

REPORT

OF THE

Technical consultation

on

measuring healthy diets:

CONCEPTS, METHODS AND METRICS

Virtual meeting, 18–20 May 2021

World Health Organization

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Acronyms

AHEI	Alternative Healthy Eating Index
DHS	Demographic and Health Surveys
DQI	Diet Quality Index
DQ-Q	Diet Quality Questionnaire
FAO	Food and Agriculture Organization of the United Nations
FAO/WHO GIFT	FAO/WHO Global Individual Food Consumption Data Tool
FBS	Food balance sheet
FIES	Food insecurity experience scale
GAIN	Global Alliance for Improved Nutrition
GBD	Global Burden of Disease
GDD	Global Dietary Database
GDQS	Global Diet Quality Score
GDR	Global Dietary Recommendations
HCES	Household Consumption and Expenditure Surveys
HEI	Healthy Eating Index
INDDEX	International Dietary Data Expansion
IYCF	Infant and young child feeding
JME	Joint Malnutrition Estimates
LMICs	Low- and middle-income countries
MDD	Minimum dietary diversity
MDD-W	Minimum dietary diversity for women
MICS	Multiple Indicator Cluster Surveys
NCDs	Noncommunicable diseases
SDGs	Sustainable Development Goals
SUA	Supply utilization account
TEAM	Technical Expert Advisory Group on Nutrition Monitoring
UNICEF	United Nations Children's Fund
UPF	Ultra-processed food
USAID	United States Agency for International Development
WFP	World Food Programme
WHO	World Health Organization

Executive summary

Healthy diets are integral to achieving the Sustainable Development Goals, including Goal 2, which aims to end all forms of malnutrition. Yet, there are no harmonized metrics for tracking how diets around the world are evolving and the impact of these changes on human health and the environment. While researchers have been developing concepts, metrics, methods and tools to characterize the healthfulness of diets, there is a need to share experiences, improve collaboration and coordination, harmonize and complement efforts, develop a common agenda, and accelerate progress around assessment and monitoring of characteristics of diets at global and national levels.

In response to this need, the WHO-UNICEF Technical Expert Advisory Group on Nutrition Monitoring (TEAM) and the Food and Agriculture Organization of the United Nations (FAO), with technical and logistical support from USAID Advancing Nutrition, hosted a Technical Consultation on Measuring Healthy Diets: Concepts, Methods and Metrics.

The goal of the consultation was to promote increased communication, coordination and collaboration for the purpose of accelerating progress towards identifying or developing a parsimonious set of metrics for global monitoring of healthy diets for individuals over 2 years of age. Eighty-five participants took part in the consultation, representing a wide range of institutions and roles in the data value chain.

Expected outputs of the consultation were to: (1) identify areas of convergence and divergence on characteristics of healthy diets that could be monitored at global and national levels; (2) map existing metrics of healthy diets with associated tools and methods; and (3) identify next steps to establish mechanisms for collaboration and reach convergence on metrics for global and national use.

Opportunities, gaps and priorities in measuring healthy diets

Through presentations, plenary discussion, working groups and a virtual chat, participants examined global monitoring needs for measuring healthy diets and identified opportunities and gaps. Participants noted the lack of consensus on the definition of a healthy diet, the limited availability and quality of dietary intake data, and the lack of consistency in what data are collected and reported over time.

Participants examined various criteria for assessing metrics for monitoring healthy diets, including the characteristics of diet quality, possible uses of a metric, the feasibility of data acquisition and analysis, and the validity and reliability of various metrics. Many participants favoured a metric assessed by food groups that could be validated against the outcomes of both nutrient adequacy and risk of noncommunicable diseases. In addition to global monitoring, some participants noted the need for metrics to support national and subnational actions. A number of participants favoured a validated composite metric for global monitoring, with individual components that could be used at the national and subnational level. There was general agreement that metrics should be simple to use, accessible and easy to communicate to policymakers. Participants noted the importance of determining the validity of the metric and the data collection tool for a given objective and context, identifying metrics that were reliable, and ensuring that those metrics were valid for purpose and context and responsive to change over time.

Participants reviewed some existing metrics for measuring healthy diets via presentations on the minimum dietary diversity for women indicator, the Global Diet Quality Project, the Global Diet Quality Score and the Nova Ultra-processed Food Score. Presentations also addressed potential data sources and modelling approaches for metrics of healthy diets. Data sources discussed included Household Consumption and Expenditures Surveys, Supply Utilization Accounts, Food Balance Sheets, Demographic and Health Surveys, Multiple Indicator Cluster Surveys, the Gallup World Poll and national surveys. Participants also explored diet quality metrics derived from modelling approaches, including the Global Burden of Disease and the Global Dietary Database projects. Participants discussed the potential complementarities, differences and opportunities presented by these approaches. An identified gap was the lack of tools, metrics, and data collection platforms to measure healthy diets among children aged 2 to 19 years, and especially those aged 2 to 14 years.

There was general agreement among participants that any assessment of diet quality must account for both the risks of nutrient insufficiency and the risks associated with overweight, obesity and diet-related noncommunicable diseases. Rather than identifying a single 'best' method or metric, decisions about which metric to use should be based on how the data would be used, what resources are available and the priorities that are set. This points to the need for a suite of metrics rather than a single indicator. Improving the global monitoring of healthy diets requires standardized approaches that are simple and feasible, and that allow for comparability over time and place. Opportunities to leverage existing data sources and data collection platforms are also important considerations. A recommended output of the consultation was to develop a decision-making tool – including constructs, metrics, data sources and uses – to help data users make decisions based on their specific objectives and priorities.

Participants representing various stakeholder perspectives identified priorities for monitoring healthy diets. From the perspective of metric developers, there is a need to focus on the validity of data collection tools and ensure cognitive validity. From the perspective of data collectors, it is important to reach consensus on a metric that is 'good enough' and ensure that the fit of the tool is aligned with the priorities of the survey programme. From the perspective of data users, metrics must be simple,

allow for disaggregation and capture multiple dimensions, such as nutrient adequacy, noncommunicable disease risk and food safety. From the perspective of United Nations agencies, it will be important to develop harmonized guidance for countries on the different modalities through which dietary information can be collected. Any approach must be relevant in low- and middle-income countries, contribute to developing national policies and address issues of data scarcity. From the perspective of donors, there is a need to advocate for investment in measures of diet quality as a global public good. Government ownership, including national investments, are important in driving donor investment.

Next steps

Follow-up actions stemming from the consultation will be led by the WHO-UNICEF TEAM Working Group on Diet Quality, with the support of FAO and USAID Advancing Nutrition. Next steps include (1) achieving consensus on terminology and developing a global definition of healthy diets, including dimensions to be measured; (2) identifying an independent group of experts to review the empirical evidence in order to compare available metrics and score them on characteristics such as content/construct validity, usefulness and feasibility; and (3) developing a decision-making tool to enable users to determine the metrics most suitable for their given measurement objectives. Eventually, with the participation of metric developers, operational guidance could be developed to describe how to collect, analyse and use these metrics for a range of applications, including global and national monitoring.

I. Introduction

Background and rationale

Diets are changing everywhere and measuring characteristics of diets at global and national levels is becoming increasingly important. Better measurement and monitoring are needed to support governments in establishing policies and programmes to promote healthy diets; to assess the effectiveness of these actions; and to hold governments accountable. Yet there are critical gaps in global, regional and national monitoring of characteristics and trends in diets.

Currently there are no World Health Assembly global nutrition targets related to diets, and although healthy diets are integral to achieving the Sustainable Development Goals (SDGs), there are no harmonized metrics for tracking how diets around the world are evolving and the impact of these changes on human health and the environment. While researchers have been developing concepts, metrics, methods and tools to characterize the healthfulness of diets, there remained a need to share experiences, improve collaboration and coordination, harmonize and complement efforts, develop a common agenda, and accelerate progress around assessment and monitoring of characteristics of diets at global and national levels.

The World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) established the Technical Expert Advisory Group on Nutrition Monitoring (TEAM) in 2015 to advise on all levels of nutrition monitoring. In 2017, TEAM established a Working Group on Diet Quality and the current TEAM workplan includes tasks related to facilitating progress in identifying metrics for global monitoring of diets. The Working Group conducted a light landscaping exercise in 2019 to identify gaps and potential focus areas across four domains: 1) concepts related to diet quality and healthy diets; 2) global and national monitoring frameworks; 3) platforms; and 4) metrics.[1] The exercise resulted in a recommendation to convene actors working on methods and metrics for healthy diets to become aware of each other's work and collaborate towards identifying common elements and areas of harmony in definitions and metrics.

In response to this need, the WHO-UNICEF TEAM and the Food and Agriculture Organization of the United Nations (FAO), with technical and logistical support from USAID Advancing Nutrition, hosted a Technical Consultation on Measuring Healthy Diets: Concepts, Methods and Metrics. The consultation was held virtually over three half-days, from 18–20 May 2021.

Guiding principles and characteristics of diets

FAO and WHO have developed 16 guiding principles on the health, environmental, and sociocultural aspects of sustainable healthy diets. [2] This consultation focused specifically on the subset of principles relating to the ***characteristics of healthy diets for individuals over 2 years of age*** (i.e., principles 2–7), rather than other elements of the food system or sustainability. Healthy diets:

- are based on a great variety of unprocessed or minimally processed foods, balanced across food groups, while restricting highly processed food and drink products;
- include wholegrains, legumes, nuts and an abundance and variety of fruits and vegetables;
- can include moderate amounts of eggs, dairy, poultry and fish; and small amounts of red meat;
- include safe and clean drinking water as the fluid of choice;
- are adequate (i.e., reaching but not exceeding needs) in energy and nutrients for growth and development, and meet the needs of an active and healthy life across the life cycle;
- are consistent with WHO guidelines for reducing the risk of diet-related noncommunicable diseases (NCDs) and ensure health and well-being for the general population.

While the consultation focused narrowly on metrics describing diets, the discussions were situated within a broader food systems framework (Annex 1). [3]

Focus, objectives and expected outputs

The consultation focused **on metrics for use at global and national levels**. While some of the metrics presented at the consultation could also be relevant for programme monitoring and evaluation, the emphasis was on metrics and associated platforms to enable countries to capture national diet trends across a wide range of age/sex groups (excluding children under 2 years of age), which could then be aggregated at regional and global levels. For the consultation sponsors, a high first-order priority was for global institutions to be able to track, monitor, and score progress using a common metric and for countries to be able to interpret and act on forces that compromise the diets of their populations.

The **overall goal** of the consultation was to promote increased communication, coordination, and collaboration for the purpose of accelerating progress towards identifying or developing a parsimonious set of metrics for global monitoring of healthy diets. The consultation was expected to contribute towards identifying a narrowed set of



the most promising measurement approaches and metrics for the general population. The specific tasks of the consultation were to:

- Work towards a shared understanding of the characteristics of diets that are both high priority and feasible to measure in global and national monitoring systems, while recognizing that countries should also define additional metrics relevant for their specific context (e.g., based on their food-based dietary guidelines).
- Share progress towards developing metrics, tools and methods to measure prioritized characteristics related to food and nutrient intakes, the gaps in knowledge and the barriers in metric development. This included flagging recommendations for new research on metrics, tools, and methods, and working towards consensus on a narrowed set of the most promising measurement approaches and metrics that are fit for purpose for the general population.
- Identify next steps to: promote collaboration among different groups working on measurement of healthy diets; reach convergence on a set of characteristics for measurement at global and national levels; and reach convergence on a parsimonious set of metrics to capture quality of diet that could be proposed for global use.

The expected outputs of the consultation were:

1. identification of areas of convergence and divergence on a selection of high priority and feasible characteristics of healthy diets that could be monitored at global and national levels;
2. a map of existing metrics with associated tools and methods that could be considered for measuring healthy diets among adults, children and adolescents in global and national monitoring systems, and remaining metric gaps, barriers and research needs; and
3. clarification of next steps to: establish mechanisms for collaboration and information-sharing; reach convergence on a set of characteristics for use at global and national levels; and eventually reach convergence on a parsimonious set of metrics that could be proposed for global use.

Report structure

This report provides a summary of presentations, working group contributions, discussions and recommendations, including those made during the plenary and among participants in the virtual chat.

The report is structured by the three overarching topics addressed during the consultation: (1) overview of global diet monitoring and prioritization of metric criteria and characteristics; (2) methods, tools and metrics to measure diets; and (3) definition and prioritization of next steps for identifying a global metric for monitoring of healthy diets.

II. Topic 1: Overview of global diet monitoring and prioritization of metric criteria and characteristics

Presentations and discussion under this topic provided an overview of the monitoring of healthy diets, including needs, opportunities, data sources, methods, criteria and characteristics, past experiences and lessons learned. Below is a summary of the presentations covered under Topic 1.



Global monitoring of healthy diets: Needs and opportunities

Lynnette Neufeld, Director, Knowledge Leadership, Global Alliance for Improved Nutrition

There has been an unprecedented focus on diet quality in the past few years. Nutrient-poor diets are a direct cause of persistent undernutrition and a well-established risk factor for NCDs. There is also greater recognition of the role of the food system in fostering healthy diets and a growing focus on the link between food systems and the environment. This interest in diets has highlighted important gaps, such as the lack of consensus on the definition of a healthy diet and the limited availability and quality of dietary intake data. Where data do exist, there is a lack of consistency in what is measured and reported across contexts and over time.

There are several new and ongoing initiatives to improve the quality, consistency, quantity, accessibility, transparency and use of dietary data. [4] Three considerations are important for the global monitoring of healthy diets: (1) metrics and benchmarks; (2) the intended use of the data; and (3) data sources and collection platforms. Different methods and benchmarks have been used to describe a healthy diet, such as: nutrient adequacy (without excess) in comparison to average requirements or upper limits; alignment with a set of specific recommendations for food types or nutrients associated with better health (e.g., WHO recommendations for consumption of sodium, sugar, fruits and vegetables, etc.); and assessments of overall quality of the diet as a pattern associated with better health outcomes (e.g., the Mediterranean diet; the EAT-Lancet Commission diet).[5]

Any assessment of diet quality must account for the double burden of malnutrition by assessing the risks of insufficiency and micronutrient deficiencies and the dietary risks associated with overweight, obesity and related NCDs. Yet, currently, all metrics and benchmarks used have limitations. For example, the use of nutrient adequacy and metrics to assess alignment with a set of recommendations do not capture the whole diet, while an overall quality of diet approach has tended to focus on either aspects of insufficiency or NCD risk, without consensus on how to bring these two aspects together.

The strengths and limitations of different metrics depend on the intended use of the data. Global monitoring requires standardized approaches that are simple, rapid and feasible, and that allow for comparability over time and geography, providing a snapshot of diet quality at the population level that is validated with a benchmark outcome. However, these data may not serve as well for informing policy and programming planning, which requires an in-depth overview of dietary patterns and determinants in a population. Research on diet and disease associations or intervention approaches may require population- or individual-level dietary assessments, with metrics and methods that are fit for research purpose, which would take priority over the data comparability issues required for global monitoring.

Data sources and collection platforms are also important considerations. For example, existing data sources may be used to classify dietary data, such as food balance sheets. Data platforms refer to mechanisms used to collect data, which may be common across settings (such as Demographic and Health Surveys [DHS] or Household Consumption and Expenditure Surveys), or unique to one setting (e.g., national nutrition surveys).

More and better diet quality evidence requires robust metrics and benchmarks, using existing or new data, collected through platforms that are feasible within time and resource constraints, and are fit for monitoring, planning and research purposes. Reconciling human and planetary health in assessing diet quality may add new levels of complexity not yet considered in diet metrics. While no single method or metric is best, it is critical to ensure clarity of purpose for data and assess strengths and weaknesses in line with this purpose.

Metrics for global monitoring: Experiences and lessons learned (a)

Chessa Lutter, Senior Nutrition Researcher and Senior Fellow, RTI International

Lessons learned from the process of developing the infant and young child feeding (IYCF) indicators can provide important insights for developing metrics for other groups. IYCF indicators have been used to improve decision-making and investments in child nutrition programmes and public policies. However, not every dimension of optimal IYCF can be reflected in an indicator when measurement depends on large-scale surveys (e.g., responsive feeding and food safety are not captured). Indicators need to be valid and reliable; they also require a value judgment about what is most important and consensus among stakeholders. Their utility depends on wide-scale adoption by many stakeholders.

The first IYCF indicators were developed in 1991 and only covered breastfeeding. In 1998, the technical basis for measuring complementary feeding was developed, followed by publication of the guiding principles for complementary feeding of the breastfed child in 2003. In 2008, indicators for assessing IYCF practices were published, along with a commentary in the ***Lancet***, followed by a 2010 guide on how to measure them. A process for updating these indicators began in 2017, with the new indicators recently published in 2021.[6] The new IYCF indicators include measurement of egg and flesh food consumption and expand the focus from undernutrition to measure aspects of unhealthy food consumption. The indicators are intended for use in large-scale surveys for assessment (including trends), targeting of at-risk populations and monitoring and evaluation of progress towards goals and the impact of interventions.

The process of developing the IYCF indicators highlighted the importance of communicating concisely using visualization. Data are easy to calculate, and the UNICEF IYCF database makes them easy to access and use for trend analysis, for comparisons, for evaluating large-scale behaviour change interventions and for use within national surveillance systems. There are also some limitations to the IYCF indicators; for example, they rely on assumptions about breastmilk intake; they do not capture all dimensions of IYCF; they have not been embraced by high-income countries (which often lack platforms from which to collect these indicators); and indicators such as minimum dietary diversity (MDD) have sometimes been understood to represent adequacy rather than a bare minimum requirement. Strengths of the indicators include their near universal acceptance by low- and middle-income countries (LMICs), their ease of use, and their ability to call attention to gaps between recommendations and practices and create momentum for tracking.

Lessons relevant to the measurement of healthy diets are as follows: (1) engage with multiple stakeholders, including data users, during the initiation planning stage; (2) focus on healthy and unhealthy foods and beverages (rather than nutrients); (3) pilot test indicators with existing data; (4) limit the number of indicators and ensure they are well understood and captured through simple visuals; (5) avoid requiring new surveys or measurement tools to collect data; and (6) ensure a good communication and dissemination strategy.

Metrics for global monitoring: Experiences and lessons learned (b)

Marie Ruel, Director, Poverty, Health and Nutrition Division, International Food Policy Research Institute

The evolution of IYCF indicators took about 20 years. The IYCF indicators are mainly used for monitoring and comparison of national and subnational trends and for targeting at the population level. The MDD indicator has been adopted outside of nutrition, including by agriculture and social protection programmes. The indicator is versatile and has proven

useful for considering whether consumption of specific food groups has been achieved. In contrast, minimum acceptable diet is a composite indicator (composed of MDD and minimum meal frequency), which is less sensitive to change.

While the MDD indicator does not measure quantity of intake, caloric consumption tends to increase as MDD increases. There is also a strong association between MDD and micronutrient intake in most contexts. Although there is now an indicator to measure intake of unhealthy foods, there is still no indicator of overall diet quality in the set of IYCF indicators. Looking back, it is clear that the existence of the IYCF indicators has given prominence to the issues around diet, which has in turn motivated programme designers to set specific goals to improve diet quality through various interventions.

Points of discussion

Below is a summary of related discussion points raised in plenary and the virtual chat.

IYCF indicators

Improvements in dietary diversity have not correlated with shifts in anthropometry. Poor anthropometry affects health and productivity in adulthood; however, there is a lack of understanding about the relationship between dietary diversity in childhood and adult health and productivity. Developing that understanding, as well as understanding whether the effects of nutritional deficiencies in childhood can be corrected during adolescence and adulthood, would help to inform the way that diet metrics related to specific populations are conceptualized.

Measuring dietary intakes

Many countries do not have an updated or complete nutrient composition database, and as such, it is difficult to calculate dietary quality indices, such as the Healthy Eating Index (HEI), the Alternative Healthy Eating Index (AHEI) or the Diet Quality Index (DQI). Some countries estimate composition using the databases of other countries; however, this is challenging given differences in the types of foods consumed. Portion size conversion is also challenging.

FAO/INFOODS has been compiling and improving food composition tables since 1984. In addition to the continued development of new tables, recent work includes a food composition evaluation framework that can be applied to evaluate the quality of existing food composition tables.[7] A Global Food Matters Database is being developed by the International Dietary Data Expansion (INDDEX) project of Tufts University and partners as a global public good to make food composition data more centralized and readily accessible for nutrient-based dietary assessment.[8] Other food composition-related initiatives were raised during the meeting, such as the Period Table of Foods Initiative (see page 31). Although food composition tables are often needed to assess nutrient adequacy, some diet quality metrics do not require nutrient composition data, such as the minimum dietary diversity for women (MDD-W) indicator and the Global Diet Quality

Score (GDQS) (see pages 15 and 18).
Global monitoring of healthy diets can build on a global definition of a healthy diet (for the purpose of comparability) and/or on national food-based dietary guidelines. Many countries are shifting towards food-based dietary guidelines that recommend a certain proportion of fruits and vegetables or emphasize plant-based foods. This shift is much more amenable to monitoring diet quality because food-based dietary patterns are in some ways easier to measure than defining nutrient adequacy for multiple components. The DQI, for example, references dietary guidelines; however, many national guidelines are limited in scope (e.g., they may not contain information on consumption of whole grains, nuts and legumes, etc.). Some efforts have been made to review the similarities in dietary guidelines globally.[9]

While dietary intakes are important to measure, they cannot capture everything; for example, biomarkers can be used to track trans-fat intakes, which are difficult to monitor using dietary assessments. Trans-fat intake can also be tracked at the policy level by monitoring the adoption of policies or regulations to limit the production of industrially produced trans-fats in foods.

Data purpose and use

There are diverse purposes for collecting dietary data. Clarity of purpose is critical for determining appropriate metrics; this highlights the need for a suite of metrics rather than a single indicator.

The merits of one 24-hour dietary recall versus multi-day recall depend on how the data will be used. To measure individual intakes, multi-day dietary recall is necessary to characterize usual intake; however, this level of detail is not necessary for national-level monitoring. At the population level, a detailed 24-hour dietary recall can provide richer data for dietary intakes than short questionnaires. They can be conducted more easily using new technologies with the right underlying databases. A three-day dietary recall is not necessary for collecting population-level data.



Food safety as part of a healthy diet

Opportunities for embedding food safety constructs within the concept of a healthy diet will be discussed during the United Nations Food Systems Summit. Food safety may be best monitored via regulation and enforcement (e.g., to prevent food contamination) rather than monitoring individual consumption. The importance of food safety can be recognized without necessarily being measured as part of an index of diet quality. Further, assessments of upstream aspects of the food system and food environment, such as informal food handling and retailing, can provide insights into food safety risks and how to address them.



Identifying criteria to assess metrics for global monitoring of healthy diets (working groups)

Participants separated into working groups to discuss the dimensions of a global monitoring indicator. The goal of the exercise was to identify a prioritized list of criteria to assess whether an individual metric or set of metrics was a good fit for use as a global monitoring indicator. Assessment criteria were prioritized by four dimensions: (1) characteristics of diet quality; (2) use of the metric; (3) feasibility of data acquisition and analysis; and (4) validity and reliability of the metric. Participants broke into eight working groups to identify prioritized criteria, with two working groups assigned to each dimension (see Tables 1–4).

Table 1: Characteristics of diet quality

Characteristics of diet quality		
Guiding questions	**Prioritized criteria (group 1)**	**Prioritized criteria (group 2)**
• What characteristics of diet quality should be captured in a high-level monitoring metric? • Would the characteristics vary if considering use at global versus national/subnational level? If so, how?	1. Foods to limit 2. Diversity and variability of foods to emphasize 3. Cross-cultural relevance and comparability 4. Safety 5. Portion sizes (to ensure moderation and balance)	1. Nutrient adequacy 2. Comparison with national or global dietary guidelines or recommendations 3. Diversity (food preparation) 4. Food processing 5. Measurement 6. Identification of healthy and unhealthy diets

Points of discussion on characteristics of diet quality[10]

Universal notion of a healthy diet: Many participants emphasized the importance of having a universal understanding of what constitutes a healthy diet (compared with more contextualized definitions) in order to define metrics to monitor progress across countries.

Food groups versus nutrient adequacy: Many participants favoured a metric assessed by food groups rather than by nutrient adequacy. However, it was noted that a food-based metric should be validated against the outcomes of both nutrient adequacy and risk of NCDs. Rough portion size estimations could be used to classify intakes to various outcomes of interest. The metric should thus be a valid measure of nutrient adequacy without the need to directly measure nutrient intake. It was also noted that different food components can antagonize or synergize (e.g., vitamin C enhancing the uptake of iron) and this element of diet assessment is underexplored.

Industrial-level food processing: The level of industrial processing was noted as important by some participants because of the evidence reporting associations between ultra-processed foods and adverse health outcomes.

Food safety: Some participants commented that food safety should be assessed separately from healthy diets through different methods and metrics. Another participant referred to the consumption of fish as an example of the importance of considering food safety in relation to healthy food recommendations (i.e., fish may be recommended because it is high in healthy polyunsaturated fatty acids, but it can also be high in hazardous heavy metals).

It was noted that while the global metric itself may not be able to meet all of these diverse needs related to diet, it should signal where additional, more granular information is required.

Table 2: Use of the metric

Use of the metric		
Guiding questions	**Prioritized criteria (group 3)**	**Prioritized criteria (group 4)**
• Who will the metric(s) serve? • What will the metric(s) be used for? • What types of comparisons and/or trends does the metric(s) need to capture? • When (how often) should the metric(s) be updated/ reported? • (For) where should the metric(s) be calculated?	1. Capture healthy eating (adequacy and diversity) and prevention of NCDs 2. Measure age groups/ subpopulations and settings 3. Allow for comparison across geography and time 4. Be validated against set standards 5. Help with actionable policy planning or prioritization 6. Be easy to define, estimate and communicate 7. Allow for monitoring and evaluation (including policy planning and prioritization)	1. Useful at lowest possible level of government administration 2. Simplicity 3. Not a single composite indicator, but also with additional granularity for use for intervention design 4. Ability to capture inequalities 5. Ability to be updated frequently

Points of discussion on use of the metric

Support for subnational and national actions: Some participants noted the importance of stratification and use of the metric at the subnational level. The importance of having granular information to track current status and inform programme design and implementation was also highlighted.

Many participants indicated that the metric must be useful in guiding both national and subnational actions, including investment planning, to hold governments accountable.

The metric should be comparable across socioeconomic groups and subnational regions, with the primary purpose of providing information to national decision-makers.

Type of indicator and purpose: Many participants favoured a suite of metrics. Some participants noted the importance of having a validated composite metric for global monitoring, with individual components for usability at the national and subnational level. Underlying data from these components should be made available and reported where possible. Indicators constructed from multiple data elements (e.g., minimum acceptable diet) can be used for different purposes, but with a common universally relevant core, to which programme managers could add their own programme-relevant metrics. Composite indicators can be effective for advocacy, but often the components are more appropriate for informing actions.

Others noted that the indicators used for national/global monitoring and subnational policy and programming may need to be different, but related. It was noted that national-level indicators can still be collected and disaggregated subnationally, which would be the most useful for the users. Some participants suggested that indicators for programme monitoring should be different as they serve a different purpose. There is a tendency to use a core set of indicators for programme monitoring even when they are not necessarily relevant for assessing programme objectives and targets.

Ease of use and dissemination: Participants emphasized the need for the metric to be simple to use, accessible and easy to communicate.

Table 3: Feasibility of data acquisition and analysis

Feasibility of data acquisition and analysis		
Guiding questions	**Prioritized criteria (group 5)**	**Prioritized criteria (group 6)**
• What are the potential means of data collection or acquisition? • What are the potential approaches to data analysis?	1. Data quality (level of precision and comparability) 2. Platform (new platform or modifying an existing platform) 3. Validity (how to define and compare with counterfactual) 4. Contextual adaptation 5. Resources (cost and time to collect the data) 6. Communication (meaning for the broader diets narrative and audience for dissemination)	1. Intended use of data 2. Accuracy to assess intended dietary constructs 3. Data collection and analysis resources 4. Primary data versus secondary analysis 5. Participant characteristics

Points of discussion on feasibility of data acquisition and analysis

Data collection via national surveys: Participants discussed whether data should be collected through a national survey and integrated into global reporting channels. The cost of freestanding surveys was noted, compared with lower-cost alternatives, such as appending questions to an existing household expenditure survey.

Data use as the first step: Participants noted the importance of first determining the intended use of the data before identifying criteria for feasibility of data acquisition and analysis. It was also emphasized that metrics be disaggregated to the level of action, whether for programme, policy or global reporting.

Leveraging innovations: Innovations can be used to improve feasibility of data collection and analysis, such as modelling and techniques developed to facilitate larger-scale real-time data collection during the COVID-19 pandemic. Short turnaround for analysis and reporting is important and can be facilitated by mobile data. Another alternative to questionnaires could be to prioritize national food availability data and monitor purchases and production.

Modelling: There were contrasting viewpoints on the usefulness and reliability of metrics derived from modelling. Some participants suggested that modelling was critical for filling data gaps using existing data and could make surveys less expensive and repetitive, while others questioned the appropriateness and reliability of a metric derived from modelled estimates.

Table 4: Validity and reliability of the metric

Validity and reliability of the metric		
Guiding questions	**Prioritized criteria (group 7)**	**Prioritized criteria (group 8)**
• What specific technical standards should the metric meet? • What specific technical standards should the instrument or data collection method meet? • How should validity of the metric be assessed? • How could approach to validation vary by the intended use of the metric?	1. Acceptable, understandable and transparent 2. Sensitive and responsive to change (over time and in response to an intervention) 3. Reliable and valid for purpose and context 4. Comprehensive and flexible for different uses 5. Useful and actionable for various stakeholders 6. Measurable and feasible to obtain the data	1. Predictive of protection against NCDs (*verification in LMICs is a challenge*) 2. Predictive of nutrient adequacy 3. Readily interpretable and related to actionable steps (*for both the composite metric and its components*) 4. Validity of the metric 5. Validity of the data collection tool 6. Cross-cultural validity

Points of discussion on validity and reliability of the metric

Validity of the criteria of the metric is a different consideration than validity of the method to collect the information about the criteria. For example, validity of food and vegetable intake itself would not need to be measured; however, the way it is measured using a particular method could be assessed.

Predictive value of the metric is useful because it is conducive to promoting preventive measures before the onset of malnutrition. The metric should be predictive of both NCD risk and nutrient adequacy. Assessment of NCD risk may be challenging in some contexts, particularly in Africa, where there are limited existing data; however, there may be opportunities to conduct small, cross-sectional studies to assess biomarkers.

Accuracy of the metric is important to ensure that the methods used for data collection work in practice.

Recommended outcomes for which the metric could be validated and agreement of what constitutes a robust validation process would be useful.

III. Topic 2: Methods, tools and metrics to measure diets

The second topic of the consultation explored existing metrics for potential use in global monitoring of healthy diets (Part A) and potential data sources and modelling approaches for metrics of healthy diets (Part B). Below is a summary of the presentations covered under Topic 2.

Part A: Existing metrics for potential use for global monitoring of healthy diets

Minimum dietary diversity for women

Yves Martin-Prevel, Senior Researcher, French Institute of Research for Development
Maria Antonia Tuazon, Nutrition and Food Systems Officer, Food and Nutrition Division, FAO

MDD-W is a gender-sensitive dichotomous indicator of whether non-pregnant, non-lactating women aged 15–49 years have consumed at least five out of 10 defined food groups[11] the previous day or night. MDD-W is a food group indicator, based on reported intake of 10 food groups, that has been validated as a proxy of micronutrient adequacy.

The Women's Dietary Diversity Project developed and validated the indicator, with an aim to integrate it within large-scale surveys. The methodology of validation involved analysis of datasets from developing countries to assess relationships between food group indicator values and good quality quantitative food consumption data (from 24-hour recall). A four-step process was undertaken to validate indicators against micronutrient adequacy of 11 micronutrients. The analysis was performed either for non-pregnant and non-lactating women or for lactating women only. Candidate indicators were tested from 2006 to 2010 and several showed a consistent relationship with micronutrient adequacy of the diet, which resulted in a Women's Dietary Diversity Score (FGI-9) used between 2010 and 2012. Additional analyses were conducted from 2012 to 2014 to identify an appropriate dichotomous indicator. Thresholds were explored for food group indicators showing that 10 food groups with a threshold of five groups performed slightly better than other indicators at the individual and population level. The process culminated in a consensus meeting in 2014 where the dichotomous MDD-W indicator was endorsed.

Although the MDD-W indicator was validated and is computed at the individual-level, the statistics derived from it are at the population level. MDD-W is a proxy for one dimension of diet quality (micronutrient adequacy), a tool for analysing individual food group consumption and an instrument used for monitoring and programme assessment. MDD-W is advantageous because it can be expressed as prevalence; it is not resource-intensive; it is relatively easy to collect; it does not require portion assessment; it can be integrated within large-scale surveys; and it has cross-cultural relevance, especially in LMICs. It is limited in that it is only validated for non-pregnant, non-lactating women of reproductive age; it cannot assess diet quality as a whole or moderation and balance; and it does not account for day-to-day variability.

MDD-W is now being collected through large-scale surveys in 55 countries. Its recent inclusion in the DHS should double or triple uptake of the indicator. MDD-W has also been included in the Comprehensive Africa Agriculture Development Programme, used for programmatic policy purposes (e.g., to evaluate food security, micronutrient deficiency, gender equality, etc.), and used as a food-based indicator for nutrition monitoring and impact evaluation.

The roll-out of the new indicator in DHS included various regional and global events and dialogues to identify issues from users and data generators and address challenges and concerns. This process resulted in fast tracking the adoption of MDD-W within national surveys. MDD-W is also stressed in the FAO European Union strategic dialogue to fast track its roll-out to countries and an updated user guide was published to address technical and operational challenges.[12]

Efforts are ongoing to expand the use of MDD-W and address knowledge gaps. For example, there is a need to validate MDD-W for other priority groups, such as pregnant and lactating women, adolescent girls and school-age children. There is also demand for capacity development among FAO Members, including to ensure harmonization of data collection and use, and to integrate innovative approaches and technologies. The new FAOSTAT Food and Diet Domain[13] will become a central hub for statistics on dietary data and knowledge products for MDD-W. Advocacy for including MDD-W as an SDG indicator is also ongoing, with criteria for inclusion likely to be complete by 2025.

The Global Diet Quality Project

Anna Herforth, Senior Research Associate, Harvard T.H. Chan School of Public Health

The Global Diet Quality Project is a collaboration between Gallup, Harvard T.H. Chan School of Public Health and the Global Alliance for Improved Nutrition (GAIN), with an aim to bridge the dietary gap by producing openly available, nationally representative, gender-disaggregated data on diet quality in more than 140 countries annually. The project seeks to enable sustained data collection by national governments through provision of country-adapted data collection tools.

The Diet Quality Questionnaire (DQ-Q) was developed in tandem with indicators to ensure that the tool is fit for purpose and that indicators are feasible to collect. The approach is to ask yes/no questions about foods or drinks consumed in the previous day or night using 29 food groups[14] but operationalized with country-adapted food items. Questions are read aloud in person or by phone and the questionnaire takes about five minutes to administer, with no specialized training, probing or adaptation required.

DQ-Q was designed to measure multiple facets of diet quality, including both nutrient adequacy (measuring MDD-W and the Food Group Diversity Score for the total population) and risk factors for NCDs (based on WHO guidance on healthy diets).[15] DQ-Q allows for monitoring intake of ultra-processed foods and is tracked in a way that has some relevance for sustainable diets.

The 11 recommendations[16] listed in the WHO guidance on healthy diets form the basis for creation of a new indicator: the Global Dietary Recommendations (GDR) Score. The indicator was validated against quantitative intakes aligned with each of the recommendations. It has two components: the healthy score, which is validated to reflect the first five elements; and the limit score, which is validated to reflect the last six elements. The limit score is subtracted from the healthy score to obtain the total GDR Score.[17] Consumption of foods from different food groups are correlated for health protective foods and foods to limit. When these scores are combined and transformed into a positive range, the GDR Score has a positive correlation of about 0.6 with meeting 11 recommendations. It also has a negative correlation with percent of energy from ultra-processed foods of about 0.5. These correlations are well within range for this type of indicator showing good validity for the indicator.

Next steps involve verifying the validation in additional diverse country datasets, as well as proxies of individual recommendations in order to have dichotomous indicators for different components, such as fruit and vegetable consumption, sugar intake, etc. Further, next steps involve work to develop a combined score that includes the GDR Score and the Food Group Diversity Score as an indicator of a diet pattern that meets nutrient needs and protects health.

The DQ-Q was validated against a reference method in three countries, with the key finding that it produced similar population scores as a 24-hour recall for both food groups and the indicators. Cognitive testing was undertaken in different settings, which has helped adapt and improve the formulation of questions and avoid misclassifications. Each food group question is adapted through a country adaptation process based on key informant interviews to identify country-specific food examples to use in list-based questions. This will produce country-adapted tools, where technical expertise is front-loaded (rather than by enumerators), making them simple to use. This facilitates and standardizes the collection of both diet quality indicators and MDD-W. Question adaptations are also being used by DHS to collect MDD-W and IYCF questions. Fully adapted DQ-Q tools for 100 countries will be publicly available by the end of 2021, which is important given the demand from countries for consistently adapted tools. Data are also being collected through the Gallup World Poll; by 2022, this will result in the beginnings of a global dataset.

There is a need to further scale up the full dataset to collect data across all countries globally. The cost of this effort is estimated to be about US$4 million, which is very cost-effective given the amount of data that would be generated. Better country uptake of the DQ-Q will also be needed as an important next step to ensure that countries can continue collecting these data through their own monitoring systems.



The Global Diet Quality Score

Megan Deitchler, Director, Intake – Center for Dietary Assessment, FHI Solutions

The Global Diet Quality Score (GDQS) is an overall metric of diet quality appropriate for global use. It was developed to address the gap in the availability of simple robust metrics to assess dietary quality, particularly in LMICs in light of inadequate micronutrient intakes and increasing overweight and obesity. It is intended to fill gaps in the availability of metrics and tools for use in global monitoring systems to be able to assess, monitor and track work towards ensuring healthy diets for all.

The process to develop the GDQS began with existing quantitative 24-hour dietary recall and food frequency datasets (from high- middle- and low-income countries) and constructed a candidate set of metrics of overall quality guided by the epidemiologic evidence and examined the associations with nutrient adequacy-related outcomes and NCD risk-related outcomes. The GDQS has been validated for global use among non-pregnant and non-lactating women of reproductive age. Additional validation analyses have been undertaken in select settings for women 50 years of age and older and for men 15 years of age and older. Once the GDQS was identified as the best performing metric, analyses were undertaken to compare it with other existing diet-related metrics (e.g., MDD-W for nutrient adequacy-related outcomes and HEI 2010 for NCD risk-related outcomes) to benchmark the GDQS performance. Two cohort data sets were used in the validation analyses to evaluate the responsiveness of outcomes to changes in the GDQS to assess diet quality over time and in response to an intervention, and to assess NCD risk-related outcomes where longitudinal design is beneficial.

The GDQS is an entirely food-based metric consisting of 25 food groups classified as either healthy, unhealthy or unhealthy when consumed in excessive amounts.[18] Quantification of consumption categories is used with each food group in scoring the GDQS (low, moderate and high); but the GDQS itself is simple to tabulate and no food composition data are required. Rather, in order to be suitable for use in global monitoring frameworks, a crude, proxy method is used to collect the data that is good enough to assess quantity of consumption.

Many datasets were examined to assess correlations between metrics and energy-adjusted nutrients. The GDQS performed well in assessing nutrient adequacy. A simplified version of the GDQS, with the consumption categories collapsed, was also tested to determine whether the quantities of consumption in the GDQS added value to the metric; results were clear that the simplified version did not perform as well and thus the full

GDQS was retained. Micronutrient biomarker data (e.g., for haemoglobin and folate) also showed an association between biomarkers and the GDQS and MDD-W metric scores.

In an assessment of the GDQS and NCD risk-related outcomes (nutrient inadequacy, metabolic syndrome and coexisting double burden), the GDQS increased as the odds ratio of each negative outcome decreased, with the P trend being highly significant. Other research showed similarly strong performance of the GDQS; for example, an assessment based on data of two-year changes in weight and waist circumference from Mexico showed that changes in the GDQS were significantly more predictive of these changes than other metrics (e.g., MDD-W and AHEI).

Data can be collected via 24-hour dietary recall surveys or food frequency surveys. However, to facilitate simple data collection for the GDQS on a global scale and be able to integrate it within large-scale existing survey platforms, an electronic tool was developed for enumerator-administered data collection that does not require country specific adaptation. The GDQS app is a 24-hour open recall to capture all foods and beverages consumed during the previous day, with a master database of foods classified into GDQS food groups integrated into the app; this allows for standardized data to be collected and for data on the DQ-Q and MDD-W indicators to be generated without any additional work from the enumerator, the respondent or the survey planners.

The GDQS app is being used to report automatically on the environmental impact of diets to feed into discussions on sustainability. The GDQS can be used for programming, planning and policy design to help understand exactly what foods and beverages are being consumed. Next steps include field testing and validating the GDQS app and working to integrate it within large-scale surveys.

Points of discussion

Below is a summary of related discussion points raised in plenary and the virtual chat.

Accounting for the contribution of fortified foods

Participants discussed whether MDD-W or DQ-Q account for the potential vitamin and mineral consumption in fortified foods. The MDD-W is validated to reflect dietary diversity composed mainly of unfortified foods; it is not designed to be used to assess coverage or impact of fortification or biofortification programmes.[19] There was almost no consumption of fortified foods in the datasets used to validate MDD-W. However, as consumption of fortified foods becomes more frequent, a question can be added about whether or not any fortified food was consumed; this can be analysed separately or via a non-standard version of MDD-W, although it is not clear if the latter has been validated. To reflect the contribution of fortified foods to achieving nutrient adequacy (e.g., fortified blended food provided to pregnant and lactating women), the World Food Programme (WFP) is using two versions of MDD-W: (1) the standard MDD-W indicator, where fortified blended food is coded as cereal; and (2) a modified version, where fortified blended food (or another comprehensively fortified food) is coded as "fortified or flesh food" to better capture the

contribution to micronutrient intake. The comparison of these two versions provides insights into both diversity and nutrient content.

Some participants noted that respondents may not be able to accurately identify foods that had been fortified, particularly in low-literacy settings. The process of capturing information on fortified foods depends on which foods are being fortified in a given setting and whether that information could be collected at an individual or aggregate level. It would also be important to consider the ability of a given country to monitor and regulate compliance with fortification standards, including foods that are imported and those that are produced/processed locally. There is a need to consider how to account for fortified foods in validation exercises and within individual-level or population-level nutrient adequacy assessments. Moreover, it was noted that while the coverage of micronutrient needs is important to measure, it is not equivalent to measuring dietary diversity.

The consumption of fortified foods would be substantially different in humanitarian contexts; it would therefore be important to account for this in settings where dietary diversity is being assessed in populations receiving food assistance, including blanket supplementary feeding. In humanitarian settings, metrics such as MDD-W can also be useful in advocating for improved ration quality. There is a need to be more systematic in including the consumption of fortified and biofortified foods as part of any tool to assess dietary intake in the general population as well as in humanitarian settings.

Fortification is highly country-specific and fortificants are not assessed by the GDQS app per se; however, the data collected from the app include expansive recall data that can be applied to better understand the distribution of fortified food consumption in a population. While the GDQS app collects recall data at the level of individual foods, the portion sizes are collected at the food group level; this means some assumptions will be required concerning how to disaggregate food group portions to assign level of consumption for each fortified food. This approach will require validation and is being discussed.

GAIN has developed a toolkit that, when combined with market data on fortification level, can be used to quantify nutrient contribution from fortified foods.[20] Several questions from that toolkit could be adapted to these data collection tools to refine data on coverage and consumption of fortified food. Data collected thus far suggest that it is risky to rely on fortification standard levels to estimate nutrient contribution, as fortification compliance by industry is highly variable. Wageningen University is also taking steps to consult experts on the best way to monitor consumption of fortified and biofortified foods as part of the framework of the European Union-funded 2FAS project. Those interested in joining can contact Inge Brouwer of the CGIAR Research Programme on Agriculture for Nutrition and Health. Modest-sized surveys using nutritional biomarkers may be needed to evaluate the effects of fortification programmes to complement dietary intake data, which are still very important.

Validation

Validation is often considered a yes/no binary question; however, it would be useful to consider a typology of metrics and their degrees and kinds of validity.

There are plans to validate the GDQS app against nutrient intakes, biomarkers and anthropometric measurements in a study population of adult men and women in Thailand.

Several participants noted that MDD-W was the only diet quality metric that had been extensively validated and endorsed by a wide group of experts. Another participant suggested that a combined indicator of the GDR Score and MDD-W, could capture similar information to the GDQS, and has a validated tool and feasible data collection platform. It was also noted that the GDQS captures several characteristics of diet quality and has been validated for its ability to predict health outcomes, in addition to being validated against a better measure of food intake like a 24-hour recall or weighed food record.

Alignment with WHO guidelines

Some participants questioned the alignment of the DQ-Q with WHO guidelines, suggesting that data to support some of the recommendations were inconsistent. For example, there is no evidence that total fat intake should be less than 30% of energy; rather, the data on obesity and cardiovascular disease may support the opposite recommendation if the type of fat is healthy. It was noted that these elements of the DQ-Q could be adjusted as the WHO guidelines are updated in response to new evidence. Further, researchers can make their own metrics with open access data. The DQ-Q development team did not consider it their role to evaluate WHO recommendations; rather they sought to use recommendations that were intended for global use, with the mandate to represent all Member States.

Complementarities between the DQ-Q and the GDQS

Regarding the intended platform for the two metrics, the DQ-Q was intended for use in multi-topic surveys and by non-nutrition experts (e.g., agriculture managers who want to measure MDD-W but lack the expertise or resources to carry out a 24-hour open recall). Gallup has played a catalytic role in demonstrating how data can be collected globally and how the DQ-Q can be used in many types of surveys without requiring nutrition expertise. Similarly, the GDQS app aimed to be simple enough to include in large-scale surveys. The GDQS is intended to be an overall composite metric of diet quality, whereas the GDR Score of the DQ-Q is one component of the suite of metrics (that includes indicators intended to measure nutrient adequacy – i.e., MDD-W and the Food Group Diversity Score). However, there are plans to validate a combined DQ-Q metric in the coming months.

The list of food groups is similar between the two metrics; however, the DQ-Q uses country-adapted food items, while the GDQS does not require adaptation. There was a query about how to ensure confidence in the validity of the global applicability of the GDQS, given that local adaptation is not required for the app used to generate it. The GDQS team has reviewed 24-hour recall surveys from around the world to compile a

global database of foods and beverages; this is similar to a first pass of a 24-hour recall multi-pass survey and collects data on how people name and refer to their foods. The GDQS app's automated search function helps identify foods that are likely matches to what the respondent mentioned based on the database. The GDQS team will have further insights into whether country adaptation is needed later in 2021, after primary data collection is complete.

The GDQS was validated against outcomes of nutrient adequacy and NCD-related risks, while the DQ-Q was validated against dietary recommendations and guidelines. There are also important differences in data collection between the two metrics: the GDQS relies on data collected through the GDQS app using open recall of foods and beverages consumed and requires some data about quantity of consumption; existing data (such as 24-hour recall data) can also be used to calculate the GDQS. In contrast, the DQ-Q asks respondents yes/no questions about their consumption of a sentinel set of individual foods and does not collect data on quantity of consumption.

The two metrics provide different data that can be triangulated and used to make meaningful inferences. Also, the GDQS app can produce the data for the indicators related to the DQ-Q and the MDD-W to create a suite of indicators without requiring additional questions. Given that both the GDQS and the DQ-Q can serve as/provide proxy indicators for nutrient adequacy and NCD risk, it is worth considering whether and how these efforts could be harmonized and scaled up globally. One option would be to agree on a unified approach, with an option to quantify consumption levels if that information is fit for purpose in specific contexts. The DQ-Q team noted that given the capabilities of end-users and diverse respondents, they did not find a feasible, valid way to capture quantified consumption. However, they did find that food group level consumption – along the lines of MDD-W data needs, with the GDR Score as a complement – are a feasible compromise that can provide a lot of information.

Part B:
Potential data sources and modelling approaches for metrics of healthy diets

Household consumption and expenditure surveys

Ana Moltedo, Consultant, Expert on Food Security and Nutrition Statistics, Statistics Division, FAO

Household consumption and expenditure surveys (HCES) is an umbrella term for household-level surveys developed to inform economic policies, provide poverty estimates and compute the Consumer Price Index. Examples of HCES include Household Budget Surveys, Household Income and Expenditure Surveys, Integrated Household Surveys and Living Standing Measurement Surveys.



HCES collect information on household characteristics (e.g., region, urban or rural area, source of drinking water); household member characteristics (e.g., sex, age, education, occupation, income and/or expenditures); and food acquired and/or consumed (by households and sometimes at the individual level for food consumed away from home) in terms of quantities and/or monetary values from all food sources. Some surveys also have an agriculture module.

In terms of coverage and frequency, HCES are conducted in LMICs every 2–10 years. By 2018, there were more than 845 surveys for at least 137 countries. [21] Surveys are representative of the entire population at national, regional and/or urban and rural area.

A strength of HCES is the type of information they collect. For example, the collection of information on household composition by sex and age enables assessment of nutrient needs for the population; socioeconomic characteristics enable different types of analysis (e.g., by food insecurity level); food sources are useful for identifying vehicles for food fortification; food amounts can provide a quantitative assessment of apparent consumption; and food monetary values can be useful when analysing environmental factors related to food insecurity. Microdata from HCES are also available for download via several platforms. [22] FAO and the World Bank also developed food data collection guidelines for HCES. [23]

Limitations of HCES include the lack of standard food module, resulting in differences in surveys across countries; for example, countries may collect information on food acquisition, consumption or a combination of these. There may also be variability in the reference period, the method of food data collection and the food list (including number of foods and the foods for which information is collected). This limits comparability across surveys. Other challenges include a lack of specificity needed for good quality

food matching (e.g., distinction between refined and whole grains), the conversion of non-standard units of measurement (e.g., cups to grams), and the possibility that seasonal variations are not captured. Finally, there is no information on intra-household food distribution, reported data are always prone to measurement error and there are challenges in measuring food consumed away from home.

FAO uses HCES to estimate a proxy for the variability in the distribution of usual dietary energy consumption, which is a parameter used to estimate the SDG 2.1.1 indicator of prevalence of undernourishment. HCES are also used to produce food and nutrient statistics for the whole population, national and subnational levels, and by food groups and food items. FAO is participating in the development of guidelines on how to process HCES food data for poverty and food security analysis, as well as an analysis of the feasibility of extending the FAO methodology used to estimate the prevalence of undernourishment to nutrients other than dietary energy.

Supply utilization accounts and food balance sheet data

Rachele Brivio, Food Balance Sheets Expert, Statistics Division, FAO

The food balance sheet (FBS) is a national accounting or statistical framework that provides a quick and cost-effective tool for obtaining a picture of the agri-food situation of a country and for analysing trends over time. The FBS brings together the variables of supply and utilization (referred to as the supply utilization account, or SUA). For foods available in a country in a given year, the total supply (e.g., production, import, etc.) must be equal to the sum of the utilization (e.g., export, feed, seed, losses, processing, food availability etc.).

FBSs are standardized aggregations of SUAs by commodity groups. To create them, a SUA must be compiled for each food. Once all the SUAs are compiled, balanced and validated, they are converted into primary equivalents and aggregated according to the respective FBS group (e.g., the SUA for flour of wheat, bread and pastry are converted into wheat equivalent and then aggregated into the "wheat and product" FBS group). The FAO SUA/FBS databases cover national-level estimates for about 180 countries. About 600 crops and livestock products are covered (450 food items) [24] annually from 1961 to 2018. Official data are collected for both supply and utilization variables, when available. However, while official production and trade data are usually quite available and reliable, for other utilization variables (including food availability) official/unofficial information is scarce. For this reason, whenever there is no data, these are imputed using statistical models.

In the SUA/FBS framework, food availability refers to quantities of any substance, whether raw, processed or semi-processed (including drinks), available for human consumption at the retail level by the country's resident population. This includes food in all settings (e.g., households, schools, hospitals), any food waste at the retail level, and food available for refugees and guest workers. FAO derives the following indicators from FBS data (by total in a country/per year and per capita/per day): food availability in quantity expressed in terms

of commodity equivalent (in the FBS) but also for each single commodity (in the SUA); food availability in calories; and food availability in proteins and fats.

Limitations include the fact that food or nutrient availability in the FBS does not capture distribution across groups. Further, food availability from the FBS is not the same as consumption; indeed, availability is expected to be greater than apparent food consumption from HCES. Strengths of the data are as follows: they cover almost all countries and are updated annually, allowing for comparisons; they provide a complete picture of food supply in a given country; they show the sources of supply and its utilization for each food item or food group; they provide information about the food available for human consumption; and they show the changes over the years in types of food available. FAO is working with countries to improve the quality of data collected; create a global food balance sheet community initiative; and include micronutrient information in the FAOSTAT corporate database (forthcoming). [25] Statistics from SUA data, HCES data, individual quantitative dietary data and MDD-W-related data will be disseminated through FAOSTAT (forthcoming), within an FAO Food and Diet Domain initiative, which aims to create an integrated platform for statistics from dietary data.

Food balance data and household consumption and expenditure survey data for global monitoring of healthy diets: Illustrative examples of relevant initiatives

Jennifer Coates, Associate Professor, Friedman School of Nutrition Science and Policy, Tufts University

FBS data and HCES data have been used to construct a range of diet-related metrics (both nutrient-based and food-based).

Data sources to monitor diet quality produce data at different levels, which yield different but complementary information. For many purposes, it is preferable to construct metrics using individual diet quality data (e.g., via quantitative 24-hour dietary recall surveys, food frequency questionnaires or DHS/Multiple Indicator Cluster Survey (MICS)/Gallup diet screeners); however, such data are not always available or nationally representative. HCES can provide insights about the quality of household food acquisition and consumption and FBSs can describe the nutrient quality of the national food supply.

Deriving indicators of nutrient supply, nutrient density, apparent intake and nutrient adequacy from FBSs and HCES: Nutrient-based indicators have been derived from HCES: A systematic review [26] found that 61 studies had used HCES to derive information on household micronutrient acquisition (i.e., micronutrient supply). Some of these studies were done as part of modelling work through Harvest Plus to inform decision-making around biofortification. A similar effort was undertaken through the UC Davis Micronutrient Intervention Modeling project, [27] which includes a tool to construct

indicators of micronutrient intake and adequacy from HCES data to predict how a micronutrient intervention can improve the nutrient adequacy of the population. In one application, data from a living standards measurement study were used to estimate dietary vitamin A inadequacy in Nigeria across a range of fortification scenarios. The Micronutrient Action Policy Support project team is co-creating a web-hosted tool to enable users to model micronutrient supplies with HCES and FBSs data, (coupled with locally-relevant food composition data in order to derive the nutrient estimates), to generate a range of modelled projections about supply and adequacy under various circumstances. [28] The tool is meant to be readily usable by the agriculture and nutrition community for a range of decision-making purposes.

FBSs data have also been used to reflect nutrient trends in national food supplies. One group constructed a micronutrient density index and an estimated prevalence of inadequate micronutrient intake index across 14 micronutrients and illustrated how the prevalence of inadequate micronutrient intake has declined over time and shifted geographically. [29]

Food and food group indicators, diet diversity and diet quality scores: There are many examples of using HCES data to calculate simple indicators of sentinel foods and food groups, as well as simple dietary diversity scores. Most of these have focused on indicators of food and nutrient adequacy, while fewer have sought to use HCES data to derive information on overconsumption of foods and nutrients, with some exceptions.[30] This is because many of these studies have taken place in countries where nationally representative individual-level quantitative dietary data were already available and because most HCES do not include processed foods and food eaten away from home as part of the consumption module.

Assessing food supply for meeting dietary guidelines analysis from FBSs: Data from FBSs have also been used to assess how a national food supply could viably support the consumption of a healthy diet. [31]

FBS data serve to illustrate whether the national food supply can contribute to the food available for a healthy diet at country level. These data also provide a picture of the national food environment and any constraints, although this is not consumption information and does not allow for disaggregation by age or sex. HCES are variable across countries, but many countries do collect these data. Efforts are underway to implement best practices in the design and implementation of HCES in order to standardize the ways in which food lists are constructed to better meet analytical needs. These surveys may still be limited when they only measure acquisition and not consumption. Moreover, they do not measure food eaten away from home and they cannot be disaggregated by individual.

Short diet screeners should be considered and some may be derivable from HCES data. Moreover, some indicators can be built into the HCES as an individual-level module; however, these are not comparable for global monitoring. In addition to focusing on the simple screener metrics needed for global monitoring, it is also important to consider what will ultimately be needed for robust dietary quality surveillance systems and complementary metrics that can be tracked at a range of levels and for different purposes.

The lowest burden metrics should be complemented by a range of granular data sources (such as 24-hour dietary recall, HCES and FBSs) that can provide policymakers with a deeper understanding of the issues identified by metrics derived from lower burden dietary screeners.

Diet quality metrics derived from modelling approaches: The Global Burden of Disease

Ashkan Afshin, Assistant Professor, Health Metrics Sciences, Institute for Health Metrics and Evaluation, University of Washington

There are a number of challenges in estimating the disease burden of nutritional risks at the population level. Data for estimating intake or exposure are limited or scattered, they are not always in the public domain, and they are often inconsistent across countries. There is also a lack of consensus on how to define and measure nutritional risks at the population level and what constitutes optimal nutrition.

The Global Burden of Disease (GBD) team developed some solutions to address these challenges. The first step involved identifying and updating all data sources that provide information about a dietary risk factor of interest; then data are standardized across data sources by adjusting to a 'gold standard' (crosswalking). The process began using statistical regression and then moved to a more sophisticated algorithm, which adjusts for the biases associated with a specific data source. For example, 24-hour recall is considered the gold standard for most dietary data. After harmonizing the data, an estimation process is used to ensure all quantities are estimated consistently, and new data are incorporated as they become available. Estimates are updated on an annual basis. The comparative risk assessment in GBD involves several steps: selecting the risk factors to be measured (e.g., diets high in processed meat, diet low in whole grains); estimating intake; estimating associated health effect; and defining optimal level of intake. Based on the last three factors, the estimated population attribution fraction is multiplied by the disease-specific burden, which allows the attributable disease burden for each dietary risk factor to be estimated. These are aggregated to determine the burden of disease related to overall dietary factors.

The dietary risk factors included in GBD are those with convincing or probable evidence of health effect, based on the criteria of World Cancer Research Fund International and using a framework to assess the strength of evidence for each dietary outcome. Multiple sources of dietary data are used (e.g., 24-hour recall, supply utilization, food frequency questionnaires, sales data, Household Budget Surveys), each with its strengths and weaknesses. These data are harmonized to make them as comparable as possible to the gold standard of dietary recall (using the process described earlier). Each dietary risk is then modelled; generally, after harmonization, most data tell a similar story. Inconsistencies are addressed by triangulating different data sources in the GBD to ensure that the estimate is not sensitive to the errors associated with one type of data.

The next step is to characterize the usual dietary intake at the population level and estimate the population distribution. An innovative framework was developed to combine different families of distribution based on goodness of fit to capture the intake of various dietary factors at the individual and population level before estimating the burden. With these data, multiple metrics can be generated based on intake level or burden level. GBD metrics are based on data availability (e.g., geographical coverage of a dietary factor), data quality, relationship with health outcomes, and sensitivity and specificity of the marker and indicator. Indicators can be based on a mean intake or proportion that is less than the recommended intake. GBD can also estimate different indices and metrics (e.g., AHEI, population attributable fraction, summary exposure value, attributable deaths, and disability adjusted life years).

The goal of the GBD is to provide a platform for estimating metrics for characterizing the diet. The reliability of the metrics depends on the primary input data that are used for developing the metrics.

Diet quality metrics derived from modelling approaches: The Global Dietary Database

Victoria Miller, Postdoctoral Fellow, Friedman School of Nutrition Science and Policy, Tufts University

The Global Dietary Database (GDD) has performed work to leverage existing dietary data and to create a comprehensive, standardized database that assesses individual-level diets around the world. The goals of the GDD are to: (1) estimate individual food and nutrient intake worldwide for the years 1990–2018; (2) create a public data and methods resource for the global nutrition community; (3) use estimates to quantify disease burdens attributable to diet; and (4) use estimates to evaluate and improve public health/nutrition policies.

The GDD methods begin with systematic electronic searches and communication with data owners to identify sources of individual-level dietary intakes, prioritizing nationally or subnationally representative surveys, focusing on LMICs, as well as on 24-hour dietary recall surveys or food frequency questionnaires. Standardized protocols are used to identify, extract and analyse the data in a comparable manner. The model generates means and statistical uncertainties for 54 dietary factors and is stratified by country, age, sex, education, urban/rural residence, and year, for 185 countries.

The GDD includes 14 foods, 7 beverages and 33 nutrients; these may be expanded in future iterations. It currently includes 1,220 dietary surveys in 187 countries, with about one-third from high-income countries. Almost all were collected at the individual level and most are nationally representative. The greatest number of surveys are on fruits and vegetables, and the fewest surveys are on reduced fat and full fat milk. There are fewer surveys on nutrients than on foods; this may because data owners need to derive nutrient intakes themselves using local food composition tables.



Modelled estimates can be used to derive existing dietary indicators. Component scores have been created for three NCD indicators (AHEI, Dietary Approaches to Stop Hypertension [DASH] and Mediterranean Diet [MED] scores). Further, separate healthy and unhealthy dietary pattern scores have been developed and a single total score. [32] Modified versions of existing indicators for maternal and child health could also be created, such as MDD for children aged 6–23 months and an animal-source food score. The GDD team also collaborated with FAO, WHO and the European Food Safety Authority to harmonize existing 24-hour recalls/records to provide granular, standardized microdata.

The GDD metadata, primary surveys and modelled estimates can be downloaded online.[33] Strengths of the GDD are as follows: it uses individual-level dietary data from national studies; it has benefited from extensive work to standardize existing dietary surveys; and dietary intakes are estimated for most food groups and are stratified by demographic characteristics. Limitations are as follows: data were limited for some dietary factors, demographic groups, countries and years, and some foods and food groups were not included. GDD data can be used to assess global diet quality within and across countries and regions over time; to investigate drivers of diet quality and transitions over time; to estimate disease burdens attributable to poor diet quality; to model policies for improving diet quality and reducing disease risk; and to develop new or existing indicators (using granular standardized data).

Nova score for the consumption of ultra-processed foods: A new tool to monitor and benchmark population diet quality

Carlos Monteiro, Professor, University of São Paulo

The Nova-UPF Score is a new tool to monitor and benchmark diet quality globally. It was designed to be a proxy for the actual population dietary share of ultra-processed food (UPF). It corresponds to the number of subgroups of UPF consumed on the day before, calculated with the application of the Nova-UPF self-report screener, which is used on a mobile phone and contains 23 questions about foods and beverages consumed the day before. The actual dietary share of UPF corresponds to the total UPF intake divided by the total food intake.

There is evidence to support the use of dietary share of UPF as a measure of the quality of diets. Higher dietary share of UPF is strongly associated with diets of increased energy density; increased content of free sugars, saturated fats and trans-fats; and reduced content of protein, fibre and micronutrients. [34] Higher dietary share of UPF is also linked to other health-relevant diet attributes, such as reduced presence of bioactive non-nutrient compounds, [35] increased presence of packaging materials (e.g., bisphenol A), [36] increased presence of potentially harmful additives (e.g., emulsifiers), [37,38] among many others. Further, seven systematic reviews were published in 2020, which show that a higher share of UPF increases the risk of obesity, hypertension, diabetes, dyslipidemias, cardiovascular

diseases and all-cause mortality. UPFs are also the most rapidly growing food industry sector.

The Nova-UPF Score was validated based on data collected from 300 adults who responded to the screener, followed by a 24-hour dietary recall using a five-stage multiple-pass method; the performance of the Nova-UPF Score in reflecting the UPF dietary share was calculated with the 24-hour recall as the 'gold standard'. As expected, the dietary share of UPF increased as the score increased. The validation showed that the Nova-UPF Score, obtained in a quick and practical manner using an electronic self-report questionnaire, has good potential to reflect the dietary share of this food group in Brazil.

In Brazil, the Nova-UPF Score is being used to monitor NCD risk factors through telephone interviews; in school-based adolescent health surveys; and in household-based adult health surveys. The Nova-UPF Score follows the same time trends in the prevalence of NCD as those identified in Vigitel (the annual surveillance system in Brazil); more data will be needed to determine if they continue to correlate. Nova-UPF has the potential to be used in every country; the screener and subgroups are currently being adapted and validated in Ecuador, India and Senegal in order to incorporate the score into the surveillance systems of these countries. The advantage of the Nova-UPF Score is that the metric allows countries to interpret and act on the dietary issues affecting their population.

Points of discussion

Below is a summary of related discussion points raised in plenary and the virtual chat.

Resources and research underway related to HCES and FBS

Additional research is underway related to FBSs. Keith Lividini at HarvestPlus is developing a database of FBSs for all countries and foods by each element in the balance sheet for a wide range of nutrients, which will soon be publicly available. In addition, a simple nutrient balance sheet analysis is being conducted by Massey University. [39]

HCES food price and food expenditure data have also been used in the WFP "Fill the Nutrient Gap" analyses to estimate the cost of the diet and affordability.

The ADePT software platform, [40] developed jointly by FAO and the World Bank, is a useful resource related to HCES data and dietary indicators. [41] ADePT is software for national statistics offices to use to calculate food security, poverty and now dietary indicators from their HCES. FAO engaged in a process, funded by the INDDEX project, to modify ADePT software to make it useful for calculating dietary indicators. This involved important methodological work to assess how these indicators could be calculated considering the variation in types of HCES. The software is well documented by accompanying manuals.[42,43]

Lastly, a global initiative is also underway to develop a periodic table of foods. [44]

Considerations for modelling predictions

The forthcoming Gallup DQ-Q data will provide prevalence of consumption of each food group in each country (beginning in 2022) and these food groups map well with the dietary risk factors tracked by GBD. The prevalence data can be used as covariates for improving the GBD model.

In developing the EAT-Lancet project, the GBD data provided the only estimates of intake for all countries. At the same time, there is a need for countries to continue improving the quality of their dietary data given that so many imputations are needed at present. More and better individual-level dietary data are needed to further optimize the accuracy of model predictions; Intake and the Tufts/INDDEX project are engaged in the work of supporting LMICs to generate more and higher-quality individual-level quantitative dietary data. [45] Individual-level quantitative data are critical for assessing disparities, including those related to age and gender. [46]

Differing perspectives were shared about the use of modelled data for global and national monitoring estimates. Some participants felt these data were very useful for filling data gaps, but that modelling and related assumptions need to be transparent. In contrast, others argued that countries need to understand the source of the data that feed into their country estimates and the methods used to generate the results, and that modelled estimates are not transparent enough for this particular use.

Comparing the GBD and the GDD

Participants discussed the differences and complementarities between the GBD and GDD, including how to coordinate the two initiatives and clarify for what purposes one might be more reliable than the other. Modelled estimates can either be estimated from other covariates or they can use proxy data (i.e., data that are not at the individual level but are harmonized to be comparable). The GBD uses proxy data to measure intake; for countries without 24-hour dietary recall surveys or other 'gold standard' data, GBD estimates are modelled based on existing data sources (e.g., data on food availability or food sales). In contrast, the GDD does not use food availability or food sales data as a primary input; rather, these are covariates in the model. GDD stratification by education and urban/rural residence allows for estimating various subgroups. The GBD uses national level data, such as FBS, to make assumptions in order to derive age- or sex-specific estimates to match primary model inputs.

There are differences in the GBD and GDD modelled estimates for many countries. [47] The differences are driven by the type of data, the covariates used in the model, and the modelling framework; however, the most important driver is the differences in the data sources. Both methods have uncertainties, and it is important to consider the uncertainty around the mean estimates. It would be helpful to compare GBD estimates with the finalized GDD estimates when available and include confidence intervals.

There is variability in the amount of existing data across countries. GBD and GDD estimates also depend on the accuracy of these data, which highlights the importance of harmonizing and triangulating various data sources.

Predictive modelling can forecast the response to particular policies and be used for advocacy. This means that the predictiveness and responsiveness of metrics to policy are important considerations. Modelling can also be used to predict whether targets will be achieved.

Types of indicators

There is consensus on the need for more and better dietary data and different types of indicators. Follow-up discussions among those developing these indices, metrics, databases and tools will be important to avoid duplication and ensure the greatest contribution to the public good. Consensus on at least one variable on diet quality will be important for global recognition. The 24-hour dietary recall is ideal in providing maximum flexibility in how the data are used; however, it is not feasible for all countries. As such, it will be important to prioritize how data are collected (i.e., by 24-hour recall), while acknowledging that some other methods that are fit for purpose and less flexible may be able to generate the needed data.

One participant suggested that a distinction should be made between indicators for epidemiological studies and indicators for surveillance systems. Rather than focusing on indicators that explain the variability in disease risk, the task of the consultation should be to identify modifiable risk factors and develop indicators for surveillance systems that support informed policies.

A suggestion was also made to consider the development of proxy indicators (based on key covariates and determinants) to track changes in dietary intake and nutrient adequacy. While it would be ideal to capture primary data that can be stratified more frequently, there are also opportunities to develop alternative metrics for a range of objectives, such as policy monitoring, programme planning and measuring trends over time. Achieving consensus on a proxy indicator with high predictive proficiency could also help fill data gaps to help inform programmes and track them more effectively.

The experience of developing the IYCF indicators is instructive. The IYCF indicators took six years to develop and 13 years to update, highlighting the extensive process needed to test, learn and adapt based on experience. This process will likely be similar for global diet quality metrics.

The merits of 24-hour dietary recall

There was some discussion about defining the 24-hour dietary recall as a 'gold standard'. Many participants noted the flexibility of these data. However, a point was also made that 24-hour recalls are not widely used, often rely on a small sample size and are based on food composition tables made of averages of averages, where the quality of the food is unknown. To influence policy, the method must be widely used; this means it is important

to consider what existing metrics are fit for purpose to influence policy (and potentially consumer awareness). For example, MDD on its own is not sufficient to monitor children's diets, but it was effective in influencing policy. In contrast, another participant noted that 24-hour dietary recalls can be used for foods (it is not necessary to calculate nutrients) and can give mean values very similar to weighed diet records.

One participant suggested that the ideal system would be to train a small group of data collectors to do continuous 24-hour dietary recalls, which does not require a large infrastructure and can yield good mean values from even a few hundred people; over a year-long period, data could be collected from 1,000 people at very low cost. Another participant proposed a combination of 24-hour recalls conducted every 5–10 years, combined with short yearly food-based 24-hour recalls, which would provide an indication of dietary patterns for monitoring NCDs.

Overall, participants noted that 24-hour dietary recall and nationally representative survey data would be an important goal for countries to strive towards. Tools and processes under development can make this process easier and less time-consuming.

Communicating about dietary metrics and supporting decision-making

Non-experts in dietary assessment can be easily confused by the terminology and framing of dietary data. While this consultation has focused on global monitoring of healthy diets, there are other monitoring objectives – such as those related to national policies, programme planning and measuring trends over time – that require different levels of specificity and validity. It is critical to achieve consensus on the characteristics of the metrics and methodologies used to serve these different purposes. The choice of metric or methodology depends on how the data will be used, what resources are available and the priorities that are set. A product of this consultation could be to develop a framework, matrix or decision-making tool to help users make these decisions based on their specific objectives and context.

To simplify and better communicate the diverse efforts to construct similar metrics, it may be useful to develop generic names or terminology for types of measurement that yield interoperable data to quantify similar concepts. This process would help describe what the various fit-for-purpose metrics have in common and how they differ from other types of measurement. Different research groups could then advance their work on the details of each type of metric over time, with their own brand names or acronyms for specific studies and software.

Metrics for national decision-making are critical and often the most likely to influence how people eat. Policies and legislation at the national level – for example food labelling, taxation, etc. – have an important influence on diets, and indicators to assess the effectiveness of these policies are key.

Processed foods and the Nova-UPF Score

A number of participants agreed that too little attention had been afforded to the role of non-nutritive bioactive compounds in unprocessed foods in the protection of human health. Increasing consumption of highly processed and unhealthy foods for infants and young children and the ways these foods are often consumed (e.g., food pouches) is a huge and growing problem in LMICs. At the same time, food groups can capture many of these non-nutrient components that cannot be characterized; for example, high consumption of fruits and vegetables and low consumption of UPFs correlates well with reduced NCDs.

Framing types of food and food products using the Nova classification is a ransformational way to think about diet. It is simple and easy to communicate to policymakers and consumers, and could support advocacy for successful interventions to curb the epidemics of obesity and NCDs.

The Nova-UPF team noted that commonly consumed subgroups of UPFs are usually the same around the world. However, it is important that the appropriateness of the original list of subgroups be examined and adapted as needed in each country or region. Efforts are underway to harmonize the screeners used in Ecuador, India and Senegal.

There was some discussion about the concept of a category for 'healthy processed food' in the Nova-UPF (e.g., to identify steps taken to preserve or enhance the nutritional value of foods, such as fermentation, canning, freezing). Indeed, Nova-UPF has four groups corresponding to four types of food processing: Group 1 foods are minimally processed and only offer benefits; groups 2 and 3 foods are acceptable when consumed in small amounts; and group 4 foods should be avoided. [48]

Data collection platforms

Participants considered which data collection platforms would be sufficiently frequent and feasible for collecting dietary data (e.g., in terms of time, questionnaire length, cost). There was openness to a wide range of platforms, with a preference for data collection via DHS, MICS and other national multi-topic household surveys conducted every 3–5 years.

Opportunities and gaps in global monitoring of healthy diets in children 2–19 years of age

Ty Beal, Research Adviser, GAIN

This presentation focused on global (rather than national) surveys, indicators, and opportunities for measuring diets as a whole, rather than specific food groups.

There are two global surveys targeting adolescents: the Global School-based Student Health Survey and the Health Behaviour in School-aged Children Survey. The former only captures school-going adolescents primarily aged 12–17 years from countries in

Africa, Asia and Latin America. In most of these countries, school enrolment is at least 50% or more; however, there is still a proportion of children being missed. The surveys measure the frequency of hunger and fruit, vegetable, sugary soft drink, non-carbonated sugary drink (a new indicator), and fast-food intake (now only included in core expanded modules). These surveys have not been validated. Health Behaviour in School-aged Children Surveys are conducted in school-going adolescents aged 11, 13 and 15 years, primarily in Europe and some settings in North America. Survey questions address the frequency of fruit, vegetable and sugary soft drink intake. Both these school surveys only measure a handful of foods; they do not measure diet quality.

While no specific indicators exist for children 2–19 years of age, there are potential global diet quality metrics that could be used for subsets of this age group. MDD-W would capture adolescents 15–19 years of age, although it is important to note that while it has been validated for women of reproductive age, it has not been specifically validated for 15–19-year-old girls. The challenge of existing surveys, such as DHS and Gallup World Poll, is that they are not necessarily intended to be disaggregated for this age range and sample sizes may not be sufficient. In some cases, a broader age group, such as 5–24-year-olds could be used instead.

Some of the diet metrics discussed in the consultation thus far could potentially be used for children and adolescents (see Table 5). The GDR Score can be calculated when the DQ-Q is administered to 15–19-year-olds and is a proxy of NCD risk. The DQ-Q will provide this information from 40 countries in 2021 and more going forward, but it is not necessarily powered to be disaggregated by age. The GDQS and the Nova-UPF are awaiting validation across broad age and sex groups (2–19-year-olds). While these scores can be calculated quickly, a global platform would be needed to administer them to scale up globally.

Some work has been undertaken by Arimond et al. (forthcoming), to validate food group diversity and MDD as indicators of nutrient adequacy in 2–19-year-olds in Mexico and China. The data from Mexico are nationally representative and results show a strong correlation between food group diversity and mean probability of adequacy. In China, results are similar: the Food Group Diversity Score has a strong relationship across age groups. Overall, the Food Group Diversity Score is a meaningful proxy indicator of micronutrient adequacy for 2–19-year-olds. For MDD, food group cut-offs are inconsistent and the issue of a universal cut-off in 2–19-year-olds is challenging and unresolved.

There are very few existing platforms that collect any data on diet quality in 2–19-year-olds. While there is some potential for data to be collected through existing surveys, there are important limitations for each sub-age group. For example, DHS or MICS could be considered as a platform for collecting dietary data on the 2–5-year-old age group, but there is currently no platform for the 6–9-year-old age group. While dietary data could be collected from adolescents aged 15–19 years via DHS and Gallup World Poll, the survey size needed for disaggregation is a challenge, as well as reaching out-of-school children.

Table 5: Summary of potential global metrics for individuals aged 2–19 years

Indicator	Strengths	Limitations
Food Group Diversity Score	• Apparently valid indicator of nutrient adequacy for boys and girls 2–19 years of age • Easily obtained for adolescents 15–19 years of age from existing global surveys (e.g., DHS and Gallup World Poll)	• May be unclear to non-experts • Does not indicate NCD risk • No global data collection platform for children 2–14 years of age
MDD-W	• Easily obtained for adolescents 15–19 years of age from existing global surveys (e.g., DHS and Gallup World Poll) • Easy for non-experts to understand	• Not validated for individuals 2–19 years of age (no established cut-offs) • Does not indicate NCD risk • No global data collection platform for children 2–14 years of age
GDR Score	• Valid indicator of adherence to global dietary recommendations (and by proxy, NCD risk) • Easily obtained for adolescents 15–19 years of age from existing global surveys (e.g., DHS and Gallup World Poll)	• Does not measure quantitative intakes • Does not indicate nutrient adequacy (unless paired with Food Group Diversity Score or MDD) • No global data collection platform for children 2–14 years of age
GDQS	• Valid quantitative indicator of nutrient adequacy and NCD risk among adolescent girls 15–19 years of age • Validated with health outcomes	• Data collection tool needs validation • No global data collection platform • Needs quantitative dietary data

Another consideration is whether full dietary data for adolescents can be collected in schools, and if so, which survey tools, metrics and platforms would be most effective. Further, it will be important to consider whether 10–14-year-olds can provide accurate diet data independently. Lastly, there is a need to validate surveys for this age group.

There is a need to focus on valid metrics that have a valid data collection tool and can be incorporated into existing global platforms or feasible new platforms.

Points of discussion

Below is a summary of related discussion points raised in plenary and the virtual chat.

Collecting data on school-age children and adolescents

There are concerns about data collection validity for children aged 5–14 years because caregivers do not necessarily know what the child consumed and children may not be able to report it. [49] It may be easiest to obtain valid dietary data from older adolescents (e.g., ages 12–19 years), whereas ages 6–12 years would be more challenging. It was also noted that sampling only school-going children could introduce biases, as out-of-school children experience unique vulnerabilities. Strategies to engage school-age children and adolescents were also noted, such as 'gamification'.

Some participants questioned the need for detailed age stratification in measuring healthy diets, noting that understanding family and community diets would provide enough information for making rational policy decisions. It would be important to note, however, that school meal programmes require targets for energy, nutrient density and diversity; the current data void makes this challenging.

Cut-off points

The challenge of identifying a universal cut-off point for a score hinders many measurement efforts. It would help to discuss the pros and cons of universal cut-offs (cross-country, all age-sex groups) versus cut-offs tailored to a country and age group. A third approach would be to have a universal cut-off for each demographic group for international comparisons and monitoring, as well as adapted cut-offs for national or regional analyses or specific objectives.



Potential metrics and methods for global monitoring of healthy diets: Strengths, gaps and research needs

Edward Frongillo, Professor, University of South Carolina

Common terminology is important in communication about metrics for monitoring healthy diets. A construct is a phenomenon of interest that is being measured; it can be observable or unobservable (e.g., food insecurity is an unobservable construct but can still be measured). A measure assigns numbers to people or things to represent relations existing among them with respect to a specific construct; the number assigned represents the relative amounts of a construct (e.g., measuring a child's length). With a reflective measure, the construct leads to the measure and represents a reflection or manifestation of a construct (e.g., classical test theory). In contrast, with a formative measure, the measure leads to the construct and is formed or induced by measures and could be a

composite of variables (e.g., socioeconomic status, which is a construct that comes from the notion that occupation and education together mean something).

An indicator is derived from measures of the phenomenon for the purpose of demonstrating something about it and implies an understanding of what is better and worse. It is usually binary and implies a cut-off point. Measures and indicators together allow for interpretation or action. For example, dietary diversity is used to assess the construct of nutrient adequacy. This involves a data collection system (e.g., DHS), a method (e.g., a questionnaire), a measure (e.g., the number of food groups), and an indicator (e.g., the minimum number of food groups (i.e., MDD). Together, they facilitate an interpretation and promote action.

Interpretable and actionable measures must be judged against certain criteria: validity (i.e., accurately reflect a given purpose and context); reliability; cross-context equivalence (i.e., comparability); relevance to purpose and context; absolute and relative cost; and credibility.

Five considerations can help guide next steps in determining appropriate metrics for healthy diets. The first consideration is whether a reflective or formative measure is most appropriate. A reflective measure that begins with a construct can provide conceptual clarity and is easy to communicate. The second consideration is the constructs and sub-constructs that are important and feasible to measure. For example, what is meant by a healthy diet or diet quality and which of these should be measured? Which is likely to provide the most clarity about what is being measured? Consideration should also be given to the sub-constructs to measure, such as nutrient adequacy, ultra-processed foods, healthy and unhealthy foods and protection against NCDs. The third consideration is clarity around the population purposes. Estimation of prevalence and monitoring are two important measurement purposes; in addition, these measures might be useful for other purposes, such as identifying causes and consequences, triggering early warning, targeting certain groups or conducting impact evaluations. The fourth consideration is usefulness and acceptability for countries (e.g., are the measures interpretable and actionable? Are the data accessible? Can the measures be scalable, down to provinces and districts). Composite measures are not always useful or understandable to countries. The fifth consideration is harmonization, including whether similar measures should be merged or whether a suite of measures with different constructs, strengths and purposes would be most appropriate.

The importance of harmonization can be illustrated through the work to produce the Joint Malnutrition Estimates (JME). Before the first JME collaborative group was formed in 2011, there were four separate entities producing child malnutrition estimates. The latest iteration includes a country-level model, which has produced a set of annual estimates for each country. The modelling is complex but relatively simple to explain to governments. Another example is the assessment of household and individual food insecurity; the four most used experience-based measures, which have a shared lineage, cover universal constructs and have a shared body of evidence about validity and cross-context equivalence. While the food insecurity experience scale (FIES) is used for SDG monitoring, the others are still useful.

Diet quality is not a clear construct. It is important for the constructs to be clear, useful, and acceptable to countries and harmonized to allow for a suite of measures that are used for the appropriate purposes.

Points of discussion

The need for harmonization

A number of participants recommended that resources be dedicated to harmonization of efforts rather than development of competing metrics and systems. There was also general agreement that common terminology would facilitate uptake and advocacy of dietary metrics.

Concepts and constructs related to 'healthy diets' and 'diet quality'

It is important for the global community to be clear about the diet constructs that need to be communicated in order to improve global nutrition. Some participants argued that the concept of a 'healthy diet' would be most conducive to identifying constructs to measure and communicate, while other participants felt that 'diet quality' was useful in describing a set of characteristics, such as nutrient adequacy, dietary diversity, balance and moderation. Work on diet costs has approached the issue by separating 'diet quality' into the two constructs of dietary patterns by functional food groups and adequacy of essential nutrients and specific compounds. This leads to a 'ladder' of diet costs because reaching nutrient adequacy is less expensive than meeting food group targets. [50] Other participants argued for only two broad constructs of diet quality: nutrient adequacy and risk of NCDs (the latter which would include satiety, phytonutrients, UPF, fibre, etc.).

Some participants suggested identifying the various constructs that would need to be included in an overall indicator or suite of indicators on diet quality; for example, nutrient adequacy; NCD protection; consumption of UPF. A suggestion was also made for a numerical score of overall diet quality, with components to explain why scores are low or high based on specific food groups. The radar graphs used with the HEI are a good visual for explaining the components that contribute to the total score, although the food groups to limit are more challenging.

It was noted that measures of UPF were useful in conferring both risk of lower probably of nutrient adequacy and risk of NCDs. UPF metrics are also important for monitoring because they indicate dietary shifts and are relevant for appropriate policy actions. At the same time, some diets do not include ultra-processed foods but nonetheless carry a high risk of negative health impacts (e.g., traditional meat and dairy diets).

Ease of communication and clarity with policymakers is paramount. For example, some participants felt that composite indicators and scores were not clear and actionable and required too much interpretation or explanation. Metrics that require significant analysis can also delay country efforts to use data to inform and track policies and programmes. It

was also noted that the ability to take action occurs at both the national policy level and the consumer level.

A useful output of the consultation could be the development of a conceptual diagram or flow chart from overall diet quality to various constructs and specific metrics, followed by data sources and uses.

IV. Topic 3: Defining and prioritizing next steps for identifying a global metric for monitoring of healthy diets



Participants representing various stakeholder perspectives – including metric developers, data collectors, data users, United Nations agencies and funding partners – shared some suggestions for next steps and priorities for identifying metrics for global monitoring of healthy diets. Below is a summary of the presentations covered under Topic 3.

Anna Herforth, Senior Research Associate, Harvard T.H. Chan School of Public Health (*Developers of metrics*)

Metric developers tend to focus on validity of the indicator (i.e., efficacy – does the indicator reflect its intended purpose). However, there is an equal need to assess the validity of the data collection tool (i.e., effectiveness – does the data collection result in accurate and reliable information). Cognitive validity is critical, including ensuring that respondents can answer the questions and that their understanding matches the intention of the question, in all contexts. The feasibility of data requirements is also important. Some diet quality measures require quantitative dietary intake data, like the HEI, AHEI and DQI, with proxies used to fill gaps by modelling in countries where such data do not exist. The 24-hour open recall is used to collect information on food items. For some measures, such as the GDQS, semi-quantitative information on amounts can be collected, while for the MDD-W, only very limited information on amounts is collected. The methods to understand quantities consumed require testing to ensure accuracy. List-based questions are used to collect data for the GDR Score and Nova-UPF Score, and can also be used for the MDD-W.

In metric development, increased attention to cognitive validity is needed, in addition to indicator validation. The more strenuous the estimation or food knowledge required, the more systematic bias to expect. The use and utility of metrics is tied to their data collection needs.

Bo Beshanski-Pedersen, Household Survey Specialist, UNICEF/MICS (*Collectors of the data*)

DHS and MICS collect data in approximately 110 countries. Gallup World Poll is the largest survey but not truly global either. The indicators and data collection tools selected for global use must allow for flexibility; selecting one metric would be a disservice. Lack

of consensus on metrics has resulted in diets being overlooked in the SDG indicators. It is therefore important to reach consensus on what is 'good enough' to begin with in order to raise diet quality to the level of attention that it deserves. The Early Childhood Development Index, for example, was developed as part of MICS; even though developers were not completely satisfied with the indicator, it was selected for monitoring the SDGs and contributed to creating a semi-global dataset because it was prioritized at the highest level. Since then, the Index has been improved to become a much better measure. This highlights the potential for selecting a metric and continuing to improve it over time.

Each of the tools discussed during the consultation has equal merit. From the perspective of a data collector, validity at the measure level should be taken into consideration during the data collection phase. The fit of the tool into the priorities of the survey programme is also important; while it may be possible to integrate questions into an existing survey, these questions must match the priorities of the survey to be impactful. MICS include follow-up telephone surveys of a sub-sample of respondents as a validation exercise. This is a useful approach to avoid overburdening surveys that are not a good match and to allow for better timing and training of those doing the surveying.

Kaleab Baye, Associate Professor, Addis Ababa University
(*Users of the metric data*)

The need to prioritize simplicity – for both enumerators and end-users – cannot be overstated. Analysis and interpretation must be clear and straightforward. The indicators selected to measure diet quality will be used by various stakeholders for multiple purposes (e.g., policy, programme monitoring and evaluation, setting targets and targeting groups for interventions), despite their initial intended purpose. Metrics should be able to capture multiple dimensions of the diet and allow for assessment of nutrient adequacy, NCD risk and food safety.

It is critical that the indicators allow for meaningful disaggregation by geographic location, age and other factors to monitor inequalities in healthy diets and affordability of diets. This is important to assess whether progress is happening broadly or only for a segment of the population. Seasonality is also an important factor in LMICs. A composite indicator or set of indicators that complement each other (with guidance on core and optional components) may be most useful.

Chika Hayashi, Senior Adviser, UNICEF Division of Data, Analytics, Planning and Monitoring
(*Joint remarks from UNICEF, WHO, FAO and WFP*)

There is no SDG indicator or global monitoring framework on diet quality and no universally recommended set of metrics on dietary intake. A global diet monitoring framework would help us better understand patterns and trends over time, between and among countries and across population subgroups. It is also useful for governments, who should be the primary users, along with researchers, programme implementers and evaluators, and industries and sectors outside of nutrition as well.

Four points are fundamental to consider in moving forward: (1) A harmonized approach to metrics is critical; it allows for comparison of standardized indicators across countries; it is also important to harmonize guidance to countries on the different modalities through which dietary information can be collected and how these data can be used to improve nutrition in their countries; (2) A global diet monitoring approach must be relevant in LMICs and contribute to developing nutrition, health and food policies and guidelines, while addressing issues of data scarcity; (3) Rigour must be applied in the development and validation of metrics, including in different settings and subgroups. Differences in estimates derived from different metrics must be understandable to countries to avoid confusion; and (4) Long-term collaboration and sharing among developers and users of metrics is important.

Three recommendations of the TEAM Working Group on Diet Quality were to 1) convene this consultation to harmonize actions; 2) set guidelines on what indicators should be used to monitor diet quality; and 3) advocate for diet quality monitoring to donors and countries. Outcomes of the consultation will be reported to the TEAM during its meeting in July 2021. Technical discussions on metrics will continue and a strategy will be developed on global diet quality monitoring (including contributions from governments) to build a road map of next steps.

Shawn Baker, Chief Nutritionist, USAID
(*Donors*)

There are important opportunities to move this agenda forward given the global attention to food systems. Good dietary data is the common language and can help explain whether actions to improve food systems are leading to intended outcomes. Dietary patterns are diverse and changing quickly, meaning that better data are critical. The food system is also vulnerable to shocks and these need to be better understood in order to mitigate them.

There is a need to make the case for structural investment in measures of diet quality as a global public good. Mobilizing investments begins with national investments so that donors can lend support without it being seen as a donor-driven priority.

Dietary aspects that need to be better understood include nutrient adequacy (including for the most at-risk populations) and inequalities in the quality of diets, affordability and safety. Government ownership and the legitimacy of the organizations collecting the data are what drive donor investment.

It is important to decide what metrics are 'good enough' to move forward and recognize them as a work in progress. While these discussions will continue to take place internally, the nutrition community needs to speak with a unified voice with external audiences, as differences in opinions and estimates can cast doubt in discussions with policymakers.

Points of discussion

Below is a summary of related discussion points raised in plenary and the virtual chat.

On metric development

It was noted that the GDQS can be collected and calculated from all sources of information as was done as part of the validation studies. Cognitive testing is important in development of the method. The final dietary assessment method also needs to be tested in relation to disease risk, biomarkers, risk factors and other intake assessment methods.

Policymakers are key data consumers; they are interested in metrics that can reliably predict the results of actions taken under different scenarios. It is also important to clarify with policymakers what can and cannot be done with the metrics proposed.

On data collection

There are politics and practicalities related to harmonization; for example, DHS and MICS are fairly harmonized in their methods across surveys, and changes to these methods would need to be driven by higher-level leadership. Differences in survey methods could also be addressed by modelling, as these approaches can use all sources of data and country diet quality scores can be rated by quality of data (e.g., top score if based on a national 24-hour dietary recall survey, a lower score if it is Gallup World Poll and the lowest score if there are no national data aside from FBSs). These can all be used to create an overall indicator of diet quality.

It is more appropriate to continue with parallel methods when the purposes are widely different. Large-scale institutional capacity-building for data collection on diet metrics is also a challenge. Currently DHS are the only platform collecting diet data for women of reproductive age and on IYCF practices. Gallup covers the total population, allowing gender disaggregation. In theory, DHS could also do this, but it would take a lot of advocacy to make that change.

Most data collection platforms do not cover high-income countries. For global monitoring (including for the SDGs) coverage of high-income countries is also important.

On data use

Data users need metrics based on complex science but with a simple message. To understand the burden of malnutrition, policymakers need data at the subnational level. To improve both human and planetary health, they also need to understand how consumption affects production and sustainability.

The issue of conflicting estimates and the potential negative impact on policy discussions needs to be addressed. While there may be good technical reasons for conflicting estimates, policymakers will not take action when the issue is presented in diverging ways; a clear message is critical. Communication also needs to translate well across agriculture, education, and other sectors.

On United Nations agencies

United Nations agencies find it useful to have a suite of metrics that can be used in their advocacy and dialogue with countries. Agreement on an interim metric is important to move the agenda forward, with the objective of improving it over time, noting that it can also be challenging to make significant changes given the impetus to monitor trends.

Apps can facilitate the process of data collection; however, external companies often need to develop and maintain these tools, which has financial implications. One participant queried whether United Nations agencies could contribute to developing and maintaining such tools.

Monitoring of healthy diets should be a core focus of the United Nations Food Systems Summit. Food systems cannot be shifted intelligently without better knowledge about what people are eating.

On resource mobilization

Lack of government prioritization and funding are the main obstacles to achieving the goal of better dietary data. A discussion is needed on strategies to drive political will and resource investment. The coalition of United Nations agencies sponsoring this consultation, along with USAID Advancing Nutrition, is a strong force for accelerating that momentum and catalysing additional political will and resources for these efforts.

There is also a need to prioritize resources for innovative, reliable tools for diet assessment. Technology and innovation can help break down data collection barriers. However, the first step is to drive uptake of dietary data by governments to inform policies and encourage national investment in dietary data collection. Data use will drive the process, as governments use dietary data to invest in building stronger food systems and donors in turn support with additional investment.

Donor funding towards development of a panel of biomarkers of diet and nutrition could also help address some of the shortcomings of diet assessment and complement them.

Cross-cutting points

It would be premature to reach consensus on some of the questions posed during this consultation; many data developers are in the process of validating aspects of their metrics and these results are needed to inform next steps. Some participants suggested that the group reconvene when there is more information available; some consensus on elements of a metric or indicator could be advanced in the meantime.

The metric of healthy diets must be applicable globally to be effective and validation against disease outcomes is essential. Some participants felt that any metric selected must be able to inform policy and be linked to consumers (e.g., via dietary guidelines). In Brazil, for example, dietary guidelines designed using simple metrics were easily communicated to consumers; and when consumers understand these guidelines, they become advocates for them. This is important because some metrics will face resistance from the food

industry – particularly those that result in declining profits for the industry – and will benefit from the public's support. Metrics also need to link with the policy cycle to identify gaps and support monitoring and sustainability of the policy and resultant programme implementation.

Consensus on one or more indicators of healthy diets (even if provisional) is important to have any global influence. One participant noted that the GDQS covers both nutrient adequacy and NCD risk and could be modified and renamed for this purpose as needed. It can also be estimated from all sources of data, including modelled dietary data. Another participant noted that different data collection platforms would be required for the GDQS given that quantitative information is required rather than list-based questions. Some participants queried whether a non-quantitative version of the GDQS could be explored, despite its limitations. Some empirical comparative evidence may be useful to address these questions.

Consensus on a single data collection method may not be necessary; rather, countries would benefit from a menu of options from which to choose based on their applicability and usefulness in relation to the local context. However, for global diet data, consensus is needed on the indicators and a feasible, affordable tool that is valid across diverse settings globally and can be incorporated into a global platform. Modelling data could also be tested and validated to fill gaps. Indeed, testing and validating proxy indicators on dietary/nutrient intake is important not only to assess adequacy, but to help project the contribution of different interventions towards improvement and demonstration of programme performance.

Metric development should consider future costs and affordability. The sources of data and the math used to calculate results can also be improved over time to measure the same construct better in the future.

Wide data availability was critical to FIES being included as an SDG 2.1 indicator. Some participants questioned whether an indicator used globally (e.g., in SDG monitoring) could do more harm than good if it was not valid for all countries. Others felt that such an indicator would still be adequate to achieve reliable data for a threshold of the global population.

V. Concluding remarks

Nancy Aburto, Deputy Director, Food and Nutrition Division, FAO

Healthy diets are a cornerstone of good nutrition today and for future generations. FAO's mandate, as codified in the preamble to the FAO Constitution, includes a call to raise levels of nutrition globally. The organization has a clear role in ensuring that healthy diets are available, accessible, and affordable to all. Data on diets are at the core of the strategy for FAO's work in nutrition, which has just been endorsed by Members and recommits to improving data collection, understanding and use.

FAO has a number of initiatives related to dietary data and diet quality. This includes work to advance MDD-W, including expanding validation, increasing capacities and using innovative strategies to expand its reach and usefulness. HCES and FBS are also potential data sources for data quality metrics. The new FAO Food and Diet Domain will be a central hub for statistics on dietary data and will be accessible later in 2021.

With the preparations for the United Nations Food Systems Summit, the current focus on diet quality is unprecedented. It is important to leverage this opportunity to accelerate efforts to close data gaps and address divergences in terminology and approaches. Robust global dietary data are essential for understanding the risks of undernutrition and NCDs but there is a lack of systematic information on dietary intake globally and, particularly, in LMICs. Measuring diet quality is critical for global and national monitoring and policy and programme planning. FAO agrees that validity and reliability of data quality metrics are fundamental; tools should not be scaled up until validated.

No one metric can meet all needs; rather, a suite of metrics or a matrix or mapping exercise may be needed. Harmonizing approaches to data quality assessment is important. The consultation is the foundation for strengthening future collaboration and FAO is eager to engage in the next steps.

Francesco Branca, Director, Department of Nutrition and Food Safety, WHO

The consultation is timely given the upcoming United Nations Food Systems Summit. However, the lack of clarity around the concept of a healthy diet poses a challenge to these efforts. With the United Nations Food Systems Summit the concept of a healthy diet is being challenged with new concepts, such as nutritious food. However, the lack of clarity in terminology is constraining the work to identify solutions. There are challenges throughout the data value chain, especially the lack of availability of data for certain subgroups. There is a need to have good data about children's diets, covering different

geographies and socioeconomic groups. Having different methods to collect data is an asset and integration with modelling could be a way forward.

It is also critical to make the data collected accessible to all. Collaboration between WHO and FAO on the Global Individual Food Consumption Data Tool (FAO/WHO GIFT) platform can support these accessibility efforts. Further, WHO will revise the approach to dietary data collection of the STEPwise Approach to NCD Risk Factor Surveillance (STEPS) survey to improve access. Interpretation of the data is also important to understand the impact on health, malnutrition, and the burden of disease. As such, WHO is working on a continuous update of the evidence to better understand what data on dietary intake mean for health.

On the use of data, operational targets would be helpful to drive policy change, including targets related to agriculture, trade and price policies. A 'good enough' metric can help drive policies in the interim. Partnership allows for impacting the data value chain at different points of intersection. The concept of sustainability is important and will need to be measured; this includes the way food is produced and distributed. Elements of sustainability can be built into an analysis of dietary metrics.

Mark Hereward, Associate Director, Data and Analytics, UNICEF

UNICEF has always recognized the role of diets in influencing nutritional status. The UNICEF conceptual framework highlights diet as an immediate determinant of maternal and child malnutrition. The revised framework, which was released as part of the UNICEF Nutrition Strategy 2020–2030, also recognizes the importance of the food environment in tackling both undernutrition and overweight and obesity.

Standardized data on the diets of children under 2 years of age exist because there are standardized indicators and a data collection strategy. UNICEF recently released new guidance on monitoring IYCF practices[51] and continues to maintain the global IYCF database, which provides cross-country estimates. Similar efforts are needed to monitor the diets of individuals over 2 years of age.

This consultation is a response to the lack of harmonized metrics, platforms and methods for measuring diets. Considering the upcoming United Nations Food Systems Summit, the consultation is an opportunity to unite efforts and move towards convergence on metrics for use at national and global levels.

UNICEF is looking forward to expanding its database to include dietary patterns for all children; the consultation is a first step towards this goal. UNICEF is exploring innovative ways of assessing diets, such as capturing data by taking photos rather than asking questions. A global strategy for monitoring diets must address undernutrition and overweight; healthy and unhealthy eating; and be applicable in high-income, low-income and food insecure settings. The metric and data collection system must be easy to implement and communicate so it can also be used for advocacy.

Omar Dary, Health Science Specialist, Nutrition, USAID

Compromise will be necessary to have a clear, common message. It is important to define constructs for the characteristics of healthy diets that are to be measured. The study of nutrition began as metabolic science; now, the concept of diets is receiving more attention. But biochemical principals should not be neglected. Indeed, a healthy diet for one individual might not be the same for another because metabolic inherited traits are different. Moreover, nutritional needs change over the life course. Methods and tools should be tailored to context. While nutritional principals may be universal, solutions are local.

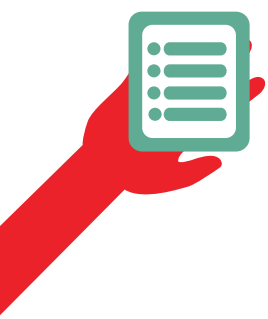
The consultation discussions reflect the multisectoral nature of the study of healthy diets. It is also important to recognize the combination of adverse effects due to inadequacies, excesses and socioeconomic and cultural conditions. Actions should not be centred only within nutrition and food science, but rather integrated and coordinated across all sectors, including health, social and behaviour change and regulations and policies. LMICs have different challenges than industrialized countries, and the challenges of the rural poor are different than those of the urban poor. This means it is important to identify challenges and inequalities at the subnational level.

Many tools for measuring healthy diets have been examined during the consultation; however, care should be taken in comparing their advantages and limitations because their purposes are often different. Application is most important – namely, whether these tools are easy to use and understand and whether they can be used to promote actionable policies. While some tools may be more appropriate at the national level, others will be more useful at a strata level or the individual level. Their effectiveness depends on objective and use.

Animal-source foods eaten in moderation, including ruminant meat, continue to be an important source of nutritious food, especially for young children. While continuing to encourage consumption of a heathy, safe and nutritious diet, fortification and supplementation can also be used to correct nutritional gaps, taking care not to supply excessive micronutrients. Fortification and supplementation, together with natural foods, should be included in any monitoring system for healthy diets.

Final remarks

Jennifer Coates, Associate Professor, Friedman School of Nutrition Science and Policy, Tufts University (TEAM co-chair and Working Group on Diet Quality lead)



The consultation has advanced the discussion on measuring healthy diets and provided some examples of a way forward. Achieving a global monitoring framework for monitoring healthy diets in a reasonable time frame will require the nutrition community to be efficient, strategic and rigorous.

The results of the consultation will be shared during the forthcoming TEAM meeting. The TEAM Working Group on Diet Quality will then launch the next phase of its process to develop a road map and strategy for collectively reaching its objectives related to diet quality metrics and monitoring.

Annex 1: Food Systems Framework

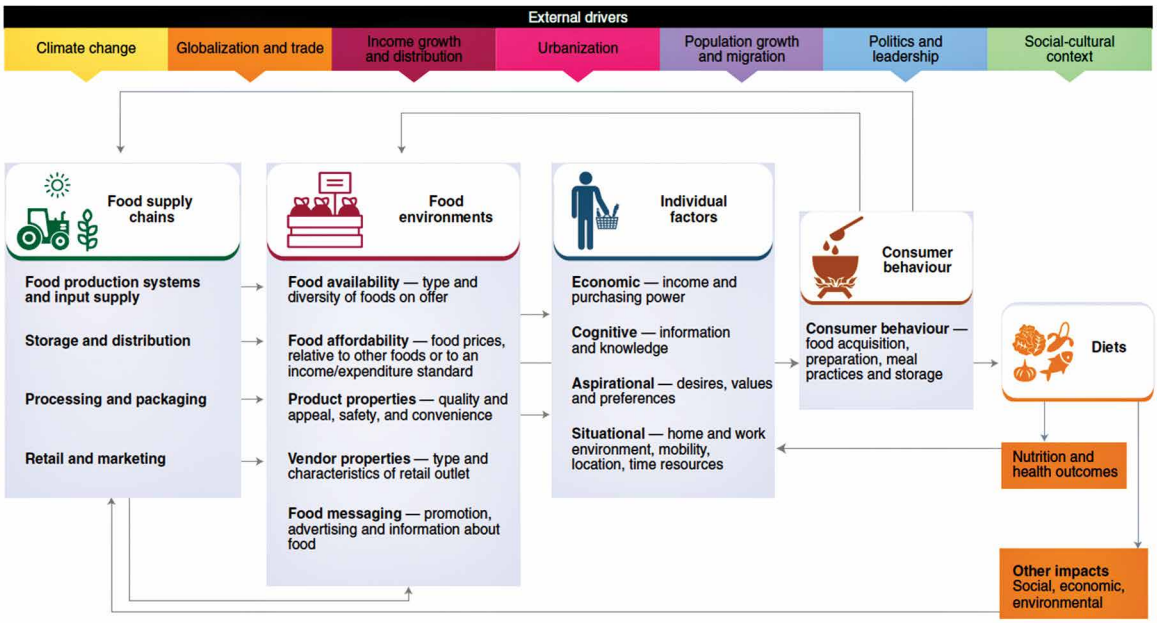


Fig. 1 | Food Systems Framework. The different components of food systems, their drivers and outcomes are interconnected. Figure adapted with permission from ref. [11].

Source: Fanzo et al., 2020.[52]

Annex 2: Meeting agenda

Technical Consultation on Measuring Healthy Diets: Concepts, Methods and Metrics

Day 1: Tuesday, May 18, 2021	
9:00–9:10 EDT 15:00–15:10 CEST	**Welcome** Moderator Rebecca Heidkamp, Associate Scientist, Johns Hopkins University Bloomberg School of Public Health
9:10–9:20 EDT 15:10–15:20 CEST	**Background and Purpose of the Online Technical Consultation** Jennifer Coates, Associate Professor, Friedman School of Nutrition Science and Policy, Tufts University and Chair, WHO/UNICEF TEAM Working Group on Diet Quality[53]
9:20–9:30 EDT 15:20–15:30 CEST	**Review Consultation Agenda** Rebecca Heidkamp
Topic 1: Overview of Global Diet Monitoring and Prioritization of Metric Criteria and Characteristics: Overview of monitoring of healthy diets: Needs, opportunities, data sources and methods, criteria and characteristics to consider, and past experiences and lessons learned.	
9:30–10:00 EDT 15:30–16:00 CEST	**Global Monitoring of Healthy Diets: Needs and Opportunities** Lynnette Neufeld, Director, Knowledge Leadership, Global Alliance for Improved Nutrition
10:00–10:25 EDT 16:00–16:25 CEST	**Metrics for Global Monitoring: Experiences and Lessons Learned** Chessa Lutter, Senior Nutrition Researcher and Senior Fellow, RTI International Marie Ruel, Director, Poverty, Health and Nutrition Division, International Food Policy Research Institute
10:25–10:35 EDT 16:25–16:35 CEST	Break
10:35–11:30 EDT 16:35–17:30 CEST	**Identifying Criteria Around Metrics for Global Monitoring of Healthy Diets** Working Groups
11:30–12:25 EDT 17:30–18:25 CEST	**Large Group Debrief & Day 1 Participant Survey** Working Groups
12:25–12:30 EDT 18:25–18:30 CEST	**Day 1 Wrap Up** Rebecca Heidkamp

Day 2: Wednesday, May 19, 2021	
9:00–9:15 EDT 15:00–15:15 CEST	**Introduction to Day 2** Rebecca Heidkamp
Topic 2: Methods, Tools, and Metrics to Measure Diets: Overview of existing metrics for potential use for global monitoring of healthy diets and potential data sources for metrics.	
Part A: Existing Metrics for Potential Use for Global Monitoring of Healthy Diets	
9:15–9:30 EDT 15:15–15:30 CEST	**Minimum Dietary Diversity for Women Indicator (MDD-W)** Yves Martin-Prevel, Senior Researcher, French Institute of Research for Development Maria Antonia Tuazon, Nutrition and Food Systems Officer, Food & Nutrition Division, FAO
9:30–9:45 EDT 15:30–15:45 CEST	**The Global Diet Quality Project** Anna Herforth, Senior Research Associate, Harvard T.H. Chan School of Public Health
9:45–10:00 EDT 15:45–16:00 CEST	**The Global Diet Quality Score** Megan Deitchler, Director, Intake - Center for Dietary Assessment, FHI Solutions
Part B: Potential Data Sources and Modelling Approaches for Metrics of Healthy Diets	
10:00–10:30 EDT 16:00–16:30 CEST	**Household Consumption and Expenditure Survey Data and Food Balance Sheet Data for Global Monitoring of Healthy Diets** Ana Moltedo, Consultant, Expert on Food Security and Nutrition Statistics, FAO Rachele Brivio, Consultant, Food Balance Sheets Expert, FAO Jennifer Coates, Associate Professor, Friedman School of Nutrition Science and Policy, Tufts University
10:30–10:45 EDT 16:30–16:45 CEST	Break
10:45–11:15 EDT 16:45–17:15 CEST	**Diet Quality Metrics Derived from Modelling Approaches** Global Burden of Disease Ashkan Afshin, Assistant Professor, Health Metrics Sciences, Institute for Health Metrics and Evaluation, University of Washington (10:45 – 11:00 EDT | 16:45 – 17:00 CEST)
	The Global Dietary Database Victoria Miller, Postdoctoral Fellow, Friedman School of Nutrition Science and Policy, Tufts University (11:00 – 11:15 EDT | 17:00 – 17:15 CEST)
11:15–11:30 EDT 17:15–17:30 CEST	**Nova Score for the Consumption of Ultra-Processed Foods: A New Tool to Monitor and Benchmark Population Diet Quality Globally** Carlos Monteiro, Professor, University of São Paulo
11:30–12:15 EDT 17:30–18:15 CEST	**Q&A**
12:15–12:25 EDT 18:15–18:25 CEST	**Day 2 Participant Survey**
12:25–12:30 EDT 18:25–18:30 CEST	**Day 2 Wrap Up** Rebecca Heidkamp

Day 3: Thursday, May 20, 2021	
9:00–9:15 EDT 15:00–15:15 CEST	**Introduction to Day 3** Rebecca Heidkamp
9:15–9:30 EDT 15:15–15:30 CEST	**Opportunities and Gaps in Global Monitoring of Healthy Diets in Individuals 2-19 Years** Ty Beal, Research Adviser, Global Alliance for Improved Nutrition
9:30–9:45 EDT 15:30–15:45 CEST	**Potential Metrics and Methods for Global Monitoring of Healthy Diets: Strengths, Gaps and Research Needs** Edward Frongillo, Professor, University of South Carolina
9:45–10:00 EDT 15:45–16:00 CEST	**Q&A**
Topic 3: Defining and Prioritizing Next Steps for Identifying a Global Metric for Monitoring of Healthy Diets: Panel and Discussion	
10:00–11:00 EDT 16:00–17:00 CEST	**Panel: Defining and Prioritizing Next Steps – Stakeholder Perspectives (5' each)** • Anna Herforth, Senior Research Associate, Harvard T.H. Chan School of Public Health -- Developers of Metrics • Bo Beshanski-Pedersen, Household Survey Specialist, UNICEF/MICS -- Collectors of the Data • Kaleab Baye, Associate Professor, Addis Ababa University -- Users of the Metric Data • Chika Hayashi, Senior Adviser, Monitoring and Statistics, UNICEF -- United Nations joint remarks • Shawn Baker, Chief Nutritionist, USAID – Donors/Funding Partners
	Additional Stakeholder Contributions (10')
	Q&A and Discussion (25')
11:00–11:15 EDT 17:00–17:15 CEST	Break
11:15–11:40 EDT 17:15–17:40 CEST	**Next Steps and Concluding Remarks** Nancy Aburto, Deputy Director, Food and Nutrition Division, FAO Francesco Branca, Director, Department of Nutrition and Food Safety, WHO Mark Hereward, Associate Director, Data and Analytics, UNICEF Omar Dary, Health Science Specialist, Nutrition, USAID
11:40–11:55 EDT 17:40–17:55 CEST	**Concluding Remarks and Farewell** Jennifer Coates, Associate Professor, Friedman School of Nutrition Science and Policy, Tufts University (Team co-chair and Working Group on Diet Quality lead)

Annex 3: List of participants

Name	Job title	Organization	Work country
Ashkan Afshin	Assistant Professor, Health Metrics Sciences	Institute for Health Metrics and Evaluation (IHME), University of Washington	United States
Imelda Agdeppa	Director IV and Scientist II	Department of Science and Technology - Food and Nutrition Research Institute	Philippines
Rina Agustina	Lecturer/Head of the Center	Department of Nutrition; and Human Nutrition Research Center, Indonesian Medical Education and Research Institute, Faculty of Medicine Universitas Indonesia	Indonesia
Silvia Alayon	Director for Measurement	USAID Advancing Nutrition	United States
Davide Arcella	Team Leader	WHO/European Food Safety Authority	Italy
Shawn Baker	Chief Nutritionist	USAID	United States
Carolina Batis	Researcher	National Institute of Public Health Mexico	Mexico
Kaleab Baye	Associate Professor	Center for Food Science and Nutrition, Addis Ababa University	Ethiopia
Ty Beal	Research Adviser	GAIN	United States
Winnie Bell	Senior Researcher	Friedman School of Nutrition Science and Policy, Tufts University	United States
Bo Beshanski-Pedersen	Household Survey Specialist	UNICEF/MICS	United States
Elaine Borghi	Statistician	World Health Organization	Switzerland
Rachele Brivio	Consultant, Food Balance Sheets Expert	Food and Agriculture Organization of the United Nations (FAO)	Italy
Sabri Bromage	Research Fellow	Department of Nutrition, Harvard T.H. Chan School of Public Health	United States
Inge Brouwer	Associate Prof Food systems for Healthier Diets	Wageningen University/CGIAR-A4NH	Netherlands
Janet Cade	Professor	University of Leeds	United Kingdom
Alicia Carriquiry	Professor	Iowa State University	United States

Jennifer Coates	Associate Professor	Tufts University	United States
Camila Corvalan	Researcher	Institute of Nutrition and Food Technology-U of Chile	Chile
Hope Craig	Research Specialist	Cornell University	United States
Julia D'Aloisio	Independent Consultant	JLD Content and Communications	Canada
Omar Dary	Health (Nutrition) Science Specialist	USAID, Bureau for Global Health	United States
Saskia de Pee	Senior Technical Adviser - Nutrition	WFP	Italy
Megan Deitchler	Director	Intake - Center for Dietary Assessment at FHI Solutions	United States
Ha Do Thi Phuong	Head of Community Nutrition	National Institute of Nutrition	Viet Nam
Jessica Fanzo	Professor	Johns Hopkins University	United States
Edward Frongillo	Professor	University of South Carolina	United States
Teresa Fung	Professor	Simmons University	United States
Jonathan Gorstein	Senior Program Officer	Bill & Melinda Gates Foundation	United States
Fatima Hachem	Senior Nutrition Officer	Food and Agriculture Organization of the United Nations	Italy
Sarah Hanck	Senior Adviser, Strategy & Impact	Rockefeller Foundation	United States
Chika Hayashi	Senior Adviser, Monitoring and Statistics	UNICEF	United States
Rebecca Heidkamp	Associate Scientist	Johns Hopkins University	United States
Anna Herforth	Senior Research Associate	Harvard School of Public Health	United States
Kirsten Herrick	Program Director	National Cancer Institute, NIH	United States
Bridget Holmes	Nutrition Assessment Group Leader	Food and Agriculture Organization of the United Nations	Italy
Margaret Holmesheoran	Nutrition Adviser	USAID BHA	United States
Jo Jewell	Nutrition Specialist	UNICEF	United States
Edward Joy	Assistant Professor in Nutrition	London School of Hygiene & Tropical Medicine	United Kingdom

Suneetha Kadiyala	Professor	London School of Hygiene and Tropical Medicine	United Kingdom
Gina Kennedy	Director, Food Systems	USAID Advancing Nutrition	United States
Sharon Kirkpatrick	Associate Professor	University of Waterloo	Canada
Julia Krasevec	Statistics and Monitoring Specialist	UNICEF	United States
Mary L'Abbe	Professor, Department of Nutritional Sciences	University of Toronto	Canada
Carl Lachat	Prof	Ghent University	Belgium
Mark Lawrence	Professor of Public Health Nutrition	Deakin University	Australia
Chessa Lutter	Senior Nutrition Researcher and Senior Fellow	RTI International	United States
Swetha Manohar	Fellow	Johns Hopkins University - SAIS	United States
Yves Martin-Prevel	Senior Researcher	IRD	France
William Masters	Professor	Tufts University, Friedman School of Nutrition	United States
Vrinda Mehra	Statistics Specialist	UNICEF	United States
Renata Micha	Associate Professor | Chair	Tufts University | Global Nutrition Report	Greece
Victoria Miller	Postdoctoral Fellow	Friedman School of Nutrition Science and Policy, Tufts University	United States
Erin Milner	Senior Nutrition Monitoring, Evaluation and Learning Adviser	USAID	United States
Ana Moltedo	Consultant, Expert on Food Security and Nutrition Statistics	Food and Agriculture Organization of the United Nations	Uruguay
Carlos Monteiro	Professor	University of São Paulo	Brazil
Dariush Mozaffarian	Dean	Tufts Friedman School of Nutrition Science and Policy	United States
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Lynnette Neufeld	Director, Knowledge Leadership	Global Alliance for Improved Nutrition	Switzerland
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Endnotes

1. The Seventh Meeting of the WHO-UNICEF Technical Expert Advisory Group on Nutrition Monitoring (TEAM): Meeting report 5–6 February 2019. Geneva: World Health Organization and United Nations Children's Fund; May 2019.
2. Sustainable healthy diets – Guiding principles. Rome: Food and Agriculture Organization and World Health Organization; 2019. pps. 10–11 (http://www.fao.org/documents/card/en/c/ca6640en/, accessed October 2021).
3. Fanzo et al., The Food Systems Dashboard is a new tool to inform better food policy. Nature Food. 2020. 1:243-246.
4. Such as INDEXX: Methods development, innovation, data utilization; GDD: Dietary data consolidation, analysis and methods improvement; INTAKE: Technical support for dietary assessment in low- and middle-income countries; FAO/INFOODS: Collection and consolidation, and quality improvement of food composition tables; FAO/WHO GIFT: Public repository of quantitative individual-level dietary data.
5. See: Willett, W. et al., Food in the Anthropocene: the EAT–Lancet Commission on healthy diets from sustainable food systems. Lancet. 2019; 393: 447-492; and Neufeld LM, Hendriks C, Hugas M. Healthy diet – A definition for the United Nations Food Systems Summit 2021. March 2021.
6. Indicators for assessing infant and young child feeding practices: definitions and measurement methods. Geneva: World Health Organization and the United Nations Children's Fund; 2021 (https://www.who.int/publications/i/item/9789240018389, accessed October 2021).
7. See: http://www.fao.org/infoods/infoods/en/.
8. See: https://inddex.nutrition.tufts.edu/global-food-matters-database.
9. See for example, Herforth et al. 2019: https://academic.oup.com/advances/article/10/4/590/5482317.
10. Includes points of discussion raised in the plenary, chat and participant survey.
11. The food groups include: 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.
12. Minimum Dietary Diversity for Women – An updated user guide for measurement: From collection to action. Rome: Food and Agriculture Organization of the United Nations; 2021 (http://www.fao.org/documents/card/en/c/cb3434en, accessed October 2021).
13. FAOSTAT is the most visited page of all FAO websites, and is the world's most comprehensive statistical database, accessed by policymakers and practitioners in all regions of the world.
14. Food groups include: 1. whole grains; 2. other foods made from grains; 3. white roots/tubers; 4. legumes; 5. nuts and seeds; 6. vitamin A-rich orange vegetables; 7. dark green leafy vegetables; 8. other vegetables; 9. vitamin A- rich fruits; 10. citrus; 11. other fruits; 12. eggs; 13. fluid milk; 14. cheese; 15. yogurt; 16. processed meats; 17. unprocessed red meat (ruminant); 18. unprocessed red meat (non-ruminant); 19. poultry; 20. fish and seafood; 21. baked sweets; 22. other sweets; 23. sodas, energy drinks, sports drinks; 24. fruit juice and fruit-flavoured drinks; 25. sweet tea/coffee/cocoa; 26. packaged ultra-processed salty snacks; 27. instant noodles; 28. deep fried foods; 29. fast food.
15. Healthy diet fact sheet no. 394. Geneva: World Health Organization; 2018 (https://www.who.int/publications/m/item/healthy-diet-factsheet394, accessed October 2021).
16. At least 400 grams of fruits and vegetables a day; legumes (beans); nuts; whole grains; at least 25 grams of dietary fibre per day; less than 10% of total energy intake from free sugars; less than 30% of total energy

intake from fats; less than 10% total energy intake from saturated fats; less than 5 grams of salt per day; no processed meat; and less than 500 grams of red meat per week.

17. Herforth AW, Wiesmann D, Martínez-Steele E, Andrade G, Monteiro CA. Introducing a suite of low-burden diet quality indicators that reflect healthy diet patterns at population level. Current developments in nutrition. December 2020;4(12). https://doi.org/10.1093/cdn/nzaa168.
18. 16 healthy scoring food groups (legumes; nuts and seeds; dark green leafy vegetables; deep orange fruits; citrus fruits; other fruits; whole grains; liquid oils; fish and shellfish; poultry and game meat; low fat dairy; eggs; cruciferous vegetables; deep orange vegetables; other vegetables; deep orange tubers); seven unhealthy scoring food groups (processed meat; refined grains and baked goods; sweets and ice cream; sugar-sweetened beverages; juice; white roots and tubers; and purchased deep fried foods); and two food groups scored as unhealthy when consumed in excessive amounts (high-fat dairy; and red meat).
19. See for example: http://www.fao.org/documents/card/en/c/cb3434en/
20. See: https://www.gainhealth.org/resources/reports-and-publications/fortification-assessment-coverage-toolkit-fact
21. Food Data Collection in Household Consumption and Expenditure Surveys: Guidelines for Low- and Middle-Income Countries. Food and Agriculture Organization of the United Nations and World Bank; 2018 (https://openknowledge.worldbank.org/bitstream/handle/10986/32503/ , accessed October 2021).
22. Such as the World Bank Microdata Library (https://microdata.worldbank.org/); the International Household Survey Network (http://www.ihsn.org/); and the national statistics websites of Kenya, Pakistan and the Plurinational State of Bolivia.
23. Food Data Collection in Household Consumption and Expenditure Surveys: Guidelines for Low- and Middle-Income Countries. Food and Agriculture Organization of the United Nations and World Bank; 2018 (https://openknowledge.worldbank.org/bitstream/handle/10986/32503/ , accessed October 2021).
24. Fish are not included into the 600. However, the fishery dataset includes around 80 fishery products aggregated into SUA.
25. See: https://www.fao.org/faostat/en/#data/SCL.
26. Tang et al., (submitted) Systematic review of metrics used to characterize dietary nutrient supply from household consumption and expenditure surveys.
27. See: https://minimod.ucdavis.edu/.
28. See: https://micronutrient.support/.
29. Beal T, et al. Global trends in dietary micronutrient supplies and estimated prevalence of inadequate intakes. PLOS ONE, 2017; 12: 4: e0175554 (https://doi.org/10.1371/journal.pone.0175554, accessed October 2021).
30. See for example: Crovetto MM, Uauy R, Martins AP, Moubarac JC, Monteiro C. Household availability of ready-to-consume food and drink products in Chile: impact on nutritional quality of the diet. Revista médica de Chile. 2014 Jul 1;142(7):850-8; and: Fiedler JL, Lividini K. Monitoring population diet quality and nutrition status with household consumption and expenditure surveys: suggestions for a Bangladesh baseline. Food security. 2017 Feb 1;9(1):63-88.
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33. See: https://www.globaldietarydatabase.org/.
34. From analyses of national studies done in more than 15 countries. See: Monteiro CA, Cannon G, Lawrence M et al. Ultra-processed foods, diet quality, and health using the NOVA classification system. Rome: FAO; 2019 (http://www.fao.org/publications/card/en/c/CA5644EN/); Askari M, Heshmati J, Shahinfar H et al. Ultra-processed food and the risk of overweight and obesity: a systematic review and meta-analysis of observational studies. Int J Obes. 2020; 44:2080-91; and Pagliai G, Dinu M, Madarena MP et al.

Consumption of ultra-processed foods and health status: a systematic review and meta-analysis. Br J Nutr. 2020; 125:308-18.

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39. See: https://sustainablenutritioninitiative.com/sustainable-nutrition-initiative/.
40. Food and Agriculture Organization of the United Nations and the World Bank. ADePT-Food Security Module. 2018 (http://www.fao.org/food-agriculture-statistics/statistical-domains/food-security-and-nutrition/methodology/en/).
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44. See: https://foodperiodictable.org/about/.
45. See https://inddex.nutrition.tufts.edu/ and https://www.intake.org/.
46. For example, the Gallup DQ-Q data revealed gender disparities in diets in the United Republic of Tanzania (but not Ghana). See: https://news.gallup.com/opinion/gallup/321968/global-diet-quality-project-aims-bridge-data-ga.
47. See for example: https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(21)00714-5/fulltext.
48. See: https://www.cambridge.org/core/journals/public-health-nutrition/article/ultraprocessed-foods-what-they-are-and-how-to-identify-them/E6D744D714B1FF09D5BCA3E74D53A185.
49. However, some validation studies do exist. See: https://onlinelibrary.wiley.com/doi/10.1111/mcn.13014 for an example of a validation study of the ability of 10-14-year-olds in Burkina Faso to report quantitative 24-hour dietary recall data.
50. See for example: https://sites.tufts.edu/foodpricesfornutrition.
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52. Fanzo et al., The Food Systems Dashboard is a new tool to inform better food policy. Nature Food. 2020. 1:243-246.
53. The content of this presentation is covered in Section I, Introduction.



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