INTERNATIONAL
DIETARY DATA
EXPANSION
PROJECT

Data4Diets: Building Blocks for Diet-related Food Security Analysis

Online at inddex.nutrition.tufts.edu/data4diets

Retrieved on 23 January 2019

About Data4Diets

The Data4Diets platform has been created as part of the International Dietary Data Expansion (INDDEX) Project. The objective of the Data4Diets platform is to aid program implementers, policy makers, and researchers to identify which diet-related food security indicators are best suited for their objectives, understand how the indicators should be constructed and used, and know which data sources and methods are preferred for producing these indicators and information.

Please cite as: INDDEX Project (2018), Data4Diets: Building Blocks for Diet-related Food Security Analysis. Tufts University, Boston, MA. https://inddex.nutrition.tufts.edu/data4diets. Accessed on 23 January 2019.

Table of Contents

- Minimum Dietary Diversity for Women (MDD-W)
- Modified Functional Attribute Diversity (MFAD)
- National average supply of protein
- National energy available from non-staples
- National fruit and vegetable availability
- Packaged food retail volume
- Per capita food supply variability
- Percent of energy comprised of ultra-processed foods
- Population share with adequate nutrients
- Prevalence of Undernourishment
- Shannon Entropy Diversity Metric
- Share of food consumed away from home of total food consumption
- Total individual energy intake
- Total individual macronutrient intake
- Total individual micronutrient intake
- Volatility of food prices

Deconstructing food security for improved measurement and action: The Data4Diets framework

About Data4Diets

The Data4Diets platform was developed by the International Dietary Data Expansion (INDDEX) Project. The INDDEX Project strives to increase the availability, access, and use of dietary data through the development of an innovative data collection platform and demonstrating uses of existing consumption data for policies and programs. The objective of the Data4Diets platform is to aid program implementers, policy makers, and researchers to identify which diet-related food security indicators are best suited for their objectives, understand how the indicators should be constructed and used, and know which data sources and methods are preferred for producing these indicators, and access case study examples of how indicators have been analyzed to produce actionable policy information. The Data4Diets platform provides a searchable set of indicators, descriptions of common data sources and methods, links to guidelines for indicator construction, and concrete case studies illustrating ways in which each type of indicator has been leveraged for diet-related food security policy and programming.

The Data4Diets framework

The most widely accepted definition of food security derives from the 1996 World Food Summit, which describes food security as a "state in which all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life" (FAO, 1996).

Experts agree that no single indicator can capture all of the dimensions of this definition. And yet, in practice, people commonly use single food security indicators without consideration of which dimensions of this definition are being captured (or not) by their chosen metric. Given the multidimensional nature of the food security construct, there has been continued debate about the best way to conceptualize, select, and organize the array of existing food security indicators. Most commonly, food security metrics reflect one of the "pillars" of availability, access, and utilization (and sometimes also stability) (USAID 1992, Webb and Rogers 2003). Others have chosen to group food security indicators by the unit of observation, such as national, market, household, and individual (Lele et al. 2016).

The Data4Diets platform follows a framework proposed by Coates (2013), which identifies six policy-relevant dimensions of the food security construct that are inherent to the1996 World Food Summit definition and were shown to reflect people's own experience of the problem of food insecurity. The six food security components in the Data4Diets platform – slightly adapted from Coates (2013) – are: **quantity** (caloric sufficiency), **quality** (nutrient adequacy), **preference**, **safety**, **stability**, and **sustainability**, all of which can be measured at four levels (national, market, household, and individual) (**Figure 1).** The indicators in the D4D are considered "diet-related food security indicators" in that they measure whether food is sufficiently available, accessible, and utilizable to meet consumption needs (where needs include preference, quality, quantity, safety, stability, and sustainability). As such, the Data4Diets platform was developed to align with the INDDEX Project objective of expanding the use of consumption and dietary data worldwide.

Figure 1. Dimensions and levels for food security measurement

	Quality	Quantity	Preference	Safety	Stability	Sustainability
National, Market (Available)						
Market, Household, Individual (Accessible)						
Household, Individual (Utilizable*)						

Indicators in the Data4Diets platform are categorized according to the dimension(s) to which they relate most closely**. Please see our FAQs and inclusion/exclusion criteria for further detail regarding the selection of indicators for the Data4Diets Platform.

*Note: 'Utilizable' in this context refers to individual food consumption. It can be examined, along with other information such as illness and biological use of nutrients, to understand the extent to which diet contributes to nutrition outcomes.

** Note: Not all food security indicators were designed to capture one of these 6 dimensions; many indicators are not specific to a single dimension, and therefore are presented under more than one dimension in the Data4Diets platform. Furthermore, this matrix approach highlights those dimensions where specific, accepted metrics are lacking – such as that of food preferences.

Understanding the ‘Dimensions’ and ‘Levels’ terminology in the Data4Diets

Food Security Dimensions:

The Data4Diets platform uses the terminology of ‘food security dimensions’ to refer to the different aspects of food security, as per the 1996 World Food Summit definition (FAO, 1996). Despite the multiple dimensions in the definition of food security, too frequently food security is measured using existing indicators that are either non-specific or only capture one piece of this multi-dimensional problem. As a result, some dimensions are rarely measured (e.g. safety, preferences) and users are often unclear which aspect of food security is actually captured by a given indicator. Coates (2013) asserts that a preferred approach is to develop and select indicators that specifically reflect each of these 6 dimension(s) to provide a holistic picture of the food security situation at a national, market, household or individual level. This approach should help to better diagnose the nature of food insecurity problems and develop solutions that are tailored to those problems. Thinking about food security through the lens of the different dimensions also highlights dimensions that have drawn the most policy attention (e.g. quantity and, increasingly, quality) and those that have been historically overlooked (e.g. safety and preference).

The food security dimensions in the Data4Diets are defined in the following way:

Quality: These indicators measure diet quality including aspects related to diversity, adequacy, moderation, and overall balance. Depending on the indicator, quality can range from considering the full dietary pattern and all foods/food groups or only specific macronutrients and micronutrients that are available, accessible, or consumed by the population of interest at national, market, household, and individual levels.

Quantity: These indicators relate to food sufficiency, primarily expressed as dietary energy (calories) that are available, accessible, or consumed by the population of interest at national, market, household, and individual levels.

Preference: These indicators relate to whether people are able to exercise the choice to consume foods that they prefer, i.e., those that are culturally and/or personally acceptable. Experiential food security scales (e.g. HFIAS, FIES) capture lack of choice by measuring people's self-reported consumption behaviors in reaction to food access constraints. Proxy information could be used to infer choice constraints from purchasing behavior or experimental data at market, household, and individual levels.

Safety: These indicators relate to the safety of the food supply and food consumed as measured through foods available that are free of contamination or exposure (through consumption) to specific contaminants at national, market, household, and individual levels. More generally, food safety refers to the handling, preparation, and storage of foods that prevent food-borne illness.

Stability: These indicators relate to the inter- and intra-annual certainty and stability of food availability, access, and consumption – often in relation to food prices and other shocks -- at the national, market, household, and individual levels.

Sustainability: These indicators relate to the long-term future preservation and assurance of food availability, access and consumption at national, market, household, and individual levels for example through sustainable diets that could contribute to a reduced environmental impact.

Data Collection Levels:

The Data4Diets platform uses the terminology of 'data collection levels' to refer to the different levels at which the Data4Diets indicators are most commonly collected (national, market, household, individual). The data collection levels (national, market, household, individual) referred to in the Data4Diets platform correspond roughly to the food security pillars of availability, accessibility, and utilization of food as conceived in the historical approach to measuring food security. National and market level data can be used to measure the availability of food that is sufficient in terms of quantity and quality, stable, sustainable, safe, and meets consumer preferences. Market, household, and individual level data can be used to measure the accessibility of food that is sufficient in terms of quantity and quality, stable, sustainable, safe, and meets consumer preferences, while individual level data can be used to measure the utilization of food that meets these same criteria.

(Note: 'Utilization' in this context refers to individual food consumption. It can be examined, along with other information such as illness and biological use of nutrients, to understand the extent to which diet contributes to nutrition outcomes).

The data collection levels in the Data4Diets are defined in the following way:

National: This level refers to data that are collected at the national level and represent national level averages (e.g. Food Balance Sheets) which cannot be disaggregated to lower data collection levels (i.e. units of analysis) like households and individuals.

Market: This level refers to data that are collected from a country's domestic markets by monitoring prices (e.g. Vulnerability Analysis and Mapping) or purchasing behavior (e.g. Euromonitor). Market level data are often available at either a national or sub-national level.

Household: This level refers to data that are collected from and about households with sub-national representability (e.g. household consumption and expenditure surveys); these data can be aggregated up to the national level but cannot be used (without large assumptions) to draw conclusions about individual access and consumption of foods.

Individual: This refers to data that are collected at the individual level (e.g. quantitative 24-hour dietary recalls), which, if collected in a nationally (or regionally) representative way can be aggregated up to the national (or regional) level in order to draw conclusions about consumption patterns and preferences about the population in a region or country.

Contributors

Winnie Bell (Researcher Data4Diets Lead, INDDEX)

Jennifer Coates (Principal Investigator, INDDEX)

Sarah McClung (Research Assistant, Tufts)

Caroline Nathan (Research Assistant, Tufts)

Tra Phuong Nguyen (Intern, Tufts)

Cathleen Prata (Senior Project Manager, INDDEX)

Beatrice Rogers (Co- Principal Investigator, INDDEX)

Nick Russell (Web Developer, Tufts)

Natalie Theys (Research Assistant, Tufts)

Gero Carletto (Technical Advisory Committee, INDDEX)

Elaine Ferguson (Technical Advisory Committee, INDDEX)

Yves Martin-Preval (Technical Advisory Committee, INDDEX)

Marie Ruel (Technical Advisory Committee, INDDEX)

Nadia Slimani (Technical Advisory Committee, INDDEX)

Anne Swindale (Technical Advisory Committee, INDDEX)

Anne Kepple (FAO)

Catherine Leclerq (FAO)

Ana Moltedo (FAO)

Nathalie Troubat (FAO)

Data4Diets: FAQs

How were indicators selected for the Data4Diets?

We systematically reviewed existing literature and indicators currently being used by key institutions to identify relevant food security and nutrition indicators. All indicators we selected fit into our predefined inclusion/exclusion criteria (see below). Some of the documents and tools we reviewed included the Food Security Information Network User's Guide for Existing Indicators, the ADePT Food Security Module Indicators, the FAO/WHO GIFT Draft Indicators, the FAO food security indicators, the Feed the Future Indicators, and the Global Nutrition Report. We then evaluated the indicators based on the predefined inclusion/exclusion criteria and carefully reviewed selected indicators to check for redundancies. Indicators that measured the same concept but were articulated slightly differently were collapsed into a single indicator.

How was this initial set of indicators and information selected?

The inclusion/exclusion criteria used for selecting indicators were as follows:

Inclusion Criteria	**Exclusion Criteria**
Indicator captures one or more of the key food security dimensions (i.e. quantity, quality, cultural preference, safety, stability, sustainability) measured at the national, market, household or individual level	No indicators measuring causes or consequences of food insecurity (e.g. empowerment, anthropometric outcomes etc.)
Indicator is in active use, defined as: • Tested or validated in one or more countries and/or actively promoted and used by one or more international organizations	No indicators related to program implementation (e.g. process indicators, coverage indicators)
Indicator fills a necessary gap (NB: if the indicator is not readily available or in active use the indicator, it may still be included in this framework, with relevant caveats, on the grounds that it could fill a data gap with further testing and validation).	

Why are so many indicators focused on quantity and quality?

The strong focus on quantity and quality is a reflection of the current types of indicators that have been widely adopted and used.

Can I see the original full list of indicators?

Yes. The full list of indicators is available upon request. Please send your request either through the 'Feedback' tab OR send us an email at: **inddex@tufts.edu**.

Data Sources and Methods

11 results

INDDEX Data4Diets

24-Hour Dietary Recall (24HR)

Highlights

- The 24-hour dietary recall (24HR) method provides quantitative information on individual diets.
- The international standard approach uses the multiple pass 24HR technique in which the respondent recalls foods and beverages consumed – and their quantities – in the past 24 hours.
- A single 24HR provides an estimate of mean intake of foods and nutrients, while collecting a second 24HR on a sub-sample of the population allows for an estimate of "usual intake".

Summary

The 24-hour Dietary Recall (24HR) method provides comprehensive, quantitative information on individual diets by querying respondents about the type and quantity of all food and beverages consumed during the previous 24-hour period (Gibson and Ferguson 2008). A standard multiple pass 24HR includes having the respondent iteratively provide increasingly granular data about each food or drink and its preparation method and other attributes as well as an estimation of the portion size consumed, The multi-pass approach has been validated in many low- and middle-income countries (Gibson et al., 2017).

Enumerator-administered, rather than self-administered, 24HRs are often used in low- and middle-income countries because they are quick, culturally sensitive, and provide quantitative data on both foods and nutrients (Gibson et al. 2017). Data from 24HR can be used to assess dietary patterns, food groups, or nutrient intake. In order to analyze the nutrient content, the food data must be matched with nutrient information from a food composition database. Mean intakes of foods and nutrients can be measured using a single 24HR, while assessing the "usual intake" of a population requires that repeat 24HRs are collected from a sub-sample of the study population (Gibson and Ferguson, 2008).

Individual level quantitative dietary data can also be used to develop a better understanding of typical household food preparation, cooking methods, and brand names of foods consumed within the household. Furthermore, if individual level dietary data are collected in conjunction with information on socio-economic status, education, and health, the data can be used to examine linkages between income levels and dietary choices, as well as dietary patterns and health outcomes.

While 24HR offer a higher degree of accuracy in assessing food and nutrient intake relative to Food Frequency Questionnaires (FFQ) or estimates derived from Household Consumption and Expenditure Surveys

(HCES), they are collected infrequently on nationally representative samples, and when they are collected, these data are typically not publicly available (Pisa et al., 2018). However, there is increasing interest in, and demand for, individual level quantitative dietary data, particularly in light of the nutrition transition and rapid food system changes (Coates et al., 2017). For example, the FAO/WHO Global Individual Food consumption data Tool (FAO/WHO GIFT) aims to make publicly available existing quantitative individual food consumption data from countries all over the world. In addition, Global Dietary Database (GDD) provides information on dietary intakes of foods and nutrients for children and adults by age, sex, pregnancy/nursing status, rural/urban, and level of education.

Strengths:

- 24HR provides quantitative estimates of individual food consumption and nutrient intake
- Can structure survey – and analyses - to include information on food sources and preparation methods
- Can account for foods consumed together that may enhance or inhibit micronutrient absorption
- 24HR offer a higher degree of accuracy in assessing food and nutrient intake relative to FFQ or estimates derived from HCES

Weaknesses:

- Given relative complexity of 24HR surveys, significant training of enumerators is required to minimize errors in data collection
- Accurately recalling the quantity consumed can be challenging for respondents and a relatively large source of error in 24HR compared to enumerator administered Weighed Food Records (WFR)
- Data are frequently collected from small samples that are not nationally representative
- As with other surveys that rely on memory and are administered by an enumerator, there is potential for recall bias and interviewer bias
- Like most surveys, to capture seasonal variation data collection must span the entire year or be repeated in multiple seasons

End of Data Source / Method: 24-Hour Dietary Recall (24HR)

Click to return to Table of Contents

Demographic and Health Surveys (DHS) & Multiple Indicator Cluster Surveys (MICS)

Highlights

- The Demographic and Health Surveys (DHS) and UNICEF's Multiple Indicator Cluster Surveys (MICS) are publicly available data sources that can be used to analyze nutritional status by health, demographic, and geographic variables for a nationally representative sample of women and children.
- Both data sources are useful for assessing breastfeeding trends and infant and young child feeding practices within and across countries over time.
- DHS and MICS data do not include comprehensive quantitative food consumption data but the existing data can be used to provide insights on the relationships between infant and young child feeding and nutritional outcomes within and across countries over time.
- DHS and MICS are highly comparable data sources.

Summary

The Demographic and Health Survey (DHS) Program has been supported by USAID for over 30 years (DHS 2018). More than 320 surveys in over 90 countries have been conducted since the program's inception, containing information on select nutrition indicators, as well as fertility, reproductive health, maternal health, child health, immunization, HIV/AIDS, maternal and child mortality, malaria, and other indicators (Fabic et al., 2012). DHS data can be explored online through the DHS STATcompiler or downloaded for further analysis (DHS 2018).

The Multiple Indicator Cluster Surveys (MICS) program is the largest household survey program on children and women worldwide. The MICS was developed by UNICEF to assist countries in filling data gaps on children's and women's health status (UNICEF 2018). MICS was officially launched in 1994 in South Asia with 28 indicators, now MICS includes over 300 surveys in 112 countries and includes about 237 distinct indicators (counting those requiring sex disaggregation). The MICS data on infant and young child feeding can be explored online through an interactive portal, as well as downloaded for further analysis (UNICEF 2018).

Neither DHS nor MICS include comprehensive food consumption data, although the standard questionnaire includes several infant and young child consumption indicators on breastfeeding and feeding practices. The data collected in both surveys represent only children age five years old and under and women ages 15-49 years old. In addition, useful analyses can be carried out to understand the relationship between infant and young child feeding practices and nutritional outcomes (e.g. stunting, wasting). Several specific food consumption indicators can be calculated with DHS and MICS data (USAID 2017; UNICEF 2018), including:

- Initial breastfeeding
- Breastfeeding status
- Median duration and frequency of breastfeeding
- Percentage of children 6-23 months who are fed according to infant and young child feeding (IYCF) practices

DHS and MICS are designed to be nationally representative, with typical sample sizes ranging from 5,000 to 30,000 households. These types of surveys are usually repeated in a given country every three to five years.

Strengths:

- Publicly available, well documented data sources that are free to use
- Provide information on trends over time as data are collected routinely in many countries (~5 years)
- A core set of survey modules are standardized across countries allowing for comparability over time and place; some countries include additional modules (e.g. biomarker data)

Weaknesses:

- Do not include food consumption data on entire diet
- Only representative of children under five years old and women 15-49 years old
- Relies on proxy-reporting by one adult female for children under five

---

End of Data Source / Method: Demographic and Health Surveys (DHS) & Multiple Indicator Cluster Surveys (MICS)

Click to return to Table of Contents

Dietary Diversity

Highlights

- At the household level, dietary diversity indicators have been validated as a proxy for socio-economic status.
- At the individual level, dietary diversity indicators can serve as a proxy for diet quality and some have shown an association with nutrient adequacy.
- Dietary diversity scores are not resource-intensive and are generally easy to calculate and use.
- Dietary diversity scores do not yield quantitative information on dietary intake or nutrient adequacy.

Summary

Variation in an individual's diet is associated with the intake of adequate energy and essential nutrients; increasing variety in one's diet is recommended in most dietary guidelines globally (Ruel 2003). Dietary diversity is especially important among populations with diets based on starchy staples where micronutrient deficiency is more likely (Ruel 2003). The most common method of measuring dietary diversity for a household or individual consists of assessing the variety of different food groups consumed in a specific recall period; information on the quantity of foods consumed is not gathered. Indicators of dietary diversity are considered to be useful as measures of impact for programs designed to address nutrition through agricultural pathways.

Dietary diversity can be measured at either the household or the individual level and higher scores represent a more diverse diet. For households, a higher score is an indicator of increased economic access to a varied diet for household members (though the indicator does not reflect intra-household dietary patterns). Household dietary diversity has been shown to be associated with caloric and protein adequacy and household income (Swindale and Bilinksy 2006).

Individual dietary diversity indices, specifically the Minimum Dietary Diversity for Women (MDD-W) and the Minimum Dietary Diversity (MDD) for children 6-23 months have been shown to be a rough proxy for diet quality and nutrient adequacy (FAO & FHI 2016, Moursi et al. 2008). While there is consensus around the significance of dietary diversity, there are multiple approaches to measurement with varied food groups and recall periods (Table 1).

Table 1

Dietary Diversity Score	Data collection level	Number of food groups	Recall period	Purpose	Universal cut-off?	Validated as a proxy measure of…	Promoted by

Household level measures							
Household dietary diversity score (HDDS)	Household	12	24 hours	Household dietary diversity and proxy for household food access and socioeconomic status	No	Socioeconomic Status	FAO
Food consumption score (FCS)	Household	8	7 days	Measures "usual" household consumption; Standardized food group weights are used to construct index.	Yes	Not Validated	WFP
Individual level measures							
Minimum Acceptable Diet (MAD)	Infant/child (6-23 months)	8 (from MDD)	24 hours	Measures both minimum dietary diversity and minimum meal frequency.	Yes	Not Validated	WHO
Minimum Dietary Diversity (MDD)	Infant/child (6-23 months)	8	24 hours	Measures infant and child dietary quality and adoption of complementary feeding practices	Yes	Nutrient Adequacy	WHO
Minimum Dietary Diversity for Women (MDD-W)	(Individual) Women 15-49*	10	24 hours	Dichotomous indicator that measures the dietary diversity of an individual woman; associated with nutrient adequacy in many contexts and can be used as a proxy for overall diet quality	Yes	Nutrient Adequacy	WHO, USAID
Women's Dietary Diversity Score (WDDS/IDDS)**	(Individual) Women 15-49*	9	24 hours	Continuous indicator that was the basis for the MDD-W (sometimes referred to as the Individual Dietary Diversity Score (IDDS))	No	Superseded by MDD-W	

*Women of reproductive age
**The WDDS, also referred to as the Individual Dietary Diversity Score (IDDS), was not included in the Data4Diets Platform as it has been superseded by MDD-W

Dietary diversity indicators can be constructed using a specific module relevant to that dietary diversity indicator (e.g. Household Dietary Diversity module, Minimum Dietary Diversity module for children from 6-23 months). In addition, the various dietary diversity scores can be constructed from existing data, as long as the recall period is aligned. Some potential data sources include Household Consumption and Expenditure Surveys (HCES), Demographic and Health Surveys (DHS) & Multiple Indicator Cluster Surveys, or Food Frequency Questionnaires. More generally dietary diversity modules are frequently included as short modules in multi-purpose household survey questionnaires.

Dietary diversity scores are not direct measures of consumption and not all have been validated as proxy measures of nutrient adequacy. A significant drawback of the household-level indicators is that scores do not provide information on whether the household dietary diversity is shared equally by all individual members of the household. For more precise population measures of nutrient adequacy by age/sex groups individual-level data from 24-Hour Dietary Recalls or Weighed Food Records should be used.

Strengths

- Relatively easy to use and to integrate as a short module into surveys
- Requires fewer resources than attempting to measure quantitative dietary consumption data for nutrient adequacy
- Calculating the scores is a straightforward process and training others to collect data does not require a large amount of time
- Dietary diversity scores can give an idea of what types of foods are consumed

Weaknesses

- Dietary diversity modules usually require tailoring to specific contexts
- Dietary diversity scores do *not* provide detailed information on quantitative dietary intakes and are not a direct measure of nutrient adequacy. The cut-offs for the MDD-W do not predict nutrient adequacy in all contexts for all population groups.
- Household level dietary diversity scores do not provide information on individual household members and cannot be used to draw conclusions about individuals

End of Data Source / Method: Dietary Diversity

Click to return to Table of Contents

Euromonitor International

Highlights

- Euromonitor is a pay-for-access source of market data for various foods spanning packaged food and fresh food.
- This is a useful source for standardized consumer purchase data that can be compared across countries for which data exist, over time.
- Euromonitor only includes high- and middle-income countries (n=54), and only one country (South Africa) in Sub-Saharan Africa.

Summary

Euromonitor International is a market research firm that provides data on consumer trends, products, and services globally. Although the data Euromonitor provides are largely targeted toward brands looking to understand consumer trends to strategically grow their market share, the database can also be a valuable source of market information to understand purchasing behavior for fresh and packaged foods and beverages.

Passport is a database product offered by Euromonitor that contains consumer purchase data for various industries in 54 countries, and includes Packaged Foods, Fresh Foods, Soft Drinks, and Alcoholic Beverages. The Passport: Nutrition database contains data on the amount of 8 nutrients that are purchased through packaged foods and soft drinks in 54 countries.

The nutrient components and nutrients included in the database are:

- Energy (calories)
- Protein
- Carbohydrate
- Sugar
- Fat
- Saturated fat
- Fiber
- Salt

These data are only accessible through private license (either institution or individual), thus limiting access and relevance. Furthermore, the Euromonitor data only exists for 54 countries, all of which are in high- and middle-income countries.

Strengths

- Contains nutrient composition of packaged food and beverage products
- Standardized data that can be compared across countries and over time
- Easy-to-use interface, with access to dashboards, data, and graphics to visually compare nutrients or product categories purchased by country
- Historical data from 2009 and five-year forecast data

Weaknesses

- Users must pay to gain access to the database
- Euromonitor only includes high- and middle-income countries (n=54), and only one country (South Africa) in Sub-Saharan Africa. The Passport: Nutrition database is limited to 8 nutrients, and does not include micronutrients. The database contains data on how much of each nutrient or type of food is purchased, not actually consumed

End of Data Source / Method: Euromonitor International

Click to return to Table of Contents

Experience-Based Scales

Highlights

- Food insecurity experience-based scales capture psychosocial and behavioral manifestations of insecure food access.
- Food insecurity experience-based scales result in a metric that is quick and easy to use in surveys and straightforward to interpret and understand.
- Food insecurity experience-based scales can be used to assess and target interventions to specific geographic or demographic segments of a population, but should not be used for household and individual eligibility screening.

Summary

Food insecurity experience-based scales capture insecure food access (i.e. the access dimension of food security) and assess the food insecurity of a population by asking about behavioral and psychological indications of food insecurity (Coates et al., 2007). Food security is achieved when “all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food” (FAO, 2001). Existing experience-based scales can be used either at the individual level or the household level in order to estimate levels of food insecurity in a given region or country. The Food Insecurity Experience Scale (FIES), developed by the Food and Agriculture Organization (FAO) and collected through the Gallup World Poll, was designed and validated specifically for individual level data collection, while the Household Food Insecurity Access Scale (HFIAS) one of the FIES antecedents, was designed specifically household level data collection. With a slight modification the FIES can be used at the household level and the HFIAS can be used for individuals.

Experience-based food insecurity scales were developed in part to respond to the call for a broader definition of the term “hunger” and can capture beginning stages of severe food insecurity such as uncertainty regarding food access and lowering quality of diet (Ballard et al., 2013) as well as more severe situations where the quantity of the food consumed is perceived by respondents to be restricted.

Four experience-based food insecurity scales are included in the Data4Diets platform: FIES, Household Hunger Scale (HHS), HFIAS, and the Latin American and Caribbean Food Security Scale (ELCSA). They all share common roots in the US Household Food Security Survey Module. Experience-based indicators are constructed from short questionnaires that capture manifestations of insecure access to sufficient, culturally acceptable, quality food at the household (or individual) level, such as having to reduce the number of meals consumed or cut back on the quality of the food due to a lack of resources. Responses to the modules, which can be easily included in diverse types of surveys, make it possible to locate the household or individual on a scale of severity of insecure food access. While these four food security scales share a common origin, and the questions that comprise them are very similar, they differ slightly with respect to the number of questions in each respective survey module, reference period, response categories and analytical approach.

Indicator	**Level***	**When to use?**	**Validated**	**Developed by**
FIES	Individual level indicator for cross-country comparisons	For comparing food security across countries or for measuring individual (or household) food insecurity	Yes, multi-country validation	FAO with data collection by Gallup World Poll
HFIAS	Household level indicator	For measuring household (or individual) food insecurity in a single country	Yes	FANTA with Tufts & Cornell
HHS	Household level indicator focused on severe food insecurity	For comparing hunger (severe food insecurity) across countries or in a single country	Yes, multi-country validation	FANTA
ELCSA	Household level indicator developed for use in Latin America	For measuring household (or individual) food insecurity in Latin America	Yes, in Latin American countries	United Nations
*Note this is the primary purpose for which the indicator was developed and validated but each one can also undergo minor adaptations to be used at the other level (individual or household)				

Due in part to their short length, experience-based scales are relatively quick and easy to use and inexpensive to integrate into larger surveys. Because experience-based scales do not directly address specific diets, focusing instead on the experience of food insecurity, they can be used cross-culturally and the FIES and HHS have been validated to show this (Cafiero et al., 2016, Ballard et al., 2011).

Strengths

- Measuring food insecurity with experience-based scales can be relatively inexpensive and quick to conduct and analyze
- Experience-based food insecurity scales capture the psychosocial and behavioral manifestations of insecure food access effects of food insecurity even when measurable clinical signs of prolonged hunger, under- or over-nutrition are absent
- Such scales are relatively easy for policy makers to interpret and understand

Weaknesses

- Food insecurity experience scales are intended for population level use only, and should not be used, for instance, to screen households for program eligibility

End of Data Source / Method: Experience-Based Scales

Click to return to Table of Contents

Food Balance Sheets (FBS)

Highlights

- Food Balance Sheets (FBS) are useful to illustrate long-term trends in national food supplies and are a free, publicly available data source for almost all countries dating back to 1961.
- FBS include information on the food supply and its utilization at the national level for primary and processed commodities.
- FBS data cannot be disaggregated to determine the distribution of food available for consumption spatially, seasonally, or by demographic characteristics.

Summary

Food Balance Sheets (FBS) -- also referred to as national food accounts, supply/utilization accounts, food disappearance data, or food consumption level estimates -- are developed by the Food and Agriculture Organization (FAO) of the United Nations in conjunction with national statistics offices. FBS are commonly used data to estimate food supply and its utilization at the national level (FAO 2001). Foods tracked through the FBS include both primary commodities (e.g. wheat, rice, fruit, vegetables) and a number of processed commodities (e.g. vegetable oils, butter).

FBS data present a comprehensive picture of the pattern of a country's food supply and show the sources of supply and utilization for each food item (FAOSTAT 2018). The equation for the calculation of total food supply (food available for consumption), is as follows:

Food available for consumption = starting stocks + (quantity imported + quantity produced) – (quantity exported + seed + animal feed + waste + other non-food uses) - ending stocks (FAO 2001).

Data on non-commercial food production and detailed information on processed foods are not available in FBS (Coates et al., 2012). Less than one hundred foods are accounted for in FBS, limiting the level of detail available (Grünberger 2014). Given the limited level of specificity of foods in FBS it can be difficult to match these food items with food composition databases in order to calculate nutrient availability in the food supply. However FAO provides information on per capita energy, protein, fat and carbohydrates by matching data to food composition database. In addition, several efforts have been made to match FBS to energy, macronutrients, and a full range of vitamins and minerals (e.g. Smith et al., 2016).

FBS report food *available* for consumption at the aggregate, national level and do not directly measure food consumption by households or individuals. Therefore, FBS data cannot be disaggregated to determine the distribution of food consumption spatially, seasonally, or by demographic characteristics. Despite some of the limitations of FBS data, one of their key strengths is that they are a free, publicly available data source for almost all countries dating back to 1961 for most variables. FBS data can be accessed through FAOSTAT.

Strengths:

- Standardized data that allow for comparisons over time
- Provides proxy information on trends of population level consumption patterns based on food available for consumption in food supply
- Easy to access and analyze, as it is publicly available and free to use through FAOSTAT
- Data available for over 245 countries and territories; collected every year starting in 1961 (presented as three-year averages)

Weaknesses:

- Limited specificity foods and processed foods which prevents nuanced analyses of food supply composition
- Limited specificity of foods and processed foods also hinders making accurate links to food composition databases to assess nutrient availability of the food supply.
- FAOSTAT is updated annually but there is an approximately three-year lag in reporting
- Quality and coverage vary across countries and commodities
- Non-commercial or subsistence production not usually included

End of Data Source / Method: Food Balance Sheets (FBS)

Click to return to Table of Contents

Food Composition Databases

Highlights

- Food composition databases (FCDBs), also referred to as Food Composition Tables (FCT), are data that provide the nutritional content of foods.
- FCDBs are a required input in order to convert foods from food consumption data to nutrient intakes.
- Due to limited funding support for FCDBs the tables are often missing data for key foods or lacking valid analytical data for key nutrients.

Summary

Food Composition Databases (FCDBs) -- sometimes also referred to as Food Composition Tables (FCT) if in printed or PDF format -- are collections of data on the nutritional content of foods. They are derived from quantitative analyses of representative samples of foods (Gibson 2005). FCDBs have multiple uses, including for nutrient analysis of foods from dietary consumption surveys, nutrition labeling, and to inform nutrition-sensitive agricultural policies (Charrondiere et al., 2011). The Food and Agriculture Organization (FAO) is the global coordinator of the International Network of Food Data Systems (INFOODS), through which it compiles a directory of national, regional, and international FCDBs that can be useful to those interested in analyzing food and nutrient availability and consumption, food fortification or supplementation programs (Greenfield & Southgate 2003). In addition, FAO/INFOODS produces guidelines for developing FCDBs, food matching, and converting food data (FAO/INFOODS 2018).

FCDBs are sometimes available online, but not always. FAO/INFOODS provides contact information and links to country and regional FCDBs. In addition, the ILSI Research Foundation has created the World Nutrient Databases for Dietary Studies (WNDDS) which catalogues 90 electronically available FCDBs and provides detailed information about each one. Electronic access to these data means the information can be quickly updated, contain a greater volume of material and be readily available for users with internet access (Greenfield & Southgate 2003). Additionally, online FCDBs make it easier for the information to be reformulated according to the needs of various users.

While some low- and middle-income countries have national FCDBs, they often contain data that is several decades old and/or rely on information that is from another country's FCDB. This is due to the expense and time-intensive nature of analyzing or gathering nutrient composition data (Greenfield & Southgate 2003). Frequently, borrowed food composition data comes from the USDA and EU FCDBs, or from other countries in the region and regional FCDBs (Coates et al., 2017). However nutrient contents of foods can vary due to environmental factors, production, and processing and thus can differ from one country to the next and even within countries (Greenfield & Southgate 2003

). Rapid food processing advancements and globalized food systems can challenge the task of keeping FCDBs both up-to-date and specific to the locale (Thompson & Subar 2013). These various issues may result in decreased precision when it comes to identifying the nutrient content in a given food.

Given the complexity of FCDBs, adequate training on food composition data use is recommended, to comprehend and use the data. One recommended resource is the FAO e-learning course on food composition data (Food Composition Data E-learning Course, 2013).

Strengths:

- Food composition data have a wide variety of uses, including matching foods with nutrients from dietary assessment data in order to conduct analyses, nutrition labeling, policy making, and nutrition-sensitive agriculture
- Well-developed national FCDBs can offer a picture of the types of food available and consumed
- When FCDBs are paired with dietary consumption data, researchers are able to answer questions about nutrient adequacy in a population

Weaknesses:

- Differences in the development of FCDBs (e.g. nutrient calculations and sampling) can reduce comparability of nutrient data for specific foods across databases
- Adequate training on food composition data use is recommended to comprehend and use the data in FCDBs
- Food composition data that are outdated or from other countries are sometimes relied upon to update the national FCDBs of low- and middle-income countries

End of Data Source / Method: Food Composition Databases

Click to return to Table of Contents

Food Frequency Questionnaire (FFQ)

Highlights

- Food Frequency Questionnaires (FFQs) are a method for collecting dietary data and use a context specific food list to estimate the usual diet and understand the relationship between consumption patterns and health outcomes.
- Data from FFQs are advantageous for measuring consumption of specific foods or specific nutrients consumed by a given population.
- Because FFQs do not typically weigh foods or quantify using household utensils, they tend to not be as accurate as other quantitative dietary assessment methods (e.g. 24-Hour Dietary Recalls and Weighed Food Records).

Summary

Food Frequency Questionnaires (FFQ) are a type of dietary assessment instrument that attempts to capture an individual's usual food consumption by querying the frequency at which the respondent consumed food items based on a predefined food list. Given that food lists are culturally specific, FFQs need to be adapted and validated for use in different contexts (Thompson & Subar, 2013).

FFQs are a common method for measuring dietary patterns in large epidemiological studies of diet and health. FFQs are often limited to the food items that are a source of nutrients related to the particular dietary exposures under study, for example fruit and vegetable consumption or foods with high levels of saturated fat. Dietary diversity scores are a type of metric that are often calculated from a simplified FFQ (see the description of Dietary Diversity metrics o learn more). Food consumption modules of Household Consumption and Expenditure Surveys (HCES) that use a food list and an extended recall period can also be considered a type of FFQ.

In general, FFQs rely on a longer recall period in order to capture foods that are not consumed every day but are still part of the individual's typical diet. FFQ recall periods vary greatly, but typically range from 7-30 days (although some are as long as one year). A drawback is that recall bias may increase with longer periods of recall (Coates et al., 2012). However, these measures of 'usual intake' are a more valid indicator of the relationship between diet and health outcomes than those capturing only a single 24-hour snapshot of the diet (24-Hour Dietary Recalls can only provide information on usual intake if data are collected from respondents on multiple non-consecutive days). Longer FFQs can better assess total diets, but shorter FFQs have higher response rates and lower respondent burdens. (Thompson & Subar, 2013).

FFQs typically collect information on the frequency of consumption but not necessarily on the quantity consumed. When FFQs do include questions about quantity consumed it is typically based on standard portion sizes, rather than direct weight or use of household utensils. Therefore, FFQs are not as accurate as other quantitative dietary assessment methods (e.g. 24-hour Dietary Recall) (Coates et al., 2012). Additional measurement error is introduced when food lists are not specific to the studied population, when questionnaires use inconsistent or imprecise portion sizes (Shim et al., 2014), or when the food lists are not granular enough to make an accurate match to a food composition table for deriving nutrient content of the diet. Because food lists are developed with a specific population in mind, it can be difficult to accurately compare results across populations (cultures or countries) with different dietary patterns.

Strengths:

- Better at estimating ‘usual diet’ due to longer recall period than the 24-Hour Dietary Recall or 24-hour Weighed Food Records
- Captures individual-level dietary patterns
- FFQs can be easier and less time-consuming to implement than a 24-Hour Dietary Recall, if the food list is relatively short (e.g. <100 items)

Weaknesses:

- FFQs require substantial up-front investment to develop and validate the instrument (food list and quantities) for a given context or country.
- Usual frequency of intake is prone to measurement error, particularly with recall periods longer than 7 days (and usual portion size questions are prone to measurement error)
- If the FFQ is too long it can be more time consuming to administer than a standard 24-Hour Dietary Recall and cause respondent fatigue
- Like most surveys, to capture seasonal variation data collection must span the entire year or be repeated in multiple seasons

End of Data Source / Method: Food Frequency Questionnaire (FFQ)

Click to return to Table of Contents

Household Consumption and Expenditure Surveys (HCES)

Highlights

- Household Consumption and Expenditure Survey (HCES) data are complex surveys conducted on a nationally representative sample to characterize important aspects of household socio-economic conditions including food acquisition and/or consumption.
- HCES, while traditionally used for poverty monitoring amongst other things, are increasingly being used for food security and nutrition related analyses.
- Due to the heterogeneity of HCES across countries, it is important to understand some of the key differences before using data from the food consumption module for food security and nutrition purposes.

Summary

Household Consumption and Expenditure Surveys (HCES) -- also referred to by a variety of other names including Household Income and Expenditure Surveys (HIES), Household Budget Surveys (HBS), or Living Standards Measurement Surveys (LSMS) -- are complex surveys conducted on a nationally representative sample to characterize important aspects of household socio-economic conditions (Coates et al., 2012). Typically, HCES are conducted every 3-5 years in a range of countries and cover between 7,000 to 20,000 households to provide a statistically representative sample (Fiedler et al., 2012). Most HCES are implemented by national statistical agencies, often with technical assistance from the World Bank's Living Standard Measurement Study (LSMS) group.

The results of HCES have wide-ranging utility. Their primary purpose is to provide information for poverty monitoring, the calculation of national accounts, and as an input for consumer price indices (Smith et al., 2014). However, there is increasing interest in using the food consumption module from HCES as a source of nationally representative data for assessing food security and nutrition. Furthermore, HCES collect a wide range of data on determinants and outcomes (e.g. socioeconomic status, education etc.), potentially enriching food security and nutrition analyses. Based on existing research there is wide consensus that HCES, with carefully designed consumption modules, are a valuable source of data for household-level food security and nutrition measurement (Russell et al., 2018, Zezza et al., 2017).

One of the major drawbacks of using HCES is that the consumption modules are heterogeneous across countries, which means that not all HCES data lend themselves to the same food security and nutrition analyses, and comparisons across countries can be inaccurate. Some of the key ways in which the consumption modules differ across surveys include: 1) the length of the recall period; 2) whether data are collected for acquisition, consumption, or both; 3) whether there is information on the mode of food acquisition (purchases, own production, and in-kind); 4) whether or not information on food consumed away from home is collected and in what form; 5) whether food detail is collected through open recall or a list, and, if a list, how disaggregated and specific the foods and food groups are; and 6) the use of non-standard units without available conversions (Smith et al., 2014). For example, if the food consumption module has a short food list with aggregated items making it difficult to match with a food composition database, excludes food away from home, and has a long recall period (>14 days) then the consumption module may not be adequate for measuring certain food security and nutrition indicators, such as total household-level calorie availability.

While the ‘C’ in HCES stands for ‘consumption’, HCES collect data on acquisition, consumption, or both. While consumption data refers to the food consumed by the household, acquisition data refers to the food acquired through purchases, own production, and in-kind. Acquisition data serve as a proxy for food consumption, as households may build food stocks or consume food stocks during the reference period, as compared to consumption, which collect data on food consumed in a specified period. This is an important point because some foods (e.g. grains) are not perishable and can be stored, therefore some households may be drawing down stocks acquired to meet current consumption, while other households may be accumulating stocks that will be consumed after that period (Smith et al., 2014). Another type of HCES collects a combination of acquisition and consumption data, wherein households report what they acquired through purchases and what they consumed from own-production and transfers (Smith 2003). Food consumption estimates generated from acquisition data or a combination of both acquisition and consumption data are typically referred to as “apparent consumption” in the literature to distinguish from actual consumption (Fiedler & Mwangi, 2016).

The World Bank Microdata Library has the most comprehensive and publicly accessible repository of HCES data at the World Bank Microdata Library. Data also can be accessed – often for a fee – from countries’ National Statistics Office, though each country has its own policies and procedures regarding data sharing. The International Household Survey Network (IHSN) is an informal network to promote data standards and dissemination where additional information (e.g. survey catalogs, guidelines, and software) on existing HCES can be found (IHSN, 2018).

Strengths:

- HCES are typically nationally representative and sometimes representative at provincial and district levels
- HCES are typically collected every 3-5 years, allowing for an examination of trends
- Food consumption data from HCES are an important source of information on food security and nutrition
- HCES include a wide range of data on determinants and outcomes (e.g. socioeconomic status, education etc.), enabling various analytical options.

Weaknesses:

- Due to issues with the structure of some consumption modules (e.g. no information on food consumed away from home), the data may not be useful for certain food security and nutrition analyses
- Some HCES only measure “apparent consumption” (based on acquisition data), not actual consumption

- The food list is not always designed with the level of detail needed to make exact matches between the food items in the food list and a food composition database
- Recall periods in HCES vary from 1-365 days, with long recall periods (>2 weeks) raising concern about reliability and recall bias
- Household-level data from HCES do not allow for measurement of individual level food security and nutrition indicators
- Many HCES do not capture seasonal variation

End of Data Source / Method: Household Consumption and Expenditure Surveys (HCES)

Click to return to Table of Contents

Weighed Food Record (WFR)

Highlights

- Weighed Food Records (WFR) provide quantitative information on individual diets and are considered a “gold standard” for dietary assessment.
- WFR are often used for the relative validation of other dietary assessment methods such as Food Frequency Questionnaires and 24-Hour Dietary Recalls.
- Due to the high cost and time investment of WFR, they are more frequently used to collect data for small, non-representative samples.

Summary

Weighed Food Records (WFR), also called weighed food diaries or simply weighed records, are considered the "gold standard" of individual quantitative dietary assessment methods (Carlsen et al., 2010). WFR require the respondent or enumerator to weigh all foods and beverages at the time of consumption (rather than asking respondents to recall their consumption, as is done in the 24-hour quantitative recall, or 24HR). Any plate waste must also be recorded, as well as a description of the food along with preparation methods and brand names.

Though no dietary assessment methodology can completely prevent measurement error, WFR are often considered the most precise method when it comes to quantifying food intake, since each food is weighed, eliminating issues associated with portion size estimation through recall. As a result, the high degree of accuracy produced by WFR means they are often used as the reference method in validation studies of other dietary assessment methods (e.g. Alemayehu et al., 2011; Nightingale et al., 2016).

If working in a low- or middle-income country with low literacy levels the presence of a trained enumerator in the household is typically required throughout the period being assessed, from the time the first food or beverage is consumed in the morning to when the last one is consumed at night. When using WFR to collect dietary data, enumerators must be carefully trained to standardize measurement, instrument calibration, and interviewing methods in order to reduce measurement error. While enumerator-administered WFR provide very accurate estimates of dietary intake, they can be intrusive and time-consuming, as well as potentially distort the behavior of respondents’ due to the presence of an enumerator throughout the day (Ortega et al., 2015).

Furthermore, administering a WFR can be difficult in populations where people are out of the home for all or most of the day (e.g. urban areas or school age children) as the enumerator would have to accompany respondents throughout the day. If the population of interest is literate, then a food diary or self-administered WFR could be used, in which the respondent weighs and records all of the foods and beverages consumed over a specified period (e.g. 24-hours). Due to the expense and small sample size of most WFR collections, care must be taken to ensure that the sample is representative of the studied population (Wrieden et al., 2003).

Strengths:

- WFR offer a high degree of accuracy in assessing food and nutrient intake relative? to other recall-based dietary assessment methods
- Provide quantitative estimates of individual food consumption and nutrient intake
- Take into account preparation methods and the effect on estimated nutrient content
- Applicable to diverse groups with a wide range of dietary patterns

Weaknesses:

- Significant training is required to minimize errors in data collection
- Data are frequently collected from small samples that are not nationally representative
- Enumerator-administered weighed records are intrusive and can distort respondent behavior
- Like most surveys, to capture seasonal variation data collection must span the entire year or be repeated in multiple seasons

End of Data Source / Method: Weighed Food Record (WFR)

Click to return to Table of Contents

World Food Programme (WFP) Vulnerability Analysis and Mapping (VAM)

Highlights

- The Vulnerability Analysis and Mapping (VAM) of the World Food Programme (WFP) provides publicly available food security data,
- Data include market prices for commodities, select calculated food security indicators, dynamic maps, and food security reports at the national, administrative, and market levels.

Summary

The Vulnerability Analysis and Mapping (VAM) platform is a central source of food security monitoring data and analysis managed by the World Food Programme (WFP). The platform offers multiple products that allow users to visualize and download data on commodity prices and calculated food security indicators, such as the Food Consumption Score (FCS). In addition, users can access timely geospatial, economic, and food security situational analyses produced by VAM analysts that can offer additional context and insight into a country's current food security situation.

Two WFP VAM products that are particularly useful for calculating indicators included in the Data4Diets platform include the Economic Explorer and the mVAM Databank. The Economic Explorer, a tool included in the VAM Data Visualization Platform, allows users to visualize and download commodity price data at the country and market levels over time (month and year). The mVAM Databank provides the Food Consumption Score (FCS) for select countries, using data collected via mobile technology.

Strengths:

- Contains up-to-date, open data supplemented by dynamic visualizations that allow users to perform preliminary analysis within the platform and download charts as .png files.
- Provides monthly and annual data on commodity prices at country and market level.
- Multiple types of data and analytic reports provide detailed food security and economic context within individual countries, administrative districts, and markets.

Weaknesses:

- The market data available across commodities, dates, or level of collection is not consistent between countries, which limits inter-country comparability.
- mVAM Databank with the FCS is only available for a select number of countries, and not all countries included have multiple years of data available.

End of Data Source / Method: World Food Programme (WFP) Vulnerability Analysis and Mapping (VAM)

Click to return to Table of Contents

Food Security Indicators

41 results

INDDEX Data4Diets

Depth of the food deficit

Overview

The indicator that measures the depth of food deficit (kcal/capita) represents the average per capita amount of additional energy (kcals) needed for undernourished individuals to meet the Average Dietary Energy Requirement (ADER) (FAO 2000). This indicator is derived from the Prevalence of Undernourishment (PoU) indicator (Cafiero 2014).

Method of construction

This indicator is calculated in three steps: First the average intensity of food deprivation of the undernourished, which is equal to the difference between the ADER and the average dietary energy consumption of the undernourished population, is estimated. The average consumption of the undernourished population can be computed by taking the average of the area limited under the distribution of dietary energy consumption and below the minimum dietary energy requirement. Second, this value is then multiplied by the number of undernourished people (derived from the PoU) to estimate the total food deficit (kcal) in the country. Third, and finally, this value is divided by the population size which results in the average per capita food deficit (Moltedo et al., 2014).

Two sources of information can be used to obtain estimates of the depth of food deficit, or to approximate the per capita daily average dietary energy consumed in the population, which is one of the parameters needed to estimate the PoU:

- The Dietary Energy Supply from the Food Balance Sheets (FBS) and the three year moving average of the depth of food deficit as part of the Suite of Food Security Indicators can both be accessed on the FAOSTAT website under the 'Data' tab.
- Alternatively, the food consumption data collected in Household Consumption and Expenditure Surveys (HCES), can be used to estimate the depth of food deficit as it is one of several indicators included in the ADePT-FSM (Food Security Module) software package, which is a free standalone software developed by the FAO and the World Bank that allows users to easily derive food security indicators from household survey data. The software download and corresponding documentation can be found on the FAO website. Please also see the Moltedo et al., 2014 book published by the World Bank, which provides detailed instructions for analyzing food security using household survey data, and discusses the depth of food deficit indicator on pages 59-60.

Uses

The depth of food deficit is useful for problem identification, advocacy, and global and national monitoring. It is often used by researchers and practitioners to understand the degree of food insecurity in a country. Because it is available in the FAOSTAT Suite of Food security Indicators for nearly all countries it can be used to compare the severity of food deficit across multiple countries (Reddy et al., 2016).

Strengths and Weaknesses

The depth of food deficit is a cost-effective way to understand trends in food insecurity at the national level over time and across countries. The indicator does not attempt to measure the quality of the diet and therefore it only represents the severity of dietary energy inadequacy.

When the depth of food deficit is informed by the PoU estimated through food consumption data from HCES, it can provide information about sub-populations and regions within a country, provided the HCES has been designed to be representative at a sub-national level. One of the downsides of using HCES data is that they are not always publically available or easily accessible, and when they are, they may not be collected with sufficient frequency.

On the other hand, when the depth of food deficit is derived from the PoU using the FBS data, data are available on an annual basis dating back to 1961 and through FAOSTAT are publically accessible. However, using FBS data means that the data cannot be disaggregated and thus information on the severity of hunger is only available at the national level. Therefore, it is not able to capture trends in the depth of hunger over short reference periods that may be associated with seasonality, price spikes, or climate-related shocks to the food system (Cafiero 2014).

Data source

HCES or FBS can be used to derive this indicator. The per capita daily average dietary energy consumption, needed for deriving the PoU, can be estimated through the Dietary Energy Supply from the FBS or the food consumption data collected in HCES. If using the FBS data from FAOSTAT it is worth noting that FAO has already paired this information with food composition data to produce information on the national supply of energy (per capita/day). Otherwise, if using HCES data, foods will need to be matched with a nationally relevant food composition data.

Underlying data used to estimate the depth of food deficit are: energy requirement derived from normative information on height and physical activity level and age/sex structure of the population and a measure of how food is distributed within the population. Most of this information is usually informed by food consumption data collected in surveys.

Links to guidelines

- FAO, (2017). "Food Security Indicators"
- Lele et al., (2016). "Measuring Food and Nutrition Security: An Independent Technical Assessment and User's Guide for Existing Indicators"
- Chandra Das, (2016). “Handbook of Research on Global Indicators of Economic and Political Convergence”

Food Security Dimensions

- Quantity

Food Composition Database Required?

No

End of Indicator: Depth of the food deficit

Click to return to Table of Contents

Diet Quality Index - International (DQI-I)

Overview

Diet quality is an important measure in understanding food security because of the synergistic nature of micro- and macronutrients (Gerber 2001) and the association of healthy diet patterns with reduced risk for diet-related disease and illness (Kant 1996). The DQI-I is illustrative of a class of diet quality indices, which include other indicators such as the Healthy Eating Index (HEI). We have chosen to highlight the DQI-I here because it is one of the few indicators that has been tested for a range of cultural contexts and validated for use in a range of countries with different dietary patterns.

The Diet Quality Index – International (DQI-I) is a composite, individual-level diet quality indicator. It was created in 2003 to enable cross-cultural diet quality comparisons, something that had previously not been done using diet quality composite indicators (Kim et al., 2003). The DQI- I is built off existing indicators, such as the HEI and the Diet Quality Index (DQI), but was formulated to incorporate the many aspects of a diet which contribute to quality, including diversity, adequacy, moderation, and balance.

Method of Construction

This indicator is created using scores from four components of diet quality, each calculated separately. The table below outlines basic information on how the components are defined, and the criteria for scoring each.

Diet Quality Component	**Grouping of diet quality component**	**Scoring criteria**	**Score**
Variety - food groups	5 food groups: meat/poultry/fish/egg, dairy/beans, grains, fruits, and vegetables	Each food group awarded 0 or 3 pts. 3 points awarded if at least 1 item from that group was consumed	0-15

Variety - protein sources	6 sources: meat, poultry, fish, dairy, beans, eggs	3 or more sources consumed: 5 pts 2 sources consumed: 3 pts 1 source consumed: 1 pts 0 sources consumed: 0 pts	0-5
Adequacy	8 groups: vegetables, fruit, grain, fiber, protein, iron, calcium, vitamin C	Between 0 and 5 points awarded for each of the 8 adequacy groups, depending on percentage of RDA met	0-40
Moderation	6 groups: total fat, saturated fat, cholesterol, sodium, empty calorie foods	Between 0 and 6 points awarded for each of the 5 moderation groups, depending on percentage of RDA met	0-30
Balance	2 groups: macronutrient ratio, fatty acid ratio	Between 0 and 6 points awarded, depending on ratio of macronutrients and between 0 and 4 points awarded depending on ratio of fatty acids	0-10

Once a score has been calculated for each of the components, the DQI-I is calculated by summing each of the four scores together, producing a number between 0 and 100. For a more detailed explanation on the process and the specific scoring criteria, please refer to the “Construction of the DQI-I” section of the paper published in The Journal of Nutrition (Kim et al., 2003).

Uses

DQI-I is used to assess the diet quality of individuals, and can be used in a variety of cross-cultural settings, making it useful in comparing diets across regions (Kim et al., 2003). Additionally, this indicator includes specific nutrients associated with chronic, diet-related illnesses and includes particular food groupings, such as empty calorie foods, that make it an especially useful tool in assessing changing diet quality associated with the nutrition transition (Kim et al., 2003). As an individual-level indicator, it can be paired with individual health outcomes or demographic information, such as religion, age, sex, education, or any other characteristics of interest (Yun et al., 2009).

Strengths and Weaknesses

The main strength of the DQI-I is that it offers greater richness in its definition and evaluation of diet quality than other composite diet quality indices. For example, the HEI is based solely on food group consumption (USDA 2006), and the DQI, the indicator on which the DQI-I is based, touches upon the same four diet quality components, but it employs fewer measures and quantifies fewer micronutrients (Newby et al., 2003).

However, both a strength and a weakness, the DQI-I uses weights to proportionally score food based on its assumed nutritional importance and researchers have found that standardized weights may not be applicable in all scenarios (Tur et al., 2005). Additionally, because of the large amount of information required to calculate this indicator, it is necessary to have multiple days of diet recall information from each respondent, which is not always feasible given resource constraints..

Data Source

Individual level dietary data can obtained from a Food Frequency Questionnaire (FFQ), 24-Hour Dietary Recall, or Weighed Food Records. National or regional Food Composition Tables should be used to identify the nutrient contents of the foods and can be found at Food and Agriculture's (FAO) International Network of Food Data Systems (INFOODS) or the International Life Science Institute's (ILSI) World Nutrient Databases for Dietary Studies (WNDDS).

Finally, to calculate the adequacy, moderation, and balance scores, Recommended Dietary Allowance (RDAs) or Reference Nutrient Intake (RNIs), can be obtained from the Institute of Medicine for the United States (IOM 2006), from the British Nutrition Foundation for the United Kingdom (British Nutrition Foundation 2016), or the European Food Safety Authority of the European Union (EFSA 2017). As an alternative to country specific RDAs/RNIs, the FAO/WHO RNIs can be used (FAO/WHO 2001).

Links to guidelines

- Kim et al., (2003). “The Diet Quality Index-International (DQI-I) provides and effective tool for cross-national comparison of diet quality as illustrated by China and the United States”

Links to validation studies

- Tur et al., (2005). “The Diet Quality Index – International: is it a useful tool to evaluate the quality of the Mediterranean diet?”
- Shin et al., (2015). “Dietary patterns and their associations with the Diet Quality Index-International (DQI-I) in Korean women with gestational diabetes mellitus”

Food Security Dimensions

- Quality

Food Composition Database Required?

Yes

End of Indicator: Diet Quality Index - International (DQI-I)

Click to return to Table of Contents

Dietary energy supply

Overview

The dietary energy supply (kcal/capita/day) is an indicator calculated at the national level that serves as an estimate of the amount of calories from foods available for human consumption. This indicator does not yield any information on the affordability, access, or consumption of dietary energy by different population groups within a given country, which means that sufficient national supply does not ensure sufficient dietary energy consumption by nutritionally vulnerable groups. Nevertheless, it can be useful for determining whether a country's food supply contains enough dietary energy to meet aggregate population needs, and whether measures need to be taken to improve the amount of dietary energy available for the population.

This indicator can be accessed through FAO's FAOSTAT website. FAOSTAT contains national level Food Balance Sheet (FBS) data. Additional indicators in the Data4Diets platform related to quantity of the food supply that also use FBS data include depth of food deficit and national dietary energy available from non-staples, among others. Alternatively, if users are interested in calculating a similar measure but with household level data, that should refer to the household dietary energy consumption indicator which relies on Household Consumption and Expenditure Survey (HCES) data.

Method of Construction

This indicator can be accessed on the FAOSTAT website by selecting FBS under the Data tab. Users can view and download this indicator for a given country and year (or span of years) by selecting 'Food supply (kcal/capita/day)' under the *Elements* section and selecting "Grand Total + (Total)" under the *Items Aggregated* section.

FAO calculates the national estimate of total food availability using data from a number of sources, including government agencies, marketing authorities, and industrial/manufacturing surveys, among others (FAO 2001). This national estimate is calculated as the sum of the elements of quantities of food from supply (production, import, and stock variation) minus the elements of quantities' of food from utilization (export, manufacturing, feed, seed, waste, and other uses) for each commodity expressed in raw equivalent. Using food composition tables, FAOSTAT sums the dietary energy content of the edible portion of each type of food available for human consumption. This value is then divided by the population size and by 365 days to calculate the per capita daily dietary energy available for human consumption. This calculated value (kcal/capita/day) is available from FAOSTAT for the total food supply, as well as for individual food items and food groups.

Uses

When data from individual dietary surveys or household surveys are unavailable, this indicator serves as a proxy for dietary energy consumption at the population level (FAO 2017). Because it is available annually for nearly all countries, it is a useful indicator for cross-country comparisons of energy consumption, as well as for analysis of trends over time within a country. When the dietary energy supply is disaggregated by food groups it provides a quick snapshot of the quality of the diet in a country through the share of dietary energy supply from each food group in total dietary energy supply.

This indicator also serves as the basis for other indicators of food security and nutrition, such as the Average Dietary Energy Supply Adequacy (ADESA) indicator (Lele et al., 2016), the Prevalence of Undernourishment, and the depth of food deficit indicator.

Strengths and Weaknesses

One benefit of this indicator is that it is available for more than 170 countries dating back to 1961. The data are regularly updated by FAO using a common methodology. The country-level data are provided by national governments and are centrally located on the FAOSTAT website. Furthermore, this indicator is simple to interpret and lacks sampling and reporting biases associated with dietary recall data (Lele et al., 2016).

A weakness of this indicator is that it does not reflect actual energy consumption but rather energy availability. In addition, since the indicator is a national-level estimate, it cannot be disaggregated by age or sex, or by any geographic scale smaller than the national level, nor can it detect disparities in dietary energy availability (or consumption) across population groups or seasons, as is possible with individual- or household- level dietary data. This indicator is limited to the foods that appear in the FBS and therefore does not capture all possible sources of dietary energy (e.g., insects or wild foods).

Although the FBS accounts for food wasted along the food chain, it does not account for losses incurred at the retail distribution level, plate waste or other non-food uses at the household or individual level (Lele et al., 2016) and stock variations are not accurately captured.

Data Source

The main source of data for this indicator is the FAO FBS data on the FAOSTAT website, that disaggregates elements of utilization and supply, and estimates total food available for human consumption. FAO pairs this information with food composition data to produce information on the national supply of energy and macronutrients (per capita/day). In addition, Household Consumption and Expenditure Surveys (HCES) could be used to calculate a similar indicator, such as household average dietary energy consumption. Alternatively, 24-Hour Dietary Recall or Weighed Food Records could be used to calculate total individual energy intake.

Links to guidelines

- FAO, (2001). “Food Balance Sheets: A Handbook”

Food Security Dimensions

- Quantity

Food Composition Database Required?

No

End of Indicator: Dietary energy supply

Click to return to Table of Contents

Domestic food price index

Overview

Market-level analyses are an important method of measuring food security and can serve many purposes, including estimating domestic supply against population requirements, evaluating market response to changes in supply or demand, and providing insight on the consumer prices of food versus those of other goods (World Food Programme, 2009). The domestic food price index is one of several market-level indices included in Data4Diets, which also includes the volatility of food prices and the food affordability index. These indicators use consumer-level data to measure prices faced by consumers in food markets. Unlike the other indices mentioned, however, the domestic food price index is a metric that directly compares the price level of food to that of other goods. This indicator is considered an 'emerging indicator' because it has not been fully validated and is not in common use.

Method of Construction

Domestic food price indices can be calculated in a number of ways and can include a wide variety of food and non-food items. One index that has been calculated across many countries and years is the Domestic Food Price Index used by the Food and Agriculture Organization (FAO). Using a combination of data from the World Bank (WB), International Comparison Project (ICO) and the International Labor Organization (ILO), it is calculated as the ratio of food and non-food consumption to expenditure in purchasing power parity (PPP) terms, in order to account for inflation. (For a description of PPP, see WB, 2006.) This ratio is then forecasted and backcasted using two other standard consumer price indices (the Food Consumer Price Index and the General Consumer Price Index), and is normalized to the base year of 2011.

Further documentation on the construction and compilation of these data can be found in the Excel Workbook Sheet titled “V_2.5 Metadata” from the file, which can be downloaded from the FAO. For further information on the calculation of consumer food price indices based on other data sources, refer to “Chapter 9: Calculating consumer price indices in practice” of the ILO’s Consumer Price Index Manual (ILO, 2004).

Uses

Consumer food price indices are used by a variety of national labor and statistical agencies as well as large international organizations such as the FAO and ILO. One of the main uses of this indicator is to quantify change in consumer purchasing power over time due to inflation, and it can be standardized in order to allow for regional or international comparison (ILO, 2004). Because this indicator is calculated based on a basket of food goods, other indicators, such as the volatility of food prices for specific foods, may be more appropriate if data are needed on particular food groups or individual commodities. This indicator is part of the FAOSTAT Suite of Food Security Indicators and is published annually by FAO in the State of Food Insecurity (SOFI).

Strengths and Weaknesses

One strength of this indicator is that its ease of comparability makes it conducive for understanding trends over time and place. Additionally, indices can be computed using a variety of food and non-food items depending on programmatic or research priorities. However, the major weakness of this indicator, as reported by FAO, is that it utilizes a standard set of food and non-food items, which may not be appropriate for all sociocultural contexts. In response, researchers have proposed using different items depending on the population of interest, differing based on poor and ultra-poor subgroups as well as those living in urban versus rural areas (USAID, 2013).

Data Source

Country-specific consumer food price indices are available from many national statistical agencies and from the World Food Programme's (WFP) Vulnerability Analysis and Mapping. Annual calculations from the FAO are also available on FAOSTAT (FAOSTAT).

Links to guidelines

- International Labor Organization. (2004). “Consumer price index manual: theory and practice”

Food Security Dimensions

- Stability

Food Composition Database Required?

No

End of Indicator: Domestic food price index

Click to return to Table of Contents

Food affordability index

Overview

Market-level analyses are an important method of measuring food security and can serve many purposes, including estimating domestic supply against population requirements, evaluating market response to changes in supply or demand, and providing insight on the consumer prices of food versus those of other goods (World Food Programme, 2009). A food affordability index is one of several market-level indices included in Data4Diets, which also includes the domestic food price index and the volatility of food prices. These indicators use consumer-level data to evaluate price faced by consumers in food markets. Unlike the other indices mentioned, however, a food affordability index is a ratio of food prices to wages; it is not a measure of price level itself, as is the case with the domestic food price index nor does it quantify the intensity of food price fluctuations, as the volatility of food prices does. Although a standardized food affordability index does not yet fully exist, researchers are currently working on developing one through the Affordability of Nutritious Diets in Africa (IANDA) project (for more information, refer to the project's homepage, IANDA). This indicator is considered an 'emerging indicator' because it has not been fully validated and is not in common use.

Method of Construction

A food affordability index is the ratio of average wages, usually of unskilled or low- skilled laborers, to the price of one individual food item or a combination of items. Wages of unskilled or low skilled workers are often used because individuals in this category are usually those most vulnerable to fluctuations in food price that can lead to food insecurity and poor nutrition (Lele et al., 2016). As one standardized indicator has not yet been developed, there is no manual to create such an indicator. However, one example of how a food affordability index is created can be found in the following paper published in Food Policy (Dorward, 2013) in the section entitled “An indicator of real food prices relative to real incomes”.

Uses

A food affordability index provides useful information on access to food both within and across countries. It has also been suggested as a way to measure the income effect, or the change in consumption due to changes in real incomes, of food prices on the world's poor (Dorward, 2013). Food affordability indices can be designed to focus on the prices of staple foods, nutrient dense foods, or other food items of interest. This metric could be used for problem identification, program design, advocacy, and national (or global) monitoring purposes. As mentioned previously, IANDA is currently developing such an indicator for the purpose of improving monitoring and tracking of market-level data and to help inform policymakers and program staff on the availability and affordability of nutritious food (IANDA).

Strengths and Weaknesses

A strength of this indicator is that it is relatively easy and inexpensive to develop and update as it pulls from market level data as opposed to household level data or individual level data. Additionally, this indicator provides more insight into the affordability of food, as compared to simply looking at the price level as is done with the domestic food price index, because of its incorporation of wage data. However, a major weakness of this indicator is that currently this metric is not routinely collected by any major data provider, and thus any analyses may be more difficult to contextualize with previous findings, which would not be the case for the more standard market-level indicators included in the Guiding Framework, such the domestic food price index and the volatility of food prices.

Data Source

Market level food price data must be collected through price surveys in food markets or by drawing on an available source of secondary data. Examples of where food price data could be found include

The World Food Programme's (WFP) Vulnerability Assessment and Mapping (WFP, 2015) and the Food and Agriculture Organization's (FAO) Global Information Early Warning System database (GIEWS). Wages could also be obtained from secondary sources such as government agencies collecting information on labor or household or individual level surveys. Other options include data from the International Labor Organization (ILO, 2015).

Links to guidelines

- Lele et al. (2016). "Measuring Food Security and Nutrition: An Independent Technical Assessment and User's Guide for Existing Indicators."

Food Security Dimensions

- Quantity
- Quality
- Stability

Food Composition Database Required?

Yes

End of Indicator: Food affordability index

Click to return to Table of Contents

Food Consumption Score (FCS)

Overview

The Food Consumption Score (FCS) is an index that was developed by the World Food Programme (WFP) in 1996. The FCS aggregates household-level data on the diversity and frequency of food groups consumed over the previous seven days, which is then weighted according to the relative nutritional value of the consumed food groups. For instance, food groups containing nutritionally-dense foods, such as animal products, are given greater weight than those containing less nutritionally dense foods, such as tubers. Based on this score, a household's food consumption can be further classified into one of three categories: poor, borderline, or acceptable. The food consumption score is a proxy indicator of household caloric availability. Validation studies have demonstrated that the FCS and the Household Diet Diversity Score (HDDS) are both associated with caloric intake, as well as with each other (Coates et al., 2007; Weismann et al., 2009). While the FCS has been validated against quantity of caloric intake, it has not been validated against adequacy of macronutrients or micronutrients (Leroy et al., 2015).

Method of Construction

A brief questionnaire is used to ask respondents about the frequency of their households' consumption of eight different food groups over the previous seven days. To calculate the FCS from these results, the consumption frequencies are summed and multiplied by the standardized food group weight (see the food groups and corresponding weights below). Households can then be further classified as having 'poor', 'borderline', or 'acceptable' food consumption by applying WFP's recommended cut-offs to the food consumption score.

Food Group	Weight
Main staples	2
Pulses	3
Vegetables	1
Fruit	1
Meat/Fish	4
Milk	4
Sugar	0.5

Oil	0.5

Steps:

1. Group food items in the specified food groups (condiments not included)
2. Sum all the consumption frequencies of food items within the same group
3. Multiply the value of each food group by its weight (see table)
4. Sum the weighted food group scores to obtain FCS
5. Determine the households food consumption status based on the following thresholds: 0-21: Poor, 21.5-35: Borderline, >35: Acceptable.

For more in-depth information on calculation of FCS, see the technical document provided by WFP (WFP 2008).

Uses

This indicator is useful for categorizing and tracking households' food security across time, specifically as a proxy for the quantity dimension (i.e. caloric sufficiency) of food security, for which this indicator has been validated. The FCS captures information about *usual* household diet, since it asks respondents to recall what they consumed over the past seven days. The FCS can be used in a range of ways, including for program monitoring and evaluation, and population-level targeting. Since it is a standardized measure, it can also be useful in comparing households in different locations, as well as tracking cyclical changes in household diet if collected repeatedly across seasons or years. The WFP uses the FCS as part of its Comprehensive Food Security & Vulnerability Analysis (CFSVA) tool to assess food security and vulnerability in crisis-prone populations (WFP 2009).

The FCS and HDDS are highly correlated and can be used interchangeably as a measure of household-level diet diversity and as a validated proxy for energy sufficiency in most contexts (Maxwell et al., 2013), however, neither of these indicators have been validated as a proxy for micronutrient adequacy. Therefore before they are used to proxy nutrient adequacy they require further validation (Leroy et al., 2015). Since the FCS and HDDS provide very similar information, the selection of one over the other can often be driven by the need for comparability with other surveys or by institutional preference. In other words, if an organization or individual is interested in comparing their results to those of a WFP survey, it makes sense to collect the FCS, while a comparison with other surveys may be more appropriately based on the HDDS, if the HDDS had been used previously.

Strengths and Weaknesses

The FCS indicator captures information about *usual* household diet, as it incorporates consumption frequency over a seven day period. This is different from the HDDS which only gathers information about the previous day of consumption (Kennedy et al., 2010). Both the FCS and the HDDS were designed as potentially useful indicators to capture quantity (energy) and quality (nutrient adequacy) however neither has been validated against gold standard measures of micronutrient adequacy and, as such, should only be used to as a proxy for energy sufficiency (i.e. quantity dimension). By applying standard nutritional value weights to the food groups in the index, WFP intends for the score to be a more accurate reflection of the calorie content of the diet pattern than an index where all food groups are equally weighted. That said, validation research by Weismann et al., suggests that these weights do not usefully increase the association of the FCS index with caloric intake over an un-weighted version of the index, and the weights themselves are not based on a clearly defined nutritional metric (Weismann et al.,2009).

The FCS and HDDS need to undergo some adaptation to the context in which they will be used in order for enumerators to be able to list contextually appropriate examples of foods that belong to the food groups in the questionnaire. For both the FCS and HDDS, one challenge is how to capture, and whether to exclude, small amounts of food consumed as seasonings or condiments. For both indicators, research has shown that the ability to accurately predict caloric adequacy is greatly increased by ensuring items consumed in small amounts are excluded so as not to overstate the nutritionally relevant diversity of a household's diet (Lonvon &Mathiassen 2014).

Additionally, as household-level measures, neither the FCS nor HDDS are sensitive to intrahousehold inequities in food consumption, and therefore should not be used for interventions specifically targeting individuals, such as nutritionally vulnerable women or children. (Please see the Minimum Dietary Diversity for Women (MDD-W) and Minimum Dietary Diversity for children 6-23 months (MDD) indicators for alternative individual-level measures.

Data Source

In order to construct this indicator, household data must be obtained using the WFP's standard food consumption score questionnaire (see page 16). In some cases it may be possible to use secondary data from a seven day food frequency questionnaire or the consumption module of a Household Consumption and Expenditure Survey (HCES) provided that 1) the recall is seven days, 2) the frequency of consumption is collected, and 3) the food items can be mapped to WFP's standard eight food groups (see table above). Additionally, WFP standardized food group weights must be used. More details can be found in the technical guidelines from WFP (WFP 2008) and FCS data for select countries can be found on the Vulnerability Analysis and Mapping Databank.

Links to guidelines

- World Food Programme, (2008). "Food consumption analysis: calculation and use of the food consumption score in food security analysis"

Links to validation studies

- Baumann et al., (2013). "Validity of food consumption indicators in the Lao context: moving toward crosscultural standardization"
- Leroy et al., (2015). "Measuring the Food Access Dimension of Food Security: A Critical Review and Mapping of Indicators"

- Wiesmann et al., (2009). “Validation of the World Food Programme’s food consumption score and alternative indicators of household food security”
- Coates et al., (2007). "Diet diversity study"

Food Security Dimensions

- Quantity

Food Composition Database Required?

No

End of Indicator: Food Consumption Score (FCS)

Click to return to Table of Contents

Food Insecurity Experience Scale (FIES)

Overview

The Food Insecurity Experience Scale (FIES) is one of the four experience-based food insecurity scales included in the Data4Diets platform, which also contains the Household Hunger Scale (HHS), the Household Food Insecurity Access Scale (HFIAS), and the Latin American and Caribbean Food Security Scale (ELCSA). The FIES was developed by the Food and Agriculture Organization (FAO) through the Voices of the Hungry (VoH) project, building on the pioneering work of the HFIAS and the ELCSA. It was derived from the adult-referenced questions of the ELCSA to create a shortened, standardized experience-based measure for use across sociocultural contexts (Ballard et al., 2013).

In 2014, FAO began collecting FIES data by leveraging the Gallup® World Poll (GWP), which surveys nationally representative samples of the adult population annually in nearly 150 countries. With this data in hand, Voices of the Hungry (VoH) developed the analytical protocols necessary to take experience-based food security measurement global, making it possible to compare prevalence rates across countries and even sub-national populations (Cafiero et al., 2016).

Method of Construction

The FIES module can be administered with either a one month or twelve month recall period, depending on the research or programmatic priorities. It consists of eight questions capturing a range of food insecurity severity, with yes/no responses. While developed primarily to measure the individual experience of food insecurity, the scale can also be modified for use at the household level, in which case the questionnaire can be administered to an individual who responds on behalf of the household. The FIES survey modules (individual and household versions) and translations can be found on the VoH website. The creation of the scale requires a statistical module programmed in R, which can also be found on the VoH website, along with supplemental explanatory materials. Based on output from the model, two indicators are produced: the prevalence of severe food insecurity, and the prevalence of moderate or severe food insecurity (the prevalence of moderate and severe combined).

Uses

The FIES is one of two indicators used for measuring progress toward achieving one of the Sustainable Development Goals, Goal 2.1, which relates to ending hunger and ensuring food access (SDGs 2016). This indicator is currently used by FAO and a growing number of countries to monitor national and global food security trends.

The FIES can be used to measure food security for the following purposes:

- To **assess** the population **prevalence of food insecurity** (for both SDG monitoring and national use)

- To **identify vulnerable** populations
- To **guide** and **monitor** the effects of food security **policies and programmes**
- To **identify risk factors and consequences** of food insecurity

The FIES does not quantify food consumption nor assess diet quality; doing so requires other methods and indicators such as a quantitative 24-hour dietary recall to quantify food consumption to calculate the Mean Adequacy Ratio (MAR) or a diet diversity index to determine the Minimum Dietary Diversity Score for Women (MDD-W) in order to gain a picture of the 'adequacy' aspect of diet quality.

Strengths and Weaknesses

The main strength of the FIES is that it produces population-level estimates of food insecurity that are comparable across countries, cultures and sub-populations. The FIES analytical methodology can be applied to data collected using the HFIAS and the ELCSA survey modules to produce comparable results. Additionally, when the individual-referenced survey module is used, the FIES offers the advantage of allowing for disaggregation of data by gender (Brunelli & Viviani 2014). The FIES analytical methodology involves a sophisticated probabilistic approach to classify households according to their food security status. Though the results are statistically robust and comparable across countries and sub-populations, it may be challenging for non-specialists to conduct the analysis and produce the estimates. However, this analytic approach makes it possible to account for differences in experiences of food insecurity across specific cultural or personal perceptions. FAO provides tools, including software and learning materials, to support users, as well as technical assistance.

Data Sources

The data required to calculate this indicator are collected using the 8-item FIES survey module (individual or household version) which can be easily integrated into a broader survey of individuals (e.g. a health and nutrition survey) or households (e.g. Household Consumption and Expenditure Survey (HCES)). The FIES survey modules, and translations of the individual version into 170 languages and dialects, can be found on the VoH webpage. Also included on the webpage is the FIES Statistical Software Package for conducting data analysis and producing estimates of the prevalence of food insecurity.

Links to guidelines

- Ballard et al., (2013). "The Food Insecurity Scale: Development of a Global Standard for Monitoring Hunger Worldwide"
- Voices of the Hungry, (2018). "Voices of the Hungry: One Metrix for the World".
- FAO e-learning course, (2018). "SDG Indicator 2.1.2: Using the Food Insecurity Experience Scale"

Links to validation studies

- Cafiero et al., (2016). “Methods for estimating comparable prevalence rates of food insecurity experienced by adults throughout the world”
- Cafiero et al., (2018). "Food security measurement in a global context: The Food Insecurity Experience Scale"

Food Security Dimensions

- Quantity

Food Composition Database Required?

No

End of Indicator: Food Insecurity Experience Scale (FIES)

Click to return to Table of Contents

Fresh food retail volume

Overview

Fresh food retail volume includes uncooked and unprocessed foods sold in various channels (Euromonitor International 2018), and is an indicator that can be used to understand trends in shifting dietary patterns and changing dietary quality. Low- and middle-income countries have rapidly been undergoing a nutrition transition characterized by increased consumption of processed foods coupled with decreased consumption of fresh foods (Popkin et al., 2013). These changes come with serious health implications, as processed and ultra-processed foods tend to be less nutrient dense and have been linked with poorer diet quality (Imamura et al., 2015), as well as increased diet-related illness (Micha et al., 2012). The fresh food retail volume is a national-level indicator that quantifies the volume of fresh foods sold at markets (including supermarkets, wet markets, convenience stores, and online purchases), reported in kilograms per capita. It provides information on the quantity of healthier foods in the food supply and can provide a fuller picture of dietary transition when used in conjunction with the indicator for packaged food retail volume (Global Nutrition Report 2015).

Method of Construction

The total amount of fresh foods sold in various retail outlets of interest (e.g. supermarkets, wet markets, convenience stores etc.) should be converted into kilograms and summed. This figure is divided by the total population of interest to determine the amount of fresh food retail volume (kg/capita). Currently, data for this indicator are collected for a subset of countries (none of which are low-income countries) and are available for purchase from Euromonitor. If one has access to Euromonitor, data can be easily downloaded as national per capita values (Euromonitor International 2016). If calculating this indicator from other market data (i.e. not using Euromonitor), it is necessary to clearly define what is meant by fresh foods and what is meant by markets. For example, the NOVA Food Classification system could be used to group foods into unprocessed/minimally processed, processed, and ultra-processed categories (Monteiro et al., 2010). Government ministries may also collect data related to market- level retail sales and/or volume.

Uses

This indicator for fresh food retail volume, in combination with the indicator that measures retail volume of packaged foods, has been recommended by the Global Nutrition Report (GNR) to assess national food consumption diversity (Global Nutrition Report 2015). When used in conjunction with other market-level data on production and/or consumption, it can also be used to capture the extent to which fresh foods are transported along the supply chain.

Strengths and Weaknesses

This indicator is helpful in providing insight into the availability of fresh foods on the market. A drawback is that, as a national-level indicator, it does not capture any measurement of distribution among regional, socioeconomic, or age/sex groups. Furthermore, if using Euromonitor data it only provides information at the aggregate level for the quantity of all fresh foods and for a select sub-set of high and middle-income countries. Therefore, if you are interested in more detailed information of specific fresh foods, or identifying the quantity of fresh food retail volume for low-income countries then other indicators should be considered. For example, an indicator like household adequacy of fruit and vegetable consumption would be more appropriate for examining fresh food consumption (specifically fruit and vegetable consumption) on a finer scale and potentially comparing across sub-populations and groups.

Additionally, although fresh foods are assumed to be nutritionally superior to packaged ones, this indicator does not report macronutrient or micronutrient consumption, which would be better examined using an individual indicator such as total individual micronutrient intake or total individual macronutrient intake. A clear drawback of using Euromonitor data is that these data are not publically available and only exist for 54 countries, none of which are low-income countries, (Euromonitor International 2016).

Data Source

One potential data source for this indicator is Euromonitor, which collects and compiles data on fresh food retail volume in 54 countries, none of which, however, are low-income countries, and access must be purchased (Euromonitor International, 2016). One publically available alternative, would be to use Food Balance Sheet (FBS) data to calculate similar indicators such as National fruit and vegetable availability in food supply, or Household Consumption and Expenditure Survey (HCES) data and household adequacy of fruit and vegetable consumption.

Food Security Dimensions

- Quantity
- Quality

Food Composition Database Required?

No

End of Indicator: Fresh food retail volume

Click to return to Table of Contents

Household adequacy of fruit and vegetable consumption

Overview

Low fruit and vegetable consumption is one of the leading contributors to the global burden of non-communicable disease and death (Lim et al., 2013). A 2003 FAO/WHO joint report defines adequate fruit and vegetable consumption as an individual daily intake of 400 grams of fruit and vegetables (or the equivalent of 5 servings). This household level indicator provides a measure of diet quality and can be used to understand diet pattens. Since this indicator uses Household Consumption and Expenditure Survey (HCES) data, analyses can, be disaggregated to analyze patterns between regions, income groups, and sub-populations.

Method of Construction

HCES data are used to construct this indicator by summing the total weight (in grams) of fruits and vegetables consumed by the household as reported by the respondent. This total can then be divided by the number of household members, and then divided by the number of days within the survey recall period. The resulting value is the number of grams of fruits and vegetables consumed per capita per day for the household (with infants and children included as household members). If this number is at or above 400 grams/capita/day, the household is classified as having adequate fruit and vegetable consumption and if below 400 grams/capita/day, the household is considered to have inadequate fruit and vegetable consumption.

This indicator is one of several indicators included in the ADePT-FSM (Food Security Module) software package, a free standalone software developed by the FAO and the World Bank, that allows users to easily derive food security indicators from household survey data. The software download and corresponding documentation can be found on the FAO website.

Please also see the Moltedo et al., 2014 book published by the World Bank, which provides detailed instructions for analyzing food security using household survey data. Alternatively, a national level indicator measuring the national availability of fruit and vegetables (grams/capita/day) can be calculated using Food Balance Sheets (FBS).

Uses

This household level indicator can be used to identify inadequacy of fruit and vegetable consumption between population sub-groups, including those based on household income, gender of the household head, and different geographic areas. It can be used in studies to identify the potential socioeconomic and cultural determinants of inadequate fruit and vegetable consumption that can advise local or national strategies to encourage consumption and improve dietary practices (Jaime et al., 2005).

Strengths and Weaknesses

This household level indicator reflects an important aspect of dietary quality based on the quantity of consumption of fruits and vegetables. Other indicators of adequacy of fruit and vegetable consumption may use the consumption of five servings per day as the definition of adequacy, rather than 400 grams (Hall et al., 2009), but the concept of serving size may differ by country. These indicators may be subject to bias due to the considerable variability of definitions of fruits, vegetables, and portion sizes between countries (Agudo 2004), though the data from HCES could be classified by the researcher into standardized categories of fruits and vegetables. A benefit of using grams instead of serving sizes is that it can improve comparability across countries.

This indicator is based on the WHO recommendation that all individuals in a population should consume at least 400 grams (5 servings) of fruits and vegetables per day. Because this measure is applied to household level data, there is no consideration of individual consumption as the indicator is based on the total amount of fruits and vegetables per household divided by the number of individuals. The recommendation of 400 grams does not take into account different individual needs depending on age and sex, and the variation in the recommended nutrient intakes. Food-based national dietary guidelines should be referenced for more detailed information and requirements for individual age/sex groups (FAO 2018). In addition to these other limitations, this indicator uses data collected from one individual within the household who is reporting everyone's consumption, which may not be accurate, especially given the increasing importance of food consumed away from home, particularly in urban areas. Because this is a household level indicator, it can be used to compare diet quality across households, but should not be used to draw conclusions about individuals within the same household or about specific age and sex groups in the population.

Data Source

HCES data can be used to calculate this indicator. The World Bank Microdata Library has the most comprehensive and publically accessible repository of data (World Bank Microdata Library). Otherwise, data can be accessed – often for a fee – from the National Statistics Office, though each country has its own policies and procedures. The International Household Survey Network (IHSN) is an informal network to promote data standards and dissemination (IHSN). National or regional Food Composition Tables should be used to identify the nutrient contents of the foods and can be found at Food and Agriculture's (FAO) International Network of Food Data Systems (INFOODS) or the International Life Science Institute's (ILSI) World Nutrient Databases for Dietary Studies (WNDDS). In addition, FBS data could be used to calculate a similar indicator, such as national fruit and vegetable availability in the food supply. Alternatively, market data such as Euromonitor could be used to calculate the fresh food retail volume, or individual level data such as 24-Hour Dietary Recall or a Food Frequency Questionnaire (FFQ) could be used to calculate consumption of specific food groups (e.g. fruits and vegetables).

Links to guidelines

- Agudo, (2004). "Measuring intake of fruit and vegetables"

Food Security Dimensions

- Quality

Food Composition Database Required?

No

End of Indicator: Household adequacy of fruit and vegetable consumption

Click to return to Table of Contents

Household average dietary energy acquisition or consumption

Overview

Household average dietary energy consumption per capita is an indicator that estimates calorie consumption based on the total amount of food acquisition or consumption by the household. Consuming an adequate number of calories is necessary (but not sufficient) for proper growth, development, and cognitive and physical functioning. Trends in household average per capita energy acquisition or consumption can provide early warnings of where there may be problems for population-level undernutrition or overweight/obesity for specific regions within a country or for the country as a whole. This indicator is different from the simpler indicator dietary energy in the food supply, which cannot be disaggregated at a sub-national level and uses Food Balance Sheet (FBS) data to determine the calories per capita available at a national level.

Method of Construction

To construct this indicator, existing Household Consumption and Expenditure Surveys (HCES) data can be analyzed with a statistical software program (e.g. Stata or R). Each household's reported acquisition or consumption of foods is converted into dietary energy (kcals) by matching individual foods with a Food Composition Table. The total quantity of calories is determined by accounting for the portion purchased or consumed, divided by the total number of members in that household. If data are collected over a number of days or if recall periods cover more than one day, the above calculation must also be divided by the number of days of collection in order to generate the number of calories/person/day.

An alternative option to the basic per capita measure, is to use the Adult Male Equivalent (AME). The AME method takes account of the household size and composition (age, sex, and physical activity level) and assumes that the distribution of food within the household is in direct proportion to the biological requirement of each individual based on a specific physical activity level. Using a multiple of the AME to account for all members of the household provides a more accurate picture of households of different sizes and compositions than just using the per capita measure (Weisell and Dop, 2012). Table 9 on page 82 of the following International Food Policy Research Institute (IFPRI) document provides guidelines for benchmarking per capita calorie consumption in categories ranging from very low to very high (Smith & Subandoro, 2007).

This indicator is one of several indicators included in the ADePT-FSM (Food Security Module) software package, which is a free standalone software developed by the FAO and the World Bank that allows users to easily derive food security indicators from household survey data. The software download and corresponding documentation can be found on the FAO website. Please also see the Moltedo et al. (2014) book published by the World Bank, which provides detailed instructions for analyzing food security using household survey data. See pages 35 and 36 of this document for more discussion on this particular indicator.

Uses

This measure of diet quantity provides an understanding of the energy available to a household, and can be used to assess the food insecurity (quantity dimension, caloric sufficiency), of a population in order to design appropriate interventions (Smith & Subandoro 2007). This indicator, and others relying on HCES data, can be a good option when more granular data, such as individual-level dietary data are not available. As this is an average per capita estimate based on data collected at the household level and is not based on individual-level data, it cannot be used for individual targeting or used to assess population sub-groups, such as pregnant and lactating women or young children.

Strengths and Weaknesses

This indicator is designed for use with HCES, and using the ADePT-FSM software package can ease some of the challenges of using household level data for less experienced analysts. However, this indicator only estimates acquisition or consumption of dietary energy, and does not provide insight into nutrient adequacy or overall health of diet (Smith 2002, Claro et al., 2010).

Data Source

HCES data can be used to calculate this indicator. The World Bank Microdata Library has the most comprehensive and publically accessible repository of data (World Bank Microdata Library). Otherwise, data can be accessed – often for a fee – from the National Statistics Office, though each country has its own policies and procedures. The International Household Survey Network (IHSN) is an informal network to promote data standards and dissemination (IHSN). National or regional Food Composition Tables should be used to identify the nutrient contents of the foods and can be found at Food and Agriculture's (FAO) International Network of Food Data Systems (INFOODS) or the International Life Science Institute's (ILSI) World Nutrient Databases for Dietary Studies (WNDDS). In addition, Food Balance Sheet (FBS) data could be used to calculate a similar indicator, such as dietary energy in the food supply. Alternatively, 24-Hour Dietary Recall or Weighed Food Records could be used to calculate total individual energy intake.

Links to guidelines

- Smith and Subandoro, (2007). "Measuring food security using household expenditure surveys"
- Moltedo et al., (2014). "Analyzing food security using household survey data"

Food Security Dimensions

- Quantity

Food Composition Database Required?

Yes

End of Indicator: Household average dietary energy acquisition or consumption

Click to return to Table of Contents

Household Dietary Diversity Score (HDDS)

Overview

The Household Dietary Diversity Score (HDDS) was released in 2006 as part of the FANTA II Project as a population-level indicator of household food access. Household dietary diversity can be described as the number of food groups consumed by a household over a given reference period, and is an important indicator of food security for many reasons. A more diversified household diet is correlated with caloric and protein adequacy, percentage of protein from animal sources, and household income (Swindale et al., 2006). The HDDS indicator provides a glimpse of a household's ability to access food as well as its socioeconomic status based on the previous 24-hours (Kennedy et al., 2011).

Method of Construction

The following 12 food groups are used to calculate the HDDS indicator:

A.	Cereals
B.	Roots and tubers
C.	Vegetables
D.	Fruits
E.	Meat, poultry, offal
F.	Eggs
G.	Fish and seafood
H.	Pulses, legumes, nuts
I.	Milk and milk products
J.	Oil/fats
K.	Sugar/honey
L.	Miscellaneous

Each food group is assigned a score of 1 (if consumed) or 0 (if not consumed). The household score will range from 0-12 and is equal to the total number of food groups consumed by the household:

Sum (A + B + C + D + E + F + G + H + I + J + K + L)

The average household dietary diversity score for the population of study can be calculated as follows:

Sum (HDDS)/Total number of households surveyed

If using data that were not initially collected using the HDDS questions, such as Household Consumption and Expenditure Surveys (HCES) data, the food items must be regrouped according to the 12 HDDS groups to calculate the indicator. Although there is no universal cut-off or target level that indicates that a household is sufficiently diverse, FANTA suggests two alternatives for using this indicator in a performance reporting context. One option is to use the dietary diversity patterns of wealthier households as a target (the richest 33 percent), which requires the assumption that poorer households will increase their dietary diversity as their incomes rise. A second option is to establish a target using the average dietary diversity of the 33 percent of households with the highest diversity. For more information on how to set these targets, see FANTA 2006.

Uses

The HDDS is a population-level indicator that is used as a proxy measure of household food access (Swindale et al., 2006).

Unlike measures of dietary diversity collected at the individual level (e.g. Minimum Dietary Diversity for Women (MDD-W) and the Minimum Dietary Diversity (MDD) for children 6-23 months, this indicator has not been validated as a proxy for adequacy of specific macronutrients or micronutrients. If the primary concern or research objective is to assess nutrient adequacy of the population, then dietary diversity should be collected using dietary diversity indicators at the individual, not household, level (e.g. MDD-W and MDD). However, if the objective is to assess economic access to food, or to estimate which food groups households are consuming, then the household level indicator is a more appropriate measure (FAO 2011). Because household dietary diversity generally increases as income increases, this indicator is sometimes used as a proxy for the access dimension of food insecurity, and is one of the indicators frequently used to assess how interventions designed to increase household income have affected food consumption (Swindale et al. 2006).

The HDDS can be used in conjunction with other indicators of food security status (e.g. Household Food Insecurity Access Scale (HFIAS)) to understand household access to certain food groups (Cafiero et al. 2014). The components of the indicator can also be used to examine dietary patterns (e.g., what percentage of households consume any type of animal source foods?). This indicator is required for all USAID Food for Peace (FFP) projects and must be collected at the projects' baseline and endline to assess the resilience of vulnerable communities and households (USAID 2017). The FAO also uses this indicator and developed a set of guidelines for its use in different contexts (FAO 2011).

The HDDS and Food Consumption Score (FCS) are highly correlated and can be used interchangeably as a measure of household-level diet diversity and as a validated proxy for energy sufficiency in most contexts (Maxwell et al. 2013), however, neither of these indicators have been validated as a proxy for micronutrient adequacy. Therefore before they are used to proxy nutrient adequacy they require further validation (Leroy et al. 2015). Since the HDDS and FCS provide very similar information, the selection of one over the other can often be driven by the need for comparability with other surveys or by institutional preference. In other words, if an organization or individual is interested in comparing their results to those of a WFP survey, it makes sense to collect the FCS, while a comparison with other surveys may be more appropriately based on the HDDS, if the HDDS had been used previously.

Strengths and Weaknesses

One strength of the HDDS is that the standardized questions are simple and can be easily understood by both enumerators and respondents, and the full set of questions usually takes less than 10 minutes per respondent (Swindale et al. 2006). However, the standardized questionnaire provided by the 2011 FAO guidelines is not culture or population specific, so it should be adapted appropriately in adherence with the guidelines before use in a specific context (Kennedy et al. 2011). For example, while the standard module does not explicitly ask about consumption of food away from home, enumerators could be trained to probe about additional foods consumed outside the home.

A drawback of the HDDS is that, because data are collected at the household level, it does not provide any information on the consumption of different food groups or overall dietary diversity by individuals in the household. Accordingly, the HDDS does not provide any information on intra-household food distribution. As mentioned above, the indicator has not been validated against any standard of adequacy to allow a judgement on what number of food groups constitute a “sufficiently diverse”, versus “not sufficiently diverse” diet at the household level. There is no universally accepted cut-off for this indicator that could separate households that have a “sufficiently diverse” diet from those that do not.

Data Source

The source of data for the HDDS is based on a recall of food groups consumed by the household in the previous 24-hours, reported by the person primarily responsible for food preparation in the household. Other data sources can often be used to construct the HDDS indicator, including 24-Hour Dietary Recall, Food Frequency Questionnaires (FFQs), and Household Consumption and Expenditure Survey (HCES) data, where information on food consumption is collected through a fixed list of foods or food groups.

Links to guidelines

- Swindale and Bilinsky, (2006). "Household Dietary Diversity Score (HDDS) for Measurement of Household Food Access: Indicator Guide"

- Kennedy et al., (2011). "Guidelines for measuring household and individual dietary diversity"

Links to validation studies

- Hoddinott and Yohannes, (2002). "Dietary Diversity as a Household Food Security Indicator"

Food Security Dimensions

- Quantity
- Quality

Food Composition Database Required?

No

End of Indicator: Household Dietary Diversity Score (HDDS)

Click to return to Table of Contents

Household food expenditure share

Overview

The share of total household expenditure (as a proxy of income) spent on food is an indicator of household food security because it is widely documented that the poorer and more vulnerable a household, the larger the share of household income spent on food. This observation is known as Engel's law, which demonstrates that as incomes rise, both within a country and across countries, expenditure on food increases while expenditure on other things increases even more, so that the share of total income spent on food declines. Given this observation, the indicator is especially helpful to understand the impact of food price fluctuations on both the quality and quantity of household food consumption.

If a change in food prices results in a higher share of total household expenditure being spent on food, then this can result in the household being more resource constrained (i.e. poorer) as a result of the increase in food prices. Consequently, depending on the specific foods, households that are very poor and already consuming the lowest-cost foods will be unable to substitute cheaper foods and will be forced to spend more on basic staples, reduce the quality of their diets, or even reduce the quantity consumed of the least expensive foods, while also reducing non-food expenditures that may be equally needed (e.g. on health and education) (Lele et al., 2016).

Method of Construction

This indicator is commonly calculated with data from Household Consumption and Expenditure Surveys (HCES) that include the monetary value of household consumption disaggregated into food and non-food items. The share of household expenditure on food is equal to:

(expenditure on food / total expenditure) X 100.

The monetary value of non-purchased items, including consumption from own production and in-kind payments and transfers, must be imputed from available price information.

While no internationally agreed thresholds exist, Smith and Subandoro (2007) have proposed that households spending over 75% of their income on food are considered very vulnerable and consequently food insecure, whereas people spending 65-75% are considered to have high food insecurity; those spending 50-65% have medium food insecurity; and those that spend less than 50% of their income on food are considered to have lower levels of food insecurity (Smith and Subandoro 2007).

This indicator is one of several indicators included in the ADePT-FSM (Food Security Module) software package, which is a free standalone software developed by the FAO and the World Bank that allows users to easily derive food security indicators from household survey data. The software download and corresponding documentation can be found on the FAO website.

Please also see the Moltedo et al., 2014 book published by the World Bank, which provides detailed instructions for analyzing food security using household survey data. This indicator is also included in the FAO suite of food security indicators (FAO 2016) as the share of food expenditures of the poor (population belonging to the first income quintile).

Uses

Share of food expenditure in total expenditures can be used to identify populations that may be vulnerable to shocks that could affect food prices (Lele et al., 2016). This indicator can also be used for advocacy and national monitoring. The World Food Programme (WFP) frequently uses this indicator, often in combination with other indicators (e.g. Food Consumption Score), to assess food insecurity and vulnerability to future shocks (Rose 2012). This indicator is used by country governments and NGOs to assess trends in food security.

Strengths and Weaknesses

Household food share of total expenditure is generally useful due to its sensitivity to food price fluctuations, especially for staple foods. Another strength of this indicator is that it can be derived from HCES data, which are typically nationally representative. One weakness of this indicator is that if using survey data that does not adequately capture the value of home production, it may underestimate the food expenditure share (Rose 2012). Because HCES data collection is not uniform across countries, differing definitions of food and non-food expenditures, as well as the inclusion (or exclusion) of consumption from own production and consumption away from home, can potentially limit comparability of the indicator across countries (Schmidhuber 2003).

Data Source

HCES data can be used to calculate this indicator. The World Bank Microdata Library has the most comprehensive and publically accessible repository of data (World Bank Microdata Library). Otherwise, data can be accessed – often for a fee – from the National Statistics Office, though each country has its own policies and procedures. The International Household Survey Network (IHSN) is an informal network to promote data standards and dissemination.

Links to guidelines

- Smith and Subandoro, (2007). "Measuring food security using household expenditure surveys"
- Smith et al., (2014). "Assessment of the Reliability and Relevance of the Food Data Collected in National Household Consumption and Expenditure Surveys"

Food Security Dimensions

- Quantity
- Quality

Food Composition Database Required?

No

End of Indicator: Household food expenditure share

Click to return to Table of Contents

Household Food Insecurity Access Scale (HFIAS)

Overview

The Household Food Insecurity Access Scale (HFIAS) is one of the four experience-based food insecurity scales included in the Data4Diets, which also contains the Household Hunger Scale (HHS), the Latin American and Caribbean Food Security Scale (ELCSA), and the Food Insecurity Experience Scale (FIES). The HFIAS was developed between 2001-2006 by the USAID-funded Food and Nutrition Technical Assistance II project (FANTA) in collaboration with Tufts and Cornell Universities, among other partners. The HFIAS has since provided the foundation for the development of the HHS, another household-level experience-based scale, that resulted from cross-country validation of the HFIAS (Ballard et al., 2011).

Like other experience-based indicators, the HFIAS is constructed from a short questionnaire that captures households' behavioral and psychological manifestations of insecure food access, such as having to reduce the number of meals consumed or cut back on the quality of the food due to a lack of resources. Responses to the questionnaire enable the household to be pinpointed on a spectrum that indicates the degree of severity of insecure food access.

Method of Construction

The HFIAS module covers a recall period of 30 days, and consists of two types of questions: nine 'occurrence' and nine 'frequency-of-occurrence' questions. The respondent is first asked if a given condition was experienced (yes or no) and, if it was, then with what frequency (rarely, sometimes, or often). The resulting responses can be transformed into either a continuous or categorical indicator of food security. When calculating the HFIAS as a continuous indicator, each of the nine questions is scored between 0-3, with 3 being the highest frequency-of-occurrence, and the score for each is added together. The total HFIAS can range from 0 to 27, indicating the degree of insecure food access. As a categorical variable, households are categorized as food secure, mildly food insecure, moderately food insecure, or severely food insecure (for more details see Table 4 in Coates et al., 2007). Households that respond affirmatively to the more severe behaviors (or experience them more frequently) are classified as more severely food insecure. For more in-depth information on using and interpreting the HFIAS, refer to the guide created by FANTA (Coates et al., 2007).

Uses

Information gathered from the HFIAS can be used to assess prevalence of household food insecurity of a population, as well as changes in food insecurity over time. This is useful in the context of population-level targeting and program monitoring and evaluation of food access-related activities. The HFIAS has been used in myriad ways to measure food insecurity in various contexts. For example, the HFIAS is part of several household surveys and an adapted version is used in the publicly available Bangladesh Integrated Household Survey and in the Malnutrition and Enteric Infections: Consequences for Child Health and Development (MAL-ED) Network cohort study which assessed relationships between food security and child growth (Psaki et al., 2012). Another illustrative example is the inclusion of the HFIAS among Action Against Hunger's (ACF) core indicators in program evaluation (ACF 2011), as well as one of the tools used for rapid Emergency Food Security Assessments conducted by the World Food Programme (WFP 2009).

Like all experience-based food insecurity scales, the HFIAS does not quantify food consumption nor assess diet quality; doing so requires other methods and indicators such as a quantitative 24-hour dietary recall to quantify food consumption to calculate the Mean Adequacy Ratio (MAR) or a diet diversity index to determine the Minimum Dietary Diversity Score for Women (MDD-W) in order to gain a picture of the 'adequacy' aspect of diet quality.

Strengths and Weaknesses

One strength of the HFIAS, and other experience-based food insecurity scales, is that it is uniquely able to detect aspects of food insecurity involving decreased access to a sufficient quantity or quality of food and also the psychosocial manifestations of anxiety and uncertainty around food access, which can also affect health and wellbeing (Ballard et al., 2013). Additionally, it has been found to be understandable and applicable across varying contexts, including both urban (Mohammadi et al., 2012) and rural (Knueppel et al., 2010) settings. It is also relatively short and can easily be added as a module to other household surveys.

One of the weaknesses of this indicator is that some of the items in the questionnaire do not meet strict psychometric criteria for cultural invariance, meaning that it should not be used to make comparisons across diverse socio-cultural countries and contexts (Deitchler et al., 2010). In the process of testing the HFIAS for cultural invariance, the HHS was developed as a cross-culturally valid alternative, which consists of 3 of the more severe items from the HFIAS and has been validated for cross-country comparison (Ballard et al., 2011). The HFIAS is more comprehensive than the HHS and has a broader measurement range, meaning that it can capture conditions ranging from mild food insecurity to very severe food insecurity, whereas the HHS focuses only on the most severe end of the food security specturum. The HFIAS should undergo some basic adaptation of terms for the context in which it will be used in order to improve its performance (guidance for this process can be found in Section 2 of the HFIAS user manual, Coates et al., 2007). The HFIAS is meant for population level use only, meaning that it should not be used, for instance, to screen households for program eligibility.

When data are collected at the household level, the selected respondent, usually the primary food preparer, may not always be in a position to accurately represent the experience of all household members in considering responses to the questionnaire. That said, if any member of the household is reported as experiencing a food insecurity condition on the quedtionnaire, the entire household is classified as having experienced it too. This means that the indicator could potentially overestimate the number of *individuals* in households that are food insecure, while providing an accurate count of households with at least one member experiencing food insecurity. Relatedly bias may be introduced from the fact that the selected respondent's perception of their household's experience is not representative of all other household members (Coates et al., 2010).

Data Source

The data required to calculate this indicator are collected using the HFIAS module (Coates et al., 2007

), which can be easily integrated into a broader household survey.

Links to guidelines

- Coates et al, (2007). “Household Food Insecurity Access Scale (HFIAS) for Measurement of Food Access: Indicator Guide. Version 3”

Links to validation studies

- Gebreyesus et al., (2014). “Is the adapted Household Food Insecurity Access Scale (HFIAS) developed internationally to measure food insecurity valid in urban and rural households of Ethiopia?”
- Knueppel et al., (2010). “Validation of the Household Food Insecurity Access Scale in rural Tanzania”
- Deitchler et al., (2010). “Validation of a Measure of Household Hunger for Cross-Cultural Use"

Food Security Dimensions

- Quantity

Food Composition Database Required?

No

End of Indicator: Household Food Insecurity Access Scale (HFIAS)

Click to return to Table of Contents

Household Hunger Scale (HHS)

Overview

The Household Hunger Scale (HHS) is one of the four experience-based food insecurity scales included in the Data4Diets, which also contains the Latin American and Caribbean Food Security Scale (ELCSA), the Household Food Insecurity Access Scale (HFIAS), and the Food Insecurity Experience Scale (FIES). The HHS, derived directly from the HFIAS, includes only three hunger-related aspects of insecure food access, as these items were shown to be culturally-invariant across multiple sociocultural contexts (Deitchler et al., 2010), allowing for cross-country comparisons. HHS is different from the other household food insecurity indicators as it assesses only the most severe experiences of food insecurity. In contrast to the other experience-based scales: the HFIAS has limited cross-country comparative ability, the ELCSA is only validated for the Latin America and Caribbean context, and FIES, although also validated for cross-country comparisons, includes questions on a broader range of food insecurity experiences (i.e. not just extreme food insecurity) because different psychometric criteria were used to validate the FIES than the HHS.

Method of Construction

The HHS module covers a recall period of 30 days, and consists of two types of questions three ‘occurrence’ and three ‘frequency-of-occurrence’ questions. The respondent is first asked if a given condition was experienced (yes or no) and, if it was, then with what frequency (rarely, sometimes, or often). All questions are worded to be as universally relevant as possible, and focus strictly on the hunger-specific experience of insecure access to food.

The resulting responses can be transformed into either a continuous or a categorical indicator of hunger. When calculating the HHS as a continuous indicator, each of the six questions is scored between 0-2, with 0 being ‘did not occur’, 1 being ‘rarely and sometimes’, and 2 being ‘often’. The score for each of the three questions is then added together, and the total HHS ranges from 0 to 6, indicating the degree of insecure food access. As a categorical variable, households are categorized as ‘little to no hunger in the household’ (0-1), ‘moderate hunger in the household’ (2-3), or ‘severe hunger in the household’ (4-6). For more guidance, see Table 6 on page 13 in Ballard et al., 2011.

For more in-depth information on using and interpreting the HHS, refer to the guide created by FANTA (Ballard et al., 2011).

Uses

The HHS can be used to observe the prevalence of hunger over time and across countries or regions to inform policies and programming that address food insecurity and hunger. The HHS is also included in early warning or nutrition and food security surveillance systems and can inform humanitarian response. For example, it is one of the main indicators used in the Integrated Food

Security Phase Classification System (IPC), an approach developed to measure and address acute food security crises (IPC 2012). Additionally, the United States Agency for International Development (USAID) requires that all of their Food for Peace (FFP) food assistance projects utilize HHS in both baseline and endline evaluations (FANTA III 2015).

Like other experience-based food security scales, the HHS does not quantify food consumption nor assess diet quality; doing so requires other methods and indicators such as a quantitative 24-hour dietary recall to quantify food consumption to calculate the Mean Adequacy Ratio (MAR) or a diet diversity index to determine the Minimum Dietary Diversity Score for Women (MDD-W) in order to gain a picture of the 'adequacy' aspect of diet quality.

Strengths and Weaknesses

Strengths of the HHS are that it requires little time to implement and allows for valid comparisons over time, across countries and/or regions, and among important demographic groups, such as different female- versus male-headed households (Deitchler et al., 2010).

Although the HHS captures food sufficiency it does not measure the full range of severity of the experiences (mild to severe) associated with food insecurity (Ballard et al., 2011). Due to the focus on the more severe food insecure behaviors, such as skipping meals or going to bed hungry, the HHS is generally only useful in contexts with severe food insecurity and, as such, was used heavily during the peak of the Somalia famine in 2011/12 (Maxwell et al., 2013). Similar indicators, such as FIES, ELCSA, or HFIAS may be more appropriate for detecting a fuller range.

On the other hand, when data are collected at the household level, the selected respondent, usually the primary food preparer, may not always be in a position to accurately represent the experience of all household members in considering responses to the questionnaire. That said, if any member of the household is reported as experiencing a food insecurity condition on the quedtionnaire, the entire household is classified as having experienced it too. This means that the indicator could potentially overestimate the number of *individuals* in households that are food insecure, while providing an accurate count of households with at least one member experiencing food insecurity. Relatedly bias may be introduced from the fact that the selected respondent's perception of their household's experience is not representative of all other household members (Coates et al., 2010).

Finally, while primarily used as a household-level indicator, the HHS can also be used as an individual-level indicator, although in that case results would not be comparable to other studies that use the HHS at the householdhold level.

Data Source

The HHS is a short module that can be collected as part of a household survey and consists of three questions (and three follow-up questions if the respondent answers 'yes'). Detailed guidance for adapting and implementing the indicator, as well as the module itself, is available in the HHS guide created by FANTA (Ballard et al., 2011).

Links to guidelines

- Ballard et al., (2011). "Household Hunger Scale: Indicator Definition and Measurement Guide"

Links to validation studies

- Deitchler et al., (2010). "Validation of a Measure of Household Hunger for Cross-Cultural Use"
- FANTA (website). "Validation of a Measure of Household Hunger for Cross-Cultural Use"

Food Security Dimensions

- Quantity

Food Composition Database Required?

No

End of Indicator: Household Hunger Scale (HHS)

Click to return to Table of Contents

Household share of animal protein in total protein consumption

Overview

The household share of animal protein in total protein acquisition and/or consumption is a household-level indicator that can be used as a proxy measure of diet quality at the population level. (Surveys that collect data on acquisition are a proxy for food consumption, as households may build food stocks or consume food stocks during the reference period, as compared to consumption based surveys which collect data on food consumed in a specified recall period (Fiedler et al., 2016). Both of these types (acquisition and consumption) collect information on food that is purchased, own-produced, or received as a transfer. A third type of Household Consumption and Expenditure Survey (HCES) collects a combination of acquisition and consumption data wherein households report what they acquired through purchases and what they consumed from own-production and transfers (Smith 2003)). Animal source protein is more likely than plant protein to be highly digestible and more easily utilized by the human body, in addition to having all of the essential amino acids, which cannot be synthesized by the body and must be acquired through the diet (Ghosh et al., 2012). Protein quality has significant impacts on nutritional status, and insufficient dietary protein quality has been linked to stunting in children (Semba et al., 2016; Ghosh et al., 2012). Protein quality is especially important for in populations where individuals are prone to frequent infections that both decrease intestinal absorption and increase the body's demand for protein to fight off infection (Ghosh et al., 2012). In addition, a higher percentage of animal source protein is likely to come with higher absolute consumption of animal source foods and likely to bring a variety of micronutrients that are either less frequent in other types of foods or less bioavailable in plant source foods.

Method of Construction

The data required to construct this indicator can be taken from a HCES that records both the type and quantities of foods acquired and/or consumed by each household (Smith et al., 2014). A food composition table (preferably local or regional, if available) is then used to estimate the protein composition of the foods recalled in the survey. The food commodities that are considered to be animal source foods are meat (red and white), fish, eggs, milk, and cheese (Moltedo et al., 2014). The share of animal protein in total protein consumption can be calculated using the fraction below, which is then multiplied by 100 to obtain the percent:

Total protein consumed from animal source foods (grams) / Total protein consumed from all foods (grams)

This indicator is one of several indicators included in the ADePT-FSM (Food Security Module) software package, which is a free standalone software developed by the FAO and the World Bank that allows users to easily derive food security indicators from household survey data. The software download and corresponding documentation can be found on the FAO website.

Please also see the Moltedo et al., 2014 book published by the World Bank, which provides detailed instructions for analyzing food security using household survey data.

Uses

This indicator is often used by the FAO, UNICEF, and national statistics bureaus for food security situation reports and nutrition reports. This indicator can also provide an understanding of changing patterns in diet quality over time, especially in populations with increasing or decreasing wealth, considering that higher incomes have been associated with greater consumption of or expenditure on animal source foods (Mayen et al., 2014).

Strengths and Weaknesses

This indicator provides information on one aspect of dietary quality at the population level based on household data and it can be produced using existing HCES data. However, since this indicator only measures one of many important aspects of diet quality, it should be used in conjunction with other indicators for a more comprehensive understanding of household diet quality such as the household share of dietary energy from non-staple foods. For this indicator to be accurate it is important that the food list is sufficiently detailed to match the diets of respondents. If the food list just includes “meat” as an aggregate category then it is difficult to match with specific values in the Food Composition Table, which can result in inaccuracies as the protein content varies by type of meat. Another drawback related to the HCES data source, but specific to this indicator, is that quantities of some animal source foods can be difficult to estimate given the varied cuts of meat and associated challenges of estimating the edible portion

Data Source

HCES data can be used to calculate this indicator. The World Bank Microdata Library has the most comprehensive and publically accessible repository of data (World Bank Microdata Library). Otherwise, data can be accessed – often for a fee – from the National Statistics Office, though each country has its own policies and procedures regarding data access. The International Household Survey Network (IHSN) is an informal network to promote data standards and dissemination (IHSN). National or regional Food Composition Tables should be used to identify the nutrient contents of the foods and can be found at Food and Agriculture’s (FAO) International Network of Food Data Systems (INFOODS) or the International Life Science Institute’s (ILSI) World Nutrient Databases for Dietary Studies (WNDDS). In addition, FBS could be used to calculate a similar indicator, such as the national average supply of protein. Alternatively, data from a 24-Hour Dietary Recall or Food Frequency Questionnaire (FFQ) could be used to allow for calculation of individual intake of specific food groups (e.g. animal source foods).

Links to guidelines

- Moltedo et al., (2014). "Analyzing food security using household survey data”
- Smith and Subandoro, (2007). "Measuring food security using household expenditure surverys"

Food Security Dimensions

- Quality

Food Composition Database Required?

Yes

End of Indicator: Household share of animal protein in total protein consumption

Click to return to Table of Contents

Household share of dietary energy from macronutrients

Overview

The household share of dietary energy based on acquisition or consumption from macronutrients is a household-level indicator that quantifies the percentage of caloric intake from the three major macronutrient groups: protein, fat, and carbohydrates. Surveys that collect data on acquisition are a proxy for food consumption, as households may build food stocks or consume food stocks during the reference period, as compared to consumption based surveys which collect data on food consumed in a specified recall period (Fiedler et al., 2016). Both of these types (acquisition and consumption) collect information on food that is purchased, own-produced, or received as a transfer. A third type of Household Consumption and Expenditure Survey (HCES) collects a combination of acquisition and consumption data wherein households report what they acquired through purchases and what they consumed from own-production and transfers (Smith 2003). These three macronutrients have distinct and important functions in the body, and all are necessary for proper growth, development and cognitive and physical functioning. Undernutrition and overweight/obesity due to improper macronutrient intake, and the related health complications, continue to be a major public health concern in the developing world (Muller & Krawinkel 2005).

Method of Construction

In order to estimate calories from the three macronutrients, data must be collected from a HCES that includes not just which foods were acquired or consumed, but also amount of food consumed. Then, using food type and the weight/volume consumed, a food composition database is used to estimate the amount of protein, fat, and carbohydrates (distinguishing between fiber and other forms of carbohydrates). The total grams of each nutrient are added together, and the caloric value of each is calculated using the following equation:

$$Calories(Kcal) = [Protein(g)*4] + [Fats(g)*9] + [\text{Av. } Carbohydrates(g)*4] + [Fiber(g)*2\ ] + [Alcohol(g)*7]$$

*Note in this equation, Total Carbohydrates = [Available Carbohydrates + Fiber]

Finally, the proportion of calories from each macronutrient is calculated by dividing the calories from each by the total calories consumed and multiplying by 100 to determine the percentage.

This indicator is one of several indicators included in the ADePT-FSM (Food Security Module) software package, which is a free standalone software developed by the FAO and the World Bank that allows users to easily derive food security indicators from household survey data. The software download and corresponding documentation can be found on the FAO website.

Please also see the Moltedo et al., 2014 book published by the World Bank, which provides detailed instructions for analyzing food security using household survey data. For more information on calculating this indicator, refer to the ‘Standardization Procedures’ on page 20 in the Moltedo et al., 2014

World Bank document.

Uses

This indicator provides an understanding of the overall balance of the populations' diet, as consuming disproportionately low or high amounts of energy from a given macronutrient may be a sign of under consumption (disproportionately high amount of total carbohydrates) or overconsumption (disproportionately high amount of lipids, and sometimes proteins) resulting in an imbalanced diet (Moltedo et al., 2014). Additionally, this indicator could add richness to the understanding of trends in changing energy consumption, providing information on not just changes in quantity but also changes in dietary balance.

Strengths and Weaknesses

This household level indicator for population based measurement reflects an important aspect of dietary quality. An additional strength of this indicator is that it can be constructed from existing HCES data, and is easy to communicate and interpret. However, as a household level indicator, it does not speak to distribution of macronutrients among members. Another drawback of this indicator is that it does not provide information on the consumption of micronutrients, which are also essential elements of diet quality. If the data come from household surveys, this indicator cannot be used for individual targeting.

Data Source

HCES data can be used to calculate this indicator. The World Bank Microdata Library has the most comprehensive and publically accessible repository of data (World Bank Microdata Library). Otherwise, data can be accessed – often for a fee – from the National Statistics Office, though each country has its own policies and procedures. The International Household Survey Network (IHSN) is an informal network to promote data standards and dissemination (IHSN). National or regional Food Composition Tables should be used to identify the nutrient contents of the foods and can be found at Food and Agriculture's (FAO) International Network of Food Data Systems (INFOODS) or the International Life Science Institute's (ILSI) World Nutrient Databases for Dietary Studies (WNDDS). In addition, Food Balance Sheet (FBS) data could be used to calculate a similar indicator, such as the national average supply of protein. Alternatively, 24-Hour Dietary Recall or Weighed Food Records could be used to calculate total individual macronutrient intake.

Links to guidelines

- Moltedo et al., (2014). "Analyzing food security using household survey data"
- Smith and Subandoro, (2007). "Measuring food security using household expenditure surverys"

Food Security Dimensions

- Quantity

- Quality

Food Composition Database Required?

Yes

End of Indicator: Household share of dietary energy from macronutrients

Click to return to Table of Contents

Household share of energy consumed from non-staples

Overview

The household share of dietary energy acquired or consumed from non-staples is an indicator of dietary quality that can be used to understand diet patterns at the household level. Surveys that collect data on acquisition are a proxy for food consumption, as households may build food stocks or consume food stocks during the reference period, as compared to consumption based surveys which collect data on food consumed in a specified recall period (Fiedler et al., 2016). Both of these types (acquisition and consumption) collect information on food that is purchased, own-produced, or received as a transfer. A third type of Household Consumption and Expenditure Survey (HCES) collects a combination of acquisition and consumption data wherein households report what they acquired through purchases and what they consumed from own-production and transfers (Smith 2003). Staples - including cereals, roots, and tubers - are generally the least expensive food items available and are also the least micronutrient-dense, thus a diet based predominantly on staple foods is associated with micronutrient deficiencies (Arimond et al., 2010 and Ruel 2003). A higher value of this indicator (i.e. higher consumption of non-staple foods) suggests higher dietary quality at the household level (Smith and Subandoro 2007).

Method of Construction

HCES data can be used to construct this indicator. Foods should be grouped into ‘staple’ and ‘non-staple.’ Staple foods are defined as cereals, roots, and tubers, and all other foods should be defined as non-staples (Smith and Subandoro 2007). A food composition table (preferably local or regional, if available) is then used to estimate the energy (kcal) composition of the foods recalled in the survey.

To calculate the household share of energy consumed from non-staples, multiply the following fraction by 100:

Total energy from non-staples (kcal)/Total energy from all foods (kcal)

A similar indicator, the household share of energy consumed from *staples*, is often calculated using the same method, the only difference being that the numerator is the total energy from staples and an inverse interpretation (Smith and Subandoro 2007).

Uses

This indicator can provide an understanding of diet quality within and across populations, and is a useful indicator for analyzing changes in dietary patterns over time, especially as these dietary changes relate to increased or decreased wealth and living standards. Typically, as populations become wealthier, they transition from diets that are high in starchy staples to diets that are more diverse and include more vegetables, fruits, legumes, and other non-staples (Lele et al., 2016).

Strengths and Weaknesses

This household level indicator can be used as a simple proxy for certain aspects of dietary quality and can be used to understand dietary quality at geographic scales smaller than the national level, provided that the HCES survey is sub-nationally representative. However, like other household-level indicators, it cannot be used to evaluate the diet quality of individuals within the household. Furthermore, this indicator could be misleading if ultra-processed foods are classified as non-staple foods, which could result in high fat and sugar intake, despite the appearance of low staple food consumption. Therefore, understanding the local context and food system is important.

Data Source

HCES data can be used to calculate this indicator. The World Bank Microdata Library has the most comprehensive and publically accessible repository of data (World Bank Microdata Library). Otherwise, data can be accessed – often for a fee – from the National Statistics Office, though each country has its own policies and procedures. The International Household Survey Network (IHSN) is an informal network to promote data standards and dissemination (IHSN). National or regional Food Composition Tables should be used to identify the nutrient contents of the foods and can be found at Food and Agriculture's (FAO) International Network of Food Data Systems (INFOODS) or the International Life Science Institute's (ILSI) World Nutrient Databases for Dietary Studies (WNDDS). In addition, Food Balance Sheet (FBS) data could be used to calculate a similar indicator, such as the national energy available from non-staples. Alternatively, 24-Hour Dietary Recall, a Food Frequency Questionnaire (FFQ) or Weighed Food Records could also be used to calculate an analogous indicator.

Links to guidelines

- Smith and Subandoro, (2007). "Measuring food security using household expenditure surveys"

Food Security Dimensions

- Quality

Food Composition Database Required?

Yes

End of Indicator: Household share of energy consumed from non-staples

Click to return to Table of Contents

Household share of food from various sources

Overview

The household share of food by source is an indicator that quantifies the contribution of a given food source (market, own production, gifts etc.) to total calories acquired or consumed by a household. Surveys that collect data on acquisition are a proxy for food consumption, as households may build food stocks or consume food stocks during the reference period, as compared to consumption based surveys which collect data on food consumed in a specified recall period (Fiedler et al., 2016). Both of these types (acquisition and consumption) collect information on food that is purchased, own-produced, or received as a transfer. A third type of Household Consumption and Expenditure Survey (HCES) collects a combination of acquisition and consumption data wherein households report what they acquired through purchases and what they consumed from own-production and transfers (Smith 2003). This indicator provides information on the extent to which food acquisition or consumption depends on the marketed food supply, and to what extent the household relies on its own production as a source of calories.

Method of Construction

Household food consumption data will most likely be obtained from a HCES, but only from those that include information on the source of all foods consumed. The standardized food sources are from: (1) own production, (2) purchase, (3) gifts/aid, and (4) other. As stated earlier, a majority of HCES record this information. Consumption data are transformed into standard units of weight or volume, and then national or local food composition databases are used to estimate calorie content of the consumed foods (Moltedo et al., 2014). For each of the four sources, the total numbers of calories consumed are totaled, and the indicator is calculated in the following way:

Total kcals obtained from [production/purchase/gifts/other] / Total kcals consumed from all sources

This indicator is one of several indicators included in the ADePT-FSM (Food Security Module) software package, which is a free standalone software developed by the FAO and the World Bank that allows users to easily derive food security indicators from household survey data. The software download and corresponding documentation can be found on the FAO website.

Please also see the Moltedo et al., 2014 book published by the World Bank, which provides detailed instructions for analyzing food security using household survey data, and provides more information on calculating this particular indicator under Table 1.5 ‘Shares of Food Consumption by Food Source’.

Uses

This household-level indicator provides a picture of the relative importance, in terms of energy, of various food sources for a population. It can provide useful information on the vulnerability of populations to either market shocks (if they rely heavily on purchases) or climate shocks (if they rely heavily on their own production). Additionally, in the context of fortification projects, this indicator can provide information on the potential coverage of fortified foods (which must be derived from the market) and what types of households may be unlikely to access fortified goods based on their food sources (Moltedo et al., 2014). The contribution of other food sources such as public food distribution programs and food received as wages also have policy relevance.

Strengths and Weaknesses

A strength of this indicator is that food source information has been included in about 85% of HCES , making it possible to calculate this indicator for many countries and across time (Fiedler & Mwangi 2016). Thus, the indicator can be used to assess the impact of national or sub-national changes in growing conditions, market conditions, or any other conditions that may affect how households obtain food. This indicator is derived from HCES data, and therefore can be updated only as frequently as a new HCES is conducted (Fiedler & Mwangi 2016). One weakness of this indicator is that it is based on calories only, and does not provide insight into the specific foods or food groups contributing to consumption, or the distribution of calories among household members. It also does not reveal the stability of the food sources or the relative costs a household must incur in order to obtain food from the various sources. Furthermore, one particular issue is estimation of quantities at the household level. HCES frequently rely on expenditure and/or non-standard units, which can be challenging to convert to precise quantities.

Data Source

HCES data can be used to calculate this indicator. The World Bank Microdata Library has the most comprehensive and publically accessible repository of data (World Bank Microdata Library). Otherwise, data can be accessed – often for a fee – from the National Statistics Office, though each country has its own policies and procedures. The International Household Survey Network (IHSN) is an informal network to promote data standards and dissemination (IHSN). National or regional Food Composition Tables should be used to identify the nutrient contents of the foods and can be found at Food and Agriculture's (FAO) International Network of Food Data Systems (INFOODS) or the International Life Science Institute's (ILSI) World Nutrient Databases for Dietary Studies (WNDDS).

Links to guidelines

- Moltedo et al., (2014). "Analyzing food security using household survey data"

Food Security Dimensions

- Quantity
- Quality

Food Composition Database Required?

Yes

End of Indicator: Household share of food from various sources

Click to return to Table of Contents

Inadequacy of specific micronutrient intake

Overview

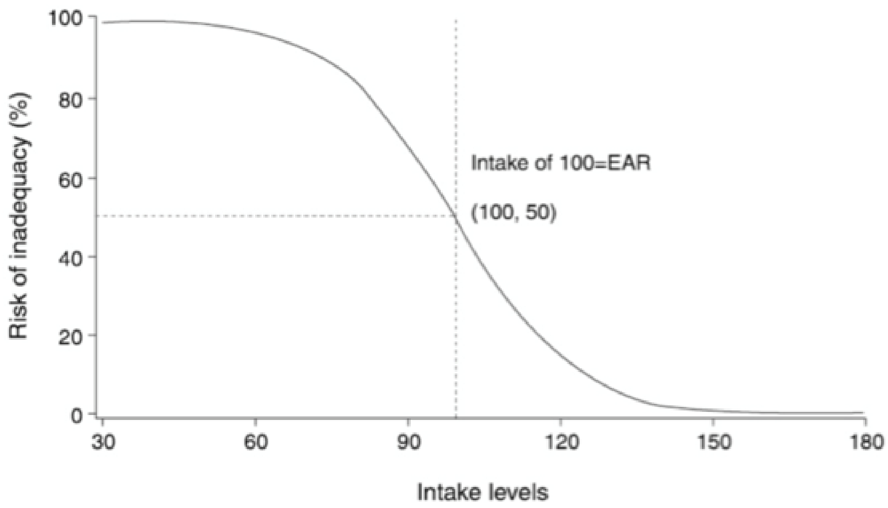
The inadequacy of micronutrient intake is an indicator that estimates the percent of a given population that is at risk of inadequate intake for a specific micronutrient. Two methods can be used to assess inadequacy: Estimated Average Requirement (EAR) fixed cut-point method, or the probability method. Both methods require nutrient intake data for a population that has been adjusted to represent the distribution of “usual” nutrient intakes. Micronutrients are of particular nutritional importance because malnutrition due to micronutrient deficiency continues to be a widespread problem in poor and developing countries. Micronutrients, such as iron, iodine, vitamin A, and zinc, are essential not just for infants and children to ensure proper growth and development, but are also necessary for adults for continued work productivity, healthy pregnancies, and overall cognitive and physical health (Muller & Krawinkel 2005). It is important to note that the EAR fixed cut-point method cannot be used for iron in the case of menstruating women and young children due to a highly skewed requirement distribution as a result of increased iron needs. The other indicators that interpret individual intake data in the Data4Diets platform include Mean Adequacy Ratio (MAR), total individual micronutrient intake, total individual macronutrient intake, and total individual energy intake.

Method of Construction

Both methods of calculating this indicator require nutrient intake data for a population, which has been adjusted to represent the distribution of “usual” nutrient intakes. The data used to estimate this distribution are collected using quantitative dietary assessment techniques, such as repeated 24-hour dietary recalls or multiple-day weighed food records, which are then translated into nutrient intakes using national or regional Food Composition Tables. To provide accurate estimates of the percent of a population at risk of inadequate intake, repeated intakes (either 24-Hour Dietary Recall or Weighed Food Records) are required on at least a sub-sample of the population, in order to account for day-to-day variation.

The EAR fixed cut-point approach plots the EAR value onto the distribution of “usual” nutrient intakes to establish a cut-point, and calculates the percent of intakes that fall below that point to estimate the percent of the population at risk of inadequate intakes. The EAR for a nutrient is its estimated average requirement for a population (i.e., 50% of the population will have a requirement >EAR and 50% will have a requirement <EAR in relation to their usual nutrient intakes). See Figure 1 below for a visual representation of this method:

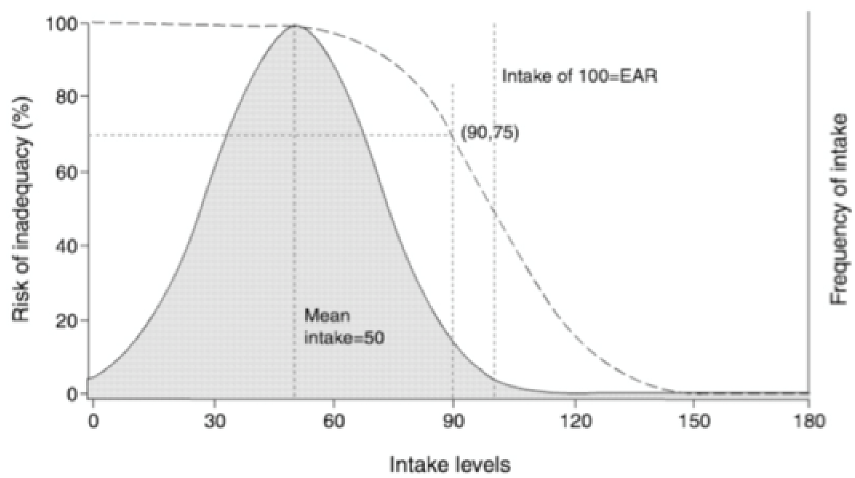
Figure 1



Source: Institute of Medicine. (2000). ‘Dietary Reference Intakes: Applications in Dietary Assessment ‘

The probability approach uses intake data from the study population to construct a distribution of intakes for that population, and uses this distribution of intakes along with the distribution of “usual” requirements to estimate the percent at risk of inadequate intakes in the population. See Figure 2 below for a visual representation of this method:

Figure 2



Source: Institute of Medicine. (2000). ‘Dietary Reference Intakes: Applications in Dietary Assessment ‘

The probability of inadequacy can be manually calculated as a weighted average of the risk of inadequacy at each potential level of intake. To perform this calculation, the requirement distribution is divided into categories based on gender and age, and the number of people from the population with nutrient intakes falling into each category is determined and multiplied by the probability of inadequacy for that category. These values are summed across all categories and then divided by the total population and multiplied by 100 to estimate the percent at risk of inadequate intakes in the population.

For an explanation of situations in which the cut-off method can be used, refer to Box 4-2 in the DRI document (IOM 2000). For a list of nutrients for which the probability approach can be used, refer to Table 4-1 in the same document (IOM 2000).

For more detail on using both the probability and cut-point methods for estimating inadequacy, refer to Chapter 4 of the DRI document (IOM 2000). To read about DRIs and their appropriate uses, refer to the following paper published in Public Health Nutrition (Murphy & Poos, 2002).

Uses

This indicator is used to estimate the percent of a given population that is at risk of inadequate intakes of individual nutrients, so it can be used to identify the need for nutrient-specific interventions such as fortification or supplementation.

Strengths and Weaknesses

The main strength of this method is that it provides an estimate of the percent of a population that is at risk of inadequate intake of specific nutrients. Although this indicator does not provide a measure of overall dietary adequacy in a single index, it does provide a measure of overall dietary adequacy when the percent at risk of inadequate intakes is calculated for multiple nutrients separately. A weakness, however, is that this indicator requires an EAR, which is unknown for certain nutrients, and is unknown for most nutrients during infancy. In addition, the DRIs for many nutrients, such as iron and zinc, vary depending on the assumed absorption, which can differ depending on the type of food consumed. Therefore, this indicator (and any others that rely on nutrient requirements) can only estimate the risk of inadequate nutrient intake, rather than confirming deficiency. Although this indicator uses individual-level dietary data, it can only be used to estimate risk of inadequate intake at the population level, and cannot be used to identify individuals who are deficient or at risk of inadequacy (Yates et al., 1998).

Data Source

The data used to estimate the “usual” distribution of intakes for a nutrient are collected using quantitative dietary assessment techniques, such as repeated 24-Hour Dietary Recalls, multiple-day Weighed Food Records, or quantitative Food Frequency Questionnaires, which are then translated into nutrient intakes using national or regional Food Composition Tables. As noted above, repeated intakes are required on at least a sub-sample of the population.

The FAO/WHO Global Individual Food consumption data Tool (FAO/WHO GIFT) is a source for individual level quantitative dietary data. The FAO/WHO GIFT aims to make publically available existing quantitative individual food consumption data from countries all over the world. Food Composition Tables can be found at the Food and Agriculture's (FAO) International Network of Food Data Systems (INFOODS) or the International Life Science Institute's (ILSI) World Nutrient Databases for Dietary Studies (WNDDS). Estimated Average Requirements (EARs) can be obtained from the Institute of Medicine (Institute of Medicine 2006), or other country-specific national sources

Links to guidelines

- National Research Council, (1986). "Chapter 5: the probability approach in nutrient adequacy: Assessment using food consumption surveys"
- IOM, (2006). "Dietary Reference Intakes: The essential guide to nutrient requirements"
- IOM, (2000). "Dietary Reference Intakes: Applications in Dietary Assessment"

Links to validation studies

- Murphy and Poos, (2002). "Dietary Reference Intakes: summary of applications in dietary assessment"

Food Security Dimensions

- Quality

Food Composition Database Required?

Yes

End of Indicator: Inadequacy of specific micronutrient intake

Click to return to Table of Contents

Latin American and Caribbean Food Security Scale (ELCSA)

Overview

The Latin American and Caribbean Food Security Scale (ELCSA) is one of the four experience-based food insecurity scales included in the Data4Diets platform, which also contains the Household Hunger Scale (HHS), the Household Food Insecurity Access Scale (HFIAS), and the Food Insecurity Experience Scale (FIES). The ELCSA was released in 2010 during a United Nations sponsored summit to create an experience-based scale specifically for the Latin America and Caribbean context (Ballard et al.2013). It was adapted from two existing scales used in Brazil (Perez-Escamilla et al., 2004) and Colombia (Alvarez et al., 2006), as well as from the US Household Food Security Survey Module (US HFSSM) and the HFIAS (Ballard et al., 2013). It has subsequently been used by the Food and Agriculture Organization (FAO) in the Latin American and Caribbean region, and served as one basis for developing the FIES.

Method of Construction

This scale uses a set of 15 questions, with yes/no response categories, seven of which are for households with children. Each question asks the respondent whether he/she or any other household member has experienced a certain manifestation of food insecurity in the previous three months. A raw score is constructed by assigning a weight of ‘1’ to each question with an affirmative answer (‘yes’). Total raw scores range from 0 to 8 (for households without children) or 0 to 15 (for households with children).

Households can be classified as mildly, moderately, or severely food insecure according to the following categorization algorithm (FAO 2012):

- *For households with minors*: ‘household food secure’ (score=0), ‘mild household food insecurity (score=1-5), ‘moderate household food insecurity’ (score=6-10), ‘severe household food insecurity’ (score=11-15).
- *For households with members above the age of 18*: ‘household food secure’ (score=0), ‘mild household food insecurity’ (score=1-3), ‘moderate household food insecurity’ (score=4-6), ‘severe household food insecurity’ (score=7-8) (Shamah-Levy et al. 2016).

A detailed manual on construction and use of ELCSA is available in Spanish from the FAO (FAO 2012). To view the questionnaire in English, refer to Table 1 in the following paper published in The Journal of Nutrition (Perez-Escamilla et al., 2009).

Uses

This indicator can be used to provide information about the distribution and severity of insecure food access in the population. If additional demographic and socio-economic data are collected along with the ELCSA, it can be used to better understand the location and characteristics of those who are most affected by food insecurity (Dallmann et al., 2015). This information can be used to develop targeted policies, inform the allocation of resources, evaluate programmatic impacts, and build political will to combat food insecurity. Additionally, validation studies have shown ELCSAs effectiveness for use in various Latin American and Caribbean countries (Perez-Escamilla et al., 2008, Munoz-Astudillo et al., 2010), making it an obvious choice to use in these contexts.

Like the other experience-based food insecurity scales, ELCSA does not quantify food consumption nor assess diet quality; doing so requires other methods and indicators such as a quantitative 24-hour dietary recall to quantify food consumption to calculate the Mean Adequacy Ratio (MAR) or a diet diversity index to determine the Minimum Dietary Diversity Score for Women (MDD-W) in order to gain a picture of the 'adequacy' aspect of diet quality..

Strengths and Weaknesses

One strength of ELCSA, and other experience-based food insecurity scales, is that it is uniquely able to detect aspects of food insecurity involving decreased access to a sufficient quantity or quality of food and also the psychosocial manifestations of anxiety and uncertainty around food access, which can also affect health and wellbeing (Ballard et al., 2013). It is also relatively short and can easily be added as a module to other household surveys.

On the other hand, when data are collected at the household level, the selected respondent, usually the primary food preparer, may not always be in a position to accurately represent the experience of all household members in considering responses to the questionnaire. That said, if any member of the household is reported as experiencing a food insecurity condition on the quedtionnaire, the entire household is classified as having experienced it too. This means that the indicator could potentially overestimate the number of *individuals* in households that are food insecure, while providing an accurate count of households with at least one member experiencing food insecurity. Relatedly bias may be introduced from the fact that the selected respondent's perception of their household's experience is not representative of all other household members (Coates et al., 2010).

Data Source

The source of data for this indicator is household survey data collected via interview with the household member who is primarily responsible for the household's food provisioning.

Links to guidelines

- Perez-Escamilla et al., (2011). "Are the Latin American and Caribbean Food Security Scale (ELCSA) items comparable across countries?"
- Perez-Escamilla et al., (2008). "Validity of the Latin American and Caribbean Household Food Security Scale (ELCSA) in Guanajuato, Mexico"
- Munoz-Astudillo et al., (2010). "Validating Latin-American and Caribbean Latin-American food security scale on pregnant adolescents"
- Perez-Escamilla et al., (2008). "Validity of the Latin American and Caribbean Household Food Security Scale (ELCSA) in South Haiti"

Links to validation studies

- Munoz-Astudillo et al., (2010). "Validating Latin-American and Caribbean Latin-American food security scale on pregnant adolescents"
- Perez-Escamilla et al., (2008). "Validity of the Latin American and Caribbean Household Food Security Scale (ELCSA) in South Haiti"
- Perez-Escamilla et al., (2008). "Validity of the Latin American and Caribbean Household Food Security Scale (ELCSA) in Guanajuato, Mexico"

Food Security Dimensions

- Quantity

Food Composition Database Required?

No

End of Indicator: Latin American and Caribbean Food Security Scale (ELCSA)

Click to return to Table of Contents

Market-level food diversity score

Overview

Poor rural market development could be a significant factor determining access to, and consumption of, diverse foods, but this type of information is not captured by household level indicators like the Household Dietary Diversity Score (HDDS). The diversity of foods available in local markets, referred to as a market-level diversity score represents the number of distinct foods or food groups available in a local market at a given point in time (Pingali and Ricketts 2014). Although this indicator has not been fully developed nor widely used, it presents an opportunity to fill a gap in the data on factors, such as availability and access to food, that influence household and individual diet diversity. This indicator is considered an 'emerging indicator' because it has not been fully validated and is not in common use

Method of Construction

The market-level food diversity score is proposed to be constructed in a manner that is analogous to the HDDS. The same 12 food groups that are used in the HDDS could be used to count the number of food groups available in a local marketplace and develop a score using the HDDS guidelines (Swindale et al 2006). The broad concept for construction of this indicator is explored in Pingali and Ricketts (2014).

The market-level food diversity score indicator is discussed in Pingali and Ricketts (2014), however it has not yet been developed and formally validated. Inspiration for construction of such an indicator could be drawn from several sources. For example, the Environmental Profile of a Community's Health (EPOCH) tool provides guidelines on how to assess fruit and vegetable availability in local markets (Miller et al., 2016; Chow et al., 2010). In addition, a simple, unweighted count of smallholder production diversity has been used in studies to investigate factors influencing household dietary diversity (Sibhatu et al. 2015). These methods, or others, could potentially be adapted for the construction of a market-level food diversity score (Jones et al., 2014; Koppmair et al., 2016).

Uses

This indicator could be useful for understanding the reasons why households with market access may consume diets lacking diversity. Household market access has been shown to positively affect household diet diversity, but this relationship depends on properly functioning markets (Sibhatu et al., 2015). This indicator could be used to identify markets that are lacking in diverse foods, which could prompt further analysis and identification of areas of agricultural production and market-level mechanisms (e.g. storage, processing, transportation) that need greater investment to improve market function (Pingali and Ricketts 2014). A market-level food diversity score could also be used to monitor, and evaluate interventions that aim to improve market function and availability of diverse foods.

Strengths and Weaknesses

This indicator could help to explain why households may consume diets lacking diversity and could highlight constraints in the supply rather than affordability of foods. Although no formal guidelines or validation studies have been published for a market-level food diversity score, its development presents an opportunity to improve the understanding of how local markets might be a help or a hindrance for achieving household and individual dietary diversity.

Data Source

Any indicator of diversity of foods in markets is likely to require primary data collection in appropriate (local) markets, with attention to geographic location and seasonal variation. Depending on the objectives of the research or intervention, data must be collected from a representative sample of markets to construct this indicator. Information is needed on where communities obtain purchased food, and on the timing of markets, in order to collect these data.

Links to guidelines

- Pingali and Ricketts, (2014). "Mainstreaming nutrition metrics in household surveys"

Food Security Dimensions

- Quantity
- Quality
- Stability

Food Composition Database Required?

No

End of Indicator: Market-level food diversity score

Click to return to Table of Contents

Mean Adequacy Ratio (MAR)

Overview

The Mean Adequacy Ratio (MAR) is a member of the class of indicators that are used to evaluate individual intake of nutrients. This index quantifies the overall nutritional adequacy of a population based on an individual's diet using the current recommended allowance for a group of nutrients of interest (HatlØy et al., 1998). It was first developed in the 1970s as a way to evaluate the effectiveness of food stamps in rural Pennsylvania (Madden & Yoder 1972). The MAR is based on the Nutrient Adequacy Ratio (NAR), a measure that expresses an individual's intake of a nutrient as a percentage (capped at 100%) of the corresponding recommended allowance for that nutrient, given the respondent's age and sex. The MAR is then calculated by averaging the NAR. The other indicators in the Data4Diets platform that measure individual nutrient intake include: total macronutrient intake, probability of inadequate intake, total individual micronutrient intake, and total individual energy intake. Rather than quantifying caloric intake, the MAR scales data on total nutrient intake to derive a comprehensive indicator of overall dietary adequacy, although it does not capture issues related to overconsumption or under-consumption.

Method of Construction

The first step to estimate the MAR is to estimate the NAR for all nutrients of interest. The NAR is equal to the ratio of an individual's nutrient intake to the current recommended allowance of the nutrient for his or her age and sex, and can be represented as a ratio or as a percentage. In the United States, this recommended allowance is referred to as the Recommended Dietary Allowance (RDA), whereas in many other countries, it is referred to as the Recommended Nutrient Intake (RNI).

If the intake of a nutrient exceeds the RDA/RNI, the NAR is capped at 100% or 1, depending on whether it is expressed as a percentage or ratio. This prevents nutrients with very high intake (NAR value > 1) from masking nutrients with very low intake (low NAR value) when they are averaged to calculate the MAR (Hatloy et al., 1998).

Once the NAR is calculated for each nutrient, the MAR is calculated by averaging all the NAR values together, as demonstrated in the equation below:

MAR = Sum of NAR / Number of Nutrients (multiply by 100 if representing as a percentage)

The MAR is reported on a scale from 0 to 100% (or 1), where 100% (or 1) indicates the requirements for all the nutrients were met.

When repeated measurements of nutrient intake are available for at least a subsample of individuals, the "probability approach" can be calculated. The repeated days are required to adjust the population nutrient intake distribution to take account of the intra-subject variability. This process allows for the usual intake distribution to be calculated allowing measurement of the individual probability of inadequacy for each nutrient and a mean probability of adequacy (MPA) over a range of nutrients (Arimond et al., 2010).

For more information on how to calculate this indicator, please see the highly detailed Methods section of the following paper published in European Journal of clinical Nutrition: (Hatloy et al., 1998).

Uses

Data are collected at the individual level to assess nutrient adequacy of populations, and can be calculated to include or exclude nutrients depending on programmatic or research priorities. The MAR has been used to validate dietary diversity indicators, and can provide additional context when examined in conjunction with standard individual dietary diversity scores (Acham et al., 2012 , Steyn et al., 2014). As an index, it does not reveal which micro- or macronutrients are or are not consumed in adequate amounts, and instead provides a general picture of adequacy aspects of an individual's diet quality within a population. Total intake for an individual micronutrient or macronutrient may be more appropriate if disaggregated information on specific nutrients is needed. In addition, data on individual intake can be paired with findings on individual health outcomes or demographic information, such as religion, income, education, or other characteristics of interest in order to assess differences between sub-population groups based on various other demographic characteristics.

Strengths and Weaknesses

One strength of this indicator is that it allows researchers to consider and communicate a population's overall nutritional adequacy, rather than focusing on specific nutrients that may not alone indicate healthy diet composition (for example the NAR only investigates one nutrient at a time). However, this indicator is based on the Recommended Dietary Allowance (RDAs) or Reference Nutrient Intake (RNIs), which are estimates of the necessary nutrient intake to meet the requirement of 97-98% of healthy people, and may vary for some nutrients (like zinc and iron) depending on the assumed absorption, which can differ depending on the type of food consumed (Institute of Medicine 2006). Thus, even a MAR of 1 (meaning requirements of all nutrients are met) does not guarantee that a population's needs are met nor that individuals within the population can properly absorb and use the nutrients. Additionally, a MAR below 1 does not necessarily indicate a population suffers from nutritional deficiencies, inherent in the way that the RDAs/RNIs are defined, the cut-off amount is actually above the required intake for all but 2-3% of the population (Institute of Medicine 2000). Thus, a population's nutritional status cannot be inferred from this measure (Institute of Medicine 2000).

Data Source

Individual level dietary data can be obtained from Weighed Food Records, quantitative 24-Hour Dietary Recalls, or quantitative Food Frequency Questionnaires.

The FAO/WHO Global Individual Food consumption data Tool (FAO/WHO GIFT) is a source for individual level quantitative dietary data. The FAO/WHO GIFT aims to make publically available existing quantitative individual food consumption data from countries all over the world. National or regional Food Composition Tables should be used to identify the nutrient contents of the foods and can be found at Food and Agriculture's (FAO) International Network of Food Data Systems (INFOODS) or the International Life Science Institute's (ILSI) World Nutrient Databases for Dietary Studies (WNDDS). RDAs/RNIs can be obtained from the Institute of Medicine for the United States (Institute of Medicine 2006), from the British Nutrition Foundation for the United Kingdom (British Nutrition Foundation 2016), or the European Food Safety Authority of the European Union (EFSA 2017). As an alternative to country specific RDAs/RNIs (e.g. if they do not exist for the country of interest), the FAO/WHO global RNIs can be used (FAO/WHO, 2001).

Links to guidelines

- Hatloy et al., (1998). "Food variety – a good indicator of nutritional adequacy of the diet? A case study from an urban area in Mali, West Africa"

Links to validation studies

- Steyn et al., (2014). "Which dietary diversity indicator is best to assess micronutrient adequacy in children 1 to 9 y?"

Food Security Dimensions

- Quality

Food Composition Database Required?

Yes

End of Indicator: Mean Adequacy Ratio (MAR)

Click to return to Table of Contents

Meat consumption

Overview

Quantity of meat consumption, estimated based on Food Balance Sheets (FBS), is a dietary indicator that can be used to understand trends in dietary patterns, dietary quality, and environmental sustainability of national diets. Animal source proteins are more readily used by the human body compared to plant proteins, and provide all the essential amino acids that cannot be synthesized by the body and must be consumed in diets (Ghosh et al., 2012). Inadequate protein consumption is associated with severe and chronic infections and fatty degeneration of organs, disease burdens for which women and children in developing countries are particularly at risk (Müller & Krawinkel 2005). However, from an environmental perspective, meat produces more greenhouse gas per kilogram than plant source proteins (Scarborough et al., 2014). In addition, from a broader food security perspective, livestock consume about one third of global cereal production and use about 40% of arable land (Mottet et al., 2017).

It is important to note that different types of meat have various impacts on health, also depending on the quantity consumed. For example, higher consumption of red meat is associated with an increased risk of cardiovascular disease and cancer mortality (Pan et al., 2012). More generally, animal source proteins are more likely than plant proteins to be highly digestible and more easily utilized by the human body, in addition to having all of the essential amino acids, which cannot be synthesized by the body and must be acquired through the diet (Ghosh et al., 2012). This indicator does not include other animal source foods such as eggs, fish, or dairy. They are excluded in part because they have a lower impact on greenhouse gas emissions, a primary measurement of a food's environmental impact.

Method of Construction

Currently, the most straightforward way to find data for this indicator is to download the food supply quantity by type of meat directly from the Food and Agriculture Organization (FAO) on the FAOSTAT website. These data can then be summed across type of meat to come up with the total kilograms per capita. The food supply quantity is based on the following formula:

= starting stocks + (quantity imported + quantity produced) – (quantity exported + seed + animal feed + waste + other non-food uses) - ending stocks (FAO 2001)

The food supply quantity is essentially the food available for consumption in a given country.

Uses

This indicator can be used to proxy meat consumption in the 245 countries and territories that FAOSTAT tracks. Meat production (poultry, beef, veal, pork, lamb, mutton, goat, offal, and other) results in more greenhouse gas per kilogram than plant source proteins, and rising meat consumption in a country increases the carbon footprint of food production (Scarborough et al., 2014

). Therefore, tracking the meat supply available at the national level may be important in light of the Sustainable Development Goals, particularly 12 and 13, which focus on responsible consumption, production, and actions to slow climate change. This indicator can illustrate trends in meat consumption, which may be of increasing importance as countries continue to develop, since higher meat consumption is associated with increasing incomes (Daniel et al., 2011). The FBS permits disaggregation by type of meat, but provides supply data only at the national level. For more disaggregated information and sub-group analysis, household or individual level survey data are needed, and an analysis based on food groups and meat consumption must be conducted. Indicators such as the household share of animal protein in total protein consumption, total individual macronutrient intake, or total individual micronutrient intake could also be calculated.

Strengths and Weaknesses

One strength of this indicator is that it is easily constructed using FBS data, and the data used for the indicator are regularly updated by national governments and are centrally located in FAOSTAT in a standard format. This approach allows users to filter for various kinds of meat. Different types of meat have varying levels of environmental impact based on its animal source. For example, one kilogram of beef produces greenhouse gas emissions seven times as large as the same quantity of poultry (Scarborough et al., 2014).

However, a downside of this indicator is that it does not reflect actual meat consumption but meat availability in a given country. In addition, since the indicator is a national-level estimate, it cannot be disaggregated by age, sex, or by any geographic scale smaller than the national level, nor can it detect disparities in protein consumption across population groups or seasons, as is possible with individual-level dietary data. Although the FBS accounts for food losses incurred at the distribution and processing level, it does not account for plate waste at the household or individual level (Lele et al., 2016).

Data Sources

The main source of data for this indicator are the FBS data on the FAOSTAT website, that disaggregates elements of utilization and supply, and estimates total food available for human consumption. FAO pairs this information with food composition data to produce information on the national supply of energy and macronutrients (per capita/day). In addition, Household Consumption and Expenditure Surveys (HCES) could be used to calculate a similar indicator, such as the household share of animal protein in total protein consumption. Alternatively, data from a 24-Hour Dietary Recall or Food Frequency Questionnaire (FFQ) could be used to allow for calculation of individual intake of specific food groups (e.g. animal source foods).

Links to guidelines

- OECD, 2017. "Meat Consumption"

Food Security Dimensions

- Quantity
- Quality
- Sustainability

Food Composition Database Required?

No

End of Indicator: Meat consumption

Click to return to Table of Contents

Minimum Acceptable Diet (MAD)

Overview

The Minimum Acceptable Diet (MAD) for children 6-23 months old, is one of eight core indicators for assessing infant and young child feeding (IYCF) practices developed by the WHO and finalized at the WHO Global Consensus Meeting on Indicators of Infant and Young Child Feeding in 2007. These eight indicators were developed to provide simple, valid, and reliable metrics for assessing the many aspects of IYCF that are of interest at the population level (WHO 2008). The other seven indicators are: early initiation of breastfeeding; exclusive breastfeeding under 6 months; continued breastfeeding at 1 year; introduction of solid, semi-solid, or soft foods; minimum dietary diversity; minimum meal frequency; and consumption of iron-rich or iron-fortified foods. The MAD indicator is a composite indicator composed of the Minimum Dietary Diversity (MDD) and Minimum Meal Frequency.

Method of Construction

This indicator is calculated separately for breastfed and non-breastfed children and includes information on two components:

Minimum Dietary Diversity: Breastfed child consumed foods from 5 out of 8 of the food groups during the previous day. See the MDD indicator for infants and young children for more information on the food groups and how the indicator is calculated.

Minimum meal frequency: Child receives solid, semi-solid, or soft foods (but also includes milk for non-breastfed children) the minimum number of times or more over the previous day. (See the WHO 2008 reference for more detailed information on this indicator). The minimum number of times are:

- 2 times for breastfed infants 6-8 months
- 3 times for breastfed children 9-23 months
- 4 times for non-breastfed children 6-23 months

To calculate the indicator, information on breastfed and non-breastfed children is combined by adding the following two fractions:

Breastfed children 6-23 months of age who had at least the Minimum Dietary Diversity and the minimum meal frequency during the previous day / Breastfed children 6-23 months of age

AND

Non-breastfed children 6-23 months of age who received at least 2 milk feedings and had at least the Minimum Dietary Diversity not including milk feeds and the minimum meal frequency during the previous day / Non-breastfed children 6-23 months of age

Note: The WHO recommends that this indicator be further disaggregated and reported for the following age groups: 6-11 months, 12-17 months, and 18-23 months of age (WHO 2008).

Uses

The MAD, along with the other seven IYCF indicators, was developed for assessment at the population level in order to make comparisons across and within countries, to describe trends over time, to target/identify populations at risk, target interventions, make policy decisions about resource allocation, and serve as an impact measure when monitoring and evaluating IYCF programs. Because the MAD indicator captures multiple dimensions of feeding, it can be used for comparisons across populations with different rates of continued breastfeeding or be presented by breastfed and non-breastfed children (WHO 2008).

Strengths and Weaknesses

One advantage of this indicator is that it is relatively simple to calculate and interpret and is applicable across sociocultural contexts. It is also applicable for both breastfed and non-breastfed children. Analyses have shown that the MAD indicator is associated with child anthropometric status, particularly stunting (Jones et al., 2013). However, a weakness of this indicator is that it does not provide quantitative information about children’s food and nutrient intake. The indicator was designed to capture optimal complementary feeding patterns (based on WHO recommendations), but it was not designed to capture excessive intake of energy, sugar, or fat that would inform about risks for overweight and obesity (Lele et al., 2016).

Data Source

The MAD indicator can be constructed from a short Food Frequency Questionnaire (FFQ) style module administered to the child’s caretaker, usually as part of the IYCF module. Example questionnaires can be found in the WHO (2008) Indicators for assessing infant and young child feeding practices document, which includes 1) a household roster, 2) an initiation of breastfeeding module, and 3) an infant and young child feeding module. This indicator is also available for many countries in the United Nations International Children’s Emergency Fund’s (UNICEF) Infant and Young Child Feeding Database and is collected as part of many Demographic Health Surveys (DHS).

Links to guidelines

- WHO, (2008). "Indicators for assessing infant and young child feeding practices (Part 1 Definitions)"
- WHO, (2010). "Indicators for assessing infant and young child feeding practices (Part 2 Measurement)"
- WHO/UNICEF (2017). "Global Nutrition Monitoring Framework: operational guidance for tracking progress in meeting targets for 2025"

Links to validation studies

- Dewey, (2006). "Developing and validating simple indicators of complementary food intake and nutrient density for breastfed children in developing countries"

Food Security Dimensions

- Quantity
- Quality

Food Composition Database Required?

No

End of Indicator: Minimum Acceptable Diet (MAD)

Click to return to Table of Contents

Minimum Dietary Diversity (MDD)

Overview

The minimum dietary diversity (MDD) score for children 6-23 months old is a population-level indicator designed by the World Health Organization (WHO) to assess diet diversity as part of infant and young child feeding (IYCF) practices among children 6-23 months old. This indicator is one of eight IYCF indicators developed by the WHO to provide simple, valid, and reliable metrics for assessing IYCF practices at the population level (WHO 2008). The other seven indicators are: early initiation of breastfeeding; exclusive breastfeeding under 6 months; continued breastfeeding at 1 year; introduction of solid, semi-solid, or soft foods; minimum acceptable diet; minimum meal frequency; and consumption of iron-rich or iron-fortified foods. The MDD is also a component of the Minimum Acceptable Diet (MAD) indicator, which is a composite indicator.

Method of Construction

Data are gathered from a questionnaire administered to the child’s caregiver, usually as part of the IYCF module. Respondents are asked to indicate whether or not their child consumed any food over the previous 24 hours from each of seven food groups. The seven food groups included in the questionnaire are:

MDD Food Groups	
1.	Grains, roots, and tubers
2.	Legumes and nuts
3.	Dairy products
4.	Flesh foods
5.	Eggs

6.	Vtamin-A rich fruits and vegetables
7.	Other fruits and vegetables

The total number of food groups consumed is summed. The population level indicator is calculated based on the following formula:

Children 6-23 months of age who received foods from 4 food groups during the previous day / Total number of children 6-23 months of age surveyed

For more information on calculating this indicator, refer to the WHO measurement guidelines (WHO 2010).

Uses

Child dietary diversity has been shown to be positively associated with mean micronutrient adequacy of the diet (FANTA 2006). Thus, the MDD can be useful in capturing a population-level picture of infant and young child diet quality and appropriate complementary feeding practices (FANTA 2014). As a simple and easy to interpret indicator, the MDD is appropriate for population-level targeting, monitoring and assessment and target setting. The MDD only reflects the complementary feeding diet, not breastfeeding status; the MAD should be used if the objective is to measure both breastfeeding status and complementary feeding (WHO 2008).

Strengths and Weaknesses

One advantage of the MDD is that it is simple to collect, tabulate, and interpret and is applicable across sociocultural contexts. In addition, it can be applied to both breastfed and non-breastfed children between 6 and 23 months old (although these scores should not be directly compared to each other), since it is an indicator of complementary feeding and thus breastmilk is excluded from the list of foods. It is also easily disaggregated into smaller age groups, including 6-11 months, 12-17 months and 18-23 months (WHO 2008).

However, this indicator cannot be used to compare populations with different rates of continued breastfeeding, nor can it be used to compare the same population over time if rates of breastfeeding have changed (WHO 2008). The indicator, however, has been extensively validated and shown to be associated with micronutrient adequacy of the diet in multiple countries and contexts (Arimond et al., 2010, Moursi et al., 2008). Research has shown that the ability of child dietary diversity scores to represent micronutrient adequacy could be improved by either imposing consumption minimums or by assigning different weights to the food groups based on nutrient content (Gewa et al., 2014).

Data Source

The MDD indicator can be constructed, as other dietary diversity measures, from a short Food Frequency Questionnaire (FFQ) style module administered to the child's caretaker, usually as part of the IYCF module. Example questionnaires can be found in the WHO (2008) Indicators for assessing infant and young child feeding practices document, which includes 1) a household roster, 2) an initiation of breastfeeding module, and 3) an infant and young child feeding module. This indicator is also available for many countries in the United Nations International Children's Emergency Fund's (UNICEF) Infant and Young Child Feeding Database (UNICEF), and is collected as part of many Demographic Health Surveys (DHS).

Links to guidelines

- WHO, (2008). "Indicators for assessing infant and young child feeding practices (Part 1 Definitions)"
- WHO, (2010). "Indicators for assessing infant and young child feeding practices (Part 2 Measurement)"
- WHO/UNICEF (2017). "Global Nutrition Monitoring Framework: operational guidance for tracking progress in meeting targets for 2025"

Links to validation studies

- Working Group on Infant and Young Child Feeding Indicators, (2006). "Developing and validating simple indicators of dietary quality and energy intake of infants and young children in developing countries: Summary findings from analysis of 10 data sets"
- Working Group on Infant and Young Child Feeding Indicators, (2007). "Developing and validating simple indicators of dietary quality and energy intake of infants and young children in developing countries: Additional analysis of 10 data sets"

Food Security Dimensions

- Quality

Food Composition Database Required?

No

End of Indicator: Minimum Dietary Diversity (MDD)

Click to return to Table of Contents

Minimum Dietary Diversity for Women (MDD-W)

Overview

The Minimum Dietary Diversity for Women (MDD-W) is a population-level indicator of diet diversity validated for women aged 15-49 years old. The MDD-W is a dichotomous indicator based on 10 food groups and is considered the standard for measuring population-level dietary diversity in women of reproductive age. The MDD-W was preceded by the Women's Dietary Diversity Score (WDDS), which was a validated continuous indicator based on reported intake of 9 food groups. The MDD-W was developed after additional validation using new data sets was carried out and with the objective of creating a dichotomous (easier to interpret) indicator rather than a continuous one (FAO & FHI 2016).

According to the MDD-W, women who have consumed at least 5 of the 10 possible food groups over a 24-hour recall period are classified as having minimally adequate diet diversity. The Food and Agriculture Organization (FAO) and the United States Agency of International Development (USAID) both recommend the use of the MDD-W when a categorical indicator of individual dietary diversity for women is needed. These organizations also recommend using the 10-food group dietary diversity indicator if a continuous variable is desired. To further understand the differences between the dichotomous dietary diversity indicator and the continuous dietary diversity indicator, both based on 10 food groups, please see FAO & FHI 2016.

Method of Construction

Data are gathered from a questionnaire administered to a female respondent 15-49 years of age. Respondents are asked to recall the food groups that they consumed over the previous 24 hours using either a list-based method (which asks about consumption of each of the 10 food groups in order), or an open recall (where respondents recall all foods they ate during the previous day and the enumerator determines which food groups these foods belong). Although the MDD-W guidelines present both recall methods, they recommend the use of the open-recall method (FAO & FHI 2016). The ten food groups required for the MDD-W are:

MDD-W Food Groups	
1.	Grains, roots, and tubers
2.	Pulses

3.	Nuts and seeds
4.	Dairy
5.	Meat, poultry, and fish
6.	Eggs
7.	Dark leafy greens and vegetables
8.	Other Vitamin-A rich fruits and vegetables
9.	Other vegetables
10.	Other fruits

The enumerators should record whether the respondent did, or did not, consume foods within each food group. The total number of food groups consumed is summed and all foods are equally weighted. The population level indicator is calculated based on the following formula:

Women 15-49 years of age who consumed foods from 5 food groups during the previous day / Total number of women 15-49 years of age surveyed.

For more information on calculating this indicator, refer to FAO's measurement guidelines (FAO & FHI 2016).

Uses

Indicators of women's diet diversity indicators have been shown to be strongly and positively correlated with micronutrient adequacy of the diet in cross-country analyses using data from several low-income countries (Arimond et al., 2010). Micronutrient adequacy is one important element of diet quality, thus, the MDD-W can be used as a proxy for this aspect of diet quality. The survey is administered on an individual level, but the resulting indicator is appropriate only for population-level (not individual-level) targeting. It can be used to monitor and evaluate programs that seek to improve diet quality in resource-constrained settings. The MDD-W can be used to calculate and report prevalence, making it a simple and easy to understand tool that is useful for communication and advocacy materials, particularly for non-nutrition audiences (Arimond 2016, FAO & FHI 2016).

Strengths and Weaknesses

One advantage of MDD-W is that it is simple to collect, tabulate, and interpret. The results are easy to communicate (i.e., either households achieve minimally adequate diversity or not). Additionally, the threshold for adequacy is standardized which enables comparisons across time and space. However, the tool must be adapted to include culturally relevant examples of foods for each of the 10 food groups. Enumerators must be properly trained to correctly categorize meals containing a mix of different food groups, and to record only food groups where more than 15 grams of a food in that group was consumed, in order to exclude nutritionally less relevant foods used as condiments or seasonings from the total score (FAO & FHI 2016). A strength of the MDD-W is its simplicity as a measure of a key aspect of diet quality, but it remains only a rough proxy for nutrient adequacy. Individuals interested in a more precise estimate of nutrient intake and adequacy should consider conducting a quantitative 24-Hour Dietary Recall instead.

Data Source

The MDD-W is based on the recall of food groups consumed in the previous 24-hours by the respondent. Quantitative 24-hour recall data, in which the respondent describes everything that was eaten during the previous day along with the amount consumed, can also be used though it provides much more detailed information than is needed to calculate the MDD-W. Therefore it can be useful, but not essential, for constructing the MDD-W.

Links to guidelines

- FAO and FHI, (2016). “Minimum dietary diversity for women: a guide for measurement”

Links to validation studies

- Arimond et al., (2010). “Simple food group diversity indicators predict micronutrient adequacy of women’s diets in 5 diverse, resource-poor settings”
- Martin-Prevel et al., (2015). "Moving forward on choosing a standard operational indicator of women’s dietary diversity"

Food Security Dimensions

- Quality

Food Composition Database Required?

No

End of Indicator: Minimum Dietary Diversity for Women (MDD-W)

Click to return to Table of Contents

Modified Functional Attribute Diversity (MFAD)

Overview

The Modified Functional Attribute Diversity (MFAD) indicator is one of the two entropy-based indicators included in the Data4Diets platform. MFAD and the Shannon Entropy Diversity Metric both measure dietary diversity by calculating the deviation from a perfectly equal distribution of all food groups in the diet. The MFAD is derived from the Functional Attribute Diversity (FAD) approach, which is a metric used in the biological sciences to measure diversity of plant and animal communities based on functional traits, or characteristics that group species together based on their function within the community (Petchey et al., 2006). MFAD adds to this method by weighting FAD by the number of functional traits, thus measuring the dispersion of species by these functional units rather than by the individual species themselves, which in turn allows for comparison of the metric across ecological communities (Schmera et al., 2009). In the case of dietary diversity, the functional unit is defined as the nutritional components of the diet, and MFAD measures the variety of nutrients based on both the number of different food items, as well as the amount of each item present (Remans et al., 2014). For example, two food items that are nutritionally similar but are in different food groups, would not be counted twice in this metric.

Method of Construction

As mentioned previously, the main difference between FAD and MFAD is that MFAD weighs species, or foods in this case, included in the calculation by their functional traits. Functional traits are attributes of a food that are functionally similar, which in the case of diet means nutritional composition, even though the foods themselves may not be categorized into the same food group. This is to prevent an increase in measured dietary diversity when functional (or nutritional) diversity does not. For example, adding potatoes to a starch-heavy diet would increase a metric such as the Household Dietary Diversity Score (HDDS), but would not increase the MFAD, as staples and potatoes tend to provide the same nutrients.

Where n is the number of individual food items, d is the dissimilarity between food items i and j, which is defined by nutritional composition, and N is the number of functional units defined, such that foods that are identical in their nutritional composition are considered as the same functional unit (Ricotta et al., 2005). MFAD can take on a value between 0 and 100, and as the value increases it signifies a diet composed of more nutritionally dissimilar, and thus more diverse, foods.

Uses

Adapting MFAD for use in nutrition and food security research has been a relatively new development (Remans et al., 2014). Since foods are divided by their functional (nutritional) characteristics, the indicator measures the diversity of nutritive values within national food supplies or of national crop production (Lele et al., 2016). It has been suggested as a main way to measure food nutrient adequacy, which is one of the seven indicators chosen to best assess sustainable nutrition security (Gustafson et al., 2016).

Strengths and Weaknesses

A strength of this indicator is that it highlights the nutritional components of food, rather than relying on a simple count of diversity to represent quality. Additionally, as a scale invariant indicator it can be compared across countries and timeframes to assess relatively diet quality, such as was done by Remans et al. on a global level (Remans et al., 2014). However, a weakness is that MFAD calculations rely on Food Balance Sheets (FBS), which means data are not based on actual consumption but on availability, and this national-level data could obscure regional-level differences in diversity. The data source also limits the foods included in the analysis to those reported on the FBS (Lele et al., 2016). Additionally, as a composite index, the MFAD cannot distinguish between the specific nutrients that are in abundance and those that are lacking in the diet, such as a metrics like individual intake of micronutrients or individual intake of macronutrients, nor has it been adapted to use with expenditure data, such as the Shannon Entropy Diversity Metric (Wang et. al, 2017).

Data Source

MFAD can be calculated using FBS data in conjunction with a Food Composition Table to identify the nutritional values of the foods included in the analysis. National or regional Food Composition Tables should be used to identify the nutrient contents of the foods and can be found at Food and Agriculture's (FAO) International Network of Food Data Systems (INFOODS) or the International Life Science Institute's (ILSI) World Nutrient Databases for Dietary Studies (WNDDS).

Links to guidelines

- Schmera et al., (2006). "A measure for assessing functional diversity in ecological communities"

Food Security Dimensions

- Quality
- Sustainability

Food Composition Database Required?

Yes

End of Indicator: Modified Functional Attribute Diversity (MFAD)

National average supply of protein

Overview

The indicator of average protein supply provides a national-level estimate of the availability of protein and offers insight into the nutritional quality of the food supply. For example, in countries where malnutrition is prevalent, increased consumption of protein-rich foods is an important sign of improved diet quality. Consumption of protein from animal source foods has been shown to protect children against stunting (Lancet 2008). This indicator does not yield any information on the affordability, access or consumption of such foods by different population groups within a given country, meaning that a sufficient national supply does not ensure sufficient protein consumption by nutritionally vulnerable groups. Nonetheless, it can be useful for determining whether a country's food supply contains enough protein to meet aggregate population needs. If it does not, then measures should be taken, such as promoting production or increased imports of protein-rich foods.

In addition to indicators of the total supply of all protein, a similar indicator can be constructed on FAOSTAT that distinguishes between the availability of animal source protein and non-animal source protein. This more nuanced indicator can be useful, as it disaggregates animal source proteins from plant-based proteins, and as such, can be considered a proxy for diet quality. Additional indicators of quality of the food supply using Food Balance Sheet (FBS) data that are covered in the Data4Diets platform include meat consumption, national energy available from non-staples and national fruit and vegetable availability in food supply, among others. Other related indicators at the household and individual level include: household share of animal protein in total protein consumption and total individual macronutrient intake.

Method of Construction

This indicator is part of the FAO Suite of Food Security Indicators and can be accessed on the FAOSTAT website by selecting 'suite of food security indicators' under the 'data' tab. Users can produce this indicator for a given country and year (or span of years) by selecting 'Average protein supply (g/capita/day) (3-year average)' under the 'Items' section. A related indicator reflecting protein from animal-source foods, called 'Average supply of protein of animal origin (g/capita/day) (3-year average)' is also available.

FAO calculates the national estimate of total food availability using data from a number of sources, including government agencies, marketing authorities, and industrial/manufacturing surveys, among others (FAO 2001). This national estimate is calculated as the sum of the elements of supply (production quantity, import quantity, and stock variation (i.e. net increase or decrease)) minus the elements of utilization (export quantity, food manufacturing, feed, seed, waste, and other uses). Using Food Composition Tables, FAOSTAT calculates the protein content (in grams) of the edible portion of each type of food available for human consumption (e.g. eggs, wheat, beans), and then these values are added to compute the total national protein supply (FAO 2001). This value is then divided by the population size and by 365 days to calculate the per capita daily average protein supply. This calculated value (grams/capita/day) is available in FAOSTAT for the total food supply, as well as for individual food items and food groups.

Uses

When data from individual dietary surveys or household surveys are unavailable, this indicator serves as a proxy for protein consumption levels at the population level (FAO 2016). Because the data are available annually, with a 2-3 year lag, for nearly all countries, this is a useful indicator for cross-country comparisons of protein consumption, as well as for analysis of trends over time within a country. This indicator and the average supply of animal source protein, are both part of the FAOSTAT Suite of Food Security Indicators.

Strengths and Weaknesses

One strength of this indicator is that it is easily constructed using FBS data, and the data used for the indicator are regularly updated by national governments and are centrally located in FAOSTAT in a standard format. The indicator is also simple to interpret and lacks sampling and reporting biases associated with dietary recall data (Lele et al., 2016).

However, a downside of this indicator is that it does not reflect actual consumption of protein but rather protein availability in a given country. In addition, since the indicator is a national-level estimate, it cannot be disaggregated by age, sex, or by any geographic scale smaller than the national level, nor can it detect disparities in protein consumption across population groups or seasons, as is possible with individual-level dietary data. The indicator is limited to the foods that appear in the FBS food list and therefore does not capture all possible sources of protein in the diet (e.g., insects or wild foods). Although the FBS accounts for food losses incurred at the distribution and processing level, it does not account for plate waste at the household or individual level (Lele et al., 2016).

Data Source

The main source of data for this indicator is the FAO FBS database, which disaggregates elements of utilization and supply, and estimate total food available for human consumption. FAO pairs this information with food composition data to produce information on the national supply of macronutrients (per capita/day). In addition, Household Consumption and Expenditure Surveys (HCES) could be used to calculate a similar indicator, such as household share of dietary energy consumption from different macronutrients. Alternatively, 24-Hour Dietary Recall or Weighed Food Records could be used to calculate total individual macronutrient intake.

Links to guidelines

- FAO, (2001). “Food Balance Sheets: A Handbook”

Food Security Dimensions

- Quantity
- Quality

Food Composition Database Required?

Yes

End of Indicator: National average supply of protein

Click to return to Table of Contents

National energy available from non-staples

Overview

Energy available from non-staples is an indicator calculated at the national-level that estimates the percentage of all calories that come from non-staple goods in the food supply (i.e., all food items, excluding tubers and grains). Staple foods are generally the least expensive food items available and are also the least nutrient-dense, and diets based predominantly on staple foods have been associated with micronutrient deficiencies and low dietary diversity (Arimond et al., 2010, Ruel 2003). This indicator does not yield any information on the affordability, access or consumption of non-staple foods by different population groups within a given country, meaning that a sufficient national supply does not ensure sufficient consumption by nutritionally vulnerable groups. Additional indicators of that are covered in the Data4Diets platform and could be used as proxies for diet quality and reply on Food Balance Sheet (FBS) data include national average supply of protein and national fruit and vegetable availability in food supply.

Method of Construction

This indicator can be accessed through the FAOSTAT website by selecting the 'Food Balance Sheets' option under the 'Data' tab. FAO calculates the national estimate of total food availability using data from a number of sources, including government agencies, marketing authorities, and industrial/manufacturing surveys, among others (FAO 2001). This national estimate is calculated as the sum of the elements of supply (production quantity, import quantity, and stock variation (i.e. net increase or decrease)) minus the elements of utilization (export quantity, food manufacturing, feed, seed, waste, and other uses). Using food composition tables, FAOSTAT calculates the energy content (kcal) of the edible portion of each type of food available for human consumption. This value is then divided by the population size and by 365 days to calculate the per capita daily average supply of energy from each type of food (or from total food available if these food groups are added together).

To calculate this indicator, the food supply (kcal/capita/day) must first be calculated for non-staple goods. In the FAOSTAT food balance sheets, the 'Food supply (kcal/capita/day)' option can be selected under the 'Elements' heading, and food groups can be selected under the 'Items Aggregated' heading to produce a total food supply (kcal) for non-staple goods. After calculating the food supply for non-staples, the food supply for all goods is calculated by selecting 'Grand Total + (Total)' under the 'Items Aggregated' heading. The indicator for energy available from non-staples (% kcals non-staples) can then be calculated using the following fraction:

Food Supply of all non-staple foods [kcal/capita/day] / Food Supply of all foods [kcal/capita/day] and multiplied by 100 to express as a percent.

For more information on the FAO food balance sheet methodology, see FAOSTAT. For more detail on using FAO data to calculate available energy, refer to Food Security Information Network's (FSIN) guide to food security indicators (Lele et al., 2016)

Uses

This indicator can be used to gain an overview of the overall quality of the food supply by measuring the percentage of the food supply that is coming from non-staple foods. When the preferred data from individual or household surveys are unavailable, this indicator using FBS data can serve as a proxy for relative diet quality trends based on food supply at the population level (FAO 2016).

Because the data are available annually for nearly all countries, although with a 2-3 year lag, this is a useful indicator for cross-country comparisons of food supply, as well as for analysis of trends over time within a country. Non-staple items are of particular interest because they tend to be more nutrient-dense than staple goods, and previous research has found an association between the diversity of the national-level food supply (of which this is an indicator) and health outcomes (Remans et al., 2014). This indicator has also been identified as one of a suite to be used in measuring the nutrient adequacy component of 'sustainable nutrition security' (Gustafson et al., 2016). The inverse of this indicator 'energy available from staple foods -- is part of the FAO Suite of Food Security Indicators.

Strengths and Weaknesses

Due to the availability and comprehensiveness of FBS data, this indicator is easily calculated and compared across time and place (FAOSTAT). Another strength of this indicator is that it is simple to interpret and lacks sampling and reporting biases associated with dietary recall data (Lele et al., 2016).

However, a downside of this indicator is that it does not reflect actual consumption of non-staple foods, but rather the availability of these foods in a given country. In addition, as a national-level estimate, it cannot be disaggregated by sex, age, or by any geographic scale smaller than the national level, nor can it detect disparities in consumption of non-staples across population groups or between seasons, as is possible with individual-level dietary data. Although the FBS accounts for food losses incurred at the distribution and processing level, it does not account for plate waste at the household or individual level (Lele et al., 2016). It is also important to confirm the definition of non-staple goods, which may vary by context. Some have suggested excluding from the definition all foods eaten regularly (Gustafson et al., 2016), which may omit commonly consumed foods.

Data Source

The main source of data for this indicator is the FAO Food Balance Sheet (FBS) database, which disaggregates elements of utilization and supply, and estimate total food available for human consumption. FAO pairs this information with food composition data to produce information on the national supply of macronutrients (per capita/day). In addition, Household Consumption and Expenditure Surveys (HCES) could be used to calculate a similar indicator, such as the household share of energy consumed from non-staples

. Alternatively, 24-Hour Dietary Recall, a Food Frequency Questionnaire (FFQ) or Weighed Food Records could also be used to calculate an analogous indicator.

Links to guidelines

- Food and Agriculture Organization, (2001). “Food Balance Sheets: A handbook”

Links to validation studies

- Del Gobbo et al., (2015). “Assessing global dietary habits: a comparison of national estimates from the FAO and the Global Dietary Database”
- Serra-Majem et al., (2003). “Comparative analysis of nutrition data from national, household, and individual levels: results from a WHO-CINDI collaborative project in Canada, Finland, Poland, and Spain”

Food Security Dimensions

- Quality

Food Composition Database Required?

No

End of Indicator: National energy available from non-staples

Click to return to Table of Contents

National fruit and vegetable availability

Overview

This indicator is a national-level estimate of the availability of fruits and vegetables and is an indirect measure of the nutritional quality of the food supply. Low fruit and vegetable consumption is one of the leading contributors to the global burden of non-communicable disease and death (Lim et al., 2013). A 2003 FAO/WHO joint report recommends a minimum individual intake of 400g (or the equivalent of 5 servings) of fruit and vegetables per day (excluding potatoes and other starchy tubers) for the prevention of chronic diseases such as heart disease, cancer, diabetes and obesity, as well as for the prevention and alleviation of several micronutrient deficiencies (Ezzati et al., 2004). This indicator does not yield information on the affordability, access, or consumption of fruits and vegetables by different population groups within a given country, but it can be useful for determining whether a country's food supply contains enough fruits and vegetables to meet aggregate population needs. This indicator uses Food Balance Sheet (FBS) data that can be accessed through FAO's FAOSTAT website. Additional indicators of dietary quality that use FBS data and are covered in this Data4Diets platform include national average supply of protein and national energy available from non-staples, among others.

Method of Construction

This indicator can be calculated using FBS data, which can be found on the FAOSTAT website by selecting the 'Food Balance Sheets' option under the 'Data' tab. FAO calculates the national estimate of total food availability using data from a number of sources, including government agencies, marketing authorities, and industrial/manufacturing surveys, among others (FAO 2001). This national estimate is calculated as the sum of the elements of supply (production quantity, import quantity, and stock variation) minus the elements of utilization (export quantity, food manufacturing, feed, seed, waste, and other uses).

FBS data can be used to construct this indicator for a given country and year (or range of years) by selecting 'Food supply quantity (kg/capita/year)' under the 'Elements' heading, and then "Vegetables + (Total)" and "Fruits ' Excluding Wine + (Total)' under the 'Items Aggregated' heading on the Food Balance Sheets page of FAOSTAT. The total value for fruits and vegetables must then be multiplied by 1000 (to get grams from kilograms) and divided by 365 days (to get days from year).

Uses

This indicator is used to gain an overview of the food availability and food quality available in a country. When data from individual or household surveys are unavailable, this indicator serves as a rough proxy for fruit and vegetable consumption at the population level (FAO 2016). Because the data are available annually for nearly all countries, this is a useful indicator for cross-country comparisons of fruit and vegetable availability as well as for analysis of trends over time within a country. This indicator can help determine whether the availability of fruits and vegetables is enough to meet population needs, and can be useful for decision makers at the national level to inform policy action in order to increase fruit and vegetable availability through production or imports (Siegel et al., 2014).

Strengths and Weaknesses

One benefit of this indicator is that it can be calculated for nearly all countries (since it relies on FBS data) and can be compared across time and space. Another strength of this indicator is that it is simple to interpret and lacks sampling and reporting biases associated with dietary recall data (Lele et al., 2016). However, a downside of this indicator is that it does not reflect actual consumption of fruits and vegetables, but rather the availability of these foods. In addition, as a national-level estimate it cannot be disaggregated by sex, age, or by any geographic scale smaller than the national level, nor can it detect disparities in consumption of fruits and vegetables across population groups or between seasons, as is possible with individual-level dietary data. This can be a problem in countries with extreme economic inequality, where high levels of availability in a handful of locations may mask the scarcity in other areas. In addition, although the FBS accounts for food losses incurred at the distribution and processing level, it does not account for plate waste at the household or individual level (Lele et al., 2016).

Data Source

The main source of data for this indicator is the FAO FBS data on the FAOSTAT website, which disaggregates elements of utilization and supply, and estimates total food available for human consumption. In addition, Household Consumption and Expenditure Survey (HCES) data could be used to calculate a similar indicator, such as household adequacy of fruit and vegetable consumption. Alternatively, market data such as Euromonitor could be used to calculate the fresh food retail volume, or individual level data such as 24-Hour Dietary Recall or a Food Frequency Questionnaire (FFQ) could be used to calculate consumption of specific food groups (e.g. fruits and vegetables).

Links to guidelines

- WHO, (2003). "Promoting fruit and vegetable consumption around the world"

Food Security Dimensions

- Quality

Food Composition Database Required?

No

End of Indicator: National fruit and vegetable availability

Click to return to Table of Contents

Packaged food retail volume

Overview

Packaged food retail volume refers to a broad range of packaged foods including baby food, snacks, processed fruits and vegetables and ready meals (Euromonitor 2018). This is an indicator that can be used to understand trends in shifting dietary patterns and changing dietary quality. Low- and middle-income countries have rapidly been undergoing a nutrition transition characterized by increased consumption of processed foods coupled with decreased consumption of fresh foods (Popkin et al., 2013). This comes with serious health implications, as packaged and processed foods tend to be less nutrient dense, more energy- dense, and linked with poorer diet quality (Imamura et al., 2015), increased obesity (Asfaw 2009) and increased diet-related illness (Micha et al., 2012). The packaged food retail volume is a national-level indicator that quantifies the volume of packaged foods sold at markets -- including supermarkets, wet markets, convenience stores, and online purchases -- reported in kilograms per capita. When used in conjunction with fresh food retail volume, this indicator can contribute to a better understanding of the food system and provide a picture of the ongoing dietary transition (Global Nutrition Report 2015).

Method of Construction

The total amount of packaged foods sold in various retail outlets of interest (e.g. supermarkets, wet markets, convenience stores etc.) should be converted into kilograms and summed. This figure is divided by the total population of interest to determine the amount of fresh food retail volume (kg/capita). If calculating this indicator from primary data, it is necessary to clearly define what is meant by packaged foods and what is meant by markets. For example, the NOVA Food Classification system could be used as an alternative to group foods into unprocessed/minimally processed, processed, and ultra-processed categories (Monteiro et al., 2010). Alternatively, the Euromonitor definition could be used (Euromonitor 2018). Currently, data for this indicator are collected for a subset of countries (none of which are low-income countries) and available for purchase from Euromonitor (Euromonitor International 2016). Government ministries may also collect data related to market- level retail sales and/or volume.

Uses

This indicator, in combination with retail volume of fresh foods, has been recommended by the Global Nutrition Report (GNR) to assess national food consumption diversity (Global Nutrition Report 2015). When used in conjunction with other market-level data on production and/or consumption, it can also be used to capture the extent to which foods are being processed versus sold fresh within national markets.

Strengths and Weaknesses

One strength of this indicator is that it allows for an analysis of dietary patterns at the population level and is comparable across many countries. However, if using Euromonitor data it only provides information at the aggregate level for the quantity of all processed foods and for a select sub-set of high- and middle-income countries. Therefore, anyone interested in more detailed information on processed foods, or identifying the quantity of packaged food retail volume for low-income countries, should consider other data sources or indicators (Euromonitor International 2016).

The breadth that comes from combining foods of all levels of processing also means that this indicator does not provide specific insight into ultra-processed foods, which are foods that have undergone industrial processes that extend shelf life and which have been shown to be have particularly detrimental health and nutritional implications (Ludwig 2011). Percent of energy comprised of ultra-processed foods would be a more effective indicator for capturing consumption of this particularly harmful food group. Another weakness is that, as a national-level indicator, packaged food retail volume does not capture any measurement of distribution among regional, socioeconomic, or age/sex groups. An indicator like individual intake of certain food groups, such as processed meats, would be a more appropriate proxy for examining packaged food consumption on a finer scale or potentially across sub-populations or groups, however this would require individual level dietary data from 24-Hour Dietary Recalls or Food Frequency Questionnaires.

Data Source

One potential data source for this indicator is Euromonitor, which collects and compiles data on fresh food retail volume in 54 countries, however none of these are low-income countries, and access to the data must be purchased (Euromonitor International 2016). Other related indicators, for example, include the percent of energy comprised of ultra-processed foods.

Links to guidelines

- International Food Policy Research Institute, (2015). “Global Nutrition Report 2015: actions and accountability to advance nutrition and sustainable development”

Food Security Dimensions

- Quality

Food Composition Database Required?

No

End of Indicator: Packaged food retail volume

Click to return to Table of Contents

Per capita food supply variability

Overview

This indicator uses the data on dietary energy supply from the Food Balance Sheet (FBS) to measure annual fluctuations in the per capita food supply (kcal), represented as the standard deviation over the previous five years per capita food supply. Food supply variability results from a combination of instability and responses in production, trade, consumption and storage, in addition to changes in government policies such as trade restrictions, taxes and subsidies, stockholding and public distribution (Lele et al., 2016).

Method of Construction

This indicator is part of the FAO Suite of Food Security Indicators and can be accessed on the FAOSTAT website by selecting “Suite of Food Security Indicators” under the Data tab. Users can produce this indicator for a given country and year (or span of years) by selecting “Per capita food supply variability (kcal/capita/day)” under the Items section.

Uses

Volatility in the food supply, presumably reflected in price volatility, affects vulnerable households' ability to plan effectively within their resource constraints. Understanding the degree of instability or volatility within a food system can help researchers, project managers, and policy makers advocate for measures to be taken to improve the food system's (and population's) resiliency to shocks.

Strengths and Weaknesses

One benefit of this indicator is its usefulness for observing trends in the stability of a food supply over time and its comparability across regions and countries. As this indicator is derived from the dietary energy supply, which is a national level aggregate indicator, it does not measure the effect of changes in the food supply on individual or overall food prices or consumption. Nor does it measure the impact on households of bearing the risk of shocks due to instability in the food supply or of the shocks themselves. Furthermore, since this indicator reflects annual data, it cannot be used to assess the results of short-term shocks to the food system in a country, and is therefore more valuable for assessing long term trends in a country.

Data Source

The main source of data for this indicator are the FAO FBS data on the FAOSTAT website. FAO disaggregates elements of utilization and supply, and estimates total food available for human consumption and pairs this information with food composition data to produce information on the national supply of energy and macronutrients (per capita/day).

Food Security Dimensions

- Stability

Food Composition Database Required?

No

End of Indicator: Per capita food supply variability

Click to return to Table of Contents

Percent of energy comprised of ultra-processed foods

Overview

The percent of energy from ultra-processed foods in the diet is an indicator that provides an understanding of changing dietary patterns, cultural preference, and diet quality. Low- and middle-income countries are rapidly undergoing a nutrition transition that is characterized by changes in dietary patterns and nutrient intakes, resulting in higher consumption of energy dense and processed foods (Popkin 2002). Ultra-processed foods are foods that undergo industrial processes (e.g. salting, sugaring, frying, and curing) that extend shelf life, make food extremely palatable, and are designed to be ready-to-consume (Vandevijvere et al., 2013). Diets rich in ultra-processed foods may promote obesity and chronic disease because these foods typically have a high glycemic load and are energy dense, low in fiber, micronutrients, and phytochemicals, and high in unhealthy fats and sugars, in addition to being highly palatable. (Ludwig 2011).

Method of Construction

Data used to construct this indicator should come from food consumption surveys of individuals, such as quantitative 24-Hour Dietary Recalls, Weighed Food Records and quantitative Food Frequency Questionnaires (FFQs) designed specifically for this purpose. See the table below for a more detailed explanation of the classification of unprocessed/minimally processed, processed, and ultra-processed food groups, and refer to Monteiro et al., 2010. A food composition table is used to estimate the total energy (kcal) intake over the day from all foods and beverages recalled in the survey, including the energy provided by ultra-processed foods. The indicator is then constructed using the formula below:

Total energy from ultra-processed foods consumed (kcal) x 100

Total energy from all foods consumed (kcal)

Classification groups as proposed by Monteiro et al., 2010

	Group 1: Unprocessed and minimally processed foods	**Group 2**: Processed culinary or food industry ingredients	**Group 3**: Ultra-processed food products

Processing methods	Cleaning, portioning, grating, flaking, squeezing, bottling, drying, chilling, freezing, pasteurization, fermentation, fat reduction, removal of inedible parts, vacuum and gas packing, simple wrapping.	Pressure, milling, refining, hydrogenation, hydrolysis, additives, enzymes.	Includes the use of group 2 products. Salting, sugaring, baking frying, deep frying, curing, smoking, pickling, canning, addition of preservatives and additives, synthetic vitamins and minerals, packaging.
Purpose of processing	Preservation, availability and accessibility of food product, safety, palatability	Extraction of substances from unprocessed or minimally processed foods to produce culinary/food industry ingredients	Create durable, accessible, convenient, palatable, sometimes habit-forming products.
Examples	Fresh meat, grains, legumes, nuts, fruits, vegetables, roots, tubers, tea, coffee, herbs, tap water, bottled spring water.	Starches, flours, oils and fats, salt, sugar, sweeteners, high fructose corn syrup, lactose, milk and soy proteins.	Ready-to-eat snacks and desserts (breads, cereal bars, chips, cakes), ready-to-heat foods (frozen pizza and pasta, sausages, fish sticks, canned soups), infant formulas, baby foods.

Uses

This indicator has been proposed by the International Network for Food and Obesity/Non-Communicable Disease Research, Monitoring and Action Support (INFORMAS) as an indicator that can be used globally to monitor changes in population diet quality over time and across countries (Vandevijvere et al., 2013). This indicator enables an analysis of the relative contribution of ultra-processed foods to overall dietary energy intakes based on data from individuals, and therefore can be used to assess differences between sub-population groups based on geographic location, income group, and various other demographic characteristics.

Strengths and Weaknesses

This indicator measures the relative contribution of ultra-processed foods to overall dietary energy intakes; it does not provide information on the consumption of individual nutrients or specific foods. Since ultra-processed foods can often be consumed outside of the home, survey data used for this indicator that do not include detailed information about food consumed outside of the home will underestimate the percent of energy from ultra-processed foods. It should also be noted that this indicator has not yet been thoroughly tested (Vandevijvere et al., 2013).

Data Source

Data from individual quantitative 24-Hour Dietary Recalls, Weighed Food Records, and FFQs designed for this purpose can be used to construct this indicator. This indicator could also be constructed at the household level using Household Consumption and Expenditure Surveys (HCES) that have an appropriate level of disaggregation of foods and include detailed information on foods consumed away from home (Smith et al., 2014).

The FAO/WHO Global Individual Food consumption data Tool (FAO/WHO GIFT) is a source for individual level quantitative dietary data. The FAO/WHO GIFT aims to make publically available existing quantitative individual food consumption data from countries all over the world. National or regional Food Composition Tables should be used to identify the energy content of the foods and can be found at Food and Agriculture's (FAO) International Network of Food Data Systems (INFOODS) or the International Life Science Institute's (ILSI) World Nutrient Databases for Dietary Studies (WNDDS).

Links to guidelines

- Vandevijvere et al., (2013). "Monitoring and benchmarking population diet quality: a step-wise approach"
- Monteiro et al., (2010). "A new classification of foods based on the extent and purpose of their processing"

Food Security Dimensions

- Quantity
- Quality

Food Composition Database Required?

Yes

Population share with adequate nutrients

Overview

This indicator of diet quality estimates the nutrient intake adequacy of a population by using both individual-level dietary intake data and Food Balance Sheet (FBS) data. Rather than only focusing on the availability of energy, this indicator seeks to better understand the level of consumption of key nutrients within a population. This indicator is also included in a suite of indicators used to assess the environmental and nutritional sustainability of food systems developed by Gustafson et al., 2016. This indicator is considered an 'emerging indicator' because it has not been fully validated and is not in common use.

Method of Construction

This indicator requires the use of FBS data and food composition tables to derive an estimate of the quantities of key nutrients available in a country's food supply. FBS data can be accessed on FAO's FAOSTAT website. FAO calculates the national estimate of total food availability using data from a number of sources, including government agencies, marketing authorities, and industrial/manufacturing surveys, among others (FAO 2001). This national estimate is calculated as the sum of the elements of supply (production quantity, import quantity, and stock variation) minus the elements of utilization (export quantity, food manufacturing, feed, seed, waste, and other uses).

Food composition tables from the country or region of study should be used (if available) in conjunction with FBS data to estimate nutrients that vary depending on local varieties, conditions of production (e.g., soil composition) or other factors. For each nutrient, a population distribution of intake is constructed around the mean per capita nutrient availability value (calculated with FBS and food composition table data) by using a coefficient of variation (CV) equal to the inter-individual CV of nutrient intakes obtained through a survey of a representative sample of individuals in the study population. The percentage of the population with intakes above an adequate level can then be calculated using the estimated average requirement (EAR) point-cutoff method. For more detailed information on how to construct this indicator, see Arsenault et al., (2015).

Uses

This indicator is used to estimate the proportion of people within a population who are consuming key nutrients at or above an adequate level, such as the Estimated Average Requirements (EAR) as defined by the US Institute of Medicine (Arsenault et al., 2015). The information derived from this indicator can be used to identify gaps in nutrient availability in the food supply and population needs, reflecting nutrient availability in the food supply of a population, which can be used in targeted interventions to increase the consumption and availability of foods that are significant sources of certain nutrients in the food supply.

Strengths and Weaknesses

One benefit of this indicator is its ability to provide a national-level estimate of diet quality that requires less cost and effort than a nationally representative individual level dietary survey. However, this method may not be suitable for assessing iron intakes, since requirements are not normally distributed, and determining iron bioavailability is difficult without information on the whole diet. In addition, this indicator requires the assumption that the per capita nutrient availabilities (calculated using FBS data) approximate the mean per capita intakes of the population (Arsenault et al., 2015). This assumption may not always be accurate, since FBS data represent availability, not consumption, and cannot detect disparities in nutrient consumption across population groups or seasons. Another drawback of this indicator is that it addresses meeting intake thresholds, but does not address overconsumption of nutrients at potentially dangerous or unhealthy levels (Gustafson et al., 2016).

Data Source

This indicator uses data from FBS in combination with Food Composition Tables. National or regional Food Composition Tables should be used to identify the nutrient contents of the foods and can be found at the Food and Agriculture Organization's (FAO) International Network of Food Data Systems (INFOODS) or the International Life Science Institute's (ILSI) World Nutrient Databases for Dietary Studies (WNDDS). The indicator also requires individual-level dietary intake data as well as inter-individual estimates of variation from surveys of the population in order to estimate the population distribution of intake.

Links to guidelines

- Arsenault et al., (2015). "Improving nutrition security through agriculture: an analytical framework based on national food balance sheets to estimate nutritional adequacy of food supplies"

Food Security Dimensions

- Quality

Food Composition Database Required?

Yes

End of Indicator: Population share with adequate nutrients

Click to return to Table of Contents

Prevalence of Undernourishment

Overview

The Prevalence of Undernourishment (PoU) is a national-level model-based indicator used to understand access to food in terms of dietary energy inadequacy. It measures the percentage of the population whose dietary energy intake is below the Minimum Dietary Energy Requirement (MDER). As one of the Sustainable Development Goals, Target 2.1 (End hunger, achieve food security and improve nutrition), it is produced yearly by FAO. For global monitoring purposes (given the lack of nationally representative individual dietary intake surveys available, for all countries), it is produced using information on dietary energy supply from the Food Balance Sheet (FBS) data.

Method of Construction

The PoU as derived by FAO is based on a probability distribution characterized by three parameters: (1) the mean of the distribution that represents the average amount of dietary energy consumed by an hypothetical average individual in the population (2) the coefficient of variation that represents the variability that exists within the population's usual consumption and (3) a threshold that represents the minimum amount of energy needed by an hypothetical average individual of the population to be in good health and have a level of activity that is socially acceptable, also known as the Minimum Dietary Energy Requirement (MDER). The MDER of the population is used as proxy of the threshold and it is estimated based on a weighted average of the minimum energy requirements for each sex-age group in the population (Wanner et al., 2014). The PoU is then calculated as the percentage of the population whose consumption falls below the MDER. The PoU indicator produced by the FAO in the context of the global monitoring based on the Dietary Energy Supply is a three-year moving average. For more detailed information on how data are collected, assumptions, and how calculations are completed by the FAO, please read Cafiero 2014, which explains more fully the technical details.

In addition, this indicator is one of several indicators included in the ADePT-FSM (Food Security Module) software package, which is a free standalone software developed by the FAO and the World Bank that allows users to easily derive food security indicators from Household Consumption and Expenditure Survey (HCES) data. The software download and corresponding documentation can be found on the FAO website. Please also see the Moltedo et al., 2014 book published by the World Bank, which provides detailed instructions for analyzing food security using household survey data. See pages 54-57 in the Moltedo et al. document for details about how the ADePT software calculates the PoU.

Uses

The PoU is an internationally recognized indicator, and is used by intergovernmental, non-governmental, and governmental agencies alike. As mentioned above it is also one of the indicators for monitoring progress towards the second target of the SDGs. It can help paint a picture of macro-level food access trends, and given its widespread use for the past five decades, is useful in identifying national and global trends in population-level undernourishment (Jones et al., 2013). The PoU is also used to calculate the depth of food deficit indicator, which estimates the average per capita amount of additional energy (kcal) that undernourished individuals need to consume to reach their average dietary energy requirement (ADER). This indicator is part of the FAOSTAT Suite of Food Security Indicators and is published annually by FAO in the State of Food Insecurity (SOFI). The PoU is also one of the components of the IFPRI Global Hunger Index.

Strengths and Weaknesses

The PoU data are publicly available and free to access on FAOSTAT. Along with ease of access, a clear strength of this indicator is that it has been calculated for almost every country in the world over decades, allowing for standardized comparisons over time and within and across countries. However, the PoU considers only dietary energy intake, and alone it is not an appropriate indicator of nutrient adequacy or dietary quality. This is an indicator of chronic hunger that spans a one year period and therefore is unable to capture trends in undernourishment over short reference periods that may be associated with seasonality, price spikes, or climate-related shocks to the food system (Cafiero 2014).

One of the major criticism of the PoU is that it is based on the MDER and not on the ADER, but the strong correlation between intake and requirement made it impossible to use ADER. For example, using ADER in a heathy population where all people would eat according to their requirement, we would estimate that about 50% of the population is undernourished (as some people may still be healthy while consuming less energy than the average). In using the MDER the risk of misclassification is lower (FAO Sixth World Food Survey, 1996).

Data Source

For global monitoring purposes, country-level prevalence of undernourishment is released each year by the FAO using data from the Dietary Energy Supply from the FBS (after deducting losses at retail level to the Dietary Energy Supply published in FAOSTAT). HCES can be used to generate national and sub-national PoU using the ADePT-FSM software package. Finally, the PoU could also be estimated using individual dietary intake surveys (e.g. more than one 24-Hour Dietary Recall) representative at national or subnational population groups.

Links to guidelines

- Cafiero, (2014). "Advances in hunger measurement: Traditional FAO methods and recent innovations"
- SOFI, (2015). “Annex 2: Methodology for assessing food security and progress towards the international hunger targets”
- FAO, (1996). "Sixth World Food Survey"
- FAO, (2018). "Prevalence of Undernourishment E-Learning Course"

Links to validation studies

- Wanner et al., (2014). "Refinements to the FAO Methodology for Estimating the Prevalence of Undernourishment Indicator"
- Cafiero et al., (2014). "Validity and Reliability of Food Security Measures"

Food Security Dimensions

- Quantity

Food Composition Database Required?

No

End of Indicator: Prevalence of Undernourishment

Click to return to Table of Contents

Shannon Entropy Diversity Metric

Overview

The Shannon Entropy Diversity Metric is one of the two entropy-based indicators included in the Data4Diets platform. The Shannon Entropy Diversity Metric and Modified Functional Attribute Diversity (MFAD) both measure diversity by calculating the deviation from a perfectly equal distribution in the diet. Whereas the Shannon Entropy Diversity Metric measures this in terms of distribution of individual foods, MFAD measures this in terms of nutrients. As a measure of food availability, it provides a measure of the relative abundance of each food item within a given supply of food, capturing both evenness and abundance. This indicator was originally developed for use in the biological sciences, and only recently has been adapted for use in the food and nutrition disciplines (Remans et al., 2014).

Method of Construction

This indicator is based on C.E. Shannon's diversity metric that was developed to weigh both the richness and evenness of species within animal and plant communities (Shannon 1948). The formula for calculating the metric is as follows:

s

H = ? - (Pi * ln Pi)

i=1

Where:

H = Shannon

Pi = fraction of the entire population made up of species i

ln(**Pi**)= the natural log of above

S = numbers of species encountered

? = sum from species 1 to species S

Although the Shannon Entropy Diversity Metric is not commonly used in the context of nutrition and food security assessment, there is a large body of literature on Shannon Entropy Diversity methodology in general, including Begon et al., 2006, Chao 2003, and Magurran 1988, who offer further guidance on construction.

Uses

This indicator can be used to measure the diversity of food supplies on the national level in order to understand trends in food availability (Remans et al., 2014). Because the indicator can be divided by a common factor, it is useful in comparing the availability of foods across time and sociocultural contexts, and has been suggested as a main method for measuring food nutrient adequacy, which is one of the seven indicators chosen to best assess sustainable nutrition security (Gustafson et al., 2016). Additionally, it has been adapted to be used with national-level expenditure data as well as availability data (Wang et al., 2017).

Strengths and Weaknesses

One strength of the Shannon Entropy Diversity Metric is that is can be scaled from 0-1 for ease of comparison. However, a major weakness is that MFAD calculations rely on Food Balance Sheets (FBS), which means data are not based on actual consumption but on availability, and this national-level data could obscure regional-level differences in diversity. The data source also limits the foods included in the analysis to those reported in the FBS (Lele et al., 2016). Although diversity suggests a higher quality diet, the actual nutrient content or density is not captured by this metric. Indicators that measure diversity of the food supply based on nutrient composition, such as the MFAD, would be more effective for understanding the availability of any nutrients of specific research or programmatic significance.

Data Source

The Shannon Entropy Diversity Metric can be calculated from FBS data.

Links to guidelines

- Dejong, T.M., (1975). “A comparison of three diversity indices based on their components of richness and evenness”
- Gustafson et al., (2016). “Seven food system metrics of sustainable nutrition security”

Food Security Dimensions

- Quality
- Sustainability

Food Composition Database Required?

No

End of Indicator: Shannon Entropy Diversity Metric

Click to return to Table of Contents

Share of food consumed away from home of total food consumption

Overview

This indicator, share of food consumed away from home of total food consumed, provides a glimpse into individual and household dietary quality at the population level and can highlight dietary trends over time and across countries. Food prepared or purchased outside of the home is becoming an increasingly important component of the diet in many countries, especially in urban area (Smith and Subandoro 2007, Bezerra et al., 2013). The quality and nutrient content of foods purchased or consumed outside of the home can vary significantly from food consumed in the home. Foods consumed outside of the home are more likely to be processed and higher in salt, sugar, and unhealthy fats (Vandevijvere et al., 2013), and studies have found that consuming food away from home is associated with higher energy and fat intake and lower micronutrient intake (Lachat et al., 2012).

Method of Construction

Data used to construct this indicator can be obtained from individual Weighed Food Records or 24-Hour Dietary Recall surveys and Food Frequency Questionnaires (FFQs) that include both the type and amount of each food consumed and the foods consumed outside of the home. It is important to note that the information about foods consumed outside the home are at the individual level and then aggregated up to the household, if collected for all household members. After the quantities of reported foods has been determined, a Food Composition Table (preferably local or regional, if available) is used to estimate the energy (in kcal) composition of the foods recalled in the survey. The indicator can then be constructed using the fraction below, and then multiplying it by 100:

Total energy from foods consumed by household members outside of the home (kcal)/Total energy from all foods consumed by household (kcal)

Data collected at the individual level should be used for this indicator. In addition, some HCES include individual level data measuring food (or expenditure) consumed away from home in the household survey. If using individual data from the HCES, one can refer to the ADePT-FSM (Food Security Module) software package, which includes this indicator and is a free standalone software developed by the FAO and the World Bank that allows users to easily derive food security indicators from household survey data. The software download and corresponding documentation can be found on the FAO website. Please also see the Moltedo et al., 2014 book published by the World Bank, which provides detailed instructions for analyzing food security using household survey data.

Uses

This indicator can be used to assess dietary patterns with individual level data and provide information that can inform strategies to promote healthy food consumption away from home (Bezerra et al., 2013

).

Strengths and Weaknesses

This indicator can be used to assess differences in eating patterns by sub-population groups based on geographic location, income group, and other socio-demographic characteristics of interest. Using individual level data, e.g. from 24-Hour Recalls, should be used for this indicator. However, if HCES data are used, there are several constraints, including the fact that many HCES collect information only on the monetary value of food consumed away from home, making accurate energy estimations difficult, and requiring big assumptions as well as extra steps and calculations to derive an estimate of the energy (kcal) value (Moltedo et al., 2014).

Data Source

The best data source for this indicator would use individual level data from Weighed Food Records , 24-Hour Dietary Recalls, or Food Frequency Questionnaire (FFQ), which allow for quantification of food intake, both inside and outside the home, at the individual level. In addition, HCES data that include individual level data (e.g. a Nutrition Dietary Survey module) can be used to calculate this indicator. The World Bank Microdata Library has the most comprehensive and publically accessible repository of data (World Bank Microdata Library). Otherwise, data can be accessed – often for a fee – from the National Statistics Office, though each country has its own policies and procedures. The International Household Survey Network (IHSN) is an informal network to promote data standards and dissemination (IHSN). However, only a limited number of countries collect information on food consumed outside of the home in HCES (Fiedler et al., 2012). For more detailed information on the limitations of the use of HCES data for food consumed outside of the home, refer to Moltedo et al., 2014 and Smith et al., 2014.

Links to guidelines

- Moltedo et al., (2014). “Analyzing food security using household survey data”
- Smith and Subandoro, (2007). "Measuring food security using household expenditure surveys"

Food Security Dimensions

- Quantity
- Quality

Food Composition Database Required?

Yes

End of Indicator: Share of food consumed away from home of total food consumption

Click to return to Table of Contents

Total individual energy intake

Overview

Total individual energy intake is a member of the class of indicators that measure individual intake of nutrients. It quantifies daily energy intake based on individual calorie consumption. Prolonged insufficient energy intake results in undernutrition and impaired growth, development, and functioning, and as a result many developing countries still suffer from high rates of underweight among adolescents and adults, and stunting and/or wasting among young children (Muller & Krawinkel, 2005). This is the only indicator included in the Data4Diets platform that strictly measures caloric intake at an individual level but other indicators that measure caloric availability at the household or national level are: household average dietary energy consumption and dietary energy in the food supply. Examples of other indicators that use individual data to nutrient quantify intake include total individual micronutrient intake, which is measured in absolute terms, as well as the Mean Adequacy Ratio (MAR), which uses a scaled system to measure adequacy of individuals' nutrient intake.

Method of Construction

In order to construct this indicator an individual’s intake must be recorded through a 24-Hour Dietary Recall or Weighed Food Record. Population mean consumption can be estimated with a single survey but the survey must be repeated on at least a subsample of the survey population for two non-consecutive days of intake to estimate ‘usual intake’ (IOM 2000). When repeated measurements are available for at least a subsample of individuals, the “probability approach”, which accounts for day-to-day variability of food intakes at the individual level, allows to calculate the individual probability of inadequate intake for each nutrient, and a mean probability of adequacy (MPA) over a range of micronutrients. The final sample in the dietary survey should be representative of all days of the week.

A Food Frequency Questionnaire (FFQ) could also be used but would provide a less accurate estimate. A contextually relevant Food Composition Table (FCT) is used to determine the energy content in each food item consumed by the individual, and the caloric value of all food items are summed to calculate a daily total. For further information, please refer to Chapter 3 of this FAO Food and Nutrition paper on calculating energy content of foods (FAO 2003).

Uses

This indicator is used to assess the most basic element of dietary quality: intake of sufficient calories. It can provide information on risk of both over- and undernutrition, particularly for vulnerable population subgroups, such as pregnant and lactating women, and for understanding the allocation of food resources within a household. However, this indicator does not provide information on the makeup of calories consumed, which has serious health implications. Indicators such as total individual macronutrient intake or total individual micronutrient intake may be more appropriate for assessing specific components of the diet.

Strengths and Weaknesses

One strength of this indicator, as well as of all individual-level indicators, is that they can be paired with findings on individual health outcomes or demographic information, such as religion, age, sex, education, or any other characteristics of interest, assuming the study has been designed for these purposes (Ferro-Luzzi 2002). One weakness is that obtaining dietary intake data is challenging due in large part to the collection methods used, including time and cost considerations (Hedrick 2012). Additionally, consumption of a sufficient number of calories is not an indicator of diet quality, as the source of the calories also affects nutritional outcomes. Other indicators such as MAR or probability of inadequacy may be more appropriate for using individual nutrient intake data to provide a picture of the diet as a whole as they are calculated across several nutrients.

Data Source

The intake data required for this indicator can be obtained through 24-Hour Dietary Recall surveys, weighed food records or FFQ (even if less accurate). The FAO/WHO Global Individual Food consumption data Tool (FAO/WHO GIFT) is a source for individual level quantitative dietary data. The FAO/WHO GIFT aims to make publically available existing quantitative individual food consumption data from countries all over the world. National or regional Food Composition Tables should be used to identify the nutrient contents of the foods and can be found at Food and Agriculture’s (FAO) International Network of Food Data Systems (INFOODS) or the International Life Science Institute’s (ILSI) World Nutrient Databases for Dietary Studies (WNDDS). In addition, Food Balance Sheet (FBS) data could be used to calculate a similar indicator, such as dietary energy in the food supply. Alternatively, Household Consumption and Expenditure Survey (HCES) data could be used to calculate household average dietary energy consumption.

Links to guidelines

- FAO, (2003). “Chapter 3: calculation of the energy content of foods – energy conversion factors”
- National Research Council Committee on Diet and Health, (1989). “Calories: Total Macronutrient Intake, Energy Expenditure, and Net Energy Stores”

Food Security Dimensions

- Quantity

Food Composition Database Required?

Yes

End of Indicator: Total individual energy intake

Click to return to Table of Contents

Total individual macronutrient intake

Overview

Total individual macronutrient intake is a member of the class of indicators that measure individual intake of nutrients. It quantifies the percentage of caloric intake from the three major macronutrient groups: protein, fats, and carbohydrates. These three nutrients have distinct and important functions in the body, and all are necessary for proper growth, development and cognitive and physical functioning. Both undernutrition and overnutrition due to improper macronutrient intake, and the related health complications, continue to be a major health concern in the developing world (Muller & Krawinkel, 2005). Other indicators included in the Data4Diets platform that measure individual nutrient intake include Nutrient Adequacy Ratio (NAR), Mean Adequacy Ratio (MAR), probability of inadequacy of specific micronutrient intake or Mean Probability of Adequacy (MPA) across several micronutrients, total individual micronutrient intake, and total individual energy intake. For more discussion on the comparative uses of these indicators, refer to the ‘Uses’ section below.

Method of Construction

In order to estimate an individual’s caloric intake from the three macronutrients, survey data must be collected from a 24-Hour Dietary Recall , a Weighed Food Record, or a Food Frequency Questionnaire (FFQ). Population mean consumption can be estimated with a single survey, but the survey must be repeated on at least a subsample of the survey population for two non-consecutive days of intake to estimate ‘usual intake’ (IOM 2000). This should be completed in a way such that the final sample is representative of all days of the week. Using a Food Composition Table (FCT) and the weight (grams) of the foods consumed, an estimate of the amount of protein, fat, and carbohydrates consumed per subject is calculated (distinguishing between fiber and other forms of carbohydrates). The total grams of each macronutrient are added together, and the caloric value of each is calculated using the following equation:

$$Calories(Kcal) = [Protein(g)*4] + [Fats(g)*9] + [\text{Av. } Carbohydrates(g)*4] + [Fiber(g)*2] + [Alcohol(g)*7]$$

*Note in this equation, Total Carbohydrates = [Available Carbohydrates + Fiber]

Finally, the proportion of calories from each macronutrient is calculated by dividing the calories from each by the total calories consumed. For more information on calculating this indicator, refer to the first method discussed in the ‘New Methods Considered’ section of the following paper published in the Journal of Food Composition and Analysis (Schakel et al., 2009).

Uses

Individual macronutrient intake is a useful indicator for understanding the dietary intake and quality (especially balance) of population subgroups, such as pregnant and lactating women, and for understanding the allocation of food resources among household members (Ferro-Luzzi 2002). These data can also contextualize shifting diet composition that has been observed in conjunction with demographic and economic transition in low- and middle-income countries, as individuals consume a higher percentage of their calories from fat (Popkin 2001). When expressed as percentages of total energy intake, the information provided is limited and should therefore be complemented by the total intakes in energy and the intake of each macronutrient in grams. In addition, since this indicator does not include information on micronutrient intake, it is not useful for capturing a full picture of dietary quality. More inclusive indicators such as the NAR, MAR, probability of inadequacy or MPA are more appropriate for using individual nutrient intake data to provide a picture of the diet as a whole.

Strengths and Weaknesses

An advantage of this indicator is that it allows researchers to estimate an individual's intake of specific macronutrients and in gathering data on individual intake, researchers are able to pair findings with individual health outcomes and demographic information, such as religion, age, sex, education, or any other characteristics of interest, assuming the study has been designed for these purposes (Ferro-Luzzi 2002). However, a weakness of this indicator is that it does not provide information on the diet as a whole and whether intake levels are adequate and within a healthy range (IOM 2000).

Data Source

Intake data can be obtained from 24-Hour Dietary Recall , Weighed Food Records and FFQs. The FAO/WHO Global Individual Food consumption data Tool (FAO/WHO GIFT) is a source for individual level quantitative dietary data. The FAO/WHO GIFT aims to make publically available existing quantitative individual food consumption data from countries all over the world. National or regional Food Composition Tables should be used to identify the nutrient contents of the foods and can be found at Food and Agriculture's (FAO) International Network of Food Data Systems (INFOODS) or the International Life Science Institute's (ILSI) World Nutrient Databases for Dietary Studies (WNDDS). RDAs can be obtained from the Institute of Medicine (IOM 2006). In addition, Food Balance Sheet (FBS) data could be used to calculate a similar indicator, such as national average supply of protein. Alternatively, Household Consumption and Expenditure Survey (HCES) data could be used to calculate household share of dietary energy from different macronutrients.

Links to guidelines

- Schakel et al., (2009). "Adjusting a nutrient database to improve calculation of percent of calories from macronutrients"

Links to validation studies

- Basiotis et al., (1987). "Number of days of food intake records required to estimate individual and group nutrient intakes with defined confidence"

- Jackson et al., (2007). “Reproducibility and validity of a quantitative food-frequency questionnaire among Jamaicans of African origin”
- Lanigan et al., (2000). “Validation of food diary method for assessment of dietary energy and macronutrient intake in infants and children aged 6-24 months”

Food Security Dimensions

- Quantity
- Quality

Food Composition Database Required?

Yes

End of Indicator: Total individual macronutrient intake

Click to return to Table of Contents

Total individual micronutrient intake

Overview

Total individual micronutrient intake is in the class of indicators that measures individual intake of a single nutrient (e.g. vitamin A, thiamin, riboflavin, niacin, vitamin B6, folates, vitamin B12, vitamin C, calcium, iron, zinc). It quantifies the daily intake of individual micronutrients, and can also be paired with further data in order to calculate insufficient micronutrient intake or prevalence of (adequacy or) inadequacy.

Micronutrients are of particular nutritional importance because malnutrition due to micronutrient deficiency continues to be a widespread problem in low-income countries. Micronutrients, especially iron, iodine, vitamin A, and zinc, are essential not just for infants and children to ensure proper growth and development, but also adults for continued work productivity, healthy pregnancies, and overall cognitive and physical health (Muller & Krawinkel, 2005). Some of the other indicators that measure individual intake include Nutrient Adequacy Ratio (NAR) and Mean Adequacy Ratio (MAR), probability of inadequacy of specific micronutrient intake, or Mean Probability of Adequacy (MPA) across several micronutrients, total individual macronutrient intake, and total individual energy intake. For more discussion on the comparative uses of these indicators, refer to the ‘Uses’ section below.

Method of Construction

In order to estimate individual daily intake of micronutrients, data from a 24-Hour Dietary Recall method, a Weighed Food Record or a Food Frequency Questionnaire (FFQ) are required. Population mean consumption can be estimated with a single survey but the survey must be repeated on at least a subsample of the survey population for two non-consecutive days of intake to estimate ‘usual intake’. The number of days of intake per subject that must be collected depends on the micronutrient of interest (IOM 2000). The final sample should be representative of all days of the week. It is important that enumerators ensure individuals report not just food consumed, but also any supplements taken and if any of the foods were potentially fortified. Using the weight of foods consumed and a Food Composition Table (FCT), the amount of each micronutrient of interest contained in the reported foods is calculated. If information is available in the FCT, phytates and other factors that inhibit the absorption of key nutrients such as iron and zinc should be taken into consideration.

For more information on how this indicator is constructed, see Chapter 2 entitled ‘Overview of the WHO Intake Monitoring, Assessment and Planning Program (IMAPP)’ of the following World Health Organization (WHO) report (WHO 2009). If this indicator will be used to calculate inadequacy or deficiencies, intake can then be compared to the distribution of Estimate Average Requirements (EARs) or Recommended Daily Allowances (RDAs) of specific micronutrients, which depend on the individuals’ age and sex (for more information, see Murphy & Poos, 2002).

Uses

Individual micronutrient intake can be a useful indicator in assessing the need for, or impact of nutrient-specific interventions including fortification and supplementation, which may be desirable in given locations or with specific population subgroups, such as pregnant and lactating women. Additionally, if micronutrient intake data are available for all members of a household, this indicator could shed light on the dynamics of intra-household allocation of food. However, this indicator alone cannot be used to assess adequacy of intake, and indicators that incorporate age and sex specific nutrient requirements, such as MAR or probability of (in)adequate intake, may be more appropriate. Additionally, indicators such as total intake of macronutrients or total energy intake may need to be used in conjunction with this one to provide a fuller picture of the components of a healthy diet.

Strengths and Weaknesses

One strength of this indicator is that it allows researchers to estimate an individual's intake of specific micronutrients and, in gathering data on individual micronutrient intake, researchers are able to pair findings with individual demographic information, such as religion, age, sex, education, or any other characteristics of interest, assuming the study has been designed for these purposes (Nayga 1994). However, this indicator does not speak to the adequacy of the diet as a whole, to dietary patterns, or the ability of individuals to absorb and use the micronutrients.

Data Source

Intake data can be obtained from individual 24-Hour Dietary Recall surveys, Weighed Food Record or FFQ. The FAO/WHO Global Individual Food consumption data Tool (FAO/WHO GIFT) is a source for individual level quantitative dietary data. The FAO/WHO GIFT aims to make publically available existing quantitative individual food consumption data from countries all over the world. National or regional Food Composition Tables should be used to identify the nutrient contents of the foods and can be found at Food and Agriculture's (FAO) International Network of Food Data Systems (INFOODS) or the International Life Science Institute's (ILSI) World Nutrient Databases for Dietary Studies (WNDDS).

Links to guidelines

- WHO, (2009). "Report to the WHO meeting on estimating appropriate levels of vitamins and minerals for food fortification programmes"

Links to validation studies

- Kennedy et al., (2007). "Dietary diversity score is a useful indicator of micronutrient intake in non-breast-feeding Filipino children"

Food Security Dimensions

- Quality

Food Composition Database Required?

Yes

End of Indicator: Total individual micronutrient intake

Click to return to Table of Contents

Volatility of food prices

Overview

Market-level analyses are an important method of measuring food security and can serve many purposes, including estimating domestic supply against population need, evaluating market response to changes in supply or demand, and providing insight on the consumer prices of food versus those of other goods (World Food Programme 2009). The volatility of food prices is one of several market-level indices included in the Data4Diets platform, which also includes the domestic food price index and the food affordability index. All three of these indicators use consumer-level data to measure food prices faced by consumers in markets. Unlike the other indices mentioned, however, the volatility of food price indicator quantifies the intensity of fluctuations in food prices over time, rather than measuring the price level itself. It is commonly reported on a monthly or annual basis, and uses a monthly consumer food price index and a rolling standard deviation of growth rates to compute volatility. High volatility can increase vulnerability to food insecurity by increasing uncertainty, contributing to asset draw-down during price peaks, and a consequent reduction in real incomes and calorie consumption by both urban and rural net consumers, as poor households are unable to substitute cheaper foods in the face of price increases (von Braun and Tadesse 2012).

Method of Construction

This indicator can be calculated on both an annual and monthly basis and is reported as the standard deviation around the mean of the price index over the reference period. It is based on a monthly domestic consumer food price index, such as the food price index calculated by the Global Information Early Warning System (GIEWS) at the FAO.

The GIEWS index takes the log of monthly price changes and calculates the monthly standard deviation over the previous 12 months. The length of the interval used influences how short term and long-term fluctuations are reflected, as indicators that use longer intervals tend to obscure short term volatility, while using shorter intervals may highlight fluctuations that more or less cancel each other out over time (Diaz-Bonilla 2016). For information on how GIEWS calculates their price volatility index, see the GIEWS indicator description page.

Uses

The GIEWS volatility of food prices index is used as one of three market-level indicators to track potentially detrimental increases in food prices, and is reported monthly on the country-level for several major commodities (GIEWS FPMA Tool). Although GIEWS provides indices based on major commodities, other indicators may be a superior choice depending on research or programmatic needs. For example, if more detailed information on food groups is required, the domestic food price indices are available disaggregated by major food group.

Strengths and Weaknesses

One strength of this indicator is that it is comparable within and across countries and over time. This allows for identification of change in food prices that are abnormal, and thus potentially indicate increased vulnerability to food insecurity, as it is used by GIEWS.

However, a weakness of this indicator is that it is only available at a national level, and therefore may not accurately reflect local price conditions faced by households and individuals in poorly integrated markets. Additionally, annual calculations may obscure seasonal price fluctuations and aggregate indices may obscure differing price fluctuations in nutritionally important foods (Diaz-Bonilla 2016), particularly cheap staples that may be of importance for vulnerable households.

Some have questioned whether the use of a simple rolling average of unconditional standard deviations is an adequate measure of volatility since it does not incorporate the effect of past volatility on current volatility (Food Security Portal 2011), while others have argued that high food prices, rather than high food price volatility, should be the priority concern of pro-poor government policy (Barrett et al., 2011) as high food prices have been shown to be more closely tied with political unrest (Bellemare 2011).

Data Source

Monthly country-level food price volatility data can be downloaded from the GIEWS Food Price Monitoring and Analysis Tool for specific commodities.

Links to guidelines

- Diaz-Bonilla, 2016. “Volatile volatility: conceptual and measurement issues related to price trends and volatility”

Food Security Dimensions

- Stability

Food Composition Database Required?

No

End of Indicator: Volatility of food prices

Click to return to Table of Contents