INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE
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UFED
Urban Food Environments and Diets Tool

DIET ASSESSMENT

Food Frequency Questionnaire (FFQ)

Overview

Food Frequency Questionnaires (FFQs) assess an individual's typical food consumption over a specified period, ranging from weeks to years. They ask about the frequency and portion size of foods and beverages and are typically administered by an enumerator. FFQs are designed to estimate long-term dietary intake, including nutrients and food groups, and can also be adapted to assess intake during specific timeframes or seasonal consumption patterns. For example, they can help determine how often certain foods are consumed during a particular season. This makes FFQs useful for capturing both habitual and context-specific dietary behaviors.

Rationale

Food Frequency Questionnaires (FFQs) are well-suited for examining usual or long-term dietary habits, typically over weeks, months, or even a year. They are particularly valuable in epidemiological research, nutrition surveillance, and studies exploring the links between diet and disease (e.g., noncommunicable diseases). In urban settings, FFQs can be used to capture prolonged exposure to unhealthy dietary patterns.

Type of data

FFQs can be tailored to assess specific dietary components or foods and adapted for different population groups. Participants report the frequency of food consumption (e.g., daily, weekly, monthly) and estimate portion sizes to calculate nutrient intake. The

tool categorizes foods by group and can track portion sizes either using standard references or relative estimates. Portion sizes may be asked separately from frequency, which can improve accuracy but may increase survey length and respondent burden. In low-literacy settings, combining portion size questions with visual aids (e.g., images) alongside frequency questions may improve comprehension and data quality.

Indicators

If using an FFQ and <u>not</u> using a food composition table:

Daily Dietary Diversity Score (DDS)	a validated indicator used to assess diet variety and nutrient adequacy by counting the number of distinct food groups consumed over a reference period. It can be calculated using Food Frequency Questionnaires (FFQs) without requiring a food composition table. DDS is validated for use with FFQs among adults, adolescents, and children (with age-specific adaptations). To calculate DDS from an FFQ, each food group is counted if consumed at least once during the recall period (e.g., past 7 days), and the total score reflects the number of food groups consumed. **Note:** in order compile the DDS from an FFQ, all food groups must be included as well as numerous examples of foods belonging to these groups. When the interview is list-based and not open recall, the respondent might classify a food into the wrong group (e.g., classifying potatoes under consumption of "other vegetables" instead of "white tubers").
Healthy and unhealthy food consumption	While the Global Diet Quality Score (GDQS) food groups can be used to generate indicators of healthy and unhealthy food consumption, the GDQS score itself is designed for use with 24-hour dietary recall (24HR) data. Because FFQs capture habitual intake over longer periods, they are not directly compatible with the GDQS methodology. However, FFQ data can still be used to approximate consumption patterns across GDQS food groups, allowing for proxy indicators of diet quality, especially when 24HR recall data are unavailable.

If using a FFQ with a food composition table:

Summary measures such as the Probability of Adequacy and Mean Probability of Adequacy (PA/MPA)	These indicators estimate the likelihood that an individual's intake of selected micronutrients meets their daily requirements. PA is calculated for each nutrient (e.g., iron, zinc, vitamin A), and MPA is the average of these probabilities across multiple nutrients. A higher MPA indicates better micronutrient adequacy. While traditionally calculated using multiple 24HR recalls to estimate usual intake and variability, FFQs can be used if they provide quantitative intake data and are paired with appropriate statistical methods to adjust for within-person variation. However, FFQs may be less precise for estimating usual intake distributions due to their reliance on self-reported frequency and portion size.

Other indicators that can complement diversity measures

Daily intakes of specific food groups, foods, and nutrients	FFQ data can be processed using a country-specific FCT to estimate daily intake of energy and nutrients. In urban settings, indicators such as dietary energy density (kcal/gram of food) and free sugars (as a percentage of total energy intake) are useful for tracking unhealthy dietary patterns. Energy density is calculated by dividing total energy intake by the total weight of foods consumed. Free sugars can be estimated if the FCT includes added sugar values or if assumptions are made based on food types and preparation.
Percent inadequacy of specific nutrients	This indicator estimates the proportion of the population at risk of inadequate intake for each nutrient. Nutrient intake is derived from FFQ data using a FCT and compared to reference values such as the Estimated Average Requirement (EAR) using the cut-point method. **Note**: this method is not suitable for nutrients with skewed requirement distributions, such as iron intake in women and children, due the variability in physiological needs.

Additional notes on indicators

- Used with caution, a carefully adapted FFQ can be used to calculate the Household Dietary Diversity Score (HDDS), which is traditionally based on a 24HR recall.
- The FFQ food list should include detailed itemization of snacks, packaged foods, and sugary drinks as urban populations often have higher consumption of those foods than rural or peri-urban dwellers.
- A quantitative FFQ can be used to calculate the intake of specific nutrients that are over- or under-consumed in the population. Quantitative intake data on macro- and micronutrients is needed as well as the use of a FCT and conversion factors to translate reported portion sizes into grams.

  Note: Tools like 24HR recall or Observed Weighed Food Records (OWFR) do not automatically provide conversion factors (e.g., portion sizes in grams) unless these are explicitly collected during data collection. You must plan to collect portion size data using methods such as weighing foods, using standard portion size references, asking respondents to estimate quantities.

Pros

- Food Frequency Questionnaires (FFQs) can assess overall dietary intake and temporal changes, capture individual dietary patterns, and may be easier to implement than 24-hour recalls—especially when the food list is shorter. They typically take 30–60 minutes to complete, depending on the length and complexity of the list, and are moderately easy and inexpensive to administer.

- In high-income settings, FFQs are commonly used and often self-administered. In urban areas, it is important to include energy-dense, ultra-processed foods, brand names, fast foods, and items like energy bars or fortified cereals to accurately capture energy and micronutrient intake.

- In low- and middle-income countries (LMICs), considerations such as literacy (especially if self-administered) and local food availability are critical. The FFQ must reflect foods that are accessible and commonly consumed in the local context. Including foods that are not available or affordable in the region can reduce the relevance and accuracy of the data collected. FFQs can be customized to suit the target population or to address specific dietary questions.
    - FFQs can be customized to suit the target population or address specific dietary questions.
    - Food lists can be tailored to collect data on relevant food items consumed in urban areas and LMIC settings.
    - One way to adapt FFQs to the local context is to link them with a food environment assessment. For example, the In-depth Vendor Assessment (Availability) tool, can help identify locally available foods, including street foods common in urban markets that may not appear in standard FFQs. Note: the vendor assessment must be conducted well in advance of FFQ implementation to allow time for analysis and adaptation of the food list.
    - Other aspects to consider when using a FFQ include local dietary patterns and frequency of consumption (e.g., daily, monthly), and cultural factors, such as holidays or religious observances (e.g., Ramadan), which may alter usual intake. Visual aids or pictorial FFQs can support respondents in low-literacy settings and including local or colloquial food names improves comprehension and accuracy.

Cons

- FFQs do not weigh or quantify foods but they do include portion size estimation (unless you use a qualitative FFQ – see more in the lower-resource section below), which leads to lower accuracy compared to other methods. FFQs can impose a high cognitive burden on respondents. respondents face in accurately estimating how much of a food they typically consume. Without direct weighing or visual aids, people often overestimate or underestimate portions, especially for foods eaten irregularly or in varying amounts. This can lead to inaccurate nutrient intake estimates, particularly in quantitative FFQs where portion size is used to calculate energy and nutrient values. In general, FFQs are prone to overreporting because they rely on long-term recall, which can lead to memory errors, social desirability bias, and inflated estimates of frequency or quantity.

- FFQs are not ideal for cross-cultural comparisons and may take longer than methods like 24-hour recalls. FFQs are designed to capture usual intake over a longer period (e.g., weeks or months), rather than short-term or day-to-day intake. So, they are best suited for assessing long-term dietary patterns, not short-term or daily variation. While useful for studying long-term dietary patterns in cohort studies or epidemiological research, shorter, lower-burden methods are better for population monitoring. FFQs may exclude culturally-specific foods, be influenced by weekday variations, and are imprecise for absolute nutrient intake. They are more suited to case-control and retrospective studies, which do not require tracking day-to-day variations. A longer food list can improve accuracy.

- FFQs often struggle to capture foods eaten away from home, which is especially important in urban areas where people frequently consume meals from restaurants, street vendors, and delivery services. To improve accuracy, FFQs should include questions about these food sources and use formative research to identify commonly consumed out-of-home items. In rapidly changing urban food environments, FFQs should be designed to be modular and updateable (ideally digital) and regularly revised based on food environment scans to reflect current dietary patterns.

Tool and indicator validation

To ensure these indicators are reliable and meaningful, validation studies have been conducted across diverse settings and populations.

Validation is essential in determining the suitability of a dietary assessment instrument, focusing on its validity, misreporting and measurement errors. Validity assesses how accurately the instrument reflects actual intake, usually in comparison with other methods. Misreporting, influenced by factors like social desirability or memory limitations, can impact accuracy. Measurement errors, either systematic (bias) or random, affect the reliability of findings. Every dietary assessment method has its own set of potential biases and errors – no method is perfect.

Lower-resource adaptations

In settings with limited resources, adaptations to the GDQS tool and data collection methods can help maintain data quality while reducing costs and logistical burdens.

- **Dietary screeners**: In urban environments, where food choices are diverse, rapidly changing, and influenced by many factors, dietary screeners offer a practical, efficient, and less burdensome alternative to FFQs. These tools provide a low-cost way to estimate dietary intake while focusing on specific food groups rather than the entire diet. With shorter recall periods, screeners reduce cognitive burden and better capture frequent food changes in food consumption. They are especially useful for reporting food consumed away from home (FAFH), which is often underreported in traditional FFQs. However, screeners require locally validated reference data to ensure accuracy and may not reliably estimate total intake without it. Screeners are well-suited for rapid data collection and can be easily adapted to culturally specific foods and habits. They are particularly effective in urban settings where food availability is less seasonal.
    - Digital screeners enhance ease of use and practicality, especially in populations with internet access and digital literacy.
    - Screeners should include convenience foods, fast foods, and low-cost processed items, which are commonly consumed and linked to diet-related noncommunicable diseases (NCDs).
    - They can be administered in person, by phone, or online, offering flexibility for urban populations.
    - While FFQs can be used to calculate indicators such as the quantity of food groups consumed, not all screeners are capable of this. To estimate intake, screeners must be paired with appropriate reference data.

Other Adaptations

- **Targeted short FFQs** can focus on specific foods (e.g., orange-fleshed fruits or vegetables), micronutrients (e.g., vitamin A), or nutrients of interest (e.g., folate, calcium, dietary fiber).
- **Qualitative FFQs** measure only the frequency of food consumption, not quantities. While this reduces respondent burden, it limits accuracy.
- **Semi-quantitative FFQs** include portion size questions, improving precision but increasing complexity.
- These formats may allow for proxy indicators like the Global Diet Quality Score (GDQS) based on food group frequency, but they are less accurate than fully quantitative assessments.
- Shortened food lists (e.g., fewer than 100 items) can reduce burden and improve feasibility, especially in low-resource settings.
- Web-based or self-administered FFQs can be cost-effective in urban areas with good internet access but require digital literacy and reliable connectivity.

Check the register of validated short dietary assessment instruments

Higher-resource adaptations

Conversely, in high-resource contexts, expanded data collection and broader geographic coverage can enhance the depth and utility of GDQS findings.

- Pilot testing the FFQ in the target geographic areas can help refine questions and food lists, and capture changes in the food environment—such as the rise of food delivery services or increased availability of ultra-processed foods (UPFs), branded products, and restaurant items.
- Extending the reference period or increasing the frequency of data collection can help capture seasonal and temporal variations in dietary patterns.
- Visual aids—such as household measurements (e.g., cups), photographs, food models, standardized recipes, or cooking method prompts—can improve portion size estimation and data quality. Piloting portion size estimation methods is recommended to identify what works best in the local context.
- Expanding the food list to include a broader range of items improves accuracy, especially when tracking specific or less common foods. This is particularly important in urban areas, where branded products, restaurant foods, fortified items, dietary supplements, and emerging food trends are more prevalent. Be sure to include a diverse range of beverages, and distinguish those with added sugars (e.g., sugar-sweetened beverages), which are commonly consumed and contribute to rising rates of overweight and obesity.
- Expanding geographic scope, such as including rural populations for comparison, can enhance the study's relevance. However, this may require a separate FFQ tailored to rural contexts, given differences in food availability, consumption patterns, and cultural practices.

Sampling and data collection considerations

Regardless of resource level, thoughtful sampling and data collection strategies are essential to ensure representativeness and relevance of FFQ data.

The sampling approach depends on the user's question of interest and target population, but it is crucial to ensure a study's sample is representative of the target population. The two primary sampling approaches are probability and non-probability sampling. There are several methods of probability sampling, including simple random sampling, where any member of the target population has an equal chance of being selected into the study, interval sampling, in which people of the targeted group are continually available and selected into a sample (i.e., consumers in a market), and stratified sampling, which divides the target population into groups for sampling, and/or cluster sampling which uses groupings from which the sample population is selected.

In urban settings, administrative boundaries and enumeration areas can help organize sampling. In many countries, lists of enumeration areas can be acquired, after which a sample frame or list of households or targeted individuals from each of those areas are developed, from which households or individuals are sampled. Correcting for over- or under sampling through sample weighting is essential to improve data accuracy. If the question of interest is to assess changes at population-level in dietary quality due to a program or policy, it is critical that the sampling frame include populations that have been exposed to those interventions. Non-probability sampling methods, such as convenience and snowball sampling, can be used when ease of access is prioritized.

Careful conceptualization of the relationship between food environments and diets helps guide geographic focus and sampling strategy, ensuring more meaningful and representative results. For example, if your question of interest is to compare between areas of differing levels of urbanization, the geographic frame could include urban, peri-urban, and rural areas, and a sampling strategy would need to select a representative sample of households and individuals.

Sampling for FFQs must ensure participants can accurately report habitual intake, making it important to exclude those with temporary dietary changes. Unique considerations include accounting for seasonal variation, ensuring the sample is familiar with listed foods, and stratifying by factors like age or income that influence dietary patterns. The FFQ should be locally adapted, reflecting commonly consumed foods in urban areas, with care to include cultural or traditional foods and processed or convenience foods typical in urban settings. In addition, an appropriate recall period should be used (e.g., past 7 days, 30 days, typical month) that captures habitual dietary patterns and the longer the recall period, the more likely respondents will recall infrequently consumed foods but the less accurate the recall will be. Food groups must be classified in a way that is appropriate to urban settings, particularly for foods such as street foods or fast foods that are more common in urban than rural settings. Finally, portion sizes must be clearly indicated because in urban settings food portion sizes can vary significantly, this could entail the use of photographs to aid recall.

Other data sources

When primary data collection is not feasible, alternative data sources can complement or substitute GDQS-based assessments, though each comes with its own trade-offs.

While it is ideal to collect primary data, real world limitations to data collection in urban settings may prevent this, including on the implementing side (e.g., budget/resource constraints) and in the field (e.g., difficulty in accessing populations, conflict-affected settings). It may be helpful to examine secondary data sources, either as background to inform primary data collection or in place of it, if data collection is not feasible.

Data Sources	Pros	Cons	Indicators
Household consumption and expenditure surveys (HCES) [Household-level consumption]	Low cost, nationally -representative -Conducted regularly (every 3-5 years) with a large sample -Contains other variables such as data on socioeconomic status, education, and other determinants relevant to nutrition -often also includes acquisition data (food acquired from purchases, production, in-kind)	-Need nutrition and data analysis expertise -Modules are heterogenous across countries, making comparisons challenging -Does not differentiate between subgroups to estimate differences in probability of deficiencies in high-risk groups -Household level (no individual dietary data), does not address intra-household allocation issues that may affect household members -May have issues with accurately recording food consumed away from home (FAFH) which are very important in urban settings (e.g., street foods, meals consumed at school)	-Diet diversity (Household diet diversity score) -Food consumption (Food consumption score) -Nutrient availability: macronutrient and micronutrient availability per capita per day (micronutrient availability requires use of FCT), per capita energy intake. -Consumption patterns (frequency or shares of animal-sourced foods, staple foods, ultra-processed foods)

Data Sources	Pros	Cons	Indicators
Global Dietary Database [Individual-level diets]	-Harmonized data (variables, units, food definitions) for individual-level dietary data from nutrition surveys for 188 countries	-Need nutrition and data analysis expertise -Surveys use different designs and tools -Certain food categories excluded (e.g., poultry, dairy-based desserts, highly processed or packaged foods, mixed dishes and recipes, condiments and spice, supplements)	-Includes 51 dietary factors including 14 foods, 7 beverages, 12 macronutrients, and 18 micronutrients
GIFT Database (FAO) [Individual-level dietary diversity]	-Data are disaggregated by sex and age. -Individual quantitative food consumption data coded with the FoodEx2 classification system, data are screened and formatted using R -dashboards presenting indicators and summary statistics on foods and diets -Can link food groupings to own dietary data (dataset available upon request)	-Need nutrition and data analysis expertise, particularly as outliers and missing data not removed from original datasets and energy and nutrient values are provided directly from surveys (does not link food consumption datasets to food composition data) -Data not available for some countries -Many datasets are old and often not nationally representative -No data on statistical weights	-Statistics on food consumption can be calculated for individual food items or using the nutrition-sensitive food groups (e.g., sources of micro- and macronutrients in the diet, macronutrient contribution to total intake) -Estimated usual intakes of selected nutrients (with SPADE tool) -MDD-W (and Food group diversity score, individual food group consumption) -Food consumption (daily diet g/per person per day, proportion of food groups consumed (%), calories per person per day) -other indicators for food safety (dietary exposure to chemicals) and environmental impacts of food consumption (emission, water, and land use)
Demographic and Health Surveys	-Nationally representative data on dietary diversity	-Need nutrition and data analysis expertise -Alternatively, the DHS StatCompiler and mobile app allows for automatic indicator calculation and disaggregation	MDD-W -IYCF practices (MAD, MDD, MMF) -Percentage consuming food group (PLW, WRA)
Gallup World Poll (GWP) (Global Diet Quality Project)	-Global coverage and standardization (140 countries, including those that lack nutrition surveillance data) -Integration with economic, social and health indicators -Frequent updates (every 5 years) -Samples adults aged 15+ (not just women)	-Other national surveys tend to align more closely with DHS than GWP. -GWP often collects data in lean seasons, potentially underestimating MDD-W compared to DHS. -Validating MDD-W for males aged 15–49 could expand GWP's utility. -Greater variability in GWP estimates than DHS.	MDD-W, DDS -All-5, protective, and unhealthy food consumption -Healthy diet pattern for NCD prevention -Zero fruit or vegetable consumption -Consumption (yes/no) of food groups included in the DQQ

Illustrative research using these tools and indicators in urban settings

- Association between neighborhood food environment and dietary quality among adolescents in Kuala Lumpur, Malaysia (Norddin 2025)
- Association between the community food environment and dietary patterns in residents of areas of different socio-economic levels of a southern capital city in Brazil (de Almeida 2023)
- Association of the retail food environment, BMI, dietary patterns, and socioeconomic position in urban areas of Mexico (Pineda 2023)

FFQ and Dietary Assessment-related Resources

Bailey, R. Overview of dietary assessment methods for measuring intakes of foods, beverages, and dietary supplements in research studies. Current opinion in biotechnology, 70 (2021), 91-96.

Data4Diets: Building Blocks for Diet-related Food Security Analysis, Version 2.0. Tufts University, accessed 2023, https://inddex.nutrition.tufts.edu/data4diets.

INTAKE. Center for Dietary Assessment. FHI 360. Accessed 2024. https://www.intake.org/resources.

National Cancer Institute. Dietary Assessment Primer. National Institutes of Health (NIH). Accessed 2023. https://dietassessmentprimer.cancer.gov/approach/table.html.

References

Bromage, S., Zhang, Y., Holmes, M., et al. A novel food-based diet quality score is associated with nutrient adequacy and reduced anemia among rural adults in ten African countries. *Current Developments in Nutrition*, 4 (2020), nzaa061_009.

Castellanos-Gutiérrez, A., Rodríguez-Ramírez, S., Bromage, S et al. Performance of the Global Diet Quality Score with nutrition and health outcomes in Mexico with 24-h recall and FFQ data. *The Journal of nutrition*, 151 (2021), 143S-151S.

de Almeida, I, Garcez, A, Backes, V. "Association between the community food environment and dietary patterns in residents of areas of different socio-economic levels of a southern capital city in Brazil." *British Journal of Nutrition* 129, no. 6 (2023): 1066-1074.

Diop, L, Gelli, A, Huybregts, L et al. "The minimum dietary diversity for women indicator can be extended to children and adolescents aged 4-15 years as a proxy population indicator for good micronutrient adequacy of diets in low-and middle-income countries." *Current Developments in Nutrition* 9, no. 1 (2025): 104508.

Gómez, G, Monge-Rojas, R, Vargas-Quesada, R et al. "Exploring the FAO Minimum Dietary Diversity Indicator as a suitable Proxy of Micronutrient Adequacy in men and Women across Reproductive and non-reproductive ages in 8 latin American countries." *Food and Nutrition Bulletin* 45, no. 2_suppl (2024): S55-S65.

Henríquez-Sánchez, P., Sánchez-Villegas, A., Doreste-Alonso, J., et al (2009). Dietary assessment methods for micronutrient intake: a systematic review on vitamins. *British Journal Of Nutrition*, 102 no. S1 (2009), S10-S37.

Hong, Tang K., Michael J. Dibley, and David Sibbritt. "Validity and reliability of an FFQ for use with adolescents in Ho Chi Minh City, Vietnam." *Public Health Nutrition* 13, no. 3 (2010): 368-375.

Jayawardena, R, Byrne, N, Soares, M, et al. "Validity of a food frequency questionnaire to assess nutritional intake among Sri Lankan adults." *Springerplus* 5 (2016): 1-6.

Kronsteiner-Gicevic, S, Mou, Y, Bromage, S et al. "Development of a diet quality screener for global use: evaluation in a sample of US women." *Journal of the Academy of Nutrition and Dietetics* 121, no. 5 (2021): 854-871.

Norddin, N, Che'Ya, N, Mohidem, N., et al. "Association between neighborhood food environment and dietary quality among adolescents in Kuala Lumpur, Malaysia." *Heliyon* (2025).

Nsabimana, P, Gutema, B, Langley, K et al. "Exploratory dietary patterns, the global diet quality score, and their associated socio-demographic factors among young adults in Rwanda: a cross-sectional study using a food list-validated, semi-quantitative food frequency questionnaire." *Nutrition & Metabolism* 21, no. 1 (2024): 92.

Pineda, E, Cunha, D, Sharabiani, M. "Association of the retail food environment, BMI, dietary patterns, and socioeconomic position in urban areas of Mexico." *PLOS Global Public Health* 3, no. 2 (2023): e0001069.

Pufulete, M, Emery, P, Nelson, M, et al. "Validation of a short food frequency questionnaire to assess folate intake." British Journal of Nutrition 87, no. 4 (2002): 383-390.

Regassa, I, Endris, B, Habtemariam, E, et al. "Development and validation of food frequency questionnaire for food and nutrient intakes of adults in Butajira, Southern Ethiopia." *Journal Of Nutritional Science* 10 (2021): e98.

Rodriguez, C, Smith, E, Villamor, E, et al. "Development and validation of a food frequency questionnaire to estimate intake among children and adolescents in Urban Peru." *Nutrients* 9, no. 10 (2017): 1121.

Smith, L., Dupriez, O and Nathalie Troubat. "Assessment of the reliability and relevance of the food data collected in national household consumption and expenditure surveys." *International Household Survey Network* 82 (2014).

Vega-Salas, M, Curi-Quinto,K, Hidalgo-Aréstegui, K, et al. "Development of an online food frequency questionnaire and estimation of misreporting of energy intake during the COVID-19 pandemic among young adults in Peru." *Frontiers in Nutrition* 9 (2022): 949330.

Ye, Q, Hong, X, Wang, Z, et al. "Reproducibility and validity of an FFQ developed for adults in Nanjing, China." *British Journal of Nutrition* 115, no. 5 (2016): 887-894.