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Food frequency questionnaires (FFQs)

A Systematic Review of Food Frequency Questionnaires: Strengths, Weaknesses, and Best Practices for Development and Validation.

*Module: Nutritional assessment
methodology*

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Master 02 Nutrition and Pathology

Work plan

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- Definition of FFQ
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- Validation and Evaluating Validity
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Introduction

Dietary assessment tools are instruments utilized to measure and evaluate an individual's or population's dietary intake in order to understand food consumption patterns, assessing nutritional status, and identifying areas for dietary improvement.

Dietary assessment tools provide valuable information to healthcare professionals, researchers, and individuals themselves. The most used Dietary assessment tools are :**Food Frequency Questionnaires (FFQs), 24-Hour Dietary Recalls, Food Diaries, Duplicate Plate Method.**

Definition(FFQ)

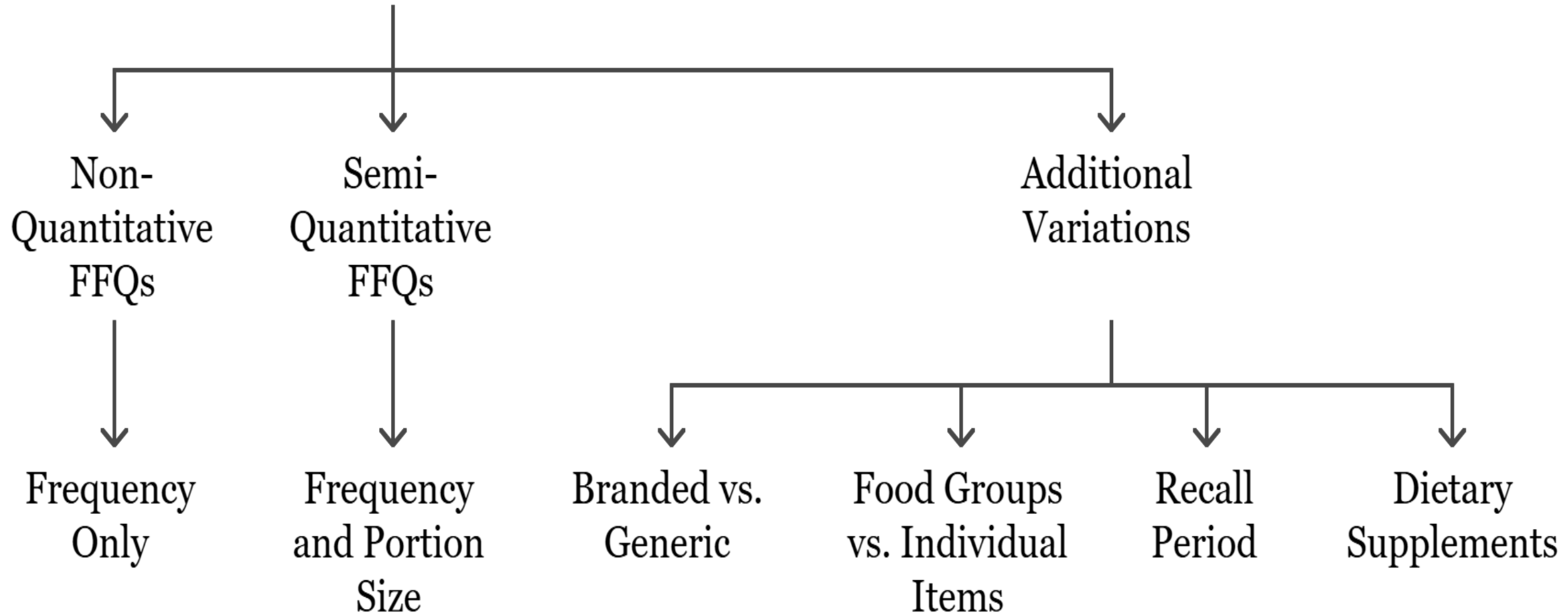
FFQ is a dietary assessment tool used to **collect informations** about how often individuals(participants) consume specific foods or food groups and baverages within **a given time frame**, such as a week or a month.

- **Objective:**

To obtain frequency and, in some cases, portion size information about food and beverage consumption over a specified period of time.

Categories of Food Frequency Questionnaires

Food
Frequency
Questionnaires
(FFQs)



Types of Food Frequency Questionnaires

Harvard FFQ

Food Categories



- Fruits
- Vegetables
- Grains
- Dairy Products
- Meats
- Beverages



Harvard
FFQ



Frequency of Consumption

- Never
- Occasionally
- Daily
- More than twice a day



Dietary Patterns

- Frequency
- Portion Sizes

2.The Diet History Questionnaire (DHQ)

DHQ is a freely available FFQ, developed by staff at the Risk Factor Assessment Branch (RFAB). DHQ can be used by researchers, clinicians, or teachers without permission.

DHQs often delve deeper into **dietary habits**, including meal patterns, cooking methods, and specific food preparation techniques. This level of detail can provide more nuanced information about dietary intake.

Block Food Frequency Questionnaire

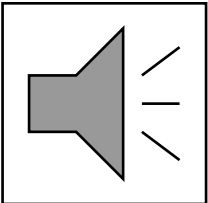
The Block FFQ was developed by Dr. Gladys Block that provides an in-depth method for analyzing the frequency of food and beverage consumption, along with the portion sizes and Unlike short-term dietary recalls, the Block FFQ is designed to assess **habitual dietary patterns over the long term**, typically one year.

The questionnaire links reported food data to a nutrient composition database, allowing researchers to estimate nutrient intakes such as calories, fat, vitamins, and minerals.

The Block FFQ has been employed in numerous large-scale studies, such as the National Health and Nutrition Examination Survey (NHANES), to evaluate the relationship between dietary patterns and health outcomes.

Utility of FFQ

- ❑ Food Frequency Questionnaires (FFQs) provide information on the consumption of specific foods and beverages over a set period. The breadth of items can be employed to assess either total dietary intake or specific dietary aspects. When portion size is not included, it only represents usual consumption frequency, and such FFQs are sometimes called **"food propensity questionnaires."**
- ❑ FFQs are better suited for assessing foods consumed episodically than short-term methods like **24-hour dietary recall**.
- ❑ Data can be linked to databases to determine nutrient intake.
- ❑ FFQs are often cost-free .



Total dietary intake determination requires information regarding dietary supplement intake as well

3. FFQs are sometimes applied to describe a population's intake in cross-sectional studies.
 - FFQs can be utilized to examine associations between diet and health or other variables.
 - FFQs are commonly utilized as main dietary assessment instrument in **large prospective studies**.
 - FFQs and screeners are the only practical methods for capturing diet in retrospective case-control studies.

Limitations of FFQ

- **Recall bias:** Participants may forget or misreport their dietary intake.
- **Portion size estimation:** Accurately estimating portion sizes can be challenging.
- **Frequency categories:** Limited granularity of frequency categories.
- **Nutrient database:** Inaccuracies and limited coverage in nutrient databases.
- **Seasonal variations:** Dietary patterns may change seasonally.
- **Individual differences:** Variations in dietary habits and preferences.
- **Cultural factors:** Differences in food knowledge and social norms.

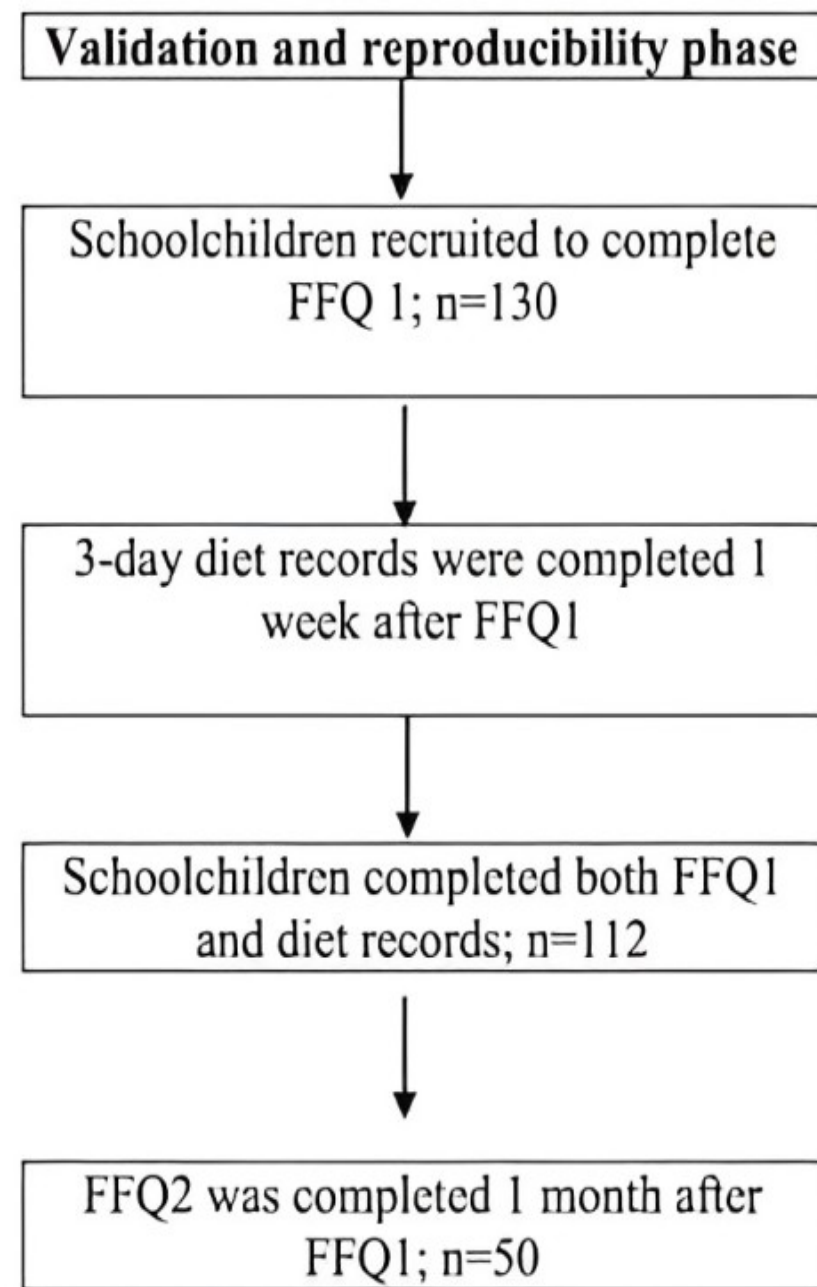
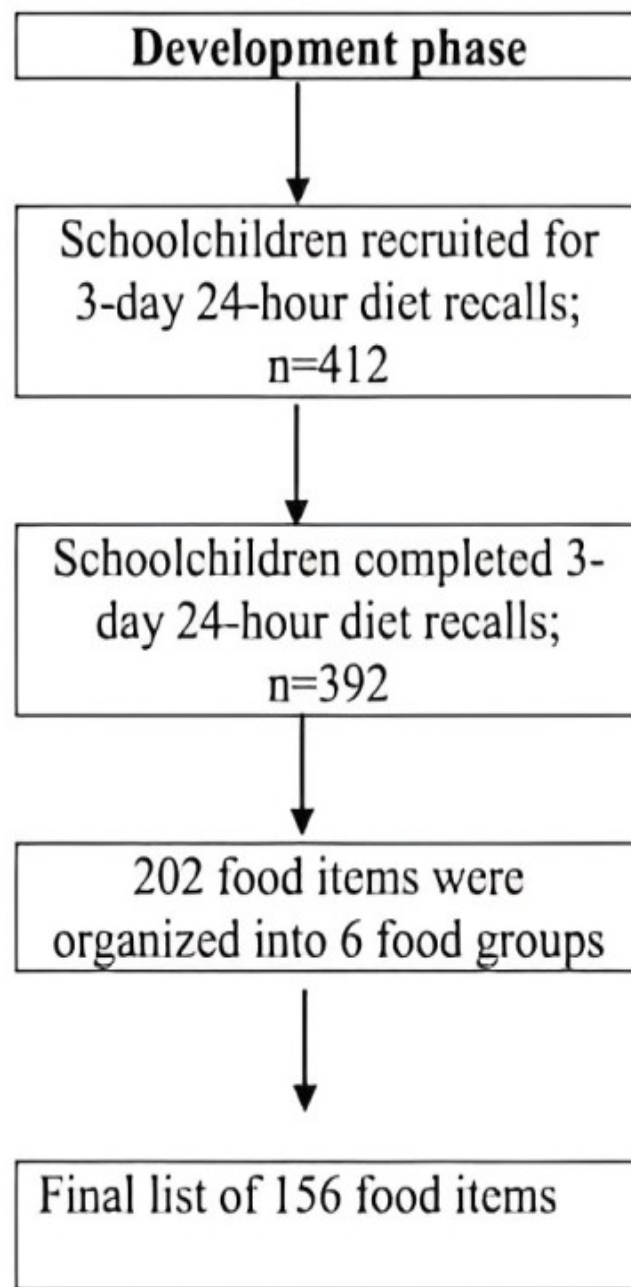
Comparison between the FFQ and other nutritional assessment tools

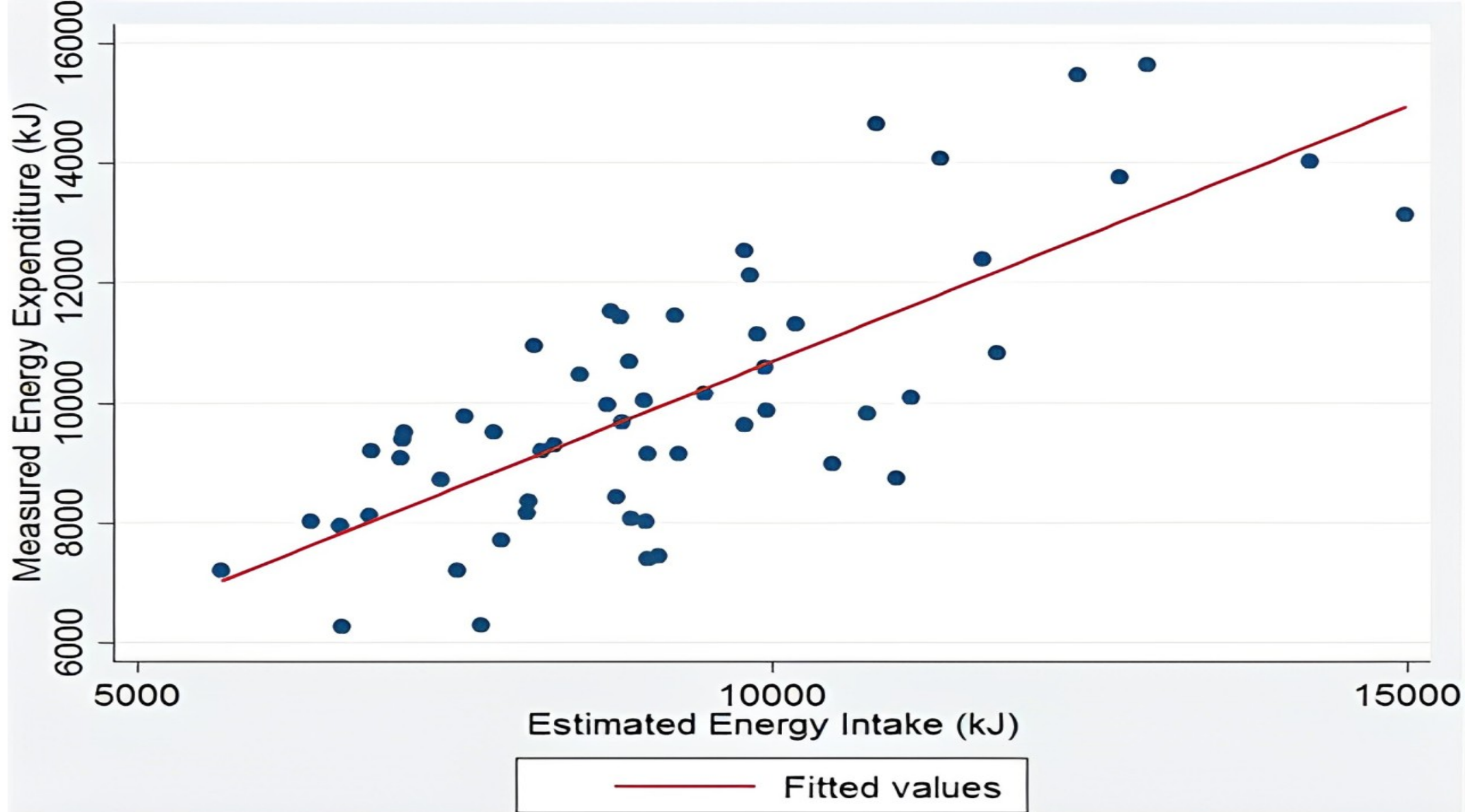
		24-Hour Recall (24HR)	Food Record (FR)	Food Frequency Questionnaire (FFQ)	Screener (SCR)
Study Design	Cross-sectional	X	X	X	X
	Retrospective			X	X
	Prospective	X	X	X	X
	Intervention	X		X	X
Scope of interest	Total diet	X	X	X	
	One or a few components			X	X
Captures contextual details regarding food preparation, timing of meals, location of meals, etc.	Yes	X	X		
	No			X	X
Time frame of interest	Short term	X	X		
	Long term			X	X
Can be used to query diet in distant past	Yes			X	X
	No	X	X		
Allows cross-cultural comparisons	Yes	X	X		
	No			X	X

Validation and Evaluating Validity

Types of Validity

- 1. Content Validity:** Refers to the extent to which the FFQ items adequately represent the domain of interest (i.e., dietary intake). A valid FFQ should include a comprehensive list of foods and food groups that are relevant to the target population.
- 2. Criterion Validity:** Refers to the extent to which the FFQ results correlate with external criteria of dietary intake. For example, FFQ data can be compared to dietary records, biomarkers, or other validated dietary assessment methods to assess criterion validity.
- 3. Construct Validity:** Refers to the extent to which the FFQ measures the underlying construct of dietary intake. This can be assessed by examining the relationships between FFQ scores and other variables that are theoretically related to dietary intake, such as health outcomes or socioeconomic status.





Considering Measurement Error

Measurement error refers to the difference between the true value of a parameter, such as true sodium intake, and the value obtained from a particular measure, for example: sodium intake estimated from a screener .

There are two types of measurement error:

- ❑ **Random error:** an unpredictable type of error that contributes to variability.
- ❑ **Systematic error:** results in measurements that consistently depart from the true value in the same direction.
Systematic error also is known as **bias**.

Factors Affecting FFQ Validity

- **Recall bias:** Participants may overestimate or underestimate their intake due to memory lapses or other cognitive biases.
- **Portion size estimation:** Challenges in accurately estimating portion sizes can affect the validity of FFQ data.
- **Cultural factors:** Variations in food habits and portion sizes across different cultures can make it difficult to develop a universally valid FFQ.
- **FFQ design:** The specific design of the FFQ, including the number of food items, frequency categories, and portion size estimation methods, can influence its validity.

Strategies for Enhancing FFQ Validity

Cultural Context

Adapting FFQs to fit cultural relevance

Visual Aids

Using images or models to estimate portion sizes

Clear Instructions

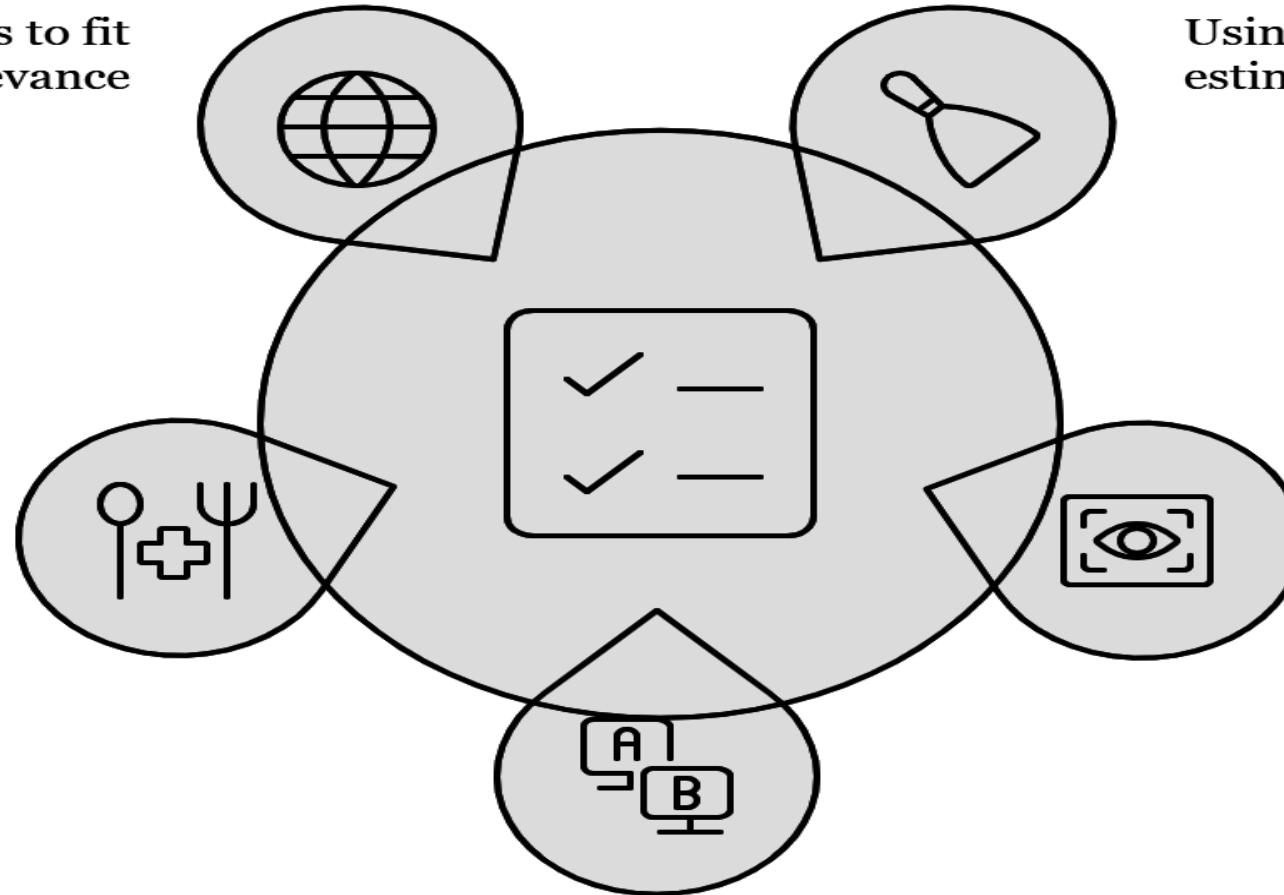
Ensuring participants understand the FFQ process

Pilot Testing

Conducting preliminary studies to identify issues

Multiple Methods

Combining FFQs with other dietary assessments





Small portion: 30 grams



Medium portion: 60 grams



Large portion: 100 grams



Extra large portion: 145 grams

Figure 1 Illustration of four portions of the same food (chayote cooked) photographed and included on the food portfolio.

Data Processing Requirements

- A nutrient composition database is required to translate foods, beverages, and supplements reported into nutrient intakes .
- A database, such as the Food Patterns Equivalents Database (FPED), is required to translate foods and beverages reported into amounts of guidance-based food groups (e.g., dark-green vegetables, whole grains, and added sugars).
- Software specific to each FFQ is required to derive nutrient and food group intakes from the respondent-reported information.
- Many FFQs include algorithms and software to automate the calculation of estimated daily intakes of nutrients and/or food groups.

Data Analysis

1. Descriptive Statistics:

- Calculate frequencies, percentages, means, medians, modes, standard deviations, and ranges for dietary variables.
- Create tables and graphs (bar charts, histograms, pie charts) to visualize the data.

2. Correlation Analysis:

- Examine the relationships between dietary variables and other variables (demographic characteristics, health outcomes).
- Calculate correlation coefficients (Pearson's correlation, Spearman's rank correlation) to measure the strength and direction of associations.

3. Regression Analysis:

- Model the relationship between dietary variables and dependent variables (health outcomes).
- Use various regression techniques (linear regression, logistic regression, survival analysis) to predict outcomes or assess the impact of dietary factors.

4. Factor Analysis:

- Identify underlying factors or dimensions that explain the relationships between dietary variables.
- Use factor analysis to reduce the dimensionality of the data and create new variables that represent these factors.

5. Cluster Analysis:

- Group individuals based on their dietary patterns.
- Use clustering algorithms (k-means clustering, hierarchical clustering) to identify distinct dietary clusters.

Application Area	Description
Epidemiological Research	- Population-level dietary assessment to identify dietary patterns and health outcomes. - Nutritional surveillance for tracking trends and nutrient deficiencies.
Clinical and Nutritional Care	- Patient dietary assessments to support diet-related disease management. - Nutritional deficiency screening for targeted support and supplementation.
Diet-Disease Relationship Studies	- Researching risk factors by linking dietary intake to diseases (e.g., red meat and colorectal cancer). - Comparing dietary data with biomarkers to validate nutrient intake and health impact.
Public Health and Policy Planning	- Data for dietary guidelines and recommendations based on population needs . - Evaluation of public health interventions to track their effectiveness
Retrospective studies	- Case-control studies that examine past diet to assess links with current health outcomes. - Longitudinal studies of dietary impact over life stages for life-course health insights.
Data for Nutritional Databases and Modeling	- Linking FFQ data with nutrient composition databases for nutrient-specific analysis.

Conclusion

Food Frequency Questionnaires (FFQs) are a valuable tool for assessing dietary intake in epidemiological and nutritional research. They offer a cost-effective and efficient way to collect dietary data from large populations. However, their accuracy and reliability depend on various factors, including the FFQ design, participant recall, and data analysis methods.

When choosing an FFQ, a nutritionist should ensure it aligns with study goals, reflects the population's dietary habits, and has strong validation. The FFQ should balance detail with respondent burden to maintain accuracy, and using one linked to a nutrient database can enhance data quality..

Bibliographic references

1. Books:

- Thompson, S. E., Subar, C. S. (2012). Dietary Assessment Methods.

2. Articles:

- Subar, C. S., & Thompson, S. E. (1998). Food frequency questionnaires: A methodological review. Nutrition Reviews.
- Freedman, L. S., Schatzkin, A., & Ziegler, R. G. (1992). Validation of a self-administered food frequency questionnaire. American Journal of Epidemiology.

3. Online Resources:

- National Cancer Institute (NCI).
- National institutes of health(NIH).

Thank you for your attention