as fortification programs, that are intended to benefit more than just one demographic group. Until individual-level dietary data collection becomes routinely available, understanding whether and how household-level data can be used to approximate actual individual food and nutrient consumption is a worthwhile undertaking. Some of the papers summarized here propose methodologies for deriving individual level estimates from household data.

- **Measuring food acquisition versus measuring food consumption.** The term food consumption is interpreted in many ways. For economists and poverty analyst the focus is on the amount of money spent to acquire food; for food security analysts, it is on the amount of food available for consumption; whereas nutritionists are primarily concerned with the quantities of foods actually eaten. Food data were initially collected in HCES simply to construct the

consumer price indices or to inform national accounts. As a result, the food data collected referred primarily to items the household acquired through purchases during the reference period. Over the years, food items procured through own-production, barter, gifts and payment-in-kind were introduced into these surveys to better capture food acquisition in rural areas. These surveys aimed at capturing food that was acquired by the household with the intention that it would be consumed. With time, surveys have been increasingly focused on food items actually consumed by the household and the various sources from which food was acquired. One issue for methodological research to examine, therefore, is the extent to which there are systematic differences in food data collected using acquisition type surveys versus consumption type surveys versus combinations of these two types of surveys.

- **Length and specificity of survey food lists.** For many analytical purposes, survey food lists need to be sufficiently detailed to accurately capture consumption of all major food groups making up the human diet. There are trade-offs involved in the design of a survey food list, including its length and specificity that are not well understood. Some of the papers provide evidence to help survey design practitioners and analysts to quantify those tradeoffs and to highlight their implications for policy analysis.

### **3. New and emerging evidence**

Starting from where Smith et al. (2014) left off, the World Bank and FAO decided to join forces to assemble rigorous empirical evidence to inform key decisions related to survey design choices for national consumption and expenditure surveys, using data from a variety of settings and types of data sources, with the aim to contribute to filling a significant gap in the literature and inform policy.

The research that we summarize in what follows brings together empirical studies on the implications of different survey design options for the measurement and estimation of different indicators and parameters of importance to several development domains. The data used in these studies include nationally-representative data and detailed case studies across a range of countries from several developing regions, as well as from high-income countries. The results draw on expertise from a range of disciplines and institutional backgrounds, as authors are nutritionists, food security and poverty analysts, economists, and statisticians from national statistical offices, international organizations and academia. Several of the studies exploit the peculiar features of existing national datasets which collected data in a particular way that allowed comparing data associated with different survey design choices, by either within or between subject comparisons. One of the studies utilizes data from a randomized methodological experiment.

The list of studies this synthesis draws on is provided in Table 1. The evidence presented in the forthcoming volume provides some very clear indications on the effects of these key survey design choices on the resulting data, but it also identifies areas where more research and validation is needed. In what follows, we present a summary of the main findings, organized around the key survey features listed in Section 2 above. The reader is encouraged to turn to the individual papers for a more complete understanding of the issues and findings of each paper.

***Assessing the quality of recall and diary surveys and informing the choice of their reference period***

The first finding is that recall surveys tend to return higher consumption values (whether in monetary or caloric terms) than diaries, with the difference between the two declining with the length of the recall period. This finding is common to the papers by Conforti et al., based on a

cross country analysis of dietary energy consumption (DEC) estimates, to an analysis of experimental Niger data by Backiny-Yetna et al., and to the analysis of Canadian data in Brzozowski et al., and is consistent with the evidence from the Tanzania experiment reported in Beegle et al. (2012).

The paper by Friedman et al. in this volume, based on the same Tanzania survey experiment, sheds some light on how different survey design options are affected by different types of reporting error. They find that relatively short recall modules (such as the 7 day) are affected on the one hand by an underestimate of the incidence of consumption, particularly for infrequently consumed items, accompanied by an overestimate of the value of consumption, conditional on positive consumption (due to telescoping error). The recall error appears to be larger for less frequently consumed items, and on short recall periods. Adopting a ‘usual month’ approach to recall does not appear to solve the problem, as it results in an overestimate of the incidence of consumption particularly for goods that are not regularly consumed, and an underestimate of consumption values for staples. Importantly, the ‘usual month’ approach also imposes a significantly higher burden on the respondent and results in longer interviews. Bounding of the recall period with an earlier visit, and further prompting of food items are possible avenues for improving the quality of recall data, but more methodological work is needed to test that hypothesis.

Diaries remain a viable option where the conditions are such that they can be properly implemented, but steps can be taken to improve their accuracy by explicitly prompting about the consumption of individual household members, particularly for foods and meals that may be consumed outside the households (more on this below). Repeating diaries in successive visits (Troubat and Grünberger), or increasing their length (Backiny-Yetna et al.; Brzozowski et al.;

Engle-Stone et al.), appears on the contrary not to add, and may even reduce the quality of the resulting data (including for nutrition analysis), while increasing cost, and is therefore to be discouraged.

Worryingly, some of the observed measurement error patterns appear to be systematically associated with household characteristics, with measurement error higher in low resource households in Tanzania (Friedman et al.) and in selected regions in urban Mongolia (Troubat and Grünberger), or significantly associated with income and household demographics in Canada (Brzozowski et al.).

### ***Measuring Food Away from Home (FAFH)***

The secular increase in FAFH as a percentage of total food consumption has long been demonstrated (Smith, 2013) and national statistical offices the world over are struggling to find new tools to keep up with the challenge of measuring this component of households' food expenditure and consumption. Three papers in this volume deal specifically with measuring FAFH.

Cafiero and Borlizzi use national data from Brazil to show how failing to account for school meals inflates the degree of inequality in the distribution of calorie consumption. They therefore recommend that surveys should collect data on actual quantity and quality of food consumed in schools and in other large national feeding programs, including by integrating the survey data collection with administrative information on the meal contents when that is available. Similarly, Farfan et al. show how poverty analysis needs to take FAFH into account as once it is incorporated it can shift both the consumption expenditure distribution and the poverty line in ways that cannot be determined a priori. Using data from Peru they find that accounting for

FAFH has opposite implications on the extent of severe and moderate poverty levels, and has a significant impact on the profile of the poor.

The paper by Fiedler and Yadav opens one avenue for further methodological validation by showing how the introduction of a new module collecting information on Meals Away from Home (MAFH), with household-member specific responses, in the India National Survey Sample Round 68 substantially reduced measurement error in this component of food consumption expenditure. The paper by Kirilin and Denbaly in this volume, while not exclusively focused on FAFH, also makes the point that in the US, accounting for FAFH-including food acquired for free-is essential in order to understand the determinants of demand for food , one of the many objectives for which HCES data is used to investigate.

### ***Individual vs Household***

While concepts like poverty and food security can be articulated and studied at the level of the household, nutrition is an eminently individual outcome. That is the reason why the papers in the volume that look at methods for estimating individual level outcomes from HCES have a specific nutrition focus. That is not to say of course that intra-household resource allocation questions are not important for poverty and food security analyses as well (Chiappori and Meghir 2015) and there have been studies recently attempting to estimate individual consumption shares from HCES data (Dunbar et al., 2013).

The results of the papers by Coates et al. and Sununtnasuk and Fiedler in this volume are both reasonably encouraging on the potential to use household level HCES data to make inferences about individual level nutrient intake and adequacy in individuals. Sununtnasuk and Fiedler, using national data for Bangladesh, find that in 91 percent of cases, estimates of energy and nutrient intake based on the gold-standard (for nutrition analysis) individual 24 hour-recall were

identical to those estimated from household data assuming that food is distributed to household members in proportion to their share of the household's total Adult Male Equivalent (AME). Qualitatively similar results are reported by Coates et al. using a different dataset for Bangladesh and data from Ethiopia. Both studies warn however that while population based estimates using the AME approach are reasonably accurate, they tend not to be reliable for specific at-risk groups in the population, such as children under three years of age. According to Coates et al., adjusting for partakers and activity levels does not significantly improve the accuracy of the AME prediction. While HCES cannot replace individual nutrition intake surveys, they can provide useful information for nutritionists. Nutritionists should be brought on board at the survey design stage to ensure that- to the extent possible,-survey implementation reflects their particular insights and needs.

One specific aspect where capturing information at the individual levels is especially important is FAFH. The main 'food preparer' can be reasonably informed of household members' food consumption at the house, but less so when it comes to food consumed (especially if also prepared) away. The findings of Fiedler and Yadav do, however, report on an important innovation in India's main national survey where complementing household- and individual-based information on meals away from home substantially reduced the extent of measurement error. This is, therefore, an approach that holds promise for reducing measurement error if it is adopted in other countries: additional testing in different settings would be desirable.

### ***Acquisition vs Consumption***

One important, often overlooked, difference in the design of HCES is that while some ask respondents to report about how much food was acquired (i.e. purchased, received as gift or other in-kind transfer, or produced or collected by household members) during a given period,

other surveys ask about the food the household consumed (often asking separate questions on the source of acquisition for the food that was consumed). Some surveys ask the household to report acquisition from purchases and combine that with questions on consumption from own production and transfers. For surveys implemented over a full year the difference between these methods should not matter as one would not expect to observe large changes in food stocks at the household level. In practice the differences might be substantial, particularly when data are collected only at one particular time of the year (Conforti et al.).

The evidence based from a regression analysis using a sample of 81 national surveys presented in this volume by Conforti et al. is that acquisition (and to an even larger extent acquisition/consumption surveys) tend to return higher caloric counts than surveys asking households to report food consumption. Conforti et al also find that while the coefficient of variation of acquisition surveys is on average also higher, as one would expect *a priori*, the difference between survey types disappears when other survey features and country characteristics are controlled for. The authors note how even if small on average, the differences in dietary energy consumption (DEC) associated with collecting consumption instead of acquisition data may result in large increase in the measures of undernourishment and have therefore substantial implications for analytical applications.

Troubat and Grünberger use a survey of households in urban Mongolia to compare average DEC from acquisition data to a measure of consumption derived from acquisition augmented with stock variations. They find that since in a majority of cases ending stocks were recorded in days of the month away from pay days, they tended to be underestimated resulting in consumption being significantly higher than acquisition. When considering only households for which beginning and ending stock data were collected at comparable times, the difference disappeared,



suggesting stocks can be estimated with recall surveys, but attention needs to be paid to correctly spreading the interview time over the survey period.

### ***Food lists***

Trade-offs in the design of the food lists included in a food consumption (or acquisition) questionnaire are quite evident. A short list will result in fewer foods and transactions, with an impact likely to be more serious for households with a more varied diet. Adding 'too many' food items to the list will on the other hand result in a burden of respondents and enumerators in return for an irrelevant amount of information collected for the few households that will report consuming or purchasing the additional items. Any quest for an 'optimal' length of a food list with global applicability is however not likely to succeed as diets are so different across the planet that the length and composition of any list will need to be country specific.

Smith et al. (2014) put forward two criteria and a few rules of thumb to guide the design of food lists. They call for survey designers to ensure the *comprehensiveness* and *specificity* of food lists. With comprehensiveness they mean that data should be collected on all of the types of food and beverages that make up a modern human diet. The rules of thumb they employ on that aspect are that (a) 14 basic food groups must be represented by at least one item in the survey questionnaire; and (b) at least 40 percent of products should be processed food items. With specificity they mean that survey food lists should be sufficiently detailed to accurately capture consumption of all major food groups making up the human diet. They suggest two rules of thumb to employ in this respect: (a) a minimum number of food items should be included in each of the 14 basic food groups; and (b) no more than 5 percent of the food items listed in the questionnaire should span more than one basic food group. While motivated by clear objectives, these criteria and rules of thumb are not based on empirical evidence on how specific choices in

food list design affect data collection. Some of the papers in the volume reviewed here try to shed more light on these issues.

The experimental work undertaken by Friedman et al. compares the use of lists of 58 and 17 food items, and a list of 11 broad food categories (as opposed to specific food items). Their findings provide strong evidence that shortening the list to such an extent introduces considerable measurement error (particularly in the case of the food categories) without a correspondingly significant reduction in interview time.

Nutritionists are interested to the length and composition of food lists also to the extent that they can signal trends in the consumption of food items or food groups that are of particular interest due to their nutritional benefits or for their association with dietary related issues such as overweight and obesity.<sup>1</sup> Louzada et al. in this volume use a particularly unique survey that combines household acquisition data with individual intake data to study whether HCES hold promise of allowing to study the consumption of ‘ultra-processed foods’. These are food items that are relatively dense in their content of sugars, total fats, saturated fats and trans fats, and poor in vitamins and other important micronutrients, and have been shown to be associated with obesity, diabetes and other diet related diseases. They find a substantial agreement between the individual intake data and the HCES data, particularly in terms of relative (percentage) energy consumption from ultra-processed foods. HCES do, therefore, hold potential to be used in the analysis of food consumption of such specific components of the diet, and clearly food lists will have to be crafted with an attention to those items that are more relevant for a country’s nutrition policy.

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<sup>1</sup> Products that are or can become the target for food fortification programs should also be singled out in food list as HCES can be used to assess the (potential) coverage of such programs.

In the future barcode scanners hold promise of being integrated in survey operations to identify specific food items, but the challenges of such operations are substantial even in countries with the most advanced statistical services, such as the United States. In this volume, Kirlin and Denbaly report on the issues encountered in the implementation of the national Food Purchase and Acquisition Survey. A substantial amount of post-data collection processing was found to be necessary in order to identify specific food items in the data, and resulted in unexpected delays and increased costs. Future rounds of the survey will provide more indications of how such problems can be avoided and how scanners may be better integrated in survey operations.

#### **4. Conclusions**

The research summarized in this paper, which is forthcoming in a *Food Policy* special issue, presents new evidence on the impact that survey design choices may have on the quality and relevance of the food consumption data collected in HCES. The survey design lessons derived from this body of work include:

1. There is enough evidence about how some survey design options are detrimental to data quality while not providing sufficient benefits in other domains (e.g. cost savings) to justify that loss of accuracy or precision. Such survey practices--including the use of a “usual month” recall period, and neglecting to collect information about school-based and other widespread feeding programs--should be discontinued.
2. Trade-offs exist across some survey design options, for which there is no clear right or wrong approach. The research presented here can help making those trade-offs clear to survey designers and data analysts and inform their decisions. Among the most important such considerations are: taking into account common shopping habits and balancing the capturing of foods less frequently purchased, the length of the recall period

and memory loss; the degree of specificity and length of the food list and the capturing of nutritionally distinct and nutritionally significant food items; and the length of the food list and how it affects interview time and survey implementation costs.

3. For some survey design options the empirical evidence is not yet sufficient to formulate definite conclusions regarding how best to capture some information. Investments in methodological research should prioritize these domains, with the collection of data on food away from home, being a priority.
4. HCES data do hold the potential for a wide range of users (economists, food security analysts, statisticians, nutritionists) for important, policy relevant analyses. A multidisciplinary approach to survey design both at the national and international levels can help to ensure that these surveys are designed with an eye to their multiple potential uses, thus increasing the informational value for money that comes with implementing an HCES.
5. Even though there might not be enough empirical evidence to resolve all survey design puzzles, and countries might have good reasons to adopt different approaches, an international effort to systematize lessons learnt from methodological research into practical guidelines for survey designers would be very useful. Such a report would help to (a) ensure national statistical offices receive consistent, science based advice for designing surveys to capture data on food consumption/acquisition, and (b) increase the harmonization of surveys across countries and over time.

**Table 1.** *List of papers in the 'Food Counts' research project.*

<b>Authors</b>	<b>Country</b>	<b>Data</b>	<b>Focus</b>
1. Conforti et al.	Global	81 national surveys	Impact of survey design issues on estimates of dietary energy consumption (DEC)
2. Friedman et al.	Tanzania	Experimental	Impact of survey design approach on frequency and value of consumption expenditure by (type of) food item
3. Sununtnasuk & Fiedler	Bangladesh	National. Includes both HH level and individual 24HR data	Comparison of estimated AME from HH data with results from 24HR recall
4. Engle-Stone et al.	Bangladesh	National. Includes 7 consecutive 2-day recall periods	Impact of extending the length of the recall period on estimates of nutrient inadequacies
5. Troubat & Grünberger	Mongolia	National, urban. Includes one-month recall, and a diary of 3*10 days, and questions on food stocks	Comparison of diary and recall, and value added of longer recall and repeated visits for estimates of DEC
6. Kirlin & Denbaly	USA	National data, innovative in many respects (coverage of FAFH, assistance programs; use of hand-held scanners)	Lessons learned from the application of innovative approaches to data collection
7. Farfán et al.	Peru	National. Includes detailed FAFH module, including at the individual level	Impact of accounting for FAFH on the estimated incidence and profile of poverty
8. Borlizzi et al.	Brazil	National. Detailed information on FAFH including meals at school.	Impact of accounting for school feeding on average and distribution of DEC
9. Coates et al.	Ethiopia, Bangladesh	Oromiya and SNNP regions (Ethiopia), 15 districts in Bangladesh. HH dietary data and individual level intake estimates	Comparison of estimated AME from HH data with results from 24HR recall
10. Brzozowski et al.	Canada	National. Diary and recall data.	Impacts of adoption of diary vs recall on extent and features of measurement error in estimate of food expenditures
11. da Costa Louzada et al.	Brazil	National. HH acquisition and individual food intake.	Possibility of capturing important dietary features (consumption of ultra-processed foods) in HCES
12. Fiedler & Yadav	India	National. HH questionnaire on FAFH, and individual questionnaire on MAFH.	Impact of adopting a MAFH questionnaire on indicators of food consumption and food insecurity
13. Backiny-Yetna et al.	Niger	Experimental. Niamey and Tillabéry districts. Includes 7-day and usual month recall, and 7-day diary questionnaires.	Impact of questionnaire design (length of recall, diary) on frequency and value of food expenditure

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