Food and Agriculture Organization
of the United Nations

MINIMUM DIETARY DIVERSITY FOR WOMEN

An updated guide for measurement: from collection to action

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Food and Agriculture Organization of the United Nations
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Abbreviations and acronyms

CAPI	Computer-assisted personal interviewing
COVID-19	Coronavirus disease 2019
DDS	Dietary diversity score
DHS	Demographic and health surveys
EPHI	Ethiopian Public Health Institute
FAO	Food and Agriculture Organization of the United Nations
FBDG	Food-based dietary guidelines
FCS	Food consumption score
FG	Food group
FIES	Food insecurity experience scale
GAFSP	Global Agriculture and Food Security Program
GDQP	Global Diet Quality Project
GDQS	Global diet quality score
GIZ	Deutsche Gesellschaft für internationale Zusammenarbeit
HH	Household
HDDS	Household dietary diversity score
ICF	International Classification of Functioning, Disability and Health
IFAD	International Fund for Agricultural Development
INDDEX	International Dietary Data Expansion Project
IYCF	Infant and young child feeding
LMIC	Low- and middle-income countries
MDD	Minimum dietary diversity
MDD-W	Minimum dietary diversity for women
MSG	Monosodium glutamate
NRV	Nutrient reference value
NCD	Non-communicable diseases
RE	Retinol equivalents
RAE	Retinol activity equivalent
RUA	Royal University of Agriculture
TAG	Technical Advisory Group
UNZA	University of Zambia
UHT	Ultra-high temperature
USAID	United States Agency for International Development
WFP	World Food Programme
WFR	Weighed food record
WHO	World Health Organization
WRA	Women of reproductive age

Scope of the guide

This guide aims to provide guidance to a diverse range of stakeholders from low and middle-income countries (LMIC) who are interested in actionable data on women's diets. It is articulated in two parts:

Part 1 The Indicator: from collection to action provides an overview of the indicator, including its rationale, definition and construction, followed by step-by-step instructions for choosing and applying each data collection method. Sample tools are supplied based on resources and survey needs, followed by suggestions for analysis, presentation, interpretation and how to use the results to serve different objectives and purposes.

Part 2 Steps for field operations includes basic steps on preparing for MDD-W data collection, selection of enumerators and planning and conducting capacity-development.

This guide follows and supersedes the 2016 *Minimum Dietary Diversity for Women: A Guide for Measurement* (FAO & FHI 360, 2016). It provides updates and new elements such as:

- Recommendations based on the most recent scientific evidence, global developments, consultations and consensus from current users
- Updated good practices for:
    - Data collection using non-quantitative list-based and open recall methods
        - Recommendation to add questions concerning unhealthy food groups to data collection tools, to account for the rising nutrition transition that is witnessed in many LMIC and to allow for research on the rising prevalence of overweight and obesity among women
        - Adaptation of extensive food lists for local contexts.
    - Using computer-assisted personal interviewing (CAPI) in survey design and administration
    - Data management, analysis, interpretation and presentation
    - Applying of MDD-W data for monitoring and evaluation purposes to inform policy and programming decisions.

Who is this guide for?

Practitioners, including:

… survey managers planning and conducting multi-topic large-scale surveys that include a module on women's diets

… technical personnel collecting dietary data for monitoring and evaluation on nutrition outcomes

… public health nutritionists

Researchers and students in academia or research institutions:

… conducting studies in the fields of nutrition, health, agriculture, development, etc.

Decision-makers in national, international and non-governmental organizations:

… interested in formulating nutrition sensitive policy and programmes to improve women's nutrition status through increasing women's diet diversity

PART 1

THE INDICATOR: FROM COLLECTION TO ACTION

PART 1

Section 1.
INTRODUCTION

Section 1. Introduction

1.1. DEFINITION OF THE INDICATOR

To start using the indicator Minimum Dietary Diversity for Women (MDD-W), we must first understand what it intends to measure, in what population, and what the resulting measurement means.

MDD-W is a dichotomous indicator of whether or not women 15 to 49 years of age have consumed at least five out of ten defined food groups the previous day or night.[1]

It is a food group diversity indicator that reflects one key dimension of diet quality – micronutrient adequacy – summarized across 11 micronutrients: vitamin A, thiamine, riboflavin, niacin, vitamin B-6, folate, vitamin B-12, vitamin C, calcium, iron and zinc.[2]

The proportion of women of reproductive age (WRA)[3] who achieve this minimum of five food groups out of ten in a population can be used as a proxy indicator for higher micronutrient adequacy. In other words, a higher prevalence of MDD-W among a group of WRA is a proxy for better micronutrient adequacy in a given population (Martin-Prével *et al*., 2015).

The ten food groups

1. **Grains, white roots and tubers, and plantains**
2. **Pulses (beans, peas and lentils)**
3. **Nuts and seeds**
4. **Milk and milk products**
5. **Meat, poultry and fish**
6. **Eggs**
7. **Dark green leafy vegetables**
8. **Other vitamin A-rich fruits and vegetables**
9. **Other vegetables**
10. **Other fruits**

1 The MDD-W indicator is dichotomous, meaning that it returns the value yes or no. The woman achieves minimum dietary diversity, i.e. yes, if she consumed at least five different food groups during the previous day or night, and no otherwise.

2 The MDD-W indicator was validated against the probability of adequacy of these 11 micronutrients using nine data sets in six countries.

3 For the purposes of this document and indicator, WRA are defined as women 15 to 49 years of age. This is sometimes expressed as aged 15.0 to 49.9 years, to include women who have reached their 15th birthday but who have not yet reached their 50th birthday.

The food groups are described, defined and elaborated in Part 1, Section 2, and Appendix 1 provides additional examples of commonly consumed food items from different diets for some of the food groups.[4]

The MDD-W was designed to:

- require only data on whether a food group is consumed (or not), and not their quantities;
- be simple to use and easy to interpret;
- be relatively low cost;
- minimize the burden on enumerator and respondent;
- allow for integration into large-scale surveys, existing data collection platforms and monitoring frameworks.

1.2. BACKGROUND

The importance of women's nutrition, with focus on dietary diversity

Women of reproductive age (WRA) are often nutritionally vulnerable because of the physiological demands of pregnancy and lactation (Black *et al.*, 2013; Torheim and Arimond, 2013). Requirements for most nutrients are higher for pregnant and lactating women than for adult men (Branca *et al.*, 2015). Insufficient micronutrient intakes before and during pregnancy and lactation can affect both women and the development of their infants, especially during the critical first 1 000 days of life (Cusick and Georgieff, 2016). Yet, in many resource-scarce environments, WRA's diets are monotonous, dominated by starchy staple foods, and do not provide sufficient micronutrients (Arimond *et al.*, 2010; Lee *et al.*, 2013; Martin-Prevel *et al.*, 2017).

These vulnerabilities and gaps in micronutrient intakes have long been recognized, along with decades of appeals to improve the quality of women's diet and nutrition. Diet quality is multidimensional,[5] and promotion of diverse diets is one of several approaches taken

4 It is important to note that when using MDD-W, the food groups should not be changed, as they are validated against micronutrient values, and any changes would risk erroneous results and interpretation, and create confusion with other indicators.

5 In addition to micronutrient adequacy, high-quality diets are characterized by adequate consumption of healthy foods, nutrients and non-nutrients (e.g. fruits, vegetables, pulses, nuts, seeds, whole grains, fibre, bioactive non-nutrients, etc.) and limited consumption of unhealthy foods and nutrients (e.g. highly-processed foods, saturated fat, sugar, sodium, etc.) associated with increased risks for chronic diseases (Guenther *et al.*, 2010). The World Health Organization (WHO) Healthy Diet Fact Sheet summarises several WHO and FAO reports and advises what a healthy diet is: http://www.who.int/mediacentre/factsheets/fs394/en/

to improve micronutrient nutrition for WRA and contribute to sustainable, healthy diets.[6] Regardless of whether other strategies for improving nutrition are in place, consumption of food items from diverse food groups can be safely and universally recommended as is increasing the corresponding availability and accessibility of nutrient dense food groups (Arimond and Deitchler, 2019).

The need for a simple food-based indicator

One major impediment to improving women's diet quality in LMIC is a lack of effective policies and programmes that lead to improved access, quality and availability of food. To formulate evidence-based policies and tailor priorities and actions for WRA, it is imperative to increase the availability and accessibility of high quality, accurate and valid data. Dietary data that are collected through quantitative dietary assessment methods including weighed food records (WFR), food diaries or open 24-hour quantitative recalls, can provide important insights into the nutrient adequacy of individuals and populations, but these methods are expensive and require highly skilled enumerators and extensive time for preparation and collection (FAO, 2018). As such, LMIC are unlikely to possess the resources or capacity to conduct data collection using these methods on a sufficiently regular basis to allow for tracking progress at the national scale. Various dietary diversity scores (DDS) have been

6 FAO and WHO (2019) Sustainable healthy diets: Guiding principles. Healthy diets: (1) start early in life with early initiation of breastfeeding, exclusive breastfeeding until six months of age, and continued breastfeeding until two years and beyond, combined with appropriate complementary feeding; (2) are based on a great variety of unprocessed or minimally processed foods, balanced across food groups, while restricting highly processed food and drink products; (3) include whole grains, legumes, nuts and an abundance and variety of fruits and vegetables; (4) can include moderate amounts of eggs, dairy, poultry and fish; and small amounts of red meat; (5) include safe and clean drinking water as the fluid of choice; (6) are adequate (i.e. reaching but not exceeding needs) in energy and nutrients for growth and development, and meet the needs for an active and healthy life across the lifecycle; (7) are consistent with WHO guidelines to reduce the risk of diet-related NCDs, and ensure health and wellbeing for the general population; (8) contain minimal levels, or none if possible, of pathogens, toxins and other agents that can cause foodborne disease (FAO/WHO, 2019).

proposed, but some are complex to collect and compute. Thus, simple indicators that allow for assessment, advocacy and accountability are essential, particularly for use in policy and programming contexts.

Moreover, among the indicator frameworks to monitor progress toward nutrition-related Sustainable Development Goals (SDGs), SDG 2 (United Nations General Assembly, 2015), there is still a lack of easy to collect food-based indicators, specifically those for diet quality, that target vulnerable populations (FAO, IFAD, UNICEF *et al.*, 2020). The inclusion of MDD-W as a food-based indicator that monitors the dietary diversity of WRA could partially address this gap, as well as contribute to the achievement of SDG 3 and SDG 5.[7]

Development of the indicator

In response to this demand, a study was conducted using nine data sets of diet consumption in Africa and Asia (Martin-Prevel *et al.*, 2015, 2017). This eventually resulted in the MDD-W indicator, a dichotomous indicator that is based on a set of ten food groups.[8] To date, the MDD-W is the only standardized dietary diversity indicator that specifically focuses on WRA. For this population, the indicator can be used for a variety of different purposes and in different settings. See Part1, sub-section 1.3 for appropriate uses of the indicator.

The wide range of intended uses for the indicator means that the data collection method must be relatively simple and chosen with careful consideration. Two non-quantitative methods were identified as the most appropriate and suitable to allow for low-cost and low-burden collection of MDD-W data: list-based and open recall methods. While MDD-W can be calculated from quantitative dietary data, in practice this is counterintuitive, for the reasons stated above, and is usually conducted in the context of research studies.

Why do we need to update the Guide for measurement?

Since the launch of the indicator, MDD-W is increasingly collected by United Nations Agencies, the European Union, GIZ and the Demographic and Health Surveys (DHS) Program among other surveys for various purposes. New technical and operational challenges have arisen for both list-based and open-recall methods. FAO has been taking stock of frequently encountered challenges through user surveys, advocacy and capacity-development events and workshops. It is timely for these findings to be shared in a systematic manner.

In 2020, FAO and its partners completed research in three countries that compared the performance and operationalization of the two methods against a reference method. These results feed into the broader understanding of the best practices for data collection, analysis and presentation of results. In addition to this study, new evidence and guidance is emerging on how to collect data for dietary diversity in large-scale surveys including for

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7 Sustainable Development Goals, SDG 2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture; SDG 3: Ensure healthy lives and promote well-being for all at all ages; SDG 5: Achieve gender equality and empower all women and girls (United Nations General Assembly, 2015).

8 Additional background on the development of the indicator is available at: http://www.fantaproject.org/monitoring-and-evaluation/ minimum-dietary-diversity-women-indicator-mddw and https://a4nh.cgiar.org/2015/09/22/get-to-know-the-new-indicator-for-measuring-womens-dietary-diversity/

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DHS,[9] the Global Diet Quality Project (GDQP) (Herforth, *et al.*, 2019; Herforth, *et al.*, 2020), and the updated Infant and Young Child Feeding (IYCF) technical guide (forthcoming, 2021). Harmonized guidance that supports the standardization of methodologies used by numerous initiatives and government agencies that conduct regular, large-scale data collection will support the increased availability of comparable data. This provides an even stronger justification for its utility to monitor progress towards achieving SDG 2, when the inclusion of additional indicators is open to consideration in the future.

Finally, MDD-W data collection has shifted rapidly towards the use of remote data collection for crisis situations, and computer assisted personal interviewing (CAPI) using tablets or mobile phones, replacing the traditional paper-based questionnaires in many large-scale national surveys.

As the demand for high-quality monitoring and evaluation tools for diet quality continues to grow, there is a clear need for an updated version of the Guide to address these new developments.

1.3. APPROPRIATE USES

The Minimum Dietary Diversity for Women (MDD-W) indicator was developed as a proxy indicator to reflect the micronutrient adequacy of women's diets. While data are collected from individual women, the indicator **cannot** be used to infer diet quality for an individual, as it is based on a single recall period over one day and night (24-hours) and does not reflect

[9] Additional information on Demographic and Health Surveys is available at https://dhsprogram.com/publications/publication-DHSQ8-DHS-Questionnaires-and-Manuals.cfm

day-to-day variability for individual intakes. The correct use and interpretation of MDD-W is at the **population-level**, i.e. for groups of WRA. Validation studies on MDD-W show that:

- Groups with a higher proportion of women consuming food items from at least five of the ten food groups are likely to have higher micronutrient adequacy than groups that have a lower proportion of women achieving this threshold (Martin-Prevel *et al.*, 2017).
- Groups of WRA who consume food items from five or more of the ten groups are also highly likely to consume at least one animal-source food and either pulses or nuts/seeds and food items from two or more of the fruit/vegetable food groups (Martin-Prevel *et al.*, 2015).

See Table 1 below for further descriptions of appropriate and inappropriate uses of MDD-W.

Table 1. Appropriate and inappropriate uses of the MDD-W indicator

Appropriate uses (Do)	Inappropriate uses (Do not)
• As a proxy to describe micronutrient adequacy at the population level. • Description of the proportion of women consuming each food group. • Tracking changes in diets of groups of women over time. • Comparing diets of groups of women in different settings, sociodemographic and other characteristics of interest.[a] • Integration in national and subnational assessments. • Evaluating impact of interventions at scale, programmes and policies.	• Assessing diet quality as a whole. MDD-W is a proxy of only micronutrient adequacy of diets of WRA. It **does not** equate to total diet quality. • Screening for individuals interventions and identifying individuals at risk for poor intakes. • Developing behaviour change messages. • Applying the cut-off of 5 out of 10 food groups to indicate micronutrient adequacy for other age groups and men.[b] • Using the cut-off of 5 out of 10 food groups when different food groups other than those defined in this Guide are used.

IMPORTANT NOTES

a. **When comparing with data from previous assessments, take into account:**

- survey timing related to seasonality;[10]
- consistent use of the same data collection method.

b. **On using MDD-W with other populations**

- In order to avoid the misuse of MDD-W, when using the same tool to collect data on dietary diversity in other population group, it should be clearly stated how the data will be analysed and interpreted.
- The cut-off was validated for the micronutrient requirements for non-pregnant WRA, which may not apply to other populations having different micronutrient needs. Data for different population can be collected with the same questionnaire, but attention should be given to the different interpretation of results, specifically the cut-off.

10 The relationship between food group diversity and micronutrient intakes and adequacy can vary by season.

BOX 1. WHY FOCUS ON WOMEN?

Gender equality and good nutrition in women and adolescent girls are pre-requisites for the implementation and achievement of all 17 of the Sustainable Development Goals (SDG), and not only SDGs 2, 3 and 5, where their importance is explicitly stated and measured. As the first dietary diversity indicator validated to collect comparable data on WRA across countries, MDD-W provides a springboard to take action in the right direction.

Beyond physiological needs

Women are central to household (HH) food security and nutrition, as they are generally responsible for food selection, preparation and infant and young child feeding (IYCF) practices. Historically, women are often assigned as primary caregivers to children and elderly family members – even though such traditional gender roles have been challenged by the empowerment of women. For instance, women's economic advancement, increased level of education and decision-making power. These reasons, together with prevailing gender norms,[11] continue to cause women to be more socially vulnerable, which in turn, impacts the quality of their diet (Clark *et al.*, 2020; Kassie *et al.*, 2020; Komakech *et al.*, 2019; Oxfam, 2019).

For example, in some parts of Africa and Asia, it is customary for women and men to eat separately (WFP, 2019). Women may eat second or last, after they have served food to other family members (den Hartog, van Staveren and Brouwer, 2006). In Uttar Pradesh, India, when food is scarce women give up their share of food in favour of men and children, which is accepted practice and justified by the need to put the interest of their families first (WFP, 2019). These practices mean that other HH members consume good quality and nutritious food (e.g. animal source foods), to the detriment of women. Therefore, adequacy of HH dietary diversity within a population may mask the fact that some women are consuming diets that are monotonous and insufficient for meeting their daily nutritional needs. On the other hand, when women's diets are diverse, it is likely that the other members of the families are also consuming diverse diets, considering the priority given to them. MDD-W has been shown to be a strong predictor of HH dietary diversity, as results of MDD-W align food consumption score (FCS), a HH dietary diversity indicator, when collected from the same HH (Lamanna *et al.*, 2019). See Appendix 2 for further information on the comparison of MDD-W with other HH dietary diversity indicators.

Finally, there is a clear impact pathway that connects women's empowerment to dietary diversity (see Figure 14). Women's empowerment is positively and significantly related to the dietary diversity of both children and women (Komakech *et al.*, 2019). The positive effects of empowering women are multi-dimensional: her livelihood and nutrition status are improved, as well as those she provides care. This highlights again the importance of more actionable data on women's diets, such as that for the MDD-W, which could be used to inform the formulation of appropriate policies and programmes that target women. The trickle-down and inter-generational effects on women's food security, nutrition, education and health of their children and family (Clark *et al.*, 2020) will certainly help pave the way towards promoting gender equality.

[11] The World Health Organization states "Sex refers to the biological characteristics that define humans as female or male." FAO states "Gender refers not to women or men per se, but to the relations between them, both perceptual and material. Gender is not determined biologically, as a result of sexual characteristics of either women or men, but is constructed socially. It is a central organizing principle of societies, and often governs the processes of production and reproduction, consumption and distribution" (FAO, 1996).

1.4. METHODOLOGICAL APPROACHES

MDD-W can be measured using two main methods: list-based and open recall. These methods are recommended and detailed in Part 1, Section 3.

List-based method

In the list-based method, **the enumerator reads the respondent a list of predefined sentinel foods and beverages** categorized under purposely ordered food groups. The enumerator informs respondents that they should respond *yes* for each food or beverage consumed during the specified recall period of the previous day and night.

Open recall method

In a non-quantitative open 24-hour recall, the enumerator asks a series of standard probing questions to help the respondent recall all foods and beverages consumed the previous day and night and also probes for the main ingredients in mixed dishes. Specifically, the recall period covers a continuous, 24-hour period starting from the time the respondent woke up the previous day.

The recall is **open** because **the enumerator does <u>not</u> read a list of predefined foods/groups to the respondent.** Each food or beverage mentioned by the respondent can be recorded on an open grid and then marked on a predefined list (either by the enumerator or using a CAPI program or after the data collection by someone familiar with matching food items to food groups).

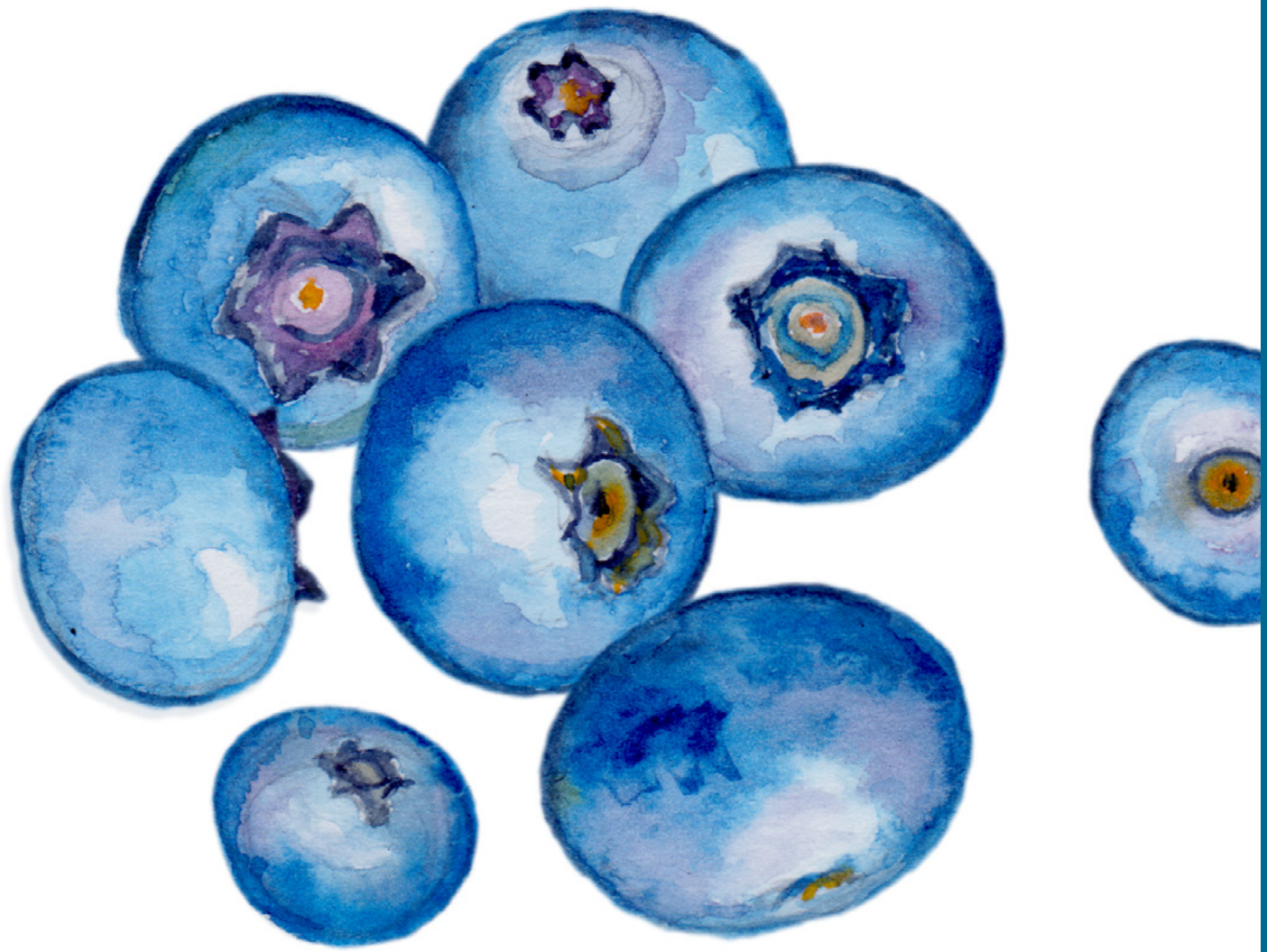
Comparison of methods

There are advantages and disadvantages to each method. Key concerns include the linked issues of respondent burden and the time needed (and thus cost) to implement the recalls.

The FAO Project *A multi-country study to improve the operationalization of the MDD-W indicator* (2018-2020) compared the relative validity of the two currently used non-quantitative data collection methods: open-recall and list-based against WFR as a reference method (Hanley-Cook *et al.*, 2020). The Project examined whether MDD-W and underlying scores generated by open-recall and list-based methods differ significantly when evaluated against those generated from WFR data. The summary and implications of the study can be found in Box 9.

PART 1

Section 2.
THE TEN FOOD GROUPS



Section 2. The ten food groups

What are the ten main groups, subdivisions in the questionnaire and additional food groups of interest?

The MDD-W indicator was defined in the previous Section, and the ten MDD-W food groups introduced. Section 2 dives deeper into the MDD-W by providing a description of each food group:

1. **Grains, white roots and tubers, and plantains**
2. **Pulses (beans, peas and lentils)**
3. **Nuts and seeds**
4. **Milk and milk products**
5. **Meat, poultry and fish**
6. **Eggs**
7. **Dark green leafy vegetables**
8. **Other vitamin A-rich fruits and vegetables**
9. **Other vegetables**
10. **Other fruits**

The food groups that make up the MDD-W are mutually exclusive – no food or ingredient is placed in more than one food group. In sub-section 1.3, however, the adapted food list and resulting model questionnaires show **some of the ten groups have been further subdivided**. This is to increase the ease of recording, to make the questionnaire more intuitive for enumerators, and allow for collection of consumption data on additional food groups that may be of interest.

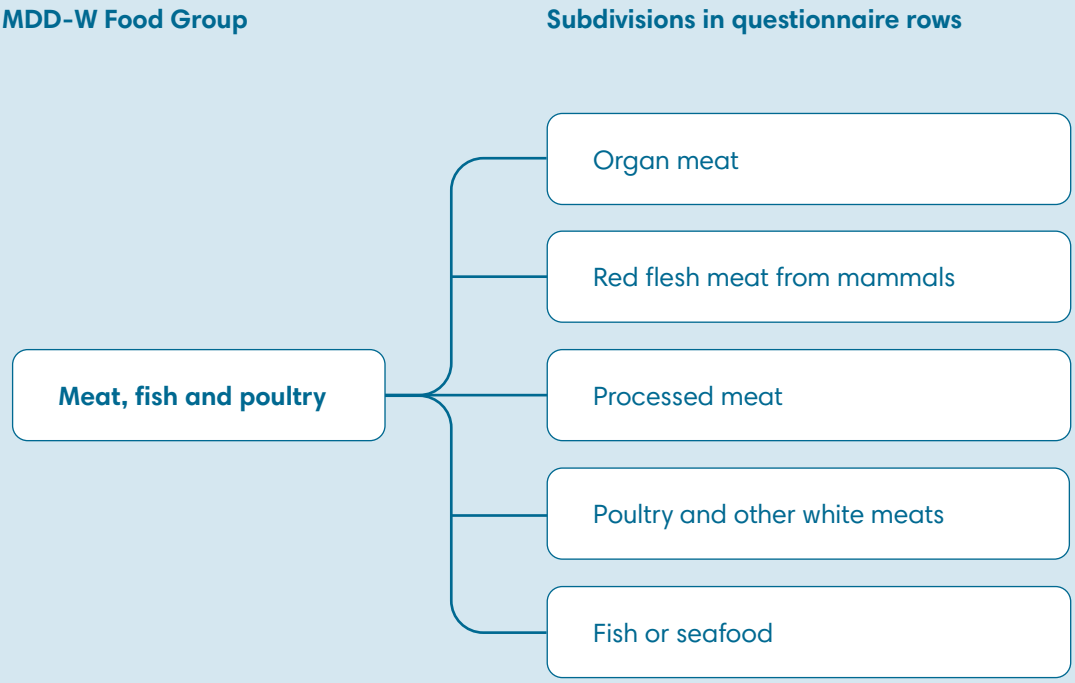
In addition, this section provides descriptions of additional food groups that appear on the extensive food list and model questionnaires (sub-section 1.3) that do not count for the indicator but may provide important information.

The rationale for including the additional food groups is stated under the descriptions below. Some food groups are those considered unhealthy and therefore of interest in the context of the non-communicable diseases, nutrition transition and multiple burden of malnutrition. Other food groups are included primarily to provide a space for enumerators to mark some foods that are prone to being incorrectly classified into one of the ten MDD-W groups. For example, the "Condiments and seasonings" group includes diverse foods and ingredients usually consumed in quantities too small to count towards the 10 MDD-W food groups. See Box 3 for further discussion on how much is enough to count and on the "Condiments and seasonings" group.

BOX 2. SUBDIVISION OF THE TEN FOOD GROUPS

Minimum Dietary Diversity for Women (MDD-W) is a simple indicator calculated for 10 food groups, but during data collection more information can be obtained through subdivision of these 10 groups into 20 or more subgroups using the rows in the questionnaire.

Example: "Meat, poultry and fish" for MDD-W is a single group, but for surveys it can be useful to subdivide this group:



Source: developed by the authors

In addition to the descriptions in this section, see Appendix 1 for detailed lists of foods belonging to some of the MDD-W food groups, as well as additional food groups. Appendix 1 also includes a table listing specific foods and ingredients that are difficult to classify.

A discussion of mixed dishes is provided at the end of this section.

2.1 SELECTION OF THE TEN FOOD GROUPS

Dietary diversity indicators group foods together when they are considered nutritionally similar and/or play the same role in the diet (Ruel, 2003). While developing the MDD-W, different numbers of food groups and food group definitions were considered. The final decision concerning use of the ten groups described here was made based on their showing a stronger relationship to micronutrient adequacy than other combinations and number of food groups tested (Martin-Prevel *et al.*, 2015).

For the purpose of clarity, **the 10 food groups** are sometimes subdivided into more than one question and placed in different rows in the questionnaire, as explained above.

Always use local names for food when listing example items in each row of the questionnaire. This is especially important for groups that include grains and pulses, where the source ingredient typically undergoes processing (commercially or in the home). For example, under "Grains, white roots and tubers, and plantains", rather than listing wheat on the questionnaire, use local food names, such as bread, chapatti, noodle, pasta, roti, seitan and/or wheat tortilla. Similarly, in the pulses group, list hummus, tofu and/or other locally consumed processed products made from pulses.

2.2 FOOD GROUP DESCRIPTIONS

Note that the food groups described here generally follow culinary, rather than botanical, definitions and classifications for such items as fruits, vegetables and seeds. For example, tomatoes and peppers are classified as vegetables rather than fruits, and the "Nuts and seeds" group includes only certain types of seeds that are typically described as such in one or many cuisines (e.g. sesame seeds or pumpkin/squash seeds).

Although the basic principles of what comprises a healthy diet remain the same, the exact composition of a healthy and diverse diet varies depending on individual characteristics, cultural context, locally available foods and dietary customs. Because of the vast variability of foods available in different climates, agro-ecological zones and cultures, every food group listed in this section will require adaption to include local food items (see Part 1, Section 3). The nutritional composition and culinary uses will guide the classification of local food items into the food groups.

Note that the classification used for MDD-W is **not** intended to:

- be used directly for nutrition education or as dietary guidelines;
- replace established/existing food group classifications, such as those used in national dietary guidelines or nutrition education programmes, which group foods in different ways.

GROUP 1 – grains, white roots and tubers and plantains

This group is sometimes also called starchy staples. These foods provide energy, varying amounts of micronutrients (e.g. certain B vitamins provided by grains) and varying amounts of anti-nutrients, such as phytates.[12] When grains are consumed whole, they also provide dietary fibre. White roots and tubers include non-coloured and non-grain-based starchy staples that mainly provide carbohydrates. These include any staple dishes/casseroles and pastes made from roots, tubers and plantains.

For purposes of the questionnaire, this group is divided into two rows: (1) foods made from grains and (2) white roots and tubers or plantains.

Commonly consumed examples include:

- **Foods made from grains** include all products and staple dishes derived from cereal crops and flours made from these crops, such as all types of breads (e.g. bagels, rolls, chapatti, roti, tortillas) and flatbreads.
    - stiff porridges of maize, cornmeal, sorghum, millet or cassava (manioc) (e.g. ugali, nsima/nshima, posho, sadza, mealies, dalia, muesli, papilla, grain fufu, couscous);
    - noodles, pasta, soba, vermicelli.
- **White roots and tubers or plantains** include potatoes, white-fleshed sweet potatoes, white yams, yucca and white-fleshed plantains/white-fleshed bananas.
    - Plantains/white-fleshed banana (a fruit) and cooking bananas are included in this group because they share a similar nutrient profile to some roots and tubers and play the same role in diets as a starchy staple food. These are different from the sweet ripe bananas that might be called dessert bananas, which are placed in the "Other fruits" group.

For survey teams interested in risks from non-communicable diseases (NCDs), a specific subdivision can be made for **whole grains.**[13]

This group does **not** include sweet biscuits and cakes, which are classified under "Sweets", and instant noodle packets, classified under "Fried and salty foods".

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12 Phytates are considered anti-nutrients because they bind with certain minerals and prevent absorption.

13 The Global Diet Quality Project includes this question, aligned with the WHO recommendation to include them as part of a healthy diet (Herforth, *et al.*, 2019).

GROUP 2 – pulses (beans, peas and lentils)

This group includes members of the plant family *Fabaceae* (alternate name *Leguminoseae*), such as beans, peas and lentils. The seeds are harvested at maturity and dried and used as food or processed into a variety of food products. The group is high in protein and B vitamins, although the protein is not complete and certain amino acids must be supplied by other foods. Pulses represent a very important protein source in plant-based diets and among populations where animal-source foods are largely unaffordable. The fat content of pulses is generally low, with the exception of soybean. However, pulses also contain varying amounts of anti-nutrients that inhibit absorption of certain nutrients.

Commonly consumed pulses include: mature seeds (beans), common beans (black, kidney, pinto), broad bean (fava, field bean), chickpea (garbanzo), pigeon pea, cowpea, lentil and soybeans, sprouted pulses, legumes and processed/prepared products, such as tofu, tempeh, soymilk, soy cheese, hummus and texturized vegetable protein. Additional examples of products made from pulses are provided in Appendix 1.

This group **excludes**:

- Plants harvested green or immature and eaten fresh from the pod – these are included in the "Other vegetables" group.
- Groundnuts (peanuts) because, while groundnuts are in the *Fabaceae* family, both its high fat content and most common culinary uses make them different from other legumes and more similar to tree nuts. Groundnuts are included in the "Nuts and seeds" group.

GROUP 3 – nuts and seeds

This group comprises mostly tree nuts but also includes groundnuts (peanuts) and may include certain seeds when consumed in substantial quantities. Nuts and seeds butters, such as pounded groundnut/peanut butter, cashew butter or sesame butter (tahini), are also included when consumed in substantial amounts (more than 15 g) and not merely added to flavour mixed dishes.

Nuts and certain seeds are rich in unsaturated fatty acids, vegetable protein, fibre, minerals, tocopherols, phytosterols and phenolic compounds. They may have unique health benefits (Alasalvar and Bolling, 2015; Del Gobbo *et al.*, 2015; Ros, 2015), with the exception of chestnuts, they generally have a very high fat content.

Common tropical tree nuts include: cashew, macadamia and Brazil nut; common nuts grown in broader temperate zones include almond, chestnut, hazelnut, pecan, pistachio and walnut.

Commonly consumed seeds include: sesame, sunflower, pumpkin/squash/gourd and pine nut.

Definition and classification of seeds and major challenges

There are two issues to be taken into account when determining items to list as examples under seeds on the questionnaire: one is the definition of seeds and the other is the usual amount consumed.

In the botanical sense, seeds include a very broad range of items, including nuts, grains and legumes. But in culinary terms, outside of nuts, grains or legumes, there are very few types of seeds. These are typically high in fat content and consumed as snacks or side dishes, in pastes, to season or garnish mixed dishes or to chew as a digestive.

For the purposes of this Guide, the culinary definition of seeds excludes tree nuts, grains and legumes. A very wide-range of seeds are foraged or cultivated and used in cuisines in many regions. While it is not possible to provide a comprehensive list of seeds used as foods; additional examples can be found in Appendix 1.

When should nuts and seeds be included under "Condiments and seasonings"?

Most of the time, as nuts and seeds are often consumed in very small quantities. Most nuts and seeds should be listed on the questionnaire among the examples in the "Condiments and seasonings" group, and not in the "Nuts and seeds" group. Nuts and seeds are included in the nuts and seeds food group only if they are a substantial ingredient in local mixed dishes or if they are eaten as a substantial snack or side dish. For some examples, refer to the extensive food lists for Cambodia, Ethiopia and Zambia in Appendix 5.

See Box 3 and the "Condiments and seasonings" group for a more detailed discussion of quantities and where to include particular nuts and seeds. The decision about where to place various types of nuts and seeds, and their products, on the questionnaire should be made during adaptation of the questionnaire.

Note: Oils extracted from nuts and seeds should be included under the optional "Other oils and fats" group.

BOX 3. THE ISSUE OF QUANTITY – HOW MUCH IS ENOUGH TO COUNT TOWARDS FOOD GROUP DIVERSITY?

The indicator Minimum Dietary Diversity for Women (MDD-W) was developed for situations where it is not practical or feasible to collect quantitative dietary information, i.e. to ask about the number and size of servings consumed.[14]

Then, how much is needed for a food group to count towards the MDD-W? And how can this be determined without asking about quantities?

Several studies suggest that, even if it is not possible to assess servings or an adequate amount, it is worthwhile to try to exclude very small quantities (Arimond *et al.*, 2010; Gewa *et al.*, 2014; Martin-Prevel *et al.*, 2015). The relationship between food group diversity and micronutrient adequacy is stronger when very small amounts of a food group are not allowed in the count.

Consumption of a food group by women of reproductive age (WRA) only counts for MDD-W when the quantity is 15 g or more. For many foods 15 g is about one tablespoon.

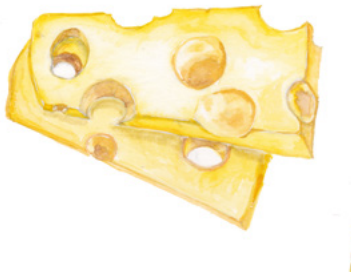
Principle: When in doubt whether a food is usually consumed in less 15 g, opt for not counting it, in order to avoid falsely inflating food group diversity.

It is recommended that survey planners define foods and ingredients that do not count for constructing the MDD-W indicator during adaptation of the questionnaire – before enumerator training and data collection begin. Foods usually consumed in very small quantities are placed in the "Condiments and seasonings" food group. Enumerators should know the principle of not counting small quantities, but should not ask questions during data collection about quantities consumed by the respondent, nor decide whether or not a certain quantity is sufficient to count.

Overestimation related to the inclusion of foods consumed in quantities below 15 g is recognized, but the degree to which it occurs does not invalidate the association of MDD-W with micronutrient adequacy (see Box 6).

To minimize this potential source of overestimation and to promote consistency, this Guide provides examples of classification in Section 2 and Appendix 1, where suggestions can be found in the right hand column of the table about the part of the food eaten, which may be helpful when adapting the extensive food list found in Section 3.

[14] Ideally, women of reproductive age would consume adequate amounts of diverse foods, such as fruits, vegetables, legumes, nuts and animal-source foods. But what is "adequate"? Various national food-based dietary guidelines provide recommendations on serving sizes and number of servings to consume from various food groups.



GROUP 4 – milk and milk products

Milk and milk products, also known as dairy foods, are important sources of high-quality protein, potassium and calcium, as well as vitamin B12 (available only from animal-source foods) and other micronutrients.

Items in this group include almost all liquid and solid dairy products from cows, goats, buffalo, sheep or camels, drunk or consumed as such (this list is not exhaustive):

- fresh whole, low-fat and skim milk;
- reconstituted powdered or evaporated milk or ultra-high temperature (UHT) milk consumed as such;
- hard cheese (e.g. cheddar, Swiss, parmesan);
- soft cheese (e.g. ricotta, cottage, mozzarella, paneer);
- kefir, yoghurt/curd.

This group is classified as “Milk and milk products” on the MDD-W questionnaire. Based on the needs of the survey, it can be subdivided into beverages or food items.

To avoid inflation of the proportion of women consuming nutritious dairy products, users should pay particular attention to **two** risks of misclassification, and correctly classify **items excluded from this group** into other rows where they belong:

- Milk/milk products consumed in amounts that are **too small** to count towards the MDD-W:
    - Milk and dairy products are often used as ingredients in mixed dishes or are added to other beverages. See Box 5, for a discussion of ingredients used in mixed dishes. When milk or dairy products are added to mixed dishes, often the amount of dairy consumed in a serving of the mixed dish is small.
    - If there is uncertainty about quantities usually consumed, milk/dairy ingredients should not be classified in the “Milk and milk products” group, unless nutritionists involved in adaptation advise otherwise.
    - Decisions on how to classify milk added to mixed dishes should always be made during adaptation of the questionnaire.
    - Example: Tea or coffee with milk can be classified under “Other beverages and foods” if unsweetened, and with “Sugar-sweetened beverages” if taken with sugar.

- **Low quality** products that are similar to dairy products but contain low or no dairy content. While high-quality ice cream and yoghurt drinks can contain substantial amounts of dairy and associated nutrients, cheaper and poorer-quality products do not (which are usually most frequently consumed):
    - Butter, cream and sour cream are classified with "Fats and oils" because of their high fat content and their typical culinary uses.
    - Ice cream and sweetened condensed milk are classified under "Sweets". If condensed milk is diluted and consumed as a beverage, classify under "Sugar-sweetened beverages".
    - Commercially processed/packaged yoghurt drinks are classified under "Sugar-sweetened beverages", because these are usually high in sugar and low in dairy content.
    - Cocoa drinks with milk: Classify with "Sugar-sweetened beverages".
- **Non-dairy products** such as: soya milk and soya yogurts in particular, but also coconut milk and almond milk.

GROUP 5 – meat, poultry and fish

This group is sometimes referred to as flesh foods, as it includes all fresh, dried and processed meats, organ meats, poultry and other wild birds and mammals (bush meat), snakes, frogs and other reptiles and amphibians and seafood/shellfish. All flesh foods are important sources of high-quality protein and bioavailable micronutrients, notably iron, zinc and vitamin B12 (the last is available only from animal-source foods).

On the MDD-W questionnaire, this group can be subdivided into (1) Organ meats, (2) Red flesh mammal's meats, (3) Processed meats, (4) Poultry and other white meats, and (5) Fish and seafood.

Organ meats

This group includes different types of red organ meats that are usually rich in iron. Blood sausage and other blood products are also included because of their high iron content.

- gizzard, heart, kidney, liver;
- blood sausage, other blood products.

Excluded from organ meats: Pale organ meats, such as tripe, because of their much lower iron content. These are classified with "Poultry and other white meats" below.

Red flesh mammal's meats

All flesh meats from mammals:

- beef, goat, lamb, mutton, pork, rabbit, yak, deer, antelope, buffalo or other large wild (bush meat) or domesticated mammals;
- cane rat, guinea pig, rat, agouti, opossum, cat, dog, anteater or other small wild (bush meat) or domesticated mammals.

Processed meats

Processed meats are smoked, cured, or salt or chemical preservatives are added, (World Cancer Research Fund, 2018). Some examples include:

- salami, bacon, bologna, hot dogs, paté, luncheon meat, pepperoni, pastrami;
- sausages such as frankfurters and chorizo, corned beef, and all types of ham.

Poultry and other white meats

Birds, reptiles and amphibians are included:

- chicken, duck, goose, guinea fowl, turkey, pigeon or other wild or domesticated birds;
- tripe or other pale organ meats;
- crocodile, frog, snake and other reptiles and amphibians.

Fish and seafood

Fish and seafood from both marine and freshwater sources, such as:

- fresh, frozen or dried fish, large or small, all species;
- canned fish (e.g. anchovies, tuna and sardines);
- clams, mussels, oysters and scallops (bivalves);
- shrimp, lobster, crayfish and crabs (crustaceans);
- edible sea urchins and sea cucumbers (echinoderms);
- octopus, squid, cuttlefish;
- shark, whale.

Fish roe and snails are not included here and are classified under the optional food group "Insects and other small protein foods".

Consumption of animal-source foods varies greatly in different settings, from very low to excessive. Considerable evidence shows that **excessive consumption of red meats and processed meats can have major health**[15] **and environmental consequences** (Swinburn *et al.*, 2019; Willett *et al.*, 2019). Long-term prospective cohort studies have demonstrated that **diets high in red and processed meats** are associated with increased risk of **type 2 diabetes,**

[15] Additional information on health consequences of excessive red meat consumption is available on the WHO website at http://www.who.int/features/qa/cancer-red-meat/en/

cardiovascular disease, cancer (particularly colorectal cancer), **and all-cause mortality** (Bouvard *et al.*, 2015; Qian *et al.*, 2020).

In order to investigate public health concerns about excessive consumption of red meat and processed meats, it is **recommended** that the above-mentioned additional rows are included on the questionnaire so as to disaggregate the different types of meat and capture this information. The same goes for surveys interested in fish consumption. However, to allow for comparability globally, these items should still count in the MDD-W in the same way as for the one single food group: meat poultry and fish.

Subdivision of red and processed meats in practice

A study that disaggregated this group because of concerns about excessive consumption of red and processed meats found that WRA who achieve MDD-W reported a significantly higher intake of most micronutrients and healthy food groups with less consumption of red and processed meats and sugar-sweetened beverages in urban areas in eight Latin American countries (Gómez *et al.*, 2020).

GROUP 6 – eggs

This group includes eggs from any type of bird (domesticated poultry and wild birds). As with other animal-source foods, eggs are a good source of protein and contain vitamin B12 and a range of bioavailable micronutrients.

- chicken eggs
- duck eggs
- guinea fowl eggs
- quail eggs

This group excludes: fish roe, which are classified under "Insects and other small protein foods."

GROUP 7 – dark green leafy vegetables

Essentially all medium-to-dark green leafy vegetables are vitamin A-rich (see Box 4 for criteria used to classify items as rich in vitamin A). In addition to being rich in vitamin A, many green leafy vegetables are rich in folate and several other micronutrients.

Commonly consumed leaves included in this group: medium green leaves, such as Chinese cabbage, romaine and bibb lettuce, along with darker greens, as well as the green leaves from other food crops such as from cassava, bean, pumpkin, amaranth. See Appendix 1 for further examples of cultivated leafy vegetables.

Leaves consumed may vary widely by country and region, and include both cultivated and wild and foraged species. In the absence of information regarding their nutrient content, wild/foraged leaves that are medium-to-dark green can be assumed to be vitamin A-rich and placed in this group.

Excluded from this group: pale green leaves, such as iceberg lettuce.

GROUP 8 – other vitamin a-rich fruits and vegetables

This group includes both vitamin A-rich fruits and a small but diverse group of vitamin A-rich vegetables other than leafy greens. These foods may also be good sources of vitamin C and/or folate and/or other micronutrients.

While "Other vitamin A-rich fruits and vegetables" comprise one of the ten distinct food groups in the indicator, **fruits are listed separately from vegetables on the questionnaire**, as this may be more intuitive for enumerators.

Most common vitamin A-rich fruits included in this group are ripe mango and ripe papaya. Others include red palm fruit/pulp, passion fruit, apricot and several types of melon.

Certain varieties of ripe, deep yellow-fleshed or orange-fleshed bananas are also rich in vitamin A, but white/cream-fleshed bananas are not. Deep yellow-fleshed and orange-fleshed bananas may be classified with vitamin A-rich fruits when:

- their vitamin A content is known to be high (see Box 4);
- it is considered feasible to distinguish bananas by colour during fieldwork on the questionnaire.

Other vitamin A-rich vegetables included in this group are: orange-fleshed sweet potato, carrot, pumpkin and deep yellow- or orange-fleshed squash.

Notable **fruits excluded from this group** and classified as "Other fruits include:"

- green (unripe), mango and papaya -because they are **not** rich in vitamin A;[16]
- all bananas except those mentioned above;
- citrus oranges (although orange-coloured, are not rich in vitamin A).

See Appendix 1 for a list of other vitamin A-rich fruits and vegetables.

BOX 4. CRITERIA FOR DEFINING FOODS AND LIQUIDS AS SOURCES OF VITAMIN A

Plant foodsproviding at least 120 retinol equivalents (RE) per 100 g are considered sources of vitamin A*. This is roughly equivalent to 60 retinol activity equivalents (RAE). Food composition tables may report vitamin A content of foods using the older RE units or the more recently adopted RAE.

Liquids (e.g. juices) provide 60 RE or 30 RAE per 100 g are considered to be sources of vitamin A.

* 120 RE per 100 g corresponds to 15 percent of the Nutrient Reference Value (NRV; 800 RE) established by the Codex Alimentarius. The Codex standard for identifying a food as a source of any nutrient states that the food should provide any of the following: 15 percent per 100 g solid food, 7.5 percent per 100 g liquids, 5 percent per 100 kcal or 15 percent per serving. To be identified as a high source, the food must provide twice this amount (e.g. 30 percent or 240 RE per 100 g solid food). The NRVs are set at a level that should meet the needs of the widest applicable age group for adult men and women (excluding pregnant and lactating women). For the definition of source, see Codex Alimentarius Commission, Guideline CXG-23 adopted 1997, revised 2013 (Codex Alimentarius, 2013). For the definition of NRV, see Codex Alimentarius Commission, Guideline CXG-2 adopted 1985, revised 2017 (Codex Alimentarius, 2017). All Codex Standards are available at http://www.codexalimentarius.org/).

[16] In South East Asia, green papaya may be classified under "Other Vegetables", as it is commonly consumed as vegetable and not as a fruit.

GROUP 9 – other vegetables

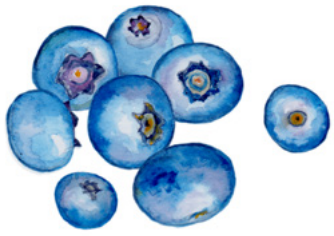
This group includes vegetables that have **not** been counted as dark green leafy vegetables or as other vitamin A-rich vegetables. Diets rich in fruits and vegetables are associated with positive health outcomes. This may be because a range of bioactive compounds found in fruits and vegetables are consumed, including phenolics, flavonoids and fibre, and not just because of their commonly recognized role as sources of micronutrients (Aune *et al.*, 2017; Gan *et al.*, 2015; Liu, 2013; Slavin and Lloyd, 2012; Zhan *et al.*, 2017).

Similar to other food groups, the "Other vegetables" group uses the culinary definition for a vegetable, not the botanical. The group includes stems, fruits and flowers of plants when generally consumed in savoury dishes and considered as vegetables in culinary systems.

This group includes legumes when the fresh/green pod is consumed (as in fresh peas, snow peas, snap peas or green beans); cucumber, tomato and okra (all fruits in botanical terms).

This group excludes high-carbohydrate starchy roots and tubers, such as white potatoes, white yams, cassava and cocoyam, because their nutrient contributions differ, even though they are considered vegetables in a few culinary definitions. The exclusion of roots and tubers is consistent with how the WHO defines which vegetables count towards the recommended consumption of fruits and vegetables.[17]

As with dark green leafy vegetables, commonly consumed vegetables vary widely with geography and can include foraged as well as cultivated foods.



GROUP 10 – other fruits

This group includes most fruits, excluding vitamin A-rich fruits. The health effects of diets rich in fruits and vegetables were noted above (Aune *et al.*, 2017; Gan *et al.*, 2015; Slavin and Lloyd, 2012; Zhan *et al.*, 2017). As explained under "Other vegetables", this group follows the culinary definition of fruits – not including tomatoes, etc. Fruits are usually easily recognized and classified as such. Note that plantains and cooking bananas are classified with starchy staples (Group 1, above), but sweet white bananas are classified with fruits.

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17 For example, see the Healthy Diet Fact Sheet at http://www.who.int/mediacentre/factsheets/fs394/en/

As with vegetables, commonly consumed fruits vary widely with geography and can include foraged as well as cultivated fruits. A list is provided in Appendix 1.

This group includes fresh and dried fruits.

This group excludes sweetened processed fruit products, which should be classified as "Sweets" or "Sugar-sweetened beverages".

2.3. ADDITIONAL FOOD GROUPS

The additional food groups listed below do not count towards the construction of the MDD-W indicator. Still, some are recommended for inclusion on the questionnaires, because of the specific interests stated below.

The interpretation of the additional results of the food groups will be descriptive only: percentage of surveyed WRA reporting consumption of the food group the previous 24-hours.

Unhealthy food groups – related to the risk of non-communicable diseases

Worldwide, highly processed commercial food products that are low-cost and nutrient-poor (such as crisps, chips, puffs and others), as well as sugar sweetened beverages are increasingly common (Baker *et al.*, 2020; Baker and Friel, 2016; Monteiro *et al.*, 2018; Moubarac, Pan American Health Organization and World Health Organization, 2015; Popkin and Hawkes, 2016). These food products compose unhealthy diets that lead to overweight, obesity, and are important risk factors linked to NCDs such as cardiovascular diseases, cancer and diabetes (Askari *et al.*, 2020; Chung, Ding and Magkos, 2019; Lane *et al.*, 2020; Pagliai *et al.*, 2020).[18] Therefore, the consumption of unhealthy foods related to NCDs should be limited. Noticeably, these food groups work opposite to the above-described MDD-W 10 healthy food groups, where consumption is recommended.[19] Moreover, evidence suggest that pre-existing conditions such as type 2 diabetes, hypertension, and obesity increase the severity of complications associated with coronavirus disease 2019 (COVID-19) (Halpern *et al.*, 2020; Katzmarzyk, Salbaum and Heymsfield, 2020).

Women are more likely to be overweight and obese than their male counterparts, which further affects reproductive health and pregnancy. Obese women present an increased risk of gestational diabetes, preeclampsia, operative delivery, foetal macrosomia and neonatal morbidity (Mitchell and Shaw, 2015). Although historically seen as a condition in high-income countries, excessive body weight is now clearly a global epidemic that impacts more women in low and middle-income countries (Ameye and Swinnen, 2019).

[18] It has been shown that excessive consumption of highly processed foods among children is associated with inadequate intake of micronutrients, which can contribute to poor growth outcomes in the context of LMIC (Pries *et al.*, 2019). Similar studies are needed for WRA population, especially where highly processed foods displace minimally processed and fresh foods in diets.

[19] In exception to the excessive consumption of red and processed meat.

How can the questionnaire be adapted to address the consumption of unhealthy and NCD relevant food groups?

The MDD-W indicator was developed with the specific objective of being a proxy that accounts for micronutrient adequacy in women's diets and did not aim to address all forms of malnutrition (such as overweight and obesity). However, there are opportunities, while collecting data for the indicator,[20] to allow for taking into consideration rising concerns about food consumption in relation to NCDs risk, through the following measures:

- **Include in the questionnaire** the food groups below that relate to NCDs on the MDD-W questionnaire.[21]
- **Do not include in food groups that count towards the MDD-W** low quality, highly processed foods, which are usually low in micronutrients and rich in salt, sugar and fat content, with potential high caloric density and low nutrient density.[22]

Fried and salty foods

This food group includes deep-fried snacks, such as doughnuts/fried dough and samosas, as well as packaged salty snacks.[23] The deep-fried foods (e.g. samosas) may include very small amounts of meat or vegetables but are mainly fat and simple carbohydrate and may also be high in sodium. The packaged salty snacks are usually simple carbohydrates high in fat and sodium and numerous artificial additives, offering virtually no protein, dietary fibre or micronutrients. These food products play a significant role in unhealthy diets (Askari *et al.*, 2020; Cranston *et al.*, 2020; Lane *et al.*, 2020; Pagliai *et al.*, 2020).

Some examples include (this list is not exhaustive):

- cassava chips, fried cassava balls, other cassava-based fried snacks;
- puffs (cheese puffs, corn/maize puffs, other puffs);
- doughnuts/fried dough/ fry bread, samosas and other deep-fried, mainly carbohydrate, snack foods;
- corn/maize chips/fried tortilla strips;
- crisps, potato chips, sweet potato chips, crackers.

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20 The double burden of malnutrition should be addressed with double duty actions – interventions, programmes, and policies that can simultaneously reduce the risk or burden of both under nutrition and overweight, obesity, or diet-related NCDs (Hawkes, Demaio and Branca, 2017). Data collection on unhealthy food groups during MDD-W surveys is useful to inform these actions. See Part 1, Section 5.

21 At the time of publication of this Guide, it is acknowledged that classification of NCD related food groups (or foods that should have moderate/limited consumption) for questionnaire purposes is an evolving area and different groupings are possible. At this time, related food groups are being grouped differently and there is no one single standard approach. Current initiatives include the Global Diet Quality Questionnaire (Herforth, *et al.*, 2019); the Intake Global Diet Quality Score (unpublished) and the Infant and Young Children Feeding Dietary Diversity (unpublished).

22 For example, do not include high fat/sugar low quality dairy products in the milk and milk products group. Do not include highly processed bums, cakes and biscuits on the starchy staples groups.

23 "Street food", was included in the 2016 Guide, but has been removed from the present Guide. In many Asian countries, these may represent main meals that contain multiple food groups, and may not necessarily be unhealthy. Some fried foods – for example, fried potatoes and fried plantains, which may be consumed as meals or snacks, are classified in a few settings with roots and tubers. This is because potatoes or plantains are staple foods, and classifying them with snacks might result in a false deflation of food group diversity if no other staple foods are consumed. Depending on their role in local diets, survey objectives and the likelihood of this false deflation, survey designers could choose to classify fried potatoes, fried plantains and similar in the "Fried and salty foods" food group. This decision should be made during the stage of survey adaptation. An option chosen by Intake Global Diet Quality Score is to classify a group as "fried foods that are purchased", and by Diet Quality Questionnaire as "fast food restaurant" and "deep fried foods" consumption.

To investigate the potential contribution of the consumption of certain foods in this group to overweight and obesity and other NCD risks, it is possible to further subdivide this food group to capture more detailed information into:

- packaged salty snacks;
- deep fried foods;
- instant noodles;[24]
- foods from fast food restaurants.

Sweet foods

The rationale for recommending this food group be included on the MDD-W questionnaire is the same as for "Fried and Salty Foods" above (Askari *et al.*, 2020; Cranston *et al.*, 2020; Pagliai *et al.*, 2020). This food group includes highly processed commercial products, but also a variety of locally produced and processed snacks and street foods.

This food group includes all food items with a high content of different sweetening agents, e.g. sugar, corn syrup, other syrup, honey, molasses or jaggery (this list is not exhaustive):

- baklava, biscuits (sweet), cakes, candies (hard candies, toffees, milk toffees or candies made with sweetened condensed milk, any other candies), halwa, halva;
- chocolates, cookies, ice cream, pie, pastries (sweet, fried or baked);
- coconut candies and sweet biscuits, and other sweetened coconut snacks;
- frozen custard/frozen yoghurt, fruit canned in sugar syrup;

24 Instant noodles may deserve a questionnaire row on its own considering that the cheap brands are deep fried during processing (often in palm oil) and are widely and frequently consumed in many settings.

- fruit gummy candies, fruit leathers;
- jam, marmalade, sesame seed candies;
- sweetened condensed milk (when used as food ingredient or consumed undiluted).

Sweet beverages

The rationale for recommending this food group on the MDD-W questionnaire is the same as for "Fried and Salty Foods" and "Sweet foods" (Askari *et al.*, 2020; Cranston *et al.*, 2020; Pagliai *et al.*, 2020). Furthermore, sweet beverages have been associated with health risk factors in a number of studies and meta-analyses (Malik *et al.*, 2019; Malik and Hu, 2019), and there is increasing interest in documenting the prevalence of their consumption.

This food group includes:

- all sweetened fruit juices and juice drinks;
- soft drinks/sodas/carbonated or fizzy drinks, including colas, fruit and other flavours;
- chocolate drinks, fortified and unfortified, both pre-packaged fluid drinks and powders;
- malt drinks, fortified and unfortified;
- fortified sweet drinks and energy drinks;
- coffee or tea with sugar (sweet tea);
- any other drink sweetened with sugar, corn syrup, honey or other sweetener.

This food group can be further subdivided in the questionnaire as:

- sugar-sweetened beverages;
- sweetened infusions (coffee or tea with sugar).

Other relevant food groups

Insects and small protein foods

The inclusion of this optional food group is recommended for survey areas where they are commonly consumed, mainly because many insects and other small protein foods can be highly nutritious. For those species with nutrient composition data, it appears insects are nutrient dense and could provide protein, fatty acids and micronutrients. In countries where insects are consumed as delicacies, they can substitute meat and fish during peak seasons. Thus, there is added value in knowing the proportion of WRA who are consuming them. These foods are also being increasingly promoted to play a greater role in filling nutrient gaps (FAO, 2013).

Nonetheless, there are a high number of different species and their nutrient content varies greatly. Available data are limited concerning their nutrient composition, bioavailability of these nutrients and quantities consumed, but improving for some insects such as crickets, termites, mopane worm and grasshopper.[25] Given these uncertainties, insects and other

[25] It is estimated that there are more than 2 000 edible insect species. In 2013 nutrient data were available for only about 10 percent of these (Ghosh *et al.*, 2017; Montowska *et al.*, 2019; Rumpold and Schlüter, 2013; Ssepuuya *et al.*, 2019).

small protein foods are not included in the MDD-W count (this is also in harmony with the IYCF MDD indicator).

This optional group includes insects, insect larvae/grubs, insect eggs, fish roe, spiders, land and sea snails and any other small invertebrates, usually from a wild source.

This group excludes frogs, snakes or other reptiles and amphibians, which are included in the "Meat, poultry and fish" group.

As for several other items above, where there is uncertainty about their nutrient content and/or the amount usually consumed, it is better to not include or not count small protein foods. This avoids the risk of inflating the proportion of women reported to consume nutrient-dense animal-source foods. This decision should be made during survey adaptation.

If these foods are not eaten, or are considered very rare throughout the survey area, this optional food group does not need to be included on the questionnaire.

Red palm oil

Red palm oil is the only food in this group as it is extremely high in vitamin A and is classified as a vitamin A-rich fruit. In areas where grown, either the oil or the oily fruit may be consumed, depending on the particular mixed dish. The oil is usually consumed as an ingredient in mixed dishes.

In geographic areas where it is available, it may be of interest to know the proportion of WRA consuming it. If red palm oil is not available, not consumed or considered very rare throughout the survey area, this optional food group does not need to be included on the questionnaire.

Other oils and fats

The reasons for including this food group on the MDD-W questionnaire vary according to context:

- To estimate the proportion of women consuming any fats or oils, particularly in areas of high poverty where fat consumption is considered too low. Although, in areas with a high incidence of poverty, where overweight and obesity are rising, concerns about low fat consumption may have reduced significance.
- For the open recall method, to give enumerators a place to mark when these are mentioned as ingredients in mixed dishes.

This optional food group includes:

- All other solid and liquid oils and fats of both plant and animal origin. Common examples are lard, suet (tallow) and butter (solid animal fats); margarine and shortening (hydrogenated vegetable oil); and a range of oils extracted from nuts, seeds and grains.
- Very high-fat dairy items, such as cream and sour cream.

Note that it is usually not feasible to capture information on the quality and type of fats and oils consumed in the context of simple surveys on food group recall. In many contexts, labelling is insufficient and/or oils are locally produced, unlabelled or repackaged into

unlabelled containers or sachets. It is common for respondents to not know the type of oil consumed.

Condiments and seasonings

The reason for including this additional food group on the MDD-W questionnaire is primarily to provide a space for enumerators to mark food items that are consumed in amounts that are typically small and do not contribute substantially to micronutrient adequacy, in order to avoid falsely inflating food group diversity. Several studies have shown that exclusion of foods eaten in very small quantities strengthens the association between food group diversity and micronutrient adequacy (Arimond *et al.*, 2010; Gewa *et al.*, 2014; Martin-Prével *et al.*, 2015). See Box 3 for further discussion regarding exclusion of small quantities.

This additional food group includes all minor ingredients in mixed dishes, which primarily provide flavour and would be consumed in very small amounts in any individual serving of the dish. It includes items added at any stage of cooking or when serving food (e.g. garnishes sprinkled on top of a dish to add flavour or for visual appeal).

"Condiments and seasonings" may include the following items added for flavour or garnish (list not exhaustive):

- fresh or dried herbs, spices, chilli peppers, ginger root, garlic, fish or chicken powder;
- bean paste, fermented bean paste, tomato paste;
- bouillon cubes, *Maggi* cubes and similar flavour cubes;
- soy sauce, tamari, spices, dried and fresh, all types;
- chilli peppers (hot), chives, dried soup seasoning packets;
- fish/chicken/pork/beef powder, fish/squid sauce;

- ketchup, mustard, pepper sauce;
- lemon or lime or other juice, added to bring out flavour of mixed dishes;
- seeds or seed pastes, when used to flavour or garnish a dish (see list of seeds under "nuts and seeds";
- any other seasoning or flavouring added during cooking;
- any garnish added at the end of cooking or when serving (e.g. grated cheese, grated vegetable, seeds or legumes).

See Part 2, Section 2 for a discussion about training enumerators on the correct use of this food group.

Other beverages and foods

Similar to "Condiments and seasonings", the rationale for including this additional food group on the questionnaire is primarily to provide a space for enumerators to mark these foods to avoid falsely classifying them under those that count towards the 10 MDD-W Food Groups when collecting data with the open recall method.

This additional food group includes:

- alcohol, all types;
- chutney, all types;
- clear broth, soup broth;
- coffee, with or without milk, if unsweetened;
- herbal beverages/infusions, if unsweetened;
- olives, pickled cucumbers/onions/capers;
- tea, with or without milk, if unsweetened;
- any other food or beverage not included in previous groups.

Further considerations

Fortified foods and products

The MDD-W is validated to reflect diet diversity composed mainly of unfortified foods. It is not adequate **nor** designed to be used to assess coverage or impact of fortification or biofortification programmes. Separate, context specific questions about the consumption of fortified foods and/or biofortified foods, coverage of specialized products, such as blended fortified foods (corn-soy blend, wheat-soy blend, etc.) or ready-to-use foods may be added to the questionnaire. Guidance on monitoring and evaluation of fortification programmes is also available elsewhere (WHO & FAO, 2006; Friesen, Mbuya and Neufeld, 2019).

Regardless of whether optional questions are developed and added to the model questionnaire, for the purposes of MDD-W, this Guide recommends classifying fortified and biofortified foods under their home food group (e.g. fortified wheat flour should be classified as a grain). In 2019, the World Food Programme (WFP) introduced a modified MDD-W

scoring system that considers the contribution of Specialized Nutritious Foods (SNF) to micronutrient intakes of WRA. Using this score, SNF is considered as part of the food group 'Meat…' based on its nutrient composition and not the food groups 'Grains…' or 'Nuts…' based on the primary ingredient, e.g. corn or peanuts (Halati, *et al*., 2020). When this score is used, it should be reported separately. It does not replace the standard MDD-W indicator.

Wild foods and neglected and underutilized species

Wild foods and neglected and underutilized species (NUS) are often overlooked in food assessments and agricultural research, but studies in Africa and Asia show that these foods often contribute significantly to individuals' diets as well as the global food basket (Bharucha and Pretty, 2010). The inclusion of wild foods and NUS in MDD-W surveys may facilitate the understanding of the contribution of food biodiversity to healthy diets and sustainable food systems. When the nutritional content is known, locally available, wild and foraged plants (fruits and vegetables) should be classified in their respective MDD-W food groups during adaptation of the questionnaire. However, if there is a specific research interest in the foods' sources (wild, cultivated or acquired), additional questions may be needed after the local species have been identified (Lulekal *et al.*, 2011).

The enumerators need to be trained to probe for this information, as respondents in some cultures may be reluctant to provide them because of social desirability bias (they may be perceived as poor people's food, famine foods or illegal).

Researchers who are interested in conducting a stocktaking exercise of local wild foods may refer to the publication *Guidelines on assessing biodiverse foods in dietary intake surveys* (FAO and Bioversity International, 2017) .

2.4. MIXED DISHES AND FOOD ITEMS WITH MULTIPLE INGREDIENTS

Mixed dishes and food items with multiple ingredients present the most difficult challenge to implementation of food group recall surveys. It is not possible to provide comprehensive lists for classification. This Guide aims to provide principles and a few examples to aid in questionnaire adaptation and training enumerators to record information about these dishes and food items.

One principle that should be followed when faced with the challenging decisions described in this guide is to **avoid inflating food group diversity**.

The principle is applied to two distinct but related scenarios, where decisions should be made at the level of questionnaire adaptation:

1. Taking apart mixed dishes and deciding which ingredients should be classified into groups where they can count towards the MDD-W and which should be classified under "Condiments and seasonings". Enumerator instructions and training must include clear guidance on probing for details of mixed dishes and on recording ingredients in their correct food groups, including the "Condiments and seasonings" group for open-recall.

2. Items that contain multiple ingredients, but should be classified as a single food for purposes of the survey (e.g. bread). After the classification has been decided, this practice should be emphasised during enumerator training.

Mixed dishes

Mixed dishes may contain some ingredients in large quantities (main ingredients) and others in smaller quantities to add flavour. Following the principle stated above (and also in Box 5) items likely to be consumed in very small quantities should not be counted towards the MDD-W. Ideally, survey teams should develop a local common mixed dishes list that predefines how to classify the ingredients (food items) into food groups and excludes the ingredients usually used in small quantities (<15 g) by placing them under "Condiments and seasonings". This list can be used as a guidance sheet by enumerators during open-recall interviews.

Box 5 also provides an argument for consistency across surveys. To support consistency, this Guide suggests a list of items that should **not** be counted and should instead be classified as "Condiments and seasonings", as described above and listed in Appendix 1.

Survey designers can still choose to make different decisions, but they should do so only in consultation with nutrition experts who have a very good understanding of food composition, the principles of food group classification, and of variability in preparation of mixed dishes across the range of households in the survey area. It is important to note that if different decisions are made for surveys in the same geographic area, survey results will not be comparable.

See Box 5 for some examples of classification for the following types of mixed dishes (this list is not exhaustive):

- thin soups;
- thin soups with noodles;
- thick soups, stews and curries;
- stir fried rice or noodles;
- sautéed dark green leafy vegetables and other vegetable dishes;
- sandwiches.

BOX 5. MIXED DISHES: EXAMPLES OF CLASSIFYING INGREDIENTS INTO ROWS ON THE MODEL QUESTIONNAIRE

For list-based method, the breakdown of local, commonly consumed mixed dishes will be performed during the stage of questionnaire adaptation. For open recall method, the respondent will be asked to report ingredients consumed, which will be later classified into each food group as described in this box.

In the examples below, groups that count towards Minimum Dietary Diversity for Women (MDD-W) are in **bold and underlined**.

Thin and thick soups, stews and curries can all be served alone or served alongside or on top of a staple food. When relevant, enumerators should probe to determine which parts of the dish were consumed.

Thin soups can include any combination of meat, fish, vegetables and seasonings boiled in liquid and may or may not include oil. Thin soups have a high water content, and individual ingredients can often be picked out easily and consumed or not.

An example of a thin soup is chicken soup or a thin broth (Respondent reports the soup contained chicken, water, onion, garlic and herbs, salt and pepper)

Respondent reports she consumed the broth only	Mark under "Condiments and seasonings" (for the garlic and herbs) and "Other beverages and foods" (for the broth).
Respondent reports she consumed all parts of the soup	Mark under the two groups above and also mark "**Poultry and other white meats**" (for the chicken) and-"Condiments and Seasonings" (for the onion).

Thin soups with noodles are commonly consumed in Asian countries, soups can contain any combination of the ingredients stated above, with the addition of noodles made from rice, wheat or bean.

Respondent reports she consumed the broth and noodles	Mark under **"Foods made from grains"**, and "Condiments and seasonings" (for the garlic and herbs) and "Other beverages and foods" (for the broth).

Thick soups and stews have the same types of ingredients as thin soups but are served in a thicker consistency because of long, slow cooking and sometimes as a result of adding thickeners (starch). There may be little or no broth in thick stews. In thinner stews, some items are dissolved in the broth, but it still may be possible to pick out some items, particularly when meat is included.

Example 1: kidney bean stew **Respondent reports the stew contained: garlic, kidney beans, water, oil and spices.**	Mark under "**Pulses (beans, peas and lentils)**" (for the kidney beans), "Condiments and seasonings" (for spices) and "Other oils and fats" (for the oil).
Example 2: shiro stew **Respondent reports the stew contained shiro (legume) flour, onion, garlic, tomato, berbere (spice), oil, butter, sugar, salt.**	Mark under "**Pulses (beans, peas and lentils)**" (for the legume flour), "Condiments and seasonings" (for onion, garlic, tomato, spice, sugar and salt) and "Other oils and fats" (for the oil and butter).

Curries are similar to stews and can contain meat, fish or vegetables. Curries are usually characterized by use of many spices and seasonings. An example of a curry would be eggplant and onion curry

Respondent reports the curry contained: eggplant, onions, tomatoes, garlic, ginger, chillies, cumin seed, coriander seed and cilantro (coriander leaf).	Mark under **"Other vegetables"** (for the eggplants) and "Condiments and seasonings" (for the garlic, ginger, onion, tomato, chillies, cumin seed, coriander seed and cilantro).

Stir-fried rice or noodles contain either: rice or noodles and meat, fish or vegetables.

Respondent reports the stir-fried rice contained onions, garlic, ginger, chicken, green peas, pineapple, soy sauce and vegetable oil.	Mark under six rows: **"Food made from grains"** (for the rice or noodles), **"Other vegetables"** (for the green peas and onions), **"Other fruit"** (for pineapple), "**Poultry and other white meats**" (for chicken) "Condiments and seasonings" (for the garlic, ginger and soy sauce), and **"Other oils and fats"** for vegetable oil.

Dark green leafy vegetables and other vegetables can be included in soups, stews or curries, or be the main ingredient in dishes. In many cuisines, where vegetables are the main ingredients, dishes contain no other ingredients or only very small amounts of other ingredients.

An example of a vegetable dish might be cassava leaves with fish powder

Respondent reports the dish was made with pounded cassava leaves, water, salt and fish powder.	Mark under "**Dark green leafy vegetables**" (for the cassava leaves) and "Condiments and seasonings" (for water, salt, fish powder).

Sandwiches can be mixed dishes with meat, cheese, vegetables and/or spreads served on bread, with or without toppings or condiments that are added mainly for flavour.

Respondent reports she had a cheese sandwich with mustard.	Mark under "**Foods made from grains**" (for the bread), "**Milk and milk products**" (for the cheese) and "Condiments and seasonings" (for the mustard).

Food items with multiple ingredients

Some food items present a situation exactly opposite to that of mixed dishes. These are items that typically have more than one ingredient, but are dominated by one ingredient. For these items, it is not necessary to probe for ingredients, as the item can be classified into one food group based on the main ingredient. See Box 6 for a list of examples of these items. This list is not exhaustive but aims to provide sufficient information so that survey designers can identify similar local items that should be treated in the same way.

BOX 6. FOOD ITEMS WITH MULTIPLE INGREDIENTS

Certain food items with multiple ingredients are classified in a single food row on the questionnaire, based on the major ingredient and on the role of the item in the diet. Such classification is also typical in the visual guidance (pyramids, plates, etc.) developed by countries to illustrate food-based dietary guidelines.

The following list of examples is brief but should give some guidance for classification of similar items during adaptation of the Minimum Dietary Diversity for Women (MDD-W) questionnaire.

Considering that unique local food items with multiple ingredients may pose a challenge of classification to survey planners, a small margin of error may occur in this step. When in doubt, always avoid to overestimate or over report food groups. Aim at simplicity, when the food is mostly composed of the single ingredient, classify it as only one.

Example	Row on questionnaire	Rationale
Bread	Foods made from grains	The primary ingredient in bread is usually a grain. The simplest breads are grain (flour) and water. Rich breads may include small amounts of dairy, eggs, fats or oils, and some types of bread include cheese, fruits or nuts. However, amounts of other ingredients vary and are typically small. To avoid falsely inflating food group diversity all types of bread should be classified with grains.
Plain porridge	Foods made from grains or white roots and tubers and plantains	The rationale is the same; the main ingredient is usually a grain or a root or tuber (e.g. cassava) and other ingredients, if present, are in small quantities.
Injera	Foods made from grains	The primary ingredient of injera is a grain or the flour is made from a mix of grains. The simplest injera is made from grain (flour) and water. Some injera may include small amounts of legumes. However, amounts of other ingredients vary and are small, and to avoid falsely inflating food group diversity all types of injera should be classified with grains.
Cake, sweet pastry	Sweet foods	These items are classified as "Sweet foods" based on their role in the diet and the large amount of sugar added, and there is a growing interest in capturing the consumption of items that fall into this group.
Samosas, fried salty pastries, puffs	Fried and salty foods	Similar to "Sweet foods", it is valuable to capture the consumption of energy-dense and nutrient-poor fried snacks. In addition to grains, samosas may contain meat or vegetables, but the amounts vary, and the quantity is typically very small particularly for lower-priced items consumed by the poor.
Sweet drinks with dairy content	Sweet drink	As above, there is growing interest in capturing information about consumption of sugar-sweetened beverages. Many such beverages, and particularly lower-cost items, are marketed and described as containing milk but actually contain little or no milk. These items are classified with sweet beverages to avoid falsely inflating the proportion of women consuming dairy.

PART 1

Section 3.
DATA COLLECTION TOOLS

Section 3. Data collection tools

This Section provides step-by-step instructions for preparing data collection tools for the two non-quantitative methods: list-based and open recall.

Data collection tools must reflect the local foods and dietary habits of the target population. Thus, survey teams should follow a series of steps to prepare a culturally and linguistically adapted MDD-W questionnaire. Each country or region faces specific challenges in terms of geography, population and food culture. This is the greatest challenge faced by survey teams when adapting the questionnaires.

The data collection materials needed for MDD-W surveys are:

- extensive food list;
- introductory text for the questionnaire;
- instructions and guidance sheets for the enumerators;
- the adapted questionnaire for the chosen method (open recall or list-based).

The survey team will also adapt/translate the above items to suit the local context. This is further described in subsections 3.2, 3.3 and 3.4 of this Section.

3.1 ELABORATION OF LOCALLY ADAPTED FOOD LISTS

Regardless of the data collection method selected, the first step is to develop an extensive, context specific food list where the local food items have been categorized into each food group. This food list is needed for both list-based and open recall data collection methods. For the list-based method, it will be the basis for the shortened (sentinel) food lists used in the questionnaire, whereas for the open recall it will be used to correctly classify the food items consumed into the corresponding food groups. The generic food list presented in this Guide must undergo the process of linguistic and cultural adaptation as described below. The survey team should use the content presented in Part 1, Section 2 regarding the description and examples of food groups, together with the additional examples in Appendix 1 of this Guide, to create their own adapted local food list. Examples of the extensive food lists used in the FAO study for Cambodia, Ethiopia and Zambia can be found in Appendix 5.

In the extensive food list, each food group and its subdivisions are listed in rows.

Indicator calculations should be reviewed carefully and adapted as needed if rows are added and questions renumbered.

Table 2. Sample of an extensive food list

Extensive food list *Sample only.* This should not be used as a questionnaire, but as a reference tool for both list-based and open recall methods

MDD-W required food groups			
Food groups	**Row**	**Food group subdivisions**	**Food items**
1. Grains, white roots and tubers, and plantains	**A**	**Foods made from grains**	*Porridge, bread, rice, pasta/noodles, sorghum, millet, corn, couscous, barley*
	B	**White roots and tubers or plantains**	*White potatoes, white yams, manioc/cassava/ yucca, cocoyam, taro roots or tubers, plantains*
2. Pulses (beans, peas or lentils)	**C**		*Beans, peas, lentils, hummus, tofu, tempeh*
3. Nuts and seeds	**D**		*Groundnut/peanut, cashew, walnut, Baobab seeds, chia seeds, flaxseed*
4. Dairy	**E**	**Milk**	*Milk*
	F	**Dairy foods**	*Cheese or yoghurt*
5. Meat, poultry and fish	**G**	**Organ meats**	*Blood sausage, gizzard, heart, kidney, liver*
	H	**Red flesh meat from mammals**	*Beef, goat, lamb, mutton, pork, rabbit, yak*
	I	**Processed meat**	*Salami, bacon, bologna, hot dogs*
	J	**Poultry and other white meats**	*Chicken, duck, goose, guinea fowl*
	K	**Fish and seafood**	*Fresh, frozen or dried fish, shrimp, clams*
6. Eggs	**L**		*Eggs from poultry or any other bird*
7. Dark green leafy vegetables	**M**		*Kale, mustard greens, spinach, amaranth greens, chicory, broccoli, Swiss chard*
8. Vitamin A-rich fruits and vegetables	**N**	**Vitamin A-rich vegetables or roots**	*Pumpkin, carrots, squash or sweet potatoes*
	O	**Vitamin A-rich fruits**	*Ripe mango, ripe papaya*
9. Other vegetables	**P**		*Beets, cabbage, cauliflower, celery, cucumbers, eggplant, zucchini, radish, tomato, mushroom*
10. Other fruits	**Q**		*Apple, avocado, banana, baobab fruit, berries, pineapple, orange, watermelon, berries, guava, coconut flesh, tangerine*

Unhealthy food groups Do not count for MDD-W Recommended for inclusion in questionnaire			
Food groups	**Row**	**Food group subdivisions**	**Food items**
Fried and salty foods	**R**	**Packaged salty snacks**	*Crisps, chips, puffs*
	S	**Deep fried foods**	*Doughnuts/fried dough/fried bread, samosas*
	T	**Instant noodles**	*Instant noodles*
	U	**Fast food restaurant foods**	*Foods from … [name local fast food chains]*
Sweet foods	**V**		*Chocolates, candies, pastries, cakes, biscuits, cookies, ice cream and popsicles*
Sweet beverages	**X**	**Sugar-sweetened beverages**	*Soft drinks, sodas, fruit juices, chocolate drinks, energy drinks*
	Z	**Sweetened infusions**	*Sweetened tea, sweetened coffee, or sweetened herbal drinks*
Optional food groups **Do not count for MDD-W** **Include depending on survey objectives and choice of data collection method**			
Wild Foods		**Insects and small protein foods**	*Insects, insect larvae/grubs, insect eggs and land and sea snails*
		Wild plants	*[Name local wild plants]*
Red palm oil			*Red palm oil*
Other oils and fats			*Oil, fats or butter added to food or used for cooking, including extracted oils from nuts, fruits and seeds, and all animal fat*
Condiments and seasonings			*Onion, parsley, garlic, herbs, spices, bouillon cubes, tomato paste*
Other beverages and foods*			*Alcohol, chutney, clear broth, olives, pickled cucumbers/onions/capers*

* This row is for open recall only, primarily to provide a space for enumerators to mark these foods and beverages to avoid falsely classifying them under those that count towards the 10 MDD-W Food Groups when collecting data with the open recall method.

The process of linguistic and cultural adaptation is carried out to complete or replace the lists of examples of food items in each row. This step involves consulting members of the target population in the form of key informant interviews and focus group discussions in different

subpopulations or locations within the survey area(s).[26] These consultations provide critical information on:

- most frequently consumed food items per food group in the local context;
- seasonality of locally available food items (including foods gathered in the wild) and their common names;
- commonly consumed mixed dishes and ingredients used in these local dishes;
- foods that are typically consumed in small amounts that should not count as part of an MDD-W food groups (see Box 6) but rather should be classified as condiments or seasonings;
- commonly consumed street foods and prepared foods purchased outside the home.

See Figure 1 for steps in the process of developing or adapting an extensive food list for local contexts.

Identifying existing surveys for use as reference

Where previous food group diversity surveys have been implemented, existing questionnaires can be a useful reference. Previous surveys, prepared following a thorough process employing steps similar to those described in this Guide, may be available. Adaptation of the questionnaire may be quicker, as food items from previous questionnaires can be used as the bases for the adapted MDD-W survey tools. After further verification, during pre-test and pilot in the survey area, the questionnaire can be finalized.

Open access resources include the soon to be available DHS-8 model questionnaires and country specific list-based questionnaires, as well as those being compiled and tested by the Global Diet Quality Project (GDQP). These open access resources are expected to be available shortly (see further discussion at the end of subsection 3.3).[27] These questionnaires were developed and adapted for assessments at the national level. They can also be used as a starting point for subnational surveys, following the above described adaptation process.

Order food items by frequency of consumption in the population

Where recent national quantitative 24-hour recall surveys are available, it is of great value to perform an analysis or desk review to understand the frequency of consumption of foods among the population. Food items within each food group row in the questionnaire should be placed starting with the most frequently consumed to less frequently consumed, which will optimize and reduce time spent for the interview.[28]

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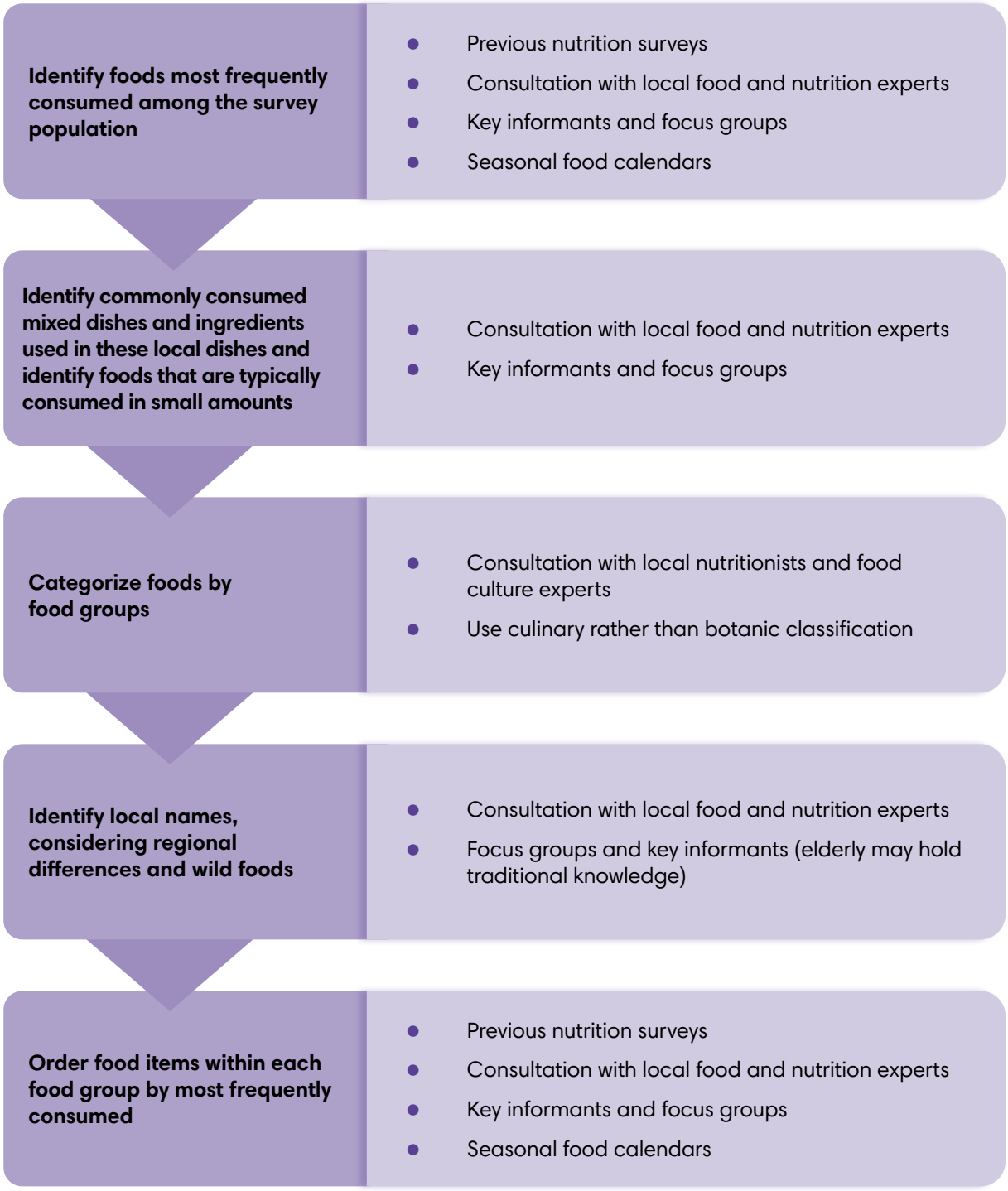
[26] This step may also be incorporated into enumerator training, as in Tajikistan, when training focused only on collecting dietary diversity information (see http://www.fao.org/fileadmin/templates/nutrition_assessment/Workshops/Training_Report_Khujand_April_201503062015_.pdf). However, this would not be practical when training on the MDD-W is incorporated into a broader enumerator training session for multi-topic surveys.

[27] New DHS-8 model questionnaires and country specific list-based questionnaires are published regularly online at https://dhsprogram.com/publications/publication-dhsq8-dhs-questionnaires-and-manuals.cfm

[28] This process does not require the use of food frequency questionnaires. Using quantitative 24-hour recall to collect data over one or two days, it would be possible to identify food items that are most commonly consumed among the population that belong in each food group. It refers to the frequency of food items consumed among population and not at the level of the individual.

Figure 1. Steps in the development of an extensive food list and the corresponding support tools



Source: Developed by the authors.

For example, in Zambia, the most consumed staple food is Ugali/Nshima. By placing it in the first place on the list of items for the starchy staple food group, it accounted for a large percentage of reported consumption. When foods are ordered by frequency of consumption, in both list-based and open recall methods, the interview is optimized for both enumerators and respondents. If it is not possible to analyse national nutrition surveys for frequency of consumption, this issue may be addressed during the key informants interviews and focus groups. As the frequency of consumption of many foods is affected by the season, the order

of the foods may need to be revalidated when using a food list that had been adapted during a different season.

3.2. TRANSLATION AND ADAPTATION

Initial translation of the food list into local languages

The present Guide, in English,[29] contains the MDD-W model for an extensive food list including instructions for enumerators and model questionnaires for each of the data collection methods. Where English is not the primary language, the MDD-W data collection tools with its generic food examples should first be translated into one of the principal survey languages. This is the starting point for the linguistic and cultural work of adaptation that follows.[30]

Several methods can be employed to ensure the translation is good, including group work to reach consensus on translation and translating back into English.[31] The initial translation into the predominant survey language will reflect the generic examples of foods provided in the MDD-W data collection tools. The initial translation will be the starting point for adapting the data collection tools into other survey languages, if any. Where possible, words and phrases should be used that are easily understood by both the enumerators and the respondents.

Linguistic and cultural adaptation of the data collection tools

Linguistic and cultural adaptation means modifying the translated MDD-W data collection tools to reflect cultural norms, vocabulary and usage (words and phrases) that will be easily understood. Locally available and commonly consumed foods should be included. This step will be carried out by the survey teams in consultation with local nutrition experts and involves customizing the food items in each row of the food list, as well as the introductory text and enumerators' guidance sheets (See subsections 3.3 and 3.4).

It may be advantageous to involve field staff (enumerators and supervisors) early on in the adaptation process. Their input may be useful in reviewing the translation of the introductory text to ensure the language and terms will be understood by the respondent, such as translation of terms used to describe key concepts (such as meal, snack or main meal). Involving field staff early on may also provide additional assurance of their ability to collect accurate information during the survey.

During this step, the names of the food groups should be reviewed and translated. Where appropriate, the list of examples in each food group should be filled in with a comprehensive list of seasonally and locally available foods and the local names used.

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29 French version of the Guide is planned.

30 It is recommended research be conducted and foods identified using locally understood names, for example in Kenya, Tanzania and Uganda, the term for kale is "sukumawiki".

31 Although back-translation of survey questionnaires has been a common practice, some take the approach of first focusing on producing the best-translated version of the MDD-W questionnaire into the target language, and evaluating it directly, rather than indirectly by way of a back-translation. For further guidance on survey translation, see https://ccsg.isr.umich.edu/chapters/translation/

Section 2 of Part 1 and Appendix 1 provide guidance on how to classify individual food items to result in an adapted, extensive food list. During the process, consult individuals who are familiar with commonly consumed foods in the target population. Ask a nutritionist to review the draft food list and advise on the correct classification of the food items into the food groups. These foods may change seasonally. The nutritionist alone can conduct the review or, ideally, together with the survey team and field staff.

After making any modifications to the extensive food lists, the study team should review and crosscheck all the English and local language content to ensure alignment.

Informants for this process may include experts at the local and national levels, community leaders, agricultural or health extension workers at the local level and women in the community who are responsible for food planning and preparation for their households, as well as enumerators from the study area. Informants from various communities in the survey area whose food patterns may differ should also be included: urban, rural and peri-urban residents, and different ethnic and livelihood groups. For surveys that will be carried out over large geographic areas, where there are distinct dietary practices by location, it may be necessary to compile more than one adapted food list.

Traditional knowledge of wild foods provides greatly relevant information on usual quantities consumed. It helps the survey planner exclude foods usually consumed in less than 15 g and assign foods to the correct groups. However, sometimes information may be lacking on the nutritive content of indigenous and wild foods, as well as their common names.

Substantial up-front investment is required to develop food lists for a given context or country. This may allow for faster data collection and data management. Once the preparatory work has been completed in a specific geographic area, subsequent surveys can use the same adapted food lists, enumerator instructions and guidance sheets, which will greatly reduce preparation time.

3.3. ADAPTING SURVEY TOOLS FOR COMPUTER-ASSISTED PERSONAL INTERVIEWING

Increasingly, survey teams use tablets or other mobile devices to capture data for computer-assisted personal interviewing (CAPI) instead of forms printed on paper. How the questionnaire is displayed and organized in the CAPI application will differ from that on paper forms, and subsequently, the data entry methods.

See Box 7 on programming the adapted survey into the chosen application. Box 8 gives an overview of the two data collection methods. Also see Box 10, Box 11 and Box 14 for information related to CAPI.

BOX 7. PROGRAMMING THE ADAPTED SURVEY INTO THE CHOSEN APPLICATION

An information technology (IT) expert should be involved throughout the process of Computer-Assisted Personal Interviewing (CAPI), from design, programming and testing the survey. The IT expert should be able to tailor and adjust the layout of the survey based on the needs expressed by the survey team. Based on the experience gained during the FAO study, the following materials should be prepared to allow the survey interface to be adjusted to the local context:

- Word or Excel file with the updated instructions and adapted questionnaire (prepared by survey team).
- Data collection forms used for programming in the formats of XLS and XML (Excel files), in both English and the local language (prepared with IT expert).

Survey language

Using CAPI, it is possible to programme the survey in both local language and English and complete the questionnaire in either language. The standard practice is to program and administer the survey in the same language, so that enumerators do not have to translate while administering the questionnaire, to avoid any misinterpretation.

Built-in data quality control measures

The following measures are recommended to improve data entry speed and accuracy by reducing data entry errors, as well as simplify data processing and cleaning:

- Place prompts to ensure that no mandatory questions are left blank.
- Set reasonable limits for the range of acceptable answers on questions that accept numeric values.
- Where possible use drop down lists and multiple-choice answers.
- Use the global positioning system (GPS) to record the coordinates of the household at the end of each survey.

Members of the core survey team should repeatedly test the electronic data collection tools to ensure there are no errors in content or programming. The tools should be piloted in a context similar to the actual data collection site so as to identify any challenges and allow for necessary improvements.

(Example forms from the FAO MDD-W study can be found in Appendix 6)

3.4. SELECTION OF THE DATA COLLECTION METHOD

Overview of methods

The two non-quantitative methods share similarities regarding the food groups' classification system for the extensive food list. Both methods require the respondent to report what she ate during the previous 24-hours before the interview. Each, however, entails a specific interview protocol and adapted questionnaire.

BOX 8. OVERVIEW OF THE TWO DATA COLLECTION METHODS

List-based – The enumerator solicits *yes* or *no* answers to questions from the respondents regarding food groups with a limited number of food items (sentinel), concerning respondent's food consumption over the previous day or night.

Open recall – The enumerator asks the respondent to openly recall their food consumption over the previous day or night, in chronological order, starting with the first food consumed, up to the last one at the end of the day.

See Figure 2 for a comparison of the two methods, which will be explained in further detail later in this section.

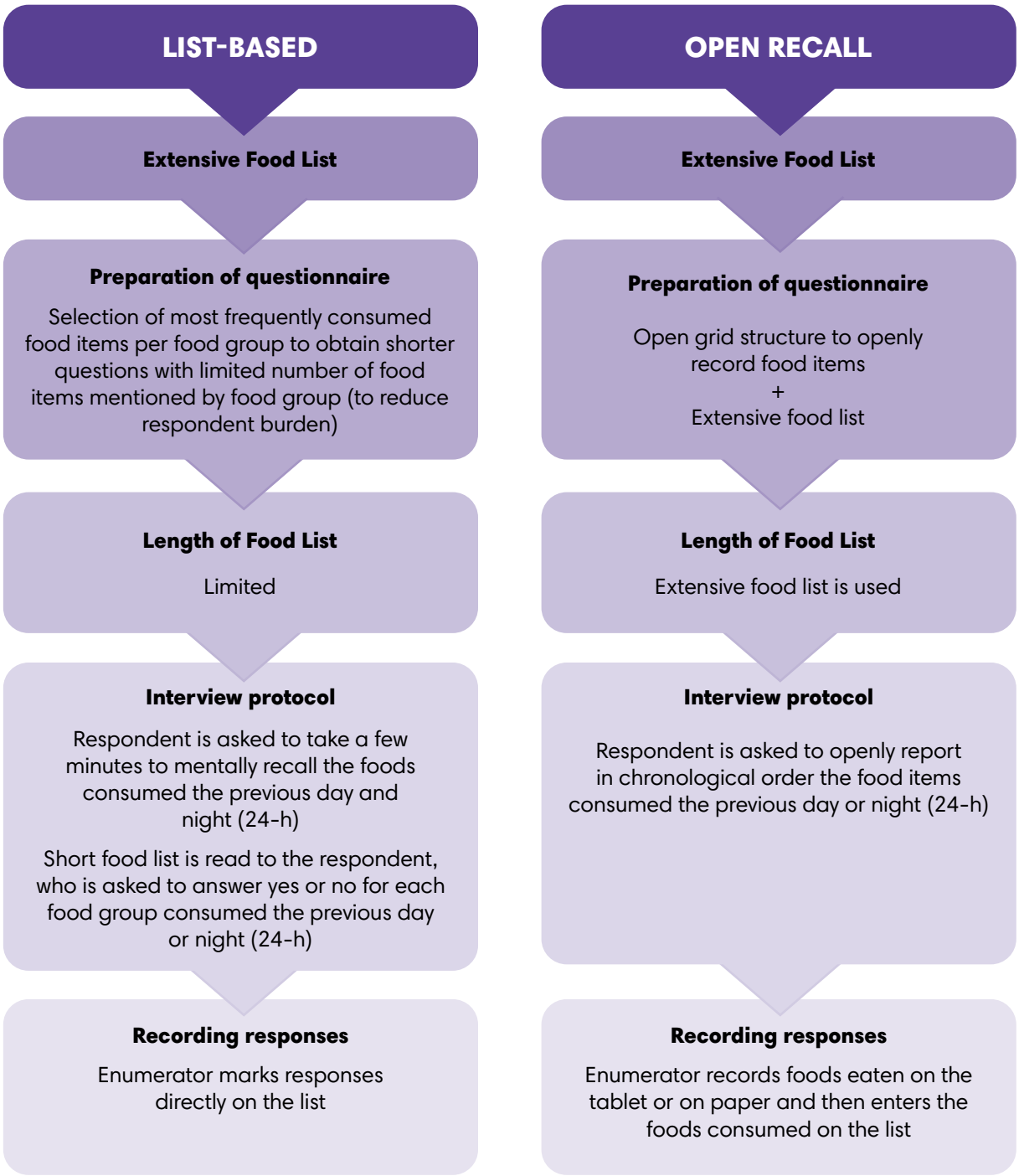
Both methods involve the **identification of local and context specific food items** to be classified into each food group in the food list, as described above. More effort will be required when a survey is planned where there have been no previous surveys, or where records are not available from previous nutrition surveys.

The **list-based method** is always completed prior to data collection and requires the survey team to select the most commonly consumed food items to be included on the questionnaire.

For **open recall**, identification of local and context specific food items for classification into each food group may either be:

- Completed previously – The enumerator is provided with the pre-prepared adapted food list as part of the open recall interview. The *yes* or *no* answers for the foods recorded in each food group are marked in a grid, or directly on the previously developed questionnaire list (paper or tablet).
- Performed after data collection – Foods recorded in the open-recall grid are classified by knowledgeable members of the research team into food groups. In this way the adapted, extensive food list can be generated after data collection. This option is usually employed when limited information and resources are available for the development of an extensive food list before data collection or when enumerators' capacity to correctly classify food items into food groups is not certain.

Figure 2. Comparison of the two proxy methods for data collection: preparation of the questionnaire, length of food list, interview protocol and recording of responses

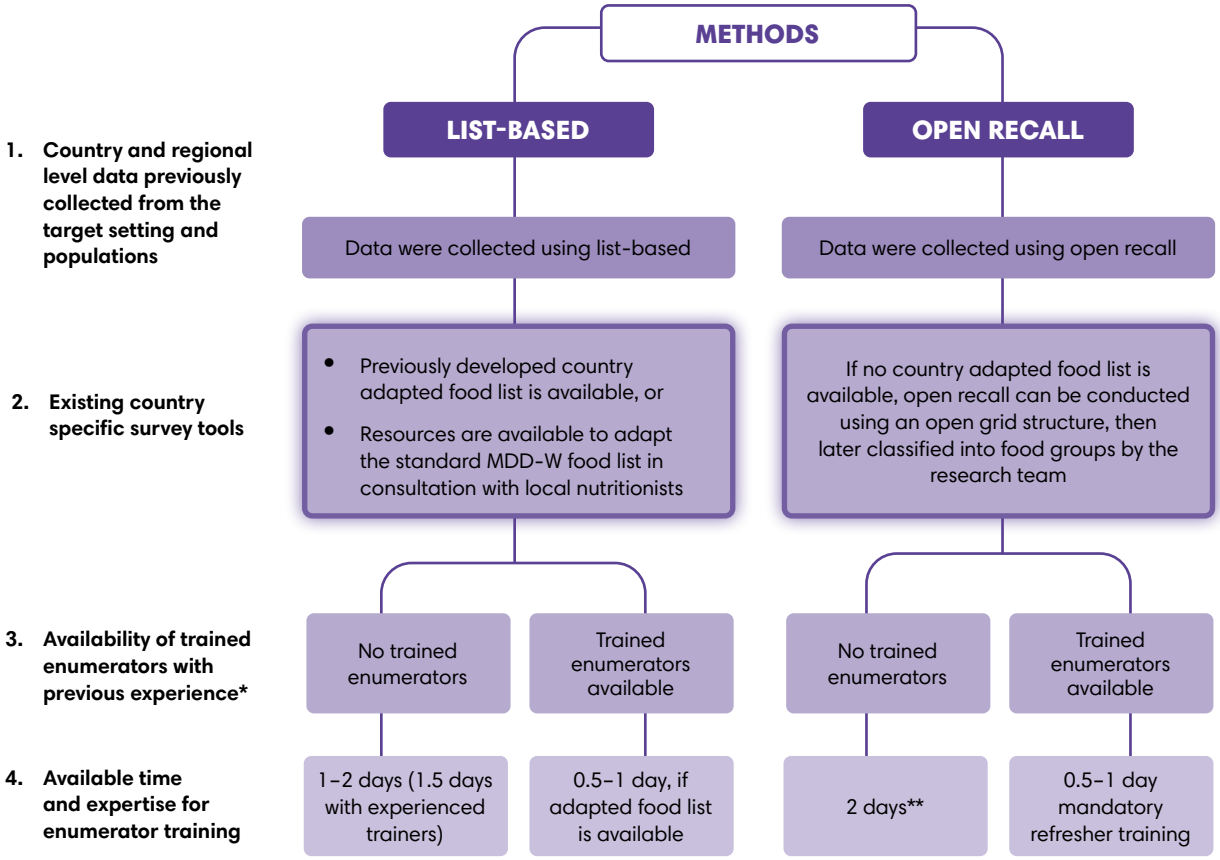


Source: Developed by the authors.

Choosing a data collection method

As described above, the methods have similarities and differences, each with their own advantages and disadvantages. Both approaches require preparatory work to identify the most frequently consumed local/national foods and common dishes, and to classify each food into the correct food groups. Therefore, greater analytical effort is required when classifying local food items into food groups. The instructions for the enumerator, the opening text to read to respondents, the questionnaire development or adaptation as well as enumerator training content will vary depending on the chosen method.

Figure 3. Main considerations when selecting the data collection methodology for the MDD-W indicator



* Previous experience collecting data for surveys is preferred. See Part 2, Section 2 for suggested enumerator selection criteria.

** Previous open recall experience is desired; training will be more time and resource intensive for inexperienced enumerators

Source: Developed by the authors.

It is highly recommended the survey team document the process and steps taken to adapt the questionnaire and ensure any information, such as local adaptations or deviations from the methods in this Guide, are clearly described in publications resulting from the survey. Regardless of the methodology, questionnaires should be pretested and piloted before use. See subsection 2.2 for a short discussion on pre-test and pilot.

It is essential that data collection methodologies are harmonized so that results from different countries or settings can be compared easily. See Figure 3 for considerations when selecting the data collection methodology.

Local studies or impact evaluation may require a full record of what people ate, obtained through open recall, which may provide useful information when assessing other aspects of the diet in addition to MDD-W. A full record of food items (not only food groups) is particularly useful when the survey is interested in understanding consumption of specific foods items or food groups that do not count towards the MDD-W, or subdivisions of MDD-W food groups. For instance: some types of meats, poultry and fish, different types of vegetables and specific wild foods (Refer to Part 1, Section 2 for further discussion of these foods). When a standalone survey is implemented for these purposes, the open recall method may be more appropriate.

Survey planners may wish to refer to Part 2 of this Guide for operational guidance on planning and capacity-development of enumerators for standalone surveys.

National or multi-country surveys can be used when the objective is to track diet over time. Important considerations include minimizing the time needed to conduct the survey and interviewer variability or error in eliciting responses. It may be easier to standardize data collection across survey teams if the list-based method is employed to improve consistency and comparability. Therefore the list-based method may be recommended**.** See Table 3 for comparison of the advantages and disadvantages of each method.

To summarize, each method has its positive aspects. List-based requires a shorter interview, which is reported to last fewer than six minutes. Open recall may be more intuitive for respondents. The list-based method may lead to greater overestimation than open recall (as seen in Box 9). By carefully considering the steps described in this Guide, overestimation can be minimized and high quality data can be collected using both methods.

Table 3. Advantages and disadvantages of list-based and open recall methods

	LIST-BASED	OPEN RECALL
ADVANTAGES	• Fewer requirements for capacity of enumerators • Shorter enumerator training time required • Easier data processing and cleaning • Upcoming availability of validated nationally adapted questionnaires by DHS and Global Diet quality Project for various countries • If questionnaires are standardized, potentially promotes better comparability within and between surveys	• Intuitive for both enumerator and respondent • More complete data: all foods consumed by the survey population, including those that do not pertain to MDD-W or were not mentioned in the prepared food list • Shorter preparation time for survey tools (does **not** require shortening the list of food items to reduce respondent burden)
DISADVANTAGES	• When no previous survey was conducted in the area, requires longer preparation time for survey tools (extensive list of food items must first be prepared then shortened to include only the foods most consumed, to reduce respondent burden) • Requires respondent to mentally take apart mixed dishes • Requires respondent to mentally move back and forth in time as foods are mentioned	• Longer enumerator training time required • Requires enumerators to have a good understanding of questionnaire's objectives and a reasonable knowledge of how food is acquired, prepared and consumed in the survey areas • Training inexperienced enumerators is time and resource intensive • More challenging to program in CAPI applications, especially if drop-down food lists are used [32]
SIMILARITIES	• Adaptation of the questionnaire for local cultures: ◦ Stocktaking exercise for availability and consumption of food items in survey setting • Classification of food items into food groups	

[32] Drop down features involve extensive preparatory w`ork; consume a lot of memory on the mobile device, which may cause the data collection application to run slower, thus disrupting the flow of the survey.

BOX 9. SUMMARY OF THE MULTI-COUNTRY STUDY IN CAMBODIA, ETHIOPIA, AND ZAMBIA ON MDD-W

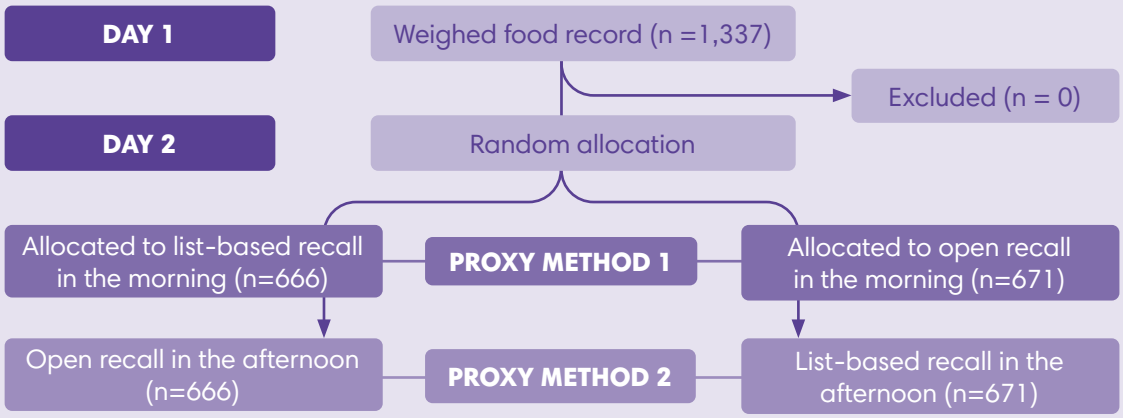
Title: MDD-W data collection: validity of the list-based and open recall methods as compared to weighed food record

Objective: To examine the measurement agreement of non-quantitative list-based and open recall as compared to the weighed food record (WFR), the reference method for individual quantitative dietary assessment, used to achieve the score for MDD-W and ordinal food group diversity score.

Methods

The methods were compared using the study design shown in Figure 4.[33] Data were collected from non-pregnant WRA in Cambodia (n=430), Ethiopia (n=431), and Zambia (n=476) from the 9th of June to the 14th of December 2019.[34] For the pooled sample (n=1,337), proportions of women achieving MDD-W from both proxy methods were compared to the proportion from WFR using three different statistical methods. For more details see publication: Hanley-Cook *et al.*, 2020. Ordinal food group diversity score (0-10) was also compared using three other appropriate statistical methods. MDD-W food groups that were most often misreported by the proxy methods (i.e. false negatives and false positives) were identified.

Figure 4. Diagram of study design



Source: Hanley-Cook *et al.*, 2020

Key findings

- List-based and open recall methods over-reported MDD-W by 16 and 10 percentage points ($p<0.001$) respectively, as compared to WFR (proportion achieving MDD-W: 30 %).
- Food groups that were most likely to be misreported using proxy methods were beans and peas, dark green leafy vegetables, vitamin A-rich fruit and vegetables and other fruits.

Continued >>

33 This study uses a non-inferiority design, which shows that a new dietary assessment method is not unacceptably worse than the current standard method.

34 In Ethiopia, data collection was conducted between 9th June and 1st of August 2019; in Cambodia between 8th August to early-September 2019; and in Zambia from 21st October to 14th December 2019.

Conclusions

Statistical evidence shows over-reporting of both list-based and open recall methods when assessing the prevalence of MDD-W or ordinal food group diversity score for WRA in LMIC, with higher over-reporting for list-based. When MDD-W is made operational using non-quantitative recall methods, careful development of the questionnaire and potential trade-offs should be considered concerning accuracy, enumerator/respondent burden and requirements for resources.

What do these results mean for users of MDD-W?

Both proxy non-quantitative methods may overestimate dietary diversity, when compared with the reference method. However, these methods remain useful as long as users understand the reasons leading to overestimations, and the actions to be taken to minimize them in terms of questionnaire development. Throughout this Guide, users will find recommended good practices in questionnaire development that can limit potential causes of overestimation.

As long as these good practices are followed during survey planning and data collection, and results using the same methodology are compared, both methods will remain useful in demonstrating changes in trends in dietary diversity over time and between populations.

A few reasons for overestimation found in the two proxy methods and potential solutions:

- List-based and open recall are retrospective methods that rely heavily on the respondent's memory and self-reporting. Therefore, the respondent is subject to a certain degree of recall and social desirability bias.
- Some food groups such as dairy (milk and milk products), nuts and seeds, beans and peas are more prone to over-reporting for two reasons:
    - Respondent misreports because of misclassification (e.g. non-dairy creamer counted as dairy).
    - Foods are counted towards the MDD-W when consumed in less than 15 g. The recommended practice of including foods usually consumed in less than 15 g in the group of "Condiments and Seasonings" may not sufficiently solve the issue (see Box 6) and a small margin of error is expected for this reason.

Potential solutions – Proper adaptation of list-based questionnaires and suitable training of enumerators for both methods, as described in this Guide.

- Respondents in charge of food preparation in the household may mistakenly report foods prepared for others, instead of or in addition to those consumed by herself. Foods that were consumed on other days beyond the previous day or night of the interview may be recalled.

Potential solution – Clearer wording of the introduction to the questionnaire, provide clarity regarding the recall period.

- Open-ended questions in the list-based method may lead to incorrect reporting of items in some food groups.

Potential solution – For most questions, and as far as possible, use close-ended questions that include a limited number of the most frequently consumed food items. Open-ended means structuring the question as: "*rice, bread, corn and other foods made from grains*", where the interpretation of what *other* means can vary widely between respondents and lead to misclassification.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3.5. LIST-BASED METHOD

When the list-based method is used, the enumerator reads a list of foods and beverages to the respondent. The enumerator informs respondents that they should respond *yes* for each food or beverage consumed during the specified 24-hour recall period. The enumerator continues by reading the list of locally representative food items, which have been organized into groups in each row of the questionnaire. Thus far, a few useful articles have been published on list-based development methods (Herforth, *et al*., 2019; Hotz and Abdelrahman, 2019). It is expected that the widespread use of this Guide and the MDD-W data published by DHS and GDQP will encourage survey planners to report how adapted list-based questionnaires are developed for their surveys.

Generating a shortlist of commonly consumed food items

A new, important step has been added to the food list adaptation process. See discussion on **identification of the most frequently consumed food items** in the survey population, in subsection 2.2. Although the extensive food list should be compiled initially for reference by the survey team, the generation of this shortlist is highly recommended. The food items listed for each food group in the list-based questionnaire should not be exhaustive or extensive. Updated evidence concerning respondent cognitive burden led to the recommendation to limit the number of foods items per row in the questionnaire and, with a few exceptions, employment of close-ended questions.

There is no universally defined number of food items that optimize the list-based method data collection tool for all food groups, as this will depend on the local food group diversity. **Cognitive burden** from survey questions is known to be a serious source of response error, and shorter lists can reduce respondent burden. Therefore, an important objective when designing questionnaires is to write clear questions. This will minimize the cognitive effort required on the part of the respondents. The Global Diet Quality Project (GDQP) investigated

respondents' burden linked to interviews for MDD-W list-based method data collection through the use of cognitive interviews (Herforth, *et al.*, 2019), specifically the:

- type of question (open or close-ended):[35] respondents' misinterpretation of open-ended question led to misclassification of food items into foods groups
- number of food items per row of the questionnaire: seven or fewer food items per row in the questionnaire are enough to be sufficiently representative of frequently consumed items while simultaneously reducing respondent burden.

These results, together with the Demographic and Health Survey's MDD-W questionnaire approach to data collection, and recommendations found in the updated World Health Organization (WHO)/United Nations Children's Fund (UNICEF) *Indicators for assessing infant and young child feeding practices* and the FAO MDD-W study (See Box 9) led to the following recommendations:

- **Adopt close-ended questions** (use food items themselves only, avoid mentioning the generic food group term for "*and other*…"), as much as possible.
- **Adopt the sentinel approach** (reduced number of food items per food group) **by limiting the number of food items per food group in list-based questionnaires to seven (7) or fewer**, whenever possible.

Exception: when the terminology for food groups is widely understood and used by respondents, open-ended questions can be used. These foods groups may be:

- "other fruits" and "nuts and seeds";
- groups that include animal sourced foods, such as eggs, meats, cheese and milk;
- unhealthy food groups related to non-communicable diseases.

When the survey team is confident that the generic term is understood, and that the open-ended questions are more suitable because of a large variety of food items in the food group, as an exception open-ended questions may be employed. Where possible these decisions should be based on qualitative research, such as cognitive interviews, key informants and questionnaire pre-tests.

As mentioned in Section 1.2, it is important to list foods using nomenclature that corresponds to the way the food is consumed: for example, hummus, tofu and tempeh instead of beans, peas and lentils; peanut butter or nut or seed butters or pastes; porridge or bread rather than wheat; tortillas or tamales rather than maize.

Exceptions to the *rule of seven* – When there is high diversity within specific food group(s): In some settings, such as Southeast Asia, there may be a large diversity of foods within specific food groups, such as dark green leafy vegetables. More than seven food items may be easily identified, and all are consumed at an equally high frequency. In these cases, it is

[35] The 2016 MDD-W Guide suggested open-ended questions for the list-based questionnaire. This means that the food groups were described generically before or after the example food items were read (e.g. "Yesterday during the day or at night, did you eat any vegetables or roots that are orange coloured inside, like: pumpkin, carrots, squash or sweet potatoes?" or "Yesterday during the day or at night, did you eat kale, spinach, chicory or any other dark green leafy vegetables?"). The interpretation of which vegetables are orange coloured inside or which are dark green leafy vegetables may vary considerably among respondents, as people do not always classify food in the same way. This question format may be ambiguous, induce misclassifications and reduce the quality of data collected.

recommended that the row in the questionnaire should be split into two.[36] This will offer a break in the list of food items per row and reduce the respondent's cognitive effort. Therefore, if twelve food items are considered as frequently consumed, they should be divided into two rows with six examples each. This will give the respondent time to think of her answer.

Ordering food groups to avoid misclassification

Since all the food items are read to the respondent in the order listed on the questionnaire,[37] it is recommended that food groups are arranged in such a way as to avoid double-counting of certain foods. This entails placing the more *specific* group of vitamin A rich roots, tubers and vegetables before the general group of white roots and tubers, which minimizes the risk of misclassification. An example is orange-flesh sweet potato (i.e. the respondent may erroneously say *yes* to white potatoes, when in fact the sweet potato was consumed). This is not an issue when using the open recall method.

Classification of mixed dishes

Employing the list-based approach, the enumerator may be required to classify mixed dishes if the respondent offers information outside of the questions being asked. The extent of enumerator training and capacity-development will determine if enumerators are able to classify food items outside of the list by themselves. Where training is minimal and concise, which is often the case for large multi-topic surveys, enumerators may not be capable of classifying the food items on their own, and should only be instructed to mark a food group if a food in the mixed dishes is an exact item on the list, to avoid misclassification.

Instructions for enumerators

It is important that the enumerator gives a clear introduction before the questionnaire is read. The introduction can be on a guidance sheet or included on the questionnaire form. The introduction should (Herforth, *et al.*, 2019):

- Instruct and allow the respondent to take a few minutes to recall all the foods she has eaten the previous day or night. This is because the questions for the list-based method are not in chronological order, as they are for open recall.
- Clearly state and emphasize the recall period. This is crucial for data quality, as this ensures the respondent understands the recall refers **only** to the previous day and night and **not** to usual consumption, which may lead to overestimation.

Nevertheless, some multi topic surveys may allocate a short time to the questionnaire and may opt for a briefer introduction. With this in mind, examples of two scripts to be followed by the enumerator when speaking to the respondent can be found below.[38]

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36 Note that whenever questionnaire rows are split or questions added, the question numbers change: tabulation/calculation instructions should be adjusted accordingly.

37 Different from open recall, when the respondent recalls her food consumption from the previous day or night in chronological order.

38 The two options for introductions (short and long) for list-based were developed by DHS, and are scheduled for piloting in 2021. The shorter introduction may result in a lower burden on the enumerator and respondent, especially in a long multi-topic survey. The long introduction may improve retrieval cues that activate the memory of survey respondents and may prompt the respondent to consider their consumption during the previous day or night rather than a typical day.

LIST-BASED SHORT INTRODUCTION

Now I'd like to ask you about foods and drinks that you consumed yesterday during the day or night, whether you ate or drank it at home or somewhere else. Please think about snacks and small meals as well as main meals.

I will ask you about different foods and drinks, and would like to know whether you ate the food even if it was combined with other foods.

Yesterday during the day or at night, did you eat or drink:

LIST-BASED LONG INTRODUCTION

Now I'd like to ask you some yes-or-no questions about foods and drinks that you consumed yesterday during the day or night, whether you had it at home or somewhere else.

First, I would like you to think about yesterday, from the time you woke up through the night. Think about the first thing you ate or drank after you woke up in the morning … Think about where you were when you had any food or drink in the middle of the day … Think about where you were when you had any evening meal … and any food or drink you may have had in the evening or late-night... and any other snacks or drinks you may have had between meals throughout the day or night.

I am interested in whether you had the food items I will mention even if they were combined with other foods.

Please listen to the list of foods, and if you ate or drank any one of them, say yes.

Yesterday during the day or at night, did you eat or drink:

Enumerators should not rush when reading the introduction or the food items. Give the respondents time to recall the food they consumed the previous day.

Mark yes if any item in a food group was consumed and no if the woman reports she did not consume any of the items in the food group.

LIST-BASED MODEL QUESTIONNAIRE

Now I'd like to ask you about foods and drinks that you consumed yesterday during the day or night, whether you ate or drank it at home or somewhere else. Please think about snacks and small meals as well as main meals.

I will ask you about different foods and drinks, and I would like to know whether you ate the food even if it was combined with other foods.

Yesterday during the day or at night, did you eat or drink:	
Porridge, bread, rice, noodles, or pasta?	YES ☐ NO ☐
Pumpkin, carrots, squash, or sweet potatoes? *	YES ☐ NO ☐
Plantains, white potatoes, white yams, manioc, or cassava?	YES ☐ NO ☐
Beans, peas, or lentils, hummus, tofu or tempeh?	YES ☐ NO ☐
Tree nuts, groundnuts, peanuts, cashews, Baobab seeds, chia seeds or flaxseed?	YES ☐ NO ☐
Milk?	YES ☐ NO ☐
Cheese or yoghurt?	YES ☐ NO ☐
Liver, kidney, or heart?	YES ☐ NO ☐
Beef, pork, lamb or goat meat?	YES ☐ NO ☐
Chicken or duck?	YES ☐ NO ☐
Sausage, salami, ham or pastrami?	YES ☐ NO ☐
Fish or seafood?	YES ☐ NO ☐
Eggs?	YES ☐ NO ☐
Spinach, mustard green, chicory, or kale?	YES ☐ NO ☐
Eggplant, cucumber, beets, cabbage or zucchini?	YES ☐ NO ☐
Ripe mangoes or ripe papayas? **	YES ☐ NO ☐
Apple, avocado, banana, baobab fruit, berries, pineapple, or orange?	YES ☐ NO ☐

Yesterday during the day or at night, did you eat or drink:	
Crisps, chips, puffs?	YES ☐ NO ☐
Doughnuts/fried dough/fried bread, samosas?	YES ☐ NO ☐
Instant noodles?	YES ☐ NO ☐
Foods from fast food restaurants?	YES ☐ NO ☐
Chocolates, candies, pastries, cakes, biscuits, ice cream or popsicles?	YES ☐ NO ☐
Soft drinks, sodas, fruit juices, chocolate drinks, energy drinks?	YES ☐ NO ☐
Sweetened tea, sweetened coffee, or sweetened herbal drinks?	YES ☐ NO ☐

* The vitamin A rich vegetables come before white roots and tubers to avoid the classification of sweet potatoes as white potatoes.

** Vitamin A rich fruits were ordered close to the other fruits groups

BOX 10. LIST-BASED: USING COMPUTER-ASSISTED PERSONAL INTERVIEWING FOR MDD-W

For both methods, the instructions and script to be read out to the respondent will be displayed at the start of the questionnaire.

The list-based questionnaire will contain questions showing the selected top food items under each group. The groups can be presented one at a time, where the enumerator moves to the next screen after each food group until all questions have been asked.

The enumerators should be able to select *yes* if any item in a group was consumed and *no* if the respondent reports she did not consume items in the group. To ensure all questions were answered, the programme should **not** allow the enumerator to skip to the group unless a response is recorded.

After the data have been recorded, the enumerator should save the questionnaire, which should be checked by the supervisor afterwards, ideally at the end of each day. See Appendix 6 for the steps to be followed and examples of employing the list-based questionnaire in the Open Data Kit (ODK) application.

Country specific list-based tools in development

As mentioned in subsection 3.1, in 2020-2021, the Global Diet Quality Project is developing a systematic, standardized method of adapting the list-based questionnaire to country context. These country-specific adaptations of the MDD-W list-based questionnaire will be released alongside a longer Diet Quality Questionnaire (DQ-Q), which includes additional food groups that capture other aspects of diet quality.[39] These adaptations will be implemented in the DHS and the Gallup World Poll, to facilitate consistent data collection between countries and over time.

Adaptations are carried out by nutrition experts, in consultation with local partners and after review of existing materials. The most-commonly consumed foods or beverages in each food group (sentinel foods) are identified. Adaptations are made to reflect the appropriate local terminology. Each sentinel food item is referred to, and items typically consumed in small, insignificant amounts are excluded.

3.6. OPEN-RECALL METHOD

In the open recall method, the respondent is asked to openly recall, in chronological order, starting with the first food consumed, up to the last one at the end of the day or night. The non-quantitative recall is *open* because the enumerator does not read predefined foods or groups to the respondent. The enumerator classifies the foods into the extended food list

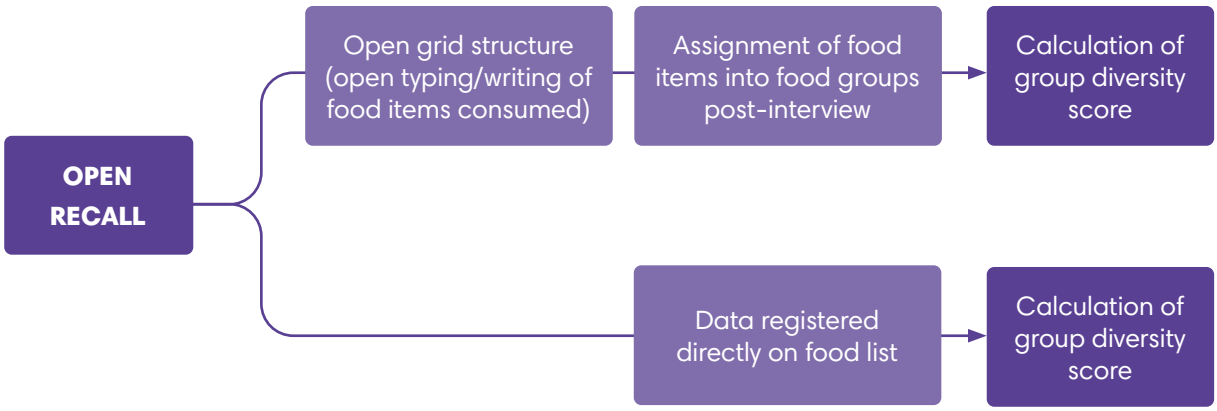
[39] By late 2021, country-adapted tools for approximately 100 countries will become available for use by any survey team interested in gathering MDD-W, or broader information on diet quality in a particular country. This work is supported by grants from USAID Advancing Nutrition, the European Commission/GIZ Capacity for Nutrition, and the Rockefeller Foundation.

at the end of the interview. If an adapted food list is not available, the food items collected can be classified into food groups at a later stage by knowledgeable members of the team. Information on quantities is not recorded, only the food items consumed. Foods mentioned by the respondent, but not already included on the MDD-W adapted food list, can be either classified by the enumerator into an existing food group (such as "Condiments and seasonings") or recorded in a separate space on the questionnaire and coded later into one of the predefined food groups for the construction of MDD-W.

Questionnaire structure

Forms should provide a space for enumerators to record each food or ingredient as mentioned. A grid structure for morning, midday, afternoon and evening is recommended. This type of questionnaire structure has been found to be helpful in a number of small to medium-sized surveys. The questionnaire is constructed in a way that ensures the enumerator first records the foods/ingredients, then each food or ingredient item is coded into its respective row on the questionnaire at the end of each interview. This two-step process may not be feasible for larger surveys because of the increased time required to collect and classify food items into food groups. In these cases, the previously developed food list, where the enumerator marks the answers directly, may be the most efficient data collection method. The interview protocol is described in Figure 5.

Figure 5. Possible options for open recall interview protocol



Source: Developed by authors.

Instructions for enumerators

The following text can be provided to enumerators on a guidance sheet or included on the questionnaire form. A script example to be followed by the enumerator when speaking to the respondent can be found below.

OPEN RECALL INTRODUCTION

Now I'd like to ask you to describe everything you ate or drank yesterday during the day or night, whether you ate it at home or anywhere else. Please include all foods and drinks, main meals as well as any snacks or small meals. Please also include food you ate even if it was eaten away from your home. Let's start with the first food or drink consumed yesterday.

Did you have anything to eat or drink when you woke up? If yes, what? Anything else?

Did you have anything to eat or drink later in the morning? If yes, what? Anything else?

Did you eat or drink anything at mid-day? If yes, what? Anything else?

Did you have anything to eat or drink during the afternoon? If yes, what? Anything else?

Did you have anything to eat in the evening? If yes, what? Anything else?

Did you have anything else to eat or drink in the evening before going to bed or during the night? If yes, what? Anything else?

The enumerator should continue probing until the respondent says "*no, nothing else*". If the respondent mentions a mixed dish such as a soup or stew, the enumerator should ask for all the ingredients.

Depending on the choice of protocol for the open recall interview described in Figure 5 (either use of grid structure or directly marking the answers on the food list), the instructions for the enumerator will differ on how to record the answers given by the respondent.

When using the grid, the enumerator may first conduct a free recall with the respondent concerning the foods consumed over the previous 24-hours, then record their responses in the extensive food list provided.

When the survey team chooses to skip the grid structure and record the answers directly on the food list, it is recommended that the following text be provided to the enumerators on the questionnaire form:

As the respondent recalls foods and drinks, mark the corresponding food item on the food list and mark *yes* in the response column for that row on the questionnaire. If more than one item in a row is mentioned, mark each item. If the same food or drink is mentioned more than once, you do not need to mark it again after the first time. If the food is not listed in any of the rows on the questionnaire, write the food in the bottom row labelled: "Other beverages and foods".

Immediately after completing the recall, the enumerator should mark *no* for rows where the respondent did not report consuming any items.[40]

This Guide does **not** recommend the enumerator conduct a second pass to remind respondents about potential food items forgotten during open recall, or to read the food list to respondents, as this may induce bias and over estimation.

MODEL QUESTIONNAIRE FOR USE WITH OPEN RECALL

There are two steps to the model questionnaire:

Step 1: A grid structure and a table showing examples of food items in each row of the questionnaire (See Table 4).

Table 4. Example of a grid structure

Time of Day	Meal	Food and beverages
	B=Breakfast L=Lunch D=Dinner/Supper S=Snack	Example: Mashed sweet potato Chicken breast, cooked with corn oil Orange juice, 100%, unknown brand

Step 2: The extensive food list described in Part 1, Section 3**,** with an additional yes/no column at the end of each row, is used in the open recall for classification of food items recorded on the open grid into food groups. This list can also be used to record direct data, according to the survey team's decision and specific needs. This step is subsequently used to calculate the final score.

40 The method for marking no will vary depending on the standard practice preferred by the survey designers; it can be entered as a code 0 in a blank space (|0|) or codes on the form may be circled or ticked.

BOX 11. OPEN RECALL: USING COMPUTER-ASSISTED PERSONAL INTERVIEWING

As mentioned in Box 10, the instructions and script to be read out to the respondent will be displayed at the start of the questionnaire. Please refer to Appendix 6 for examples on creating open recall questionnaires using the Open Data Kit (ODK) application.

The open recall questionnaire should be programmed to allow the enumerator to electronically execute the two steps described above. The exact layout of the questionnaire depends on the software used and the time and capacity available for the survey design process. The following is based on experience gained during the FAO MDD-W study.

The first step comprises free recall of single food items and all ingredients in the mixed dishes consumed. These are either recorded by typing out the food names in a blank space or, if constructed, selecting them from a drop-down food list. The enumerator moves to the next screen after recording each meal/snack until all foods consumed by the respondent have been recorded.

The second step resembles that of the list-based questionnaire. Enumerators will be asked to categorize the foods recorded during the open recall into each of the expanded food groups by going through them one-by-one. During this process, they should be able to see all food items recorded in the first step simultaneously on the same screen as the expanded food group. This will prevent the enumerator from missing any foods and avoid their having to go back and forth to check the food items recorded.

Similar to the interface for the list-based questionnaire, the groups can be presented one-by-one, where the enumerator moves to the next screen after each food group until all questions have been asked. Again, the enumerators should be able to select *yes* if any item in a food group was consumed and *no* if none of the food items reported fall into a food group. To make sure all questions were answered, the program should not permit the enumerator to skip to the group unless a response has been recorded.

Before ending the interview, the enumerator scrolls back and checks the answers, and asks the respondent for any necessary clarification. Afterwards, the enumerator saves the questionnaire, which is checked by the supervisor ideally at the end of each day.

Example screenshots of the open recall questionnaire developed for the FAO MDD-W project can be found in Appendix 6.

With the advancement in survey design and programming, it is hoped that, where resources and time permit, the construction and use of an exhaustive drop down list of pre-categorized, locally specific foods, an automated categorization of foods could be programmed, which removes the burden of categorizing food groups from the enumerator. The use of a pre-coded list of foods for CAPI has been tested by the International Dietary Data Expansion Project (INDDEX) for collection of quantitative dietary data and is being developed for CAPI the Global Diet Quality Score (GDQS) by Intake and Harvard[41] (Bromage *et al.*, 2020). Potential exists for adaptation of platforms for future collection of data for MDD-W data.

41 More information is available on the INDDEX 24 dietary assessment platform: https://inddex.nutrition.tufts.edu/inddex24

PART 1

Section 4.
ANALYSIS, PRESENTATION AND INTERPRETATION

Section 4. Analysis, presentation and interpretation

4.1. CONSTRUCTING THE INDICATOR

To construct the MDD-W indicator, the first step is to combine (aggregate) questionnaire rows (food groups subdivisions) into the 10 MDD-W food groups, as shown in Table 5.

Table 5. Aggregation of subdivided food groups for MDD-W

Assigning questionnaire rows to the 10 MDD-W food groups		
	Questionnaire rows	**Food groups**
A.	Foods made from grains	1. Grains, white roots and tubers, and plantains
B.	White roots and tubers and plantains	
C.	Pulses (beans, peas and lentils)	2. Pulses (beans, peas and lentils)
D.	Nuts and seeds	3. Nuts and seeds
E.	Milk	4. Milk and milk products
F.	Milk products	
G.	Organ meats	5. Meat, poultry and fish
H.	Red flesh mammal's meat	
I.	Processed meat	
J.	Poultry and other white meats	
K.	Fish and seafood	
L.	Eggs	6. Eggs
M.	Dark green leafy vegetables	7. Dark green leafy vegetables
N.	Vitamin A-rich vegetables, roots and tubers	8. Other vitamin A-rich fruits and vegetables
O.	Vitamin A-rich fruits	
P.	Other vegetables	9. Other vegetables
Q.	Other fruits	10. Other fruits

For example, if a questionnaire is coded *1* for *yes* for either questionnaire row A or B, the respondent receives a point for the first MDD-W group ("Grains, white roots and tubers, and plantains"). **She does not receive an additional point if she consumed food items from both rows in the questionnaire rows contribute to the same MDD-W food group.**

If rows are added, and questions renumbered, tabulation of the final count for the 10 MDD-W food groups should be reviewed carefully and adapted, as needed.[42]

Construct the food group diversity score: The 10 MDD-W food groups are first summed into a score ranging from 0 to 10. Begin with a score of 0. For each of the food groups, add one point if any food in the group was consumed.

Construct the MDD-W: Each woman is then coded *yes* or *no* for scoring at least (≥) 5, followed by calculation of the proportion of women who score at least (≥) 5. Dummy tables can be used for the calculations. These may be tables and figures planned for use as an outline to present the result,[43] which can be programmed into the statistical software of choice.

Definition: the percentage of WRA who consumed foods and beverages from at least (≥) five food groups during the previous day.

Numerator: the number of WRA who consumed foods and beverages from at least (≥) five food groups during the previous day.

Denominator: the total number of WRA surveyed.

Indicator calculation formula

$$\text{Percentage of WRA who consumed foods and beverages from} \geq \text{five food groups during the previous day} = \frac{\text{WRA who consumed foods and beverages from} \geq \text{five food groups during the previous day}}{\text{total number of WRA surveyed}} \times 100$$

For additional food groups that should be surveyed, but do not count towards the MDD-W, such as the unhealthy food groups, calculation will simply include the percentage of women reporting consumption the previous day.

42 For the list-based method the vitamin A-rich vegetables are located on row B, to avoid misclassification of white potatoes as sweet potatoes.

43 Wide format with 0/1 (no/yes) coding for 10 food-groups and 0/1 (no/yes) coding for achieving MDD-W (5 or more food groups consumed).

4.2. DATA PROCESSING AND MANAGEMENT

Even when measures have been put in place to ensure data are collected following the standardized protocol, the correct processing and management of the data is essential in ensuring that the survey objectives are achieved. Data processing and data cleaning are essential parts of the process of quality assurance that aims to achieve consistent and usable data that are appropriate for analysis by:

- identifying any errors or corruptions in the data;
- correcting or manually processing the data, as needed, to prevent any recurring errors;
- anonymising any data that may contain respondents' personal identifiers.

This step is critical for MDD-W because the correct classification of food items into food groups, and the appropriate collection of other variables of interest (e.g. sociodemographic) are required to correctly interpret results and for comparison with other surveys. Development of a standardized data management protocol will help streamline this process:

- **Ensure safe storage of the data** – The data should be uploaded to a secure server that can be accessed remotely by the survey team during data collection. The data manager should monitor the server.
- **Simplify manual data processing/cleaning** – Cleaning can be a substantial and time-consuming task. While much of data cleaning can be accomplished by using data analysis software, the process and output must be monitored and reviewed for inconsistencies. To ensure quality of collected data, the team should develop a cleaning and error checking system to verify data errors, prior to the tabulation of data outputs for data analysis and report writing.
- **Allow download and export of the data** – This will permit the statistical software to analyse, manage and produce graphic visualizations of data.

How to handle missing information

Types of missing information include responses such as *I don't know*; questions that are accidentally left blank; and responses with inconsistent or illogical codes as a result of errors in recording or data entry. Usually, the use of CAPI applications minimizes missing information. If information is missing, it is assumed the WRA did not consume the food group.

4.3. PRESENTATION AND INTERPRETATION OF RESULTS

Presentation of the MDD-W can be as simple as stating the percent of WRA who have achieved MDD-W. The indicator was developed exactly for this purpose – as a single, simple, population-based dichotomous indicator.

The basic interpretation of the indicator is: "X% of women achieved minimum dietary diversity, and they are more likely to have higher (more adequate) micronutrient intakes than the X% of women who did not."

In some cases, it may be useful to present results separately by:

- selected geographic characteristics (e.g. by province or region, food system typology or by agro-ecological zone) (Figures 6, 7 and 8);
- socioeconomic or household characteristics (e.g. urban versus rural households, by wealth quintile, age subgroup, level of education) (Figures 11 and 13);
- food insecurity status based on the Food Insecurity Experience Scale (FIES) or comparable experience-based food insecurity scale.

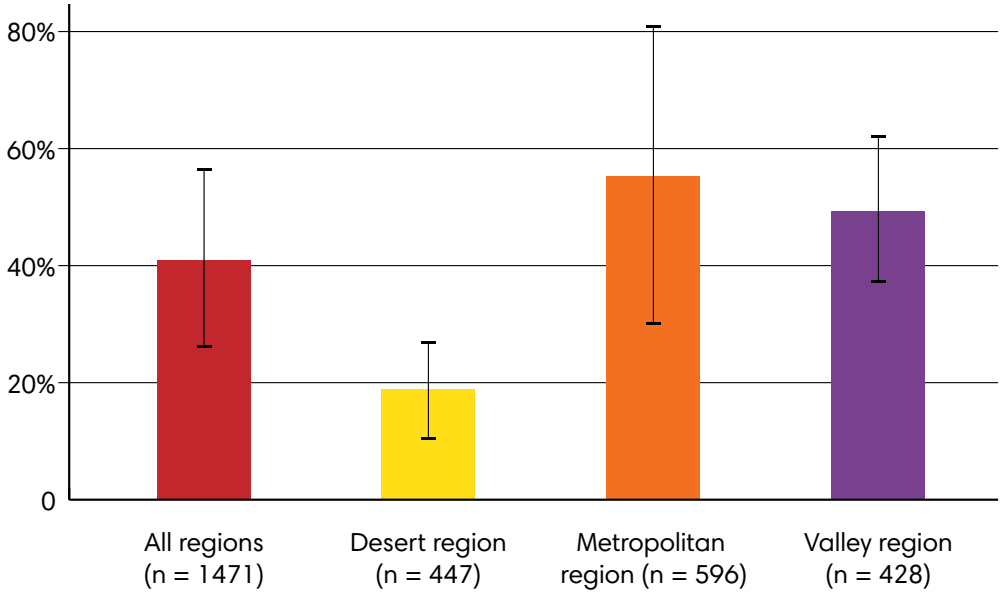
Decisions regarding appropriate disaggregation will be specific to the survey and context and depend on the objectives, sampling and sample sizes.

The example Figures in this section present hypothetical data for illustrative purposes only. They do not represent an exhaustive set of presentation options. Decisions concerning presentation of the data depend on the target audience and objectives of presentation.

Food group diversity

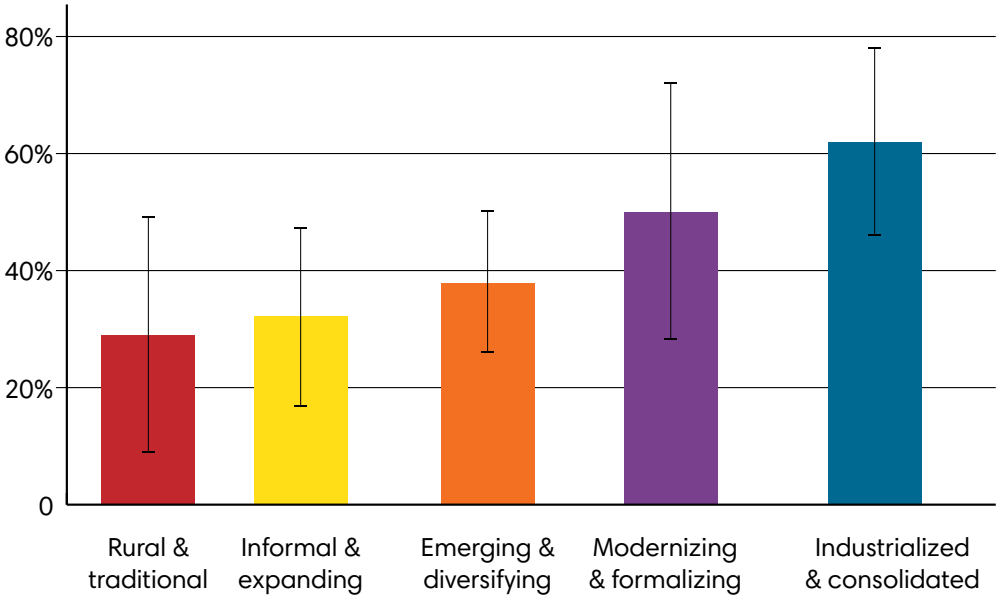
While designed to meet the need for a single, simple dichotomous indicator, the data collected to construct the indicator also provide descriptive information on food group diversity (Figures 9 and 10). This may also reflect the consumption of food groups of particular interest (e.g. animal-source foods, fruits and vegetables, unhealthy groups and other specific food groups that may be promoted in specific interventions) (Figure 12). In addition to presenting the percent of WRA achieving minimum dietary diversity (Figure 6), it is useful to present the median (interquartile range) diversity score (Figure 11) and a histogram illustrating the distribution of food group diversity scores (Figures 9 and 10). This is especially useful where the percentage of women consuming foods from five or more food groups is low.

Figure 6. Percent of WRA achieving MDD-W during the previous day or night, by region



Source: Developed by the authors.

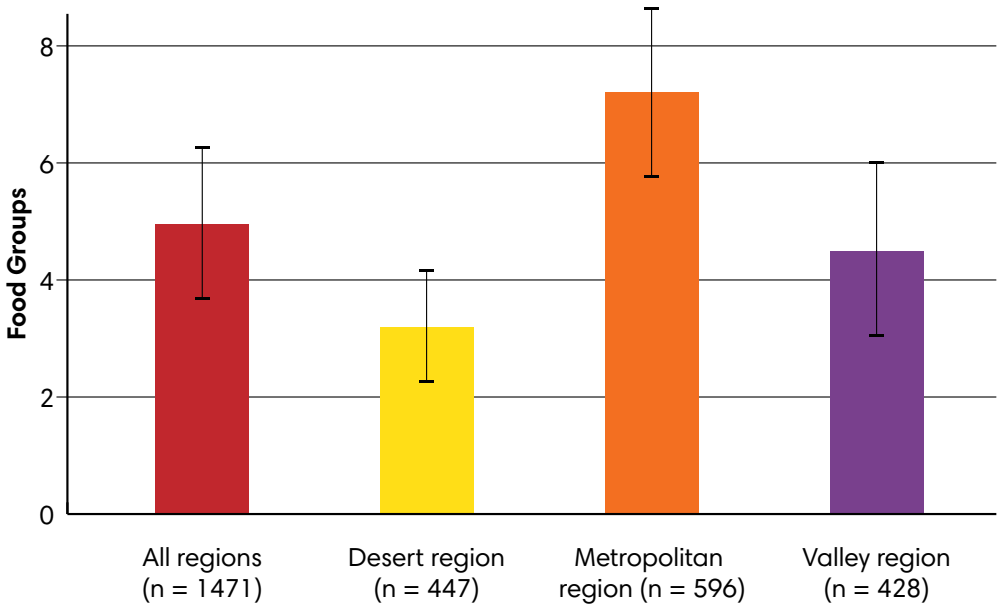
Figure 7. Percent of WRA achieving MDD-W during the previous day or night, by food system typology



Based on the www.foodsystemsdashboard.org classification.

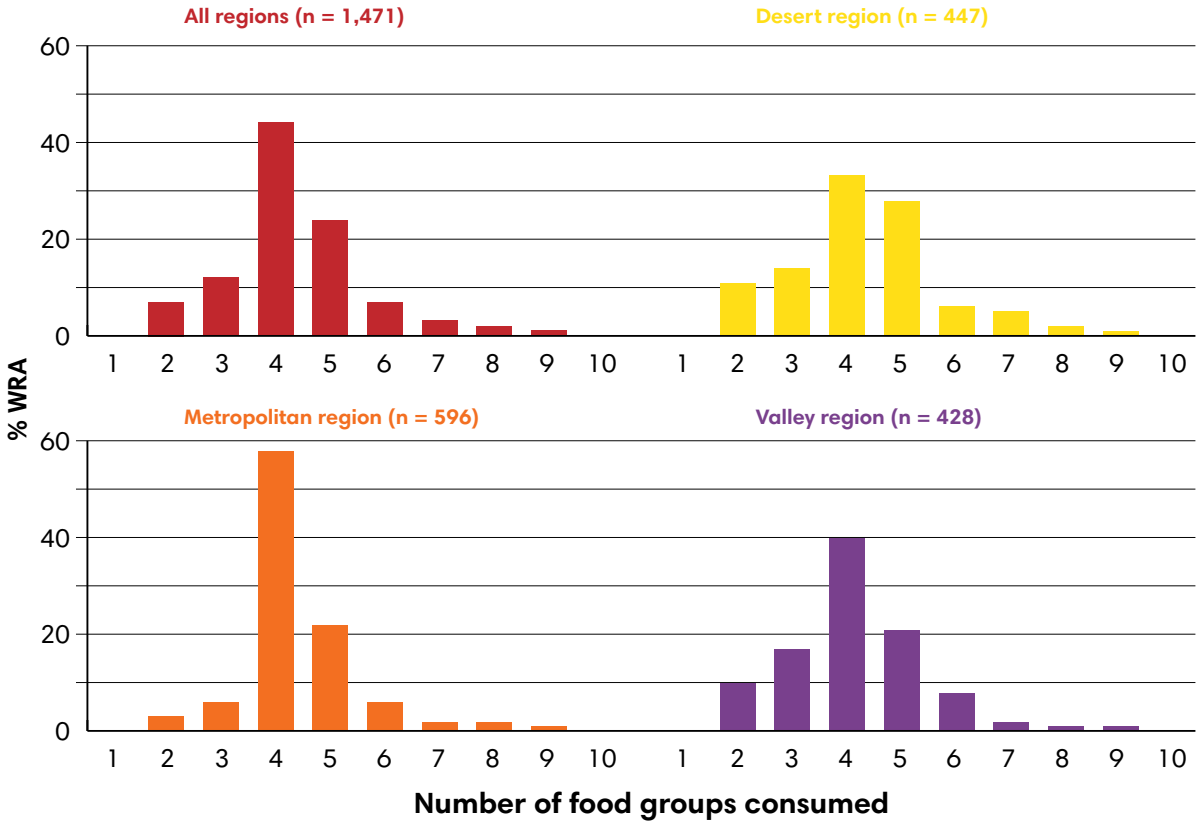
Source: Developed by the authors.

Figure 8. Mean (Standard Deviation) food group diversity score during the previous day or night, by region



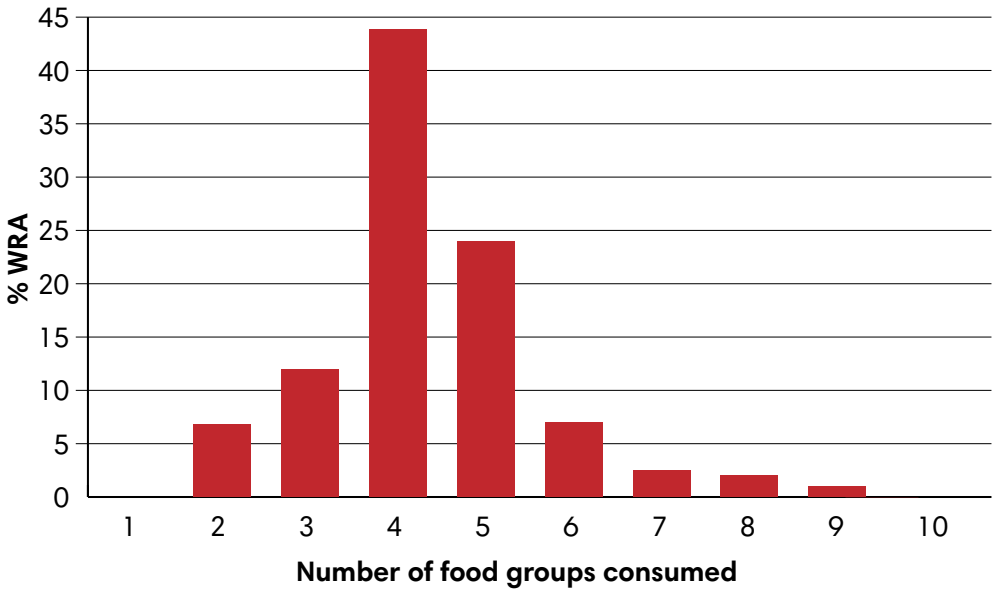
Source: Developed by the authors.

Figure 9. Percent of WRA by food group diversity scores during the previous day or night, by region



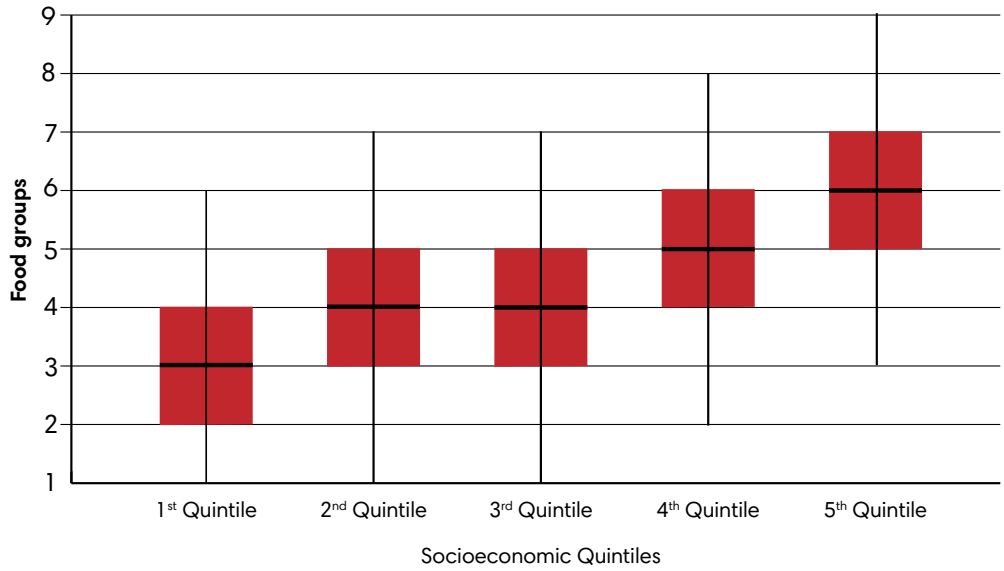
Source: Developed by the authors.

Figure 10. Percent of WRA by food group diversity scores, during the previous day or night



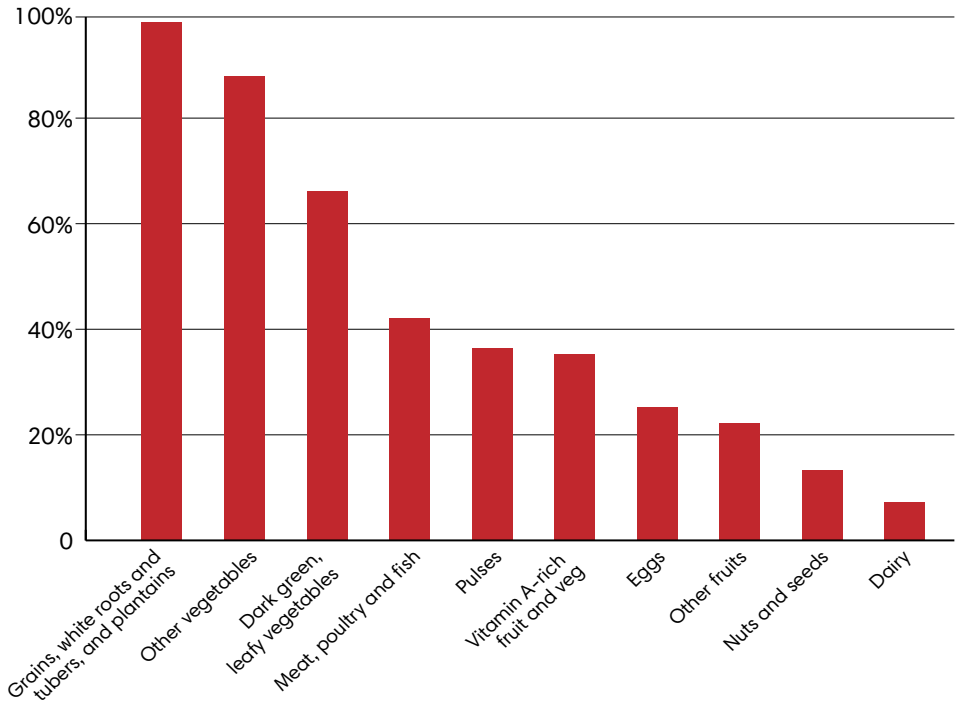
Source: Developed by the authors.

Figure 11. Median (interquartile range) food group diversity score for WRA during the previous day or night, by wealth quintiles



Source: Developed by the authors.

Figure 12. Percent of consumption of food groups by WRA, during the previous day or night



Source: Developed by the authors.

Consumption of specific food groups

Presentation and examination of the percent of WRA who consume foods from specific food groups and subgroups provide a good non-quantitative description of the diet. As demonstrated in Figure 12 (above) and Figure 13 (overleaf), this type of presentation is useful for both nutrient-rich food groups in the MDD-W and the unhealthy food groups.

Figure 13. Percent of WRA who reported consumption of unhealthy food groups during the previous day or night, based on age group

Source: Developed by the authors.

Presenting data in tables

The results shown in this section could also be presented in table format (Table 6). The data, when collected from the MDD-W questionnaire, also allow for a variety of context-specific descriptive analyses using different social demographic characteristics.

Table 6. Percent of WRA achieving MDD-W, during the previous day or night, according to urban/rural residence and wealth quintile

	The Federal Democratic Republic of Nepal	The Federal Republic of Nigeria	The Republic of Tajikistan
Overall	**50.0**	**56.0**	**80.0**
By residence			
Urban	55.1	61.0	86.1
Rural	44.4	51.1	78.5
By wealth quintile			
Lowest	37.5	48.9	72.1
Second	44.3	48.0	76.3
Middle	43.6	53.4	81.3
Fourth	58.1	58.2	85.6
Highest	75.9	66.8	86.4

Sources: National Population Commission of Nigeria and International Classification of Functioning, Disability and Health – ICF. 2019. Nigeria Demographic and Health Survey 2018. Abuja, Nigeria, and Rockville, USA; Statistical Agency under the President of the Republic of Tajikistan, Ministry of Health and Social Protection Population of the Republic of Tajikistan & ICF. 2018. Tajikistan Demographic and Health Survey 2017. Dushanbe, Republic of Tajikistan, and Rockville, USA; Ministry of Health of Nepal, New ERA & ICF. 2017. Nepal Demographic and Health Survey 2016. Kathmandu, Nepal, Ministry of Health of Nepal. (In FAO, IFAD, UNICEF *et al.*, 2020).

Differences in food group consumption for those above or below the threshold can be explored and will vary by context, as exemplified in Table 7.

Table 7. Percent of WRA in hypothetical countries where food is consumed from various food groups the day before data collection, when above or below MDD-W [a]

	COUNTRY A		COUNTRY B		COUNTRY C	
	< 5 groups (n=381)	≥ 5 groups (n=50)	< 5 groups (n=184)	≥ 5 groups (n=246)	< 5 groups (n=244)	≥ 5 groups (n=232)
Pulses	90	88	3.3	27.2	27.9	42.2
Nuts and seeds	2	16	1.1	12.2	2.9	18.5
Milk and milk products	3.7	34	0.5	6.9	2.5	11.2
Meat, poultry and fish	6.8	40	98.9	99.6	35.3	60.3
Egg	2.6	32	7.6	37.8	20.5	44.8
Dark green leafy vegetables	5.8	40	60.3	87.4	61.1	82.3
Vitamin A-rich fruits and vegetables	5.8	52	4.4	36.6	20.5	51.3
Other vegetables	96.9	100	70.1	95.5	93.4	97.8
Other fruits	2.1	40	16.3	56.5	7.4	34.5

[a] Starchy staples were consumed by 100 percent of women.

PART 1

Section 5.
FROM COLLECTION TO ACTION

Section 5. From collection to action

Improving women's dietary diversity requires a common understanding of the pathways that lead to diverse diets. In parallel, countries must first generate reliable data and ensure it is readily available and accessible for use. Reliable data, when effectively applied, can inform evidence-based policies, interventions and investments. Once in place, appropriate indicators, such as the MDD-W, can be used to regularly monitor progress and impact on improving diets in the target population.

For these reasons, the methods and tools in this Guide are designed to assist and strengthen countries' capacities in generating, analysing and applying credible data for development of policies, programmes investment and action plans.

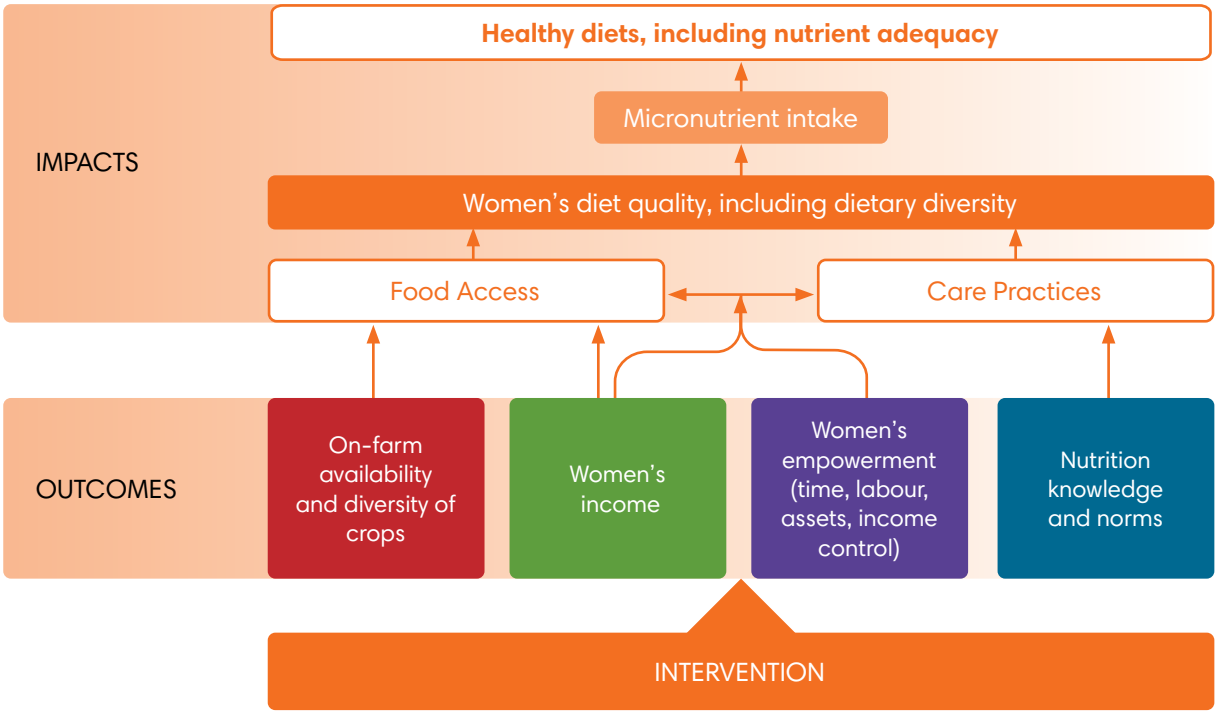
MDD-W may be considered as a measurement tool in the context of programme and policy, when the impact pathways indicate the **potential to increase food group diversity and contribute to healthy diets for WRA**. Many agricultural and health sector projects may improve nutrition, but not all will do so by increasing food group diversity (FAO, 2016; Herforth and Ballard, 2016). There is evidence that dietary diversity may be improved by interventions with the following objectives:

- women's empowerment (time, labour, assets, and income control) (Girard *et al.*, 2017; Kassie *et al.*, 2020; Komakech *et al.*, 2019; Yimer and Tadesse, 2016);
- increased women's income (Jones, 2017; Komatsu, Malapit and Theis, 2018);
- nutrition knowledge and norms (Nguyen *et al.*, 2017; Ochieng *et al.*, 2017);
- on-farm availability and diversity of crops[44] (Jones, 2017; Sibhatu and Qaim, 2018).

The framework (Figure 14) identifies four outcome areas that can affect MDD-W through agriculture, rural development and food systems.

[44] Farm production diversity was found to be positively associated with the MDD-W in four rural settings (Adubra *et al.*, 2019; Bellon, Ntandou-Bouzitou and Caracciolo, 2016; Ludwig, 2018). On the other hand, a meta-analysis found that increasing farm production diversity alone may not be a universally-applicable tool to improve nutrition (Sibhatu and Qaim, 2018), therefore a multidimensional intervention may be more effective.

Figure 14. Simple pathways to women's dietary diversity



Source: Adapted from FAO (2016) and Herforth and Ballard (2016).

5.1. PRACTICAL USES FOR THE INDICATOR OF MINIMUM DIETARY DIVERSITY FOR WOMEN

Monitoring nutrition progress at national and regional levels

As mentioned in Part 1, Section 1, MDD-W is designed for easy integration into large- scale, multi-topic surveys. These may include Household Budget Surveys and National Food Consumption Surveys, among others to collect nationally representative data on the dietary diversity of WRA. Where possible, the process should be country-led, and eventually country-owned (see Figure 15). MDD-W has already been integrated into the DHS, Phase VIII, which covers 90 countries and the adapted survey tools and data will become freely available to the public (see Part 1, sub-sections 3.1. and 3.3.). At the regional level, MDD-W is one of the 17 mandatory food and nutrition indicators included in the Comprehensive Africa Agriculture Development Programme (CAADP) results framework for nutrition reporting (NEPAD Planning and Coordinationg Agency, 2015). As additional, comparable, regularly collected data become available, MDD-W shows promise in filling the gap for a food-based indicator to monitor progress towards SDG 2.

Monitoring and evaluation of programmes

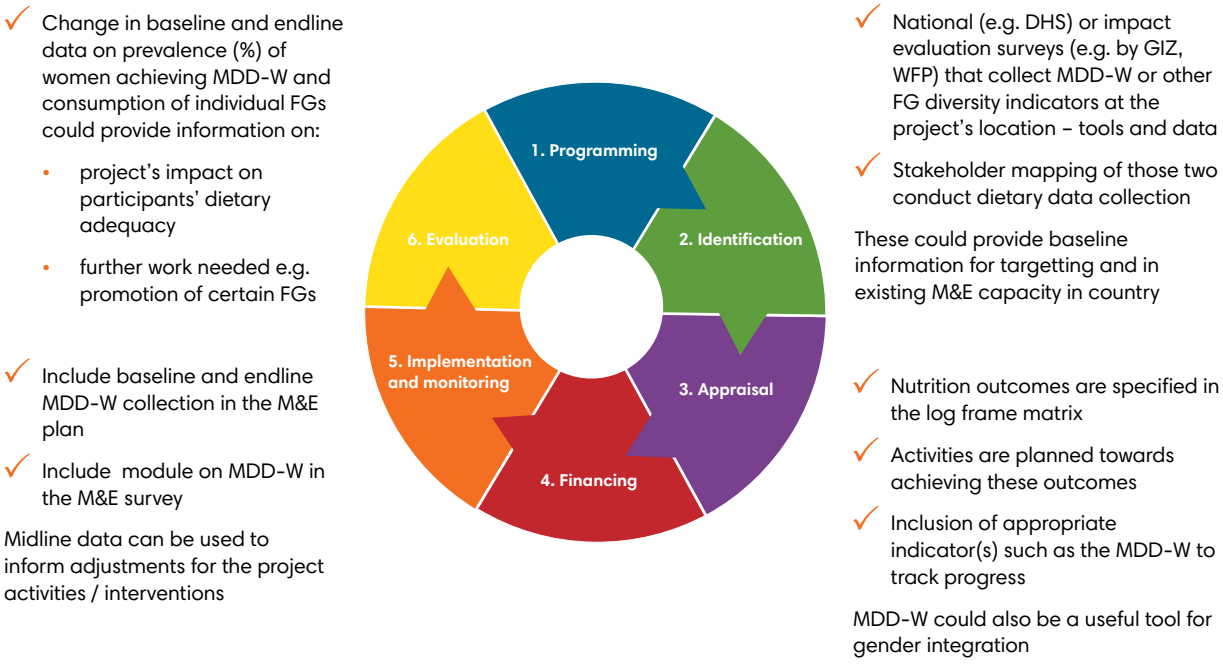
Increasingly MDD-W is used to monitor and evaluate programmes in different contexts. A study of a maternal and child health and nutrition programme in Bangladesh (Nguyen *et al.*, 2017) observed significant effects on the proportion of women who consumed ≥5 food groups/day. MDD-W is currently used by WFP and IFAD as one of their corporate indicators to

evaluate the performance of nutrition-sensitive programming (Odenigbo, Elabor-Idemudia and Geda, 2018; WFP, 2020). GIZ's Global Programme for Food and Nutrition Security, Enhanced Resilience under the Special Initiative ONE WORLD – No Hunger (SEWOH), also uses MDD-W as a monitoring indicator in 12 countries. Positive effects on dietary diversity were observed between the baseline and follow up, as well as a higher food group diversity score for beneficiaries as compared to non-beneficiaries (GIZ, 2019). See Figure 16 for potential entry points for MDD-W in programme evaluation in a generic project cycle.

Figure 15. Integrating MDD-W into national nutrition information systems

Source: Developed by the authors.

Figure 16. Uses for MDD-W in programme evaluation: Entry points in the project cycle



Source: Developed by the authors.

Analysis of food security

As the discussion of diet in relation to food security evolved from a focus on caloric adequacy (usually dependent on staple foods) to healthy diets, MDD-W can help elevate food security analysis beyond access to food in terms of quantity, but also access to a quality diet, specifically micronutrient adequacy.

The use of MDD-W in food security surveys may shed light on the missing link between food security, diet quality and nutrition outcomes:

- Household versus individual food security, by comparing MDD-W with FIES and FCS (see Box 2). Studies have shown that both dietary diversity and consumption of nutritious foods that compose MDD-W, such as fruits, vegetables, dairy and meat, tend to worsen as food insecurity becomes more severe (FAO, IFAD, UNICEF *et al.*, 2020; Hanson and Connor, 2014; Johnson *et al.*, 2018; Leung *et al.*, 2014).
- The MDD-W indicator is associated with socioeconomic characteristics, especially poverty and education levels, as demonstrated by results from several studies (Adubra *et al.*, 2019; Chakona and Shackleton, 2017; Huang *et al.*, 2018; Morseth *et al.*, 2017).
- Gender inequalities in relation to food insecurity, including access and diet quality. At the global level, the prevalence of moderate or severe food insecurity is higher among women than men (FAO, IFAD, UNICEF *et al.*, 2020).

Rapid assessment of women's diets in crises situations

MDD-W can be incorporated into rapid assessments of diets for a specific population or geographical area during crisis situations, such as the COVID-19 pandemic. WFP regularly uses MDD-W in crises situations, usually in combination with FCS-Nutrition (WFP, 2015).

Based on the local security situation, data collection can be conducted remotely (phone) or in person (paper or tablet) in the household or in specific locations (e.g. food collection points) (Lamanna *et al.*, 2019). When it may be unsafe for the enumerator to visit the household, it is recommended that the respondent be interviewed remotely. Guidance on conducting telephone interviews for MDD-W has been published by WFP (WFP, 2017).

Development of food-based dietary guidelines

National food based dietary guidelines (FBDG) represent what a country considers to be a healthy diet in their context. FBDGs are developed through an evidence-informed, multi-sector and structured process and can inform various food and nutrition policies and programmes (Herforth *et al.*, 2019).

The basis of FBDGs entails a comprehensive situation analysis and evidence review, during which the target group(s) are identified (often, FBDGs are directed towards healthy individuals over two years of age). The situation analysis includes looking at various key factors, such as the country's nutrition-related health problems, diet patterns and diet issues, specific aspects of the food system, policy and programme environment, among others.

FBDGs are often accompanied by food graphics such as pyramids and plates that guide populations on consumption of diverse diets and/or food items from specific sets of food

groups.[45] How country specific foods and nutrients can best be grouped is taken into consideration so as to provide consumers with useful information and advice.

As data are lacking in many countries on national individual food consumption, MDD-W data can provide useful insights into dietary diversity and micronutrient adequacy of women's diets to inform the FBDG development process. The advantage of using an indicator such as MDD-W as part of a large-scale national survey such as the DHS, rather than a measure tailored to an individual country's FBDGs, is the ability to compare data across time and location, even if changes are made to the national FBDGs.

Collect information on other dimensions of diet quality and health outcomes

Careful consideration should be given when using MDD-W to infer health outcomes for populations. As mentioned in Table 1, the indicator has only been validated for micronutrient adequacy of WRA and does not equate to total diet quality, and therefore should not be related to health outcomes at the individual level.

Risk of non-communicable disease

Thus far, a few studies have shown the importance of considering unhealthy food groups when exploring linkages between MDD-W and health outcomes such as coronary artery disease (Fung *et al.*, 2018) and diabetes (Fung *et al.*, 2020; Gicevic *et al.*, 2018). With the addition of unhealthy food groups to MDD-W surveys, it is possible to generate data that provide insights for considering the double-burden of malnutrition (see Part 1. sub-section 2.3. for further discussion on these food groups). The data can stimulate further research and dialogue on potential double duty actions such as interventions, programmes, and policies that can simultaneously reduce the risk or burden of both undernutrition and overweight, obesity, or diet-related NCDs (Hawkes, Demaio and Branca, 2017).

Data on unhealthy food groups collected through MDD-W surveys may shed light on how to identify:

- shared drivers between different forms of malnutrition;
- how existing interventions, policies, and programmes that are designed to address one type of malnutrition can be leveraged to similarly reduce (or at least not increase) the risk of another.

[45] FAO compiles national food based dietary guidelines, which are available at http://www.fao.org/nutrition/nutrition-education/food-dietary-guidelines/en/

BOX 12. SETTING TARGETS FOR MDD-W

Only general guidance can be provided for setting targets for Minimum Dietary Diversity for Women (MDD-W), as it is **not** possible to recommend universal targets. **A target is a specific, planned level of a result to be achieved within a specific timeframe, with a given level of resources.**

Setting targets is not an exact science. It is rare that a specific, single value is the only acceptable expected value for an indicator target. An acceptable range is usually used. Targets should be ambitious, but achievable given the project's inputs and timeframe.

When using MDD-W as a (programmatic or policy) performance indicator, during the planning stage, expected results may be set into a measurable quantity against which future progress can be compared objectively.

Measurable quantity of interest – Increase in the percentage of women of reproductive age (WRA) consuming five or more food groups on the day previous to the interview.

Example of a valuable target – Closing the inequality gap – aiming at lower quintiles of wealth and educational status to reach the levels of the higher quintiles.

When setting targets for MDD-W, planners should consider a wide-range of parameters, such as:

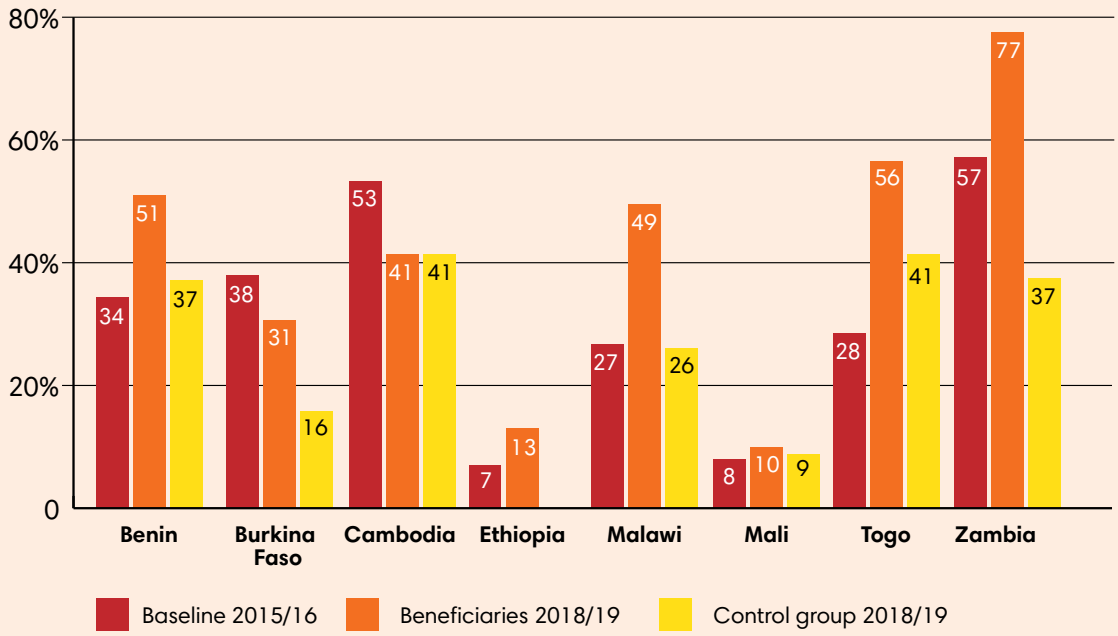
- local context;
- baseline values;
- type of intervention implemented and its theory of change or impact pathway;
- scientific evidence on the impact of this type of intervention, if available;
- timeframe and season (especially relevant to MDD-W);
- ongoing interventions in the same area and/or events that may affect the desired outcome.

Targets are best determined in consultation with local stakeholders and experts, who can provide realistic expectations of what can be achieved for an intervention during the planned duration. The USAID *Monitoring toolkit: performance indicator targets* provides best practices and a wealth of supportive information (USAID, 2021).

Examples of MDD-W target setting

GIZ's Food Security Enhanced Resilience programme does not set a single MDD-W target for all countries where MDD-W is measured (Programme, Security and Resilience, 2017). As seen in Figure 17, end-of-project evaluations showed that, with few exceptions, the proportion of women in the beneficiary groups, who achieved MDD-W, increased in comparison to baseline and to the control group. While only women from one country reached 70 percent of achieving MDD-W at end line, nevertheless impressive improvements were demonstrated in Benin, Malawi and Togo. In Burkina Faso, a decrease in the proportion of women who achieved MDD-W was observed, but this was smaller in the beneficiary group than in the control group. Thus, despite this decrease, the intervention may have had some protective effect against deterioration of diet diversity.

Figure 17. Proportion of women reaching MDD-W (%)



Source: *Programme, Security and Resilience*, 2017

Control groups should be used to study causal inference (i.e. verify whether an intervention caused a change in the MDD-W). In other words, cause cannot be inferred by simply comparing an intervention's end line and baseline values. Instead, the difference-in-difference should be compared between these values and those from control groups. The results above from Burkina Faso illustrate the need for this type of analysis. Further information on this subject can be found in *Evaluating Nutrition-Sensitive Programs: Challenges, methods, and opportunities: achieving a nutrition revolution for Africa: The road to healthier diets and optimal nutrition* (Leroy *et al.*, 2016).

As more national level MDD-W data become available, the FIES methodology on target setting might be used. This is described in the *FIES Exploration paper: Global agriculture and food security program (GAFSP) operationalization and target setting* (Kar, Hayward and Viviani, 2017). Following this method, targets are estimated based on *ex-ante* and *ex-post* approaches.

Ex-ante targets typically use structural models or simulations to determine the likely anticipated gains (or not) for an indicator. Using an *ex-ante* approach, the paper attempted to predict the change in prevalence of severe food insecurity under GAFSP in response to income changes. The approach can be used to understand a specific intervention's potential impacts on MDD-W, such as women's empowerment (time, labour, assets, and income control); increased women's income; nutrition knowledge and norms; and on-farm availability and diversity of crops, among others.

PART 2

STEPS FOR FIELD OPERATORS

While Part 1 of the guide discusses the theoretical and methodological considerations of MDD-W data collection, analysis, interpretation and application, Part 2 of the guide focuses on the operational aspects of MDD-W data collection. The following two sections describe a series of steps that are necessary prior to data collection, including the process of recruiting and training enumerators. Large-scale, multi-topic surveys such as the DHS may have their established protocol. Depending on the survey, in which MDD-W is integrated, established guidance should be followed and the MDD-W specific content in these sections can be referenced as necessary.

PART 2

Section 1.
PREPARING TO COLLECT THE DATA

Section 1. Preparing to collect the data

Before collecting data for MDD-W in a new setting, careful planning and preparatory work is required. A series of preparatory steps are described in Box 13. A few of these preparatory steps are similar to generic ones for starting any research activities or data collection, thus also applicable to MDD-W.

BOX 13. SNAPSHOT OF PREPARATORY STEPS INVOLVED AND THEIR OBJECTIVES

1. **Assemble a multi-disciplinary team with the required technical and operational expertise and experience**

   Objective: To solicit technical inputs and support from relevant experts for planning and conduct of high-quality data collection and analysis

2. **Liaise with relevant national and local authorities and obtain the necessary approvals** (Ethical clearance, approvals from national and local authorities etc.)

   Objectives: To facilitate the conduct of data collection in the chosen country(ies)/ region(s) in compliance with laws and regulations. Establish rapport with the authorities to obtain assistance on the planning and implementation of data collection as needed.

3. **Procure equipment that meet required technical specifications and prepare materials for *enumerator kits***

   Objectives: To ensure that required equipment is in place prior to testing the survey tool and capacity-development, e.g. tablets and power banks, if used (see checklist Table 9).

4. **Determine survey population and sample size**

   Objectives: To ensure that sample size and study area population is sufficiently representative for and in line with the survey's objectives, and to inform the selection of the appropriate data collection site(s).

5. **Selection of data collection site(s)**

   Objective: To ensure sufficient availability of respondents that meet the criteria defined in Step 4, and data collection is feasible in the area identified.

Steps 3, 4 and 5 should be based on the objectives of the survey

The following preparatory steps are described in other sections of the Guide where they have technical relevance:

6. **Create/adapt a comprehensive food list, verified for the local context**

   (See Part 1, Section 3: Data collection tools).

   Objective: Ensure there is a valid, locally adapted food list that carefully takes into account local diets and food consumption patterns. Include this locally adapted food list in the dietary intake assessment questionnaire. Develop materials for enumerator training.

BOX 13 – CONTINUED

7. **Design and test the questionnaire on paper and for computer-assisted personal interviewing (CAPI) data collection interface**, ***if using***

   (See Part 1, Section 3: Data collection tools).

   Objectives: To have pre-tested paper versions (as main tool or as backup to CAPI); and electronic version programmed into an application for mobile device or tablet, as appropriate

8. **Enumerators' and supervisors' recruitment and training**

   (See Part 2, Section 2: Capacity development).

   Objective: To ensure availability of skilled enumerators, who are able to collect high quality data following the standard protocol, under minimal supervision.

9. **Prepare a protocol for standard data management and analysis**

   (See Part 1, Section 4: Analysis, presentation and interpretation).

   Objective: To ensure that data will be properly saved, stored, cleaned and analysed using the appropriate tools, and the results interpreted and presented in line with the survey objectives.

1.1. ASSEMBLE A MULTI-DISCIPLINARY TEAM

See suggestions in Table 8 for the types of expertise and personnel required for MDD-W data collection and analysis. Depending on the scale of the survey, budget and existing capacity of the institution leading the survey, one person may fulfil multiple roles.

In national surveys, include personnel from the relevant governmental agencies involved in collecting data on nutrition. For example, people with a background in food consumption or anthropometric data such as health; agriculture and demographic data. Also include the Ministry of Agriculture; Ministry of Health; National Statistics Office or equivalent. The team should consult stakeholders including United Nations agencies, international and local non-governmental organizations (NGO) and research institutes that may have collected MDD-W data previously or are potential users.

Moreover, while not officially part of the survey team, identify individuals for consultation and focus groups during the planning stage of the survey, and to act as 'field guides' during the survey, as needed. These may include community nutritionists and health workers and organizations with local knowledge of the community, diets and common foods consumed and their preparation.

Table 8. Potential composition of the team to investigate MDD-W

Expertise required	Role and responsibilities
Mid to senior-level nutritionist(s), where available, or from public health, food security agriculture background with experience in planning and conducting large-scale dietary assessments	• Oversee the overall planning, implementation and follow-up activities • Survey design and protocol preparation, including adaptation of survey (described in Part 1, Section 3) in collaboration with key local informants • Liaise with national and local authorities and obtain necessary approvals • Provide technical specifications for necessary equipment • Recruit supervisors, enumerators and other relevant team members
Nutrition or background in public health or similar field, with experience in leading survey teams, knowledge in local language and survey areas (where possible)	As field coordinators and/or team supervisors, depending on scale of the survey.[46] • Participate in enumerator training • Systematically identify HHs/respondents for the survey and prepare HH listings for WRA • Supervise enumerators in the field to ensure data collection is conducted on schedule and according to the standardized procedures • Provide technical support for problems encountered during fieldwork and back-up equipment, liaise with other team members, e.g. IT expert, as necessary • Conduct data quality checks and spot-checks on interviewed HHs • Serve as a back-up/substitute for enumerators, able to conduct the same tasks as required • Track the number of surveys completed each day and identify necessary follow up for incomplete surveys/absent respondents • Review the daily plan and performance with team members • Coordinate with the community leaders/local administration to resolve any administrative issues related to travel, accommodation, communication and security that might emerge during field work through appropriate channels
Statistician	• Draft study protocol for sample design, sample selection, and handling of sampling errors • Advise on types of statistical tests to be conducted • Conduct quality assurance of the analysed results
Information technology specialist	• Develop the CAPI interface used for data collection • Provide technical support on data collection using the mobile device/tablet for the duration of the survey

46 In large-scale, multi-topic surveys such as the DHS, regional coordinators are typically high-level supervisors who rotate between teams, while team leaders supervise each individual enumerator team.

Expertise required	Role and responsibilities
Data manager (in some situations, the statistician, IT specialist and data manager can be the same person with expertise in all areas)	• Manage, process, analyse and interpret the data collected, following the standard protocol
Enumerators (see Part 2, Section 1 for selection criteria)	• Participate in mandatory training • Collect accurate data following the survey protocol • Each day ensure necessary equipment is kept safe and ready before fieldwork • Report on respondents who could not be interviewed • Ensure the safe handover of completed data to the field supervisor for verification at the end of each day • Assist other enumerators, as needed • Report to the team supervisor
Drivers familiar with the data collection areas	• Safely transport the survey team to and from data collection sites

1.2. LIAISE WITH LOCAL AUTHORITIES TO OBTAIN APPROVALS

Ethical clearance

In line with standard practices required for conducting any data collection on human subjects in most countries, ethical approval must be obtained through a locally recognized Institutional Review Board, National Ethics Committee or equivalent body. For standalone MDD-W surveys, requested information includes:

- survey protocol;
- team composition and qualifications;
- sample of survey to be used;
- informed consent form;
- measures to maintain confidentiality of personal data participants.

This list is not exhaustive and will vary based on individual country requirements.

Collection of MDD-W data is generally considered a *low-risk* activity because of the following reasons:

- Non-invasive procedure (no direct body contact/measurement, or collection of bodily fluids/samples required from the respondent).

- Minimal disruption of daily routine:
  - does not require or encourage participant to change their regular eating habits;
  - takes a short time to complete.
- Respondent's privacy is protected, as data are anonymised for analysis.

The above justifications can be elaborated, as needed, to support an ethics clearance application.

As mentioned, this process may be different for large-scale, multi-topic surveys, and the individuals involved in planning should follow the specific guidelines and requirements for these surveys, which are not described here.

Approval to conduct a study at the national and local level

Where the work is conducted by a non-governmental organization, approvals and agreement to conduct data collection in the potential data collection area(s) may be required from the relevant government ministries and regional/local authorities. This entails meeting local authorities to inform them of the purpose of the survey, target respondents, any benefits or risks to the local population, and contacting local leaders; for example zonal administrators or village chiefs. Approvals and agreements should be sought in advance to allow time to explain the process and advocate for any benefits for those participating in the survey. Advance approval will facilitate logistics for the field team in the enumeration area and help ensure approval and acceptance in the area. Table 9 gives a checklist of possible equipment for enumerators.

1.3. PROCURE EQUIPMENT AND PREPARE THE ENUMERATOR KITS

Table 9. Checklist of equipment and supplies required by each enumerator

Equipment	Purpose
Project identification card, t-shirt with project/ organization logo	• Proof of identity for the survey team
Tablet or other mobile device with the survey platform installed and surveys downloaded, with SIM card (if used)[47]	• For data collection, if used • Should be charged every evening • SIM card, if used, should be obtained by the from a provider that has good coverage the survey area
Power bank*	• To allow for charging of tablets in case of power outage.
Hard copies (paper versions) of survey and informed consent forms	• For data collection, if used • In case of equipment failure for CAPI surveys
Pen, notebook and clipboard	• Field notes • In case of equipment failure
Mobile phone with SIM card	• To stay in contact with the survey team and supervisors • Can be provided by enumerator, but signal coverage of survey area should be ensured, where possible
GPS device if survey is paper-based, and also for some tablets, an optional GPS dongle device may be used	• To allow location tracking of households surveyed, to avoid duplication and facilitate return visits for quality checks, if needed.

47 SIM cards are not always needed for all tablets – for example, interviewers who are part of a survey team may transfer data collected to the supervisor via Bluetooth while in the field, and supervisors will then transfer the combined team data to the central office at the end of the day.

BOX 14. DECIDING ON THE SOFTWARE AND HARDWARE

The list of software is not exhaustive.

Available and commonly used platforms for electronic surveys that run on the Android platform include KoBo Toolbox and Survey Solutions and Open Data Kit (ODK), each with their own specifications. There are other platforms for Windows-based tablets.[48] The choice will depend on the specific needs of the survey, and will not be elaborated in this Guide. The FAO study used ODK because the country partners, including the Ethiopian Public Health Institute and GIZ, are experienced in using the application to programme surveys where MDD-W data are collected in different contexts.

Servers are needed to upload and store the surveys and the data collected during the study. A server may be private or a cost-free online server, such as KoBo Toolbox.[49] Local IT consultants should manage the servers.

Hardware

Both tablets and mobile phones can be used to collect data. Power banks should be provided to charge tablets in the field to prevent interruptions in data collection if there is a power-outage.*

Requirements for hardware depends on the chosen survey application and survey design, namely, the complexity of the survey content and other components and the capacity needed to handle them, as well as the resources available. Decisions should be made in consultation with IT experts and survey team members with previous experience collecting data using tablets.

* See Appendix 3 for an example of the minimum technical specifications for a tablet and power bank used to collect MDD-W data using ODK.

1.4. SAMPLING AND SAMPLE SIZE CALCULATION

It is beyond the scope of this Guide to provide in depth recommendations with regard to sampling and calculation of the sample size. Sampling and calculation of the sample size will depend on the theory of change and specific characteristics of each study, (e.g. whether comparison is required over time, season and/or policy and intervention effects). Comprehensive guidance on sampling can be found in *Feed the future population-based survey sampling guide* (Stukel, 2018) However, a few decisions are relevant to MDD-W and are listed:

- selection of respondent(s) within the household;
- sampling of days of the week;
- sampling of *unusual* days (e.g. feasts) and seasonality.

48 DHS, Multiple Indicator Cluster Surveys and some National Statistical Offices use the Census and Survey Processing System (CSPro) https://www.census.gov/data/software/cspro.html

49 KoBoToolbox is a suite of tools for field data collection. The software is free and open source, available at https://www.kobotoolbox.org/

These considerations are warranted for any estimation of dietary intake, pattern and/or indicator.

When publishing study results, the information detailed below must be reported to ensure correct interpretation of the findings and further use of the data to draw appropriate conclusions. To ensure high quality and complete reporting for research in nutritional epidemiology and dietary assessment, researchers recommend following the guidelines under the STROBE checklist: Strengthening the reporting of observational studies in epidemiology. In particular the 24 recommendations for Nutritional Epidemiology (STROBE-nut) (Lachat *et al.*, 2016).

Selection of respondents within the household

Two options are available for the selection of respondent women within a household: selection of all eligible women or selection of one eligible woman. Selection may be aided by a census or a household listing compiled by local informants, such as health or agricultural extension workers and village chiefs.

Age: Women are first screened by age. Select those who have reached their 15th birthday but who have not yet reached their 50th birthday.[50]

Physiological status: As mentioned in Part 1, Section 1, MDD-W has only been validated for non-pregnant WRA. If data are collected on other population groups (e.g. pregnant women, women outside the age range of WRA) in large-scale surveys or for research or other purposes, this should be clearly documented and data analysis and interpretation should be conducted with care (Nguyen *et al.* 2018).[51]

Health related concerns: Dietary intake and diversity may be lower than usual because of illness, or if a person is following a special diet for health reasons. However, unless the respondent is too sick to be interviewed, it is not necessary to exclude respondents who fall into this category or avoid using data from respondents who report they were ill, had little appetite or followed a special diet. This is part of normal variation in intakes within a population on any given day.

Number of respondents from each household: The decision on whether to include all women in the household or to randomly select one, or to use other approaches such as for probability sampling (e.g. systematic sampling) will depend on the broader decisions on sample design. Either choice is valid, so long as analysis methods and inferences account correctly for this choice.

- **Selection of all age-eligible women**: Leads to non-independent observations, which should be handled appropriately during data analysis.

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50 The process for assessing age is not simple. It is important to do this correctly as the process determines the denominator in the MDD-W calculation. *The Demographic and health surveys interviewer's manual* (ICF, September 2020) provides information on how to collect data for birth, age, and how to perform consistency checks for women in the woman's questionnaire section (ICF, 2020).

51 Excluding pregnant women in large-scale surveys such as the DHS may result in a pattern of skipping, or not asking about dietary consumption in this population. It is proposed that dietary information be collected on all WRA and to report the information stratified by pregnancy status.

- **Random selection**: Requires information on the number of eligible women in the household so as to calculate appropriate sampling weights. Sampling weights should be applied during analysis to avoid under-representation of women who live in larger households with multiple WRA.
- **Fractional interval systematic sampling**: Systematic sampling is used to select households but not to select individuals within a household, unless selecting more than one woman (but not all) per household (Shoemake, 1991). The steps to apply fractional interval systematic sampling can be carried out using any appropriate software.

Eligible women should be a regular resident in the household (as defined by a fixed period of continuous residency or other criteria)[52] but not necessarily present at the time the survey team visits. For nomadic populations such as pastoralists, the survey team may wish to increase the sample size to account for dropout (inability to follow-up because of relocation) or, if the entire community that practice regular relocation is of interest (e.g. examining how relocation or seasonal changes have affected their dietary diversity), the survey team may need to follow the respondents to the new location for subsequent data collection(s).[53]

Sampling considerations in relation to the timing of data collection

Days of the week

During the survey, every effort should be made to collect data every day of the week. People may eat differently on different days, which is part of overall dietary patterns and forms part of the picture of diet quality at population level. If days of the week are represented with equal frequency in the data set, dietary patterns will also be represented correctly. If it is not possible to collect data every day of the week, for example, on Sundays, or for legal, cultural or religious reasons, it is still important to collect data on the other six days – DHS, for example, uses this approach.

Unusual days

Feasting and other celebrations on certain days of the week may entail increased and more diverse intakes. If a large proportion of a community participated in a special feast or celebration, it is better not to visit (sample) that community the following day, as the recall day would be considered unusual for the entire community. Generally, there is no need to exclude respondents if they say they have participated in feast days, weddings or other celebrations, for the same reason noted above in relation to sampling every day of the week. Having a few individuals in the sample who recall having consumed more than usual is part of normal variation in population level intakes.

Reduced intake related to religious or cultural reasons may affect Orthodox Christians and Seventh Day Adventists, who may fast or refrain from consuming animal products on specific days of the week. However, if the sampling community is predominantly composed of these individuals, data collection should not exclude these days, as the reduced intake on that day

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52 Populations that can be considered are either "de facto", i.e. by the place where enumerated or "de jure", i.e. by regular or legal residence, as they are more likely to be at the household during the interview period.

53 However, in most cases, MDD-W will be sampled over time for different WRA (as MDD-W is a population-level indicator).

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is considered part of the individual's regular dietary pattern. Lent, however, presents a more extended period of fasting and, if possible, data collection should be avoided during this period in communities where fasting is widely practiced.

Similarly, data collection in Muslim communities should be avoided during Ramadan, except in the context of rolling surveys that sample the entire year. This is because of the duration of Ramadan and eating patterns may be significantly different for many or all members in the community as compared with all other times of the year. If data need to be collected during Ramadan, the days of the fast should be considered in the interpretation of the results.

In summary, unusual intakes at the individual level should not be treated differently during data collection or analysis. However, when there are reasons to believe intakes for an entire community or a large segment of the community would be highly unusual, it would be better to avoid starting a survey at that time.

Seasonality

In many contexts, dietary patterns may vary with season. For example, mango season may strongly affect the proportion of women reporting consumption of vitamin A-rich fruits. This may affect the proportion of women reaching the threshold of five or more food groups. Other seasonal foods may have less impact; for example, in some settings, types of green leafy vegetables vary with season, but one type or another is consumed year-round.

Food group diversity may increase during lean/hunger seasons, when foraged foods may be consumed. These foods may add diversity, and even micronutrients, but caloric intake may be inadequate. In this situation, increased diversity cannot be viewed in isolation.

Surveys conducted during the same time period, but in different geographic areas may experience different seasons, e.g. hunger and post-harvest season. Increasingly, climate change is leading to unpredictable weather, thus seasonal patterns may vary in comparison

to previous years. Survey teams should adjust the timing of the survey based on local conditions.

Rolling surveys that cover all seasons or generate MDD-W data from surveys that have been carried out in the same season will allow for comparability that is unaffected by seasonality. When data and capacity allow (e.g. in the context of research), it is possible to adjust for seasonality using the survey dates and global positioning system (GPS) data.

In general, survey designers should consider seasonality when fielding and interpreting results from surveys of food group diversity. If it is clear seasonality could affect dietary diversity in the context of the survey, avoid direct comparisons between surveys conducted during different seasons, unless the purpose of the survey is to examine the seasonal variability of dietary diversity.

Determination of sample size

Determination of the sample size should take into consideration that MDD-W is a dichotomous indicator of proportions, in which the main analytical outcomes are the proportion of women that achieve minimum dietary diversity and the proportion of women who have reported consumption of each food group. For more detailed information on calculation of the sample size, refer to *Feed the future population-based survey sampling guide* (Stukel, 2018). The sampling guide contains formulas that determine the initial sample size for two types of surveys with different objectives that are relevant to MDD-W data collection and analysis. These are to power statistical tests of differences over time and to ensure high-precision single-point-in-time estimates, both for indicators of proportions.

Analyses of most interest to users are tests of differences in MDD-W across population groups and/or at different points in time. To allow for meaningful comparisons, survey planners should ensure that sample sizes are large enough in each group. Both of these analyses indicate the need for a comparative analytical survey, where, commonly, data are collected at different times (e.g. at the start and end of an intervention or project – baseline and end-line). For these types of surveys, a sample size that controls for the levels of inferential errors associated with the statistical tests of differences is required (Stukel, 2018).

One critical question, related to calculating the sample size in studies using the change in MDD-W to demonstrate project impact is: What increase in the percentage of women achieving MDD-W can be considered meaningful? In other words, the "minimum meaningful difference", that is deemed sufficiently significant to detect a change in the indicator between two points in time. For example: between the beginning and end of an intervention, project, programme or policy.

Calculation of sample size will depend on the following:

- To detect a smaller difference in proportions reaching MDD-W, a larger sample size is required.
- Larger variability (a priori) in MDD-W requires larger sample size for the same level of precision. Moreover, if smaller sampling errors are desired, a larger sample size is needed.
- Higher levels of significance require larger sample sizes.

PART 2

Section 2.
CAPACITY DEVELOPMENT

Section 2. Capacity-development

Collection of high-quality data is critical to ensuring the accuracy of the MDD-W indicator. Data quality is contingent on the ability of enumerators to consistently apply the correct standardized data collection methodology. This is especially important when MDD-W is used in large-scale, multi-topic national surveys, where enumerators often work with minimum supervision.

This section describes the key topics and steps to train enumerators in data collection for MDD-W, both for list-based and open recall methods. Moreover, frequently encountered challenges are highlighted as well as areas requiring further guidance, based on feedback provided by trained enumerators and experienced MDD-W data collectors. The section also contains lessons learned during training, pre-test, the pilot study and the data collection process for the FAO MDD-W project.

2.1. RECRUITMENT AND SELECTION OF ENUMERATORS AND SUPERVISORS

The following procedures are recommended for recruitment and selection of enumerators:

- Consult organizations or relevant government ministries or agencies that have conducted surveys to collect MDD-W, nutrition or food consumption data, for an existing pool of enumerators.
- Issue an open call for candidates through relevant networks, who are studying or have graduated in the field of nutrition food science, health, agriculture, sociology or related subject, or have experience working in a related field.

Ideally, candidates should meet the following selection criteria:

- have completed post-high school education;
- have previous experience in large-scale data collection, and be able to use a tablet for data collection, if CAPI is used;
- be familiar with the local foods in the survey or study areas, their names and typical preparation;
- be able to travel and stay in survey areas for the duration of training and survey;
- possess good communication skills in the language employed for training and survey.

Candidates for the position of supervisor should be experienced in managing and supervising survey teams and be familiar with logistics for large-scale surveys in a related field.

While it is advantageous for enumerators to have a background in nutrition, the FAO MDD-W study found this was not necessary if thorough training is provided. The selection process should also be gender sensitive. Qualified candidates of both sexes should be considered, and cultural dynamics taken into account. For example, is it socially acceptable for a male enumerator to be alone in the home with the female respondent? Or is it acceptable for a much younger enumerator to interview an older respondent?

2.2. TOPICS TO COVER DURING THE TRAINING

It is important to include training modules that build the required functional and technical competencies. Training employs different learning modalities and may include lectures and presentations, demonstration of survey techniques, large and small group discussions and hands-on practice in both classroom and community settings. People who are experienced in the topic should lead each training module.

Table 10. Target areas for capacity-development

Technical capacities	Functional capacities
• The principles and purpose of the MDD-W indicator and the chosen dietary assessment method. • Conducting the chosen data collection method in line with the provided protocol. • Classification of foods into food groups. **Optional for large-scale surveys** • Understanding the concept of the minimum quantity (15 g) threshold (Applicable for standalone MDD-W surveys - where open recall method is used and where there is more time allocated for training). • Knowledge on computing and interpreting MDD-W.	• Interview skills and techniques, including obtaining informed consent. • Process documentation (any anomalies, errors on the survey or challenges encountered). • Handling and use of tablets and data collection using Open Data Kit or other selected application, if used. • Fieldwork procedures and etiquette (establishing rapport). • Survey team composition, roles and responsibilities.

Regardless of the chosen method (open recall or list-based), the purpose of training is to develop the capacities of enumerators so they can collect data independently using the prescribed standardized methodology. Prior to data collection, typical training entails initial training in the classroom, followed by field practice/pre-test, debriefing and modifications and pilot. Refresher training may be required if changes are made as a result of lessons learned during the pre-test/pilot, or if the survey period continues over months or years.

Training duration can be adjusted, but generally lasts at least one day. Length of training is decided based on the enumerators' background; purpose of the survey; method chosen; length and content of other modules if the indicator is used as part of a larger survey. For large-scale, multi-topic surveys, such as the DHS, enumerator training may last up to three or four weeks, where MDD-W is a small component of the entire training.

2.3. TRAINING PROTOCOL

Training should focus on the chosen methodology for the study, unless both list-based and open recall methods are used in the same study to fulfil specific research objectives, in which case enumerators should be trained in both methods. In all cases, during dedicated discussion and feedback sessions, enumerators should be encouraged to record and share their experiences as well as their comments for the respective components.

The first four steps in the training protocol are the same for both methodologies.

Step 1. Ensure a thorough understanding of theory and concepts

This includes:

- importance of dietary diversity for healthy diets;
- importance of diets of women of reproductive age;
- dietary diversity as a dimension of diet quality;
- the ten food groups for MDD-W, and the final output of the survey is a total count of food groups;
- MDD-W is a non-quantitative measure, so no quantities should be collected during the survey;
- MDD-W is a population level indicator, not intended for use to provide advice on dietary intake to the individual respondent.

Step 2. Introduce the survey modules and the information they intend to capture

This includes:

- the introductory text
- the MDD-W questionnaire and the importance of the recall period of 24 hours (previous day and night)
- additional questionnaires (if collected) such as socioeconomic, household or geographic characteristics or FIES.

Step 3. Present the preparatory steps to follow before the assessment

A short, standard introductory message should be provided to the enumerators to introduce themselves and the survey to the potential respondent. The enumerators should become very familiar with this by the end of the training. Similar to informed consent, this message should include:

- name of organization and enumerator;
- purpose of data collection, how data will be used and anonymity of data;
- what the survey will entail (process and approximate duration);
- any potential benefits to respondent;
- appreciation for the respondent's voluntary participation.

*Note: If MDD-W is conducted as part of a large-scale survey**, 2 and 3** may be integrated into the training for other modules*

Step 4. Provide necessary equipment for conducting the survey and checklist

Enumerator toolkit for list-based and open recall methods using tablets include:

- tablet with the ODK installed and surveys downloaded, if used;
- paper versions of survey and notepad and pen (for notes and in case of equipment failure);
- power bank

Step 5. Introduction to method and to recording information on the questionnaire

Introduction to the list-based and open recall questionnaires

N.B. the first two steps are common to both list-based and open-recall questionnaires' methods.

For list-based questionnaires

1. Explain the principles behind 24-hour recall. The objective is to gather information about the foods and drinks consumed by the respondent during the past 24-hour period from the time the respondent woke the previous day throughout the day and overnight. Emphasize that this means food consumed during meals, between meals and when food is prepared, and food that is consumed both in the home and outside.
2. Using the adapted questionnaire as a guide, read through and discuss the script for the enumerators and the instructions.
3. Explain the list-based method, and how enumerators should read out the food items listed under each row of the questionnaire in the same order they are presented in the survey. The enumerator should continue reading the list until the respondent answers *yes* to indicate they consumed a food item.

4. As part of the demonstration, go through each of the food groups in order and review their classification.

For open recall questionnaires

1. Explain the principles behind 24-hour recall. The objective is to gather information about all the foods and drinks consumed by the respondent during the past 24-hour period from the time the respondent woke the previous day throughout the day and overnight. Emphasize that this means food consumed during meals, between meals and when food is prepared, and food that is consumed both in the home and outside.
2. Using the adapted questionnaire as a guide, read through and discuss the script for the enumerators and the instructions.
3. Explain the open recall method, and how respondents should recall food items in chronological order.
4. Describe the components of the questionnaire:
    a. Step 1: Free recall using grid structure or recorded on tablet, with respondent during the interview.
    b. Step 2: Classifying responses to Step 1 into food groups, on the pre-developed locally adapted food list, without the respondent after the interview
5. For step 1, explain how to probe for ingredients in mixed dishes. Use the Common Mixed dishes list as an aid.
6. For step 2, review the food list and explain how to correctly classify these items from the foods recorded in step 1. Note that the decision of who should classify the food items into food groups depends on the technical capacities and training offered. Enumerators should only be responsible for classification if appropriate training was provided for such.

(If training time is limited, points 5 to 6 may be integrated as part of the demonstration process)

Description of food groups and classification of foods

> This section's relevance depends on the completeness of previous work conducted during adaptation and translation of the questionnaire. Disregard this section if the questionnaire is ready beforehand, and enumerators are not involved.

If enumerators are involved in the process of adapting the questionnaire, it is suggested these materials be prepared ahead of time:

- pre-adapted questionnaire and food list ;
- pre-adapted list of commonly consumed mixed dishes and their ingredients;
- slide deck with food item examples from each food group; and
- slide deck with examples of mixed dishes.

These materials will be useful during the training as well as for actual data collection.

Protocol:

- Review the groupings listed on the adapted questionnaire (MDD-W groups and additional food groups) and clarify any questions regarding why items are placed in the various groups.
- Explain that certain foods are classified in only one group even if they contain several ingredients (e.g. bread).
- Specific guidance may be given on classifying beverages, condiments and seasonings used in mixed dishes, etc. (see Appendix 1 for a list of foods that are difficult to classify).
- Explain the concept of mixed dishes and discuss where to place ingredients in the food groups using a guidance sheet for common mixed dishes.

Note: If enumerators are involved in the process of adapting the questionnaire, this section should be carefully designed and conducted bearing in mind:

- Enumerators have different levels of knowledge of food consumption and food preparations methods.
- Some enumerators may have a different understanding, or ideas, about quantities of common ingredients for a typical local dish, depending on their background.
- There may be challenges with the classification of vitamin A rich fruits and vegetables.
- Enumerators may find it challenging to understand which foods classify as condiments.
- Document additional local foods and alternative names identified during this session, to allow for further adaptation and refinement of the questionnaire and foods listed under each food group.

For both methods, emphasize that the enumerator should not ask respondents for quantities of the food consumed during the interview.

BOX 15. OPTIONAL SUGGESTED EXERCISES TO ASSIST UNDERSTANDING OF FOOD GROUP CLASSIFICATION AND 15 G

Appropriate only when enumerators are involved in the adaptation phase of the questionnaire

- Show one slide per food group with photos of local food items and ask enumerators which food group the food belongs to.
- Show photos of common mixed dishes and discuss what goes in each food group, and what counts as a minimum quantity of 15 g.
- Using a paper version of the pre-adapted food list, go through the food groups one by one and discuss the list of food items in each food group.
- Discuss the recipes for common dishes by meal to ensure every ingredient is listed clearly.
- Discuss examples where foods count as condiments, and where food counts towards the food group.
- Summarize problem foods and common scenarios where certain foods do not count and should be classified as condiments and seasonings.

Demonstration and practice in carrying out the open recall or list-based method

Role-play is used to explain and demonstrate how enumerators should record the information on the questionnaire when using a printed questionnaire or tablet (see Box 16). Two trainers will conduct the role-play: one as the enumerator and one as the respondent, following the instructions for administering the selected method for collecting MDD-W.

Following the demonstration, enumerators will practice the chosen method in pairs, taking turns to play the interviewer and the respondent. Following the practice session, the pair will share their experience and questions with the group.

BOX 16. CAPACITY-DEVELOPMENT USING TABLETS AND THE DATA COLLECTION APPLICATION

If a tablet is used for data collection, each enumerator will be assigned a tablet on the first day of training. The tablet will be loaded with the selected application and be connected to the server on which the survey has been uploaded. Final selection should be made in consultation with an IT expert and take into consideration: survey requirements; technical specifications of tablets and interfaces; and survey team's familiarity with the selected equipment. The FAO Minimum Dietary Diversity for Women (MDD-W) Project selected Open Data Kit, an Android-based survey application. Other examples of applications include KoBo Collect and Survey Solutions. Instructions may vary depending on the selected survey platform.

Where available, local experts should be involved with the development and troubleshooting of the data collection interface and co-lead the training. The training will cover:

- Overall use and maintenance of the tablet.
- How to access the application installed on the android devices.
- How to navigate through the application to start a new interview, view, edit or finalise saved forms, view and send finalized forms.
- Introduction to the different forms of input in the application, for example, radio buttons; check boxes, numeric inputs and string inputs.
- How to record location information of the households using global positioning system (GPS) coordinates to the most accurate possible values, where to record and what to do if faced with difficulties on recording GPS coordinates.[54]
- How to send finalized forms to the server (centralized data repository)
- Other relevant features such as how to change the text size.

Enumerators should be given the opportunity to familiarize themselves with the tablet. Entering, editing, saving and uploading collected data should be practiced repeatedly throughout the training. It is essential that enumerators carefully go through the installed survey to ensure they understand the steps, raise questions and any errors or issues encountered during the process. The survey developer should be present during these feedback sessions, as this will also help to refine the final interface.

Step 6. Introduce field practice, pre-test and pilot

[54] Collected only when approved by the relevant regulatory authority.

Field practice permits the enumerators to rehearse data collection and use of the standard methodology in a real-life setting similar to the area the actual survey will be conducted, prior to pilot testing and the actual survey. Standard practices that have been established by the survey organizers should be followed for field-testing and practice. Variations will be linked to the type and scale of the survey in which the MDD-W questionnaire is embedded.

Survey organizers will need to plan ahead for the field practice. They will need to visit the selected communities to ask for voluntary participation to ensure a sufficient number of households. Each enumerator should be able to interact with at least one to two households during the one-day field practice.

During field practice, the supervisors should follow and observe the enumerators to identify and provide clarification on aspects where more guidance is needed. Supervisors may use a standard checklist to assist them in evaluating the enumerators' performance.

Field practice may also double as a pre-test of the survey tools. Necessary changes can be identified, existing errors in the survey corrected, and food lists can be further adapted if variations are found in names of local foods. If the practice is also used as a pre-test of the survey tools, ensure that a sufficient number of households have been interviewed ($n > 10$).

Field practice should be followed by a half-day group session in the classroom with the enumerators. This session will allow for further discussion and clarification of challenges and queries. It will help determine if additional practice is needed prior to the pilot study and actual data collection.

Step 7. Post training follow-up and final adjustment of questionnaire prior to data collection

After the initial training, it is suggested that lists be compiled. For example:

- frequently encountered challenges/issues (see Appendix 4 for a summary of issues raised by research teams and enumerators during the FAO MDD-W study);
- terms that frequently cause confusion or are easily misinterpreted;
- frequently consumed local dishes and their ingredients;
- problem foods (see Appendix 1).

Share the lists with the enumerators so they can use them for reference during the pilot and actual data collection.

Following training, field-testing and piloting, revise the questionnaire and enumerator instructions as needed. Review all changes with the enumerator trainees.

Conclusion

The MDD-W is a simple but versatile indicator that can be easily incorporated in large-scale national surveys, in rapid assessments, used for impact evaluation and in research to provide information on dietary diversity of WRA. This updated Guide aims to support users in collecting high-quality data using the standardized methodologies described, and as more data become available, allow for analysis and interpretation of comparable data that illustrate trends in women' diets over time.

We hope you have found this updated Guide a useful reference, regardless of whether you plan to collect data for MDD-W for the first time or are an experienced user of the indicator, or have access to MDD-W data and would like to use the data to answer some research questions, or inform plans on programming and policies that target WRA.

To obtain the latest information on MDD-W, please join the FAO MDD-W network, where members may raise questions, provide answers and share existing survey tools and experiences and lessons learned on planning surveys that include MDD-W indicator, data collection, analysis and application of the indicator in different contexts.

Please contact the FAO Food and Nutrition Division at nutrition-assessment@fao.org regarding any questions or feedback you may have on the Guide and if you need further assistance on its use.

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APPENDICES

Appendix 1. Additional examples of food items for MDD-W

This appendix provides additional examples of some food groups on the list for Minimum Dietary Diversity for Women (MDD-W) in Part 1, Section 2 of this Guide.

Table A1-1. Food groups

Food made from grains

Common name *(regional common names)*	*Binomial name OR genus*	Family	Edible part of the plant
Amaranth *(kiwicha)*	*Amaranthus*	Amaranthaceae	Seed
Barley	*Hordeum vulgare*	Poaceae	Seed
Buckwheat	*Fagopyrum esculentum*	Polygonaceae	Seed
Corn *(maize)*	*Zea mays*	Poaceae	Seed
Fonio	*Digitaria exilis*	Poaceae	Seed
Kamut	*Triticum turanicum*	Poaceae	Wheat-like seed
Millet	*Pennisetum typhoides*	Poaceae	Seed
Oats	*Avena sativa*	Poaceae	Seed
Palmer's grass	*Distichlis palmeri*	Poaceae	Wheat-like seed
Qañiwa *(kañiwa, canihua)*	*Chenopodium pallidicaule*	Amaranthaceae	Seed
Quinoa *(quinua)*	*Chenopodium quinoa*	Amaranthaceae	Seed
Rice	*Oryza sativa*	Poaceae	Seed
Rye	*Secale cereale*	Poaceae	Seed
Sorghum	*Sorghum bicolour*	Poaceae	Seed
Spelt	*Triticum spelta*	Poaceae	Wheat-like seed
Teff	*Eragrastris albysinnica*	Poaceae	Seed
Triticale *(cross between wheat and rye)*	*Triticosecale*	Poaceae	Seed
Wheat	*Triticum*	Poaceae	Seed

White roots and tubers and plantains

Common name ***(regional common names)***	***Binomial name OR genus***	**Family**	**Edible part of the plant**
Ahipa *(ajipa)*	*Pachyrhizus ahipa*	Fabaceae	Tuberous root
Arracacha *(racacha, white carrot)*	*Arracia xanthorhiza*	Apiaceae	Tuberous root
Arrowroot	*Maranta arundinacea*	Marantaceae	Rhizome
Bananas *(green/unripe)*	*Musa*	Musaceae	Starchy fruit
Breadfruit	*Artocarpus*	Moraceae	Starchy fruit
Burdock root	*Arctium lappa*	Asteraceae	Taproot
Canna lily *(achira)*	*Canna*	Cannaceae	Starchy rhizome
Cassava *(yucca, manioc, mandioca)*	*Manihot esculentum*	Euphorbiaceae	Tuberous root
Chicory root	*Cichorium intybus*	Asteraceae	Tuberous root
Elephant foot yam *(white)*	*Amorhophallus paeoniifoleus*	Araceae	Starchy corm
Jicama/Yambean	*Pachyorhizuserosus*	Fabaceae	Tuberous root
Lotus root	*Nelumbo nucifera*	Nelumbonaceae	Spongy root
Maca	*Lepidium meyenii*	Brassicaceae	Tuberous root
Mashwa *(mashua)*	*Tropaeolum tuberosum*	Tropaeolaceae	Stem tuber
Mauka	*Mirabilis longiflora*	Nyctaginaceae	Tuberous root
Nopal	*Opuntia*	Cactaceae	Succulent stem
Oca	*Oxalis tuberosa*	Oxalidaceae	Tuberous root
Parsnip	*Pastinacea sativa*	Apicaceae	Tuberous root
Plantains *(ripe and green)*	*Musa*	Musaceae	Starchy fruit
Potatoes *(all skin colours – white, yellow, blue, purple, black)*	*Solanum tubeosum*	Solanaceae	Stem tuber
Rutabaga	*Brassica napobrassica*	Brassicaceae	Tuberous root
Sweet potato *(white/pale yellow-fleshed)*	*Ipomoea batatas*	Convolvulaceae	Tuberous root
Tannia *(yautia)*	*Xanthosoma sagittifolium*	Araceae	Starchy corm
Taro root *(cocoyam, dasheen, eddo, tannia, colocasia, arbi/arvi)*	*Colocasia esculenta*	Araceae	Starchy corm
Turnip	*Brassica rapa*	Brassicaceae	Tuberous root
Ulloco *(melloco)*	*Ullucus tuberosus*	Chenopodiaceae	Stem tuber
Water chestnut	*Eleocharis dulcis*	Cyperaceae	Starchy corm
Yam	*Dioscorea*	Dioscoreaceae	Tuberous root

Pulses (beans, peas and lentils)

Common name *(regional common names)*	*Binomial name OR genus*	Family	Edible part of the plant
Adzuki bean	*Vigna angularis*	Fabaceae	Mature seed
Bambara groundnut *(jugo bean)*	*Vigna subterranea*	Fabaceae	Mature seed
Broad bean *(fava bean, faba bean, horse bean, field bean, tic bean)*	*Vicia faba*	Fabaceae	Mature seed
Chickpea *(chana dal)*	*Cicer arietinum*	Fabaceae	Mature seed
Cluster bean *(guar)*	*Cyamopsis tetragonoloba*	Fabaceae	Mature seed
Common bean *(black bean, kidney bean, pinto bean, others)*	*Phaseolus vulgaris*	Fabaceae	Mature seed
Coral bean *(Cherokee bean)*	*Erythrina herbacea*	Fabaceae	Mature seed
Cowpea *(black-eyed pea, catjang, yardlong bean, southern pea, zombi pea)*	*Vigna unguiculata*	Fabaceae	Mature seed
Horse gram	*Macrotyloma uniflorum*	Fabaceae	Mature seed
Hyacinth bean	*Lablab purpureus*	Fabaceae	Mature seed
Jack bean	*Canavalia*	Fabaceae	Mature seed
Lentil *(dal, pulses)*	*Lens culinaris*	Fabaceae	Mature seed
Lima bean	*Phaseolus limensis*	Fabaceae	Mature seed
Lupin *(lupini, tarwi, tarhui, chocho)*	*Lupinus sp.*	Fabaceae	Mature seed
Moth bean	*Vigna aconitifolia*	Fabaceae	Mature seed
Mung bean *(green gram)*	*Vigna radiata*	Fabaceae	Mature seed
Pea	*Pisum sativum*	Fabaceae	Mature seed
Pencil yam	*Vigna lanceolata*	Fabaceae	Mature seed
Pigeon pea	*Cajanus*	Fabaceae	Mature seed
Rice bean	*Vigna umbellata*	Fabaceae	Mature seed
Soybean *(soya bean)*	*Glycine max*	Fabaceae	Mature seed
Sweet pea	*Lathyrus odoratus*	Fabaceae	Mature seed
Urad bean *(black gram)*	*Vigna mungo*	Fabaceae	Mature seed
Velvet bean *(cowitch)*	*Mucuna pruriens*	Fabaceae	Mature seed
Winged bean *(Goa bean)*	*Psophocarpus tetragonolobus*	Fabaceae	Mature seed

Nuts and seeds

Common name *(regional common names)*	*Binomial name OR genus*	Family	Edible part of the plant
Peanut/groundnut	*Arachis hypogaea*	Fabaceae	Pod/seed
Tree nuts			
Almond	*Prunus dulcis*	Rosaceae	Nut
Brazil nut	*Bertholletia excelsa*	Lecythidaceae	Nut
Cashew	*Anacardium occidentale*	Anacardiaceae	Nut
Chestnut	*Castanea*	Fagaceae	Nut
Filbert	*Corylus maxima*	Betulaceae	Nut
Hazelnut	*Corylus avellana*	Betulaceae	Nut
Macadamia nut	*Macadamia*	Proteaceae	Nut
Pecan	*Carya illinoinensis*	Juglandaceae	Nut
Pistachio	*Pistacia vera*	Anacardiaceae	Nut
Walnut	*Juglans*	Juglandaceae	Nut
Seeds			
Baobab seed *(monkey bread)*	*Adansonia*	Malvaceae	Seed
Chia seed	*Salvia hispanica*	Lamiaceae	Seed
Wild mango *(bush mango, dika, ogbono)*	*Irvingia gabonensis*	Irvingiaceae	Seed
Flaxseed	*Linum usitatissimum*	Linaceae	Seed
Hibiscus seed *(dried, may be fermented)*	*Hibiscus sabdariffa*	Malvaceae	Seed
Locust bean seeds *(néré; may be fermented; soumbala)*	*Parkia biglobosa*	Fabaceae	Seed
Melon seeds *(egusi)*	*Citrullus lanatus*	Cucurbitaceae	Seed
Pine nut *(piñon)*	*Pinus*	Pinaceae	Seed
Poppy seed	*Papaver somniferum*	Papaveraceae	Seed
Pumpkin seed *(pepita)*	*Cucurbita*	Cucurbitaceae	Seed
Sesame seed	*Sesamum indicum*	Pedaliacae	Seed
Shea butter seed/kernel	*Vitellaria paradoxa*	Sapotaceae	Seed
Sunflower seed	*Helianthus*	Asteraceae	Seed

Dark green leafy vegetables

Common name *(regional common names)*	*Binomial name OR genus*	Family	Edible part of the plant
Alfalfa greens	*Medicago sativa*	Fabaceae	Leaves
Amaranth greens *(bugga, kiwicha, dodo)*	*Amaranthus*	Amaranthaceae	Leaves
Arugula *(rocket, rúcula, oruga)*	*Eruca sativa*	Brassicaceae	Leaves
Baobab greens	*Adansonia*	Malvaceae	Leaves
Bean greens	*Phaselus mungo*	Papilinaceae	Leaves
Beet greens *(Swiss chard, silverbeet, perpetual spinach, crab beet, mangold)*	*Beta vulgaris*	Chenopoidiaceae	Leaves
Bitter leaf *(ewuro, ndole, onugbu)*	*Vernonia calvoana*	Asteraceae	Leaves
Bitter melon greens	*Momordica charantia*	Cucurbitaceae	Leaves
Broccoli	*Brassica oleracea*	Brassicaceae	Leaves and head (flower buds)
Broccoli rabe *(rappi, broccoletti)*	*Brassica rapa*	Brassicaceae	Leaves
Carrot greens	*Daucus carota*	Umbelliferae	Leaves
Cassava greens	*Manihot esculenta*	Euphotbiaceae	Leaves
Chicory greens	*Cichorium intybus*	Asteraceae	Leaves
Chili greens	*Capsicum frutescens*	Solanaceae	Leaves
Chinese cabbage (bok choy, pak choy)	*Brassica rapa*	Brassicaceae	Leaves
Collard greens (Chinese kale, Chinese broccoli, gai-lan/kai-lan)	*Brassica oleracea*	Brassicaceae	Leaves
Cowpea greens	*Vigna unguiculata*	Paplionaceae	Leaves
Dandelion greens	*Taravacum*	Asteraceae	Leaves
Drumstick greens (moringa)	*Moringa oleifera*	Moringaceae	Leaves
Endive	*Cichorium endivia*	*Asteraceae*	Leaves
Fenugreek greens (methi)	*Trigonella foenum*	Fabaceae	Leaves
Fiddlehead fern (dod)	*Pteridium aquilinum*	Dennstaedtiaceae	Leaves
Garden cress (pepper grass)	*Lepidium sativum*	*Brassicaceae*	Leaves
Kale (spring greens)	*Brassica oleracea*	*Brassicaceae*	Leaves
Lamb's quarters (bathua)	*Chenopodium alba*	Chenopodiaceae	Leaves

Common name *(regional common names)*	*Binomial name OR genus*	Family	Edible part of the plant
Lettuce (bibb, romaine)	*Lactuca sativa*	Asteraceae	Leaves
Malva greens (mallow)	*Malva vertcillata*	Malvaceae	Leaves
Mustard greens	*Sinapsis alba*	Brassicaceae	Leaves
Okra greens (lady's finger, gumbo)	*Abelmoschus esculentus*	Malvaceae	Leaves
Pumpkin greens	*Cucurbeta pepo*	Cucurbitaceae	Leaves
Purslane	*Portulaca oleracea*	Portlacaceae	Leaves
Quinoa greens (quinua)	*Chenopodium quinoa*	Amaranthaceae	Leaves
Spinach	*Spinous oleracea*	*Amaranthaceae*	Leaves
Sweet potato leaves	*Ipomoea batatas*	Convolvulaceae	Leaves
Tannia greens	*Xanthosoma*	Araceae	Leaves
Taro greens	*Colocasia esculenta*	Araceae	Leaves
Turnip greens	*Brassica rapa*	Brassicaceae	Leaves
Watercress	*Nasturtium officinale*	Brassicaceae	Leaves
Water spinach (swamp cabbage, water morning-glory, kangkung, kang kung)	*Ipoemoea aquatica*	Convolvulaceae	Leaves
Yau choy	*Brassica napus*	Brassicaceae	Leaves

Vitamin A-rich vegetables, roots and tubers

Common name *(regional common names)*	*Binomial name OR genus*	Family	Edible part of the plant
Carrot	*Daucus carota*	Umbelliferae	Tuberous root
Pumpkin	*Cucurbita pepo*	Cucurbitaceae	Fruit
Red pepper *(sweet)*	*Capsicum annuum*	Solanaceae	Fruit
Squash *(orange- or dark yellow-fleshed only)*	*Cucurbita*	Cucurbitaceae	Fruit
Sweet potato *(orange- or dark yellow-fleshed only)*	*Ipomoea batatas*	Convolvulaceae	Tuberous root

Vitamin A-rich fruits

In addition to the examples in the table below, include any other locally available dark yellow or orange fruits that are sources of vitamin A (see Box 4).

Common name *(regional common names)*	*Binomial name OR genus*	Family	Edible part of the plant
Apricot *(fresh and dried)*	*Prunus armeniaca*	Rosaceae	Fruit
Cantaloupe melon *(ripe)*	*Cucumis melo*	Cucurbitaceae	Fruit
Hog plum	*Spondias mombin*	Anacardiaceae	Fruit
Locust bean fruit/pulp	*Parkia biglobosa*	Fabaceae	Fruit
Loquat	*Eriobotrya japonica*	Rosaceae	Fruit
Mango *(ripe, fresh and dried)*	*Mangifera indica*	Anacardiaceae	Fruit
Musk melon	*Cucumis melo*	Cucurbitaceae	Fruit
Papaya *(ripe, fresh and dried)*	*Carica papaya*	Caricaceae	Fruit
Passion fruit *(ripe)*	*Passiflora edulis*	Passifloracceae	Fruit
Persimmon *(ripe)*	*Diospyros kaki*	Ebenaceae	Fruit
Pitanga *(Surinam cherry, Brazilian cherry)*	*Eugenia uniflora*	Myrtaceae	Fruit
Red palm fruit, red palm pulp	*Elaeis guineensis*	Arecaceae	Fruit
Tree tomato *(tamarillo)*	*Solanum betaceum*	Solanaceae	Fruit

Other fruits

Common name *(regional common names)*	*Binomial name OR genus*	Family	Edible part of the plant
Acerola *(West Indian cherry)*	*Malpighia glabra*	Malpighiaceae	Fruit
Apple	*Malus domestica*	Rosaceae	Fruit
Avocado	*Persea americana*	Lauraceae	Fruit
Banana	*Musa indica*	Musaceae	Fruit
Baobab fruit *(monkey bread)*	*Adansonia*	Malvaceae	Fruit
Blackberry	*Rubus fruticosus*	Rosaceae	Fruit
Blackcurrant	*Ribes nigrum*	Grassulariaceae	Fruit

Common name ***(regional common names)***	***Binomial name OR genus***	**Family**	**Edible part of the plant**
Blueberry	*Vaccinium*	Ericaceae	Fruit
Cactus pear	*Opuntia*	Cactaceae	Succulent stem
Cape gooseberry *(ground cherry, golden berry)*	*Physalis peruviana*	Solanaceae	Fruit
Cashew fruit *(cashew apple, tupi)*	*Anacardium occidentale*	Anacardiaceae	Fruit
Cherries *(cornelian)*	*Corneus*	Cornaceae	Fruit
Coconut flesh	*Cocos nucifera*	Arecaceae	Fruit
Cranberry	*Vaccinium*	Ericaceae	Fruit
Dates *(fresh and dried)*	*Phoenix dactyfera*	Arecaceae	Fruit
Durian	*Durio*	Malvaceae	Fruit
Elderberry	*Sambucus*	Adoxaceae	Fruit
Figs *(sycamore)*	*Ficus*	Moraceae	Fruit
Gooseberry	*Ribes species*	Grassulariaceae	Fruit
Grapefruit	*Citrus paradisi*	Rutaceae	Fruit
Grapes	*Vitis*	Vitaceae	Fruit
Guava	*Psidum*	Myrtaceae	Fruit
Guinep *(chenette, genip)*	*Mamoncillo/Mellicoccus*	Sapindaceae	Fruit
Honeydew melon	*Cucunis melo*	Cucurbitaceae	Fruit
Huckleberry	*Vaccinium*	Ericaceae	Fruit
Indian gooseberry *(amla)*	*Ribes crispa*	Saxifragales	Fruit
Jackfruit *(kathal)*	*Artocarpus heterophyllus*	Moraceae	Fruit
Jujube	*Ziziphus jujuba*	Rhamnaceae	Fruit
June plum *(Jew plum, golden apple)*	*Spondias dulcis*	Anacardiaceae	Fruit
Kiwi	*Actinidia deliciosa*	Actinidiaceae	Fruit
Lemon	*Citrus limon*	Rutaceae	Fruit
Lime	*Citrus aurantifolia*	Rutaceae	Fruit
Litchi	*Litchi chinensis*	Sapindaceae	Fruit
Mandarin orange	*Citrus reticulate*	Rutaceae	Fruit

Common name *(regional common names)*	*Binomial name OR genus*	Family	Edible part of the plant
Mulberry	*Morus nigra*	Moraceae	Fruit
Nectarine	*Prunus persica*	Rosaceae	Fruit
Orange	*Citrus sinesis*	Rutaceae	Fruit
Peach	*Prunus persica*	Rosaceae	Fruit
Pear	*Pyrus communis*	Rosaceae	Fruit
Pineapple	*Ananas*	Bomeliaceae	Fruit
Plum	*Prunus*	Rosaceae	Fruit
Pomegranate (anar)	*Punica granatum*	Luthraceae	Fruit
Pomelo	*Citrus grandis*	Rutaceae	Fruit
Pomerac (Malay apple)	*Syzigium malaccense*	Myrtaceae	Fruit
Prune	*Prunus domesticus*	Rosaceae	Fruit
Quince	*Cydonia oblongata*	Rosaceae	Fruit
Rambutan	*Nephelium lappaceum*	Sapindaceae	Fruit
Raspberry	*Rubus*	Rosaceae	Fruit
Sapodella (naseberry)	*Manikara zapota*	Sapotaceae	Fruit
Soursop (guanábana, graviola)	*Annona muricata*	Annonaceae	Fruit
Star fruit (kamrakh)	*Averrhoa*	Oxalidaceae	Fruit
Strawberry	*Prunus*	Rosaceae	Fruit
Sweetsop (sugar apple, custard apple)	*Annona squamosa*	Annonaceae	Fruit
Tamarind	*Tamarindus indica*	Caesalpinioideae	Fruit
Tangerine	*Citrus tangerina*	Rutaceae	Fruit
Watermelon	*Citrullus lanatus*	Cucurbitaceae	Fruit
Yacon	*Smallanthus sonchifolius*	Asteraceae	Fruit

Other vegetables

The following table provides a long list of examples, but other local vegetables can also be classified in this group.

Common name ***(regional common names)***	***Binomial name OR genus***	**Family**	**Edible part of the plant**
Artichoke	*Cynara cardumculus*	Asteraceae	Fleshy bracts
Asparagus	*Asparagus officinales*	Asparagaceae	Young shoots
Bamboo shoots	*Bambusavulgaris*	Poaceae	Young stem
Beans (various) when eaten as fresh pods[a]	*Phaseolus, others*	Fabaceae	Young pod
Beets	*Beta vulgaris*	Chenopodiaceae	Root
Bitter melon	*Momordica charantia*	Cucurbitaceae	Fruit
Brussels sprouts	*Brassica oleracea*	Brassicaceae	Fleshy bracts
Cabbage *(common and red varieties)*	*Brassica oleracea*	Brassicaceae	Leaves
Caigua *(caihua, slipper gourd)*	*Cyclanthera pedata*	Cucurbitaceae	Fruit
Cattail	*Typha*	Typhaceae	Rhizome
Cauliflower	*Brassica oleracea*	Brassicaceae	Head (thalamus and flower buds)
Celery	*Apium graveolens*	Apiaceae	Leaf stalk
Ceylon spinach	*Basella alba*	Basellaceae	Succulent leaves
Chayote *(sayote, tayota, choko, chocho, chow- chow, christophine)*	*Sechium edule*	Cucurbitaceae	Fruit
Corn *(fresh, not dried/flour/meal) (green maize)*	*Zea mays*	Poaceae	Corn cobs, kernels
Cucumbers	*Cucurbita Species*	Cucurbitaceae	Fruit
Eggplant *(aubergine, brinjal)*	*Solanum melongena*	Solanaceae	Fleshy fruit
Fennel	*Foeniculum vulgare*	Apiaceae	Bulb, stem, leaves
Green pepper	*Capsicum annum*	Solanaceae	Fruit
Jicama *(yam bean)*	*Pachyrhizus erosus*	Fabaceae	Tuberous root
Kohlrabi *(German turnip)*	*Brassica oleracea*	Brassicaceae	Stem
Leek	*Allium ampeloprasum*	Alliaceae	Stem/leaf sheaths
Lettuce *(light green)*	*Lactuca sativa*	Asteraceae	Leaves

Common name *(regional common names)*	*Binomial name OR genus*	Family	Edible part of the plant
Luffa *(rigged gourd)*	*Luffa acutangula*	Cucurbitaceae	Fruit
Mushroom	*Agaricus bisporus*	Agaricaceae	Stem and cap
Nakati *(mock tomato)*	*Solanum aethiopicum*	Solanaceae	Leaves
Okra	*Abelmoschus esculentus*	Malvaceae	Green fruit
Onion	*Alleum cepa*	Liliaceae	Bulb
Palm hearts *(palmito, chonta, swamp cabbage)*	*Bactris gasipaes*	Arecaceae	Inner core
Parwal *(pointed gourd)*	*Trichosanthes dioica*	Cucurbitaceae	Fruit
Peas, green, when eaten as fresh pod	*Pisum sativum*	Fabaceae	Young pod
Radish	*Raphanus sativus*	Brassicaceae	Tuberous root
Snake gourd *(serpent gourd, chichinga, and padwal)*	*Trichosanthes cucumerina*	Cucurbitaceae	Fruit
Squash *(summer and other light-coloured squash)*	*Cucurbita maxima*	Cucurbitaceae	Fruit
Tomatillo	*Physalis philadelphica*	Solanaceae	Fruit
Tomato	*Solanum lycopersicum*	Solanaceae	Fruit
Winter melon *(white gourd, ash gourd)*	*Benincasa hispida*	Cucurbitaceae	Fruit
Zucchini	*Cucurbita pepo*	Cucurbitaceae	Fruit

a Various varieties of young bean pods are eaten as vegetables; please refer to the "Pulses (beans, peas and lentils)" group for a list of many varieties. All the varieties of bean consumed as a young pod should be included in this group. When only mature seeds are eaten (fresh or dried), they should be listed under group "M".

Classification challenges

Table A1-2 presents some food classification challenges. While there are no perfect solutions to some challenges, standardized classification can help ensure comparability between surveys, and in general we recommend a standard approach to these difficult choices. Three types of items present challenges or uncertainties: items that are unusual for a group (e.g. several high-fat fruits), items that contain multiple ingredients but that are considered a single food (e.g. bread) and items that are often consumed in small quantities.

The classification decisions in this table follow two principles. When in doubt about how to classify food items:

- Always avoid falsely inflating food group diversity
- Aim at simplicity when a single ingredient usually dominates in a food or is most likely to dominate in lower-cost versions of the food

Table A1-2. How to classify problem foods

Problem foods	Questionnaire group and comments
Avocado	"Other fruits"
Biofortified foods	Classify as a natural food and, if desired, design additional questions to capture information on consumption of biofortified crops or varieties. For example, biofortified maize should be classified with "Foods made from grains" for the purposes of Minimum Dietary Diversity for Women (MDD-W).
Blended fortified foods, such as corn-soy blend, wheat-soy blend, donated commodities or local blends/fortified cereals	Classify with main ingredient (usually grain). It is also advisable to add separate questions to capture coverage of fortified foods if this is of interest to the survey designers.
Bread	"Foods made from grains"
Chili peppers, red and green	"Condiments and seasonings"
Clear broth	"Other beverages and foods"
Coconut flesh	"Other fruits"
Coconut milk†	"Condiments and seasonings" or "Other oils and fats"
Coconut water	"Other beverages and foods"
Coffee, sweetened, with or without milk or cream	"Sweet beverages". Though the amount of milk or cream can vary and be high, very often it is not, and this classification is intended to avoid the risk of falsely inflating the proportion of women reported to consume the nutrient-dense dairy group.
Coffee, unsweetened, with or without milk or cream	"Other beverages and foods". Rationale as above.
Doughnuts (fried dough)	"Savoury and fried snacks"
Dried soup seasoning packets	"Condiments and seasonings". These may be rehydrated and consumed as a main dish in a meal, but are not very different nutritionally from bouillon cubes. They are typically high in sodium and, if they contain dried vegetables, the amounts are typically very small, particularly for lower-cost products.
Fish powder	"Condiments and seasonings"
Fortified foods and products	Classify as if unfortified and, if desired, design additional questions to capture information on consumption of fortified foods or products. For example, fortified oil should be classified with "Other oils and fats".

† This food is not part of any of the MDD-W groups, so this classification choice does not affect the indicator. In some areas (particularly poor rural areas), coconut milk may be the predominant fat source in the diet, and there may be an interest in including this in the "Other oils and fats" group. In other areas, particularly where coconut milk is typically made very thin with water, it is more appropriate to consider in the "Condiments and seasonings" group.

Problem foods	Questionnaire group and comments
Fruit juices (100% fruit)	If it is known that 100 % fruit juice is commonly consumed **and** if survey designers consider it is feasible to train enumerators to probe and distinguish this from sugar-sweetened juice, this can be placed in the "Other vitamin A-rich fruits and vegetables" (e.g. mango juice) or "Other fruits" group, depending on the type of fruit. If this is not certain or not feasible, all juices should be placed in the "Sweetened beverages" group.
Fruits, canned with sugar syrup	"Sweet foods"
Garlic	"Condiments and seasonings"
Herbs	"Condiments and seasonings"
Olives	"Other beverages and foods"
Palm fruit	"Other vitamin A-rich fruits and vegetables". Note that this may be referred to as palm nut in some cuisines because the entire pulp-covered kernel is cooked in stews. It is the oily flesh/pulp of the fruit that is high in vitamin A.
Pastries, sweet breads	"Sweet foods"
Pickles	"Other beverages and foods"
Ready-to-use therapeutic food, ready-to-use supplementary food	These specialized products are sometimes distributed to women of reproductive age, particularly during pregnancy. Classify based on main ingredient. Often this is peanut (so classify with "Nuts and seeds"), but it may be a pulse. It is also advisable to add separate questions to capture coverage of these specialized products, if this is of interest to survey designers.
Samosas and similar savoury fried pastries	"Savoury and fried snacks"
Seaweed	"Other vegetables". Most species/varieties are not vitamin A-rich, but a few are. If a locally consumed type of seaweed is known to be vitamin A-rich (defined as ≥120 Re^b/100 g, in form as eaten), it can be classified with "Dark green leafy vegetables".
Snails	"Insects and other small protein foods"
Street foods/ other mixed foods prepared outside the home	Probe for main ingredients and record as for mixed dishes. If mainly one ingredient, place in the group for main ingredient (e.g. porridges, rice dishes in the group "Foods made from grain"). If fried snacks, place in the group for "Savoury and fried snacks".
Sugar added to mixed dishes	"Condiments and seasonings". The questionnaire is not designed to capture total intake of free sugars. This is not feasible in a simple food group recall. It does capture prevalence of consumption of two food groups of interest: sweet beverages and items that are commonly considered as Sweet foods (cakes, candies, etc.).
Sweetened condensed milk	"Sweet foods" if boiled and served as a sweet; "Sweet beverages" if diluted and consumed as a drink.

Problem foods	Questionnaire group and comments
Sweet drinks with milk (e.g. drinks made with milk and chocolate powder, including fortified powders; sweet tea or coffee with milk)	"Sweet beverages". Though such drinks will provide varying amounts of dairy, they are classified as Sweet beverages to avoid the risk of falsely inflating the proportion of women reported to consume the nutrient-dense dairy group because often the amount of dairy is small.
Tea, sweetened, with or without milk	"Sweet beverages". Rationale as for coffee.
Tea, unsweetened, with or without milk	"Other beverages and foods". Rationale as above.
Tomato paste	"Condiments and seasonings"
Vegetable juices (100%)	The issue is the same as for fruit juices. If 100 % vegetable juice is commonly consumed and survey designers consider it feasible to train enumerators to probe and distinguish this from sugar-sweetened juice, this can be placed in the "Other vegetables" group, depending on the type of vegetable. If this is not certain or not feasible, all juices should be placed in the "Sweet beverages" group. vitamin A-rich fruits and vegetables" (e.g. carrot juice) or "Other vegetables" group, depending on the type of vegetable. If this is not certain or not feasible, all juices should be placed in the "Sweet beverages" group.
	The issue is the same as for fruit juices. If 100% vegetable juice is commonly consumed **and** survey designers consider it is feasible to train enumerators to probe and distinguish this from sugar-sweetened juice, this can be placed in the "Other vitamin A-rich fruits and vegetables" (e.g. carrot juice) or "Other vegetables" group, depending on the type of vegetable. If this is not certain or not feasible, all juices should be placed in the "Sweet beverages" group.

b. RE = retinol equivalents

Appendix 2. Comparing MDD-W and other food group diversity indicators

Dietary diversity has been measured in many different ways, in both research and programmatic contexts. However, only a few simple food group diversity indicators have been promoted for wide population-level use in resource-poor settings. These include the Household Dietary Diversity Score (HDDS), the MDD for **children 6-23 months of age** (WHO & UNICEF, 2017). and the weighted household-level food group score Food Consumption Score (FCS) that measures the frequency of consumption over 7 days (WFP, 2008, 2015) which are compared with the MDD-W in **Table A2-1** below.

Table A2-1. Food group diversity indicators currently in use or advocated for use at population level

	MDD-W	MDD for children	HDDS[1]	FCS/ FCS-N[2,3,4]
Population sampled/unit of analysis	Women aged 15–49 years (individual)	Infants and young children aged 6–23 months	Households	Households
Validated against	Micronutrient adequacy assessed by multiple 24-hour open recalls	Micronutrient density compared with desirable density for complementary foods, assessed by 24-hour recall or weighed food records	Kilocalorie availability as assessed in household-level consumption surveys	Caloric intake and HDDS FCS-N dimensions on protein, vitamin A and iron, validated against HH nutrient adequacy
Meaning	Proxy for the probability of micronutrient adequacy of women's diets Reflects micronutrient adequacy, which is one critical dimension of diet quality	Proxy for the adequacy of the micronutrient density of infant and young child diets Reflects one of several favourable IYCF practices	Proxy for household-level access to kilocalories (dietary energy), which is one dimension of household food security Reflects economic access to a diet with higher kilocalories per capita	HH food security across time, as measured by food group consumption and main sources of each food group
Recall period	24 hours			7 days

Number of food groups	10	8 (including breastmilk)	12	FCS- 9 FCS-N 15
Threshold for dichotomous indicator	5 or more of the 10 food groups	5 or more of the 8 food groups	Not a dichotomous indicator	Weighted scores have thresholds for poor, borderline and acceptable consumption, set according to context
Indicator tabulation includes fats/ oils, sweets, and all beverages, including alcohol	No, but option to include in extended food group list	No	Yes	Yes (not alcohol)
Foods consumed outside the home	Included	Included	Not included	Not included.

1. Guidelines for measuring HDDS http://www.fao.org/fileadmin/user_upload/wa_workshop/docs/FAO-guidelines-dietary-diversity2011.pdf (Kennedy, Ballard and Dop, 2011)
2. Technical Guidance Note for the Joint Approach to Nutrition and Food Security Assessment (JANFSA) (from WFP and UNICEF, 2016)
3. WFP Technical Guidance on FCS construction and calculation (WFP, 2008)
4. WFP Technical Guidance on FCS-Nutrition (WFP, 2015)

The updated Infant and Young Child Feeding Minimum Dietary Diversity (IYCF MDD)

Infant and Young Child Feeding (IYCF) MDD is a proxy indicator for micronutrient adequacy that was developed in relation to IYCF practices. In 2017, it has been updated from 7 to 8 standard food groups, with the **addition of breastmilk** to grains, roots and tubers; legumes and nuts; dairy products; flesh foods; eggs; vitamin-a rich fruits and vegetables; and other fruits and vegetables. The cut-off for achieving adequacy is set at the consumption of 5 out of 8 food groups in the previous day (WHO & UNICEF, 2017). The IYCF operational manual will be updated by 2021, and reflect will changes to this food grouping, among others.

Both the MDD-W indicator and the IYCF MDD indicator are dichotomous indicators based on consumption of a number of food groups the previous day or night. Since some users may wish to construct both indicators, the two tables, below show which food groups comprise the indicators (Table A2-2).

Table A2-2. Comparing food groups for the Infant and Young Child Feeding MDD indicator and the MDD-W indicator

Groups/rows on the MDD-W questionnaire		MDD-W Food Groups		Eight food groups in the IYCF MDD[b]	
A	Foods made from grains	1.	Grains, white roots and tubers, and plantains	2	Grains, white roots and tubers, and plantains
B	White roots, tuber and plantains				
C	Pulses (beans, peas and lentils)	2.	Pulses (beans, peas and lentils)	3	Legumes and nuts
D	Nuts and seeds	3.	Nuts and seeds		
E	Milk and milk products	4.	Dairy	4	Dairy products (milk, infant formula, yogurt, cheese)
F	Dairy Foods				
G	Organ meats	5.	Meat, poultry and fish	5	Flesh foods (meat, fish, poultry and organ meats)
H	Red flesh mammals' meat				
I	Processed meat				
J	Poultry and other white meats				
K	Fish and seafood				
L	Eggs	6.	Eggs	6	Eggs
M	Dark green leafy vegetables	7.	Dark green leafy vegetables	7	Vitamin A-rich fruits and vegetables
N	Vitamin A-rich vegetables, roots and tubers	8.	Other vitamin A-rich fruits and vegetables		
O	Vitamin A-rich fruits				
P	Other vegetables	9.	Other vegetables	8	Other fruits and vegetables
Q	Other fruits	10.	Other fruits		
				1	**Breastmilk**

a. Only the first 17 rows listed here are used to calculate the MDD-W. Questionnaires for both indicators (IYCF MDD and MDD-W) may include other optional foods/groups.

b. https://www.who.int/publications/i/item/9789241513609 (WHO & UNICEF, 2017) Updated IYCF guidance is expected in 2021.

Appendix 3. Example Technical Specifications for Tablet and Powerbank used in the FAO MDD-W study

Table A3-1. Technical specifications for tablet and powerbank

Tablets

NETWORK (OPTIONAL*)	Technology	GSM / HSPA / LTE
BODY	Dimensions	186.9 x 108.8 x 8.7 mm (7.36 x 4.28 x 0.34 in)
	Weight	283 g (9.98 oz)
	Build	Plastic body
	SIM	Micro-SIM
DISPLAY	Type	IPS LCD capacitive touchscreen, 16M colours
	Size	7.0 inches, 142.1 cm2 (~69.9% screen-to-body ratio)
	Resolution	800 x 1280 pixels, 16:10 ratio (~216 ppi density)
PLATFORM	OS	Android 5.1.1 (Lollipop)
	CPU	Quad-core 1.5 GHz Cortex-A7
MEMORY	Card slot	microSD, up to 256 GB (dedicated slot)
	Internal	8 GB, 1.5 GB RAM
MAIN CAMERA	Single	5 MP, AF, f/2.2
	Features	Panorama
	Video	720p@30fps

SELFIE CAMERA	Single	2 MP, f/2.2
SOUND	Loudspeaker	Yes
	3.5mm jack	Yes
COMMS	WLAN	Wi-Fi 802.11 b/g/n, Wi-Fi Direct, hotspot
	Bluetooth	4.0, A2DP
	GPS	Yes, with A-GPS, GLONASS
	Radio	No
	USB	microUSB 2.0
FEATURES	Sensors	Accelerometer
BATTERY	Type	Non-removable Li-Ion 4000 mAh battery
	Talk time	Up to 11 h (multimedia)
	Music play	Up to 100 h
MISC	Colours	Metallic Black
	SAR EU	0.64 W/kg (head) 0.85 W/kg (body)

Portable power bank

Capacity	10000-12000mAh
Power input/output	5v
Over discharge protection	
Low temperature	

Appendix 4. Frequently encountered challenges and proposed solutions for list-based and open recall methods

Challenges and proposed solutions were compiled based on country experience and feedback from the research teams during the FAO Minimum Dietary Diversity for Women (MDD-W) project.

Table A4-1. Challenges and solutions

	Frequently encountered challenges/ issues	Proposed solutions
Probing techniques		
Open Recall	Enumerator has difficulty in asking the respondent to name/probe for ingredients of mixed dishes	• Survey team can share a list of commonly prepared local dishes, with common ingredients used. • Enumerators should always ask for ingredients, including for items such as dessert and mixed or fresh fruit juice.
Open Recall	Enumerator is unsure of the probing practice when the respondent does not mention the usual ingredients of a mixed dish	Enumerator should never mention the foods they think are missing foods by name, but instead use phrases such as *was there anything else you ate*.
Classification of foods into food groups		
Open Recall	There is confusion on categorization of mixed fresh fruit juice versus processing soft drink	If the juice fruit purely made from pure fruit (no sugar or water added), it should be classified in the relevant food group, e.g. ripe mango juice should be categorized under "Vitamin A rich fruits." It has to be distinguished whether they bought processed mixed fruit juices or when they prepared the mixed fruit juice themselves whether they diluted it with water and added sugar. If only water is added, it goes into the food group, if sugar is added, it goes into sweetened beverages.

	Frequently encountered challenges/ issues	Proposed solutions
Open Recall	Enumerator is unable to classify some foods mentioned by the respondent during the free recall into food groups	A space should be provided at the end of the questionnaire to record these foods. They will be categorized afterwards by the research team upon referencing the national food composition, or after consulting knowledgeable people.
List-based	Respondent may have consumed foods that are not included on the preadapted list-based questionnaire	In case respondent offers information outside of the questions being asked, the enumerator should only mark a food group if a food is an exact item on the list. In case the training was short and concise, enumerators may not be capable of classifying the food items on their own, especially with the often limited training offered in a multi-topic survey.

Appendix 5. Samples of extensive food lists from the FAO MDD-W study for use in both list-based and open recall adapted tools.

Important: For the list-based method, the top seven or fewer food items should be identified per food group, see Part 1, Section 3 of the Guide. For open recall, the extensive food list may be used for classification of food items reported and score calculation.

Table A5-1. Cambodia extensive food list

	Food groups	Food items
A	**Foods made from grains**	Rice, corn, bread, noodles, spaghetti or Banh srung
B	**White roots and tubers or plantains**	White potatoes, white yams, cassava, white sweet potato, lotus root
C	**Beans, peas, lentils**	Beans, peas, lentils, soya, Lactasoy
D	**Nuts or seeds**	Peanuts (peanuts groundnut flower), tree-nuts, cashew nuts or seeds including sunflower seeds, sesame seeds, pumpkin seeds
E	**Milk**	Milk
F	**Milk products**	Cheese or yogurt
G	**Organ meat**	Liver, kidney, heart, lung, gizzard, pancreas, blood
H	**Red flesh mammals' meat**	Beef, pork, lamb, goat, mice, rats, dog, rabbits
I	**Processed meat**	-
J	**Poultry and other white meats**	Chicken, ducks, fowls, geese, snake, turtle, stomach, intestine
K	**Fish and seafood**	Fresh or dried fish, shellfish, or sea foods, pa'ork, fish paste (ohokpr)

	Food groups	Food items
L	**Eggs**	Quail eggs, chicken eggs, goose eggs, turkey eggs, duck eggs
M	**Dark green leafy vegetables**	Water convolvulus, amaranth, pumpkin leaves, sweet potato leaves, Ivy gourd leaves, kale, blue basil, green garlic, green onion, mustard, spinach, morning glory, garlic chives and other local varieties (slek prech, slek bas, slek m'rom (moringa), slek ngob, p'ty, kale, chaya
N	**Vitamin A rich vegetables or roots**	Pumpkin, carrots, yellow or orange sweet potatoes, red sweet pepper
O	**Vitamin A rich fruits**	Ripe mangoes, ripe paw paw
P	**Other vegetables**	Tomato, cucumber, eggplant, cauliflower, radish, pepper, yard long bean, cabbage, mushroom, wax gourd bottle gourd, luffa gourd, wing bean, bitter gourd, green pepper, winter melon
Q	**Other fruits**	Oranges, tangerines, bananas, coconut flesh, melon, jackfruit, fruit, rambutan, tamarind, jujube, green mango, apple, watermelon, avocado
R	**Packaged salty snacks**	Crisps and chips
S	**Deep fried foods**	Fried potatoes, fried dough.
T	**Instant noodles**	Instant noodles
U	**Fast food restaurant foods**	*[cite local fast food chains]*
V	**Sweet foods**	Chocolates, sweets, candies, cakes, or biscuits, sugarcane juice, sugar palm juice, sugar palm, ice-cream
X	**Sweet beverages**	Sweet drinks or sweetened fruit juice or juice-drinks, soft drinks/fizzy drinks like, Fanta, coca cola, sprite, chocolate drinks.
Z	**Sweetened infusions**	Sweetened tea, sweetened coffee, or sweetened herbal drinks
ZA	**Insects**	Termites, grasshoppers or crickets

Were considered Condiments and seasonings and therefore excluded from food groups counting: Chilies, pepper, ginger, spices, herbs, lemongrass, fish sauce or fish powder, soya sauce salt, lime/lemon juice in small quantities, MSG, preserved reddish, soybean paste, fish paste (prohok) in small quantities, vinegar, garlic, galangal, coriander, mint, parsley

Table A5-2. Ethiopia extensive food list

	Food groups	Food items
A	**Foods made from grains**	Teff, wheat, corn/maize, barley, rice, sorghum, millet, oats, enjera, bread, porridge, kita, chechebessa, kolo, nifiro, noodles (pasta, spaghetti)
B	**White roots and tubers or plantains**	Potatoes (all skin colours), enset (kocho, bulla or amicho), sweet potato (white/pale yellow fleshed), white yam (boye), cassava, taro (godere)
C	**Beans, peas, lentils**	Beans, peas, lentils, or chickpea
D	**Nuts or seeds**	Groundnut/peanut, seeds (like sesame) and seed "butters"
E	**Milk**	Milk
F	**Milk products**	Cheese, yoghurt
G	**Organ meat**	Liver, kidney, heart, gizzard
H	**Red flesh mammals' meat**	Beef, lamb, goat
I	**Processed meat**	–
J	**Poultry and other white meats**	Chicken
K	**Fish and seafood**	Fresh, frozen, dried or canned fish
L	**Eggs**	Eggs
M	**Dark green leafy vegetables**	Kale, broccoli, lettuce, spinach, and Swiss chard
N	**Vitamin A rich vegetables or roots**	Pumpkin, carrots, squash, or orange flesh sweet potatoes
O	**Vitamin A rich fruits**	Ripe mangoes or ripe papaya
P	**Other vegetables**	Tomato, eggplant, green pepper, cucumber, cabbage (common and red varieties), cauliflower, mushroom, and zucchini, beans, peas or lentils when the fresh/ green pod is consumed
Q	**Other fruits**	Orange, banana, avocado, pineapple, guava, watermelon, apple, grapefruit, berries
R	**Packaged salty snacks**	Crisps and chips

	Food groups	Food items
S	**Deep fried foods**	Fried dough other fried snacks
T	**Instant noodles**	Instant noodles
U	**Fast food restaurant foods**	*[cite local fast food chains]*
V	**Sweet foods**	Honey, chocolates, candies, sweet biscuits and cakes, ice cream
X	**Sweet beverages**	Sweet drinks or sweetened fruit juice or juice-drinks, soft drinks/fizzy drinks like, Fanta, coca cola, sprite, chocolate drinks,
Z	**Sweetened infusions**	Tea or coffee with sugar
ZA	**Insects**	–
Were considered Condiments and seasonings and therefore excluded from food groups counting: Spices, herbs (dried and fresh) such as chilli peppers (hot), garlic, ginger root, mustard and others. Any sauce or paste such as fish powder, tomato or bean paste, or seeds and others. Lime or other juice, added to bring up flavour of mixed dishes		

Table A5-3. Zambia extensive food list

	Food groups	Food items
A	**Foods made from grains**	Nshima, rice, corn, bread, noodles, samp, spaghetti, delite, porridge, sorghum, millet
B	**White roots and tubers or plantains**	White potatoes, white yams, cassava, white sweet potato, lotus root, mponda, kandolo yovundula, chikanda, busala, chilungwa, bipamba
C	**Beans, peas, lentils**	Beans, peas, lentils, soya
D	**Nuts or seeds**	Peanuts (peanuts groundnut flower), tree-nuts, or sunflower seeds, sesame seeds, pumpkin seeds, cashew nuts
E	**Milk**	Milk
F	**Milk products**	Cheese or yogurt

	Food groups	Food items
G	**Organ meat**	Liver, kidney, heart, stomach, lung, gizzard, pancreas, intestine, blood, or other organ meats
H	**Red flesh mammals' meat**	Beef, pork, lamb, goat, mice, rats, rabbits
I	**Processed meat**	Sausage
J	**Poultry and other white meats**	Chicken, ducks, fowls, geese, turtle
K	**Fish and seafood**	Fresh, frozen, dried or canned fish - tilapia/ bream, buka buka, kapenta, chisense, mulamba/kapontha, nchenga, mackerel
L	**Eggs**	Quail eggs, chicken eggs, goose eggs, turkey eggs, duck eggs
M	**Dark green leafy vegetables**	Amaranth, pumpkin leaves, sweet potato leaves, kale, spinach, basil, green garlic, green onion, mustard, spinach, garlic chives, okra (derere), kanuka, chimpapila, kachesha, suntha, delele, pupwe, zumba
N	**Vitamin A rich vegetables or roots**	Pumpkin, carrots, yellow sweet potatoes or sweet potatoes that are yellow or orange inside, red sweet pepper, chikanda, kandolo yo sashila
O	**Vitamin A-rich fruits**	Ripe mangoes, ripe paw paw, sweet melon
P	**Other vegetables**	Cucumber, eggplant, cauliflower, radish, pepper, mushroom, green pepper, tomato (chimati), garden eggs (impwa) green, yellow or red pepper, cabbage (common and red varieties), mushroom (bowa), baby marrow, okra (lady's finger)/derere, beetroot, green beans
Q	**Other fruits**	Oranges, tangerines, bananas, coconut flesh, jackfruit, tamarind, plum, nectarines, green mango, apple, mabuyu, makole, bwemba, masuku, malianfungo
R	**Packaged salty snacks**	Crisps and chips
S	**Deep fried foods**	Fried potatoes, fried dough, other fried snacks
T	**Instant noodles**	Instant noodles

	Food groups	Food items
U	**Fast food restaurant foods**	*[cite local fast food chains]*
V	**Sweet foods**	Chocolates, sugar, honey, sweets, candies, cakes, or biscuits, sugarcane juice, sugar palm juice, sugar palm, ice- cream
X	**Sweet beverages**	Sweet drinks or sweetened fruit juice or juice-drinks, soft drinks/fizzy drinks like, fanta, coca cola, sprite, chocolate drinks,
Z	**Sweetened infusions**	Tea or coffee with sugar
ZA	**Insects**	Termites, grasshoppers, crickets

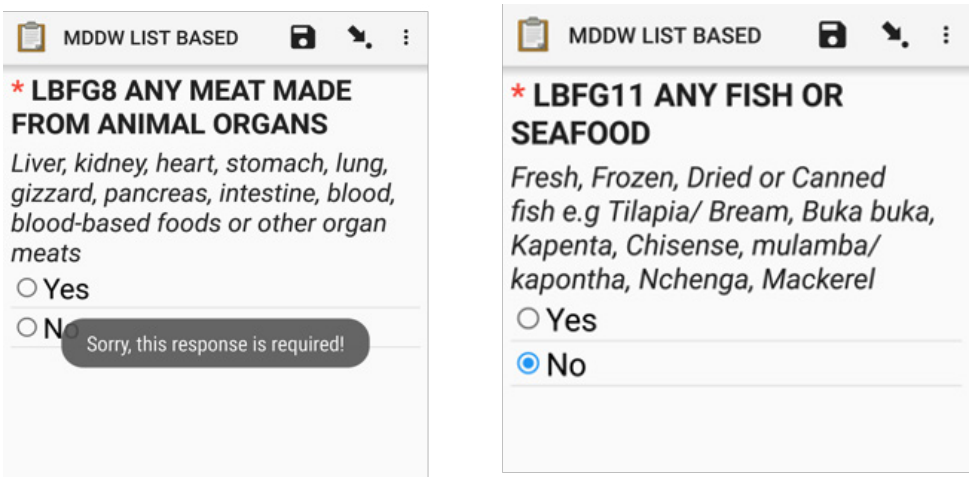
Were considered Condiments and seasonings and therefore excluded from food groups counting: Chilies, pepper, ginger, spices, herbs, lemongrass, fish sauce or fish powder, soya sauce, salt, lime/lemon juice in small quantities, MSG, preserved reddish, soybean paste, fish paste in small quantities, vinegar, garlic, galangal, coriander, mint parsley

Appendix 6. Examples of list-based and open recall questionnaire in Open Data Kit application

From the FAO MDD-W study

List-based

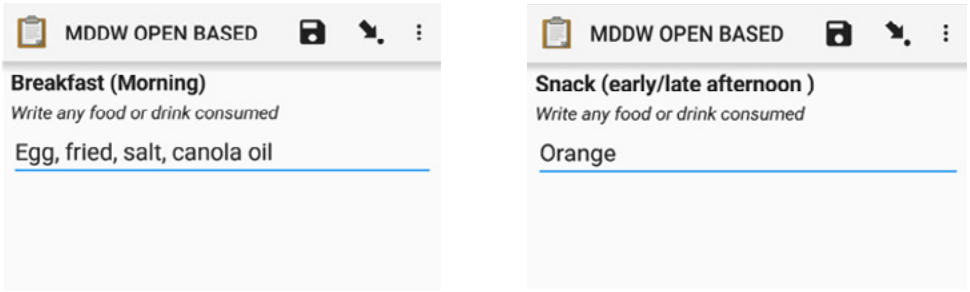
Figure A6-1. Recording consumption of food groups using the list-based questionnaire on the tablet, example from Zambia



Open recall

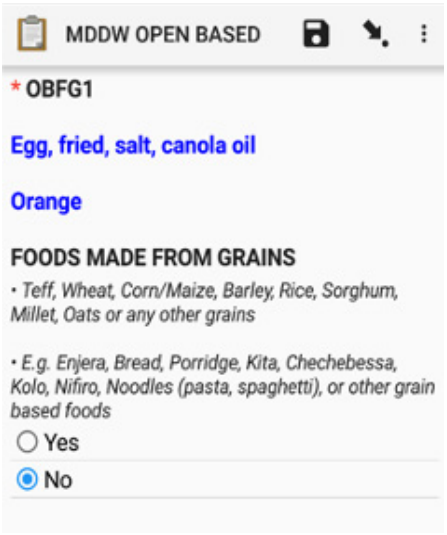
The Open recall questionnaire comprises two steps as shown in Figure A6-2 and A6-3 below:

Figure A6-2. First step: free recall of a single food item or all ingredients in the mixed dish in the space provided



When all the foods consumed by the respondent have been recorded, the enumerator will be able to view them when categorizing the foods into the into the list of expanded food groups.

Figure A6-3. Second step: categorization of foods into food groups



Appendix 7.
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